CM Marya

A Practical Manual of
PUBLIC HEALTH
DENTISTRY

A Practical Manual of
Public Health Dentistry

A Practical Manual of
Public Health Dentistry

CM Marya BDS MDS
Professor and Head
Department of Public Health Dentistry
Sudha Rustagi College of Dental Sciences and Research
Faridabad, Haryana, India

Inquiries for bulk sales may be solicited at: jaypee@jaypeebrothers.com

This book has been published in good faith that the contents provided by the author contained herein are original, and is intended for educational purposes only. While every effort is made to ensure an accuracy of information, the publisher and the author specifically disclaim any damage, liability, or loss incurred, directly or indirectly, from the use or application of any of the contents of this work. If not specifically stated, all figures and tables are courtesy of the author. Where appropriate, the readers should consult with a specialist or contact the manufacturer of the drug or device.

A Practical Manual of Public Health Dentistry

First Edition: **2012**

ISBN 978-93-5025-709-8

Printed at

List of Contributors

Anil Gupta MDS
Professor and Head
Department of Pedodontics
IDST Dental College
Muradnagar, Uttar Pradesh, India

Ashish Gupta MDS
Professor and Head
Department of Oral Surgery
Sudha Rustagi College of Dental
Sciences and Research
Faridabad, Haryana, India

Avinash Jnaneswar MDS
Professor
Department of Public Health
Dentistry
Sudha Rustagi College of Dental
Sciences and Research
Faridabad, Haryana, India

CS Baiju MDS
Professor and Head
Department of Periodontics
Sudha Rustagi College of Dental
Sciences and Research
Faridabad, Haryana, India

Hind Pal Bhatia MDS
Professor and Head
Department of Pedodontics
Santosh Dental College
Ghaziabad, Uttar Pradesh, India

HL Jayakumar MDS
Professor and Head
Department of Public Health
Dentistry
AECS Maaruti College of Dental
Sciences
Bangalore, Karnataka, India

KR Indushekhar MDS
Professor and Head
Department of Pedodontics
Sudha Rustagi College of Dental
Sciences and Research
Faridabad, Haryana, India

Navin Anand Ingle MDS
Professor and Head
Department of Public Health
Dentistry
Meenakshi Ammal Dental College
Chennai, Tamil Nadu, India

Preface

*" Accurate diagnosis of a disease depends on
the art of taking Case History"*

The traditional approach to the diagnosis and treatment of a patient in medicine or dentistry starts with recording of the history of the problem. Despite major advances in investigative techniques, an analysis of history and clinical examination of the patient remains the cornerstone of correct diagnosis and sound treatment. Even then, many clinicians skip the process, jump to "spot-diagnosis" and start with the treatment. Such an approach is likely to miss coincidental pathology and co-morbidity. Therefore, it is imperative that a detailed dental and general medical history is elicited and recorded on record sheets. The recording of an accurate medical history is in the best interest of patients and dental staff alike.

There is little information in the literature concerning the standard of medical history recording thought to be adequate and the questions necessary for comprehensive medical history taking. It has been suggested that efforts need to be made by the dental profession to set standards and formulate guidelines to establish a more standardized medical history questionnaire. The use of a pre-printed dental/medical history questionnaire can serve a valuable role in taking and documenting history and clinical examination of a patient, and formulation of a treatment plan. This manual is an effort in that direction.

There are several books of Public Health Dentistry available in the libraries and market but no book till date is written on how to successfully record a case history including indices and planning of treatment by dental students especially for the department of Public Health Dentistry. This book, written in concise and clear language, is intended to fill that lacuna.

This manual takes into consideration the method of history taking, clinical diagnosis, levels of prevention and comprehensive treatment planning. It also highlights different questions and also tries to provide answers. This book is intended to be used in practicals in Public Health Dentistry. The manual would be useful for both undergraduate and postgraduate students.

In conclusion, I hope that this manual will prove to be valuable to staff and students of the department of Public Health Dentistry.

CM Marya

Acknowledgments

Contents

Introduction

"Accurate diagnosis of a disease depends on the art of taking Case History"

Case history is an important and integral part of treatment.

Ideally case history is taken in a consultation room or a private office in which the surroundings and the conditions are entirely friendly and not like the dental operating room. In many occasions a properly prepared case history alone is sufficient to diagnose the disease without examining the patient.

Case history is defined as planned professional conversation that enables a patient to communicate his/her feelings, fear and sequence of events leading to the problem for which the patient seeks professional assistance, to the clinician so that patients' real or suspected illness and mental attitude of the patient can be determined.

Eliciting accurate, detailed and unbiased information from a patient is a skilled task and not simply a matter of recording the patient's responses to a checklist of questions. Avoid interrupting patients, particularly as they begin to tell you the story of the presenting features of the illness. Recognizing the patient's need to talk without interruption and being a good listener will greatly help you to establish a good relationship quickly (Fig. 1.1).

A case history is of immense value in the following ways:
• To provide information regarding etiology and establish diagnosis of oral conditions

Fig. 1.1: Listen to the patient

- To reveal any medical problem necessitating precautions, modifications during appointments so as to ensure that dental procedures do not harm the patient and also to prevent emergency situations
- Evaluation of other possible undiagnosed problems
- Discovery of communicable diseases
- Gives an insight into emotional and psychological factors
- For effective treatment planning
- Record maintenance for future reference and periodic follow-up
- Acts as a evidence in legal matters.

Components of Clinical Record Sheet:
- General Information
- History Recording
- Examination of the patient
- Establishment of provisional diagnosis
- Necessary investigations
- Final Diagnosis
- Treatment plan.

Methods of Recording a Case History

Establishing a good rapport with the patient is important for recording a complete history with valid information. A sincere smile and being a good listener will help reassure the patient that it is appropriate and safe to divulge personal information.

There is usually a traditional approach in the design of a case history. The preliminary part of the case history is usually based on questionnaires.

Sequence of case recording and evaluation:
• General Information
• Chief Complaint
• History of Present Illness
• Previous Dental History
• Medical History
• Family History
• Personal History
• General Physical Examination
• Extraoral Examination
• Intraoral Examination
• Provisional Diagnosis
• Investigations
• Final Diagnosis
• Treatment Plan.

General Information

It is recorded so as to impart knowledge to the investigator regarding important events in human life such as; births, deaths, marriage and migrations. Also, it makes the investigator familiar with the patient as it does contain personal details of the patient such as; name, age, etc.

PATIENT REGISTRATION NUMBER

It helps the investigator in:
- Record maintenance
- Billing purposes
- Medicolegal aspects
- Identification of the patient.

DATE

The date is recorded in full for the following purpose:
- Reference
- Record maintenance.

NAME

Knowing the complete name of the patient while recording history leads to:
- Identification
- Communication

- Establishing a rapport with patient
- Record maintenance
- Psychological benefit; specially in case of pediatric patient if called by nickname
- Sense of importance and acceptance to the patient
- Information of patient such gender and religion.

AGE

Age (date of birth) has a particular significance to the investigator to decide upon:
- Diagnosis
- Treatment planning
- Behavior management techniques.

It is also used for maintaining hospital records and to know the psychology/mental development of the patient which has role on his dietary habits, oral hygiene practices and personal habits.

Diagnosis

There is a predilection of certain diseases at different age levels. Based on the disease predilection of age patients are divided into:
- **Neonatal:** At Birth
- **1–3 Yrs**: Infancy
- **4–14 Yrs**: Child
- **15–20 Yrs:** Young Adults
- **21–40 Yrs:** Adults
- **40–50 Yrs:** Older Adults
- **Above 50 Yrs**: Old Age.

So based on these age groups one can rule out some of the dental diseases as well as medical conditions which in turn relate to dental problems.

For example, Periodontitis is seen generally in old age, i.e. > 50 yrs. But if the condition is seen in children and young adults one can confirm that it is Juvenile Periodontitis.

Examples of conditions present at different ages are mentioned as follows:

Conditions commonly present at birth:

- Cleft lip and palate
- Ankyloglossia
- Teratoma
- Hemophilia
- Facial hemihypertrophy
- Facial hemiatrophy
- Fissured tongue
- Median rhomboid glossitis, etc.

Conditions commonly present in children and young adults:

- Papilloma
- Juvenile periodontitis
- Scarlet fever, etc.

Conditions commonly occurring in old age:

- Attrition/abrasion
- Periodontitis
- Pulp stones
- Root resorption, etc.

Treatment Planning

- Comparison/Correlation of chronological age with dental age will help to decide the line of treatment for a patient.
  Chronological age gives information about the dento-skeletal development of the person.
- Growth spurts: It is also important in developmental and hereditary diseases which occur at the time of birth and grows up to the puberty or ceases with growth.
  - Infantile/childhood growth spurt
  - Mixed dentition/juvenile growth spurt
  - Prepubertal/adolescent growth spurt
- Calculation of child's dosage.

Based on age

1. Young's Rule

$$\frac{\text{Age} \times \text{adult dose}}{\text{Age} + 12} = \text{Dose for child}$$

Based on weight

2. Clark's Rule,

$$\frac{\text{Weight (in lb)} \quad \text{adult dose}}{150 \text{ (average weight for adult in lb)}} = \text{Dose for infant}$$

3. Fried's Rule for Infants

$$\frac{\text{Weight (in months)} \quad \text{adult dose}}{150} = \text{Dose for child}$$

Based on body surface area (BSA)

BSA is determined from a nomogram using the child's height and weight.

$$\frac{\text{Child s BSA}}{1.73 \text{ M}^2} \times \text{adult dosage} = \text{Dose for child}$$

Example: If the child has a BSA of 0.67 M^2 (in meters) and the adult dose is 40 mg. Then dose for child would be

$$\frac{0.67}{1.7} \times 40 = \frac{26.8}{1.7} = 15.8 \text{ mg}$$

Calculation of child's dosage by BSA is thought to be the most reliable method.

Behavior Management Techniques

Management of patients of different age groups requires different behavior modification methods.

SEX

Similar to age, certain dental and systemic diseases also show sex predilection. Some diseases are more specific to females while some are to males.

Diseases affecting them are as follows:

Females

- Iron Deficiency Anemia
- Pleomorphic Adenoma
- Sjogren's Syndrome

- Adeno Ameloblastoma
- Myasthenia Gravis
- Sickle Cell Anemia
- Thyroid Diseases
- Juvenile Periodontitis
- Peripheral Ossifying Fibroma
- Nasoalveolar Cyst
- Anorexia nervosa
- Parotid gland diseases
- Erosion
- Aphthous ulcers
- Oral Lichen Planus.

Males

- Stomatitis nicotina palate
- Hemophilia
- Attrition
- Carcinoma *in Situ*
- Carcinoma of the buccal mucosa
- Leukoplakia
- Keratoacanthoma
- Basal Cell Carcinoma
- Verrucous Carcinoma
- Adenoid cystic Squamous cell carcinoma
- Liposarcoma
- Hodgkins Disease
- Multiple Myeloma
- Chondrosarcoma
- Herpes Simplex
- Ewings Sarcoma
- Ameloblastic fibro-odontoma
- Basal cell Adenoma.

Along with sex Predilection of the diseases, Gender also helps to analyze the following:

1. Important for the treatment planning in case of orthodontic patients as timing of growth spurts is different in males and females.

2. Esthetic: Girls are more conscious about their esthetics.
3. Dosage of Drugs: The dosage of drug is affected by certain factors which are discussed below:
   - Females require low dosage of drugs than the Males as their Body weight is less when compared to the males
   - Extraordinary care should be taken while prescribing medicines to patients who are in Menstruation, Pregnancy, Lactation
   - Drugs given during pregnancy could affect the Fetus directly
   - Long term use of Antihypertensive Drugs can lead to Impotency in Males
   - Gynecomastia may be caused in males due to some medications like Digitalis, Ketoconazole, Chlorpromazine, etc.
4. Most of the times, sex is linked to occupation and in turn, related to occupational hazards.

EDUCATION

Education level of the person is recorded to determine:
- Socioeconomic status
- Intelligence quotient (IQ) for effective communication
- Attitude towards general and oral health.

ADDRESS

Full Postal Address should be taken in order for communication and to ascertain geographic distribution.
1. For future correspondence/Recall
2. Gives a view of the socioeconomic status. For example, diseases such as Diabetes, Hypertension and Dental caries are more prevalent in high socioeconomic status persons and diseases such as Tuberculosis, Chronic generalized periodontitis are more commonly found in low socioeconomic strata.
3. To know prevalence of diseases: certain diseases are found more in a particular area.
   For example:
   a. Fluorosis (as a result of increased level of fluorides in water) is spread differently in various parts of country. It is endemic in certain areas.

   b. Caries are more common in modern industrialized areas, whereas periodontal diseases are more common in rural areas.
   c. Filariasis common in Orissa
   d. Leprosy common in West Bengal
   e. Carcinoma of the Palate common in Srikakulam AP
4. For hospital records/Administrative purposes.

FACTORS RELATED TO SOCIOECONOMIC STATUS

Socioeconomic status (SES) is assessed by looking at an individual group's housing, occupation, education and income levels in comparison to their country's statistical averages from surveys. Socioeconomic status is typically broken into 3 categories: high SES, middle SES and low SES to describe the areas a family or an individual may fall into.

OCCUPATION

It is an indicator of socioeconomic status. Also, it shows predilection of diseases in different occupations, such as:

Oral Manifestations of Occupational Disease according to Etiologic Agent

Occupation	Specific factor	Possible oral manifestations
Cobblers, carpenters, glass blowers, musicians	Instruments for prehension	Localized abrasion
Fishermen, asphalt and coal tar workers, pavers, pitch roofers, wood preservers	Tar	Stomatitis, caricinoma of lip and mucosa
Bronzers, cement workers, electrotypers, metal grinders, miners, stone cutters	Copper, iron, nickel, chromium, coal, etc.	Staining of teeth, pigmentation of gingiva, generalized abrasion, calculus, gingivostomatitis, hemorrhage
Chemical workers, electroplaters, metal refiners, rubber mixers	Arsenic	Necrosis of bone, blue black pigmentation of gingiva

Contd...

Contd...

Occupation	Specific factor	Possible oral manifestations
Bismuth handlers, dusting powder makers	Bismuth	Blue pigmentation of gingiva, oral mucosa, gingivostomatitis
Refiners, bakers, candy makers	Sugar	Caries
Alcohol, distillery, explosives, shellac, smokeless powder and shoe factory workers	Amyl acetate	Stomatitis

(Adapted from I. Schour and B. G. Sarnat. Oral manifestations of occupational origin. JAMA 1942; 120: 1197)

Thus, occupation can be an important factor in determining the source or cause of the disease for the further treatment of the disease. It helps in planning appointments for the patient as per their occupation and also determines their affordability in relation to money and time for the treatment.

It also tells about the socioeconomic status of the patient and his ability to afford the nutritious food and use of healthy oral hygiene practices.

RELIGION

Religion has a particular significance to the investigator in:
• Identifying the festive periods when religious people are reluctant to undergo treatment procedures
• Predilection of diseases in specific religions.

Chief Complaint

The chief complaint is established by asking the patient to describe the problem for which he or she is seeking help or treatment. It is recorded in patient's own words as much as possible, and no documentary or technical language should be used. It answers the question, "Why are you here today?" It is primarily a statement of the patient's signs and symptoms. It is recorded in chronological order of their appearance, and in the order of their severity. The chief complaint aids in the diagnosis and treatment planning and should be given the first priority.

Common chief complaints include:

- Pain
- Bad taste
- Bleeding from gums
- Loose teeth
- Hypersensitivity
- Burning sensation
- Recent occlusal problems
- Delayed tooth eruptions
- Dry mouth
- Swellings
- Paresthesia and anesthesia
- Irregular teeth
- Missing teeth
- Routine dental check-up.

History of Present Illness

Initially, the patient may not volunteer the detailed history of the problem, so the examiner has to elicit out the additional information by the possible questionnaire about the symptoms. The patient's response to these questions is termed history of present illness. It is a chronological account of the chief complaint and associated symptoms from the time of onset to the time the history is taken. The history commences from the beginning of the first symptom and extends to the time of the examination.

Expanding the chief complaint by filling in the dimensions of the problem identified in the chief complaint provides a more complete statement—the history of present illness.

- The questions can be asked in the manner:
  - When did the problem start?
  - What did you notice first?
  - Did you have any problems or symptoms related to this?
  - What makes the problem worse or better?
  - Have any tests been performed before to diagnose this complaint?
  - Have you consulted any other examiner for this problem?
  - What have you done to treat this problem? Etc.
- In general, the symptoms can be elaborated under:
  - Mode of onset
  - Cause of onset
  - Duration

– Progress and referred pain
– Relapse and remission
– Treatment
– Negative history.

DETAIL HISTORY OF PARTICULAR SYMPTOM

Pain

The International Association for the Study of Pain (IASP) gives this definition as "an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage". The IASP classification system recommends describing pain according to five categories: duration and severity, anatomical location, body system involved, cause, and temporal characteristics (intermittent, constant, etc.)

Note the following:

• Anatomical location (site)
• Origin and mode of onset
• Intensity of pain
• Nature of pain
• Progression of pain
• Duration of pain
• Movement of pain

- Localization behavior
- Effect of functional activity
- Neurological signs
- Temporal behavior.

Analysis of Pain

The word pain is derived from Latin word 'poena' meaning penalty or punishment. It is a very common symptom and occurs in response to an injurious stimulus.

Four types of pain are noticed:
1. **Superficial:** occurs due to direct irritation of the peripheral nerve endings.
2. **Segmental:** occurs due to irritation of a sensory nerve trunk or root.
3. **Deep or visceral:** occurs due to irritation of deep structures in the body.
4. **Psychogenic or central:** pain arises from brain, due to an emotional or hysterical situation.

   Analysis of pain is important so as to reach to the proper diagnosis. A careful history is an essential prerequisite; else it may confuse the clinician to frame a wrong diagnosis. There are various factors to be considered in pain:

- **Site of pain:** determining the original site of pain is important. The clinician may ask the patient 'where did the pain start'? Although the site of pain may have changed after a short period, the original site must be known.
- **Origin and mode of onset:** The clinician may ask the patient 'how did the pain start'? The origin and mode of onset is important to determine the chronicity of pain. A long continued pain with insidious onset indicates chronic nature of the disease, whereas a recent onset of pain with sudden impact indicates acute nature of disease.
- **Severity:** The perception of pain varies in different individuals. A mild pain may be severe to others. The severity of a pain gives an impression of the acuteness of the symptoms felt by the patient, thus helping in constituting a proper diagnosis.

- **Type of pain:** There are various types of pain. The most common are:
  - *Vague pain:* It is a mild continuous pain, e.g. periodontal pain
  - *Burning pain:* Pain usually occurs with the burning sensation, e.g. reflex oesophagitis.
  - *Throbbing pain:* Type of pressured throbbing sensation is felt, e.g. in abscesses.
  - *Stabbing pain:* Sudden, severe, sharp and short-lived pain, e.g. acute pulpal pain.
  - *Shooting pain:* Pain increases in severity in a short period, e.g. trigeminal neuralgia.
- **Progression of pain:** The clinician asks the patient 'how is the pain progressing'? The progression of pain from the time of its onset is to be asked.
- **Duration of the pain:** In terms of days/months/years. The clinician asks 'how long the pain lasts'? Pain can be intermittant or continuous. A continuous pain is the one which persists for a longer duration. An intermittent pain is the one which occurs after short intervals of time.
- **Radiation of pain:** It is the extension of pain to another site, while the original site is still painful. The radiating pain has the same character as the original pain.

  Referred Pain is a term used to describe the phenomenon of pain perceived at a site adjacent to or at a distance from the site of an injury's origin. (Dorland's Medical Dictionary)
- **Precipitating or aggravating factors:** different factors may worsen the pain suggesting a specific diagnosis about the disease. For example, the pain of cracked tooth syndrome occurs when the patient relieves the occlusal pressure over the tooth.
- **Relieving factors:** factors which reduce the severity or frequency of pain are considered important in diagnosis. For example, in some cases, pain of chronic pulpitis gets relieved by cold application.
- **Associated symptoms:** pain may occur along with nausea, vomiting, sweating, flushing and increase in pulse rate.

Swelling

- Anatomical location (site)
- Duration
- Mode of onset
- Symptoms
- Progress of swelling
- Associated features
- Secondary changes
- Impairment of function
- Recurrence of swelling.

Examination of a swelling should be accompanied by a complete history of the patient. Following points should be noted:

- **Duration:** The clinician may ask 'when was the swelling first noticed'? Swellings that are painful and of shorter duration are mostly inflammatory (acute), whereas those with longer duration and without pain are chronic, e.g. a chronic periapical abscess.
- **Mode of onset:** The clinician may ask 'how did the swelling start'? The history of any injury or trauma or any inflammation may contribute to the diagnosis and nature of the swelling.
- **Progression:** The clinician should ask 'has the lump changed in size since it was first noticed? Benign growths such as bony swellings grow in size very slowly and may remain static for a long period of time. If the swelling decreases in size, this suggests of an inflammatory lesion.
- **Site of swelling:** The original site where it started must be assessed.
- **Other symptoms:** Pain, fever, difficulty in swallowing, difficulty in respiration, disfigurement, bleeding or pus discharge are the common symptoms associated with swellings in the orofacial region.
- **Recurrence of the swelling:** many swellings do recur after removal of the tissue, indicating the presence of precipitating factor, e.g. ranula.

Ulcer

COMMON TYPE OF ULCERS IN THE ORAL CAVITY

• Traumatic ulcer
• Recurrent aphthous ulcers
  – Bacterial infection
  – Immunologic abnormalities
  – Iron, Vitamin B_{12} or Folic acid deficiency
  – Hormonal conditions (premenstrual/postovulation period in females)
  – Psychic factors (stress)
• Infections, e.g. Tuberculosis, Syphilis, Oral Candidiasis, HIV
• Drug-induced Aspirin burn, allergic reactions to drugs, Stevens-Johnson syndrome
• Malignant squamous cell carcinoma
• Blood dyscrasias: Agranulocytosis, Anemia, Leukemia
• Underlying systemic diseases: Behcet's syndrome, Reiter's syndrome, Crohn's disease, Ulcerative colitis

An ulcer is a break in the continuity of epithelium. A proper history must be taken in case of an ulcer:

- **Mode of onset:** The clinician may ask 'how has the ulcer developed'? The patient may provide significant information about the nature and etiology of the ulcer such as any trauma or spontaneously.

- **Duration:** The clinician may ask 'how long is the ulcer present here'? It determines the chronicity of the ulcer. For example, traumatic ulcers in oral cavity are acute (occurring for a short period), but if the agent persists; it may become a chronic ulcer.

- **Pain:** The clinician may ask 'is the ulcer painful'? Most of the ulcers, being inflammatory in nature, produce pain. Painless ulcers usually suggest nerve diseases (such as peripheral neuritis, syphilis, etc).

- **Discharge:** Any blood, pus or serum discharge must be noted.

- **Associated disease:** Any associated generalized systemic problem may be associated with the ulcers of oral cavity (such as tuberculosis, squamous cell carcinoma, etc).

Dental Hypersensitivity

Causes

Exposure of dentinal tubules due to
• Wasting diseases — attrition, abrasion, erosion, abfraction
• Gingival recession
• Following periodontal surgery/root planing due to removal of cementum overradicular dentin.

Patient History

Patients often report with complaint of a sudden, short, sharp shock-like sensation in response to cold or hot, sweet or sour substances, or touch. This sensation is a hyperreactive pulpalgia and must be elicited by some exciting factor. It is never spontaneous. Exciting factors are usually cold food or drink or cold air, contact of two dissimilar metals that will yield a galvanic shock, or stimulation of the exposed dentin on the root surface by cold, sweet or sour, vegetable or fruit acid, salt, or glycerine, or often just touching the surface with a fingernail, toothbrush, or explorer.

Bleeding from the Gums

Patients often report with problems of chronic or recurrent bleeding, which is provoked by mechanical trauma (e.g. from toothbrushing, toothpicks, or food impaction) or by biting into solid foods such as apples.

History of Bleeding Gums

• Duration
• Amount/Quantity
• Ease with which bleeding can be elicited
• Associated symptoms (dull pain, sensitivity).

Causes

Chronic or recurrent bleeding: Most common cause is chronic gingival inflammation.

Acute bleeding
- Caused by injury or can occur spontaneously in acute gingival disease
- Acute Necrotizing Ulcerative Gingivitis (ANUG).

Gingival bleeding associated with systemic changes
- Hemorrhagic disorders (Vitamin C deficiency, Schonlein-Henoch purpura)
- Platelet disorders (thrombocytopenic purpura)
- Hypoprothrombinemia (Vitamin K deficiency)
- Other coagulation defects (hemophilia, leukemia, Christmas disease)
- Deficient platelet thromboplastic factor (PF_3) resulting from uremia, multiple myeloma, postrubella purpura
- Excessive intake of drugs (salicylates, anticoagulants — dicoumarol and heparin).

Dry Mouth (Xerostomia)

The subjective feeling of oral dryness is termed xerostomia. It is a symptom, not a diagnosis or a disease.

Causes of Xerostomia

- Developmental (Aplasia and hypoplasia of the salivary glands)
- Drugs (Tricyclic antidepressants, antipsychotics, antihistaminics, atropine, β-lockers)
- Radiation therapy of head and neck
- Oncologic chemotherapy
- Infections and inflammatory conditions (Parotitis, Mumps)
- Benign or malignant tumors of the salivary glands
- Systemic diseases
    - Sjogren's syndrome
    - Granulomatous diseases (Sarcoidosis, Tuberculosis)
    - Graft-versus-host-disease
    - Cystic fibrosis
    - Bell's palsy

- – Diabetes
- – Amyloidosis
- – HIV infection
- – Thyroid disease
- – Late stage liver disease
- – Patients on hemodialysis for end-stage renal disease
- Psychological factors (affective disorders)
- Malnutrition (anorexia, bulimia, dehydration)
- Idiopathic disorders
- Smoking, use of smokeless tobacco products, alcoholism and caffeine can aggravate dry mouth.

Diagnosis and Evaluation of Xerostomia

- **Patient history:** Patient complains of dryness of all oral mucosal surfaces, particularly at night, or of difficulty chewing, swallowing and speaking, mucosa may be sensitive to spicy or coarse foods.
- **Past and present medical history:** Assess for medical conditions or medications known to cause dry mouth.
- **Clinical features:** The oral mucosa may be dry and sticky, lips are often cracked, peeling and atrophic, buccal mucosa may be pale and corrugated or erethamatous due to an overgrowth of Candida albicans. There may be little or no pooled saliva in the floor of the mouth, and the tongue may appear dry with loss of papillation. The saliva may appear stringy, ropy or foamy. There is often a marked increase in erosion and dental caries, particularly root caries and even cusp tip involvement.

Two Additional Indications of Oral Dryness

"Lipstick sign" — Lipstick adheres to the facial surface of maxillary anterior teeth.

"Tongue-blade sign" — Tongue blade adheres to the buccal mucosa.

Clinical examination should also include bimanual palpation of major salivary glands to assess the size, consistency and tenderness of the glands, and also to determine if saliva can be expressed via the

main excretory ducts. Enlarged, painful glands are indicative of infection or acute inflammation. The consistency should be slightly rubbery, but not hard, and distinct masses within the body of the gland may be indicative of a salivary gland tumor.

Several office tests and techniques can be utilized to ascertain the function of salivary glands. Sialometry, or salivary flow measurement can determine the salivary output from the individual major salivary glands or from the whole saliva. Unstimulated whole saliva flow rates of < 0.1 mL/min and stimulated whole saliva flow rates of < 1.0 mL/min are considered abnormally low and indicative of marked salivary gland hypofunction.

Salivary gland imaging can provide information on salivary function, anatomic alterations, and space-occupying lesions within the glands. Various salivary gland imaging modalities include plain-film radiography, Sialography, Ultrasonography, Radionuclide Salivary Imaging, Computed Tomography and Magnetic Resonance Imaging. Minor salivary gland biopsy is often used in the diagnosis of Sjögren's syndrome (SS), human immunodeficiency virus-salivary gland disease, sarcoidosis, amyloidosis and graft-vs-host disease. Biopsy of major salivary glands is an option when malignancy is suspected.

Burning Sensation of the Mouth

Burning sensations accompany many inflammatory or ulcerative diseases of the oral mucosa, but term Burning Mouth Syndrome is reserved for describing oral burning that has no detectable cause.
- Local causes
  - Stomatitis
  - Ulcers
  - Infections (e.g. Candidiasis)
  - Dry mouth, salivary gland hypofunction
  - Mucosal disorders (Geographic tongue, lichen planus, etc.)
  - Trauma to oral mucosa (e.g. Poorly fitting dentures)
  - Gastroesophageal reflux disease.
- Systemic causes
  - Vitamin B_{12}, folate, iron deficiencies
  - Medication (e.g. ACE inhibitors such as Captopril)

- Immunologically mediated diseases (e.g. Sjogren's disease)
- Psychogenic disorders (e.g. Anxiety, depression, fear of cancer)
- Psychosocial stress
- Diabetes mellitus
- Menopause/hormonal disturbances.

Diagnosis and Evaluation of Burning Mouth

- **History:** When questioned, 10 to 15 percent of postmenopausal women are found to have a history of oral burning sensations, and these symptoms are most prevalent 3 to 12 years after menopause. Burning may be intermittent or constant, but eating, drinking, or placing candy or chewing gum in the mouth characteristically relieves the symptoms. Tongue is most frequently involved, followed by lips and palate. These patients usually are anxious, they may also have symptoms suggestive of depression.
- **Clinical features** and laboratory studies can help eliminate other causes of burning symptoms of oral mucosa from burning mouth syndrome. Patients with unilateral symptoms require thorough evaluation of trigeminal and other cranial nerves to eliminate a neurological source of pain. Oral examination for lesions resulting from Candidiasis, lichen planus or other mucosal diseases should be performed. Salivary gland assessment should be done for patients complaining of a combination of xerostomia and burning. When indicated, laboratory tests should be carried out to detect undiagnosed diabetic neuropathy, anemia or iron, folate or Vitamin B_{12} deficiencies.

Loose Teeth or Tooth Mobility

Causes

- Loss of tooth support (bone loss) due to periodontal disease
- Trauma (physical trauma from a fall or blow to the teeth)
- Trauma from occlusion
- Abnormal occlusal habits (bruxism, clenching)
- Hypofunction
- Extension of inflammation from the gingival or periapex into the periodontal ligament results in changes that increase mobility.

For example, spread of inflammation from an acute periapical abcess may increase tooth mobility in the absence of periodontal disease

- Periodontal surgery temporarily increases tooth mobility
- Mobility may be increased in pregnancy, or sometimes may be associated with menstrual cycle or use of contraceptive pills
- Osteomyelitis of the alveolar bone
- Cysts/tumors of the jaw.

Symptoms and Diagnosis of Tooth Mobility

Patient complains of discomfort while chewing of food, pain may accompany the mobility of teeth; the tissues around a mobile tooth are invariable red, swollen and damaged. At times, patient may report with complaint of the loose tooth without any accompanying symptom.

Halitosis or Oral Malodor

"Halitosis may rank only behind dental caries and periodontal disease as the cause of the patient's visit to the dentist."

Origin may be either –

Oral

- Poor oral hygiene
  – Retention of odoriferous food particles on and between the teeth
  – Coated tongue
  – Artificial dentures
- Acute Necrotizing ulcerative gingivitis
- Pericoronitis
- Abscesses
- Dehydration states
- Ulceration in the oral cavity
- Hyposalivation/Xerostomia
- Bone disease (Dry socket, Osteomyelitis, Osteonecrosis and malignancy)
- Smoker's breath
- Healing oral wounds
- Chronic periodontitis with pocket formation.

*Extraoral (Conditions that can Contribute
to Presence of Oral Malodor)*

• Sinusitis and other bacterial infections
• Dry nasal mucosa
• Blocked nose (which can cause mouth breathing)
• Tonsillitis/tonsil stones
• Various carcinomas
• Infections of the respiratory tract (bronchitis, pneumonia, bronchiectasis)
• Alcoholic breath
• Uremic breath of kidney dysfunction
• Acetone odor of Diabetes

When a patient presents to the dental office with the complaint of halitosis, it is important for the dental professional to eliminate systemic conditions that may be contributing to the presence of oral malodor. For this reason, it is important to have an up-to-date medical history of the patient, which should help the dental professional eliminate any systemic causes for the presence of oral malodor.

The clinical assessment of oral malodor is either subjective or objective. Subjective assessment is based on smelling the exhaled air of the mouth and nose and comparing the two (organoleptic assessment). Various scoring systems, such as a 0- to 5-point scale (Table 1), and a 0- to 10-point scale can be used to estimate the intensity of exhaled oral odor, tongue odor and nasal odor, among others.

ORGANOLEPTIC SCORING SCALE

• Absence of odor
• Questionable to slight malodor. Odor is deemed to exceed the threshold of malodor detection
• Moderate malodor. Odor is definitely detected
• Strong malodor. Malodor is objectionable but examiner can tolerate
• Severe malodor. Overwhelming malodor. Examiner cannot tolerate.

Methods for objective measurement of the breath include:
- Detection of sulphides with an appropriate monitor—simple, but may fail to detect oral malodour caused by nonsulphide components. Halimeter is a instrument that can be used chair-side to measure volatile sulfur compounds in the exhaled air.
- Gas chromatography—not applicable for routine clinical practice.
- Bacterial detection (such as benzoylarginine- naphthylamide test (BANA test), polymerase chain reaction, dark field microscopy)—not applicable for routine clinical practice.

Oral Pigmentation

Pigmented lesions are commonly found in the mouth. Such lesions represent a variety of clinical entities, ranging from physiologic changes to manifestations of systemic illnesses and malignant neoplasms.

Oral pigmentation may be exogenous or endogenous in origin. Exogenous pigmentation is commonly due to foreign-body implantation in the oral mucosa. Endogenous pigments include melanin, hemoglobin, hemosiderin and carotene.

Classification of Oral Pigmented Lesions

Exogenous

- Accidental pigmentation (e.g. Graphite tattoos — due to pencil points broken off in gingival tissue, if not completely removed can cause permanent discoloration)
- Iatrogenic pigmentation (e.g. Amalgam tattoo)
- Pigmentation due to drugs and metals (e.g. Bismuth line, Burtonian (lead) line, Mercurialism, Argyria)
- Localized pigmentation (e.g. Chlorhexidine stains, hairy tongue, tobacco stains).

Endogenous

- Kaposi's Sarcoma
- Hereditary hemorrhagic telangiectasia

- Brown melanotic lesions
  - Melanotic macule
  - Melanoplakia
    a. due to racial pigmentation
    b. may occur due to smoker's melanosis
    c. Peutz-Jegher's syndrome
    d. Addison's disease
  - Nevi
  - Melanoma
- Physiological pigmentation
- Cyanosis
- HIV oral melanosis
- Brown heme-associated lesions
  - Ecchymosis and petechiae
  - Hemochromatosis
  - Caratonemia
  - Jaundice
  - Early hematoma.

Guide to Diagnosis and Evaluation of Oral Pigmented Lesions

Evaluation of a patient presenting with a pigmented lesion should include a full medical and dental history, extraoral and intraoral examinations, and laboratory tests. The history should include the onset and duration of the lesion, the presence of associated skin hyperpigmentation, the presence of systemic signs and symptoms (e.g. malaise, fatigue, weight loss), use of prescription and nonprescription medications, and smoking habits. Pigmented lesions on the face, perioral skin and lips should be noted. The number, distribution, size, shape and color of intraoral pigmented lesions should be assessed.

In general, benign pigmented lesions show regular borders and are small, symmetric and uniform in color. They may be either at surface or slightly elevated. In contrast, irregular borders, color variation, and surface ulceration suggest malignancy.

The following algorithm can be used as a guide to the assessment of pigmented lesions of the oral cavity on the basis of history, clinical examination and laboratory investigations:

Pigmented lesions

- **Diffuse and bilateral**
  - **Early onset**
    - Physiologic pigmentation
    - Peutz-Jeghers syndrome
  - **Predominantly adult onset**
    - **With systemic signs and symptoms**
      - Addison's disease
      - Heavy metal pigmentation
      - Kaposi's sarcoma
    - **No systemic signs and symptoms**
      - Drug-induced pigmentation
      - Postinflammatory pigmentation
      - Smoker's melanosis
- **Focal**
  - **Red-blue-purple**
    - **Blanching**
      - Hemangioma
      - Varix
    - **Nonblanching**
      - Thrombus
      - Hematoma
  - **Blue-grey**
    - Amalgam tattoo
    - Other foreign-body tattoos
    - Blue nevus
  - **Brown**
    - Melanotic macule
    - Pigmented nevus
    - Melano-acanthoma
    - Melanoma

[Kauzman A, Pavon M, Blanas N, Bradley G. Pigmented Lesions of the Oral Cavity: Review, Differential Diagnosis, and Case Presentations. J Can Dent Assoc 2004; 70(10):682–3]

Delayed Tooth Eruption

Delayed tooth eruption (DTE) is the emergence of a tooth into the oral cavity at a time that deviates significantly from norms established for different races, ethnicities, and sexes.

Conditions associated with Delayed Tooth Eruption:

LOCAL	
• Mucosal barriers-scar tissue: trauma/surgery	• Lack of resorption of deciduous tooth
• Gingival bromatosis/gingival hyperplasia	• Apical periodontitis of deciduous teeth
• Supernumerary teeth	• Regional odontodysplasia
• Odontogenic tumors (e.g. adenomatoid odontogenic tumors, odontomas)	• Impacted primary tooth
	• Ectopic eruption
• Nonodontogenic tumors	• Arch-length deficiency and skeletal pattern
• Enamel pearls	• Radiation damage
• Injuries to primary teeth	• Oral clefts
• Ankylosis of deciduous teeth	• Segmental odontomaxillary dysplasia
• Premature loss of primary tooth	

SYSTEMIC	
• Nutrition	• Anemia
• Vitamin D-resistant rickets	• Celiac disease
• Endocrine disorders	• Prematurity/low birth weight
• Hypothyroidism (cretinism)	• Ichthyosis
• Hypopituitarism	• Other systemic conditions: renal failure, cobalt/lead or other heavy metal intoxication, exposure to hypobaria
• Hypoparathyroidism	
• Pseudohypoparathyroidism	
• Long-term chemotherapy	
• HIV infection	
• Cerebral palsy	• Genetic disorders
• Dysosteosclerosis	• Familial/inherited
• Drugs: Phenytoin	• Idiopathic

Diagnosis

History: When teeth do not erupt at the expected age (mean ± 2 SD), a careful evaluation should be performed to establish the etiology and the treatment plan accordingly. It is important for the dentist to rule out underlying medical conditions as a cause. Family information and information from affected patients about unusual variations in eruption patterns should be investigated.

Clinical evaluation: Should be done methodically and must begin with the overall physical evaluation of the patient. Although the presence of syndromes is usually obvious, in the mild forms, only a careful examination will reveal the abnormalities. Right-left variations in eruption timings are minimal in most patients, but significant deviations might be associated with for example tumors or hemifacial microsomia or macrosomia and should alert the clinician to perform further investigation. Intraoral examination should include inspection, palpation, percussion, and radiographic examination.

Discolored Teeth

Knowledge of the aetiology of tooth staining is of importance to dental surgeons in order to enable a correct diagnosis to be made when examining a discolored dentition and allows the dental practitioner to explain to the patient the exact nature of the condition.

Classification of Tooth Discoloration

Historically, tooth discolouration has been classified according to the location of the stain, which may be either intrinsic or extrinsic. It may also be of merit to consider a further category of internalized stain or discoloration:

Intrinsic Discoloration

Intrinsic discoloration occurs following a change to the structural composition or thickness of the dental hard tissues. A number of metabolic diseases and systemic factors are known to affect the developing dentition and cause discoloration as a consequence. Local factors such as injury are also recognized.

Chronological delayed tooth eruption (>2SD)

Abnormal tooth development (defects in size, shape, structure, color)
- Amelogenesis imperfecta
- Dentinogenesis imperfecta
- Regional odontodysplasia
- Dilacerations
- Dentin dysplasia

Normal tooth development

Delayed biologic eruption: root length> expected 2/3 length

Normal biologic eruption: root length< expected 2/3 length
- Pre-term birth/ low birth weight
- Nutrition
- Vitamin D resistant rickets
- Downs syndrome
- Hypopituitarism

Physical obstruction

Radiographically evident
- Supernumerary
- Odontogenic/Nonodontogenic tumor
- Cysts
- Ectopic eruption
- Eruption sequestrum

Not evident radiographically
- Scar from trauma/surgery
- Ankylosis
- Gingival fibromatosis (hyperplasia)
- Premature loss of Primary tooth

Other
- Nutritional deficiency
- Radiation damage
- Traumatic displacement of the secondary germ
- Cleidocranial dysplasia
- Arch-length deficiency
- Sclerosteosis
- HIV infection
- Gardner syndrome
- Genetic predisposition

Diagnostic algorithm for delayed tooth eruption

[Suri L, Gagari E, Vastardis H. Delayed tooth eruption: Pathogenesis, diagnosis, and treatment. A literature review. Am J Orthod Dentofacial Orthop 2004;126:432-45]

- Alkaptonuria
- Congenital erythropoietic porphyria
- Congenital hyperbilirubinemia
- Amelogenesis imperfecta
- Dentinogenesis imperfecta
- Tetracycline staining
- Fluorosis
- Enamel hypoplasia
- Pulpal hemorrhagic products
- Root resorption
- Aging.

Extrinsic Discoloration

Extrinsic discoloration is outside the tooth substance and lies on the tooth surface or in the acquired pellicle. The origin of the stain may be:
- Metallic
- Nonmetallic

Internalized Discoloration

Internalized discoloration is the incorporation of extrinsic stain within the tooth substance following dental development. It occurs in enamel defects and in the porous surface of exposed dentine. The routes by which pigments may become internalized are:
- Developmental defects
- Acquired defects:
  - Tooth wear and gingival recession
  - Dental caries
  - Restorative materials.

Recent Occlusal Problems

A physiologic occlusion is present when no signs of dysfunction or disease are present and no treatment is indicated. A nonphysiologic (or traumatic) occlusion is associated with dysfunction or disease due to tissue injury, and treatment may be indicated.

Causes

- Missing or shifting teeth, leading to alterations in arch form and alignment.
- Acute occlusal changes—due to iatrogenic changes induced by faulty restorative dentistry, prosthetic appliances that interfere with or alter the direction of occlusal forces on teeth.
- Parafunctional habits—bruxism.

Signs and symptoms of a nonphysiologic occlusion include damaged teeth and restorations, abnormal mobility, fremitus, widened periodontal ligament, pain and a subjective sense of bite discomfort.

Clinical evaluation procedures include a screening evaluation for temporomandibular disorders and intraoral occlusal evaluation. This includes assessment of:

- Intercuspal Position stability
  - Light or absent anterior contacts
  - Well-distributed posterior contacts
  - Coupled contacts between opposing teeth
  - Cross tooth stabilization
  - Forces directed towards long axis of each tooth
- Excursive movements—smooth excursive movements without interferences
- Tooth mobility
- Attrition.

Previous Dental History

It tells the investigator about the attitude of the patient towards dentistry. It often provides the dentist with valuable prognostic as well as diagnostic information. A dental history should be performed that includes the frequency of past dental visits, a history of dental sensitivity, pain, infection, soft tissue lesions, bleeding, swelling, age and condition of existing dental prostheses, and a history of oral and periodontal surgery or any other dental treatment.

- **Frequency of visit to a dentist:** It provides the examiner with information regarding the interest of the patient in his dental health.
- **Frequency of dental prophylaxis:** It may be valuable guide in evaluating periodontal conditions which are present as well as provides the dentist with prognostic information.
- **Past experience during and following local anesthesia:** It may alert the dentist to the necessity for investigation into possible allergy to the anesthetic agent. It may also allow him to anticipate possible syncope during the administration of LA in future appointments.
- **Past periodontal therapy:** Type of treatment and the time in the past it was received, will help to evaluate the present status of periodontal structure and planning of future periodontal treatment for a patient.
- **Past orthodontic treatment:** The condition which was treated, the length of time of active treatment, the nature of the appliance

used, whether a retainer was used appropriately and is still required can be evaluated.

- **Fixed Bridges:** The comfort level of the bridge.
- **Surgical procedures in the mouth other than extraction:** Nature of the tissue removed. Manner in which it was removed and its recurrence should be enquired.

Obtaining past dental records, including radiographs, and consultation with other dentists involved in the patient's care should be considered, especially if the dentist performing the pretreatment dental evaluation is not the patient's usual dental provider.

The dental history can also give insight into the patient's level of dental awareness and motivation to maintain optimum oral health. Inquiry into the patient's perceived reasons for lack of dental care may be predictive of future compliance.

Previous dental history gives a general view about how the patient is aware about pursuing oral health.

- It provides a basis for the determination of the caries rate, the rate of plaque and calculus formation, the susceptibility to periodontal diseases, the resorption rate of edentulous ridges.
- If history of previous bad experience (pain, rude attitude of dentist, etc.) is present then moulding of behavior is done using behavior management technique.
- Significant knowledge can be drawn about the patient's previous treatment procedures and can be helpful towards the present situation.
- Also the information regarding any complication faced during the previous treatment/visit can be noted.

If this is the patient's first visit to a dental clinic then reasons for not visiting the dentist should be enquired:

Patient feels that he/she has:

- No problem
- had some problem but thinks it will get corrected by itself
- due to other reasons, like time factor/no facilities/lack of affordability, etc.

7
Chapter

Medical History

'Medical history is the description of the relevant features of the patient's health status which influence the oral health from birth to the moment that the patient enters the office'.

Medical history includes:
- Diseases or conditions that contraindicate certain kind of dental treatment.
- Diseases that require special precautions or premedication prior to dental treatment. For eg myocardial infarction, hemophilia, radiation, etc.
- Diseases under treatment of a physician with medication that contraindicates the use of additional medication. For example, Anticoagulants, steroid therapy, tranquilizers.
- Allergies/untoward reaction towards penicillin/local anesthesia.
- Diseases that endanger the dentist/other patients. For eg. Infectitious diseases like hepatitis, tuberculosis
- Physiological state of patient. For example, Pregnancy, aging.

Recording of past medical history includes history of past illnesses, health care experiences, immunization, known allergy, current treatment including medications hospitalizations and evaluation of the patient's health based on the history provided by the patient.

CHECKLIST FOR MEDICAL HISTORY BY SCULLY AND CAWSON

- Anemia
- Bleeding disorders
- Cardiorespiratory disorders
- Drug treatment and allergies
- Endocrine disorders
- Fits and faints
- Gastroinstestinal disorders
- Hospital admissions and surgeries
- Infections
- Jaundice
- Kidney diseases

All diseases suffered by the patient should be recorded in chronological order.

Patient should be evaluated for:

• Cardiovascular diseases	• Respiratory diseases
• Gastrointestinal	• Genitourinary
• Endocrine	• Neurological
• Hematological	• Psychiatric
• Allergic reactions	• Extremities and joints

Patient should be assessed by the questionnaire:
- Whether he is suffering or has suffered before from any major systemic disease?
- What is the duration and treatment of the disease?
- Is he on any medication?
- History of all the hospitalizations and their purpose should be assessed.

    Some important examples of diseases (conditions) affecting the treatment includes:
- Postpone treatment if suffering from acute illness like mumps or chickenpox
- Patient with cardiac defects needs to get a physician's report
- Patient on anticoagulant therapy
- If Asthmatic then Nonsteroidal Antiinflammatory Drugs (**NSAIDs**) are contraindicated
- Juvenile diabetes mellitus.

FAMILY HISTORY

Family history is asked to assess the presence of any inherited disease pattern or trait. The reason a family history can help predict risk is that families share their genes, as well as other factors that affect health, like environment, lifestyles and habits.

- It includes:
  - Number of siblings and their age.
    This gives an idea of:
    - Size of family and socioeconomic status.
    - Whether patient can afford for the time and treatment.
    - To know the child's psychology which has an effect on his behavior.

    Children from larger families are more adjustable, co-operative, willing to face the crisis/face challenges on their own.
    - To study the peer influence of dietary and oral hygiene practice.
  - History of any disease running in the family. For example, Diseases like hemophilia, diabetes, and hypertension recur in families' generation after generation.
  - Prenatal, Natal and postnatal history should be taken in case of pediatric patients.

8
Chapter

Personal History

It includes:
- Oral habits
- Oral hygiene habits
- Adverse habits
- Diet history.

1. ORAL HABITS

Habit

Definition
- A habit can be defined as the tendency towards an act that has become a repeated performance, relatively fixed, consistent and easy to perform by an individual (Boucher O.C.).
- A habit can be defined as fixed or constant practice established by frequent repetition (Dorland, 1957).
- Buttersworth (1961): Defined a habit as a frequent or constant practice or acquired tendency, which has been fixed by frequent repetition.
- Mathewson (1982): Defines it as oral habits are learned patterns of muscular contractions.

Various Habits are

- Thumb sucking
- Finger sucking

- Tongue thrusting
- Pacifier or dummy sucking
- Lip biting
- Nail biting
- Cheek biting
- Pencil or foreign object sucking
- Lip sucking
- Clenching
- Mouth breathing
- Bruxism
- Occupational habits.

THUMB AND DIGIT SUCKING

It makes up the majority of oral habits. About two thirds are ended by 5 years of age.

- The types of dental changes that a digit habit may cause vary with the intensity, duration, and frequency of the habit as well as the manner in which the digit is positioned in the mouth.
- Clinical and experimental evidence suggests that 4 to 6 hours of force per day are probably the minimum necessary to cause tooth movement.
- A child who sucks intermittently with high intensity may not produce much tooth movement at all, whereas a child who sucks continuously (for more than 6 hours) can cause significant dental change.

DEFINITION

Thumb sucking is the childhood habit of putting the thumb in the mouth for comfort or to relieve stress.

Thumb sucking is defined as placement of the thumb or one or more fingers in varying depths into the mouth (Gellin 1978). Fig. 8.1 shows a child with thumb sucking habit.

Thumb sucking is considered normal during the first and second year of life. It does not generate any malocclusion.

Abnormal thumb sucking persists beyond the preschool period, i.e. after the age of 3 to 4 years.

Fig. 8.1: A child sucking thumb

- **Psychological:** deep rooted emotional reason (insecurity, neglect, loneliness)
- **Habitual:** no psychological bearing; act out of a habit.

Sucking Reflex

The process of sucking is a reflex occurring in the oral stage of development and is seen even at 29 weeks of intrauterine life, and may disappear during normal growth between the ages one and three and half. It is the first coordinated muscular activity of the infant.

Finger sucking and tongue thrusting habits are normal when the child is one and a half year of age and will disappear spontaneously by the second year with proper attention to nursing. If it continues beyond three years, malocclusion will result.

Causative Factors

- Parent's occupation
- Working mother
- Number of siblings
- Order of birth of the child

- Social adjustment and stress
- Feeding practices
- Age of the child

Parents Occupation: It relates to the socioeconomic status of the family. Families living in a high socioeconomic status are blessed with ample sources of nourishment. Mothers belonging to low socio-economic group are unable to provide the infant with sufficient breast milk.

Working Mother: Sucking habits are commonly observed to be present in children with working parents. Such children brought-up in the hands of care taker may have feelings of insecurity.

Number of Siblings: The development of the habit can be indirectly related to the number of siblings.

Order of the Birth of Child : It has been noticed that the later the sibling rank of a child, greater the chance of having an oral habit.

Social Adjustment and Stress : Digit sucking has also been proposed as an emotion based behavior related to the difficulty with the social adjustment or with stress.

Feeding Practices: A negative relation is also seen between the breast-feeding and the development of dummy or finger sucking.

Age of the Child:
- In the Neonate: Primitive demands as hunger
- During the first week of life: Feeding problems
- During the eruption of the primary molar: As a teething device
- Still Later: Release of emotional tension.

Phases of Development of Thumb Sucking

Phase I: Normal/subclinically significant sucking—seen during first three years of life is considered normal during this phase.
Phase II: Clinically significant sucking—seen during three to six and half year of age indicates that child is under great anxiety.
Phase III: Intractable sucking—any thumb sucking that persists beyond fourth or fifth year of life.

Diagnosis of Digit Sucking

History: It determines the psychological component involved—Question regarding the frequency, intensity and duration of habit. Enquire the feeding patterns, and parental care of the child. Presence of other habits should be evaluated.

Extraoral Examination

Various key areas to be noted include the following:

The Digit

The digits that are involved in habit will appear reddened, clean, chapped, short finger nail and with callus formation on the thumb (Fig. 8.2).

The Lip

Chronic thumb suckers are having short, hypotonic upper lip.

Upper lip is passive or incompetent during sucking and lower lip is hyperactive and this leads to a further increase in the proclination of the upper anteriors due to its thrust on these teeth.

Fig 8.2: Callus formation on the thumb as a result of sucking habit

Facial form analysis: Check for the mandibular retrusion, maxillary protrusion, high mandibular plane angle and profile.

Other Features: Active thumb sucker also have higher incidence of middle ear infections.

Intraoral Examination

Tongue: Examine the oral cavity for size and position of tongue at rest and tongue action during swallowing.

Dentoalveolar Structure

Individuals with severe finger or thumb sucking habit, where the digit is applied as anterior superior vector to the upper dentition and palate, will have flared and proclined maxillary anteriors with diastemas and retroclined mandibular anteriors. (Fig. 8.3).

Other Symptoms are constriction of buccal musculature and tendency to narrow palates.

Gingiva: Look for the evidence of mouth breathing, gum line etching, decayed or excessive staining on labial surface of upper central and lateral incisors.

Fig. 8.3: Forces acting on the teeth while thumb sucking

Effects of Non-nutritive Thumb Sucking

Effects of non-nutritive thumb sucking habits on developing teeth are minor in infants or children under age three.

Effects of Thumb Sucking Depends On
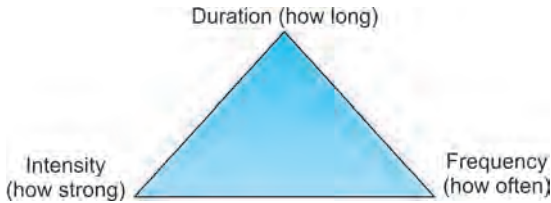
- Intensity is the amount of force that is applied to the teeth during sucking.
- Duration is defined as the amount of time spent sucking a digit
- Frequency is the number of times the habit is practiced throughout the day.

Features

- Increased overjet due to proclined maxillary anterior teeth (Fig. 8.4).
- Lingual tipping of mandibular anterior teeth.

Fig 8.4: Proclination of the upper anterior teeth and anterior open bite

- Supraeruption of buccal teeth
- Posterior crossbite due to overactivity of buccinator compressing the maxilla.
- Narrow and high palatal vault.
- Hypotonic upper lip with the lower part of the face exhibiting hyperactive mentalis activity.

There is a significant association between the prevalence of Class II malocclusion and persisting digit sucking in the different age groups.

As the duration of the habit increases, the probability of a child's developing a Class II malocclusion increases.

Emotional difficulties: Some preschoolers who suck their thumbs may feel ashamed if they are teased by other children. Parents can cause low self-esteem by ridiculing or punishing their child for this behavior.

Speech problems: The most common speech problems that develop because of thumb sucking include mispronouncing Ts and Ds, lisping, and thrusting out the tongue when talking.

Control of Thumb Sucking

Prevention

- *Motive based approach:* Its prevention should be directed towards the motive behind the habit.
- *Child's engagement in various activities:* Parents can be consulted on keeping the child engaged in various activities.
- *Parent's involvement in prevention:* When the parents are at home they should be advised to spend ample time with the child so as to put away his feelings of insecurity.
- *Duration of breastfeeding:* Duration of feeding should be adequate.
- *Mother's presence and attention during bottle feeding:* It will promote close emotional union between the mother and the baby.
- *Use of psychological nipple:* Size and number of hole should be standardized to regulate a slow and steady flow of milk.
- *Use of dummy or pacifier:* Thumb sucking can be prevented by encouraging the baby to suck a dummy instead.

Treatment Consideration

- *Psychological status of the child:* Frequency, duration and intensity of oral habit are important in evaluating the psychological status of the child.
- *Age factor:* The child having thumb sucking habit at
    - 3 Years of age:
        - Effect — Damage incurred such as open bite. No treatment provided in this age group.
    - 4 to 5 years of age :
        - Effect — Self correction can be expected.
    - 6 years of age:
        - Effect — It will not self correct.
- *Motivation of the child to stop the habit:* It is also important to assess the maturity of child in response to new situation and to observe the child's reaction to any suggestion.
- *Parental concern regarding the habit:* Negative reinforcements in the form of threats, nagging and ridicule would only entrench the habit.
- *Other factors:* Self correction again depends on severity of malocclusion, anatomic variation in the perioral soft tissue, and presence of other oral habits such as tongue thrusting, mouth breathing, and lip biting habits.

Management

- *Psychological approach:* The parents should be consulted to provide the child with adequate love and affection. They should be advised to divert the child's attention to the other things such as play and toys.
  Dunlop's beta hypothesis: This hypothesis is the best way to break a habit.
  Child should be asked to sit in front of a mirror and to suck his thumb, observing himself as he indulges in the habit.
- *Reminder therapy:*
    a. Extraoral approaches:
        It employs hot tasting, bitter flavoured preparations are distasteful agents that are applied to thumb example cayenne,

pepper, quinine, asafoetida. This is effective only when the habit is not formally entrenched.

Thermoplastic Thumb Post

A thumb device is usually made of nontoxic plastic and is worn over the child's thumb (Fig. 8.5).

It is held in place with straps that go around the wrist. A thumb device prevents a child from being able to suck his or her thumb and is worn all day.

It is removed after the child has gone 24 hours without trying to suck a thumb. The device is put back if the child starts to suck his or her thumb again. Thumb devices need to be fitted by a health professional.

- *Intraoral approaches : Removable appliances:* These are palatal crib, rakes, palatal arch, lingual spurs, Hawley's retainer with or without spur (Fig. 8.6).
- *Fixed appliances:* Upper palatal tongue screens appear to be more effective in breaking these habits.
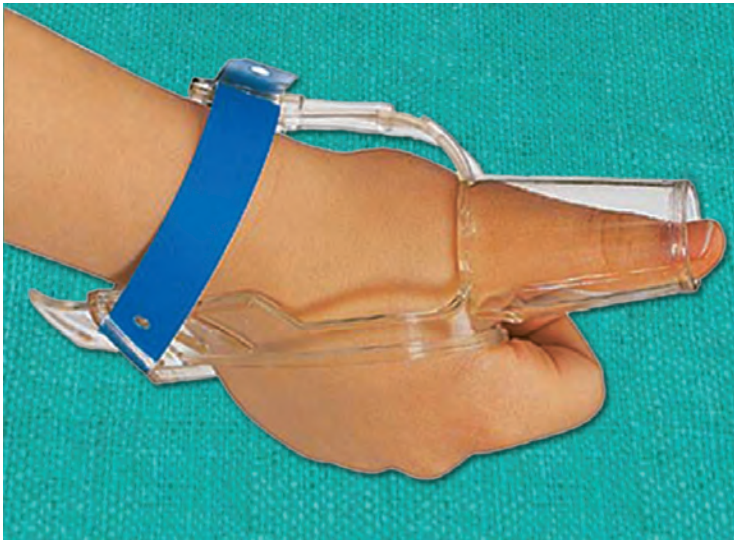
Fig 8.5: Thermoplastic thumb post
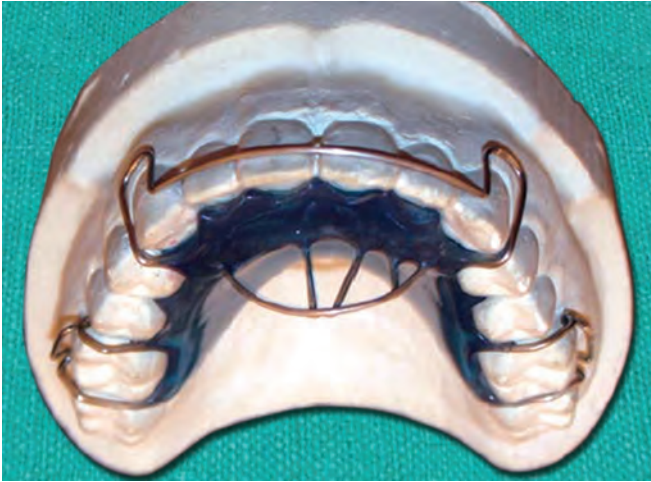
Fig 8.6: Habit crib appliance

Mechanotherapy

Fixed Intraoral Antithumb Sucking Appliances
- Bands fitted to the primary second molar or first permanent molar. A lingual arch forms the base of the appliances to which are added interlacing wires in the anterior portion in the area of the anterior part of hard palate.
- This prevents the patient from putting the palmer surface of the thumb in contact with palatal gingiva.

Quad Helix (Fig. 8.7)

It prevents the thumb from being inserted and also corrects malocclusion by expanding the arch.

PACIFIER HABITS

Dental changes created by pacifier habits are largely similar to changes created by thumb habits, and no clear consensus indicates a therapeutic difference. Anterior open bite and maxillary constriction occur consistently in children who suck pacifiers. Pacifier habits appear to end earlier than digit habits.

Fig 8.7: Quad helix

TONGUE THRUST HABIT

Definitions

Tongue thrusting is defined as a condition in which the tongue makes contact with any teeth anterior to the molars during swallowing.

A tongue thrust is said to be present if the tongue is observed thrusting between and the teeth do not close in centric occlusion during deglutition. — **Brauer (1965)**

Tongue thrust is the forward movement of the tongue tip between the teeth to meet the lower lip during deglutition and in sounds of speech, so that the tongue becomes interdental. — **Tulley (1969)**

Tongue thrust is an oral habit pattern related to the persistence of an infantile swallow pattern during childhood and adolescence and thereby produces an open bite and protrusion of the anterior tooth segments. — **Barber (1975)**

Tongue thrust is a forward placement of the tongue between the anterior teeth and against the lower lip during swallowing.

— **Schneider (1982)**

Etiology of Tongue Thrust

- Retained infantile swallow
- Upper respiratory tract infection

- Mouth breathing
- Chronic tonsillitis
- Neurological disturbances
  - Hyposensitive palate
  - Moderate motor disability
  - Disruption of sensory control
- Due to transient change in anatomy
  - Tongue can protrude when the incisors are missing
- Bottle feeding
- Thumb and finger sucking
- Hypertonic orbicularis oris
- Macroglossia.

Clinical Manifestations of Tongue Thrust

- Clinical manifestations depend on:
  - Intensity
  - Duration
  - Frequency and
  - Type of tongue thrust.

Extraoral Findings

- Lip separation
- More erratic mandibular movements
- Speech disorders such as:
  - Sibilant distortions
  - Lisping distortions
  - Problem in articulation of s/n/t//d/l/th/z/v/sounds
  - Increase in anterior face height.

Intraoral Findings

- Jerky and irregular tongue movements
- Lowered tongue tip because of :
  - Anterior open bite
  - Longer period of time required for tongue tip elevation

- Malocclusion:
  – Proclination of maxillary anterior results in increased overjet
  – Generalized spacing between teeth
  – Retroclination or proclination of mandibular teeth
  – Anterior and posterior open bite (depends on posture of tongue)
  – Posterior teeth crossbite.

Diagnosis of Tongue Thrust

A. Take History
- Ask about swallow pattern of siblings and parents to check for etiologic factor
- Get information about upper respiratory tract infection, sucking habits and neuromuscular problems.

B. Examine
- Detect perverted swallowing habit and correct it to facilitate normal development of the palate and dentitions
- Study the tongue posture
- Observe tongue movements during swallow.

Treatment Considerations of Tongue Thrust

1. **Age:** Tongue thrust often corrects itself by 8 or 9 years of age. Self-correction is due to improved musculature balance during swallowing.
2. **Presence/absence of associated manifestation:** Treatment is not recommended when tongue thrust is present without malocclusion or a speech problem.
3. **Tongue thrust with malocclusion and without speech defect:** Orthodontic treatment may be carried out.
4. **Speech defect with tongue thrust:**
   - Speech therapy is indicated.
   - Surgery may be done to reduce the size of pharyngeal lymphoid masses.
5. **Treatment of associated habit first:** If an associated habit like thumb sucking is present, it must be treated first.

Treatment of Tongue Thrust

I. Training the tongue for correct swallow and posture:

a. Myofunctional exercise:

1. The child is asked to place the tip of the tongue in the rugae area for 5 minutes.
2. Orthodontic elastic and sugarless fruit drop exercise.
3. 4s exercise.
   Includes:
   • Identifying the spot
   • Salivating
   • Squeezing the spot
   • Swallowing.
4. Ask the child to perform a series of exercises like
   • whistling
   • reciting the count from 60 to 69
   • gargling or yawning, to tone the respective muscles.

b. Use of appliances to correct position of tongue:

1. Preorthodontic trainer for myofunctional training (Fig. 8.8).
   • Nance palatal arch appliance

II. Speech therapy:

• Not indicated before the age of 8 years.

III. Mechanotherapy: Fixed (Fig. 8.9) and removable appliances can be fabricated to restrain the anterior tongue movements during swallowing.

• Force the tongue downward and backward during swallowing
• Re-educates tongue position.

Removable Appliance Therapy

• For posterior open bite modified habit crib is used
• **Oral screen**
  – Modified acrylic plate
  – Used to control muscle forces both inside and outside the dental arches
  – Reduces development of malocclusion.
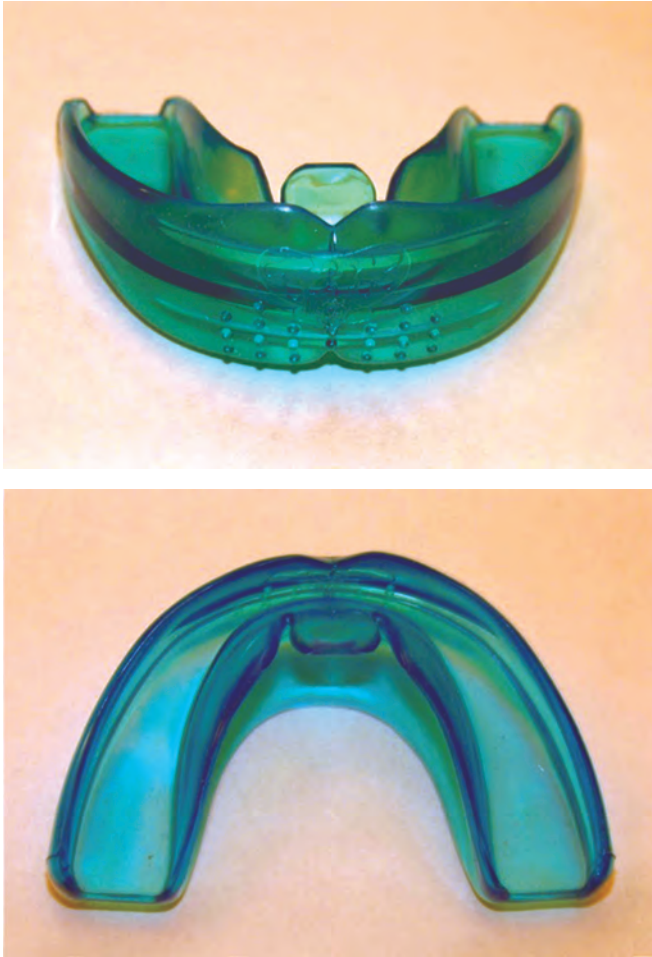
Fig 8.8: Preorthodontic trainer

IV. Correction of Malocclusion
V. Surgical Treatment
- For retained infantile swallow tongue thrust
- For reduction of lymphoid tissue size improves abnormality to tongue thrust.

Fig 8.9: Habit breaking appliance

MOUTH BREATHING HABIT

Definition

Sassouni (1971): Defined mouth breathing as habitual respiration through the mouth instead of the nose.

Merle (1980): Suggested the term oronasal breathing instead of mouth breathing.

Etiology

- Nasal Obstruction
  - Nasal obstruction may be due to
    - Enlarged turbinates
    - Deviated nasal septum
    - Allergic rhinitis
    - Nasal polyps
    - Enlarged adenoids
    - Chronic inflammation of nasal mucosa.
- Abnormally short upper lip preventing proper lip seal
- Obstruction in the bronchial tree or larynx
- Obstructive sleep apnea syndrome

- Genetically predisposed individuals: Ectomorphic children having a genetic type of tapering face and nasopharynx are prone for nasal obstruction.
- Thumb sucking or other oral habits can be the instigating agent.

Clinical Features

- General effects:
    - Pigeon chest
    - Low grade esophagitis
    - Blood gas constituents.
- Effects on dentofacial structures:
    - Facial form:
        - A large face height
        - Increased mandibular plane angle
        - Retrognathic mandible and maxilla.
    - Adenoid faces–characterized by:
        - Long narrow face
        - Narrow nose and nasal passage
        - Flaccid lips with upper lip being short
        - Dolicocephalic skeletal pattern (Fig. 8.10)
        - Nose is tipped superiorly in front
        - Expressionless face
        - V shaped maxillary arch and high palatal vault.
    - Dental defects:
        - Upper and lower incisors are retroclined.
        - Posterior cross bite

Fig 8.10: Dolicocephalic skeletal pattern

- Anterior open bite
- Narrow palatal and cranial width.
- Flaring of incisors (Fig. 8.11)
- Decrease in vertical overlap of anterior teeth.
– **Speech defects:**
  - Nasal tone in voice
– **Lips:**
  - Short thick incompetent upper lip
  - Voluminous curled over lower lip
  - Gummy smile
  - External Nares
  - Slit like external nares with a narrow nose due to atrophy of lateral cartilage.
– Gingiva
  - Inflammed and irritated gingival tissue in the anterior maxillary arch.
  - Classic rolled marginal gingiva and enlarged interdental papilla.
  - Interproximal bone loss and presence of deep pockets.
– Other Effects
  - Otitis Media
  - Dull sense of smell and loss of taste.

Fig 8.11: Flaring of incisors

Diagnosis

- History of patient.
- Clinical examination.
- Mirror test — Double-sided mirror is held between nose and mouth. Fogging on nasal side indicates nasal breathing while fogging towards oral side indicates oral breathing.
- Cotton test — A butterfly shaped piece of cotton is placed over upper lip below nostrils.

     If cotton flutters down,it indicates nasal breathing.
- Water test — Patient is asked to fill his mouth with water and retain it for a period of time.

     While nasal breathers accomplish with ease, mouth breathers find task difficult.
- Observation — In nasal breathers, external nares dilate during inspiration.
- Cephalometric examination.
- Rhinomanometry.

Management

Elimination of the Cause

Symptomatic Treatment

Interception of the habit: If the habit continues even after removal of obstruction, then it should be corrected. Correction can be done by:
- Physical exercise
- Lip exercises
- Maxillothorax myotherapy
- Oral screen

Oral Screen (Fig. 8.12): Most effective way to re-establish nasal breathing is to prevent air from entering the oral cavity.

     Oral screen should be constructed with a material compatible with the oral tissues.

     Reduction in the anterior open bite is obtained after treatment for 3 to 6 months.
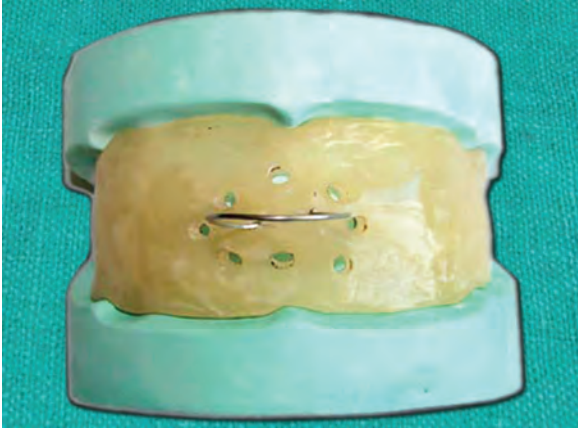
Fig 8.12: Oral screen

Preorthodontic Trainer

It is used in mouth breathers, tongue thruster and thumb suckers.

Correction of the Malocclusion

Mechanical appliances
- Children with class I occlusion and anterior spacing — oral shield appliance.
- Class II div. I dentition without crowding — Monobloc Activator can be used.
- Class III malocclusion — chin cap can be used.

BRUXISM

Definition

Defined as the clenching or grinding of teeth when not masticating or swallowing (Poselt and Wolff).

Habitual grinding of teeth when the individual is not chewing or swallowing (Ramfjord 1966).

Nonfunctional contact of teeth which may include clenching, gnashing, grinding and tapping of teeth (Rubina 1986).

Etiology

- Psychological and emotional stresses
- Occlusal interference or discrepancy between centric relation and centric occlusion
- Genetics
- Magnesium deficiency
- Allergies
- Occupational factors.

Clinical Features

- Occlusal wear facets
- Fractures of teeth and restorations
- Mobility of teeth
- Tenderness and hypertrophy of masticatory muscles
- TMJ pain and discomfort.

Diagnosis

- History and clinical examination are sufficient to diagnose
- Occlusal prematurities can be diagnosed by use of articulating papers
- Electromyographic examination to check for hypertrophy of masticatory muscles.

Treatment

- Appropriate psychological counseling
- Hypnosis, relaxing exercises and massage can help relieve muscle tension.
- Occlusal adjustments need to be carried out to eliminate prematurities
- Night guards can be given which cover the occlusal surfaces of teeth and prevent interferences and wear
- Biofeedback—utilizes positive feedback to enable the patient to learn tension reduction.

OTHER MINOR HABITS

Lip Biting

Lip biting most often involves the lower lip which is turned inwards and pressure is exerted on the lingual surfaces of maxillary anteriors.

Features

- Proclined upper anteriors and retroclined lower anteriors
- Hypertrophic and redundant lower lip
- Cracking of lips.

Interception

Lip bumpers can be used that not only keep the lips away but also improve the axial inclination of anterior teeth due to unrestrained action of tongue.

Nail Biting

It does not produce any gross malocclusion.

Minor local tooth irregularities such as rotation, wear of incisal edge and minor crowding can occur.

Nut notch is seen which is wear of teeth in the form of notch. It is seen due to cracking open of hard nuts using incisal edge of anteriors.

Self-Destructive Oral Habits/Masochistic Habits

Include picking at the gingiva with fingers and finger nails, chewing the inside of the cheek, lip or tongue.

- Associated with Lesch—Nyhan and de Lange's syndromes
- Diverting the child's attention each time habit is observed can solve the problem
- Restraints, protective padding, sedation can be used in mentally retarded children.

2. ORAL HYGIENE HABITS

- It is important so as to:
  - Assess the knowledge of dental care the patient possesses.
  - To determine the level of hygiene maintained by the patient.

- It includes: Regularity of brushing
  - Frequency and method of brushing
  - Use of fluoridated and nonfluoridated tooth pastes
  - Type of brush and how often it is changed
  - Use of other oral hygiene aids.

3. ADVERSE HABITS

- It includes:
  - Smoking: Record the type, frequency and duration
  - Alcohol consumption: Record the amount, frequency and duration
  - Tobacco chewing Arecanut chewing/Paan chewing: Record the type, amount, frequency and duration.

4. DIET HISTORY

Diet Recording

List the sweets and sugar-sweetened foods and the frequency with which they are consumed in a typical day.

A 5-day diet diary is recommended.

The diary is kept for 5 consecutive days including a weekend or holiday, to provide a more representative sample of the food intake.

DIET-DIARY
Name:
Date:
Instructions
1. Each detail about what you eat or drink in the order in which it is eaten should be recorded with time.
2. The frequency of eating is an important consideration; therefore between meal-snacks, candies, gum, etc. should also be included alongwith meals.
3. The following information is essential:
The amount in household measurements such as 8 oz, 1 serving,1/2 cup,1 teaspoon should be recorded.
The food and method of preparation such as fried chicken, baked apple, raw carrots etc should be mentioned.

Contd...

The addition of sugar, syrup or milk to cereal, beverages such as 1 bowl of cornflakes with 2 teaspoon of sugar and ½ cup of milk

4. Example:

Wrong	***Right***
Juice	½ cup tomato juice
Sandwich	1 chicken sandwich
Dessert	1 slice chocolate cake
Coffee	1 cup coffee with milk and 2 teaspoon sugar

Place a checkmark in the frequency column for each item as long as they are eaten at least 20 minutes apart.

(This time is based on the Stephan's curve that the pH of the plaque drops and remains below critical level for an average 20 minutes after introduction of sucrose into the mouth).

Form	*Frequency*	*Points*
Liquid	— × 5	
Solid and sticky	— × 10	
Slowly dissolving	— × 15	

Sweet Score

5 or less	excellent
10	good
15 or more	"watch out zone"

Diet Analysis

Sugar

The generic term "sugar" usually means sucrose, the disaccharide caloric white granular substance that is processed from sugar cane or beets.

Classification of Sugars

- Committee on medical aspects of food policy (COMA)
  - Intrinsic Sugars

- Extrinsic Sugars
  - Milk Extrinsic Sugars
  - Nonmilk Extrinsic Sugars (NMES)

Pattern of Sugar Consumption

Sugar first became inexpensive and available on a mass scale in the United States in the mide- 9th century, when tariffs on sugar imports were lifted.

When food distribution methods in the United States became more efficient after World War I, sugar consumption increased.

Since then, the rate of sugar consumption has continued to rise; the taste for sweets seems to be insatiable.

The food industry spends large amount of money each year on the promotion and advertising of sweetened products (Nielsen 1998).

Diet and Dental Caries

Dental caries is accepted as being caused by the ingestion of fermentable carbohydrates particularly sucrose.

Cariogenic potential of food containing sucrose depends on many variables such as the ability to:
- Be retained by the teeth
- Form acids
- Dissolve enamel
- Neutralize or buffer acids
  - The solid and retentive sucrose are more cariogenic than liquid and nonretentive sugars.
  - The frequency and time of ingestion of foods are also important. The sucrose containing foods becomes more dangerous if, it is eaten more frequently. Food eaten at meals produces less caries than the same eaten between meals does.
  - In decreasing order of cariogenicity, the food is grouped as:
    - Adherent, sucrose-containing foods eaten frequently between meals.
    - Adherent, sucrose-containing foods eaten during meals.

- Nonretentive (liquid) sucrose-containing beverages consumed frequently between meals.
- Nonretentive (liquid) sucrose-containing foods consumed during meals.

Consensus View on Diet and Caries

(Cannon 1992; Deptt. of Health 1989; Rugg-Gunn 1993; Sheiham 2001; WHO 1990).

• The influence of the diet is more important after the teeth have erupted. The preeruptive effect of diet on caries development is minimal.
• NMES are highly cariogenic.
• Frequency of eating/drinking NMES is important in caries development. However, frequency of intake and amount consumed are closely related.
• Intrinsic sugars, as found in for example, fresh fruits and vegetables and cooked staple starchy foods such as rice and potatoes, are of low cariogenicity. Milk extrinsic sugars, for example milk, are virtually noncariogenic.
• Alternatives or nonsugar sweeteners (bulk and intense) are non-cariogenic.
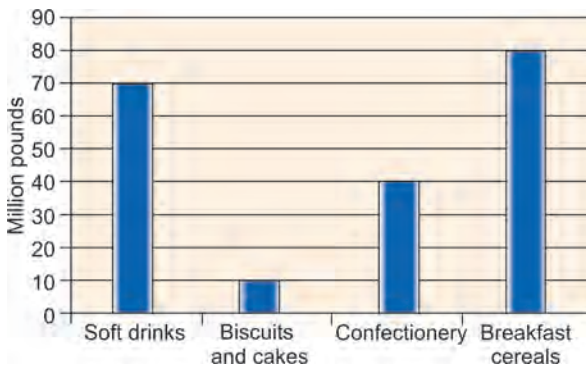
Classify each sweet into:

• Liquid
• Solid and sticky
• Slowly dissolving category.

Sugar in Liquid Form (Fig. 8.13)

- Cold drinks, soda pop, powdered drink mixes, fruit drinks
- Sweetened condensed milk, syrup
- Sweetened sauces like chocolate, butterscotch
- Chocolate milk, hot chocolate
- Milk shakes and malts.

Fig 8.13: Sugar in liquid form

Solid and Sticky Sugar (Fig. 8.14)

- Cakes, doughnuts, cookie
- Candies, chocolates
- Pastries, puddings,sweet rolls, pies
- Sugar-containing cereals sugar coated gums
- Dry fruits— raisins, dates, apricots
- Food cooked in sugar
- Ice cream, jam jellies
- Sugar containing chewing gums, caramels.

Fig 8.14: Solid and sticky sugar

Slowly Dissolving Sugars (Fig. 8.15)

• Hard candies
• Mints, lollipops, jelly beans
• Frosting honey, cough syrups, drops.

Fig 8.15: Slowly dissolving sugar

Diet Counseling

Educate the Patient in the Role of Sugar in Decay Process

The plaque that forms in the teeth every day contain bacteria. This changes the sugar present in the food in to acids.

SUGAR (in food) + PLAQUE/BACTERIA (germs)

$\downarrow$

TOOTH + ACIDS = DECAY

• The grand total of time of exposure to acid is used here to give the patient a rough idea of the risk that his diet is imposing on his teeth.

Isolate the Sugar Factor

The patient is aided in identification of these foods, whether they are healthy or harmful choices. Interviewer and patient together code

the record with different colors like Red Cross for harmful choices and time and blue cross for good choice and meal time. Taking this as a game, child is asked to count the total number of red Xs which are harmful for teeth.

Next, ask the child which X marked food he can eliminate. Tell him to reduce number of red Xs when he come next time. It is not fair to cut down all sugar from the diet. Sugar during meal time and after proper oral hygiene measures is okay. Substitute should be acceptable to dentist in terms of cariogenicity as well as to patient as far as taste and preference is concerned. List of substitute food should be made by the joint effort of dentist and patient.

List of Substitutes

- Peanuts, walnuts, pea cans, almonds, other types of nuts
- Popcorn, corn chips
- Whole wheat biscuits
- Unsweetened dry cereals
- Cold cuts of meats (unsweetened)
- Cubes of cheese
- Fresh fruits, salads
- Vegetables such as carrot slices, celery sticks, cucumber slices
- Baked potatoes
- Unsweetened fruit juices
- Freshly squeezed fruit juices
- Sugarless chewing gum.

Recall Visits

Evaluate patient's performance at regular intervals by means of:
- Patient' comments
- New diet diary
- Susceptibility tests like Snyder's test and
- Clinical judgment
- Reinforce patient by praising his efforts.

9
Chapter

Clinical Examination

The ability to perform a thorough clinical examination of the superficial structures of the head, neck and oral cavity is essential for all dentists. The examination should be carried out on all the patients, and every dentist must be trained to effectively diagnose and evaluate the disease.

To perform the examination, a dentist should have:

• Adequate knowledge of the anatomy and physiology of the region
• A well practiced technique for examination providing minimal discomfort to the patient
• Knowledge of the disease process affecting the head and neck region.

The basic techniques of diagnosis are visual inspection, palpation, olfaction, auscultation, percussion and aspiration.

• *Visual inspection:* It is a standardized observation of the anatomical landmarks of the head and neck region to ensure the completeness and accuracy of the examination. Visual inspection involves evaluating the bilateral completeness of the facial structures.
• *Palpation:* It is used to determine the size, texture, consistency, symmetry, temperature, etc. which are sensed by touch. Palpation may be done by either hand or by both hands (bimanual palpation). Findings related with the palpation techniques are confirmed with percussion and auscultatory techniques.
• *Olfaction:* Some odors can be associated with conditions of the patient such as smoking habits, poor oral hygiene, sinusitis, metabolic disorders, gastrointestinal disorders, etc.

- *Auscultation:* It is the listening to sounds. It is performed by the unaided ear or by the assistance of a stethoscope. A dentist should evaluate the sounds of crepitus or popping like in case of TMJ, blood pressure sounds, etc.
- *Percussion:* It is performed by gentle tapping over the area with fingers or an instrument to determine the relative consistency of the structure with its surroundings. Patient may even feel pain while the procedure providing valuable information about the area percussed.
- *Aspiration:* It is the removal of whole or a part of fluid from a body cavity. The area aspirated is usually a soft tissue or a bony lesion having a fluid filled cavity. The aspirated fluid is thus evaluated for its consistency and components.

The examination includes the following parts: General examination, Local examination.

Local examination further includes extraoral examination and intraoral examination.

General examination includes:
- Gait
- Posture
- Built
- Blood pressure
- Pulse
- Temperature
- Respiratory rate
- Pallor
- Cyanosis
- Edema
- Icterus
- Body mass index (BMI).

Gait: Gait is the pattern of movement of the limbs of animals, including humans, during locomotion over a solid substrate. Different gaits are characterized by differences in limb movement patterns, overall velocity, forces, kinetic and potential energy cycles, and changes in the contact with the surface (ground, floor, etc.).

Antalgic Gait: Painful gait, a limp is adopted to avoid pain on weight bearing structures (hip, knee, ankle).

Ataxic Gait: An unsteady, uncoordinated walk, a wide base of support is seen. normally due to cerebellar disease.

Festinating Gait: Short, accelerating steps are used to move forward, often seen in people with Parkinson's disease.

Four Point Gait: Utilized by crutch users, first on crutch, then the opposite leg followed by the other crutch and then the other leg.

Hemiplegic Gait: Involves flexion of the hip because of inability to clear the toes from the floor at the ankle and circumduction at the hip.

Spastic Gait: Walk in which the legs are held close together and move in a stiff manner. often due to central nervous system injuries.

Posture: In humans, posture can provide important nonverbal communication. Posture deals with how the body is positioned in relation to another person or group of persons (for example, leaning stance posture, standing, sitting, etc.) and how they are positioned relative to each other various body parts.

Built: It is how the body looks like. There are three extremes of body types.

Endomorph (Fig. 9.1)
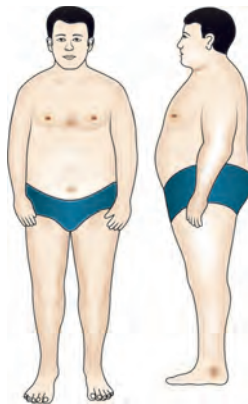
Fig. 9.1: Endomorph body type

- A pear shaped body
- A rounded head
- Wide hips and shoulders

- Wider front to back rather than side to side
- A lot of fat on the body, upper arms and thighs.

Mesomorph (Fig. 9.2)

Fig. 9.2: Mesomorph body type

- A wedge shaped body
- A cubical head
- Wide broad shoulders
- Muscled arms and legs
- Narrow hips
- Narrow from front to back rather than side to side
- A minimum amount of fat.

Ectomorph (Fig. 9.3)

Fig. 9.3: Ectomorph body type

- A high forehead
- Receding chin
- Narrow shoulders and hips
- A narrow chest and abdomen
- Thin arms and legs
- Little muscle and fat.

Blood Pressure: It is useful to determine:
- The stroke volume of the heart and stiffness of the arterial vessels.
- To assess severity of hyper and hypotension and aortic incompetence. (normal level of blood pressure is 120/80 lbmm of Hg).

Pulse: It is an important index of severity of the vascular system and heart abnormalities.

It is useful to record:
- Rate: Fast or slow (normal rate is 60–100/min)
- Rhythm: Regular or irregular
- Volume: High, normal or low pulse pressure (normal pulse pressure is 40–60 mm hg)
- Tension and force
- Character: Some vascular diseases may show different pulse character such as 'water hammer' pulse in aortic regurgitation, 'pulsus paradoxicus' in pericardial effusion, etc.

Body Temperature: The normal core body temperature of a healthy, resting adult human being is stated to be at 98.6 degrees fahrenheit or 37.0 degrees celsius.

Respiration: A respiratory rate, or breathing rate, is the number of breaths a person takes in 1 minute while at rest. Respiratory rate can be measured by counting the number of times a person's chest rises and falls within a minute.

The normal respiratory rate for babies from birth to 6 months is 30 to 60 breaths per minute; after the age of 6 months, breathing has slowed to 24 to 30 breaths per minute. For children from the age of 1 to 5 years old, normal respiration is 20 to 30 breaths per minute. Children who are from 6 to 12 years old should have a normal respiratory rate that ranges from 12 to 20 breaths per minute. The normal respiratory rate for adults and children over the age of 12 ranges from 14 to 18 breaths per minute.

Pallor: Pallor is a reduced amount of oxyhemoglobin in skin or mucous membrane, a pale color which can be caused by illness, emotional shock or stress, stimulant use, lack of exposure to sunlight, anemia or genetics.

Pallor is more evident on the face and palms. It can develop suddenly or gradually, depending on the cause. It is not usually clinically significant unless it is accompanied by a general pallor (pale lips, tongue, palms, mouth and other regions with mucous membranes). It is distinguished from similar symptoms such as hypopigmentation.

Possible causes:
- Migraine attack or headache
- Natural genetics
- Excess estradiol and/or estrone
- Vitamin D deficiency
- Weight gain
- Osteoporosis
- Emotional response, due to fear, embarrassment, grief
- Anemia, due to blood loss, poor nutrition, or underlying disease such as sickle cell anemia
- Shock, a medical emergency caused by illness or injury
- Frostbite
- Cancer
- Hypoglycemia
- Leukemia
- Albinism
- Panic attack
- Heart disease
- Peripheral vascular disease
- Hypothyroidism
- Hypopituitarism
- Scurvy
- Tuberculosis
- Sleep deprivation
- Depression
- Pheochromocytoma

- Squeamishness
- Visceral larval migrans
- High doses or chronic use of amphetamines
- Reaction to ethanol and/or other drugs such as cannabis
- Lead poisoning.

Edema: It is an abnormal accumulation of fluid beneath the skin or in one or more cavities of the body. Generally, the amount of interstitial fluid is determined by the balance of fluid homeostasis, and increased secretion of fluid into the interstitium or impaired removal of this fluid may cause edema.

Cutaneous edema is referred to as "pitting" when, after pressure is applied to a small area, the indentation persists for sometime after the release of the pressure. Peripheral pitting edema is the more common type, results from water retention. It can be caused by systemic diseases, pregnancy in some women, either directly or as a result of heart failure, or local conditions such as varicose veins, thrombophlebitis, insect bites, and dermatitis.

Nonpitting edema is observed when the indentation does not persist. It is associated with such conditions as lymphedema, Lipoedema and myxedema.

Cyanosis: Cyanosis is a physical sign causing bluish discoloration of the skin and mucous membranes. Cyanosis is caused by a lack of oxygen in the blood. It is due to the presence of greater than, or equal to, 2.5 g/dL of deoxygenated hemoglobin in blood vessels near the skin surface.

Icterus: It is defined as a yellow discoloration of mucous membranes and skin due to high concentrations of bilirubin in blood and tissues. It is seen in the condition of jaundice.

Jaundice is often seen in liver disease such as hepatitis or liver cancer.

Body mass index: Body Mass Index (BMI) is a number calculated from a person's weight and height. BMI provides a reliable indicator of body fatness for most people and is used to screen for weight categories that may lead to health problems.

Calculation of BMI: BMI is calculated the same way for both adults and children. The calculation is based on the following formula:

$$\text{Weight (in kg)}/[\text{height (in m)}]^2$$

With the metric system, the formula for BMI is weight in kilograms divided by height in meters squared.

Interpretation of BMI:

BMI	WEIGHT STATUS
• Below 18.5	Underweight
• 18.5–24.9	Normal
• 25.0–29.9	Overweight
• 30.0 and Above	Obese

10
Chapter

Extraoral Examination

It includes the examination of skin, head, face, nose, paranasal sinuses, external ear, nasal mucosa, lips, cheeks, lymph nodes, TMJ, muscles of mastication and salivary glands.

SKIN

Note the general appearance of the individual and the changes in appearance or any rashes, sores or ulcerations. If present, is questioned.

Also note for the change in color of the skin as it signifies anemia and jaundice. Generalized pallor is seen in severe anemia. Yellowness of skin is seen in carotenemia. Pallor is seen in hypopituitarism, shock, syncope and left heart failure.

Check out for texture of the skin. Skin becomes dry and inelastic in dehydration and becomes greasy in acromegaly. Skin gets atrophied with age and with steroid medications.

Also note for the abnormal signs such as petechial hemorrhages (e.g. in blood dyscrasias), any eruptions, erosions, pigmentations (e.g. in Addison's disease, in Von Recklinghausen's disease) or any swelling or edema if present. The positive findings denote a specific sign of characteristic abnormality which is to be questioned.

HEAD

Patient should be evaluated for head region in terms of its appearance, its circumference, etc.

(Hydrocephalus is suspected when the growth of the head is abnormal as compared to age and sex of the patient)

Shape of the Head

The head can be classified into one of the following three types:
1. Mesocephalic: Average shape of head. Patient usually possesses normal shaped dental arches.
2. Dolichocephalic: Long and narrow shaped head. Patients usually have narrow dental arches.
3. Brachycephalic: Broad and short shaped head. Patients usually have a broad dental arch.

FACIAL FORM

The overall shape of the face is generally classified into following three types:
1. Mesoprosopic: It is an average or normal facial form.
2. Euryprosopic: This type of face is broad and short.
3. Leptoprosopic: It is a long and narrow form.

Facial Symmetry

Diagnosis of the symmetry of patients face is important so as to determine the disproportions of face in transverse and vertical planes. No face is ideally symmetrical on both the sides. Some degree of asymmetry is always considered normal.

Asymmetries that are gross and identifiable should be noted and recorded. Gross facial abnormalities can occur as a result of:
- Congenital defects
- Hemifacial hypertrophy/hypotrophy
- Unilateral condylar ankylosis/hyperplasia
- Chronic abscesses/presence of a large cyst/space infections (facial swellings)
- Facial fractures, etc.

Facial Profile

Profile of the patient is determined by visualizing the patient from the side. Profile assessment helps in diagnosing gross deviations in the maxillomandibular relationship.

Three types of facial profiles have been classified:
1. Straight profile: an imaginary line is drawn from the forehead to the upper lip and another line from the upper lip to the anterior

point of chin. Both these lines when joined form a nearly straight line.

2. Convex profile: the two imaginary lines form an angle with the concavity facing the tissue. This type of profile is seen in a prognathic maxilla or a retrognathic mandible.

3. Concave profile: the two imaginary lines form an angle with the convexity towards the tissue. This type of profile s associated with a prognathic mandible or a retrognathic maxilla.

NOSE, PARANASAL SINUSES, EXTERNAL EAR AND NASAL MUCOSA

The nasal area should be examined for any sinus pain, discharge, obstruction, continuous sneezing, periorbital swelling or inflammation.

Some of the common examples are:

- An apical abscess of upper tooth may lead to acute sinusitis.
- Nasal obstruction may lead to mouth breathing habit
- Epistaxis (nasal bleeding) is seen in severe conditions like cerebral hemorrhage.

LIPS

Note the lip color, texture, and any surface abnormalities as well as angular or vertical fissures, sores, ulcers, nodules, plaques, scars and swellings. Notice the vermillion border and the presence of fordyce's granules.

CHEEKS

Note any changes in pigmentation and linea alba, any hyperkeratotic or any hyperpigmented patch, swellings, nodules, scars or ulcers.

LYMPH NODES (FIG. 10.1)

Examination of neck nodes is important, particularly in head and neck malignancies and a systematic approach should be followed. Neck nodes are better palpated while standing at the back of the patient. Neck is slightly flexed to achieve relaxation of muscles.
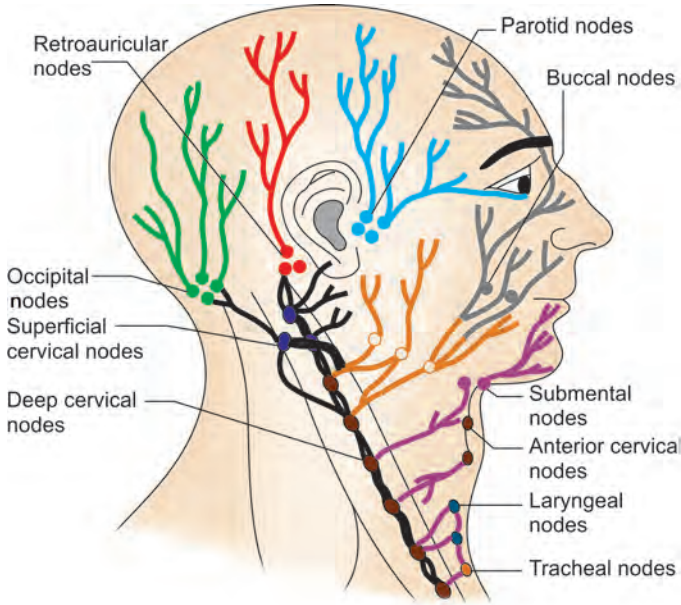
Fig. 10.1: Lymph nodes of head and neck

When a node or nodes are palpable, look for the following points:
- Location of nodes
- Number of nodes
- Size—Abnormal Nodes
    - Greater than 1.5 cm in jugulo digastric area (level I, II, III)
    - Greater than 1cm elsewhere
- Consistency. Metastatic nodes are hard; lymphoma nodes are firm and rubbery; hyperplastic nodes are soft. Nodes of metastatic melanoma are also soft
- Discrete or matted nodes.
- Tenderness. Inflammatory nodes are tender.
- Fixity to overlying skin or deeper structures. Mobility should be checked both in the vertical and horizontal planes (Fig. 10.2).

The lymph nodes of head and neck region are classified according to their position level:

Level I includes

- **IA** Submental nodes, which lie in the submental triangle, i.e. between right and left anterior bellies of diagastric muscles and the hyoid bone.

Fig. 10.2: Examination of the neck nodes

- **IB** Submandibular nodes, lying between anterior and posterior bellies of diagastric muscle and the body of mandible.

Level II Upper Jugular Nodes

- They are located along the upper third of jugular vein, i.e. between the skull base above, and the level of hyoid bone (or bifurcation of carotid artery) below.

Level III Middle Jugular Nodes

- They are located along the middle third of jugular vein, from the level of hyoid bone above, to the level of upper border of cricoid cartilage.

Level IV Lower Jugular Nodes

- They are located along the lower third of jugular vein; from upper border of cricoid cartilage to the clavicle.

Level V Posterior Cervical Group

- They are located in the posterior triangle, i.e. between posterior border of sternocleidomastoid(anteriorly), anterior border of trapezius (posteriorly), and the clavicle below. They include lymph nodes of spinal accessary chain, transverse cervical nodes and supraclavicular nodes.

Level VI Anterior Compartment Nodes

- They are located between the medial borders of sternocleido-mastoid muscles (or carotid sheaths) on each side, hyoid bone

above and suprasternal notch below. They include prelaryngeal, pretracheal, paratracheal nodes.

Level VII

They are located below the suprasternal notch and include nodes of the upper mediastinum.

Examination of Various Lymph Nodes

- **Submental Nodes** (Fig. 10.3)
  Roll the fingers below the chin with patient's head tilted forwards.
- **Submandibular Nodes** (Fig. 10.4)
  Roll your fingers against inner surface of mandible with patient's head gently tilted on one side.
- **Parotid (Preauricular) Nodes** (Fig. 10.5)
  Roll your finger in front of the ear, against the maxilla
- **Postauricular (Mastoid Nodes)** (Fig. 10.6)
  Roll the fingers behind the ear
- **Internal Jugular Chain** (Fig. 10.7)
  Examine the upper, middle and lower groups.
      Many of them lie deep to sternomastoid muscle which may need to be displaced posteriorly.
- **Transverse Cervical Nodes**
- **Supraclavicular (Scalene Nodes)** (Fig. 10.8)
  Roll your fingers gently behind the clavicles.

Fig. 10.3: Examination of submental nodes

Fig. 10.4: Examination of sub-mandibular nodes

Fig. 10.5: Examination of preauricular nodes

Fig. 10.6: Examination of postauricular nodes

Fig. 10.7: Examination of internal jugular chain

Fig. 10.8: Examination of supraclavicular chain

Instruct the patient to cough or to bear down like they are having a bowel movement. Occasionally an enlarged lymph node may pop up.

A normal lymph node cannot be felt. If a node is palpable, it must be abnormal.

If a node is palpable, record the:
• Site
• Size-measure using vernier calipers

- Texture-soft (in case of infection), rubbery hard (in case of Hodgkin's disease), stony hard (in case of secondary carcinoma)
- Tenderness to palpation-in case of infection
- Fixation to surrounding tissues may suggest metastatic cancer
- Coalescence in case of tuberculosis
- Number of nodes-multiple in case of glandular fever, leukemia, etc.

Palpable node characteristics:
- Acute infection—large, soft, painful, mobile, discrete, rapid onset
- Chronic infection—large, firm, less tender, mobile
- Lymphoma—rubbery hard, matted, painless, multiple
- Metastatic cancer—stony hard, fixed to underlying tissues, painless.

Area of Lymphatic Drainage of Face

The face has three lymphatic territories:
a. The upper territory: Including the greater part of the forehead, the lateral halves of the eyelids, the conjunctiva, the lateral part of the cheek and the parotid area, drains into the preauricular (parotid) nodes.
b. The middle territory: Including a strip over the median part of the forehead, the external nose, the upper lip, the lateral part of the lower lip, the medial halves of the eyelids, the medial part of the cheek and the greater part of the lower jaw, drains into the submandibular nodes.
c. The lower territory: Including the central part of the lower lip and chin, drains into the submental nodes.

TEMPOROMANDIBULAR JOINT

The importance is to determine deviation of jaw from the midline during the opening and closing of the jaws.

Causes of jaw deviation:
- Traumatic injuries of the joint
- Infection of the jaw
- Fractures of the jaw
- Muscular hypertrophy and hypotrophy.

The lateral mandibular range of motion or movement is assessed "normal 8 to 10 mm" by having the patient to occlude the teeth and then slide the jaw in both directions. The range of movement from midline and any pain, location and severity is recorded.

Maximum interincisal opening: As a general guide, mobility is considered to be reduced if the subject is unable to open his or her jaw to the width of two fingers (< 30 mm).

Palpation: (Figs 10.9A to C)

- Palpation of TMJ may be bimanual and bidigital palpation; may be extra-auricular or intra-auricular.
- The palpation may reveal pain and irregularities during condylar movement, described as clicking or crepitus. Clicking reveals the internal derangement of TMJ.
- The lateral pole of condyle is most accessible for palpation during mandibular movements.
- Palpation just anterior and posterior to the lateral pole detects pain associated with TMJ capsular ligament.
- The comparison between both condyles must be assessed by palpation.

MUSCLES OF MASTICATION (FIGS 10.10A TO G)

- The patient is asked to clench their teeth and, using both hands, the practitioner palpates the *masseter* muscles on both sides, making sure that the patient continues to clench during the procedure.
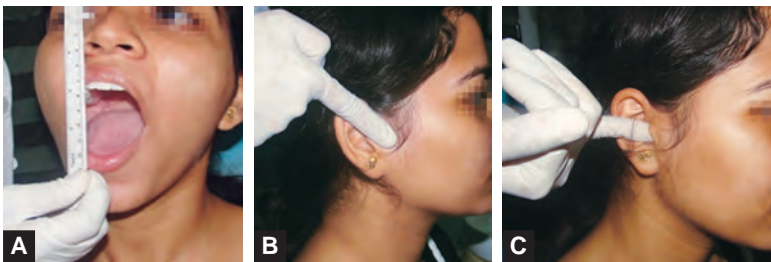
Figs 10.9A to C: TMJ examination: A. Measuring maximum interincisal opening; B. Palpation of the pretragus area, lateral aspect of the TMJ; C. Intra-auricular palpation, the posterior aspect of TMJ

Figs 10.10A to G: Examination of muscles of mastication: A. Palpation of the masseter muscles; B. Bimanual palpation of the masseter muscles; C. Palpation of the lateral pterygoid muscles; D. Palpation of the medial pterygoid muscle; E. Palpation of the temporalis muscle; F. Palpation of the sternocleidomastoid; G. Palpation of the trapezius muscles

- Palpate the origin of the masseter along the zygomatic arch and continue to palpate down the body of the mandible where the masseter is attached.
- Parafunctions such as bruxism and clenching also gives rise to masseter pain that is frequently associated with pain in the temporalis muscle.
- The temporalis is palpated in much the same manner to detect lateral interferences.
- The lateral pterygoid muscle is sometimes painful on the contralateral side in patients with nonworking side interferences.

- In addition, this muscle will be painful whenever there is a centric slide with an anterior component and the patient is bruxing or clenching in this anterior position.
- The lateral pterygoid, despite its commonality in displaying a spasm, cannot be palpated intraorally.
- The medial pterygoid muscle is not usually involved in gnathic dysfunctions but when they are hypertonic, the patient is usually conscious of a feeling of fullness in the throat and an occasionally pain on swallowing.

SALIVARY GLANDS

Parotid Gland

- Check for any swelling over the region. Note the extent, size shape and consistency of the gland over the area. The position determination is vital so as to rule out the lymph node swellings that may be confused with parotid swellings.
- In case of parotid abscess, the skin over the area becomes edematous with pitting on pressure.
- Examine the area for presence of any fistula, and enlargement of lymph nodes or involvement of facial nerves.

  The parotid gland duct (stenson's duct) opens in the buccal mucosa opposite to the crown of maxillary second molar. Retract the cheek for its proper examination.

Submandibular Gland

- History of the patient is to be noted, e.g. swelling with pain at the time of meals suggests obstruction in submandibular duct. Calculi are more common in submandibular gland as compared to others major salivary glands.
- Check for any nodal swelling, it may suggest of lymph node enlargement.

  Inspection over the area of the gland should be done to check the overlying skin color and distension of the mucosa and the orifice of the Wharton's duct.

- Bimanual palpation — in the open mouth, the physician's finger of one hand is placed on the floor of the mouth and pressed as far as possible. The finger of the other hand is placed on the exterior at the inferior margin of the mandible. These fingers are pushed upwards and palpation is achieved.

If the gland or duct is infected, slight pressure over the gland will exudates pus from its orifice.

If any obstruction is suspected, it is checked by placing dry cotton over both the orifices, and the patient is asked to suck lemon juice for 2 minutes. After 2 minutes, both the rolls are taken out. The gland that is obstructed will not wet the cotton on its side.

11
Chapter

Intraoral Examination

SOFT TISSUE EXAMINATION

Examination of Lips and Labial Mucosa

Logically, the intraoral examination begins with the examination of the lips. The exposed red portion of the lips, or the vermillion border, forms a transition between the external skin and the moist mucous membrane of the oral mucosa.

Because the overlying epithelium is thin, a normal lip shows the characteristic reddish color. Several folds and sulci over the epithelium of the lip may crease the skin. The thick, pink labial mucosa that lines the internal surfaces of the lips may appear mildly lumpy or nodular on visual inspection. This is due to the presence of accessory salivary glands found just beneath the mucosal surface.

Both the upper and lower lips have a flap of tissue called a frenum or frenulum, which attaches to the midline mucosa of the maxillary and mandibular alveolar processes.

The clinical features of normal lips and labial mucosa are:
- Reddish color over the area
- Folds and sulci over the surface of lips
- Absence of any plaque or patchy area
- Absence of any erosive areas

The lips and the labial mucosa are examined by the observation of the patient at rest. The lips are normally in contact or slightly apart. The lip line, the level of the edge of the lip should be noted, both at

rest and when the patient smiles. Any abnormalities should be carefully noted and recorded. A careful evaluation of the lip by bidigital palpation is done using the index finger and the thumb to gently squeeze the lip mass. Any abnormalities to sight or feel are carefully recorded.

The lips are thus recorded for:
- Competency
- Color
- Texture
- Fissuring
- Shape
- Presence of any lump or hard tissue.

Some of the common conditions that manifest as lip abnormalities are:

1. *Lip pits and commissural pits:* These are congenital defects of lip and labial mucosa that result in unilateral or bilateral depression or pit that may occur on the lip region or on the commissures (angles of mouth).
2. *Cleft lip:* These are one of the most common developmental malformations. The incidence of cleft lip varies from 1:500 to 1:2500 in Asians. It presents a unilateral or bilateral deficiency over the lip area, extending up to the nasal area. Cleft lip is most common in upper lip. Cleft lip is also commonly associated with cleft palate (Figs 11.1A and B).
3. *Angular cheilitis:* Inflammatory lesion at the labial commissure, or corner of the mouth, and often occurs bilaterally. The condition manifests as deep cracks or splits.
4. *Angioedema:* Diffuse edematous swelling occurring as a result of allergic reactions. Spreads to other tissues very rapidly and should be treated instantly.

Examination of Buccal Mucosa

Buccal mucosa is the internal lining of the cheek region. The mucous membrane often varies considerably in thickness from one area to another but it is generally thick and pink like the labial mucosa with which it is continuous.

Figs 11.1A and B: (A) Unilateral cleft lip, (B) bilateral cleft lip

Occasionally, there is seen a white line running anteroposteriorly at the occlusal level, termed as Linea Alba. This line is produced by continuous pressing of buccal mucosa by the teeth due to the action of buccinators. Also, a frequent observation of small yellow nodules is seen at the posterior parts of buccal mucosa. These are actually the ectopic sebaceous glands, termed as Fordyce's Granules.

Clinically, a normal buccal mucosa presents:
- Pink to slight reddish surface
- Occasionally, Linea alba may be present
- Occasional occurrence of Fordyce's granules.

The buccal mucosa can be best visualized when the patient partially opens the mouth. A mouth mirror or clinicians finger can be used to retract the cheek to expose all the areas. Gauze should be used to dry the surface of buccal mucosa when required. Any abnormal finding should be carefully noted and recorded.

Some of the common conditions in buccal mucosa that manifest as abnormalities are:
1. *White lesions of oral cavity:* Such as hyperkeratosis, leukoplakia, actinic keratosis, candidiasis, chewer's mucosa, white sponge nevus, lichen planus, etc.
2. *Red lesions of oral cavity:* Hemangiomas, varix, erythroplakia, ecchymosis, etc.
3. *Ulcerative lesions of oral cavity:* Trauma, apthous stomatitis, herpangina, behcet's syndrome, etc.

Examination of the Floor of the Mouth

The floor of the mouth is a narrow, horse shoe shaped depression lying between the base of the tongue and alveolar processes of the mandible. There is present in the midline a Lingual Frenulum, connecting the inferior surface of the tongue with the floor of the mouth.

Clinically, a normal floor of mouth presents:
- Shiny pink surface
- Presence of normal lingual frenal attachments
- Absence of any patchy or ulcerated lesion.

The best view of the floor of the mouth is seen by asking the patient to raise the tongue to the roof of the mouth and then using a mouth mirror to further retract the tongue away from the medial sides of the mandible. The mucosa is gently dried with gauze.

Palpation is done by gently pressing the floor of the mouth by index finger of one hand and the opposite hand palpating from outside of the jaw extra orally, gently pressing up.

Some of the common conditions of floor of mouth that mani-fest as abnormalities are:
- *Mandibular tori:* A physiologic enlargement of alveolar process on the lingual surface that can be seen while examining the floor of the mouth.
- *Ranula:* A traumatic swelling that occurs on the floor of mouth as a result of calculi in the duct of salivary gland or obstruction of minor salivary glands on the surface.

Examination of the Tongue

The dorsum of a healthy tongue is covered by a mucous membrane, which is rough due to the presence of thousands of papillae projecting onto the surface. There are three types of papillae present on the surface:
1. *Filiform papillae:* these are the most numerous type of papilla, with small, spikelike projections covering most of the surface of tongue. This papilla does not contain taste buds and are responsible for surface roughness.
2. *Fungiform papillae:* these are the second most numerous papillae, containing taste buds, having mushroom shaped projections, most commonly on the lateral borders and on the tip of tongue.
3. *Circumvallate papillae:* these are 7 to 14 in number, distinctively present slightly anterior to the sulcus terminalis (a v-shaped groove on the posterior part of tongue), running parallel to it. Each circumvallate papilla is surrounded by a trough or crypt, into which numerous taste buds open.

A normal tongue presents the following characteristics:
- A moist, reddish mucosa over the dorsal surface
- Roughness over the dorsal surface indicating the presence of papilla
- Absence of any plaque or ulcer.

The dorsal and lateral surfaces of the tongue are best examined by asking the patient to open his mouth wide and the tongue thrust forward. A piece of gauze is wrapped around the tip of the tongue, enabling the clinician to manually move the tongue by itself, for examining the lateral borders.

All surfaces of the tongue should be carefully inspected and palpated by running a finger firmly over the surfaces. Care must be taken not to stimulate the patient's gag reflex by touching the soft palate.

Some of the conditions of tongue that manifest as abnormalities are:

- *Aglossia:* Absence of tongue
- *Microglossia:* Decrease in size of tongue
- *Macroglossia:* Increase in size of tongue
- *Ankyloglossia:* Also known as 'tongue-tie'. A condition, where lingual frenum attaches overly to the bottom of the tongue and restricts its free movement (Fig. 11.2)
- *Sprue:* A common condition seen in malabsorption syndrome where tongue becomes severly ulcerated and inflamed with a painful, burning sensation
- *Iron deficiency anemia:* Tongue presents depapillated areas with erosive lesions
- *Fissured Tongue*
- *Geographic Tongue*
- *Ulcers*
- *Squamous Cell Carcinoma*
- *Median rhomboid glossitis.*

Examination of the Hard and Soft Palate

The hard palate forms two third of the palatal region, lying between the alveolar processes of the maxilla and palatine bones. The soft palate

Fig. 11.2: Ankyloglossia

is just the posterior one third of the palatal region, and is formed by a group of small palatal muscles covered by a mucous membrane.

The hard palate consists of an incisive papilla, a soft tissue portion overlying the incisive canal, a median palatine raphe, which can be distinguished by a shallow depression or a low ridge extending to the soft palate and palatine rugae, which are dense ridges of mucosa present on anterior hard palate. The soft palate consists of a soft tissue projection in the midline termed as the uvula.

The hard and soft palates can be best visualized when the patient's head is tilted back as the patient lies in a supine position with the mouth wide open. A mouth mirror may be used for additional help. In addition, the patient is asked to say 'ahhh' as the examiner gently depresses the tongue, visualizes the soft palate function.

Some of the common conditions of palate that manifest as abnormalities are:

- *Cleft palate:* A common developmental anomaly resulting in incomplete fusion of the two lateral processes creating a gap in the palatal shelf. Cleft palate may be complete (involving the hard and soft palate) or incomplete (involving only the hard palate or only the soft palate) (Fig. 11.3).

Fig. 11.3: Cleft Palate

- *Torus palatinus:* A slow growing, physiologic, bony protuberance occurring in the midline area of the palate.
- *Smoker's palate:* A common condition where multiple petechiae are seen over the hard palate, as a result of inflammation of minor salivary glands and hyperkeratosis in response to tobacco smoking (Fig. 11.4).

Examination of Swelling

- **Inspection:** A good observation of the lump is important for determining the nature of the swelling. A few points must be considered:
    – Site of the swelling
    – Shape of the swelling
    – Size of the swelling
    – Surface mucosa
    – Edges
    – Number

Fig. 11.4: Smoker's Palate

– Movement with deglutition
– Movement with protrusion of tongue.

- **Palpation:** This is the most important part of the physical examination of the swelling, giving many clues about the diagnosis. The swelling must be gently palpated to avoid producing any associated problems. Following points must be noticed:

  – *Surface temperature:* localized temperature may be raised in cases of increased vascularity as in inflammatory swellings.

  – *Tenderness:* If the patient complains of pain while touching the swelling, it is considered as tender. The inflammatory swellings are mostly tender.

  – *Consistency:* The consistency of a swelling indicates the contents of the swelling and the clue to which anatomical structure it is derived from. A soft swelling may indicate a cyst or an acute abscess and a hard swelling may indicate of a neoplasm or a chronic abscess.

  – *Size, shape and extent:* On palpation, a general idea can be taken about the deeper dimensions of the swelling inside the oral cavity which is not evident from inspection.

  – *Fluctuation:* to determine a fluctuant swelling, a sudden pressure is applied at one end of the swelling, and vibrations are felt at the other end. When a swelling fluctuates, it indicates the presence of a liquid or a gas, e.g. in case of lipoma, irritation fibroma, etc.

  – *Translucency:* The amount of clear fluid (such as water, serum, plasma, fat globules) present in a swelling decides the amount of light to pass through it. It is mostly used to analyze extra-oral swellings. A torch is used to produce light to be transmitted through the swelling, e.g. Ranula, Mucocele.

  – *Fixity to the skin:* pedunculated swellings (such as papilloma) or sessile swellings (such as sebaceous cyst) are assessed.

  – *Relation to surrounding structures:* The clinician must try to assess the anatomical structure from which the swelling has originated and must assess whether it is confined to that structure or has invaded to other structures. This is mostly done to rule out malignancies in the orofacial region.

- **State of the regional lymph nodes:** The lymph nodes associated with the area of swelling should be assessed for determining chronicity and tenderness.

Examination of Ulcer

- **Inspection:** following points should be considered:
  – *Size and shape:* different diseases produce a variety of ulcers (for example, syphilitic ulcers are circular or semilunar, carcinomatous ulcers are irregular in shape, traumatic ulcers take the shape of the injurious agent, etc).
  – *Number:* ulcers of neoplastic origin, tuberculous ulcers, etc. are solitary while other are numerous in number. For example, recurrent apthous ulcers.
  – *Position:* position of the ulcer over the face or in the oral cavity itself gives an important clue about the diagnosis (ulcers of squamous cell carcinoma reside mostly in the middle third of face, position of traumatic ulcers in denture wearers gives the idea of the offending artificial tooth, etc.)
  – *Edges:* It suggests of both the diagnosis and the condition of the ulcer. Five common types of ulcer edges are seen:
    - Undermined edge: seen in tubercular ulcers. The ulcer spreads and destroys the subcutaneous tissue faster than skin.
    - Punched out edge: mostly seen in gummatous or recent traumatic ulcers. The edge is seen at right angles to the base of ulcer.
    - Sloping edge: healing ulcers mostly present this edge. It suggests that the disease is confined within the ulcer itself, not beyond that.
    - Raised edge: is a feature of rodent ulcer.
    - Rolled out (averted) edge: suggests neoplastic diseases. The fast growing cellular matter heaps up and spills over the normal skin to produce an everted edge.
  – *Floor:* This is the major portion of the ulcer and is exposed to the environment. The presence of granulation tissue over the

base indicates a healing ulcer. A smooth and shiny base indicates a growing, inflamed ulcer.

– *Discharge:* The amount and nature of discharge from the ulcer should be noted. A spreading and inflamed ulcer will produce a purulent discharge. Discharge may also be associated with the etiologic organism associated with the disease.

– *Surrounding area:* Generally, the surrounding of an acute ulcer is inflamed. Wrinkling around the ulcer may indicate a healing ulcer which may produce a scar.

• **Palpation:** Following points should be kept in mind:

– *Tenderness:* Acute ulcers are usually found to be more tender than the chronic ones.

– *Depth:* Depth of an ulcer is to be noted.

– *Bleeding:* clinician must see whether the ulcer bleeds on touching or not. It is a common feature of a malignant ulcer.

– *Surrounding skin:* increased temperature and tenderness of the adjoining skin is seen in an acute ulcer.

– Relation with deeper structures.

• **Examination of lymph nodes:** The regional lymph nodes relating to the area of the ulcer must be assessed. In acutely inflamed ulcers, the lymph nodes become large and tender. A chronic nonhealing ulcer may too produce an enlarged lymph node. In malignant ulcers, the nodes are stony hard and fixed to the surrounding structures.

Periodontal Examination

The periodontal assessment is typically done after the extraoral and intraoral assessment, and mostly after the dental assessment. In this way, a number of periodontal abnormalities can be directly associated to dental hard tissue problems such as faulty restorations, open contacts, malpositioned teeth, anatomical variations, etc.

The visual examination of periodontium is difficult because the appearance of periodontal disease varies widely. Instruments such as mouth mirror, periodontal probe, furcation probe, explorer, etc. are necessary for the complete assessment of the periodontium.

The components of the periodontal examination include:
- Visual characteristics of gingiva
  - Color
  - Contour
  - Consistency
  - Surface Texture
  - Shape
  - Size
- Periodontal pocket assessment
- Assessment of gingival recession and the level of gingival attachment
- Detection of bleeding while probing
- Detection of suppuration
- Detection and measurement of furcations.

Gingival Characteristics

- *Color:* Healthy gingiva has always been described as being coral pink, although variable melanin pigmentation between individuals may differ its appearance. An inflamed gingiva may appear erythematous or cyanotic or both. Capillary dilation due to inflammation make the gingiva appear red and shiny. Gingival color is not a good indicator of its health as normal colored gingiva may exhibit deep pockets too.
- *Contour:* A healthy gingival contour follows the margin of underlying bone. In an inflamed gingiva, the connective tissue is destroyed and hence, the accumulation of extracellular fluid occurs in it. This edema, swells up the tissue and normal contour is lost. A rimlike enlargement of gingival margin is also observed and noted as rolled or rounded.
- *Consistency:* Healthy gingiva is firmly bound to underlying bone and tooth. Inflamed gingiva, being edematous, the gingiva here loses its firmness and resiliency. The papilla can be seen retractable, the tissue becomes loose.
- *Surface Texture:* Normal gingiva shows an orange peel like appearance which is termed stippling. Histologically, stippling is formed by intersection of epithelial rete pegs and the interspersing penetration of connective tissue papillae. Loss of stippling occurs when gingival loses its resiliency, i.e. it becomes edematous.

- *Size:* A healthy gingiva is flat and not enlarged, fitting snugly around the tooth. The fitting is because of the attached gingiva that varies among patients and in different areas of the mouth from 1 to 9 mm.

    In an inflamed gingiva, the size becomes enlarged, either localized to specific areas or generalized throughout the gingiva. The amount of false pocket depth also increases.

    Size of gingiva increases in:
    – Chronic gingival inflammations
    – Pregnancy associated gingivitis
    – Puberty associated gingivitis
    – Drug induced gingival reactions.

- *Position:* The actual position of the gingiva is at the level of the attached periodontal tissue, but it can only be determined by probing. In a fully erupted tooth in and adult, the apparent position of gingival margin is normally at the level of, or slightly below, the enamel contour or prominence of the cervical third of the tooth.

    In a diseased gingiva, the margins of gingiva may be high on the enamel or at a lower level exposing a part of the cervical area and the root surface.

    Conditions producing a high margin:
    – Gingival enlargements
    – Short clinical crowns.

    Conditions producing a lower margin:
    – Gingival recessions
    – Trauma from occlusion
    – Supraeruption
    – long clinical crowns.

- *Bleeding on probing:* The insertion of probe to the bottom of the pocket elicits bleeding if the gingiva is inflamed, atrophic or ulcerated. In most cases, bleeding on probing is an earlier sign of inflammation than gingival color changes.

    To test for bleeding, a blunt periodontal probe is carefully introduced to the bottom of the pocket along the long axis of the tooth and is gently moved with a weight ranging from

20 to 25 grams. The clinician should wait for at least 30 seconds to check the presence of any bleeding (Figs 11.5A and B).

Bleeding on probing occurs when:

- Gingiva is inflamed
- Ulcerated
- Necrosed.
- *Exudate:* In a clinically healthy gingiva, there is no exudation from the gingival sulcus except a slight gingival sulcular fluid,


Figs 11.5A and B: Bleeding on probing

which cannot be seen by visual observation. But in an inflamed gingiva, the amount of sulcular fluid is increased and there may be an evidence of suppurative exudation from the gingival sulcus. Although exudation is an important sign of inflammation, it does not give any information about the depth of periodontal pockets.

Periodontal Pocket Assessment

A periodontal pocket occurs as a result of apical migration of the junctional epithelium in the presence of disease from the CEJ. A calibrated periodontal probe must be used to both detect and measure the depth of pocket. The periodontal probe consists of a handle connected to a tapered shank with a working end marked in millimeters, terminating in a blunt tip.

The most common probes used for measuring pocket depth are:
- Michigan 'O' probe: markings are at 1-2-3-5-7-8-9-10 mm
- The WHO/CPITN probe: markings are at 0.5-3.5-5.5-8.5-11.5 mm (Fig. 11.6).
- William's periodontal probe: markings are at 1-2-3-5-6-8-9 mm (Fig. 11.7).
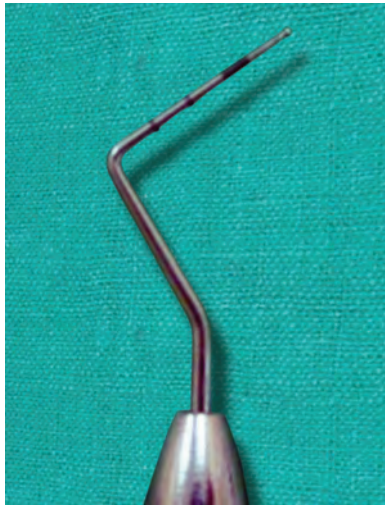
Fig. 11.6: CPITN probe

Fig. 11.7: William's periodontal probe

Probing is done by gently inserting the probe into the sulcus parallel to the long axis of the tooth with a mild force of 20 to 25 gms. At the 'col' space, the probe is tilted slightly (up to 10 degrees) to ensure an accurate reading. Measurements for a tooth are usually made at all the surfaces individually. The tendency to probe gently in the anterior region and more forcefully in the posterior region leads to inaccurate measurements and patient discomfort. A clinically acceptable healthy gingiva may have a sulcus depth ranging from 1 to 3 mm.

Attachment Loss and Gingival Recession

Probing depth alone does not indicate the amount of periodontal destruction, assessing the loss of attachment is also vital. Loss of attachment, the distance between the CEJ and the base of the pocket, is the true clinical measure of the amount of destruction.

Furcation Assessment

The point at which the root trunk on a multirooted tooth diverges to form more than one root is called a furcation or furca. Bone loss

during the periodontal disease may progress to the level that results in involvement of the furcation area. Once a furcation gets involved, the prognosis of the tooth decreases significantly.

Naber's probe is the probe of choice for detecting and measuring furcation areas (Fig. 11.8). It is a double-ended curved probe with alternate 3 mm markings. While examination, the tip of the Nabers probe should be held as parallel as possible to the long axis of the tooth and the furcation is explored as the probe is moved with a horizontal walking stroke apically and laterally into the furca.

In 1953, Irving Glickman graded furcation involvement into the following four classes:

Grade I: Incipient furcation involvement, with any associated pocketing remaining coronal to the alveolar bone; primarily affects the soft tissue. Early bone loss may have occurred but is rarely evident radiographically.

Grade II: There is a definite horizontal component to the bone loss between roots resulting in a probeable area, but bone remains

Fig. 11.8: Naber's probe

attached to the tooth so that multiple areas of furcal bone loss, if present, do not communicate.

Grade III: Bone is no longer attached to the furcation of the tooth, essentially resulting in a through-and-through tunnel. Because of an angle in this tunnel, however, the furcation may not be able to be probed in its entirety; if cumulative measurements from different sides equal or exceed the width of the tooth, however, a grade III defect may be assumed. In early grade III lesions, soft tissue may still occlude the furcation involvement, though, making it difficult to detect.

Grade IV: Essentially a super grade III lesion, grade IV describes a through-and-through lesion that has sustained enough bone loss to make it completely probeable.

Mobility Test

The periodontal attachment surrounding the tooth is evaluated by using the test. The test is performed by moving the tooth laterally in its socket either by using a back end of a mirror and a finger or by using the handles of two instruments.

Mobility is of two types:
1. Pathologic mobility: resulting from destruction of attachment apparatus around the tooth, or by parafunctional habits.
2. Adaptive mobility: resulting from anatomic factors such as short root-crown ratio, or short roots, etc.

Tooth mobility is measured by:
1. According to Glickman:
    a. Grade I–Slightly more than normal
    b. Grade II–Moderately more than normal
    c. Grade III–Severe mobility also in the lateral sides combined with vertical depression
2. According to Miller in 1950:
    0 – It denotes no detectable movement when force is applied except for the normal (physiologic) mobility.
    1 – Mobility greater than normal
    2 – Mobility upto 1 mm in buccolingual direction
    3 – Mobility greater than 1 mm in buccolingual direction with the ability to depress the tooth.

Check for the presence of any root stump, filled tooth, defective restorations, the areas devoid of teeth (missing teeth areas), any supernumerary teeth or any other abnormality present in the dentition.

Detection of Suppuration

Suppuration is the formation or secretion of PUS. Pus is an exudate, resulting from inflammatory products consisting of leukocytes and debris of dead cells and tissue elements. The presence of suppuration indicates the presence of inflammation of the periodontium, but does not signify its severity. Notably, suppuration is not related to pocket depth too.

HARD TISSUE EXAMINATION

A proper hard tissue evaluation involves more than just reporting the positive findings over the area. Condition presented in the intraoral examination should be comprehensively recorded and compared to the results of history. The way and order of the comprehensive recording depends on dentist's preference.

Dentition

There are different nomenclature systems proposed for naming each tooth in the oral cavity:

FDI (two digit system): This is the most commonly used system. The first digit in the system indicates the quadrant number and the second digit denotes the number of tooth in the quadrant.

Permanent teeth:

18 17 16 15 14 13 12 11 21 22 23 24 25 26 27 28
48 47 46 45 44 43 42 41 31 32 33 34 35 36 37 38

Primary teeth: 55 54 53 52 51 61 62 63 64 65
                 85 84 83 82 81 71 72 73 74 75

Zsigmondy and palmer system: The oldest method, divides the oral cavity into four quadrants.

The deciduous teeth are named by the formula

$$\text{E D C B A} \mid \text{A B C D E}$$
$$\text{E D C B A} \mid \text{A B C D E}$$

The permanent teeth are named by the formula

$$\text{8 7 6 5 4 3 2 1} \mid \text{1 2 3 4 5 6 7 8}$$
$$\text{8 7 6 5 4 3 2 1} \mid \text{1 2 3 4 5 6 7 8}$$

Universal system: The entire dentition is named by continuous alphabets/numbers after dividing the quadrants.

Deciduous teeth:

$$\text{A B C D E} \mid \text{F G H I J}$$
$$\text{T S R Q P} \mid \text{O N M L K}$$

Permanent teeth:

$$\text{1 2 3 4 5 6 7 8} \mid \text{9 10 11 12 13 14 15 16}$$
$$\text{32 31 30 29 28 27 26 25} \mid \text{24 23 22 21 20 19 18 17}$$

Dane system:

For permanent teeth:

$$\text{8+ 7+ 6+ 5+ 4+ 3+ 2+ 1+} \mid \text{+1 +2 +3 +4 +5 +6 +7 +8}$$
$$\text{8– 7– 6– 5– 4– 3– 2– 1–} \mid \text{–1 –2 –3 –4 –5 –6 –7 –8}$$

For primary teeth:

$$\text{05+ 04+ 03+ 02+ 01+} \mid \text{+01 +02 +03 +04 +05}$$
$$\text{05– 04– 03– 02– 01–} \mid \text{–01 –02 –03 –04 –05}$$

Dental Caries Assessment

Dental caries: It is an infectious, microbiological disease of teeth that results in localized dissolution and destruction of the calcified tissue.

Any type of carious exposure to the patient is examined and recorded. The caries below an existing restoration are also carefully checked and recorded.

Classification of Caries

According to EXTENT of lesion:
- *Incipient caries (Initial or primary):* Carious lesion appears as a white opaque region (white spot lesion)
- *Cavitated caries:* The enamel surface is broken (not intact) and the lesion has advanced into enamel/dentin. No remineralization is possible at this stage.

According to RAPIDITY of caries progression

- *Acute caries (active):* spreads rapidly invading almost the entire dentition. It involves several teeth. The carious lesion is soft and light-colored. For example, Rampant caries appears suddenly in the dentition and progresses rapidly with early pulp involvement.
- *Chronic caries (slow):* caries spreading slowly over the tooth surface. The carious lesion is darker in colour and harder in consistency due to repeated phases of demineralization and remineralization.

According to PREVIOUS treatment

- *Primary caries:* Primary caries is the original carious lesion of the tooth
- *Recurrent caries (secondary):* Occurs at the interface of tooth and restorative material.

According to the INVOLVING SITES and SURFACES to be treated:

GV BLACK'S classification:

CLASS 1: Cavities on occlusal surface of premolars and molars, on occlusal two-thirds of the facial and lingual surfaces of molars, and on lingual surfaces of molars.

CLASS 2: Cavities on proximal surfaces of posterior teeth.

CLASS 3: Cavities on proximal surfaces of anterior teeth that do not involve the incisal angle.

CLASS 4: Cavities on proximal surfaces of anterior teeth that do involve the incisal edge.

CLASS 5: Cavities on the gingival third of the facial and lingual surface of all teeth.

CLASS 6: Cavities on the incisal edge of the anterior teeth or occlusal cusp heights of posterior teeth.

Based on LOCATION of caries:

- Pit and fissure caries
- Smooth surface caries
- Root surface caries
    - Check out for any defective restoration or recurrent caries.

Percussion Test

This test evaluates the status of periodontium around the tooth. It is done by two methods: vertical percussion and horizontal percussion test. The percussion test is done by striking the tooth with a quick, moderate blow, first on the teeth adjacent to the suspected teeth and then in succession to the last teeth.

If vertical percussion test comes positive, it indicates periapical pathology and if horizontal percussion test is positive, it indicates periodontium pathology. Also, the patient's response over the striking of the tooth is noted.

Malocclusion

Edward Angle gave the classification for permanent dentition (1890):
- Class I—Arch in normal mesiodistal relationship, the mesio-buccal cusp of the maxillary first permanent molar coincides with the buccal groove of the mandibular permanent first molar (Fig. 11.9).
- Class II—The distobuccal cusp of the upper first permanent molar coincides with the buccal groove of the lower first permanent molar (Figs 11.10A and B).
- Class III—The mesiobuccal cusp of maxillary first permanent molar coincides with the interdental space between the mandibular first and second permanent molar (Fig. 11.11).

Developmental Anomalies of Teeth

Developmental anomalies of teeth are not very rare and can occur at various stages of tooth development:
- Dental Lamina formation stage: Anodontia (no teeth)
- Initiation and Proliferation (during the formation of tooth bud): Partial anodontia, supernumerary, geminated/fused teeth
- Histo-differentiation: Odontodysplasia
- Morpho-differentiation: Macro/micro size, dans invaginatus, dens evaginatus, Hutchinson's Incisors, talon cusp, taurodontism, dilacerations

Fig. 11.9: Class I malocclusion

Figs 11.10A and B: Class II malocclusion:
A. Class II Div. 1;
B. Class II Div. 2

Fig. 11.11: Class III malocclusion

- Apposition–matrix formation
  - Amelogenesis imperfecta
  - Dentinogenesis imperfecta
  - Enamel Hypoplasia (Fig. 11.12)
- Calcification–mineralization of the matrix
  - Fluorosis
  - Amelogenesis Imperfecta.

Wasting Diseases of Teeth

Tooth wear describes the noncarious loss of tooth tissue as a result from the interaction of four processes which may occur in isolation or in combination; attrition, erosion, abrasion and abfraction.

Erosion is a chemical process in which the tooth surface is removed in the absence of plaque. Erosive factors may be either intrinsic or extrinsic. Extrinsic sources include drinks such as fresh fruit juices, carbonated drinks and alcoholic beverages; and some foods and industrial processes. Intrinsic sources include gastro-esophageal reflux and eating disorders (Fig. 11.13).

Abrasion refers to the loss of tooth structure due to external agents which have an abrasive effect on the teeth for example, toothbrush bristles and dietary factors (Figs 11.14A and B).

Fig. 11.12: Enamel Hypoplasia

Attrition is a process in which tooth tissue is removed as a result of opposing tooth surfaces contacting during function or parafunction. Such direct contact occurs at proximal areas, on supporting cusps and on guiding surfaces during empty grinding movements (Figs 11.15A and B).

Abfraction (stress lesions) has been suggested to be as a consequence of eccentric forces on the natural dentition. Cusp flexure causes stress at the cervical fulcrum and results in loss of the overlying tooth structure. The lesion is typically wedge shaped with sharp line angles, but occlusal abfractions may present as circular invaginations (Figs 11.16A and B).

Bruxism: It is defined as the grinding of teeth during nonfunctional movements of the masticatory system. The wear is usually uniform when opposing teeth are affected. Bruxism can also be associated with muscle spasm, fractured teeth and restorations (Figs 11.17A and B).

Enamel Hypoplasia

Enamel hypoplasia is a defect that occurs when dental enamel doesn't form completely, usually because of malnutrition or disease. Enamel hypoplasia is identified as a horizontal line, a series of pits or grooves

Fig. 11.13: Dentition showing erosion

Figs 11.14A and B: Abrasion (marked by arrow)

Figs 11.15A and B: Attrition

along the outer surface of the tooth. These lines mark points at which the tooth's growth was resumed after it had stopped.

Hypoplasia is most common in the permanent teeth and represents episodes of arrested growth in infancy or childhood while these teeth were still developing. Once the enamel forms, it can no longer be affected (Figs 11.18A and B).

This type of defect may cause tooth sensitivity, may be unsightly or may be more susceptible to dental cavities. Some genetic disorders cause all the teeth to have enamel hypoplasia.
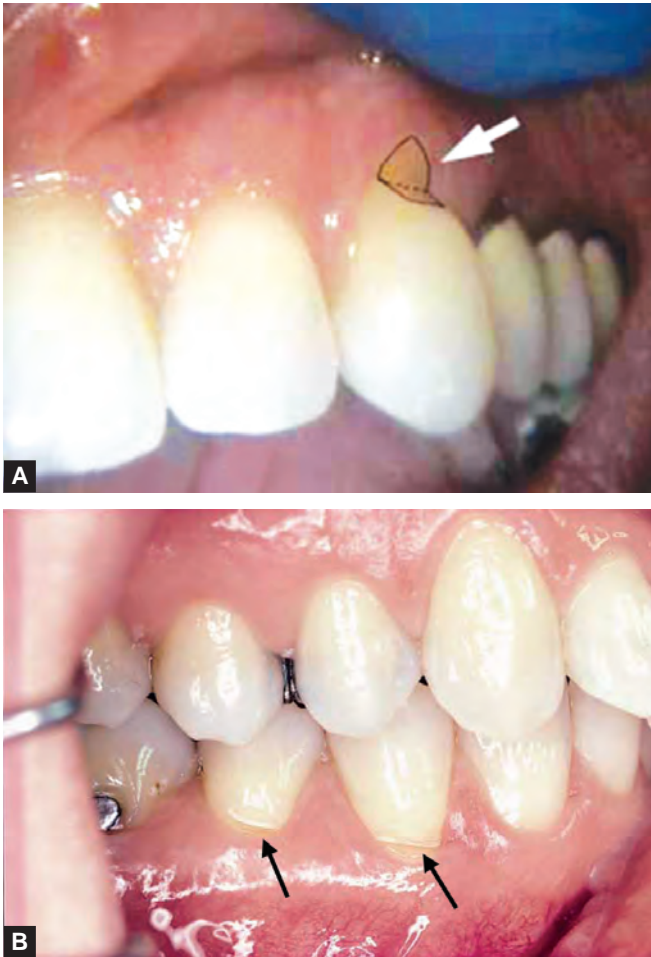
Figs 11.16A and B: Abfraction (marked by arrows)

Environmental and genetic factors that interfere with tooth formation are thought to be responsible for enamel hypoplasia. This includes trauma to the teeth and jaws, infections during pregnancy or infancy, poor prenatal and postnatal nutrition, hypoxia, exposure to toxic chemicals and a variety of hereditary disorders.

Figs 11.17A and B: Bruxism

Dental Fluorosis

It is important to diagnose the condition. It is difficult to differentiate between dental fluorosis and other enamel disturbances. Dental fluorosis is generalized within the dentition and over the entire tooth surface which makes it easy to distinguish fluoride-induced enamel changes from other enamel defects (nonfluoride origin) which may be symmetrically distributed in the oral cavity.

Due to excessive fluoride intake, enamel loses its lustre. In its mild form, dental fluorosis is characterized by white, opaque areas
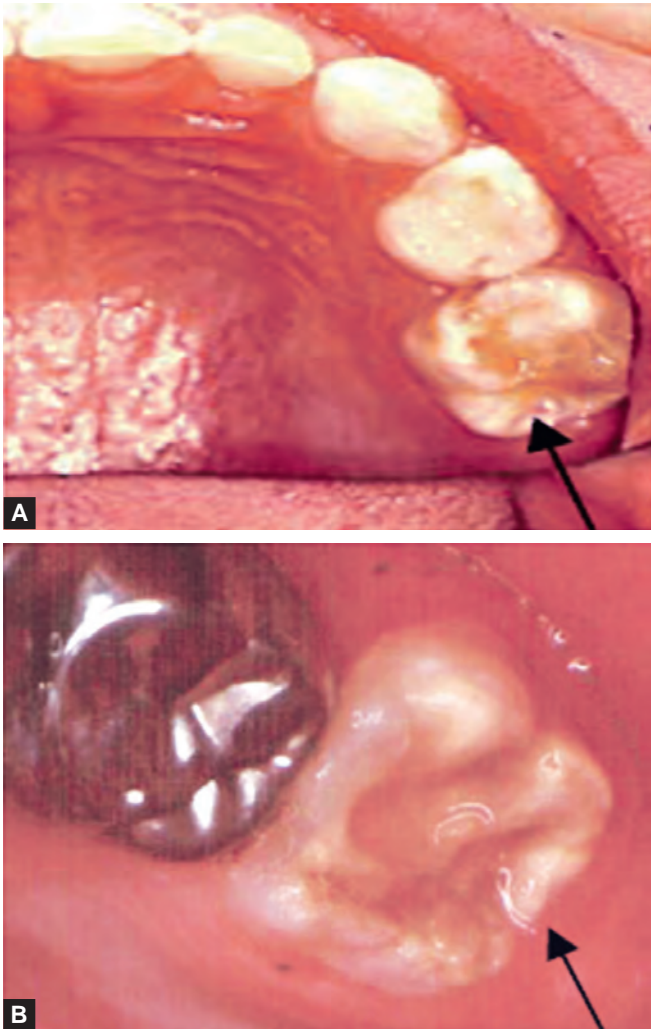
Figs 11.18A and B: Enamel hypoplasia

on the tooth surface and in severe form, it is manifestated as yellowish brown to black stains and severe pitting of the teeth. This discoloration may be in the form of spots or horizontal streaks.

Normally, the degree of dental fluorosis depends on the amount of fluoride exposure up to the age of 8 to 10 years, as fluoride stains

only the developing teeth while they are being formed in the jawbones and are still under the gums.

The effects of dental fluorosis may not be apparent if the teeth are already fully grown prior to the fluoride over exposure. Therefore, the fact that an adult shows no signs of dental fluorosis does not necessarily mean that his or her fluoride intake is within the safety limit.

The levels of prevention for dental fluorosis and Indices for scoring dental fluorosis are discussed in subsequent chapters (Chapters 16 & 17).

Trauma from Occlusion

It can be defined as pathologic or adaptive changes which develop in the periodontium as a result of undue force produced by the masticatory muscles.

Stillman (1917): A condition where injury results to the supporting structures of the teeth by the act of bringing the jaws into a closed position

WHO (1978): Damage in the periodontium caused by stress on the teeth produced by the teeth of the opposing jaw.

Trauma from occlusion [TFO] is classified into two categories:

Primary: A tissue reaction, which is elicited around a tooth with normal of the periodontium, thus no attachment loss is seen.

Secondary: This is related to situations in which occlusal forces cause damage in a periodontium of reduced height (attachment loss present).

The clinical signs that are seen are:

- Pain
- Tooth migration
- Attrition
- Muscle/joint pain
- Fractures, chipping
- Fremitus.

Etiology of TFO

- Occlusal disharmony
- Tooth drifting, tipping and overeruption following extraction of neighboring teeth results in occlusal interference
- Failure to contour the cusps of restorations
- Occlusal interference following orthodontic tooth movement
- Excessive occlusal stress as badly designed partial denture
- Parafunctional activity, e.g bruxism
- Decreased adaptive capacity of the tissues to occlusal forces.

Tooth Fracture (Figure 11.19)

Tooth fracture is the **break in the continuity of a tooth** with or without any displacements of the fragments. It may be pathological or by the result of an injury of an already diseased tooth or a healthy one. Tooth fracture can be as a result of many causes including; sport injuries, automobile accidents, bicycle falls, physical fighting and chewing of very hard items.

Ellis and Davey have classified tooth fracture according to the level and severity of fracture:

Class I   Simple fracture of crown involving enamel.
Class II   Fracture of crown involving dentin but no pulp

Fig. 11.19: Tooth fracture

Class III   Extensive fracture of crown involving dentin and pulp exposure

Class IV   Traumatized tooth becomes nonvital (with or without loss of tooth structure)

Class V   Tooth lost due to trauma

Class VI   Fracture of root with or without loss of crown structure

Class VII   Displacement of the tooth without crown or root fracture

Class VIII   Fracture of crown en mass

Class IX   Fracture of deciduous tooth.

Classification by Garcia Godoy

- 0– Enamel crack
- 1– Enamel fracture
- 2– Enamel, dentin fracture without pulp exposure
- 3– Enamel, dentin fracture with pulp exposure
- 4– Enamel, dentin, cementum fracture without pulp exposure
- 5– Enamel, dentin fracture with pulp exposure
- 6– Root fracture
- 7– Concussion
- 8– Luxation
- 9– Lateral displacement
- 10– Intrusion
- 11– Extrusion
- 12– Avulsion.

Establishing the Diagnosis

The diagnosis of patient's symptoms and other significant disease processes leads to sometimes a self-evident conclusion. The diagnosis is usually established by:

- Reviewing the patient's history and examination data
- Listing those items that may suggest the possibility of a significant health problem
- Grouping items into primary and secondary, acute and chronic, high priority versus low priority, etc.
- Categorizing the disease on the basis of this grouping.

For an effective treatment and insurance and medicolegal purposes, it is essential that the diagnosis should be written into the patient's record after the detailed history and examination data.

Although, there is no universal accepted system for identifying and classifying diseases, the diagnosis are often written for the purpose of accurate understanding of the disease. Some of the standardization has been done by WHO under 'International Classification of Diseases (ICD)' system, continuously revised by it.

A definite diagnosis cannot be always made, despite possessing full examination and history data. In such cases, a descriptive term may be used for describing the probable health problem, termed as the 'provisional diagnosis'. The clinician should always keep in mind about the differential diagnosis. The 'provisional diagnosis' indicates to list those items that indicate an abnormality or suggest the possibility of significant health problems.

Investigations

It helps to come to the final diagnosis. These are adjuvant methods of examining the patient for further confirmation of the provisional diagnosis.

The **common methods** are:
- Radiographic investigations
- Biochemical investigations
- Histopathological investigations
- Pulp vitality testing
- Hematological investigations
- Urine analysis
- Microbiological investigations
- Special investigations like MRI, CT Scan, etc.

RADIOGRAPHIC INVESTIGATIONS

Clinical situations for which radiographs may be indicated are:
- Positive historical findings
  - Previous periodontal or endodontic therapy
  - History of pain or trauma
  - Familial history of dental anomalies
  - Postoperative evaluation of healing
  - Presence of implants.
- Positive clinical signs/symptoms
  - Clinical evidence of periodontal disease
  - Large or deep restorations

- – Deep carious lesions
- – Malposed or clinically impacted teeth
- – Swelling
- – Evidence of facial trauma
- – Mobility of teeth
- – Fistula or sinus tract infection
- – Clinically suspected sinus pathology
- – Growth abnormalities
- – Oral involvement in known or suspected systemic disease
- – Positive neurologic findings in the head and neck
- – Evidence of foreign objects
- – Pain and/or dysfunction of the temporomandibular joint.
- – Facial asymmetry
- – Abutment teeth or fixed or removable partial prosthesis
- – Unexplained bleeding
- – Unexplained sensitivity of teeth
- – Unusual eruption, spacing, or migration of teeth
- – Unusual tooth morphology, calcification, or color
- – Missing teeth with unknown reason.

The radiographs used in dentistry are:
- • Intraoral periapical radiographs
- • Bitewing radiographs
- • Occlusal radiograph
- • Panoramic radiographs (orthopantomogram).

In choosing the type of radiograph to be examined, the dentist should consider the anatomic relationships, the size of the field, and the radiation dose from each view.

Radiographic examination is categorized under: Intraoral radiographs and Extraoral radiographs.

Intraoral Radiographs

Intraoral radiographs are examinations made by placing the X-ray film within the patient's mouth during the exposure. Intraoral films provide more detailed information but a significantly higher radiation dose per unit area exposed.

They are of three types:

A. Periapical Radiograph (Fig. 13.1)

Periapical views show all of a tooth and the surrounding bone and are very useful for revealing caries and periodontal and periapical disease. These views may be made of a specific tooth or region or as part of a full mouth examination.

B. Interproximal Radiograph (Fig. 13.2)

Interproximal views (bitewings) show the coronal aspects of both the maxillary and mandibular dentition in a region, as well as the
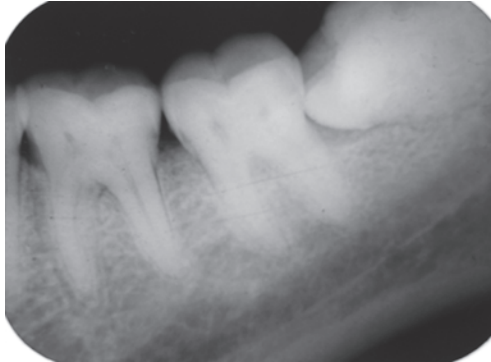
Fig. 13.1: Periapical radiograph
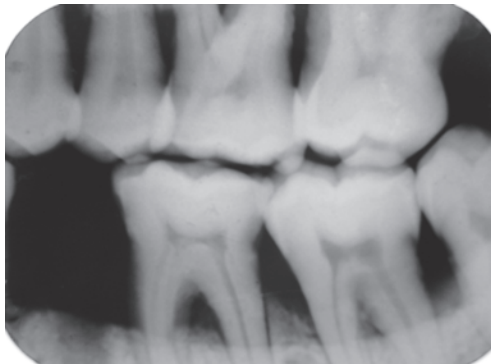
Fig. 13.2: Interproximal radiograph
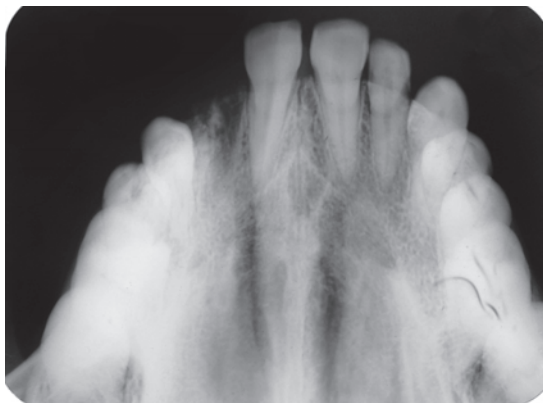
Fig. 13.3: Occlusal radiograph

surrounding crestal bone. These views are most useful for revealing proximal caries and evaluating the height of the alveolar bony crest.

C. Occlusal Radiograph (Fig. 13.3)

Occlusal views are intraoral radiographs in which the film is positioned in the occlusal plane. They are often used in lieu of periapical views in children because the small size of the patient's mouth limits film placement. In adults, occlusal radiographs may supplement periapical views, providing visualizations of a greater area of teeth and bone. They are useful for demonstrating impacted or abnormally placed maxillary anterior teeth or visualizing the region of a palatal cleft. Occlusal views may also demonstrate buccal or lingual expansion of bone or presence of a sialolith in the submandibular duct.

Extraoral Radiographs

These are examinations made of the orofacial region using films located outside the mouth. The panoramic radiograph has the most common use for general dental patients.

Panoramic Radiograph (Fig. 13.4)

These radiographs provide a broad view of the jaws, teeth, maxillary sinuses, nasal fossa and TMJs. They show which teeth are present,
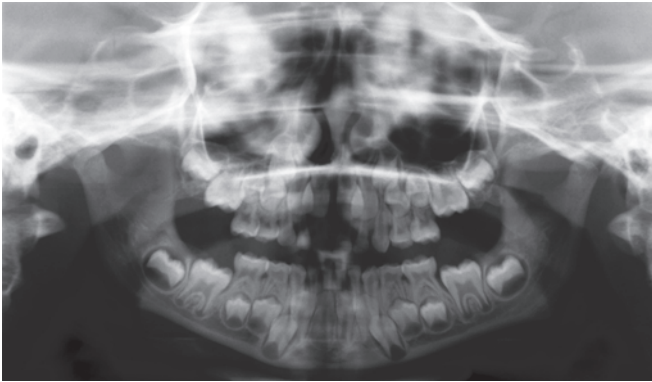
Fig. 13.4: Panoramic radiograph

their relative state of development, presence or absence of dental abnormalities, and many traumatic and pathologic lesions in bone. Panoramic radiographs are the technique of choice for initial examinations of edentulous patients. Panoramic radiographs are also susceptible to artifacts from improper patient positioning that negatively affect the image. This system is considered inadequate for independent diagnosis of caries, root abnormalities, and periapical changes.

Advanced Imaging Procedures

A variety of advanced imaging procedures such as CT.

CT scanning (sometimes called CAT scanning) is a noninvasive medical test that helps physicians diagnose and treat medical conditions. CT scanning combines special X-ray equipment with sophisticated computers to produce multiple images or pictures of the inside of the body. These cross-sectional images of the area being studied can then be examined on a computer monitor, printed or transferred to a CD. CT scans of internal organs, bones, soft tissue and blood vessels provide greater clarity and reveal more details than regular X-ray exams (Fig. 13.5).

MRI, Ultrasonography, and nuclear medicine scans may be required in specific diagnostic situations. For these techniques, the
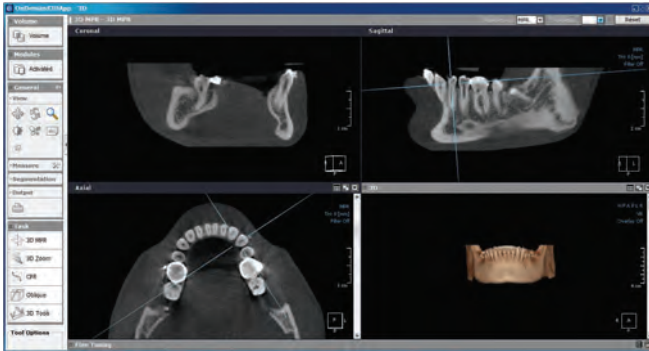
Fig. 13.5: CT scan

dentist refers the patient to a hospital or other imaging center, rather than performing them in the dental office.

Type of examination	Detectable disease
Intraoral radiographs	
Periapical	Caries, periodontal disease, occult disease
Bitewings	Caries, periodontal bone level
Full–mouth periapical	Caries, periodontal disease, dental anomalies, occult disease
Occlusal	Dental anomalies, occult disease, salivary stones, expansion of jaw
Extraoral radiographs	
Panoramic	Dental anomalies, occult disease, extensive caries, periodontal disease, periapical disease, TMJ
Conventional Tomography/	Slice TMJ, implant site assessment
CT/Head	Extent of craniofacial pathology, fracture, implants
MRI	Soft tissue disease, TMJ

HISTOPATHOLOGICAL INVESTIGATIONS

Biopsy

Biopsy is the removal and examination of a section of tissue or other material from the living body for the purposes of diagnosis.

Indications for biopsy:
- Any unusual oral lesion that cannot be identified with clinical certainty must be biopsied.
- Any lesion that has not shown evidence of healing in 2 weeks should be considered malignant until proven otherwise.
- A persistent, thick, white, hyperkeratotic lesion and any mass that does not break through the surface epithelium should be biopsied.
- Any tissue surgically removed must be submitted for microscopic examination.

Cytologic Smear

The cytologic smear technique is a diagnostic aid in which surface cells of a suspicious lesion are removed for microscopic evaluation. Indications for smear technique:
- In general, a lesion for which biopsy is not planned may be examined by smear. An exception is a keratotic lesion that is not suitable for exfoliative cytology.
- A lesion that looks like potential cancer should be examined be smear if the patient refuses to have a biopsy specimen taken.
- The smear technique is used for follow-up examination of patients with oral cancer treated by radiation. The treated tissue may heal inadequately and cause persistent ulceration.
- Cytology is useful for identifying Candida Albicans organisms in patients with suspected candidiasis.
- Cytology may be useful in identifying herpes virus by taking a smear from an intact vesicle.
- In mass screening programs for cancer detection, smears may be taken.
- Research studies to show changes in surface cells, for example, the effects of topical agents, may use a smear technique.

Exfoliative Cytology

Stratified squamous epithelial cells are constantly growing towards the surface of the mucous membrane, where they are exfoliated. Exfoliated cells and cells beneath them are scraped off, and when these cells are prepared on a slide, changes in the cells can be detected

by staining and studying them microscopically. The malignant cells stain differently from normal cells and take on unusual, abnormal forms.

PULP VITALITY TESTING

Dental pulp tests are investigations that provide valuable diagnostic and treatment planning information. Pulp testing combined with information taken from the history, examination, and other investigations such as radiographs leads to the diagnosis of the underlying disease. Pulp sensibility tests include thermal and electric tests, which extrapolate pulp health from sensory response. With all pulp tests, the results need to be carefully interpreted as false results can lead to misdiagnosis leading to incorrect, inappropriate, or unnecessary treatment.

Cold tests: Ethyl chloride and ice have been popular in the past, but CO_2 snow and other refrigerants such as dichlorodifluoromethane (DDM) have been shown to be effective and superior to ice and ethyl chloride. Ice is the most common and easiest way for cold test. A common way to make ice in useful sizes and dimensions involves freezing water in empty local anesthetic cartridges.

Heat test: Typical methods used include gutta-percha or compound material heated to melting temperature and directly applied to the tooth being tested with lubricant in order to facilitate removal of the material. Heated ball-ended metallic instruments placed near the tooth (without touching the tooth surface), battery-powered controlled heating instruments such as 'Touch n Heat' and hot water bathing with the tooth isolated by rubber dam are other alternative methods.

Electric pulp test: Electric pulp testing (EPT) works on the principle that electrical stimuli cause an ionic change across the neural membrane, thereby inducing an action potential with a rapid hopping action at the nodes of Ranvier in myelinated nerves. The pathway for the electric current is thought to be from the probe tip of the test device to the tooth, along the lines of the enamel prisms and dentine tubules, and then through the pulp tissue. The circuit is completed with the patient wearing a lip clip or by touching the

probe handle with his/her hand; alternatively, the operator can touch the patient's skin with one "gloveless" hand. A tingling sensation will be felt by the patient once the increasing voltage reaches the pain threshold. This threshold level varies between patients and teeth, and is affected by individual age, pain perception, tooth surface conduction, and resistance.

Test cavity: The preparation of a test cavity has been suggested as a last resort in a tooth where no other means can ascertain the pulp status. Cutting into dentine using a high or low speed bur without local anesthetic may give some indication of whether the sensory element of the pulp is still functioning. This method is considered invasive and irreversible. It is unlikely that this procedure would provide any more information than thermal and electric pulp sensibility tests. The defect made in the tooth can be repaired with restorative dental materials.

Final Diagnosis

All the records, clinical findings, the provisional diagnosis and investigations are clubbed together to frame the final diagnosis on which treatment is planned. The final diagnosis is first made on the chief complaint of the patient and then other problems are considered.

Patients must be informed of their diagnosis and the results of the various examination and tests performed on it. Also, the patient should be informed of the nature, significance and treatment of the health problem that has been clearly diagnosed.

15
Chapter

Formulating a Comprehensive Treatment Plan

The goal of treatment planning is to devise the best treatment for the patient. The diagnostic procedures help the clinician in establishing a suitable treatment plan for the respective patient. The plan of treatment should also be included in the record of the patient and explained to the patient in detail. If the patient has a compromising medical health situation, the risks for the treatment should be assessed and informed to the patient.

The decision for or against a medically compromised patient is usually arrived by the dentist requesting the patient's physician to 'clear the patient for dental treatment'. The plan of treatment is usually directed towards the severity of patient's symptoms, referring to as rational or scientific treatment planning.

COMPREHENSIVE TREATMENT PLAN MAY BE DIVIDED INTO THE FOLLOWING PHASES
Phase I: Emergency phase Phase II: Preventive phase Phase III: Promotive phase Phase IV: Curative phase Phase V: Rehabilitation phase Phase VI: Maintenance phase

A treatment plan that works effectively in a private practice as well as teaching institute can be divided into following phases:

PHASE I: EMERGENCY PHASE

It includes the procedures which eliminate pain and manage the acute infections. The effort should be made to include the chief complaint in this phase as it addresses the main dental problem of the patient.

Procedures in this phase include:
- Treatment of pulpally involved teeth by emergency endodontics or extraction
- Treatment of painful oral conditions such as ANUG, etc.
- Placement of temporary restorations in case of deep caries threatening pulp exposure
- Drainage of abscess.

PHASE II: PREVENTIVE PHASE

In this phase, the effort is made to control the disease process rather than to provide therapy.

Procedures undertaken in this phase include:
- Pit and fissure sealants
- Topical fluoride application
- Oral screens and other habit breaking appliances
- Space maintainer and Preventive orthodontics.

PHASE III: PROMOTIVE PHASE

Oral health promotion aims to improve the oral hygiene and dental awareness of the patient.

Procedures undertaken in this phase include:
- Oral hygiene instruction
- Diet advice/counseling
- Oral health education.

PHASE IV: CURATIVE PHASE

This phase aims to eliminate all the dental problems of the patient. This phase is also called as therapeutic phase.

Procedures undertaken in this phase include:
- Oral prophylaxis and root planing
- Restoration
- Endodontic therapy
- Periodontal therapy
- Extraction of teeth
- Oral surgical procedures.

PHASE V: REHABILITATION PHASE

In this phase, the goal is to restore the mouth to full function using restorative and prosthodontic procedures.

Procedures undertaken in this phase include:
- Crowns and Bridges
- Implant supported prosthesis
- Complete or removable partial dentures
- Reconstruction prosthesis.

PHASE VI: MAINTENANCE PHASE

It includes the steps such as recall, review and reassessment of the oral conditions of the patient after the treatment.

The recall interval is indeed an important step in dental care as it helps the clinician to assess the effectiveness of the treatment and preventive advice provided previously.

The recommended interval for recall should be determined specifically for each patient and tailored to meet his or her needs, on the basis of an assessment of disease levels and risk of or from dental disease.
- The beneficial effects of oral hygiene, diet, fluoride use.
- The ill effects of tobacco, alcohol and pan chewing on oral health.
- The risk factors that may influence the patient's oral health, and their implications for deciding the appropriate recall interval.
- The outcome of previous care episodes and the suitability of previously recommended intervals.
- The patient's ability or desire to visit the dentist at the recommended interval.
- The financial costs to the patient of having the oral health review and any subsequent treatments.
  - The interval before the next oral health review should be chosen, either at the end of an oral health review if no further treatment is indicated, or on completion of a specific treatment.
  - According to National Institute for Health and Clinical Excellence, the patient should be assigned a recall interval of

3, 6, 9 or 12 months if he or she is younger than 18 years, or 3, 6, 9, 12, 15, 18, 21 or 24 months if he or she is aged 18 years or older.

During a recall visit, the patient record can be updated in terms of his or her previous treatment/s, new lesions, reinforcement of prevention advice, etc.

Periodic maintenance is infact of more importance than seeking a treatment. If regular evaluation of patient is done then the need for complex, invasive or surgical procedures can be eliminated with the help of preventive and promotive procedures only.

Factors to consider when deciding a patient's recall interval

	Adults	24
3	Children	
3	Months	12

Decreased interval   Increased interval

Risk factors	**Protective factors**
• Medical history of note	• No medical history of note
• Social risk factors	• No social risk factors
• Poor dietary habits	• Good dietary habits
• No exposure to fluoride	• Exposure to fluoride
• Caries experience	• No caries experience
• Peridontal disease experience	• No periodontal disease experience
• Mucosal lesions	• No mucosal lesions
• Plaque present	• No plaque present
• Low saliva flow	• Normal saliva flow
• Erosion	• No erosion

Oral health review

Dentists use clinical judgement to weigh these factors when deciding on a patient's recall interval

Levels of Prevention

In modern day concept of prevention has become 'Broad Based'.

Four levels of prevention can be identified in relation to natural history of disease:

• Primordial prevention
• Primary prevention
• Secondary prevention
• Tertiary prevention.

Levels of prevention	Primordial	Primary	Secondary	Tertiary
Priorities of prevention	Before disease initiation	Disease Initiation	Disease progression and recurrence	Loss of function
Taxonomy of prevention	Prepathosis	Prepathosis	Intervention	Replacement
Preventive services	Individual and mass education	Health promotion Specific protection	Early diagnosis and prompt treatment	Disability limitation Rehabilitation

Primordial prevention consists of actions and measures that inhibit the emergence of risk factors in the form of environmental, economic, social, and behavioral conditions and cultural patterns of living, etc.

Primary prevention is defined as action taken prior to onset of disease which removes the possibility that a disease will ever occur.

Secondary prevention is defined as action which halts the progress of disease in its incipient stage and prevent complications.

Tertiary prevention is defined as all measures available to reduce or limit impairments and disabilities, minimize suffering caused by existing departures from good health to promote patients adjustment to irremediable conditions.

LEVELS OF PREVENTION FOR DENTAL CARIES

Levels of prevention Preventive services	Primary prevention		Secondary prevention	Tertiary prevention	
	Health promotion	Specific protection	Early diagnosis and prompt treatment	Disability limitation	Rehabilitation
Services provided by the individual	Diet planning. Demand for preventive services. Periodic visits to the dental office.	Appropriate use of fluoride. Ingestion of fluoridated water. Use of fluoridated dentifrice. Oral hygiene practices.	Self examination and referral. Utilization of dental services.	Utilization of dental services	Utilization of dental services
Services provided by the community	Dental health education programs.	Community or school water fluoridation.	Periodic screening and referral.	Provision of dental services	Provision of dental services

Contd...

Levels of prevention Preventive services	Primary prevention		Secondary prevention	Tertiary prevention	
	Health promotion	Specific protection	Early diagnosis and prompt treatment	Disability limitation	Rehabilitation
	Promotion of lobby efforts	School fluoride tablet program. School sealant program	Provision of dental services		
Services provided by the dental professional	Patient education. Plaque control program. Diet counseling. Recall re-inforcement. Caries activity tests. Assessing the Dietary habits, especially frequency of sugary food and drink con-sumption.	Topical application of fluoride. Fluoride supple-ments/rinse-preparation. Pit and fissure sealants. Assessing the clinical evidence of previous disease.	Complete examination. Prompt treatment of incipient lesions. Preventive resin restorations. Simple restorative dentistry. Pulp capping. Limiting the impact of caries at an early age.	Complex restorative dentistry. Pulpotomy. RCT, extraction.	Removable and fixed prosthodontics. Minor tooth movement. Implants. Rehabilitation of decayed teeth with further preventive care

LEVELS OF PREVENTION FOR PERIODONTAL DISEASE

Levels of prevention / Preventive services	Primary prevention		Secondary prevention	Tertiary prevention	
	Health promotion	Specific protection	Early diagnosis and prompt treatment	Disability limitation	Rehabilitation
Services provided by the individual	Demand for preventive services. Periodic visits to the dental office.	Oral hygiene practices.	Self-examination and referral. Utilization of dental services.	Utilization of dental services	Utilization of dental services
Services provided by the community	Dental health education programs. Promotion of lobby efforts. Promotion of research efforts. Provision of oral hygiene aids.	Supervised school brushing programs	Periodic screening and referral. Provision of dental services	Provision of dental services	Provision of dental services

Contd...

Levels of prevention Preventive services	Primary prevention		Secondary prevention	Tertiary prevention	
	Health promotion	*Specific protection*	*Early diagnosis and prompt treatment*	*Disability limitation*	*Rehabilitation*
Services provided by the dental professional	Patient education. Plaque control program. Recall reinforcement.	Correction of tooth malalignment. Prophylaxis. Immunization against specific plaque pathogens. This should be done especially in patients with periodontal disease; pregnant women; diabetic patients; patients infected with the human immunodeficiency virus; patients with neutrophil defects, etc.	Complete examination. Scaling and curettage. Corrective, restorative and occlusal services. Treatment of gingivitis.	Procedures that limit the impact of established disease (for example, resection of deep periodontal pockets to reduce nidi for plaque accumulation. Deep curettage. Root planing. Splinting. Periodontal surgery. Selective extractions	Removable/fixed prosthodontics. Minor tooth movement

PREVENTION OF DENTAL TRAUMA

Primary prevention	Secondary prevention	Tertiary prevention
Four components of the thoroughly tested, easy-to-implement SAFE model: National Program for Playground Safety (NPPS) recommends: **S**upervision—adults must be trained in appropriate active supervision techniques. **A**ge-appropriate design—children of varying age groups need equipment designed for their specific developmental characteristics. **F**all surfacing—the type and depth of ground materials must be adequate for cushioning falls. **E**quipment—plastic, wooden, and metal equipment must be maintained, repaired, and replaced. **Playground surfaces:** Most government rules for play equipment recommends that an impact absorbing surface be provided around the items from which children are most likely to fall. **Early treatment of large overjets (mixed dentition)** Studies have shown that the incidence of accidental trauma to permanent incisors significantly increases with overjets greater that 9 mm.	Prompt intervention following dental trauma can reduce complications of injury and also improves the prognosis.	Provision of dental services (Pulp care and restoration, Prosthesis)

LEVELS OF PREVENTION FOR ORAL CANCER

Levels of prevention Preventive services	Primary prevention		Secondary prevention	Tertiary prevention	
	Health promotion	Specific protection	Early diagnosis and prompt treatment	Disability limitation	Rehabilitation
Services provided by the individual	Demand for preventive services. Periodic visits to the dental office.	Avoidance of known irritants.	Self examination and referral. Utilization of dental services.	Utilization of dental services	Utilization of dental services
Services provided by the community	Dental health education programs. Promotion of lobby efforts. Promotion of research efforts.		Periodic screening and referral. Provision of dental services	Provision of dental services	Provision of dental services
Services provided by the dental professional	Patient education	Removal of known irritants in the oral cavity.	Complete examination, biopsy, oral cytology, complete excision	Chemotherapy, radiation therapy, surgery	Maxillofacial and removable prosthesis. Plastic surgery, speech therapy, counseling.

LEVELS OF PREVENTION FOR DENTAL FLUOROSIS

Primary prevention	Secondary prevention	Tertiary prevention
Specific guidelines on the use and appropriate dose levels of fluoride supplements, and use of fluoride tooth paste for young children. In high fluoride areas: • Provide an alternate supply of drinking water • Employ defluoridation techniques at the community or individual level	Improve the nutritional status, especially of expecting mothers, newborns and children up to the age of 12 years. Treat other causes of fluoride toxicity such as kidney and thyroid diseases, etc.	Treat the discolored/ disfigured dentition by appropriate aesthetic treatment such as bleaching, micro-abrasion, laminate veneers, etc.

LEVELS OF PREVENTION OF MALOCCLUSION

Primary prevention	Secondary prevention	Tertiary prevention
This includes control of harmful oral habits, and preservation and restoration of primary and permanent dentition.	Habit-breaking appliances should be used. Serial extractions, space maintainers/regainers, and functional appliances to correct jaw relations are other modalities. Frenectomies and simple appliances can be used to correct anterior cross bites.	Corrective orthodontic treatment includes the use of fixed and removal appliances and surgical orthodontics in cases of severe malocclusion

17
Chapter

Dental Indices

Dental indices provide a quantitative method for measuring, scoring, and analyzing dental conditions in individuals and groups. An index describes the status of individuals or groups with respect to the condition being measured. It is an objective mathematical description of a disease or condition based on carefully determined criteria under specified circumstances.

Oral health surveys depend on dental indices, as do researchers and clinicians, to help in understanding trends of a disease and patient's needs. In epidemiological oral health surveys, an index is used to show the prevalence and incidence of a particular condition, to provide baseline data, to assess the needs of a population, and to evaluate the effects and results of a community program. Researchers use indices to determine baseline data and to measure the effectiveness of specific agents, interventions, and mechanical devices. In private practice, index scores are used to educate, motivate, and evaluate the patient. By comparing scores from the initial exam during a follow-up exam, the patient can measure the effects of personal daily care.

The first dental index, developed by Schour and Massler, was known as a Papilla, Marginal gingiva and Attached gingiva (PMA) Index. Each of those areas was examined and scored from 0 to 5, depending on the severity of inflammation. The PMA Index, largely of historic interest now, was primarily used in surveys of acute gingivitis. The status of a patient's periodontal health or disease is commonly measured by an index in private practices. One of the most widely used is the Periodontal Screening and Recording (PSR) Index, adapted in 1992 from a system in use in Europe called the Community Periodontal

Index of Treatment Needs. The PSR is an early detection system for periodontal disease. It is not intended to replace full periodontal charting, but to serve as a simple and convenient screening tool.

Today, dental indices are used to assess both individual and group oral health and disease status. They can be simple, measuring only the presence or absence of a condition, or they can be cumulative, measuring all evidence of a condition, past and present.

DEFINITION

An index is defined as a numerical value describing the relative status of a population on a graduated scale with definite upper and lower limits, which is designed to permit and facilitate comparison with other populations classified by the same criteria and methods (AL Russell, 1969).

Professional Implications

Dental professionals from the private practice clinician to the researcher use indices to benefit their patients. A dentist or hygienist might use a PI to impress upon a patient the need for better oral hygiene. A World Health Organization researcher might use the same index to assess the home care practices of a population. Indices will continue to be important and necessary tools for dental professionals.

PROPERTIES OF AN IDEAL INDEX

Reliability: It should be able to measure consistently at different times and under a variety of conditions. The term is synonymous with reproducibility, repeatability that is, if a researcher examined the same patient with the same condition multiple times, each times the score or results would be the same.

Validity: It should measure what it is intended to measure. It should accurately reflect the extent or degree to which the condition or disease is present.

Clarity, simplicity and objectivity: The examiner should be able to remember the criteria. Index should be easy to apply. The criteria should be clear and simple.

Quantifiability: The index should be amenable to statistical analysis, so that status of a group can be expressed by a statistical measure. For example, mean, median.

Acceptability: The use of an index should not be painful and demeaning to the subject.

Sensitivity: The index should be able to detect reasonably small shifts, in either direction in the condition.

TYPES OF INDICES

Simple index: It is the one which measures the presence or absence of a condition. For example, an index which measures the presence of plaque without evaluating its effects on the gingiva.

Cumulative index: It is the one which measures all the evidence of a condition (past and present). An example is DMFT index for dental caries.

Irreversible index: An index which measures the conditions that will not change. For example, a dental caries index.

Reversible index: One that measures conditions that can be changed or reversed.

Full mouth indices: These indices measure the patient's entire periodontium or dentition, e.g. Russell's periodontal index.

Simplified indices: These indices measure only representative samples of dental apparatus, e.g. Green and Vermillion's simplified oral hygiene index (OHI-S).

Indices are also classified in general categories according to the entity which they measure

- Disease index, e.g. 'D' (Decay) portion of the DMF index is the best example for disease index.
- Symptom index, e.g. measuring gingival or sulcular bleeding are essentially examples for symptom indices.
- Treatment index, e.g. the 'F' (Filled) portion of DMF index is best example for treatment index.

PURPOSE AND USES OF AN INDEX

Indices can be used for individual assessment, for clinical trials or epidemiological surveys as shown in Table 17.1.

In addition to measuring a patient's periodontal status, dental indices can measure the amount of plaque and calculus present or not present in a patient's mouth, the amount of bleeding present in

Table 17.1: Purpose and uses of an index

Type	Uses
Individual assessment	Evaluation and monitoring the progress and maintenance of oral health
	Measures effects of personalized disease control programs overtime
	Monitors progress of disease healing
	Patient education and motivation
	Provides individual assessment to help patient to recognize an oral problem
Clinical trial	Comparison of an experimental group with a control group
Determines the effect of	Determines baseline data before the experimental factors are introduced
an agent or procedure	Measures the effectiveness of specific agents used for prevention, control and treatment of oral
on the prevention,	conditions
progression, or control	Measures the effectiveness of mechanical devices used for personal care, i.e. toothbrushes,
of a disease	interdental cleaning aids
Community health/	Not designed for evaluation of an individual patient
epidemiologic survey	Measures the prevalence and incidence of a oral condition occurring within a population
Survey for the study of	Provides baseline data to show existing dental health practices
disease characteristics	Compares the effects of a community program and evaluates the results
of populations	Finds out the needs of a community

IDEAL REQUISITES OF AN INDEX

- Should be simple to use and calculate
- Uses a minimal amount of time to complete
- Does not cause discomfort to the patient
- Is acceptable to the patient
- Requires minimum equipment and expense
- Has clear-cut criteria that are easily understood
- Is reproducible in assessing the condition by the same or different examiner
- *Should be realistic:* It should relate numerically to the clinical stages of the specific disease.

the gingiva, the amount of tooth mobility present at a given time, the amount of fluorosis present, and the number of decayed, missing, or filled teeth present.

RECOMMENDED METHOD OF PERFORMANCE OF AN INDEX

- Explain procedure to patient
- Drape patient
- Give patient protective eyewear
- Wash hands
- Don PPE (Personal protective equipment)
- Position patient in reclined position in dental chair
- Adjust dental light for maximum illumination
- Apply lubricant gel to patient lips and opaque colored restorations
- Dry teeth with compressed air using recommended sequence
- Carry-out the index.

INDICES COMMONLY USED IN DENTISTRY (BOX 17.1)

Periodontal Indices

There are 4 main areas in periodontal disease for which indices are required:
a. Plaque or soft deposits on teeth
b. Calculus
c. Gingivitis
d. Periodontal destruction or loss of attachment.

Dental Caries

Dental Fluorosis

Malocclusion

BOX 17.1: INDICES USED IN DENTISTRY

1. *Indices used in assessing oral hygiene:*
   a. Oral hygiene index.
   b. Simplified oral hygiene index.
   c. Patient hygiene performance index.
2. *Indices used in assessing plaque and debris:*
   a. Plaque component of the periodontal disease index.
   b. Shick and Ash modification of plaque criteria.
   c. Turseky-Gilmore-Glickman modification of the Quigley Hein plaque index.
   d. Plaque index.
   e. Navy plaque index.
   f. Distal mesial plaque index.
   g. Glass Index.
   h. Plaque free score index.
   i. Plaque control record.
   j. Oral health status index.
3. *Indices used in assessing calculus:*
   a. Calculus surface index.
   b. Calculus surface severity index.
   c. Marginal line calculus index.
   d. Calculus component of the periodontal disease index.
   e. Probe method of calculus assessment.
   f. Calculus component of OHI-S.
4. *Indices used in assessing gingival inflammation:*
   a. Papillary marginal attachment index.
   b. Gingivitis component of the periodontal disease index.
   c. Gingival index.
   d. Papillary marginal gingivitis index.
   e. Modified gingival index.
   f. Gingival tissue index.
   g. Gingival pain index.
5. *Indices used in assessing gingival bleeding:*
   a. Sulcus bleeding index.

Contd...

Contd...

b.   Papillary bleeding index.
c.   Gingival bleeding index.
d.   Interdental bleeding index.
e.   Gingival status index.
f.   Bleeding points index.
g.   Quantitative gingival bleeding index.
h.   Gingival fluid flow index.

6.   *Indices used in assessing periodontal diseases:*
a.   Periodontal index.
b.   Periodontal disease index.
c.   Gingival bone count index.
d.   Navy periodontal disease index.
e.   Community periodontal index of treatment needs.
f.   Community periodontal index.
g.   Gingivitis periodontitis missing teeth index.
h.   Periodontitis severity index.
i.   Extent and severity index.
j.   Gingival sulcus measurement component of periodontal disease index.
k.   Periodontal screening and recording index.

7.   *Indices used in assessing dental caries:*
a.   DMFT index.
b.   DMFS index.
c.   def index.
d.   Root caries index.
e.   Modified DMFT index.
f.   Caries Severity index.
g.   Czechoslovakia caries index.
h.   DMF surface percentage index.
i.   Functional measure index.
j.   Dental health index.
k.   WHO dentition status & treatment needs index.
l.   Restorative Index.
m.   Stone's index.
n.   Significant Caries index.

8.   *Indices used in assessing dental fluorosis:*
a.   Dean's fluorosis index.
b.   Moller's fluorosis index.
c.   Chronological fluorosis assessment index.
d.   Fluorosis risk index.
e.   Young's classification.
f.   Al-alousi classification.

Contd...

> g. Murray and Shaw classification.
> h. DDE index & modified DDE index.
> i. Thylstrup Fejerskov fluorosis index.
> j. Tooth surface index of fluorosis.
> 9. *Indices used in assessing malocclusion:*
>   a. Malalignment index.
>   b. Handicapping malocclusion assessment index.
>   c. Occlusal feature index.
>   d. Occlusal index.
>   e. Index of orthodontic treatment needs.
>   f. Norwegian index of orthodontic treatment needs.
>   g. Handicapping labiolingual deviation index.
>   h. Massler and Frankel index.
>   i. Peer assessment rating index.
>   j. Dental Aesthetic index (DAI).
> 10. *Indices used in assessing tooth wear:*
>   a. Eccles index of non-industrial origin.
>   b. Tooth wear index.
>   c. Exact tooth wear index.

Some of the more widely known indices are:

INDICES USED IN ASSESSING ORAL HYGIENE

Oral Hygiene Index (OHI)

The OHI, developed by John C Greene and Jack R Vermillion (1960), has two components, the debris index and the calculus index, and is an indication of oral cleanliness. The scores may be used singly or in combination. For scoring, the clinician divides the dentition into segments and selects the facial (or buccal) and lingual tooth surface in each segment that is covered with the greatest amount of debris and calculus. Twelve surfaces, therefore, are evaluated. For this index, a surface includes half the circumference of the tooth.

The Oral Hygiene Index is composed of the combined Debris Index and Calculus index, each of these index is in turn based on 12 numerical determinations representing the amount of debris or calculus found on the buccal and lingual surfaces of each of three segments of each dental arch.
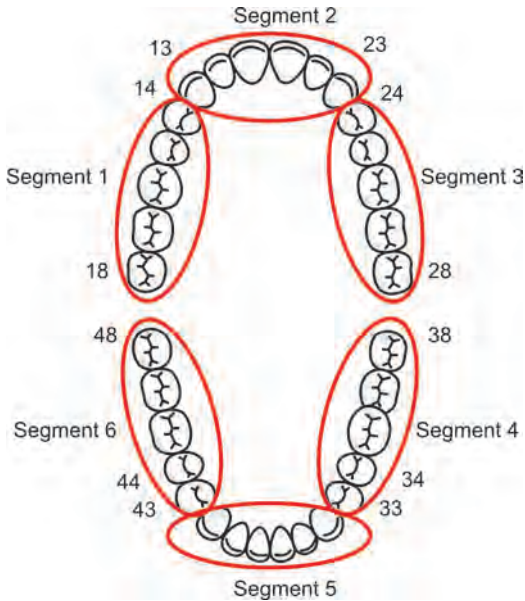
Fig. 17.1: Various segments of the mouth (OHI)

The Maxillary and the Mandibular arches are each composed of three segments (Fig. 17.1).

Segments

Maxillary

1. *Segment 1:* The segment distal to the right cuspid.
2. *Segment 2:* Upper right canine to upper left canine.
3. *Segment 3:* The segment distal to the left cuspid.

Mandibular

4. *Segment 4:* The segment distal to the left cuspid.
5. *Segment 5:* Lower left canine to lower right canine.
6. *Segment 6:* The segment distal to right cuspid.
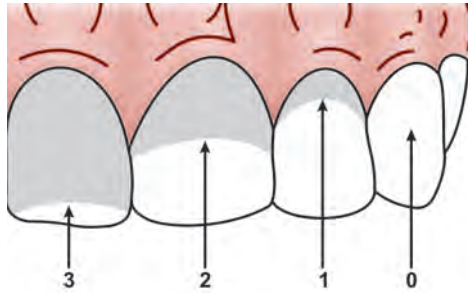
Fig. 17.2: Scoring method for debris

Each segment is examined for debris or calculus. From each segment one tooth is used for calculating the individual index, for that particular segment. The tooth used for the calculation must have the greatest area covered by either debris or calculus (Fig. 17.2).

The method for scoring calculus is the same as that applied to debris, but additional provisions are made for recording subgingival deposits.

Debris Score

Scores	Criteria
0	No debris or stain present
1	Soft debris covering not more than one third of the tooth surface, or presence of extrinsic stains without other debris regardless of surface area covered.
2	Soft debris covering more than one third, but not more than two thirds, of the exposed tooth surface.
3	Soft debris covering more than two thirds of the exposed tooth surface.

$$\text{Debris index (DI)} = \frac{\text{Total debris score}}{\text{No. of segments scored}}$$

Calculus Score

Scores	Criteria
0	No calculus present
1	Supragingival calculus covering not more than one third of the exposed tooth surface.
2	Supragingival calculus covering more than one-third but not more than two thirds of the exposed tooth surface and/or the presence of individual flecks of subgingival calculus around the cervical portion of the tooth.
3	Supragingival calculus covering more than two-third of the exposed tooth surface and/or a continuous heavy band of subgingival calculus around the cervical portion of the tooth.

$$\text{Calculus index (CI)} = \frac{\text{Total calculus score}}{\text{No. of segments scored}}$$

The average individual or group debris and calculus scores are combined to obtain oral hygiene index, as follows.

Oral hygiene index = Debris index + Calculus index

A perfect score would be 0, and the worst score possible is 12.

The Oral Hygiene Index-Simplified (OHI-S)

This index was given by John C. Greene and Jack R. Vermillion in 1964. It offers a more rapid method for evaluation of oral cleanliness of population groups, but lacks in degree of sensitivity in comparison to the original OHI index.

It differs from the original index in:
- Number of tooth surfaces scored [6 rather than 12]
- The method of selecting the tooth surfaces to be scored
- The scores which can be obtained.

Selection of Tooth

The six surfaces examined for the OHI-S are selected from four posterior and two anterior teeth.
- In the posterior teeth, the first fully erupted tooth distal to the second bicuspid, usually the first molar but sometimes the second or third molar, is examined on each side of each arch.

- In the anterior portion of the mouth upper right central incisor and lower left central incisor are scored.
- In the absence of either of these anterior teeth, the central incisor on the opposite side of the midline is substituted.
- Only fully erupted permanent teeth are scored. A tooth is considered to be fully erupted when the occlusal or incisal surface has reached the occlusal plane.
- Natural teeth with full crown restorations and surfaces reduced in heights by caries or trauma are not scored. Instead an alternate tooth is examined.

Surfaces to be Seen (Fig. 17.3A)

- Six surfaces are examined [from four posterior teeth and two anterior teeth].

Upper molars $[6|6]$: The buccal surfaces of selected teeth is inspected.

Lower molars $[\overline{6}|\overline{6}]$: The lingual surfaces of the selected teeth are checked.

Upper and Lower Central incisor 1: labial surface is scored.
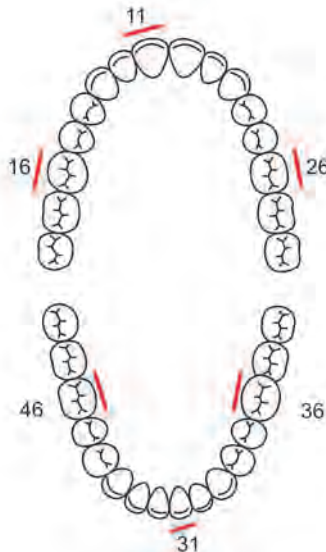
Fig. 17.3A: Six teeth and the surfaces scored (OHI-S)

Examination Method

To obtain the scores for debris and calculus, each of the six selected tooth surfaces are examined for debris and then calculus. The surface area covered by debris is estimated by running the side of a No. 5 explorer (Shepherd's Crook) along the tooth surfaces being examined (Explorer is moved from incisal/occlusal to gingival margin). The occlusal or incisal extent of the debris is noted as it is removed (Fig. 17.3B). Same No. 5 explorer is used to estimate the surface area covered by the supragingival and subgingival calculus.

- Spray water into patient/client's mouth and instruct patient/client to swish.
- Insert saliva ejector into patient/client's mouth.
- Select teeth for examination by choosing six specific teeth with one in each sextant.

Fig. 17.3B: Examination method for OHI-S

- Evaluate teeth.
    - Start evaluation with maxillary posterior sextant and work way around maxillary arch.
    - Drop down to mandibular left lingual posterior sextant and work way around to other side of mouth.
- Evaluate teeth for soft debris by recording six debris scores on appropriate recording form(s).
- Evaluate teeth for calculus by recording six calculus scores.
- Calculate debris score by totalling debris scores and dividing by number of teeth scored.
- Calculate calculus score by totalling calculus scores and dividing by number of teeth scored.
- Calculate OHI-S score by adding debris score to calculus score that equals OHI-S score.
- Record OHI-S score in patient/client's chart or on appropriate recording form(s).

Scoring Criteria (Debris) (Fig. 17.4A)

Scores	Criteria
0	No debris or stain present.
1	Soft debris covering not more than one third of the tooth surface being examined or presence of extrinsic stains without debris regardless of surface area covered.
2	Soft debris covering more than one third, but not more than two thirds, of the exposed tooth surface.
3	Soft debris covering more than two thirds of the exposed tooth surface.

Scoring Criteria (Calculus) (Fig. 17.4B)

Scores	Criteria
0	No calculus present.
1	Supragingival calculus covering not more than one-third of the exposed tooth surface being examined.
2	Supragingival calculus covering more than one-third but not more than two thirds of the exposed tooth surface and /or the presence of individual flecks of subgingival calculus around the cervical portion of the tooth.
3	Supragingival calculus covering more than two-third of the exposed tooth surface or a continuous heavy band of subgingival calculus around the cervical portion of the tooth.

In the simplified OHI, the worst score possible is 6.

Interpretation

Individually DI-S and CI-S is scored as follows:

0.0 to 0.6 = Good oral hygiene
0.7 to 1.8 = Fair oral hygiene
1.9 to 3.0 = Poor oral hygiene

An OHI-S is scored as follows:

0.0–1.2 = Good oral hygiene
1.3–3.0 = Fair oral hygiene
3.1–6.0 = Poor oral hygiene

Debris   3   2   1   0
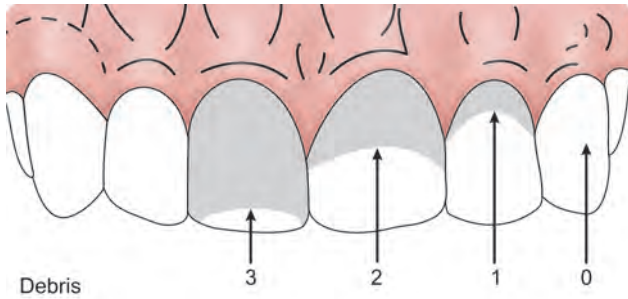
Fig. 17.4A: Scoring method for debris

0   1   2   3
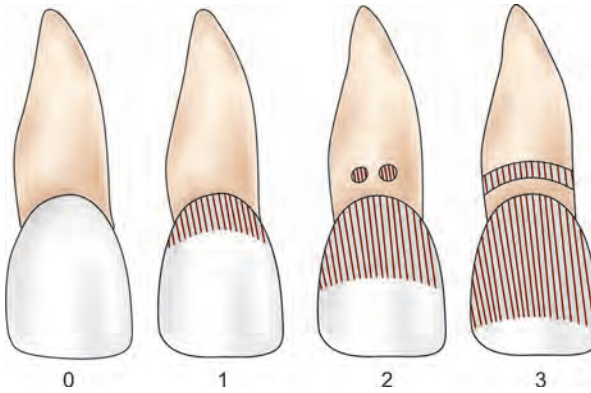
Fig. 17.4B: Scoring method for calculus

Patient Hygiene Performance Index (PHP Index)

It was developed by Podshadley AG, and Haley JV (1968) to assess the extent of plaque and debris over a tooth surface as an indication of oral cleanliness. Debris for PHP was defined as the soft foreign material consisting of bacterial plaque, material alba and food debris that is loosely attached to tooth surfaces.

Most useful for individual patients who have significant plaque accumulation.

Teeth and Surfaces Examined (Fig. 17.5)

Tooth Numbers in FDI System

16 - Upper right first molar
11 - Upper right central incisor
26 - Upper left molar
36 - Lower left first molar
31 - Lower left central incisor
46 - Lower right first molar
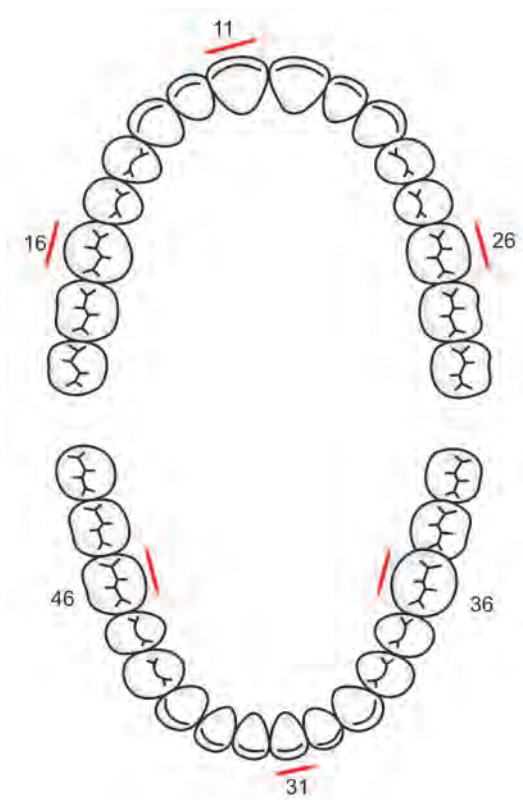
Fig. 17.5: PHP index: 6 tooth surfaces are scored

Surfaces

Facial surfaces: Incisors and maxillary molars.
Lingual surfaces: Mandibular molars.

Substitutions for Missing Teeth

- The second molar is used if the 1st molar
    - Is missing
    - Less than three–fourth erupted
    - Has a full crown
    - Is broken down/exposed surface area is reduced
- The third molar is used when the second molar is missing.
- The adjacent incisor of the opposite side is used, when the central incisor is missing.

Procedure

- Disclosing solution is applied.
- Patient is asked to swish for 30 seconds and expectorate but not rinse.
- Examination is made using a mouth mirror.
- Each tooth surface to be evaluated is subdivided into five sections as follows (Fig. 17.6).
  Vertically: Three divisions mesial, middle and distal.
  Horizontally: The middle third is subdivided into gingival, middle and occlusal or incisal thirds.
- Each area with plaque is scored a point so each tooth score can range from 1 to 5 points.
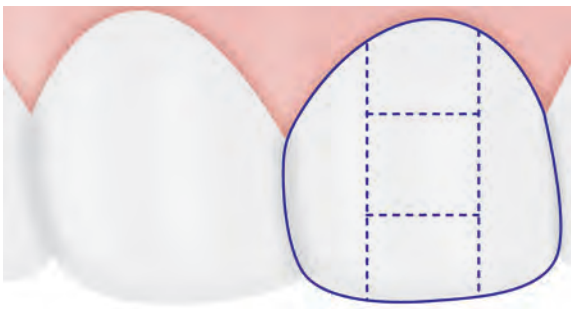
Fig. 17.6: Subdivision of a tooth into 5 sections (PHP index)

Scoring

Debris scores for individual tooth: Add the scores for each of the five subdivisions. The scores range from 0 to 5.

PHP for an individual: Total the scores for the individual teeth and divide by the number of the teeth examined. The PHP value ranges from 0 to 5.

PHP Index for a group: To obtain the average PHP score for a group or a population, total the individual score and divide by the number of people examined.

Interpretation

Nominal scale for evaluation of scores:
Rating scores
1. Excellent = 0 (No debris)
2. Good   = 0.1–1.7
3. Fair   = 1.8–3.4
4. Poor   = 3.5–5.0

INDICES USED IN ASSESSING PLAQUE AND DEBRIS

Turesky-Gilmore-Glickman Modification of the Quigley-Hein Plaque Index

Quigley G and Hein J (1962) proposed a system for scoring dental plaque. They examined only the facial surfaces (gingival third) of the anterior teeth using basic fuchsin as a disclosing agent, and scoring 0 to 5.

Plaque Scoring System for Quigley and Hein

Scoring criteria	Score
No plaque	0
Flecks of stain at the gingival margin	1
Definite line of plaque at the gingival margin	2
Gingival third of surface	3
Two-thirds of surface	4
Greater than two-thirds of surface	5

This was modified by Turesky S, Gilmore ND and Glickman I to more explicitly describe mild to moderate plaque deposits in 1970.

Scoring by the Turesky Modification

- All teeth assessed except third molars (maximum number 28)
- A staining solution is used to show plaque deposits (Quigley and Turesky used basic fuchsin, Gordon used erythrosine)
- Both the facial and lingual surfaces examined (maximum number 56)
- A score is assigned to each facial and lingual nonrestored surface.

Modified Plaque Scoring System of Turesky et al (Fig. 17.7)

Criteria	Score
No plaque	0
Separate flecks of plaque at the cervical margin of the tooth	1
A thin continuous band of plaque (up to 1 mm) at the cervical margin of the tooth	2
A band of plaque wider than 1 mm coercing less than one-third of the crown of the tooth	3
Plaque covering at least one-third but less than two-thirds of the crown of the tooth	4
Plaque covering two-thirds or more of the crown of the tooth	5
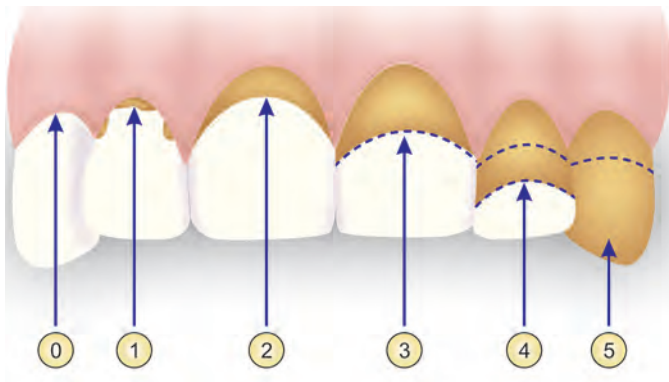
Fig. 17.7: Tooth areas graded by the Turesky et al modified Quigley Hein plaque index

Total score = Sum (scores for all facial and lingual surfaces)
Index = (total score)/(number of surfaces examined)

Interpretation

A score of 0 or 1 is considered low.
A score of 2 or more is considered high.

Periodontal Indices

Plaque Index (PI)

The PI as developed by Silness and Loe (1964) assesses the thickness of plaque at the cervical margin of the tooth (closest to the gum). The scoring is done on the entire dentition or on selected teeth. If it is done on selected teeth, then index teeth will be 16, 12, 24, 36, 32 & 44. Four gingival areas, i.e. distofacial, facial, mesiofacial and lingual surfaces are examined.

- Each tooth is dried and examined visually using a mirror, an explorer, and adequate light. The explorer is passed over the cervical third to test for the presence of plaque. A disclosing agent may be used to assist evaluation.
- Missing teeth are not substituted.
- Four different scores are possible.
- Each of the four surfaces of the teeth (buccal, lingual, mesial and distal) is given a score from 0 to 3.

PI Score for Tooth

The scores from the four areas of the tooth are added and divided by four in order to give the plaque index for the tooth with the following scores and criteria:

Scoring Criteria: The Plaque Index

The indices for the following six teeth may be grouped to designate the index for the group of teeth: 16, 12, 24, 36, 32, and 44. (Fig. 17.8).

Scores	Criteria
0	No plaque
1	A film of plaque adhering to the free gingival margin and adjacent area of the tooth. The plaque may be seen *in situ* only after application of disclosing solution or by using the probe on the tooth surface.
2	Moderate accumulation of soft deposits within the gingival pocket, or the tooth and gingival margin which can be seen with the naked eye.
3	Abundance of soft matter within the gingival pocket and/or on the tooth and gingival margin.
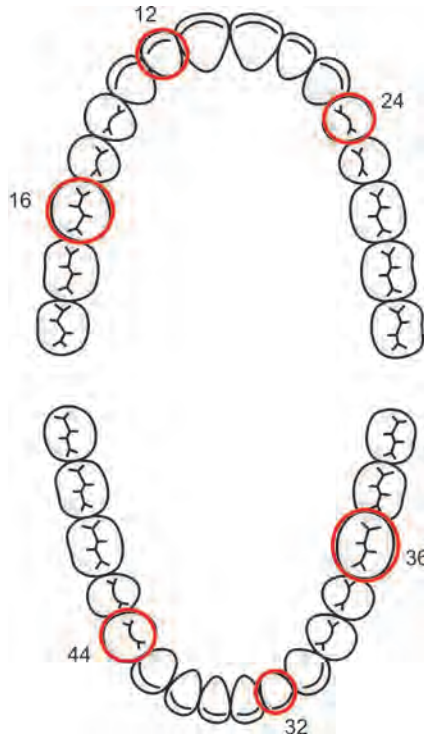
Fig. 17.8: Teeth and surfaces scored (Silness and Loe PI)

PI for an Individual

The index for the patient is obtained by summing the indices for all six teeth and dividing by six.

Interpretation for PI Scores

Four ratings may be assigned:

    0   = Excellent oral hygiene
    0.1–0.9 = Good oral hygiene
    1.0–1.9 = Fair oral hygiene
    2.0–3.0 = Poor oral hygiene

Navy Plaque Index

The Navy Plaque Index (NPI) was developed by Grossman FD and Fedi PF (1970) as part of the Navy Periodontal Screening Examination, along with the Navy Periodontal Disease Index. It reflects the plaque control status of the patient and emphasizes plaque in the cervical portion of the tooth which is in contact with the gingiva margins.

Teeth Examined

16 - Maxillary Right First Molar
21 - Maxillary Left Central Incisor
24 - Maxillary Left First Premolar
36 - Mandibular Left First Molar
41 - Mandibular Right Central Incisor
44 - Mandibular Right First Premolar.

Substitutions

If 16, 24, 36 or 44 are missing, then substitute the next most posterior tooth.

If 21 or 41 are missing, then substitute the nearest incisor in the arch. If all incisors are missing from the arch, then substitute a cuspid.

Surfaces Examined on Each Tooth

Facial gingival area (G) mesial proximal area (M) distal proximal area (D)

Lingual gingival area (G) mesial proximal area (M) distal proximal area (D).

Scoring Critera—NPI

Plaque status	Designated	Points
Plaque in contact with gingival tissue on mesial proximal surface	M	3
Plaque in contact with gingival tissue on facial or lingual surface	G	2
Plaque in contact with gingival tissue on distal proximal surface	D	3
Plaque on facial or lingual surface of tooth surface but not in contact with gingival tissue	R	1

For Each Tooth

Facial points = (M points on facial aspect) + (G points on facial aspect) + (D points on facial aspect) + (R points on facial aspect)

Lingual points = (M points on lingual aspect) + (G points on lingual aspect) + (D points on lingual aspect) + (R points on lingual aspect)

Calculating the NPI

Tooth score = (facial points) + (lingual points)

NPI score = MAX (all 6 tooth scores)

NPI total = SUM (all 6 tooth scores).

Interpretation

Minimum score for a surface   :   0

Maximum score for a surface   :   9

Minimum tooth score   :   0

Maximum tooth score   :   18

Maximum NPI score   :   18

Minimum NPI total   :   0

Plaque Control Record

It was given by O'Leary TJ, Drake RB and Naylor JE (1972). This system measures plaque present, rather than plaque not present, but no attempt is made to differentiate in the quantity of plaque seen on each surface.

Selection of Teeth and Surfaces

- All teeth are examined.
- Missing teeth are indicated on the record form as a single thick horizontal line.
- Four surfaces are examined: facial, lingual, mesial and distal.
- The number of surfaces examined may be increased from four to six. When using six surfaces, they are facial (or buccal), mesiofacial, mesiolingual, lingual, distolingual, and distofacial.

Procedure

Plaque is disclosed by either applying disclosing agent or the patient is asked to chew disclosing tablet and swish and rub the solution over the tooth surfaces with the tongue before rinsing. The operator uses an explorer or the tip of probe, examines each stained surface for soft accumulations at the dento gingival junction. Those surfaces which do not have soft accumulations at the dentogingival junction are not scored.

Scoring

For individual: The number of surfaces with plaque is multiplied by 100, and divided by the number of tooth surfaces examined.
Percent with plaque =

$$\frac{\text{The number of surfaces with plaque}}{\text{Number of tooth surfaces examined}} \times 100$$

For example, if an individual has 26 teeth, that equals 104 surfaces. If eight surfaces are found to have plaque, then 800 are divided by 104, leaving a plaque control index of 7.6 percent.
A score under 10 percent is considered good.

INDICES USED IN ASSESSING CALCULUS

Calculus Surface Index

This index was developed by Ennever J, Sturzenberger CP and Radike AW (1961).

The Calculus Surface Index is a measure of dental calculus formation. It can be used to quantitate the accumulation of dental calculus in short-term testing programs to evaluate the effectiveness of preventive care.

Method

Presence or absence of supragingival and/subgingival or subgingival calculus on the four mandibular incisor is assessed.

Each incisor is divided into four scoring units. The facial surface is considered as one unit, and the lingual surface is divided longitudinally into three subsections, the distal-lingual, middle-lingual and the mesial-lingual.

The presence or absence of calculus is examined by visual or tactile examination using a mirror and dental explorer (sickle type).

Each surface with calculus is scored 1 point.

Scoring

For a person
Calculus surface index = Sum total of calculus points on the 16 surfaces surveyed.

Interpretation

Minimum score: 0
Maximum score: 16

INDICES USED IN ASSESSING GINGIVAL INFLAMMATION

Papillary-Marginal-Attachment Index

PMA index is probably the oldest reversible index which was developed by Schour I and Massler M (1944).

It was used to assess the extent of gingival changes in large groups for epidemiological studies. It was based on the concept that the extent of inflammation serves as an indicator of the severity of the condition. The presence or absence of inflammation is recorded in three areas of gingiva around the teeth.

Selection of Teeth and Surfaces

Three gingival units are examined for each tooth
P = *Papillary* portion between the teeth
- Papilla is numbered by the tooth just distal to it. Papilla is not present when teeth are separated by a diastema or there is an edentulous area.
- Inflammation usually begins within the papilla at the col area. Papillary changes—Mild gingivitis.
M = Marginal collar around the teeth
- It is located between papillae, attached by junctional epithelium, and demarcated from attached gingiva by the free gingival groove.
- Papillary and marginal gingival inflammation- Moderate gingivitis.
A = Attached gingiva overlying the alveolar bone
- Stippled gingiva between the free gingival groove and the mucogingival junction.
- Spread of inflammation from papillary and marginal gingivitis into the attached gingiva — Severe gingivitis.

Method

All the teeth can be assessed starting from maxillary second molar of one side to the second molar of the other side and then mandibular second molar of the same side to the second molar of the other side. Third molars are not included. Adequate light and mouth mirror are used. Probe usually a blunt probe is used for pressing on gingiva.

Scoring Criteria

Papillary = P
0   =   Normal, no inflammation.
1+ =   Mild papillary engorgement, slight increase in size.

2+ = Obvious increase in size of gingival papilla, bleeding on pressure.
3+ = Excessive increase in size with spontaneous bleeding.
4+ = Necrotic papilla.
5+ = Atrophy and loss of papilla (through inflammation).

Marginal = M
0 = Normal, no inflammation visible.
1+ = Engorgement, slight increase in size, no bleeding.
2+ = Obvious engorgement, bleeding upon pressure.
3+ = Swollen collar, spontaneous bleeding, beginning infiltration into attached gingiva.
4+ = Necrotic gingivitis.
5+ = Recession of the free marginal gingiva below the cementoenamel junction as a result of inflammatory changes.

Attached = A
0 = Normal; pale rose, stippled.
1+ = Slight engorgement with loss of stippling, change in color may or may not be present.
2+ = Obvious engorgement of attached gingiva with marked increase in redness, pocket formation present.
3+ = Advanced periodontitis, deep pockets evident.

Scoring

P-M-A for individual
Count the number of P, M and A units scored and record separately as: P-M-A =?-?-?

Keeping the total separate, as on adding the sum will not represent the area of the gingiva where the inflammation is present.
P-M-A for a group: The average of the P, M and A is computed by totalling each for all individuals and then dividing each number of individuals examined.

Gingival Index (GI)

Also attributed to Loe and Silness (1963), the GI assesses the severity of gingivitis based on color, consistency, and bleeding on probing. It describes the clinical severity of gingival inflammation as well as its location. The scoring is done on the entire dentition or on selected

teeth. If it is done on selected teeth, then index teeth will be 16, 12, 24, 36, 32 & 44. Four gingival areas, i.e. distofacial, facial, mesiofacial and lingual surfaces are examined. A probe is used to press on the gingiva to determine its degree of firmness, and to run along the soft tissue wall adjacent to the entrance to the gingival sulcus.

Teeth Examined

- Maxillary right first molar
- Maxillary right lateral incisor
- Maxillary left first bicuspid
- Mandibular left first molar
- Mandibular left lateral incisor
- Mandibular right first bicuspid.

Surfaces Examined on each Tooth

Distofacial, facial, mesiofacial and lingual surfaces.
Scoring is based on the following criteria:

Scoring Criteria: Gingival Index

Average gingival index (Score)	Interpretation
0	Normal gingiva/absence of inflammation
1	Mild inflammation: Slight change in color, slight edema. No bleeding on probing;
2	Moderate inflammation: Redness edema and glazing. Bleeding on probing
3	Severe inflammation: Marked redness and edema. Ulceration and a tendency for spontaneous bleeding

Each surface is given a score, and then the scores are totaled which gives the score for area and divided by four gives score for the tooth. Totaling all scores and dividing by the number of teeth examined provides GI score per person.

Interpretation: Gingival Index

Average gingival index (*Score*)	Interpretation
2.1 – 3.0	Poor (severe gingivitis), severe inflammation
1.1 – 2.0	fair (moderate gingivitis), moderate inflammation,
0.1 – 1.0	Good (mild gingivitis), mild inflammation
< 0.1	Excellent (no gingivitis), no inflammation

INDICES USED IN ASSESSING GINGIVAL BLEEDING

Gingival Bleeding Index (GBI)

Unwaxed dental floss is used to measure a GBI, developed by Carter and Barmes (1974). A full complement of teeth has 28 proximal areas to be examined. Floss is passed interproximally, first on one side of the dental papilla, then on the other. Although this involves two sulci, they are scored as one interdental unit. The clinician curves the floss around each tooth and passes it below the gingival margin, taking care not to lacerate the gingiva. Any bleeding noted indicates the presence of disease. The numbers of bleeding areas versus proximal areas scored is recorded. It can be used for initial patient evaluation and motivation or overtime to assess response to interventions to improve periodontal health.

Procedure

Selection of Teeth

The mouth is divided into 6 segments (upper right, upper anterior, upper left, lower left, lower anterior, lower right).

Areas involving the third molars are not scored because of variations in arch position, access and vision.

Method

Unwaxed dental floss is alternately passed interproximally into the gingival sulcus on both sides of the interdental papillae. With the floss extended as far as possible towards the buccal and lingual, the floss is carried to the bottom of the sulcus. The floss is then moved in an

incisogingival motion for one double stroke. Care is taken not to cause laceration of the papillae. A new length of clean floss is used for each interproximal unit.

Bleeding is generally immediately evident in the area or on the floss, but 30 seconds are allowed for reinspection of each segment. If bleeding is copious, the patient should rinse between segments.

An area is nonscoreable when tooth positions, diastemas or other factors compromise the desirable interproximal relationships.

Bleeding Assessment

No attempt is made to quantify the degree of bleeding.
Bleeding is assessed only as present or absent.

Scoring Codes for GBI

Not bleeding : None (blank)
Bleeding   : B
Notscoreable : X

Recording Method

Interproximal areas of maxillary teeth	Code
17–16	——
16–15	——
15–14	——
14–13	——
13–12	——
12–11	——
11–21	——
21–22	——
22–23	——
23–24	——
24–25	——
25–26	——
26–27	——

Similarly scores are recorded for mandibular teeth.

Result

Total scoreable areas = 26 – (number of nonscoreable areas)

Gingival Bleeding Score (total bleeding areas) = Sum of number of bleeding areas.

Interpretation

The fewer the number of bleeding sites, the less the extent of gingivitis. Ideally the score should be 0.

If the patient is to be followed overtime, previous bleeding sites are monitored to see if they become nonbleeding. The goal of interventions is to reduce the score as much as possible.

INDICES USED IN ASSESSING PERIODONTAL DISEASES

Periodontal Index (PI)

Russell [1956] developed an index for measuring periodontal disease that could be used in population surveys. It can be based solely upon the clinical examination, or it can make use of dental X-rays if they are available. It places greater emphasis on advanced disease. PI determines the periodontal disease status of populations in epidemiologic studies. Each tooth is scored according to the condition of the surrounding tissues. On examination, each tooth is assigned a score using the following criteria:

Scoring

- Each tooth is scored separately according to the following criteria.
- Rule: When in doubt, assign the lower score.

Reasons for its Widespread Use

- Ease of use
- Clarity of criteria
- Reasonable comparability of results

    Scoring values (0, 1, 2, 6, and 8) relate to the stages of the disease scored in an epidemiological survey to the clinical condition observed. The jump from 2 to 6 in the scale recognizes the change in disease condition from a severe gingivitis to an overt destructive periodontal

Scoring Criteria of Russell's Periodontal Index

Criteria for field studies	Additional X-ray criteria	Score
Negative (neither overt inflammation in the investing tissues, nor loss of function due to destruction of supporting tissues)	Radiographic appearance normal	0
Mild gingivitis (overt area of inflammation in the free gingivae, but this area does not circumscribe the tooth)		1
Gingivitis (inflammation completely circumscribes the tooth, but there is no apparent break in the epithelial attachment) (Not used in field study)	Early, notchlike resorption of the alveolar crest	2
		4
Gingivitis with pocket formation (the epithelial attachment is broken, and there is a pocket. There is no interference with normal masticatory function, the tooth is firm in its socket, and has not drifted).	Horizontal bone loss involving the entire alveolar crest, up to half of the length of the tooth root (distance from apex to cementoenamel junction)	6
Advanced destruction with loss of masticatory function (tooth may be loose, tooth may have drifted, tooth may sound dull on percussion with a metallic instrument, the tooth may be depressible in its socket)	Advanced bone loss, involving more than half of the length of the tooth root, or a definite intrabony pocket with definite widening of the periodontal membranes. There may be root resorption, or rarefaction at the apex	8

disease with obvious loss of attachment. PI can be considered a true interval scale.

Scores for each tooth are added, and the total is divided by the number of teeth examined. Scores can be interpreted as follows:

- 0.0–0.2 = Clinically normal supportive tissues.
- 0.3–0.9 = Simple gingivitis.
- 0.7–1.9 = Beginning destructive periodontal disease.
- 1.6–5.0 = Established destructive periodontal disease.
- 3.8–8.0 = Terminal periodontal disease.

Individual score = Average (scores for all of the teeth in the mouth)

Population score = Average (individual scores in population examined).

Periodontal Disease Index (PDI)

The periodontal disease index was introduced by Sigurd P Ramfjord in 1959. It was a modification of Russell index, particularly designed for assessing the extent of pocket deepening below the cementoenamel junction. The PDI comprises of three components namely: Plaque component, Calculus component, Gingival & periodontal component. It combines the evaluation of gingival status with the probed attachment level (crevice depth measured from the cementoenamel junction).

Selection of Teeth and Surfaces

Teeth examined: (FDI system tooth numbers are in the parenthesis)
- Maxillary right first molar   - (16)
- Maxillary left central incisor   - (21)
- Maxillary left first bicuspid   - (24)
- Mandibular left first molar   - (36)
- Mandibular right central incisor   - (41)
- Mandibular right first bicuspid   - (44)

If any of the teeth are missing or unerupted, then only the teeth present are examined (only fully erupted teeth are used).

Substitution is not made for missing teeth.

Scoring Method

For Gingival Status: The gingiva around the teeth to be scored is first dried superficially by gently touching with absorbing cotton. Changes in color are evaluated by observing the color of the gingiva around the tooth to be scored and comparing the color corresponding to the buccal, lingual and interproximal surfaces with each other. Change in form is initially a blunting or rounding of the margin of the gingiva and thickening of papilla. Change in consistency is detected by applying gentle pressure with the side of periodontal probe against the gingiva to determine if there is soft or spongy consistency.

For Crevicular measurements: To measure crevice depth related to cementoenamel junction, a University of Michigan #O Probe is used. The end of the probe should be placed against the enamel surface coronally to the margin of the gingiva so that the angle formed by the working end of the probe and long axis of the crown of the tooth is approximately 45°. Minimal force should be used to pass the probe in apical direction maintaining contact with the tooth. The probe should always be pointed towards the apex of the tooth or the central axis of multirooted teeth. After the distance from the free gingival margin to the CEJ has been measured, an attempt should be made to move the probe along the cemental surface. This can be achieved only if there has been loss of periodontal attachment.

The University of Michigan number O probe is graduated at 3, 6 and 8 mm, making it necessary to estimate intervening measurements. The following criteria are used for crevicular measurements:

1. If the gingival margin is on enamel, measure from gum margin to CEJ and record the measurement. Then record the distance from the gingival margin to the bottom of the pocket. The distance from the CEJ to the bottom of the pocket can then be found by subtracting the first from the second measurement.

2. If the gingival margin is on cementum, record the distance from the CEJ to the gingival margin as a minus value (a) then record the distance from the CEJ to the bottom of the gingival crevice as a positive value (b) Both loss of attachment and actual crevice depth can easily be assessed from these scores.

Ramfjord's method for measuring this distance is often referred to as the "Indirect method for measuring periodontal attachment loss".

Scoring Criteria: Periodontal Disease Index

Gingivitis	No signs of inflammation	0
	Mild to moderate inflammatory gingival changes, not extending around the tooth	1
	Mild to moderately severe gingivitis extending all around the tooth	2
	Severe gingivitis characterized by marked redness, swelling, tendency to bleed and ulceration	3
Gingival crevice depth	Gingival crevice in any of the two measured areas (mesial, buccal), extend apically to the cementoenamel junction but not more than 3 mm	4
	Gingival crevice in any of the two measured areas extending apically to the cemento-enamel junction from 3 to 6 mm inclusive.	5
	Gingival crevice in any of the two measured areas extending more than 6 mm apical to the cementoenamel junction.	6

Scoring PDI

For individuals: Add the scores for individual teeth and divide by the number of teeth examined. The PDI ranges from 0 to 6.

For group: Total the individual PDI scores and divide by the number of individuals examined. The average ranges from 0 to 6.

Plaque and Calculus Component of the Periodontal Disease Index (PDI).

Although not part of PDI, a Plaque Index and Calculus Index are included when making a survey hence described.

Dental Plaque

For each of 6 teeth mentioned above 4 surfaces (facial, lingual, mesial and distal) are scored from 0 to 3.

Procedure

- Apply disclosing agent
- Patient is asked to expectorate and rinse with water
- Specific surfaces with disclosed plaque are observed.

Scoring Criteria for Plaque

Criteria	Score
None	0
Present on some but not on all interproximal, buccal and lingual surfaces	1
Plaque present on all of the interproximal, buccal and lingual surfaces, but covering less than half of these surfaces	2
Plaque extends once all interproximal, buccal and lingual suface and covering more than one half of these surfaces	3

$$\text{Plaque score of an individual} = \frac{\text{Total score}}{\text{Number of teeth examined}}$$

Calculus

To measure the presence and extent of calculus a subgingival explorer or a periodontal probe is used.

Procedure

For each of the 6 teeth, the presence and extent of calculus on facial and lingual surfaces is scored from 0 to 3.

Scoring Criteria for Calculus

Criteria	Score
None	0
Supragingival calculus, extending only slightly below the free gingival margin (not more than 1 mm)	1
Moderate amount of supra- and subgingival calculus or subgingival calculus alone	2
An abundance of supra- and subgingival calculus	3

Scoring

For individual teeth: Add scores for each surface and divide by the number of surfaces (4).

For an individual: Add the scores for an individual tooth and divide by the number of teeth.

Gingival Bone Count Index

The Gingival Bone Count Index was developed by Dunning JM and Leach LB (1960). It is a composite score based on the gingival condition and degree of bone loss affecting a person's teeth. This can be used to evaluate periodontal health, especially in epidemiologic studies.

Instruments Used

- Mouth mirror
- No. 17 Probe
- Two no. 3 posterior bitewing radiographs.

Method

- The gingival score is based on the clinical examination.
- The bone score is based on the clinical examination and evaluation of dental X-rays
- A mean for each score is then computed for the whole mouth.

Scoring Criteria

A single gingival score and a single bone score is generated for each tooth studied.

Gingival Score

Criteria/Finding	Score
Negative	0
Mild gingivitis involving the free gingiva (margin, papilla, or both)	1
Moderate gingivitis involving both free and attached gingiva	2
Severe gingivitis with hypertrophy and easy hemorrhage	3

Bone Score

Criteria/Finding	Score
No bone loss	0
Incipient bone loss or notching of alveolar crest.	1
Bone loss about one fourth of root length, or pocket formation on one side, not over one half of root length.	2
Bone loss about one half of root length, or pocket formation on one side, not over three-fourth root length, mobility slight	3
Bone loss about three quarters of root length, or pocket formation on one side to apex, mobility moderate	4
Bone loss complete, mobility marked	5

Gingival bone score

   = SUM ((gingival score) + (bone score))/
      (number of teeth examined) =

   = (mean gingival score) + (mean bone score)

Interpretation

- Minimum score: 0
- Maximum score: 8
   The higher the score, the more serious the periodontal disease.

The Navy Periodontal Disease Index (NPDI)

The Navy Periodontal Disease Index (NPDI) was developed as part of the Navy Periodontal Screening Examination, along with the Navy Plaque Index. It is composed of a gingival and a pocket scores. The NPDI score can be used to determine the level of treatment required by the individual patient.

Teeth examined

16 - Maxillary Right First Molar
21 - Maxillary Left Central Incisor
24 - Maxillary Left First Premolar
36 - Mandibular Left First Molar

41 - Mandibular Right Central Incisor

44 - Mandibular Right First Premolar

Substitutions

If 16, 24, 36 or 44 are missing, and then substitute the next most posterior tooth.

If 21 or 41 are missing, then substitute the nearest incisor in the arch. If all incisors are missing from the arch, then substitute a cuspid.

Gingival Score

Each tooth is examined for evidence of inflammatory change, which constitutes one or more of the following findings:

- Any change from normal gingival color
- Loss of normal density and consistency
- Slight enlargement or blunting of the papilla or gingiva
- Tendency to bleed upon palpation or probing.

Scoring Criteria

Gingival Score	Points
Gingival tissue is normal in color and tightly adapted to the tooth. Tooth is firm and no exudate is present.	0
Inflammatory changes are present but do not completely encircle the tooth.	1
Inflammatory changes completely encircle the tooth.	2

Pocket Score

With a calibrated periodontal probe, take six measurements of each designated tooth:

1. Mesial facial surface
2. Middle facial surface
3. Distal facial surface
4. Mesial lingual surface
5. Middle lingual surface
6. Distal lingual surface

Scoring Criteria

Pocket measurements	Points
Probing reveals sulcular depth not over 3 mm	0
Probing reveals pocket depth greater than 3 mm but not over 5 mm	5
Probing reveals pocket depth greater than 5 mm	8

Pocket score = Maximum score taken at the 6 probing sites

Calculating the NPDI

Tooth score = Gingival score + pocket score
NPDI score = Maximum of all six tooth scores
NPDI total   = Sum of all six tooth scores

Interpretation

- Minimum tooth score   :   0
- Maximum tooth score   :   10
- Minimum NPDI score   :   0
- Maximum NPDI score   :   10
- Minimum NPDI total   :   0
- Maximum NPDI total   :   60

Community Periodontal Index of Treatment Needs (CPITN)

The FDI-WHO Joint Working Group on periodontal diseases supports the use of the CPITN as an epidemiological screening procedure for periodontal treatment needs in populations. The Community Periodontal Index of Treatment Needs (CPITN) is an epidemiologic tool developed by the World Health Organization (WHO) for the evaluation of periodontal disease in population surveys. It can be used to recommend the kind of treatment needed to prevent periodontal disease. Following extensive discussion and testing the CPITN was finalized and described in 1982 (Ainamo Jukka, Barmes David, Beagrie George, Cutress Terry, Martin Jean and Sardo-Infirri Jennifer).

The CPITN is primarily a screening procedure which requires clinical assessment for the presence or absence of periodontal pockets, calculus and gingival bleeding. Use of a special CPITN periodontal probe (or its equivalent) is recommended.

For epidemiologic purposes in adult populations, 10 specified index teeth are examined. For persons under 20 years of age only, six index teeth are specified. In dental practice, all teeth are examined and the highest score for each sextants noted. Only six scores are recorded. Measures of gingival recession, tooth mobility, intensity of inflammation, precise identification of pocket depths or differentiation between supra- and subgingival calculus are not included in the CPITN. Individuals are assigned to one of four treatment need categories determined from their CPITN scores.

Teeth examined: Two methods of selection

Sextants: Total six sextants

14 teeth on the maxilla and 14 teeth on the mandible, divided into three segments on each arch with following tooth numbers (FDI).

Maxilla:

Sextant 1 : 17 to 14

Sextant 2 : 13 to 23

Sextant 3 : 24 to 27

Mandible:

Sextant 4 : 37 to 34

Sextant 5 : 33 to 43

Sextant 6 : 44 to 47

Third molars are not used unless they function in place of the second molars.

Index Teeth

In epidemiological surveys, for adults aged 20 years or more, only 10 index teeth are examined (5 teeth on the maxilla and 5 teeth on the mandible). These have been identified as the best estimators of the worst periodontal condition of the mouth.

MAX	17	16	11	26	27
MAND	47	46	31	36	37

The molars are examined in pairs and only one score, the highest is recorded. Only one score is recorded for each sextant.

For young people, up to 19 years only, six index teeth

MAX	16	11	26
MAND	46	31	36

The second molars are excluded as index teeth at these ages because of the high frequency of false (noninflammatory associated with tooth eruption) pocket.

For screening and monitoring purposes in dental practice all teeth in a sextant are examined for adults over age 19 years. Only one score, the highest is recorded for each sextant

When examining children less than 15 years, pockets are not recorded although probing for bleeding and calculus are carried out as routine.

Recording Data

The following box chart is recommended as the epidemiologic and dental office chart for recording CPITN data. The recommended periodontal probe for use with CPITN was described in the WHO 621 report (WHO 1978). The approved basic probe is suitable for general use in epidemiology and routine screening of patients in general practice. The CPITN is particularly designed for gentle manipulation of the often very sensitive soft tissues around the teeth; as such it is different in concept from the probes for dental caries and most other oral care instruments in current use.

The Probe

The probe is both thin in the handle and is of very light weight (5 gms). The probe has a black band starting at 3.5 mm and ending at 5.5 mm a ball tip of 0.5 mm diameter.

The functions of ball tip are:

• To aid in detection of calculus and other tooth surface roughness.
• To facilitate assessment of the base of the pocket and reduce the risk of over measurement.

A variant of this basic probe has two additional lines at 8.5 mm and 11.5 mm from the working tip. The additional lines may be of use when performing a detailed assessment and recording of deep pockets for the purpose of preparing treatment plan for complex periodontal therapy. The two instruments can be identified as:

CPITN-E for the epidemiologic probe with a black band from 3.5 and 5.5 mm (Fig. 17.9).

CPITN-C for the clinical probe with the additional 8.5 and 11.5 mm markings (Fig. 17.10).

5.5 mm

3.5 mm

0.5 mm
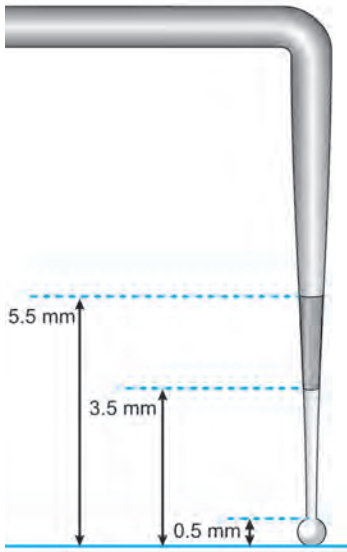
Fig. 17.9: Community periodontal index of treatment needs (CPITN) 'E' probe

11.5 mm

3.0 mm

8.5 mm

3.0 mm

5.5 mm

2.0 mm

3.5 mm

3.5 mm   5.5 mm

0.5 mm
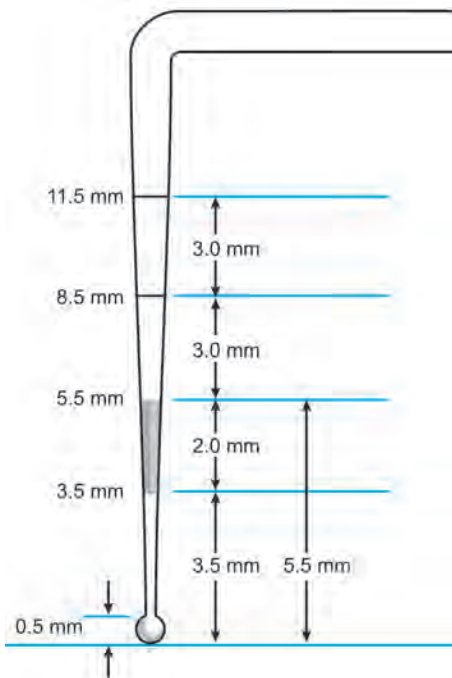
Fig. 17.10: Community periodontal index of treatment needs (CPITN) 'C' probe

Sensing Gingival Pockets

An index tooth should be probed, using the probe as a "sensing" instrument to determine pocket depth and to detect subgingival calculus and bleeding response. The sensing force used should be not more than 20 grams. A practical test for establishing this force is to place the probe point under the thumb nail and press until blanching occurs. For sensing subgingival calculus, the lightest possible force that will allow movement of the probe ballpoint along the tooth surface should be used.

The ball-end should be in contact with the root surface. When inserting the probe, the ballpoint should follow the anatomical configuration of the surface of the tooth root. If the patient feels pain during probing, this is an indicative of the use of too much force.

The probe tip should be inserted gently into the gingival pocket and the depth of insertion read against the color coding. The total extent of the pocket should be explored and at least six points on each tooth should be examined: mesiobuccal, midbuccal, distobuccal, and the corresponding lingual sites.

Codes and Criteria (Fig. 17.11)

The codes are listed in the descending order of treatment complexity as follows:

Code X: When only one tooth or no tooth is present in the sextant (third molars are excluded unless they function in place of second molars).

Code 4: Pathological pocket of the 6 mm or more, that is, the black area of the CPITN probe is not visible.
Note: If the designated tooth or teeth are found to have a 6 mm or deeper pocket in the sextant being examined, a code of 4 is given to the sextant. Recording of Code 4 makes further examination of that sextant unnecessary. There is no need to record the presence or absence of pathological pockets of 4 or 5 mm, calculus or bleeding.

Code 3: Pathological pocket of 4 or 5 mm that is when the gingival margin is on the black area of the probe.
Note: If the deepest pocket is found at the designated tooth or teeth in a sextant is 4 or 5 mm, a code 3 is
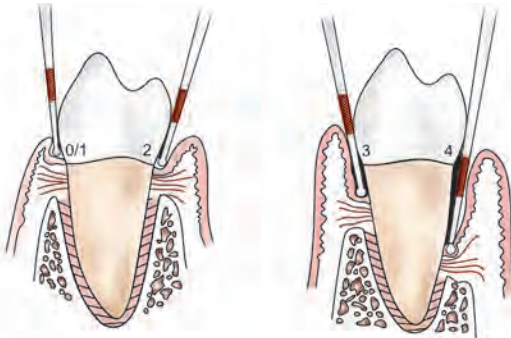
Fig. 17.11: Community periodontal index of treatment needs (CPITN)

Code-0 = No Periodontal disease (Healthy Periodontium)
Code-1 = Bleeding observed during or after probing
Code-2 = Calculus or other plaque retentive factors either seen or felt during probing
Code-3 = Pathological pocket 4 to 5 mm in depth. Gingival margin situated on black band of the probe
Code-4 = Pathological pocket 6 mm or more in depth. Black band of the probe not visible

recorded. There is no need to examine for calculus or gingival bleeding.

Code 2: Calculus or other plaque retentive factors such as ill fitting crowns or poorly adapted edges of restoration are either seen or felt during probing.
Note: The black band remains fully visible.

Code 1: Bleeding observed during or after probing (either immediate or delayed).

Code 0: Healthy tissue: The black band on the probe remains fully visible. There is no bleeding after probing. No calculus, restoration overhangs or other plaque retention factors are present.

Treatment Needs

TN 0: A recording of code 0 (health) or X (missing) for all six sextant indicates that there is no need for treatment.

TN 1: A code of 1 or higher indicates that there is need for improving the personal oral hygiene of that individual.

TN 2:   a.   Code of 2 or higher indicates a need of professional cleaning of the teeth and removal of plaque retentive factors. Patient require oral hygiene instructions

           b.   Shallow to moderate pocketing (4 or 5 mm, code 3). Oral hygiene and scaling will reduce inflammation and bring 4 or 5 mm pockets to values of or below 3 mm. Thus, sextants of these pockets are placed in the same treatment category as scaling and root planning, i.e. Treatment Needs 2 (TN 2)

TN 3:   A sextant scoring code 4 (6 mm or deeper pockets) may or may not be treated successfully by means of deep scaling and efficient personal oral hygiene measures. Code 4 is therefore assigned as complex treatment which can involve deep scaling, root planning and more complex procedures.

Explanation of the Clinical Criteria and Treatment Needs

Bleeding on gentle probing, plaque retentive factors (calculus or overhangs of restoration), 4 or 5 or 6 mm or deeper pockets are basic indicators if treatment needs. These criteria were chosen for the following reason:

1. TN 1: Bleeding is sign of a early disease which can be overcome by self-care following suitable oral health care educations and instructions. Control of gingival bleeding is a prerequisite for all periodontal therapy. This treatment is recognized as treatment need 1 (TN 1). The control or elimination of gingival bleeding should be the prime goal even if further treatment is not available.

2. TN 2: Although not pathological in themselves, Calculus and other plaque retentive factors favor plaque retention and inflammation. Unlike plaque that can be eliminated by self-care, the removal of calculus demands the professional care defined as treatment need 2 (TN 2).

3. TN 3: In patient with deep pocket even after scaling, root planning and control of bleeding by oral hygiene methods there will generally be residual pockets. The treatment of these conditions may require complex therapy for which skilled and trained dental professionals are needed. This treatment is recognized as TN 3.

Substitution for Excluded and Missing Index Teeth

The ten CPITN index teeth are first molar and second molars in the posterior sextant and a central incisor in each of the two anterior sextant. When one or more index teeth are missing at the time of examination, substitute teeth are selected using the following rules:

- Two or more functioning teeth must be present in a sextant for it to qualify for scoring.
- If in posterior sextant, one of the two index teeth is not present or has to be excluded, then the recording is based on the examination of remaining index tooth.
- If both index teeth in posterior sextant are absent or excluded from examination, all the remaining teeth in that sextant are examined and highest score recorded.
- In the anterior maxillary sextant, if tooth 11 is excluded, substitute 21. If 21 is also excluded, then identify the worst score for the remaining teeth. Similarly substitute tooth 41 if 31 is missing.
- In subjects under 20 years of age, if the first molar is not present or has to be excluded the nearest adjacent premolar is examined.
- If all teeth in a sextant are missing or only one functional tooth remains, the sextant is coded as missing.
- A single tooth in a sextant is considered as a tooth in the adjacent sextant and subject to the rules for that sextant. If single tooth is an index tooth, then the worst index tooth score is recorded.

Examination Procedure

The aim is to determine the highest score applicable to each sextant with least number of measurements.

First decide whether the sextant can be validly scored. More than one functional tooth should be present.

If 'no', then give a score X and move to the next sextant. If 'yes', examine index teeth (epidemiological) or all teeth (in clinical screening procedure) in the order of presence of 6 mm or deeper pockets; 4 to 5 mm pockets, calculus or other plaque retentive factors and bleeding only.

Determine appropriate highest score for each sextant. As soon as the highest score criteria has been determined there is no need to examine for the presence of lower score criteria.

Number of Probings Per Sextant

The tip of the CPITN probe is gently inserted between tooth and gingiva to the full depth of the sulcus or pocket and the probing depth read by the observation of the position of the black band. Recommended sites for probing are mesial, midline and distal on both facial and lingual surfaces. The probing may be done by withdrawing the probe between each probing or alternatively with probe tip remaining in the sulcus the probe may be 'walked' around the tooth. Sites in addition to the recommended one should be probed, if there is suspicion that a higher scoring condition is present.

Community Periodontal Index (CPI) (Fig. 17.12A)

This index is based on a modification of the earlier used CPITN. The modification is done by the inclusion of measurement of "Loss of attachment" and elimination of the "Treatment Needs" category.

The CPI was proposed by World Health Organization in 1997.
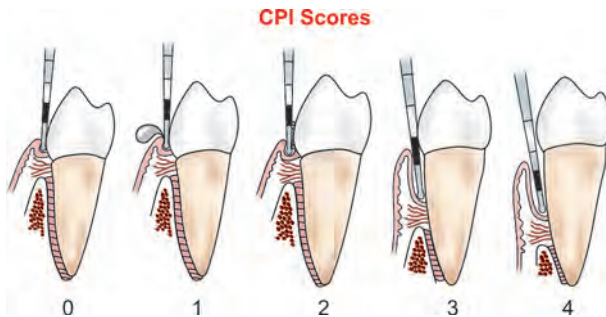
Fig. 17.12A: Community periodontal index codes

Code 0. Healthy periodontal tissues. Entire black band of the probe is visible.
Code 1. Entire black band is visible, but bleeding is present after gentle probing.
Code 2. Entire black band is visible, but calculus is present. (Bleeding may or may not be present.)
Code 3. 4 to 5 mm pocket depth. (Black band on probe partially hidden by gingival margin.)
Code 4. 6 mm or greater pocket depth. (Black band of the probe is completely hidden by the gingival margin.)

Indicators

Three indicators of periodontal status are used for this assessment:
1. Gingival bleeding
2. Calculus
3. Periodontal pockets

A specially designed lightweight CPI probe with a 0.5 mm ball tip is used, with a black band between 3.5 and 5.5 mm and rings at 8.5 and 11.5 mm from the ball tip.

Sextants

The mouth is divided into sextants defined by tooth numbers: 18-14, 13-23, 24-28, 38-34, 33-43, and 44-48. A sextant should be examined only if there are two or more teeth present and not indicated for extraction. (Note: This replaces the former instruction to include single remaining teeth in the adjacent sextant.)

Selection of teeth: For adults aged 20 years and over, the teeth to be examined are:

| 17 | 16 | 11 | 26 | 27 |
| 47 | 46 | 31 | 36 | 37 |

The two molars in each posterior sextant are paired for recording, and if one is missing, there is no replacement. If no index teeth or tooth is present in a sextant qualifying for examination, all the remaining teeth in that sextant are examined and the highest score is recorded as the score for the sextant. In this case, distal surfaces of third molars should not be scored.

For subjects under the age of 20 years, only six teeth: 16, 11, 26, 36, 31 and 46 are examined. This modification is made in order to avoid scoring the deepened sulci associated with eruption as periodontal pockets. For the same reason, when examining children under the age of 15 are examined, pockets should not be recorded, i.e. only bleeding and calculus should be considered.

Sensing Gingival Pockets and Calculus

An index tooth should be probed, using the probe as a "sensing" instrument to determine pocket depth and to detect subgingival

calculus and bleeding response. The sensing force used should be not more than 20 grams. A practical test for establishing this force is to place the probe point under the thumb nail and press until blanching occurs. For sensing subgingival calculus, the lightest possible force that will allow movement of the probe ball tip along the tooth surface should be used.

When the probe is inserted, the ball tip should follow the anatomical configuration of the surface of the tooth root. If the patient feels pain during probing, this is an indicative of the use of too much force.

The probe tip should be inserted gently into the gingival sulcus or pocket and the total extent of the sulcus or pocket explored. For example, the probe is placed in the pocket at the distobuccal surface of the second molar, as close as possible to the contact point with the third molar, keeping the probe parallel to the long axis of the tooth. The probe is then moved gently, with short upward and downward movements, along the buccal sulcus or pocket to the mesial surface of the second molar, and from the distobuccal surface of the first molar towards the contact area with the premolar. A similar procedure is carried out for the lingual surfaces, starting distolingually to the second molar.

Examination and Recording

The index teeth, all remaining teeth in a sextant where there is no index tooth, should be probed and the highest score is recorded in the appropriate box. The codes are:

0– Healthy

1– Bleeding observed, directly or by using mouth mirror, after probing

2– Calculus detected during probing, but all the black band on the probe visible

3– Pocket 4 to 5 mm (gingival margin within the black band on the probe)

4– Pocket 6 mm or more (black band on the probe not visible)

X– Excluded sextant (less than two teeth present)

9– Not recorded

Loss of Attachment (Fig. 17.12B)

Information on loss of attachment gives an estimate of the lifetime accumulated destruction of the periodontal attachment. Loss of attachment should not be recorded for children under the age of 15.

The most reliable way of examining for loss of attachment in each sextant is to record this immediately after recording the CPI score for that particular sextant.

The highest scores for CPI and loss of attachment may not necessarily be found on the same tooth in a sextant.

Highest score recorded in the appropriate box.

The codes are:

0– Loss of attachment 0 to 3 mm (CEJ not visible and CPI score 0-3)

If the CEJ is visible, or if CPI score is 4, LOA codes 1 to 4 are used.

1– Loss of attachment 4 -5 mm (CEJ within black band)

2– Loss of attachment 6 to 8 mm (CEJ between the upper limit of the black band and the 8.5 mm ring)

3– Loss of attachment 9 to 11 mm (CEJ between 8.5 mm and 11.5 mm ring)
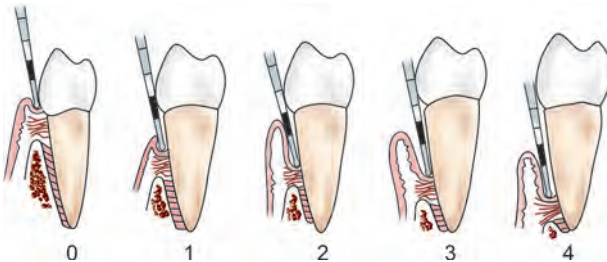
Fig. 17.12B: CPI: Lost of attachment codes

Code 0.   0 to 3 mm loss of attachment. (Cementoenamel junction [CEJ] is covered by the gingival margin and the CPI score is 0 to 3.) If the CEJ is visible, or if CPI score is 4, LOA codes 1 to 4 are used.

Code 1.   3.5 to 5.5 mm loss of attachment. (CEJ is within the black band on the probe.)

Code 2.   6 to 8 mm loss of attachment. (CEJ is between the top of the black band and the 8.5 mm mark on the probe.)

Code 3.   9 to 11 mm loss of attachment. (CEJ is between the 8.5 and the 11.5 mm marks on the probe.)

Code 4.   12 mm or greater loss or attachment. (CEJ is beyond the highest [11.5 mm] mark on the probe.)

4– Loss of attachment 12 mm or more (CEJ beyond the 11.5 mm ring)

X– Excluded sextant (less than two teeth present)

9– Not recorded (CEJ neither visible nor detectable).

INDICES USED IN ASSESSING DENTAL CARIES

Diagnosis of dental caries is difficult in initial stages. Early approximal lesions are readily revealed by a radiograph but may not be detected by an explorer. There always exists interexaminer variations.

Decayed, Missing and Filled Teeth (DMFT) Index

This index was developed by Henry Klein, Carrole E Palmer and Knutson JW in 1938. This index was based on the fact that the dental hard tissues are not self-healing and established caries leaves a scar. The tooth either remains decayed and if treated may be extracted or filled. It is an irreversible index.

DMFT describe the amount (the prevalence) of dental caries in an individual. DMFT numerically expresses the caries prevalence and is obtained by calculating the number of teeth (T) which are:
- Decayed (D)
- Missing (M)
- Filled (F).

It is thus used to get an estimation illustrating how much the dentition until the day of examination has become affected by dental caries. Thus:
- How many teeth have caries lesions (incipient caries not included)?
- How many teeth have been extracted?
- How many teeth have fillings or crowns?

Selection of Teeth

All 28 teeth are examined (based on 28 teeth).
Teeth not included are:
- Third molars
- Unerupted teeth (a tooth is considered as erupted when the occlusal surface or incisal edge is totally exposed)
- Supernumerary and congenitally missing teeth

- Teeth removed for reasons other than dental caries such as for orthodontic reasons and impactions
- Teeth restored for reasons other than dental caries, such as trauma, use as a bridge abutment and cosmetic purposes
- Retained primary tooth when the successor permanent is present. The permanent tooth is considered.

Procedure

Each tooth is examined using a mouth mirror, an explorer and adequate light. The teeth should be observed by visual means as much as possible and only questionable small lesions should be checked by using an explorer.

Rules for Scoring DMFT

- No tooth should be counted more than once
- Decayed (D), Missing (M) and Filled (F) teeth should be recorded separately
- Tooth lost or filled due to reasons other than caries are not included
- Deciduous teeth are not considered in DMFT index
- A tooth with several filling is counted as one tooth.

Criteria for Recording

i. Decayed (D) recording:
   - When dental caries and a restoration are present on the same tooth, the tooth is recorded as D
   - When a crown is broken due to caries, it is recorded as D
   - Tooth with temporary restoration are recorded as decayed.

ii. Missing (M) recording:
   - When a tooth has been extracted because of dental caries
   - When a tooth is carious, cannot be restored and is indicated for extraction.

iii. Filled (F) recording:
   - Permanent restorations are recorded as F.

Criteria for Identification of Dental Caries

- Lesion is clinically visible and obvious
- Discoloration or loss of translucency typical of undermined or demineralized enamel

- Definite catch and the explorer tip can penetrate into soft yielding material.

DMFT Scores

The sum of the three figures forms the DMFT value. For example, DMFT of 4 + 3 + 9 = 16 means that 4 teeth are decayed, 3 teeth are missing and 9 teeth have fillings. It also means that 12 teeth are intact

Individual DMFT

Total each component separately ie total D, total M, total F.

$$\text{Total D + M + F = DMF SCORE}$$

Group Average

- Total the D, M and F for each individual
- Divide the total DMF by the number of individuals examined.

$$\text{Average DMF} = \frac{\text{Total DMF}}{\text{Total Number of Individuals Examined}}$$

Treatment Needs

$$\text{Percentage needing restorations (\%)} = \frac{\text{Total Number of D Tooth}}{\text{Total Number Examined}} \times 100$$

Limitations of DMFT Index

- DMF values are not related to the number of teeth at risk. A DMF score does not directly gives an indication of the intensity of attack in any one individual, e.g. a child of 8-year-old may have DMF score of 3 with only nine permanent teeth in mouth (one-third of teeth have been already affected by caries), whereas an adult may have a DMF score of 8 (more than the child score) out of 32 teeth (only one fourth of the teeth have been affected)
- The DMF index is invalid when teeth have been removed or lost due to other reasons, e.g. periodontal reasons
- The index gives equal weight to all the three components, i.e. missing decayed and well-restored teeth
- Does not tell about the treatment needs of a person
- The DMF index can overestimate caries experience in cases having teeth with preventive restorations
- Cannot be used for root caries.

Decayed, Missing and Filled Surface (DMFS) Index

DMFS index assesses the total no. of tooth surfaces affected rather than the tooth. It is a more detailed index in which DMF is calculated per tooth surface.

Rules, method and criteria are same as that of DMFT index except that all tooth surfaces are examined in DMFS index.

Surfaces Examined

Anterior teeth: Four surfaces are examined; Facial, Lingual, Mesial and Distal.

Posterior teeth: Five surfaces are examined; Facial, Lingual, Mesial, Distal and Occlusal.

Maximum value for DMFS comes to 128 for 28 teeth.

Posterior teeth: 16 with 5 surface, each: 16×5 = 80
Anterior teeth: 12 with 4 surface, each: 12×4 = 48
                                      Total   = 128 surfaces.

Calculating the DMFS

Individual

Total number of decayed surfaces   =   D
Total number of missing surfaces   =   M
Total number of filled surfaces   =   F
Total DMFS score for an individual   =   D +M+ F (surfaces)

It is a more precise index but takes a longer time to perform.

WHO Modification of DMF Index

1. Third molars are included.
2. In persons below 30 years of age, teeth lost due to caries are considered missing. In persons above 30 years, teeth lost for any reasons are considered as missing.
3. Initial caries is not regarded as decayed.

Dental Caries Index for Deciduous Teeth (dmft and dmfs)

This index for primary teeth was given by Grubbel in 1944. It is used for the primary dentition, consisting of maximum 20 teeth.

Designations are "deft" or "defs":

Where   d = decayed primary teeth

          e = extracted tooth/indicated for extraction (due to caries)

          f = filled teeth/surfaces

Selection of Teeth or Surfaces

dmft: 20 teeth are evaluated (all the primary teeth are included).

For Surfaces

dmfs: 88 surfaces are evaluated.

Posterior teeth: 8 teeth × 5 surfaces = 40 surfaces

Anterior teeth: 12 teeth × 4 surfaces = 48 surfaces

Teeth not Counted

- Missing teeth, including unerupted and congenitally missing teeth.
- Teeth restored for reasons other than dental caries are not counted as f.
- Supernumerary teeth.

Procedure and Criteria

Same as for DMFT

Calculating the def

Total def score   = d + e + f

Total defs score = d + e + f surfaces.

Mixed Dentition

In mixed dentition, DMFT or DMFS and a deft and defs index are done separately and never added together. Separate index is done for each child for permanent teeth and primary teeth starting with permanent teeth first.

WHO Dentition Status and Treatment Needs

Dentition Status and Treatment Needs was proposed by the World Health Organization in the year 1997.

The index is used to determine the treatment needs in relation to dental caries.

Method

The examination is conducted with a mouth mirror. Radiography for the detection of approximal caries is not recommended because of the impracticability of using the equipment in all situations.

The examination is conducted for the assessment of dentition status and treatment needs. The examination should proceed in a systematic manner from one tooth or tooth space to the adjacent tooth or tooth space. A tooth should be considered present when any part of it is visible. If a permanent and primary tooth occupy the same tooth space, the status of the permanent tooth should be scored.

Dentition Status: An entry is made pertaining to the coronal or root status. The same boxes are used for recording both primary and permanent teeth. In case of surveys of children, where root status is not assessed, a code 9 is entered in the box pertaining to the root status.

It is recommended, that care should be taken to record all tooth-colored fillings, which may be difficult to detect.

Scoring Criteria

Code			Condition/Status
Primary Teeth	Permanent Teeth		
Crown	Crown	Root	
A	0	0	Sound
B	1	1	Decayed
C	2	2	Filled, with decay
D	3	3	Filled, without decay
E	4	–	Missing as a result of caries
–	5	–	Missing, any other reason
F	6	–	Fissure sealant
G	7	7	Bridge abutment, special crown or veener/ implant
–	8	8	Unerupted tooth (crown)/ unexposed root
T	T	–	Trauma
–	9	9	Not recorded

The criteria for diagnosis and coding are:

- **0:** A zero indicates a sound crown or root, showing no evidence of either treated or untreated caries. A crown may have defects and still be recorded as 0. Defects that can be disregarded include white or chalky spots; discolored or rough spots that are not soft; stained enamel pits or fissures; dark, shiny, hard, pitted areas of moderate to severe fluorosis; or abraded areas.

- **1:** One indicates a tooth with caries. A tooth or root with a definite cavity, undermined enamel, or detectably softened or leathery area of enamel or cementum can be designated as 1. A tooth with a temporary filling, and teeth that are sealed but decayed, are also termed 1. Score 1 is not assigned to any tooth in which caries is only suspected. In cases where the crown of a tooth is entirely decayed, leaving only the root, score 1 is assigned to both crown and root. Where only the root is decayed, only the root is termed as 1. In cases, where both the crown and root are involved with decay, whichever site is judged the site of origin is recorded as 1. These criteria apply to all numbers.

- **2:** Filled teeth, with additional decay, are termed 2. No distinction is made between primary caries which is not associated with a previous filling, and secondary caries, adjacent to an existing restoration.

- **3:** It indicates a filled tooth with no decay. If a tooth has been crowned because of previous decay, that tooth is judged 3. When a tooth has been crowned for another reason such as aesthetics or for use as a bridge abutment, 7 is used.

- **4:** It indicates a tooth that is missing as a result of caries. Only crowns are given 4 status. Roots of teeth that have been scored as 4 are recorded as 7 or 9. When primary teeth are missing, the score should be used only if the tooth is missing prematurely. Primary teeth missing because of normal exfoliation needs no recording.

- **5:** A permanent tooth missing for any other reason than decay is given as 5. Examples are teeth extracted for orthodontia or because of periodontal disease, teeth that are congenitally missing, or teeth missing because of trauma. The 5 is assigned to the crown, the root is given a 7 or 9. Knowledge of tooth eruption patterns is helpful to determine whether teeth are missing or not yet erupted. Clues to help in the determination include appearance

of the alveolar ridge in the area in question, and caries status of other teeth in the mouth.

- **6:** A 6 is assigned to teeth on which sealants have been placed. Teeth on which the occlusal fissure has been enlarged and a composite material placed should also be termed 6.
- **7:** A 7 is used to indicate that the tooth is part of a fixed bridge. When a tooth has been crowned for a reason other than decay, this code is also used. Teeth that have veneers or laminates covering the facial surface are also termed 7 when there is no evidence of caries or restoration. A 7 is also used to indicate a root replaced by an implant. Teeth that have been replaced by bridge pontics are scored 4 or 5; their roots are scored 9.
- **8:** This code is used for a space with an unerupted permanent tooth, where no primary tooth is present. The category does not include missing teeth. Code 8 teeth are excluded from calculations of caries. When applied to a root, an 8 indicates the root surface is not visible in the mouth.
- **9:** Erupted teeth that cannot be examined because of orthodontic bands, e.g. are coded a 9. When applied to a root, a 9 indicates the tooth has been extracted. The crown of that tooth would be scored a 4 or 5.
- **T:** Indicating trauma, a T is used when a crown is fractured, with some of its surface missing but with no evidence of decay.
  The "D" of DMFT refers to all teeth with codes 1 and 2. The "M" applies to teeth scored 4 in subjects under age 30, and teeth scored 4 or 5 in subjects over age 30. The "F" refers to teeth with code 3. Those teeth coded 6, 7, 8, 9, or T are not included in DMFT calculations.

Treatment Needs of Individual Teeth

Treatment requirements should be assessed for the whole tooth, including both coronal and root caries. Immediately after the status of a tooth is recorded, and before proceeding to the next tooth or tooth space, the type of treatment required, if any, should be recorded. If no treatment is required, code "0" should be placed in the appropriate treatment box. (If this is not done it will be impossible to determine later, when the data are processed, whether no treatment was necessary, or whether the examiner or recorder omitted to make an appropriate entry.)

Scoring Criteria

The codes and criteria for treatment needs are:

0. None (no treatment). This code is recorded if a crown and a root are both sound, or if it is decided that a tooth should not receive any treatment.
P. Preventive, caries-arresting care
F. Fissure sealant
1. *One surface filling*
2. *Two or more surface fillings.*
    One of the codes P, F, 1 or 2 should be used to indicate the treatment required to:
    • Treat initial, primary or secondary caries;
    • Treat discoloration of a tooth, or a developmental defect;
    • Treat lesions due to trauma, abrasion, erosion or attrition;
    • Replace unsatisfactory fillings or sealants.
    A sealant is considered unsatisfactory if partial loss has extended to exposure of a fissure, pit, or junction or surface of the dentine which, in the examiner's opinion, requires resealing.
    A filling is considered unsatisfactory if one or more of the following conditions exist:
    • *A deficient margin* to an existing restoration that has leaked or is likely to permit leakage into the dentine. The decision as to whether a margin is deficient should be based on the examiner's clinical judgment, on evidence gained from the insertion of a CPI probe at the margin, or on the presence of severe staining of the tooth structure.
    • *An overhanging margin* of an existing restoration that causes obvious local irritation to the gingiva and cannot be removed by recontouring of the restoration.
    • *A fracture of an existing restoration* that either causes it to be loose or permits leakage into the dentine.
    • *Discoloration.*
3. *Crown for any reason.*
4. *Veneer or laminate* (may be recommended for aesthetic purposes).
5. *Pulp care and restoration:* This code is used to indicate that a tooth probably needs pulp care prior to restoration with a filling

or crown because of deep and extensive caries, or because of tooth mutilation or trauma.

Note: A probe should *never* be inserted into the depth of a cavity to confirm, the presence of a suspected pulp exposure.

6. Extraction: A tooth is recorded as "indicated for extraction", depending on the treatment possibilities available, when:
   • Caries has so destroyed the tooth that it cannot be restored;
   • Periodontal disease has progressed so far that the tooth is loose, painful or functionless and, in the clinical judgment of the examiner, cannot be restored to a functional state;
   • A tooth needs to be extracted to make way for a prosthesis; or
   • Extraction is required for orthodontic or cosmetic reasons, or because of impaction.

7/8. *Need for other care:* The examiner should specify the types of care for which codes 7 and 8 are used. The use of these two codes should be kept to a minimum.

9. Not recorded.

Significant Caries Index

In 2000, the World Health Organization developed the significant caries index (SiC) to be used when studying DMFT scores on a global basis. A single population may include a number of individuals with low DMFT scores, as well as those with high scores. A mean DMFT value would not accurately reflect the status of the population. The SiC Index isolates and highlights those individuals with the highest caries values in a particular population.

DMFT score show that there is a skewed distribution of caries prevalence. Clearly, the mean DMFT value does not accurately reflect this skewed distribution leading to incorrect conclusion that the caries situation for the whole population is controlled while in reality several individuals still have caries.

A new index called the 'Significant Caries Index' (SiC) was proposed by Bratthall D in the year 2000, in order to bring attention to those individuals with the highest caries scores in each population.

The SiC Index is the Mean DMFT of the one third of the study group with the highest caries score. The index is used as a complement to the mean DMFT value.

Steps to Calculate Significant Caries Index

- Sort the individuals according to their DMFT
- Select the one third of the population with the highest caries values
- Calculate the Mean DMFT for this subgroup, suppose the DMFT of 15 students was calculated as, e.g. 0, 1, 5, 0, 0, 2, 1, 7, 0, 9, 0, 4, 1, 0, 5

   Arranged in increasing order the DMFT scores are 0, 0, 0, 0, 0, 0, 1, 1, 1, 2, 4, 5, 5, 7, 9

   The highest 1/3rd scores are - 0, 0, 0, 0, 0, 0, 1, 1, 1, 2, 4, 5, 5, 7, 9

   Thus, the SiC Index is - 4 + 5 + 5 + 7 + 9 / 5 = 30/5 = 6.0

   DMFT - 0 + 0+ 0 + 0 + 0 + 0 + 1 + 1 + 1 + 2 + 4 + 5 + 5 + 7 + 9 / 15 = 35 / 15 = 2.33.

INDICES USED IN ASSESSING DENTAL FLUOROSIS

Dean's Fluorosis Index

HT Dean's fluorosis index was originally given in 1934 and later modified in 1942 and is currently the most universally accepted classification system. An individual's fluorosis score is based on the most severe form of fluorosis found on two or more teeth. Dean's is used to score the amount of dental fluorosis (discoloration) present on teeth. Fluorosis generally appears as a horizontal striated pattern across a tooth. Molars and bicuspids are most frequently affected, followed by upper incisors. The mandibular incisors are usually least affected. Fluorosis tends to be bilaterally symmetrical. Defects may appear as fine white or frosted lines or patches near the incisal edges or cusp tips. A score is given, based on the two teeth most affected. If the teeth are not equal in appearance, the less affected tooth is the one scored.

Scores and Criteria for Dean's Fluorosis Index

Score	Criteria
Normal (0)	The enamel represents the usually translucent semivitriform type of structure. The surface is smooth, glossy, and usually a pale creamy white color.
Questionable (0.5)	The enamel discloses slight aberrations from the translucency of normal enamel, ranging from a few white flecks to occasional white spots. This classification is utilized when a definite diagnosis of the mildest form of fluorosis is not warranted and a classification of "normal" is not justified.
Very mild (1)	Small, opaque, paper white area scattered irregularly over the tooth but not involving as much as approximately 25 percent of the tooth surface. Frequently included in this classification are teeth showing no more than 1 to 2 mm of white opacity at the tip of the summit of the cusps of the bicuspids or second molars.
Mild (2)	The white opaque areas in the enamel of the teeth are more extensive but do not involve as much as 50 percent of the tooth.
Moderate (3)	All enamel surfaces of the teeth are affected, and surfaces subject to attrition show marked wear. Brown stain is frequently a disfiguring feature.
Severe (4)	All enamel surfaces are affected and hypoplasia is so marked that the general form of the tooth may be altered. The major diagnostic sign of this classification is the discrete or confluent pitting. Brown stains are widespread and teeth often present a corroded appearance.

Source: Dean 1942. American Association for the Advancement of Science.

Community Fluorosis Index

In 1942, Dean modified his index by reducing the number of categories and developed a scoring system to derive the Community Fluorosis Index (CFI).

In a given population, the proportion in each category is multiplied by the weight given to derive a score for the community.

$$F_{ci} = \frac{n \ w}{N}$$

Where,

F_{ci} – Community fluorosis index

n – Number of children in each category (frequency)

w – The weighing for each category

N – Total population

The index, weights ranging from 0 to 4, is defined mathematically as the average weighted score per person surveyed.

Interpretation

Range of scores	Public health significance
0.0–0.4	Negative
0.4–0.6	Borderline
0.6–1.0	Slight
1.0–2.0	Medium
2.0–3.0	Marked
3.0–4.0	Very marked

The use of the CFI results in the familiar "S" curve, displaying the relationship of the index plotted against the fluoride content of the water supplies of communities with various levels of fluoride. The shape of this relationship probably reflects the lower weight assigned to questionable cases which represent a high percentage of cases at low levels of fluoride exposure, and to a lack of sensitivity of index criteria at higher levels of exposure.

Advantages

- It gives an indication of the public health significance of fluorosis.

Disadvantages

- The statistical basis for using arithmetic mean to calculate CFI is questionable on the grounds that the classification is based on an ordinal scale and not an interval scale.
- The CFI, because of its method of calculation, may not give a true reflection of the severity of fluorosis within the community.
- The CFI is an average; it provides little information about the variation within a population, particularly if measures of variance are not provided.

- The index may misrepresent the dose response relationship between fluoride and fluorosis.

Dental Fluorosis Index by Moller (1965)

Weighting	Diagnosis	Clinical criteria
0	Normal	The enamel shows the usual translucency. The surface is smooth, shiny and usually of a pale, creamy white to gray white color. In this group are also opacities, which are not considered to be of fluorotic character.
0	Optimal	The enamel is on clinical inspection completely homogeneously mineralised without hypomineralization of any sort. The enamel is smooth and mirror-like, and has a shiny, "Varnished" look. The colour is creamy white to yellowish white.
0.25	Questionable	In areas with relatively low fluoride content in drinking water, there are cases which even the most experienced researchers cannot classify as either normal or very mild. These cases show mainly labially in the upper front teeth as very narrow, opaque, paper-white, horizontal lines in the tooth's incisal third especially. In back teeth are now and then seen small, opaque spots (about 0.5 mm in diameter) directly on the cusp tips, while the rest of the tooth is completely normally mineralized. The features of these opaque lines and spots are so fine that they are often confused with perichymata. This fine feature shows more clearly with drying the tooth, a procedure which should always be done while diagnosing.
0.25–1	Very Mild	Clearer opaque, paper-white, transversely oriented striations or spots, found spread especially on the upper incisors' labial surfaces and most concentrated in the incisal third. In the back teeth are seen opaque regions (< 1 mm in diameter) directly on the cusp tips. Opaque, paper-white, narrow, transversely running lines reach down over the cusp, while the rest of the tooth is normal. The opaque regions cover almost a fourth of the surface of the tooth. When viewed from a dis-

Contd...

Weighting	Diagnosis	Clinical criteria
1.5–2	Mild	tance, the tooth seems to have a slightly mother-of-pearl sheen. The lower grades of very mild dental fluorosis are rated 0.5 and the worst 1.0. The mainly transversely running opaque lines and spots are more clear and stretch further down over the tooth's surface towards the outer circumference. One can detect that the opaque lines begin to merge together into diffuse regions, so that the tooth seen at a distance (40–50 cm) seems whiter, more opaque than a normally mineralized tooth. Seen close to these opaque areas take up, however, at most half of the tooth's surface. Changes in the front teeth's lingual surfaces are considerably less obvious than on the labial. As far as the back teeth are concerned, the changes in labial and lingual surfaces are of more or less the same degree. On the cusps of canines, premolars and molars, there are cases where the cusp tips are worn, so that the wear facets peripherally are bordered by a narrow, opaque ring (an expression of the fluorotic surface layer) surrounded by the clearer underlying enamel. In pronounced cases the development of pigment can be seen, especially in the upper incisors. Lower grades of mild dental fluorosis are scored 1.5 and the worst 2.0.
2.5–3	Moderate	The opaque regions take-up practically all the tooth's surface. Tooth shape is normal, but a weak "pit" development can be found, especially on premolar buccal and palatal surfaces, as well as upper incisor labial surfaces. Pigment where present can vary in color from yellow to brown. The lower grades of moderate dental fluorosis are rated 2.5 and the worst 3.0.
3.5–4	Severe	The shape of the tooth can be changed. The development of pits is pronounced. Merging of pits is often seen. Sometimes, the outer layer of enamel parlty or completely missing, and the tooth has a corroded look. Pigmentation varies in color from brown, to dark brown, to black. Lower degrees of severe dental fluorosis score 3.5 and the worst 4.0.

Thylstrup-Fejerskov Index of Fluorosis (TF)

This index was developed by A. Thylstrup & O. Fejerskov in 1978 and has a stronger biological basis than Dean's index because the index scores were developed by relating them to histologic features of affected enamel. As the procedure includes drying of tooth it is the most sensitive of the existing indices. Also, it requires assessment of only one surface per tooth because fluorosis affects all tooth surfaces equally. It can be used on selected teeth or entire dentition.

Clinical Criteria and Scoring for the TF (Thylstrup-Fejerskov) Index

Score	Criteria
0	Normal translucency of enamel remains after prolonged air drying.
1	Narrow white lines corresponding to the perikymata.
2	*Smooth surfaces:* More pronounced lines of opacity that follow the perikymata. Occasionally confluence of adjacent lines. *Occlusal surfaces:* Scattered areas of opacity <2 mm in diameter and pronounced opacity of cuspal ridges.
3	*Smooth surfaces:* Merging and irregular cloudy areas of opacity. Accentuated drawing of perikymata often visible between opacities. *Occlusal surfaces:* Confluent areas of marked opacity. Worn areas appear almost normal but usually circumscribed by a rim of opaque enamel.
4	*Smooth surfaces:* The entire surface exhibits marked opacity or appears chalky white. Parts of surface exposed to attrition appear less affected. *Occlusal surfaces:* Entire surface exhibits marked opacity. Attrition is often pronounced shortly after eruption.
5	*Smooth surfaces and occlusal surfaces:* Entire surface displays marked opacity wtih focal loss of outermost enamel (pits) < 2 mm in diameter.
6	*Smooth surfaces:* Pits are regularly arranged in horizontal bands < 2 mm in vertical extension. O*cclusal surfaces:* Confluent areas < 3 mm in diameter exhibit loss of enamel. Marked attrition.
7	*Smooth surfaces:* Loss of outermost enamel in irregular areas involving < 1/2 of entire surface. *Occlusal surfaces:* Changes in the morphology caused by merging pits and marked attrition.
8	*Smooth and occlusal surfaces:* Loss of outermost enamel involving > 1/2 of surface.
9	*Smooth and occlusal surfaces:* Loss of main part of enamel with change in anatomic appearance of surface. Cervical rim of almost unafffected enamel is often noted.

Tooth Surface Index of Fluorosis (TSIF)

This index was developed in 1984 by Horowitz HS, Driscoll WS, Meyers RJ and used by researcher in the National Institute of Dental Research. It is probably more sensitive than Dean's index specially for the mildest forms of fluorosis. Each tooth surface is seen and scored on a 0-7 scale, whereas Dean's index applies only to two worst teeth in the mouth.

Selection of Teeth

All the teeth are assessed.

Surface

Anterior teeth: Separate score is given for every intact labial or lingual surface of anterior teeth.
Posterior teeth: Every buccal, occlusal and lingual surface are given a separate score.

Scoring Criteria

Clinical Criteria and Scoring System for the Tooth Surface Index of Fluorosis

Score	Criteria
0	Enamel shows no evidence of fluorosis.
1	Enamel shows definite evidence of fluorosis, namely areas with parchment-white color that total less than 1/3rd of the visible enamel surface. This category includes fluorosis confined only to incisal edges of anterior teeth and cusp tips of posterior teeth ("snow capping").
2	*Parchment*-white fluorosis totals at least 1/3rd of the visible surface but less than 2/3rd.
3	*Parchment*- white fluorosis totals at least 2/3rd of the visible surface.
4	Enamel shows staining in conjunction with any of the preceding levels of fluorosis. Staining is defined as an area of definite discoloration that may range from light to very dark brown.
5	Discrete pitting of enamel exists, unaccompanied by evidence of staining of intact enamel. A pit is defined as a definite physical defect in the enamel surface with a rough floor that is surrounded by a wall of intact enamel. The pitted area is usually stained or differs in color from the surrounding enamel.
6	Both discrete pitting and staining of the intact enamel exists.
7	Confluent pitting of the enamel surface exists. Large areas of enamel may be missing and the anatomy of the tooth may be altered. Dark-brown stain is usually present.

INDICES USED IN ASSESSING MALOCCLUSION

The Index of Orthodontic Treatment Need (IOTN)

This index was put forward by Peter H. Brook and William C. Shaw in 1989.

Overview

The Index of Orthodontic Treatment Need (IOTN) was developed as a means to objectively measure a person's need for orthodontic treatment.

Components

- Dental health: 5 grades from none to very great
- Aesthetics: attractiveness of the patient's labial aspect ranked from 1 (close to normal) to 10.

Dental Health Component Grade 1: None

- Extremely minor malocclusions including displacements < 1 mm.

Dental Health Component Grade 2: Little

- Increased overjet 3.6 to 6.0 mm, with competent lips
- Reverse overjet 0.1 to 1.0 mm
- Anterior to posterior cross bite with up to 1 mm discrepancy between retruded contact position and intercuspal position
- Displacement of teeth 1.1 to 2.0 mm
- Anterior or posterior openbite 1.1 to 2.0 mm
- Increased overbite ³ 3.5 mm, without gingival contact
- Prenormal or postnormal occlusions with no other anomalies. Includes up to half a unit discrepancy.

Dental Health Component Grade 3: Moderate

- Increased overjet 3.6 to 6.0 mm, with incompetent lips
- Reverse overjet 1.1 to 3.5 mm
- Anterior or posterior cross bites with 1.1 to 2.0 mm discrepancy.
- Displacement of teeth 2.1 to 4.0 mm

- Lateral or anterior cross bite 2.1 to 4.0 mm
- Increased and complete overbite without gingival trauma.

Dental Health Component Grade 4: Great

- Increased overjet 6.1 to 9.0 mm
- Reversed overjet > 3.5 mm with no masticatory or speech difficulties
- Anterior or posterior cross bites with > 2 mm discrepancy between retruded contact position and intercuspal position
- Severe displacement of teeth, > 4 mm
- Extreme lateral or anterior openbites, > 4 mm
- Increased and complete overbite with gingival or palatal trauma
- Less extensive hypodontia requiring prerestorative orthodontic space closure to obviate the need for a prosthesis
- Posterior lingual crossbite with no functional occlusal contact in one or both buccal segments
- Reverse overjet 1.1 to 3.5 mm with recorded masticatory and speech difficulties
- Partially erupted teet, tipped and impacted against adjacent teeth
- Supplemental teeth.

Dental Health Component Grade 5: Very Great

- Increased overjet > 9 mm
- Extensive hypodontia with restorative implications (more than 1 tooth missing in any quadrant) requiring prerestorative orthodontics
- Impeded eruptions of teeth (with the exception of the third molars) due to crowding, displacement, the presence of supernumerary teeth, retained deciduous teeth, and any pathological cause
- Reverse overjet > 3.5 mm with reported masticatory and speech difficulties
- Defects of cleft lip and palate
- Submerged deciduous teeth.

Aesthetic Component

- A patient's score is based on matching his or her dental appearance with one of a series of 10 photographs showing the labial aspect of different Class I or Class II malocclusions ranked according to their attractiveness.

The Dental Aesthetic Index (DAI)

The Dental Aesthetic Index (DAI) is an orthodontic index which incorporates socially defined aesthetic standards. This index was given by the WHO in 1997. This index is recommended for use in age groups where, there are no longer primary teeth, i.e. 12 year onwards. In addition, it provides a severity measure for psychologic and functional impairment. It consists of 10 components multiplied by weights based on regression coefficients, plus a constant.

Component	Finding	Weight
Constant		**13**
Missing teeth	Number of missing incisor, canine and premolar teeth	6
Crowding in incisal segments	Number of segments crowded	1
Spacing in incisal segments	Number of segments spaced	1
Diastema	In millimeters	3
Anterior irregularity in maxilla	Largest irregularity in mm	1
Anterior irregularity in mandible	Largest irregularity in mm	1
Anterior maxillary overjet	In millimeters	2
Anterior mandibular overjet	In millimeters	4
Vertical anterior openbite	In millimeters	4
Anteroposterior molar relation	Largest deviation from normal 0.5 cusp=1 >=1 cusp=2	3

Where:

Diastema = the space between 2 adjacent teeth on the same dental arch

DAI score = SUM((finding) * (weight))

Interpretation

Minimum score: 13

Further the score falls from the norm of most acceptable dental appearance, the more the occlusal condition may be judged socially or physically handicapping if left untreated.

INDICES USED IN ASSESSING TOOTH WEAR

Eccles Index for Dental Erosion of Nonindustrial Origin

Eccles in 1979 originally classified lesions broadly as early, small and advanced, with no strict criteria definitions, thus allowing wide interpretation.

Classification of Dental Erosion

Class I	Superficial lesions-involving enamel only
Class II	Localized lesions-involving dentin for less than one-third of the surface
Class III	Generalized lesions-involving dentin for more than one-third of the surface
	a. Facial surfaces
	b. Lingual and palatal surfaces
	c. Incisal and occlusal surfaces
	d. Severe multisurface involvement

Later, the index was refined and expanded, with greater emphasis on the descriptive criteria. It was presented as a comprehensive qualitative index, grading both severity and site of erosion due to nonindustrial causes, and is considered as one of the cardinalindices from which others have evolved. In essence, it breaks down into three classes of erosion, denoting the type of lesion, assigned to four surfaces, representing the surface where erosion was detected.

Eccles Index for Dental Erosion of Nonindustrial Origin

Class	Surface	Criteria
Class I		Early stages of erosion, absence of developmental ridges, smooth, glazed surface occurring mainly on labial surfaces of maxillary incisors and canines
Class II	Facial	Dentine involved for less than one-third surface; two typesType 1 (commonest): ovoid–crescentic in outline, concave in cross-section at cervical region of surface. Must differentiate from wedge shaped abrasion lesionsType 2: irregular lesion entirely within crown. Punched out appearance, where enamel is absent from floor

Contd...

Contd...

Class	Surface	Criteria
Class IIIa	Facial	More extensive destruction of dentine, affecting anterior teeth particularly. Majority of lesions affect a largepart of the surface, but some are localized and hollowed out
Class IIIb	Lingual or palatal	Dentine eroded for more than one-third of the surface area. Gingival and proximal enamel margins have white, etched appearance. Incisal edges translucent due to loss of dentine. Dentine is smooth and anteriorly is flat or hollowed out, often extending into secondary dentine
Class IIIc	Incisal or occlusal	Surfaces involved into dentine, appearing flattened or with cupping. Incisal edges appear translucent due toundermined enamel; restorations are raised above surrounding tooth surface
Class IIId	All	Severely affected teeth, where both labial and lingual surfaces are extensively involved. Proximal surfaces may be affected; teeth are shortened

Tooth Wear Index (TWI)

Smith and Knight in 1984 took Eccles' ideas a stage further, producing the tooth wear index (TWI), a comprehensive system whereby all four visible surfaces (buccal, cervical, lingual and occlusal-incisal) of all teeth present are scored for wear, irrespective of how it occurred.

Smith and Knight Tooth Wear Index

Score	Surface	Criteria
0	B/L/O/I/C	No loss of enamel surface characteristics No loss of contour
1	B/L/O/I/C	Loss of enamel surface characteristics. Minimal loss of contour
2	B/L/O/I/C	Loss of enamel exposing dentine for less than one third of surface. Loss of enamel just exposing dentine. Defect less than 1 mm deep
3	B/L/O/I/C	Loss of enamel exposing dentine for morethan one third of surfaceLoss of enamel and substantial loss of dentine. Defect less than 1–2 mm deep
4	B/L/O/I/C	Complete enamel loss–pulp exposure–secondary dentine exposure Pulp exposure or exposure of secondary dentine. Defect more than 2 mm deep– pulp exposure– secondary dentine exposure

(B-Buccal; L-Lingual; O-Occlusal; I-Incisal; C-Cervical)

The Exact Tooth Wear Index

A modified tooth wear index was developed by J. Fares, S. Shirodaria, K. Chiu, N. Ahmad, M. Sherriff, D. Bartlett in 2009 according to the basic principles of the Smith and Knight Index.

The wear on teeth was graded separately for enamel and dentine using 5- and 6-point scales, respectively. Any surface change resulting from wear, irrespective of the aetiology, was scored on the cervical, buccal, occlusal/incisal and palatal/lingual surfaces of the upper first molar to the contralateral first molar in both arches. In cases of doubt the lower score was recorded.

A separate score was given to the area around the cervical margin and to the buccal/facial surface following the protocols defined by Smith and Knight. In brief, the area around the enamel/cemental junction or the zone just above the gingival margin, if this was not visible, was considered as the cervical area. Any part of the tooth coronal to this area was considered to be on the facial/buccal surface. Restorations covering more than 25 percent of any tooth surface (cervical, buccal, occlusal/incisal and palatal/lingual surfaces) and missing teeth were recorded separately.

The Exact Tooth Wear Index

Exact Tooth Wear Index for Enamel	
0	No tooth wear: no loss of enamel characteristics or change in contour
1	Loss of enamel affecting less than 10 percent of the scored surface
2	Enamel loss affecting between 10 percent and one third of the scored surface
3	Enamel loss affecting at least one-third but less than two-thirds of the scored surface
4	Enamel loss affecting two-thirds or more of the scored surface
Exact Tooth Wear Index for Dentine	
0	No dentinal tooth wear: no loss of dentine
1	Loss of dentine affecting less than 10 percent of the scored surface
2	Dentine loss affecting between 10 percent and one third of the scored surface
3	Dentine loss affecting at least one-third but less than two-thirds of the scored surface
4	Dentine loss affecting two-thirds or more of the scored surface, no pulpal exposure
5	Exposure of secondary dentine formation or pulpal exposure

Appendices

Appendix 1: Case History

History Taking

- Demographic details
- Chief complaint
- History of present illness
- Medical history
- Past dental history
- Family history
- Personal history

Clinical Examination

- General examination
- Local examination
  - Extraoral
  - Intraoral: soft tissue, hard tissue
- Making a provisional diagnosis
- Appropriate investigations
- Final diagnosis

Treatment Planning

- Comprehensive treatment plan
  - Emergency phase
  - Preventive phase
  - Promotive phase
  - Curative phase
  - Rehabilitation phase
  - Maintenance phase
- Community treatment plan

Appendix 2: Case History Proforma

Date: _____ OPD No. _____ Student's Name: _____

Patient's Name: _____ Age/Sex: _____

Date and Place of Birth: _____

Education: _____ Occupation: _____

Total Income of Family per Month: _____

Address: _____

_____ Contact No: _____

   I. Chief Complaint:

  II. History of Present Illness:

  III. Medical History:

     Diabetes:

     Hypertension:

     Blood Dyscrasias:

     Hospitalizations:

     Blood Transfusions:

     Medications:

     Asthma:

Drug Allergies:

Others:

IV. Dental History:

V. Family History:

    a. Siblings: Number _____ Age _____

    Does any member in your family suffer from similar problem? ☐

    Do you know of any illness that runs in your family? ☐

    b. Marital Status: Married   ☐

                           Unmarried ☐

    c. Children (if any)   Number   ☐   Age: _____

VI. Personal History:

    a. Personal Habits: Number   Frequency   Duration

      1. Smoking:

      2. Smokeless Tobacco:
        (with/without Pan Chewing)

      3. Pan Chewing:

      4. Alcoholism:

    b. Habits related to Oral Cavity:

Mouth Breathing	Thumb Sucking	Tongue Thrusting	Bruxism	Lip/Nail/Pencil Biting
☐	☐	☐	☐	☐

Duration: _____

c. Oral Hygiene Practices:

1. Type of Cleaning:

Toothbrush ☐   Finger ☐

Stick ☐   Any Other (specify) ☐

2. Method of Cleaning:

Vertical ☐   Horizontal ☐   Circular ☐

3. Materials Used:

Toothpaste ☐   Tooth Powder ☐   Charcoal ☐

Others ☐

4. Frequency of Cleaning:

Once ☐   Twice ☐   Thrice ☐

5. Time of Brushing:

Before Meals ☐   After Meals ☐

6. Frequency of changing the Toothbrush: _____
_____

7. Use of other Oral Hygiene Aids:

Flossing ☐   Other Interdental Aids ☐

Oral Mouth Rinse ☐

d. Dietary Habits:

1. Vegetarian ☐   Mixed ☐

2. Dietary Chart: (Staple Diet)

Time	Item	Sugar Exposure
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

3. Sugar Consumption (per day):

- Type:

    Fermentable ☐   Less Fermentable ☐

- Frequency:

    Once ☐   Twice ☐   Thrice ☐

    Please Specify If More: _____

- Time of Intake: With Meals Without Meals

- Form and Consistency:

    Solid ☐   Liquid ☐

    Sticky ☐   Non sticky ☐

VII. General Examination:

Gait: _____   Pallor: _____

Posture: _____   Cyanosis: _____

Built: _____   Edema: _____

Blood Pressure: _____   Icterus: _____

Pulse: _____   Height: _____

Temperature: _____   Weight: _____

Respiratory Rate: _____   BMI: _____

VIII. Local Examination:

A. Extraoral:

Symmetry: _____

T.M.J: _____

Lymph Nodes: _____

B. Intraoral:

1. Soft Tissue:_____

    - Tongue _____

    - Buccal Mucosa _____

    - Labial Mucosa _____

- Gingiva: _____

  Color _____

  Contour _____

  Consistency _____

  Size _____

  Shape _____

  Texture _____

  Position _____

  Bleeding on Probing _____

- Palate _____

- Floor of Mouth _____

- Alveolar Mucosa _____

2. Hard Tissue:

   Dentition: Deciduous ☐ Mixed ☐ Permanent ☐

   Number of Teeth Present:

   Teeth Absent and Reason for Loss:

   Root Stumps:

   Dental Caries:

      Noncavitated:

      Cavitated:

   Filled Teeth:

   Any Prosthesis: (Mention Tooth)

      Crown

      Bridge

      RPD/Implant

   Wasting Disease: Generalized   Localized (mention tooth)

      Attrition:

      Abrasion:

      Erosion:

Enamel Hypoplasia:

Generalized ☐ Localized (Mention Tooth) ☐

Fluorosis:

Generalized ☐ Localized (Mention Tooth) ☐

Supernumerary Teeth:

Any Other Anomaly Please Specify:

Malocclusion:

Trauma from Occlusion:

Fractured/Nonvital Tooth:

Stains: Extrinsic ☐ Intrinsic ☐

3. Periodontal Status:

	Generalized	Localized (Mention Tooth)
Gingivitis		
Periodontal Pocket		
Mobility of Teeth		
Gingival Recession		

4. Oral Hygiene Status:

Dental Deposits:

Plaque ☐ Stains ☐ Calculus ☐

Good ☐ Fair ☐ Poor ☐

Halitosis :

IX. Provisional Diagnosis:

_____

_____

_____

_____

X. Investigation:

_____

_____

_____

XI. Diagnosis:

_____

_____

_____

_____

_____

XII. Treatment Plan:

1. Emergency Phase

_____

_____

_____

2. Preventive Phase

_____

_____

_____

_____

3. Promotive Phase

_____

_____

_____

_____

4. Curative or Therapeutic Phase

_____

_____

_____

_____

_____

5. Rehabilitation

_____

_____

_____

_____

6. Maintenance Phase

   a. Recall

     _____

     _____

   b. Review

     _____

     _____

   c. Reassessment

     _____

     _____

XIII. Community Treatment Plan:

_____

_____

_____

_____

_____

_____

_____

_____

Teacher's Signature

Appendix 3: Oral Hygiene Index (OHI)

Described by John C. Greene and Jack R. Vermillion in 1960

Name _____   Date__/__/____

Age/Sex _____   Case No. _____

Income -   Brushing -

Education -   Agent -
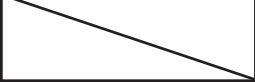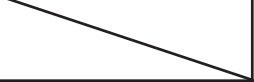
Occupation -   Frequency -

Diet -   Sugar exposure -
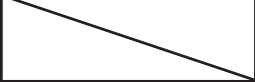
DEBRIS INDEX (DI)

Right	Anterior	Left

$$DI = \frac{\text{(Total of upper and lower buccal scores)} + \text{(Total of upper and lower lingual scores)}}{\text{(The no. of segments scored)}}$$

DI =

CALCULUS INDEX (CI)

Right	Anterior	Left

$$CI = \frac{\text{(Total of upper and lower buccal scores)} + \text{Total of upper and lower lingual scores)}}{\text{(The no. of segments scored)}}$$

CI =

OHI= DI + CI =

_____

Staff Signature

Oral Hygiene Index-Simplified (OHI-S)

Described by John C. Greene and Jack R. Vermillion in 1964

Name _____   Date__/__/____

Age/Sex _____   Case No. _____

Income -   Brushing -

Education -   Agent -

Occupation -   Frequency -

Diet -   Sugar exposure -

DEBRIS INDEX–SIMPLIFIED (DI-S)

16	11	26
46	31	36

DI-S = Total score/no. of surfaces scored

   =   Interpretation = _____

CALCULUS INDEX–SIMPLIFIED (CI-S)

16	11	26
46	31	36

CI-S = Total score/no. of surfaces scored

   =   Interpretation = _____

OHI-S = DI-S + CI-S

   =   Interpretation = _____

                                    _____

                                    Staff Signature

Decayed-Missing-Filled Teeth Index (DMFT and deft)

Described by Henry T. Klein, Carrole E. Palmer and Knutson J W in 1938

Name _____   Date__/__/____

Age/Sex _____   Case No. _____

Income -   Brushing -

Education -   Agent -

Occupation -   Frequency -

Diet -   Sugar exposure -

55 54 53 52 51 61 62 63 64 65

18 17 16 15 14 13 12 11 21 22 23 24 25 26 27 28

48 47 46 45 44 43 42 41 31 32 33 34 35 36 37 38

85 84 83 82 81 71 72 73 74 75

D =   d =

M =   e =

F =   f =

DMF-T = D + M + F =   **def-t = d + e + f =**

_____

Staff Signature

Decayed-Missing-Filled Tooth Surfaces Index (DMFS and defs)

Described by Henry T. Klein, Carrole E. Palmer and Knutson J W in 1938

Name _____   Date__/__/____

Age/Sex _____   Case No. _____

Income -   Brushing -

Education -   Agent -

Occupation -   Frequency -

Diet -   Sugar exposure -

55 54 53 52 51 61 62 63 64 65

18 17 16 15 14 13 12 11 21 22 23 24 25 26 27 28

48 47 46 45 44 43 42 41 31 32 33 34 35 36 37 38

85 84 83 82 81 71 72 73 74 75

D-S =   d-s =

M-S =   e-s =
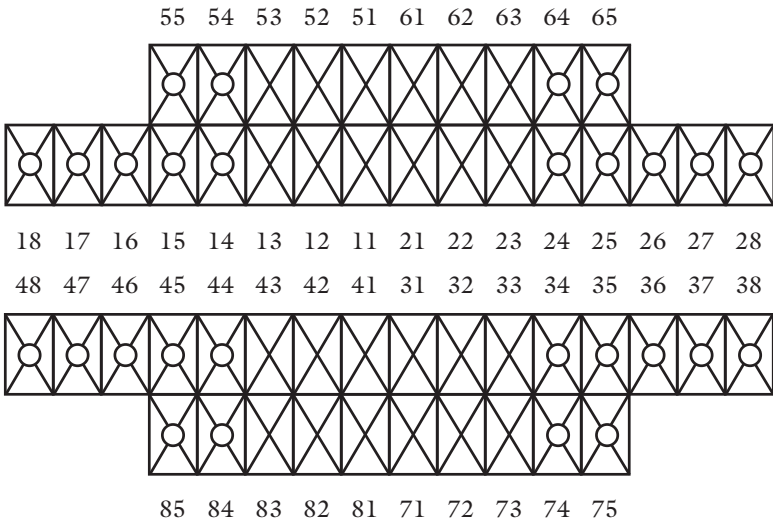
F-S =   f-s =

DMF-S = D-S + M-S + F-S =   **def-s = d-s + e-s + f-s =**

_____

Staff Signature

Community Periodontal Index (CPI)

Described by WHO/FDI in 1982

Name _____   Date__/__/____

Age/Sex _____   Case No. _____

Income -   Brushing -

Education -   Agent -

Occupation -   Frequency -

Periodontal Status

17/16	11	26/27
47/46	31	36/37

Loss of Attachment

17/16	11	26/27
47/46	31	36/37

_____

Staff Signature

Periodontal Index (PI)

Described by Rusell AL in 1956

Name _____   Date__/__/____

Age/Sex _____   Case No. _____

Income -   Brushing -

Education -   Agent -

Occupation -   Frequency -

Diet -   Sugar exposure -

18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28
48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38

PI for an individual = $\dfrac{\text{Sum of score of all individual tooth examined}}{\text{No. of teeth examined}}$

Score: _____

Inference: _____

_____

Staff Signature

Gingival Index (GI)

Described by Loe H and Silness P in 1963

Name _____

Age/Sex _____

Socioeconomic status -

Agent -

Diet -

Date __/__/__

Case No. _____

Brushing - Brush/ Finger/ Neem/ Other

Frequeny -

Sugar exposure -

18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28
B															
P															
B															
L															
48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38

Calculations:

$$\text{GI for a tooth} = \frac{\text{Sum of score of four areas of tooth}}{4}$$

$$\text{GI for an individual} = \frac{\text{Sum of score of all the individual tooth examined}}{\text{No. of teeth examined}}$$

Score: _____

Interpretation:

0.1–1.0   Mild Gingivitis

1.1–2.0   Moderate Gingivitis

2.1–3.0   Severe Gingivitis

_____
Staff Signature

Plaque Index (PII)

Described by Silness P and Loe H in 1964

Name _____

Age/Sex _____

Socioeconomic status -

Agent -

Diet -

Date __/__/____

Case No. _____

Brushing - Brush/ Finger/ Neem/ Other

Frequeny -

Sugar exposure -

	18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28
B																
P																
B																
L																
	48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38

Calculations:

$$PII \text{ for a tooth} = \frac{\text{Sum of score of four areas of tooth}}{4}$$

$$PII \text{ for an individual} = \frac{\text{Sum of score of all the individual tooth examined}}{\text{No. of teeth examined}}$$

Score: _____

Interpretation:

0	Excellent
0.1–0.9	Good
1.0–1.9	Fair
2.0–3.0	Poor

_____
Staff Signature

Index

Page numbers followed by *f* refer to figure