Diagnostic and Futuristic Aspects of Oral Medicine and Radiology

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Cambridge
Scholars
Publishing

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This book first published 2024

Cambridge Scholars Publishing

Lady Stephenson Library, Newcastle upon Tyne, NE6 2PA, UK

British Library Cataloguing in Publication Data
A catalogue record for this book is available from the British Library

ISBN: 978-1-0364-1302-6
ISBN (Ebook): 978-1-0364-1303-3

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PREFACE

The textbook "**Diagnostic and Futuristic Aspects of Oral Medicine and Radiology**" is a clinical guide focusing on the core areas of oral medicine and oral radiology, clearly written in an understandable language with brevity. This book contains updated information on the subject in this rapidly changing world of science. The book is divided into three sections. Section One deals with oral medicine, Section Two with oral radiology, and Section Three with tools and scales for detection, assessment, and monitoring of oral lesions. The book begins with an introduction to oral medicine, followed by sections on oral examination, oral manifestations of systemic diseases, the role of the oral physician in oral and general wellbeing, salivary diagnostics, recent advances in diagnostic and management procedures, tools for detection and monitoring of oro-facial conditions, dento-maxillofacial imaging, and other relevant topics. This book has covered conventional chapters and newer advances in a comprehensive manner. There are several photographs, illustrations, tables, and radiographs in this book, and it will be beneficial for undergraduates, postgraduates, and general practitioners for regular reading, reference, and clinical applications.

Dr. Sujatha Reddy S

ACKNOWLEDGEMENTS

We are thankful to our Dean, the faculties of our department and infrastructure for the contribution to this edition. We thank all the contributors for allowing us to share their expertise and clinical experience.

A sincere thanks to all my colleagues and students for helping us in one way or the other and contributing towards the book.

Finally, we are also thankful to the publishers for their generous support, energy, and creativity in the presentation of the content of this book.

Dr. Sujatha Reddy S

SECTION – 1

CHAPTER 1

INTRODUCTION TO ORAL MEDICINE AND RADIOLOGY

Introduction

Although oral medicine and radiology are distinct specialties in many parts of the world, it is a combined specialty of dentistry in India [1]. Oral medicine is concerned with the clinical diagnosis and non-surgical management of pathologies affecting the orofacial region, particularly those of a systemic, multiorgan, or drug-induced nature. According to the **American Academy of Oral Medicine**, oral medicine is defined as the discipline of dentistry concerned with the oral health care of medically complex patients, including the diagnosis and management of medical conditions that affect the oral and maxillofacial region. The **British Society of Oral Medicine** has defined oral medicine as the specialty of dentistry concerned with the oral health of patients with chronic, recurrent, and medically related disorders of the oral and maxillofacial region and with their diagnosis and non-surgical management. In simpler terms, oral medicine is concerned with medical disorders at the interface of medicine and dentistry, and its activities influence on the clinical practice of every dental practitioner. It is an area of dentistry of fundamental importance to us as health care professionals. [1][2].

History

- As the mirror of the human body, the oral cavity is streamlined by oral medicine specialists. Oral medicine specialists play a major role in the early diagnosis and prevention of a variety of oral diseases. The history of oral medicine traces back to the 18th century. In the 1920s, Dr. William Geis of Columbia University helped the United States of America establish oral medicine as a separate area of study. Oral medicine is a recognized specialty and a distinct field of study in India, unlike in some countries [1]. Sir William Burkett was one of the first educators to promote the

concept of the integration of medicine into dental education and clinical practice [3]. Overall, India is noted to have the largest increase in the number of oral medicine services as defined by the increasing numbers of clinicians within the specialty in comparison with other countries.

In the year 1959, a 2-year master's degree in oral radiology was initiated by Bombay University [3]. In the year 1970, Bombay University changed the MDS course in dental radiology to the MDS course in oral medicine, diagnosis, and radiology. Oral medicine as a subject in the curriculum of the Bachelor of Dental Surgery in India was introduced around 37 years ago. The Government Dental College, Bangalore, was the first college in India to teach oral medicine with help from the World Health Organization (WHO). The Government Dental College, Bangalore, was also the first to introduce the master's in dental surgery (MDS), a 2-year course in oral medicine, diagnosis, and radiology (1970). Earlier, oral radiology, being a minor subject, used to be merged with subjects like periodontics, conservative dentistry, and surgery. In some institutions, it is termed "oral medicine and diagnosis". Oral medicine residency graduates receive clinical training in several medical specialties, which include hematology/oncology, otolaryngology/head and neck oncology, infectious diseases, dermatology, pain management, medical radiology, and forensic medicine. During the postings for each subdiscipline, residents partake in physical evaluation, diagnosis, and patient management [2][3][4].

The "Indian Academy of Oral Medicine" was founded in Bangalore on June 20, 1985, by Dr. BK Venkataraman and Dr. Ramachandra Reddy. During the Fifth National Conference held in Chennai, the academy was renamed the Indian Academy of Oral Medicine and Radiology. Presently, the academy has over 2500 life members. The academy publishes a peer-reviewed journal, '**Journal of the Indian Academy of Oral Medicine and Radiology' (JIAOMR),** every quarter. The journal is indexed in or included in the following databases: DOAJ, Emerging Sources Citation Index, Scimago Journal Ranking, SCOPUS, and Web of Science. JIAOMR publishes scientific content on all aspects of oral medicine, oral diagnosis, oral and maxillofacial radiology, and its allied subjects. The journal provides a platform to bring out research work and practice-oriented skills and provides the latest information on advancements in the field of oral medicine and oral and maxillofacial radiology worldwide [1][3][4].

CHAPTER 2

CURRENT SCENARIO IN ORAL MEDICINE

Oral medicine includes the diagnosis and management of complex diagnostic medical disorders affecting the mouth and jaw. Oral medicine is an area of dentistry that has been constantly changing over the years and has expanded in both scope and complexity. Over the last several years, oral health care has taken substantial strides and seen dramatic advancements. Owing to rapid advancements in both medicine and dentistry and to the rising percentage of senior citizens across the globe, adequate diagnosis and treatment of oral diseases will become even more complex in the future. The current decade has seen vast progress in the field of diagnostic oral medicine, which has progressed from the laboratory to the dental chairs in order to provide a high level of care, making an impact on clinical dental practice. Technical advances in biochemistry, immunology, histopathology, molecular biology, and optical physics have moved from laboratories into dental clinics, aimed at reducing the morbidity and mortality associated with oral diseases [4]. All these advances have combined to change the way diagnoses are arrived at or confirmed. Advances have been made to a greater degree in both academics and research, and as a result of the application of recent technical developments, it has made investigations possible that were previously not expected. Radiology has also contributed to recent advances in computerized health care management, as well as to the demand for cost-effective and rapid communication between the department of radiology and other dental specialties. But, with these recent technical innovations, the art of diagnosis has become much more of a science, and the attitude of clinicians has changed from clinic-centric to technical-centric.

Oral and maxillofacial radiology is the cornerstone of every emergency or comprehensive dental treatment. Oral and maxillofacial imaging includes cone beam computed tomography (CBCT), multi-slice medical computed tomography, ultrasonography (US), magnetic resonance imaging (MRI), positron emission tomography, nuclear medicine, panoramic radiography, cephalometric imaging, intra-oral imaging (e.g., bitewing, peri-apical, and

occlusal radiographs), in addition to special tests like sialography, etc. Oral and maxillofacial radiology reporting is gaining importance exponentially over time as it provides complete and exhaustive interpretations and diagnoses of all the aspects of the maxillofacial complex, which is an essential element in dental treatment planning.

Intraoral imaging provides the finest spatial resolution of any imaging method presently available. Likewise, panoramic radiography is also a commonly used two-dimensional technique that gives a wide view of both jaws. In response to the high demand for a technique that could provide three-dimensional data at a lower cost and with lower radiation doses than conventional computed tomography used in medical radiology, cone beam computed tomography (CBCT) was developed specifically for dento-maxillofacial imaging [5].

Oral Medicine: A Specialty Placed Between Medicine and Dentistry

Ever since the formation of the first dental college in 1840, dentistry has remained a distinct entity from medicine. This division has been propagated by diverse education, divergent practices, payment models, and health care policies. It is a discipline devoted to teaching, research, service, and patient care. Oral medicine, placed at the interface, is the only subject in dentistry bridging the gap between dentistry and general medicine. It is essential for us to address the gap between medicine and dentistry and promote the integration of medical and dental services. The interaction of oral and general health demonstrated in oral medicine disorders and therapy highlights that dentistry is not merely a technological and surgical vocation [1][5]. Oral health is a vital part of overall health. The mouth remains to be perceived as a distinct entity from the body by both the community and health care professionals alike. Poor oral health has an impact on an individual's general, social, psychological, and economic well-being. Several epidemiological studies have linked poor oral health with cardiovascular disease, poor glycaemia control in diabetics, low birth weight in preterm babies, and several other conditions, including rheumatoid arthritis and osteoporosis. Oral medicine specialists provide clinical care to patients with a wide variety of orofacial conditions, including oral mucosal diseases, orofacial pain syndromes, salivary gland disorders, and oral manifestations of systemic diseases like gastrointestinal, dermatological, autoimmune, immunodeficiency, neurological, psychiatric, and haematological diseases [6]. Oral infections have become a progressively

common risk factor for systemic disease, which clinicians should consider. Clinicians should increase their knowledge of oral diseases, and dentists must strengthen their understanding of general medicine to avoid unnecessary risks of infections that originate in the mouth [7].

Another aspect of this field is managing the dental and oral conditions of medically compromised patients, such as cancer patients suffering from related oral mucositis, bisphosphonate-related osteonecrosis of the jaws, or oral lesions related to radiation therapy. Additionally, it is involved in the diagnosis and management of salivary gland disorders and dry mouth conditions (such as Sjogren's syndrome), taste disorders, and non-dental chronic orofacial pain, such as burning mouth syndrome, trigeminal neuralgia, and temporomandibular joint disorders. Tobacco cessation services, oral cancer screening, and the management of potentially malignant disorders are also some of the areas of this field. Early detection of cancer is of critical importance because survival rates markedly improve when the oral lesion is identified at an early stage. Oral cancer screening and management of diseases using intralesional steroids are also some of the areas of this field.

Oral and maxillofacial radiology is an integral part of the field that deals with radiographic imaging, interpretation, and diagnosing diseases of the head and neck region. Oral radiology is concerned with the performance and interpretation of diagnostic imaging used for examining the craniofacial region, dental structures, and adjacent structures. Oral and maxillofacial imaging includes intra-oral imaging (e.g., bitewing, peri-apical, and occlusal radiographs), panoramic radiography, cephalometric imaging, and cone-beam computed tomography (CBCT), in addition to special tests like sialography, etc. For studying the salivary glands. Oral and maxillofacial radiology also includes the interpretation of multi-slice computed tomography (CT), magnetic resonance imaging (MRI), positron emission tomography (PET), and ultrasound imaging of the head and neck region [6]. Over the years, maxillofacial radiology has seen a boom with the advent of new technologies, particularly cone-beam computed tomography.

CHAPTER 3

FUTURE ASPECTS OF ORAL MEDICINE AND RADIOLOGY

Oral medicine is an area of dentistry that is constantly changing. Over the past several years, oral medicine has expanded in both scope and complexity. There have been strategic clinical, educational, and research advances in the field of oral medicine over the past few decades. Changing demographics and changes in medical management have altered the population's dental care needs. Consequently, there is a demand for improved knowledge and awareness in the diagnosis and medical management of the oral mucosal disease. This is due to the need for oral manifestations of systemic disease, oral complications of chemotherapy, saliva production, salivary gland disorders, and diagnosis and management of orofacial pain. The oral health professional must be aware of the patient's medical conditions, medications, and the impact of oral health and dental care on the patient's overall health. There is a greater need for the integration of dentistry and medicine and an increased need for undergraduate and postgraduate training to manage the oral and maxillofacial health care needs of medically, physically, and behaviorally compromised patients and to prevent, diagnose, and treat common and unusual oral-medical diseases [8].

This decade has witnessed vast advances in diagnostic oral medicine, which have progressed from the laboratory to the chairside. Technical advances in biochemistry, immunology, histopathology, molecular biology, and optical physics have moved from research laboratories to dental clinics. They have revolutionized the way a diagnosis is arrived at or confirmed. There is a need for point-of-care testing to produce results rapidly so that apt treatment can be executed, leading to an improved clinical or economic outcome. Although point-of-care testing is more expensive than laboratory testing, it produces wider economic benefits as it reduces hospital stays, improves adherence to treatment, and reduces complications [9].

Though oral health is considered an integral part of general health, oral treatment occurs in a separate domain from medical care. An integrated electronic health record between oral health and general health is essential for providing affordable and accessible health care for all. For complex medical and dental conditions, an interdisciplinary approach between dental and medical practice integrating the knowledge, skills, and experience of all the disciplines of dentistry, medicine, and its associated fields into comprehensive treatment has become essential to maximize results. Such care should be provided on a case-by-case and personalized basis, as well as by a dental professional with an adequate background in medicine [10]. Oral medicine training in emerging areas like oral regenerative medicine, 3D printing of oral tissues, stem cell-based tissue regeneration, oral diagnostics, immunotherapy, etc. has a wide scope. These developing fields require far more medical knowledge than what dental curricula can accommodate in their current configuration.

The impact of oral health and its comorbidities on a patient's overall well-being must be comprehensively understood by health care providers [11]. Robust research is still needed in many areas of oral medicine, including potentially malignant disorders, dermatologic diseases of the oral cavity, and orofacial pain. Despite this, oral medicine specialists have made distinguished contributions to current scientific research concerning oral health. Significant clinical research achievements in the field of oral medicine will be more feasible when the specialty is integrated within health care systems, where interprofessional patient care occurs. Many parts of the world are now home to accredited oral medicine training programs, featuring established goals for the field, core competencies, and experienced practitioners [11].

Maxillofacial Radiology has contributed in a big way towards computerized management in the health service and has responded to the demand for cost-efficient and rapid communication between the department of radiology and other dental specialties. However, with these recent technical innovations, the art of diagnosis has become much more of a science and the attitude of clinicians has changed from clinic-centric to technocentric. Advances in diagnostic oral medicine are aimed at reducing the morbidity and mortality associated with oral diseases.

Oral Radiology

Most of the national and international guidelines regarding radiation protection have not been updated for more than two decades. The update

is needed for newer technologies such as Cone Beam Computed Tomography (CBCT) and digital imaging. Diagnostic Reference Levels (DRLs), a well-established method of dose optimization, are not yet defined for CBCT and have to be set for a variety of clinical indications. Dental radiology utilizes X-ray technology to diagnose and treat various clinical problems related to the oral cavity and surrounding tissues. As technology quickly evolves, there are numerous X-ray modalities using various tools in the attempt to precisely image and effectively treat these diseases.

i. Digital Registry for Recording Radiographic Features of Various Lesions

A digital registry needs to be developed for recording the radiological features of various diseases both in 2D and 3D formats. Diseases should be classified based on radiological appearance, borders, location, surrounding area, and content, which are supplemented by descriptive analysis of lesions in terms of digitally calculated texture, homogeneity, etc. Hence there is a need to decide on a common format for reporting features of various diseases after performing standardized diagnostic methods.

ii. Indigenous Software for Image Management

Dental professionals cannot view and use complex 3D images using manufacturer-based software, as it is expensive and technique-sensitive. There is a need for the development of indigenous software which is cost-effective and applicable to general dentistry [12].

iii. Artificial Intelligence (AI) and Machine Learning (ML)

Artificial intelligence (AI) encompasses a broad spectrum of emerging technologies that continue to influence daily life. AI in dentistry is a growing topic, as it assists clinicians in providing high-quality patient care, and simplifies complicated protocols by providing a predictable outcome. Its applications evolve rapidly day by day. Future AI-based comprehensive care systems will enable high-quality patient care and innovative research and development, facilitating advanced decision support. AI has been used to improve image interpretation in dental radiology. One limitation of this is that direct interpretation will not be provided by AI; a misinterpretation might occur due to the misconduct of the algorithms. In using artificial intelligence, the results might be reflected subjectively using associations, not causality. AI programs still need to be developed in collaborations that

involve experienced clinicians and expert computer engineers to minimize the potential risks of AI [12][13].

Scope of Oral Medicine and Radiology Specialist

The study of oral medicine and radiology covers such areas as oral mucosal lesions, tumours, the manifestations of systemic diseases, radiographic imaging principles and techniques and their interpretation, palliative care, and treatment modalities. The majority of oral medicine specialists work in clinical settings, such as hospitals, dental clinics, and diagnostic centres. In addition, they work in primary health centres or in dental colleges as academicians and researchers. Another viable alternative is the job of a dentist in the armed forces. One of the most common oral diseases in India is oral cancer, oral submucous fibrosis, and leukoplakia. Oral medicine specialists play a prominent role in managing medically compromised patients and alleviating their suffering. We as oral physicians can address this alarming situation of oral health in our country. Since OMDR specialty is concerned with oral and medical-related disorders, including orofacial manifestations of systemic diseases, including gastrointestinal, dermatological, rheumatological and haematological diseases, autoimmune and immunodeficiency disorders, and the manifestations of neurological or psychiatric disease it allows the clinician for comprehensive assessment, diagnosis, and non-surgical management of varied and challenging cases while also providing opportunities as an educator or a researcher [14][15].

Postgraduates are trained in maxillofacial magnetic resonance imaging, positron emission tomography, computed tomography, ultrasound usage, and interpretation. The oral medicine specialty has now gained deep insights into various specialized categories such as orofacial pain, temporomandibular disorders, sleep medicine, diagnostic radiology, forensic odontology, maxillofacial oncology, etc., with a primary goal of providing a better quality of treatment to patients. With the advent of modern clinical research in oral medicine and advancements in the field of radiological diagnostics, it has heralded a new era in dentistry, thereby widening its horizons and empowering an OMDR specialist.

CHAPTER 4

ROLE OF ORAL PHYSICIAN IN GENERAL AND ORAL WELL-BEING

Role of Oral Physician

As the complexity of oral medicine increases, the training of oral medicine specialists is becoming more critical. An oral medicine specialist is trained to diagnose and manage patients with disorders of the orofacial region. He/she essentially is a "physician of the mouth." As primary health care providers/ general physicians, oral medicine specialists are often the first to evaluate patients with orofacial symptoms and make diagnoses related to oral health, whether explicit or manifested through systemic diseases. An oral medicine professional receives additional specialized training and is experienced in the diagnosis and management of oral mucosal abnormalities (growths, ulcers, infection, allergies, immune-mediated and autoimmune disorders, cancers), salivary gland disorders, temporomandibular disorders (e.g.: problems with the Temporo-Mandibular Joint(TMJ) and orofacial pain (due to musculoskeletal or neurologic conditions), taste and smell disorders; and recognition of the oral manifestations of systemic and infectious diseases. The clinical skills and diagnostic methodologies practiced by an oral physician will necessarily be used by all dentists in the future.

The oral cavity plays a critical role in various physiologic processes, such as digestion, respiration, and speech. It is also unique for the presence of teeth and mucosa. The mouth can be subject to change or damage because of disease that predominantly affects other body systems which can vary in both frequency and presentation [16]. Oral involvement may be the first, only or most severe feature of systemic disease; or the principle focus of therapy; and/or the dominant cause of lessening the affected person's quality of life. The oral features that a health care provider may witness are often reliant on the nature of clinical practice. The oral manifestations of systemic diseases are likely to be attended to by oral medicine services. Oral manifestations of systemic disease are common. Systemic disease is

sometimes already known at the time of consultation. However, in some cases the diagnosis is made after investigation as a result of the presence of oral lesions. The development of oral lesions in systemic diseases may also reflect the progression of the disease. For example, oral candidiasis in HIV infection, oral ulceration and lip swelling in Crohn's disease, or development of lymphomas in the parotid gland in patients with Sjogren's syndrome. Maturity onset diabetes is frequently diagnosed in oral medicine clinics when patients are investigated for persistent candidiasis or multiple periodontal abscesses Similarly haematological abnormalities are also often revealed because of the presence of oral manifestations. Dermatologists play a crucial role in oral medicine clinics as they manage patients with oral and skin lesions. The oral immunologist investigates those aspects of oral diseases that relate to immunology [16][17]. Therefore, oral medicine specialists have an essential role in the management of patients who may have oral consequences of systemic disease. This is because they are likely to be the first to observe such abnormalities.

Oral medicine clinics play a vital role in the early detection and monitoring of oral potentially malignant disorders and oral cancers. Since oral medicine specialists are the first to notice any tobacco-induced changes in the oral cavity, they can play a chief role in its prevention and intervention. Tobacco cessation clinics are usually positioned in the department of oral medicine across India. They can provide tailor-made specific cessation programs for every individual to improve the tobacco quitting rate and prevent relapse. Integrated care is provided in association with oral and maxillofacial surgeons, dermatologists, psychiatrists, pain specialists and oncologists. Oral physicians also refer, among others, to gastroenterologists, haematologists, neurologists, neurosurgeons and endocrinologists. Although they may not know the exact nature of the disease, timely referral of patients to the appropriate specialist will allow these patients to be treated appropriately, thereby improving the quality of life of the patient.

Oral health, for general health and well being

Oral health is a window into one's overall health. Poor oral health is characterized by caries, poor oral hygiene, edentulism, dry mouth and impaired taste. This is seen in the elderly, limiting their food choices and diminishing the pleasure of eating. This impacts the quality of their lives. For example, many chronic conditions and the use of medications among

the elderly increase the likelihood of dry mouth. Frequently used drugs that can induce dry mouth include tricyclic antidepressants, antipsychotics, atropines, β-blockers, and antihistamines. In addition to affecting the patient's health, a loss of taste can cause poor appetite, weight loss, and undernutrition due to the depletion of proteins and essential nutrients. Partial or complete tooth loss impairs chewing ability, causing the individual to indulge in easier-to-chew food items. Thus, a nutrient rich diet high in carotenes, vitamins C, B-complex, and fibres is replaced with cholesterol and fats which may be associated with both weight loss and obesity. Furthermore, pain from untreated oral diseases can restrict regular day-to-day activities, disrupt sleep and profoundly impact the quality of life. Further, failure to prevent or control the progression of oral disease may raise the risk of adverse health outcomes [18].

A recent Cochrane systematic review revealed evidence that the treatment of periodontal disease improved metabolic control among persons with type 2 diabetes. Another recent study found that invasive dental procedures like periodontal therapy and tooth extraction are likely avoidable with early diagnosis, treatment and prevention. Various studies have validated a similar association between oral hygiene and positive health outcomes. Two systematic reviews have shown that proper oral hygiene practices can prevent respiratory infections and death from pneumonia among the hospitalized elderly. Another recent study found that frequent tooth brushing was associated with lower levels of cardiovascular disease [19][20].

Extensive tooth loss can affect the physical appearance and speech which in turn limits social interaction and inhibits intimacy due to low self-esteem. Poor oral health is largely preventable. Hence maintaining proper oral hygiene and oral health among the elderly should get high priority to prevent nutritional deficiencies and improve patients' general health and quality of life. Further, healthy oral conditions contribute to better taste perception, stimulate appetite and enhance caloric intake. Hence, maintaining oral health is essential for living a healthy life.

CHAPTER 5

INTRAORAL AND EXTRAORAL EXAMINATION

General Examination

A thorough examination includes observing the patient's general appearance. The examination starts as soon as the patient enters the dental office. The patient's general appearance may give clues to the underlying medical condition. As the patient enters the room and during history taking, observe the patient's general appearance, symmetry, gait, and mobility. During the history-taking, observe for any facial asymmetries, lesions, or scars. A detailed medical history, drug history, and personal history are vital for diagnosis and management. If the patient has decreased mobility of the head and neck, this should be noted, as it may affect the patient's ability to tolerate dental procedures.

Extra oral Head and Neck Examination

a. Asymmetries

Asymmetries of the head and neck are assessed by standing straight in front of the patient. It may be challenging to observe with the patient sitting in the dental chair, so the patient may have to sit on the side of the chair. Compare one side of the head and neck to the other. Most individuals are not totally symmetrical, but significant asymmetries should be noted, and the reason should be sought from the patient if known. Examples of asymmetries are previous surgeries, nerve paralysis from a CVA or stroke, tumours, and infections. Details of the asymmetries should be noted in the chart, for example, "3-cm scar in left submandibular area from submandibular gland stone removal in 2001" [21].

b. Skin

- Appearance: changes in appearance, rashes, sores, lumps, or itching are looked for, and the history of sun exposure is questioned.
- Colour: it is seen for anaemia and jaundice.

- Generalized pallor: it is seen in severe anaemia. Pallor can be seen in hypopituitarism, shock, syncope, left heart failure, and Raynaud's disease.
- Lemon yellow tint: a pale
- A lemon-yellow tint in haemolytic jaundice and a dark yellow or orange tint in obstructive jaundice are seen.
- Yellowness of skin: yellowness of skin is seen in carotenemia.

c. Jaws

- **Normal landmarks:** Normal anatomic landmarks to be identified include the mandibular border, angle of the mandible, condyle and coronoid process, maxillary bone, lingual notch, and maxillary sinus.
- **Tenderness over the jaws**: Note any tenderness over the joint or masticatory muscles (temporalis, masseter) while palpating externally over the lateral pterygoid and buccinator muscles (distal and lateral to upper molar teeth) and medial pterygoid muscle (pterygomandibular ligament and medial aspect of anterior faucial pillars) with the mouth open.
- **Trauma**: Any trauma to the head and neck, such as an injury from a motor vehicle or bicycle accident, or an injury to the side of the face and chin, should be looked at.

d. Temporo-Mandibular Joint Examination

The major symptoms associated with TMDs (temporomandibular joint disorders) are orofacial pain, noises in the joint, limitation of movement (mouth opening), or a combination of these. Limitation may present suddenly as locking or may be slowly progressive.

Extra-auricular and **intra-auricular** examination methods are used for assessing the joint.

- **Interincisal opening**: the maximum interincisal opening of the mouth should be determined, which is, normally, 35–50 mm in an adult. Measurement needs to be taken for the degree of opening where pain begins.
- **Mandibular movement**: any deviation of the mandible during opening should be noted, along with its severity. The lateral mandibular range of motion is determined by having the patient

occlude the teeth and then slide the jaw in both directions. The range of movement from the midline is measured in mm, and any pain, along with its location and severity, is recorded. Normal lateral movement is usually 8–10 mm.

- **Significance of palpation:** it is important to perceive, during pre-tragus and intra-auricular palpation, whether the condyle moves symmetrically, with the rotation and translation phases being evident. Palpation is also used to detect tenderness, clicking, and crepitus. Subluxation of the joint is also recorded.

Muscles of mastication

- **Digital palpation:** regional muscles are examined for tenderness and trigger points using digital palpation.
- **Masseter muscles**: the masseter muscles are most effectively examined by simultaneously pressing them from inside and outside the mouth in the process of bimanual palpation.
- **Lateral pterygoid muscle**: the lateral pterygoid muscles are evaluated by inserting a finger behind the maxillary tuberosities, whereas the medial pterygoid is checked by running a finger in an anteroposterior direction along the medial aspect of the mandible in the floor of the mouth.
- **Temporalis:** trigger points in the temporalis are palpated with the mouth partly open to place the muscle fibres on stretch. Trigger points in the anterior and intermediate fibres are palpated just above the upper border of the zygomatic arch. Trigger points in the posterior fibres are palpated above the ear.

e. Lymph Node Examination

The lymph nodes in the head and neck area should be palpated gently to look for tenderness or enlargement. Healthy lymph nodes are not palpable. Lymphadenopathy is a term that refers to the swelling of lymph nodes, which can be due to either infection or inflammation (viral, bacterial, or fungal), an autoimmune condition (e.g., Sarcoidosis, Amyloidosis, Systemic Lupus Erythematosus (SLE)), or malignancy (Leukaemia, Lymphoma). Often, medicinal therapy (carbamazepine, cephalosporins, penicillin, phenytoin, captopril, etc.) can provide insight into the benign growths of lymph nodes. These causes of lymphadenopathy may be subdivided into the acronym "MIAM" (Malignancy, Infection, Autoimmune, and

Medications), which can be useful as a recalled tool for the differential diagnosis of lymphadenopathy.

When examining for lymphadenopathy, one must carefully examine all pertinent anatomic locations, including the head and neck region. In the case of cancer, abnormal lymph nodes are generally larger, tender, and may be fixed. Generally, the size of the lymph nodes in an adult is less than 1 cm; however, there are exceptions to this rule. Lymphadenopathy can be localized (periodontal and periapical abscesses) or diffuse (Hay fever, HIV, etc.). A thorough history and physical examination are important in determining the underlying cause of lymphadenopathy. Lymph node examination includes the following:

- Location
- Number
- Size
- Consistency
- Tenderness/pain (sign of inflammation)
- Mobility should be recorded

Tenderness of the lymph nodes generally indicates inflammation or drainage of infection. Cancer metastasis to a lymph node is often a fixed, non-tender, firm enlargement. Lymphoma is another possible cause of non-tender enlargement of the lymph nodes of the neck (Figure 19.16, Pg. 157). In addition to the clinical examination, further evaluation of lymphadenopathy may require a lymph node biopsy, computed tomography, and lab evaluation of blood chemistry. Health care providers must be aware of the significance of lymphadenopathy. Most lymphadenopathy cases may be nonspecific; hence, the patient has to be advised to monitor for any increase in size or any inconsistencies and report back.

Examination of Other Parts

- **Nose**: severe nasal obstruction leads to breathing through the mouth, which leads to dryness of the mouth, which results in a persistent sore throat. Infection from the nose may spread to the orbit from the adjacent paranasal sinus. Longstanding nasal obstruction suggests a deviated nasal septum. Epistaxis (nasal bleeding) may indicate life-threatening conditions like cerebral haemorrhage. Nasal discharge may be purulent, bloody, watery, or mucoid.

- **Paranasal sinus:** an apical tooth abscess of the upper jaw may drain into the maxillary sinus, causing acute sinusitis.
- **Eyes:** visual disturbances, colour of the sclera, and conjunctiva are looked for in anaemia and liver diseases.
- Ocular pain, diplopia, and oedema of the eyelid, etc., are also looked at.
- **Ears**: impaired hearing, loss of hearing, discharge from ears, tinnitus
- **Neck**: check for movement in the neck, a lump in the neck, and cervical lymphadenopathy. If thyroid enlargement is suspected, check if the mass moves up and down the trachea when the patient swallows.

Intraoral Soft Tissue Examination

It is important to record if the soft tissue is within normal limits or not. If there is an abnormality, further details are noted, such as:

- Type of abnormality, e.g., polyp, macule, ulcer
- Size: measure the exact size with a perio probe or ruler
- Colour
- Location
- Surface texture, e.g., smooth, papillary, lobulated
- Consistency, e.g., soft, firm, fluctuant, hard

Good knowledge of normal anatomy and common variations of normal is essential to determining if a structure is within normal limits or abnormal. To examine a patient's oral soft tissue, good lighting is needed, as are appropriate instruments. Dental professionals usually use two mirrors and an overhead dental light. A periodontal probe is often useful to measure the size of any abnormality. In other settings, such as screening clinics or nursing homes, tongue depressors and a headlamp or flashlight may be used.

a. Examination of the Oral Cavity

- **Tongue:** the volume of the tongue should be examined for lymphangioma, haemangioma, and neurofibroma**. Papillae of the tongue**—observe and note the distribution of filiform and fungiform papillae, the margins of the tongue, crenation and fasciculation, de-papillated areas, fissures, ulcers, and keratotic

areas. **Colour:** the white colour of leukoplakia; candidiasis; the red colour of the tongue when the leukoplakic plaque gets desquamated; the blue colour of a venous haemangioma. A black, hairy tongue due to hyperkeratosis of the mucous membrane in heavy smokers or caused by the fungus Aspergillus is very characteristic. In jaundice, a yellowish tint to the tongue may be seen.

- **Palate:** should be examined for congenital cleft, perforation, ulceration, swelling, fistulae, papillary hyperplasia, tori, recent burns, and hyperkeratinisation.
- **Lip**: lip should be examined for colour, texture, and any surface abnormalities, such as angular or vertical fissures, cleft lip (either complete or incomplete), bilateral complete cleft lip, in which there is also a cleft palate and a protruding pre-maxilla. Cleft between the maxilla and side of the nose, pigmentation of the lip and buccal mucosa, which is usually noted in Addison's disease. In Peutz-Jeghers syndrome, melanin pigmentation of the lips and oral mucosa occurs, and chancre on the lips, which is a painless ulcer with a dull red colour, should also be examined.
- **Floor of the mouth:** examination of sublingual lesions, swelling, frenal attachments, etc.
- **Tonsil and pharynx:** examination of the colour, size, and surface abnormalities of the tonsils. Check the tonsils for discharge and tenderness by palpating them. Note the restriction of the oropharyngeal airway. Observe the facial pillars for nodules, red and white patches, lymphoid aggregates, and deformities. Observe the post-pharyngeal wall for swelling, nodules, lymphoid hyperplasia, hyperplastic adenoid, and postnasal discharge.
- **Buccal Mucosa:** the clinician will then examine the inside of the cheeks, called the buccal mucosa, using two mirrors to retract the buccal mucosa to one side. This examination will be performed in a thorough and stepwise manner, moving from one side to the other. The mucosa should be smooth, moist, and shiny. If the mirror sticks to the mucosa, xerostomia, or dry mouth, may be present.

b. Examination of the dental structures

- **Teeth:** teeth nomenclature can be done using various systems, e.g., Zsigmondy's and palmar methods, the universal method, and F.D.I. (the two-digit system).

- The hard tissue should be examined for caries (pit and fissure, smooth surface, and cervical caries), faulty restorations, or recurrent caries. Also, missing and supernumerary teeth (mesiodens, paramolar, and distomolar). The presence of root portions of severely decayed, fractured teeth. You should also look for retained deciduous teeth, impacted teeth, ankylosed teeth, fusion of teeth, Talon's cusp, dens evaginatus, taurodontism, and anodontia; enamel hypoplasia, mottled enamel, neonatal teeth; eruption sequestration; delayed eruption; attrition, abrasion, erosion, sclerosis; pulp calcification; resorption of teeth; hypercementosis; plaque; and stains.
- **Percussion test:** this test enables us to evaluate the status of the periodontium surrounding a tooth. There are two types of percussion tests carried out, i.e., vertical percussion and horizontal percussion tests.

Vertical percussion test: if the vertical percussion test is positive, it indicates periapical pathology. To carry out the vertical percussion test, the tooth is struck with a quick, moderate blow, initially with low intensity by the finger and then with increasing intensity by using the handle of an instrument, to determine whether the tooth is tender. First, you must tap adjacent teeth first, and then tap an affected one. Observe the patient's body movement and reflex eye response to determine the response. If the tooth is tender, the patient will blink his eyes due to pain.

Horizontal percussion test: if the horizontal test is positive, it indicates periodontium-associated problems. In the case of horizontal percussion testing, the procedure is the same, but the direction of the blow is in a horizontal direction.

Dental arch irregularities are classified by Angle's as follows:

Class I: arch in normal mesiodistal relationship, i.e., the mesio-buccal cusp of the maxillary first permanent molar occludes in the buccal groove of the mandibular first permanent molar. Dewey's modification of Angle's Class I is as follows:

- Type I—crowded anterior teeth.
- Type II—proclinated maxillary incisors.
- Type III—anterior cross bite.
- Type IV—posterior cross bite.
- Type V—the permanent molar has drifted, particularly due to early extraction of the second deciduous molar or the second premolar.