Journal of Advanced Medical and Dental Sciences Research

@Society of Scientific Research and Studies *NLM ID: 101716117*

Journal home page: www.jamdsr.com doi: 10.21276/jamdsr Indian Citation Index (ICI) Index Copernicus value = 100

(e) ISSN Online: 2321-9599; (p) ISSN Print: 2348-6805

Review Article

Academic Journey in Oral Medicine and Diagnosis Case-Based Learning-Part 2

Daniya Naved[1], Yusra Fatima[1], Nagaraju Kamarthi[2]

[1]Intern, Subharti Dental College & Hospital, Swami Vivekanand Subharti University, Meerut, India
[2]Department of Oral Medicine and Radiology, Subharti Dental College & Hospital, Swami Vivekanand Subharti University, Meerut, India

ABSTRACT:
Both medical and dental councils in India are trying to get these professional degrees accredited by international organisations so that the students meet international standards. Radiographic interpretation of both odontogenic and non-odontogenic tumours is complex and needs to be correlated clinically. Problem-based learning (PBL) allows graduate students to seek guidance, which promotes self learning. This article is a continuation of a two-part series on PBL with an emphasis on bony lesions and their radiographic interpretations. The article is based on the presentation of a bony cyst and a tumour and their clinical and radiographic interpretations. The emphasis is on this learning method in dental radiology.
Key words: cone beam computed tomography, orthopantomogram, case based learning, odontogenic tumour, cyst

Received: 30 December, 2024 Accepted: 17 January, 2025

Corresponding author: Daniya Naved, Intern, Subharti Dental College & Hospital, Swami Vivekanand Subharti University, Meerut, India, **Email:** daniyanaved61@gmail.com

This article may be cited as: Naved D, Fatima Y, Kamarthi N, Academic Journey in Oral Medicine and Diagnosis Case-Based Learning –Part 2.J Adv Med Dent Scie Res 2025; 13(2):36-42.

INTRODUCTION

This article is a continuation of a series of clinical cases seen in the department of oral medicine and radiology by a group of intern students, who evaluate the problem-based learning (PBL) or case-based learning experiences through their clinical experience. In the first part, the method adopted by the Medical and Dental Council of India regarding graduate training in India was emphasized. While the PBL in the first episode of this article series focused on soft tissue potentially malignant disorders and malignancies, this article presents bone malignancies and benign soft tissue abnormalities (congenital or acquired) observed during clinical intern training. Using traditional teaching approaches results in poor student involvement and easy distractions throughout class.[1] Furthermore, students are unable to give useful and timely feedback on their own learning while using conventional teaching approaches. It follows that there is a need for improved oral mucosal disease education through the use of innovative pedagogical approaches.[2] PBL, on the other hand, is a North American-originated popular method that has been recognised by various organisations [World Federation for Medical Education and World Health organization].[3,4] The PBL teaching method focuses on students as subjects, aiming to stimulate their interest in learning and improve their self-learning, problem-analysing, and problem-solving skills. Students collect patient-related information themselves, using the internet and libraries. Students can develop their problem-solving skills and gain a foundational understanding using this method. According to research, PBL encourages student engagement and helps them develop skills that will serve them throughout their professional careers. Results on the US Dental Examinations (National Board) have been shown to improve using PBL.[5]

Bony lesions present a different set of challenges for both tutors and students. Oral radiology is a crucial part of dental training, requiring mastery in perception and cognition to interpret intra- and extraoral radiographs. These skills are essential for patient assessment and treatment planning, making radiography a vital diagnostic tool. Traditionally, oral radiology clinical postings teach grouped dental

students radiographic interpretation skills, resulting in passive, teacher-centred learning.[6] This approach lacks a deep understanding and application of concepts in new situations. PBL overcomes many of these shortcomings as it allows a student to enquire about the unfamiliar or unknown areas.[7] Soltanimehr et al.'s study on dental students found that a virtual teaching method, incorporating a learning management system, significantly improved theoretical knowledge and clinical radiographic reporting skills compared to traditional methods over 6 weeks.[8] A study by Ji et al. found higher satisfaction and self-awareness scores of third-year dental students after smartphone-based oral radiology training compared to traditional lecture-based training.[9] New problem-based learning methods like structured algorithms, syndicate learning, OMP, web-based learning, simulation, and virtual-based learning enhance student exploration, self-study, critical thinking, and self-reliance, leading to improved radiographic interpretation skills.[10-12.] Most of the difficulties involved by students in interpreting radiographs are the skills of applied basic sciences, wherein they cannot differentiate or identify the features between two similar radiographic lesions with different clinical diagnosis. This correlation between the clinical lesion and the radiographic image has also been found to be low among undergraduate students in various other medical and dental disciplines.[13,14]

This article, being a further continuation, presents cases of a cyst and a tumour and their relative radiographic appearances during the course of doing internship. Other lesions include various soft tissue benign lesions encountered during the course of problem-based learning.

CASE 1

Adenoid cystic carcinoma: Figure 1A presents a case of a 45-year-old labour asymptomatic patient who experienced pain in the upper back gum region 1 year back along with swelling and nose bleeding. Pain spread to the palate and ear, and swelling increased. The patient struggled with chewing food. The patient had undergone extraction 1 year back in relation to the left side's first and second molars. The patient had a history of chronic smoking for many years. Extraoral examination did not reveal any significant abnormalities. The only significant clinical findings were chronic generalised periodontitis with bleeding on probing. Swelling in the posterior left maxillary region, extending up to the palatal area, was confirmed by inspectory findings. The mucosa was smooth and continuous, tender on palpation, and the affected teeth were not mobile. A greyish patch was also present (Figures 1A and B). Mucoepidermoid carcinoma, ameloblastoma, central giant cell granuloma, minor salivary gland malignancy, and adenoid cystic carcinoma are all types of cancer that were considered as differential diagnosis. The lesion located on the left side of the maxilla was multilocular. The lesion exhibited cortication and a noticeable thinning of the buccal cortical plate. The lesion was infiltrating the maxillary sinus, the palatine process of the maxilla, and the osteomeatal complex on the ipsilateral side, causing a deviation of the nasal septum to the right. An incisional biopsy of the alveolar mucosa was conducted. The biopsy indicates the presence of basaloid tumour cells organised into nests, sheets, and strands of diverse sizes and shapes, exhibiting cribriform and tubular patterns. The cystic spaces exhibit mucin accumulation, with some regions demonstrating extensive cystic degeneration. The stroma has a minor chronic inflammatory response. Regions of hyalinization and haemorrhage were also seen in the stroma. The definitive diagnosis was made for adenoid cystic carcinoma with a poor prognosis. The nonsurgical phase includes education and motivation to stop the habit of tobacco chewing and smoking. Surgical treatment advised was surgical resection along with a maintenance phase of chemotherapy and radiotherapy. Radiographically, the lesion needs to be differentiated from mucoepidermoid carcinoma, pleomorphic adenoma, and squamous cell carcinoma.[15] In mucoepidermoid carcinomas, low-grade tumors present as well-circumscribed masses, typically with cystic components. The solid constituents are augmented, and calcification is occasionally observed. In pleomorphic adenoma, the neoplasm is contained within the osseous defect or its projected circumferential diameter in cases of complete erosion, and there is no periosteal reaction or osseous involvement of the adjacent hard palate.[16]The radiograph shows a radiolucent defect with well-defined cortical margins and bevelled edges, which indicate an intraoral neoplasm origin. The most frequent cancer that causes radiolucent lesions in the jawbones is squamous cell carcinoma. Based on their origin, SCCs that damage bone can be classified as either mucosal or peripheral.[17] A peripheral radiograph reveals lytic abnormalities. Both kinds of radiolucent lesions may have ragged radiopacities, which are little sequestra of bone.

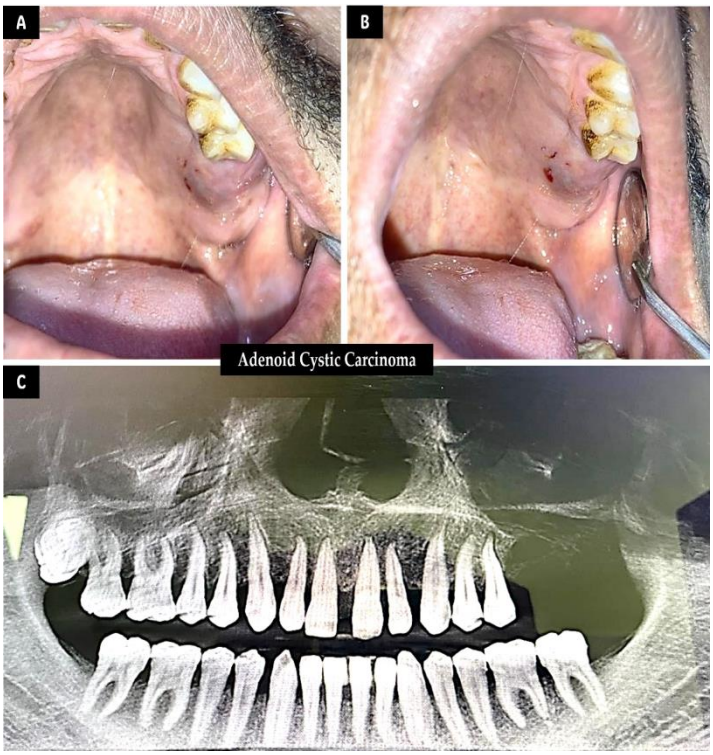

Figure 1: (A) Intra oral picture of maxillary arch showing the growth in the region of maxillary tuberosity (B) the overlying mucosa on the growth showing changed color of mucosa (C) orthopantomograph showing a wide tumor on the left side with loss of bony structures.

Case 2: Figure 2A presents a case of a calcifying odontogenic cyst (COC) in a 34-year-old adult patient with a chief complaint of swelling and discomfort in the maxillary right anterior region for the last two months. The patient's complaint was about a swelling in his mouth that has increased from a lesser bulge to its current stage. The patient's personal history did not reveal any significant associations with the condition; a three-year history of trauma in the same region was the only significant association. Medical, drug, and dental histories were within normal limits. The patient presented with a slight asymmetrical face and a single, wide enlargement in the labial vestibule, spanning from tooth number 11 to 14. The swelling was hard, non-tender, and did not yield to pressure. The mucosa over the swelling was smooth with a reddish-pink hue, easily differentiated from the adjacent paler mucosa. The teeth associated with the lesion showed no sensitivity to percussion, despite appearing to have drifted. Radiographic investigations revealed a well-defined, non-corticated lesion on the right maxilla, measuring 13.45 mm by 16.37 mm by 25.20 mm. The lesion had a radiolucent mass with a conglomerate radioopaque central mass (Figure 2B). The perforation of the labial cortical plate was evident. History differentiated the radiographic picture as an infected dentigerous cyst with either a mesiodens or an odontoma. The apices and axial surfaces showed no signs of root resorption. Fine needle aspiration confirmed the cystic lesion. Other differential diagnoses considered included ameloblastoma, ameloblastic fibroma, odontome, lateral periodontal cyst, odontogenic tumour, and COC. The patient was treated for a cystic odontogenic cyst with an odontome through surgical enucleation. The patient underwent a crevicular incision and careful dissection. Histological examination revealed fibrous connective tissue reinforcing the cystic epithelial lining. The cyst lining showed isolated patches of ameloblast-like cells, tall columnar cells, stellate reticulums, ghost cells, and eosinophilic structures. The patient experienced uneventful postoperative healing and was advised for periodic follow-up. The long-term follow-up was scheduled for 5 years, with radiographic verification for recurrence.

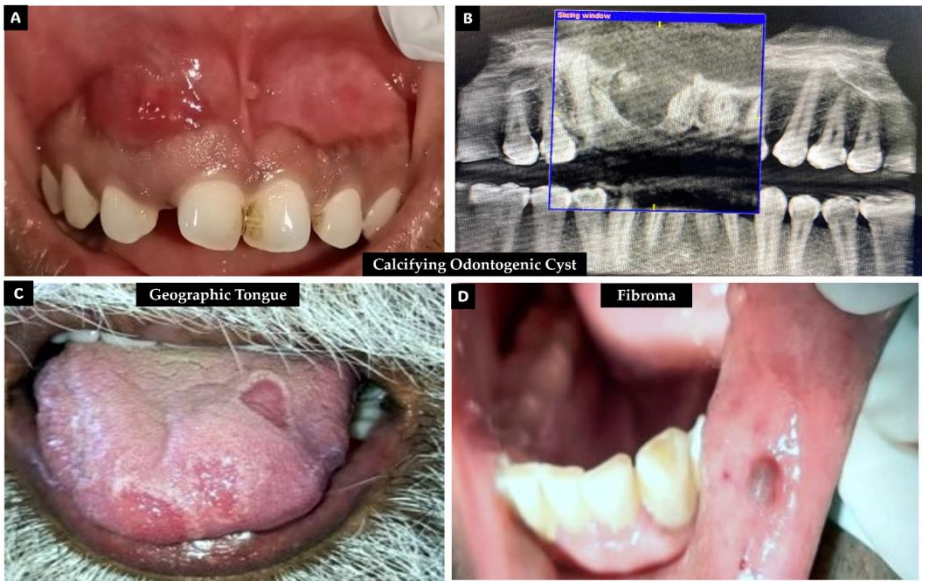

Figure 2: (A) Intra oral image showing the clinical picture of labial mucosa of maxillary anterior region involved due to calcifying odontogenic cyst (B) Cone beam computed tomographic image showing a central radioopaque mass within a radiolucent cyst with a clear radiopaque lining (C) benign migratory glossitis or geographic tongue showing parts of tongue denuded or devoid of papillae (D) traumatic fibroma of the lower lip showing a small fibrotic swelling

Case 3: Figure 2 C presents a case of benign glossitis that is migratory in nature and is otherwise also called geographic tongue because of its characteristic nature of migration and remission. The condition, which was first described by Rayer in 1831,[18] is a mild inflammatory disorder that affects the back of the tongue. It is marked by multiple, uneven erythematous patches surrounded by regenerating filiform papillae that move around because the epithelial cells are both losing their outer layer and growing new ones at the same time.[19.] The patient reported with no known medical or dental disorder. Geographic tongue's aetiology is unknown, but theories suggest psychosomatic and hereditary factors, higher prevalence in mentally ill patients, and decreased stress aiding in healing. Family and hereditary factors also play a role, with first-degree relatives more prevalent and parents and siblings having higher prevalence.[20] A polygenetic inheritance model is proposed. Geographic tongue starts in childhood and affects 1%–2.5% of the worldwide population.[21] Paediatric prevalence is 0.37-14.3 percent. The frequency is highest among 20–29-year-olds at 39.4%.[20,21] Geographic tongue favours women somewhat more than males. Geographic tongue is diagnosed by clinical features and history, with differential diagnosis including infections like candidiasis, aphthous ulcer, and stomatitis to lesions like leukoplakia, psoriasis, lichen planus, erythroplakia, and squamous cell cancer.[21-24]

Case 4: Figure 2D presents a case of a traumatic fibroma of the lower lip mucosa, which appeared as a firm, asymptomatic nodule and occurred along the occlusal plane. The patient did not have any significant medical or dental problems but noted the lesion since it impaired his oral proprioception. The lesion was histologically showing reactive hyperplasia with no feature of a neoplasm or other similar lesion. Traumatic fibroma (TF) is a benign, asymptomatic, small, mucosa-coloured, smooth papule typically found on the buccal mucosa, tongue, lip, hard palate, or gingiva, often presenting as solitary or multiple lesions.[25,26] TF is a common oral lesion, with an incidence ranging from 1% to 15%. Among oral lesions evaluated between 1986 and 2019, it was the most prevalent, but its diagnosis ranked second to fifth. In total, it was observed in 8.6% of cases.[26] Two studies (retrospective) found a higher female predilection [Female 1.6: Male 1.0] in one study and 2.4:1.0 in the other.[27] The age of onset for TF is typically 19 years above for 90% of patients.[28] The duration of the lesion prior to diagnosis is typically 1 year or less for 75% of cases, with the lesion present for two years prior to the woman's diagnosis. It may regress on its own; other surgical removal is required if the patient cannot adapt to its presence. TF has two collagen arrangement patterns: circular and radiating.[25] Circular patterns are more common in mobile cheek lesions, less traumatised, and less frequent in immobile, more traumatised mucosa overlying the bone. The patient in this report had a lower lip TF with a radiating pattern. TF has a diverse clinical differential diagnosis, with other oral cavity conditions like fibroma, fordyce granules, gingival hyperplasia, and pyogenic granuloma also having similar morphology. Other benign intraoral lesions, such as giant cell fibroma and oral squamous cell carcinoma, can also mimic it.[27,29] A biopsy may be

required for diagnosis. Lip correction surgery to restore facial aesthetics may be indicated if the lesion is between the upper and lower lips or when the growth is large.[30]

DISCUSSION

Acquiring radiographs and interpreting them in the context of actual clinical cases constitute the bulk of dental radiology training for undergraduate dental students. As per the Dental Council of India regulations-based outcomes, a dental graduate must possess proficiency in laboratory investigations like radiographs, radiation health hazards, intraoral radiograph interpretation, extraoral radiographic procedures, TMJ radiography, and sialography.[31] a total of 170 clinical hours have been allocated to the undergraduate at two different levels [third year—70 hours, fourth year—100 hours], while the same students are posted for a full twenty-five working days to gain oral medicine and radiology-related learning outcomes. [31] The traditional, teacher-centred method of oral radiology instruction is contrasted with active learning strategies that incorporate PBL objectives. Early exposure of undergraduates to advanced and artificial intelligence-based radiographic technologies like CBCT has not only renewed student and staff interests in the subject but also allowed academicians to interpret radiological images with accuracy.[32,33] Cone beam CT scans have a very well-known significance for implant dentistry due to their safety and predictability.[34] They enable dentists to accurately measure and localise the jawbone, create a complete virtual model of the patient's soft tissues, bones, and teeth, design the proper bite, map sensory nerves, select the right implant length, and ensure optimal stability and integration. These digital dental technologies make work easier for both dentists and patients, making it essential to discuss specific dental conditions with a dentist. Mobile phone-based radiographic and cephalometric programmed applications have made understanding, learning, and practicing more accessible than ever before.[35] Radiographic image evaluation involves visual inspection and interpretation, requiring four steps: detection, recognition, discrimination, and diagnosis.[36] This complex process involves perceptual and cognitive processes, often based on incomplete clinical information.[37] Inaccurate thinking can lead to diagnostic errors and interpretation errors, making it unavoidable in daily practice due to the complex analysis. The complication of interpreting a radiograph, which is influenced by its type, quality, pathology type, and findings' conspicuity, increases the likelihood of interpretation errors.[38] Clinical and basic knowledge and procedural ability in dental radiology significantly impact the accuracy of radiographic diagnosis, requiring a balance between scientific understanding and patient management.[39] Dental training programs vary globally, with studies comparing dentists and students in Brazil and Switzerland.[40] Differences in sensitivity of radiographic caries diagnosis may be due to training differences. Increased training levels have been shown to be associated with improved accuracy in radiographic interpretation among students.[40] The first clinical case described in this report is that of a carcinoma, which is bound to generate more interest among learners and seek additional information on the differences in histopathological features like dysplasia, apoptosis and karyotic changes.[41] In this case, there were wide discussions held at a personal level between concerned students and mentors, teachers, postgraduates, and their own batchmates. Learning a particular interpretation in such cases is bound to be spread among all those involved. Any area of interest missed by a particular reviewer would be considered a difficult one, with students emphasising more stress on that area of interest. Undergraduate medical and dental students have been generally observed to be under stress during the learning years, mainly due to examination-passing pressures.[42] On the contrary, intern students do not feel the examination pressures and tend to learn in a more relaxed and responsible manner. PBL initiates more students efforts in terms of self-learning, and therefore it is a significant tool to learn radiographic interpretation and its relevance to clinical lesions or condition.

CONCLUSION

Patient-based learning in dental radiology helps students develop abilities in analysis, correlation, and continuous learning. It improves the quality of dentistry curricula by preparing students for the workforce by training them to think critically and find practical solutions to challenges.

Acknowledgement: The authors would like to thank all the staff and postgraduate students of the department of oral medicine and diagnosis for their valuable contributions during the diagnosis and treatment of the above-mentioned cases.

Conflict of interest: None as declared by all authors.

REFERENCES

1. Wang H, Xuan J, Liu L, Shen X, Xiong Y. Problem-based learning and case-based learning in dental education. Ann Transl Med. 2021 Jul;9(14):1137.
2. Donner RS, Bickley H. Problem-based learning in American medical education: an overview. Bulletin of the Medical Library association. 1993 Jul;81(3):294.
3. Mattoo K, Sanabani F, Adawi H, et al. Improvising medical teaching during pandemic through the platform of publishing to convey specific case based learning to undergraduate dental students – Part 1 (Psychosocial Learning). Turkish Journal of Physiotherapy and Rehabilitation 2021; 32(3):12610-18

4. Bian Z, Fan MW, Tai BJ, Huang C, Song GT. Application of Problem-based learning in Dental Education. Journal of Oral Science. 2006;22:448-50.
5. Fincham AG, Shuler CF. The changing face of dental education: the impact of PBL. Journal of dental education. 2001 May;65(5):406-21.
6. Sanabani F, Mattoo K, Makramani BM, et al. Improvising student teaching during pandemic via the platform of publishing to convey specific case based learning outcomes for undergraduate dental students – Part 2 (Applied basic sciences). Turkish Journal of Physiotherapy and Rehabilitation 2021; 32(3):27327-37
7. Santos GN, Leite AF, Figueiredo PT, et al. Effectiveness of E-learning in oral radiology education: a systematic review. Journal of dental education. 2016 Sep;80(9):1126-39.
8. Soltanimehr E, Bahrampour E, Imani MM, et al. Effect of virtual versus traditional education on theoretical knowledge and reporting skills of dental students in radiographic interpretation of bony lesions of the jaw. BMC medical education. 2019 Dec;19:1-7.
9. Ji YA, Lee YM, Lim HD, et al. Smartphone use and schema-based learning in dentomaxillofacial radiology practice: a case report from one College of Dentistry. Dentomaxillofacial Radiology. 2018;47(6):20170463.
10. Naik Z, Umarani M. One Minute Preceptor-a teaching-learning model for oral radiographic interpretation skill. J Contemp Med Edu. 2015;3(2):72-6.
11. Lohe VK, Singh A. Evaluation of effectiveness of syndicate learning in oral medicine and radiology: cardinal findings in a batch of final-year students. Astrocyte. 2015 Jan 1;1(4):301-4.
12. Baghdady MT, Carnahan H, Lam EW, Woods NN. Dental and dental hygiene students' diagnostic accuracy in oral radiology: effect of diagnostic strategy and instructional method. Journal of dental education. 2014 Sep;78(9):1279-85.
13. Pacheco-Pereira C, Senior A, Green J, et al. Assessing students' confidence in interpreting dental radiographs following a blended learning module. International Journal of Dental Hygiene. 2019 Aug;17(3):280-7.
14. Mattoo KA, Sanabani F, Farghaly A, et al. Undergraduate pupils clinical accomplishments in clinical fixed prosthodontic course (SDS-543)–Case series. JMSCR. 2020;8(4):326-30.
15. Dodd GD, Jing BS. Radiographic findings in adenoid cystic carcinoma of the head and neck. Annals of Otology, Rhinology & Laryngology. 1972 Aug;81(4):591-8.
16. Suei Y, Tanimoto K, Taguchi A, Wada T. Radiographic evaluation of bone invasion of adenoid cystic carcinoma in the oral and maxillofacial region. Journal of oral and maxillofacial surgery. 1994 Aug 1;52(8):821-6.
17. Ali FM, Al-Iryani GM, Mattoo KA, et al. Prevalence and Variation of Medical Comorbidities in Oral Surgery Patients: A Retrospective Study at Jazan University. Medical Science Monitor 2024;30:e943884-1.
18. Prinz H: Wandering rash of the tongue (geographic tongue). Dent Cosmos 1927; 69:272-75
19. Mattoo KA, Nagaraj K. Symptomatic Benign Migratory Glossitis. International Journal Of Research In Dentistry. Symptomatic Benign Migratory Glossitis. 2014: 4(4):123-26
20. Campana F, Vigarios E, Fricain JC, Sibaud V. Geographic stomatitis with palate involvement. An Bras Dermatol. 2019;94(4):449-451.
21. Nandini DB, Bhavana SB, Deepak BS, Ashwini R. Paediatric Geographic Tongue: A Case Report, Review and Recent Updates. J Clin Diagn Res. 2016 Feb;10(2):ZE05-9.
22. Gaba N, Mattoo KA, Ali FM. Fordyce spot – masking strategy. Journal of Contemporary Medicine and Dentistry 2021; 9(2): 34 – 36
23. Ogueta CI, Ramírez PM, Jiménez OC, Cifuentes MM. Geographic Tongue: What a Dermatologist Should Know. Actas Dermosifiliogr (Engl Ed). 2019 Jun;110(5):341-346
24. Picciani B, Santos VC, Teixeira-Souza T, et al. Investigation of the clinical features of geographic tongue: unveiling its relationship with oral psoriasis. Int J Dermatol. 2017 Apr;56(4):421-427.
25. Ide F, Mishima K, Saito I. Solitary sclerotic fibroma of the lip. British Journal of Dermatology. 2003 Aug 1;149(2):433-5.
26. Cohen PR. Biting fibroma of the lower lip: a case report and literature review on an irritation fibroma occurring at the traumatic site of a tooth bite. Cureus. 2022 Dec;14(12).
27. Valério RA, Queiroz AM, Romualdo PC, et al. Mucocele and fibroma: treatment and clinical features for differential diagnosis. Brazilian dental journal. 2013;24(5):537-41.
28. Toida M, Murakami T, Kato K, et al. Irritation fibroma of the oral mucosa: a clinicopathological study of 129 lesions in 124 cases. Oral Medicine & Pathology. 2001 Dec 25;6(2):91-4.
29. Mattoo KA, Singh M, Gupta S. Fordyce granules associated with hypopigmentation of facial skin. Oral Surg, Oral Med, Oral Radiol. 2014;2:23-4.
30. Siwach A, Mittal R, Mattoo KA, Goswami R. Double lip correction for enhancing complete denture aesthetics. Journal of case reports: clinical and medical. 2019;2(2):133.
31. Dental Council of India. MDS Course Regulations; 2007. Available from: http:// alongwith_Amendments.pdf. https://dciindia.gov.in/GazetteList.aspx [Last accessed on 2025 february 01].
32. Sindi AS, et al. The Role and Impact of Artificial Intelligence on the Future of Dental Radiography - A Mini-Review. Advances in Artificial Intelligence and Machine Learning. 2023;3(4):98.
33. Meckfessel S, Stühmer C, Bormann KH, et al. Introduction of e-learning in dental radiology reveals significantly improved results in final examination. Journal of Cranio-Maxillofacial Surgery. 2011 Jan 1;39(1):40-8.
34. Rathi JN, Goswami R, Mattoo KA. Implant Supported Mandibular Overdenture-Case Report. Journal of Advanced Medical and Dental Sciences Research. 2019 Nov 1;7(11):128-30.
35. Hassan MM, Alfaifi WH, Qaysi AM, et al. Comparative Evaluation of Digital Cephalometric Tracing Applications on Mobile Devices and Manual Tracing. Medical Science Monitor 2024 Jun 23;30:e944628-1.

36. Gray JE, Taylor KW, Hobbs BB. Detection accuracy in chest radiography. American Journal of Roentgenology. 1978 Aug 1;131(2):247-53.
37. Krupinski EA. The role of perception in imaging: past and future. InSeminars in nuclear medicine 2011 Nov 1 (Vol. 41, No. 6, pp. 392-400). WB Saunders.
38. Krupinski EA. Current perspectives in medical image perception. Attention, Perception, & Psychophysics. 2010 Jul;72(5):1205-17.
39. Malterud K. The art and science of clinical knowledge: evidence beyond measures and numbers. The Lancet. 2001 Aug 4;358(9279):397-400.
40. Diniz MB, Rodrigues JA, Neuhaus KW, Cordeiro RC, Lussi A. Influence of examiner's clinical experience on the reproducibility and accuracy of radiographic examination in detecting occlusal caries. Clinical oral investigations. 2010 Oct;14:515-23.
41. Alqarni A, Hosmani J, Mohammed R, et al. Shilajit (Mumio) Elicits Apoptosis and Suppresses Cell Migration in Oral Cancer Cells Through Targeting Urokinase-type Plasminogen Activator and Its Receptor and Chemokine Signaling Pathways. Pharmacognosy Magazine. 2024 Sep 23:09731296241275740.
42. Hassan SA, Kumar L, Verma A, et al. Evaluation of Perceived Stress and Its Association with Dental Caries in 290 Undergraduate Medical Students. Medical Science Monitor 2024 Dec 17;30:e946528.