Infectious Nature of Diseases and Disorders of Head and Neck Region Affecting Paediatric and Adult Population Based on Quality of Life- A Review

Dr. Karthik Shunmugavelu*[1], Dr. Nitika[2], Dr Archana Loganathan[3], Dr. S. Shabana Fathima[4], Dr Thendral Kalaichelvan[5], Dr. Sajid. T. Hussain[6]

[1]BDS, MDS OMFP, MSC London, MFDSRCS ENGLAND, MFDSRCPS GLASGOW, Faculty Affiliate RCS IRELAND, Affiliate RCS EDINBURGH, MCIP, FIBMS USA, MASID Australia, Assistant Professor / Consultant Dental Surgeon / Consultant Oral and Maxillofacial Pathologist Department of Dentistry/Oral and Maxillofacial Pathology, PSP Medical College Hospital and Research Institute, Tambaram Kanchipuram Main Road Oragadam Panruti Kanchipuram District Tamilnadu 631604

[2]BDS, MDS, Reader, Dept.of Conservative Dentistry and Endodontics, Divya Jyoti College of Dental Science and Research

[3]MDS Orthodontics and Dentofacial Orthopedics, Private Practice, Danvi Dental Care, Cuddalore, Tamilnadu, india

[4]MDS (Oral Pathology), Professor in Department of Oral Pathology, Sri Venkateshwaraa Dental College, Ariyur, Puducherry, India, Affiliated to Pondicherry Central University

[5]BDS, MDS, Reader, Department of conservative dentistry and endodontics, Sri Ramakrishna Dental College and Hospital, Nava India, Coimbatore, Tamilnadu, India

[6]B.Sc., MDS, Associate Professor, Department of Periodontology and Implantology, Sree Balaji, Dental College and Hospital, Chennai, India

Corresponding Email: *drkarthiks1981@gmail.com*

KEYWORDS

oral, dental, pathology, orthodontics, maxillofacial

ABSTRACT

The factors which determine a lesion are of its borders, colour, texture, induration and quantity. The history of the patient followed by clincial examination determines the approach to diagnosis. The diagnostic approach is based on the patient's medical history and clinical examination in conjunction with investigations. A protocol must be formed in order to provide a perfect methodology for assessment of oral and maxillofacial pathologies in an orthodontic patient. In this narrative review article, we describe the oral and maxillofacial lesions encountered in orthodontic practice.

Introduction:

Lesions with an etiology pertaining to heredity, infection, malignancy, trauma and idiopathicity are most commonly witnessed in patients undergoing orthodontic treatment. Specialist referral plays an important role in early diagnosis, detection, identification followed by effective management of patient. Prevalence of oral mucosal lesions (OMM) in normal population is around

8 to 60 percent. Etiopathogenesis can be idiopathic (without any cause), cancerous, infectious , iatrogenic or IBD (Inflammatory Bowel Disease). During orthodontic treatment the lesions which occur due to bands and brackets. For a propr management there should always be a good clinical examination, proper history taking , regular follow up after the said period of treatment. An orthodontist has an ability to identify and correlate the oral lesions with orthodontic treatment[1,2,3,4,5].

Infections:

The teeth supports integrity of the bone . There can be numerous congenital anomalies which are malformations of skull and of help to the anthropometrist (Anthropometry involves the systematic measurement of the physical properties of the human body, primarily dimensional descriptors of body size and shape) and teratologist. There are various conditions like Osteogenesis Imperfecta where the bone becomes brittle and pliable with more tendancy to fracture. And formation of attenuated trabeculae. Osteopetrosis – Increased thickness of cortical and cancellous bone. Disorientation of bone architecture. Calcium, phosphorus and phosphatase are within normal range. Diaphyseal actasis is a congenital and genetic anomaly. Reactive ,Inflammatory and infective lesions – A) Mucocoele. B)Fibrous Hyperplasia and fibroepithlial polyp. C)Pyogenic granuloma, D)Functional keratosis E)Herpes Simplex infections F)Recurrent Apthous Stomatitis G)Geographic tongue H)Gingival overgrowth and gingival hyperplasia and I)Crohn's disease. Benign Neoplasms : Squamous papilloma, Hemangioma , Pleomorphic adenoma and Lipoma. Malignant Neoplasms : Rhabdomyosarcoma, Ewing's sarcoma and Squamous Cell carcinoma (OSCC). Mucocoele's are blue, purple or gray mucosa coloured lump.Most have a history of trauma and are less than 1 cm in size. Histologic features of mucocoele includes a lumen which contains mucin, netrophils, macrophages and granulation tissue. When a mucous exudation affects sublingual gland , there is a large swelling in the floor of the mouth called Ranula. Fibroma – Fibrous Hyperplasis refers to the reactive lesions comprising increasedand often densely collagenous fibrous connective tissue.Mostly lesions occur on the tongue . Both buccal and lingual lesions are prone to inflammation .Pyogenic Granuloma : 80 % ofpyogenic granulomas occur on gums. Sometimes pyogenic granulomas occur in contact with patient's palatal gingivae in association with transpalatal arch (TPA). There after 3 months it shows complete resolution after removal of orthodontic appliance. Squamous Cell Papilloma : can also occur as a benign epithelial entity in the oral cavity for adults and children. There can be low risk human papilloma virus (HPV) involved. It is a pedunculated lesion less than 1 cm in diameter but may be mucosa coloured. Hemangioma : Infantile hemangiomas are common. Well- demarcated ,red, expansile lesions may resolve 7 years later. Frictional Keratosis : are common with a prevalence of 0.26 – 5.3 percent in children ad young adults. These are reactive lesions in response to chronic trauma. There is a faint whitening to roughening of mucosa. There is a common presentation of bilateral line along the occlusal plane known as linea alba. Recurrent Apthous Stomatitis : RAS is a common non infectious lesion affecting young adults more in prevalence[6,7,8]. There can be family history prevalence of these ulcers , drugs or B 12 deficiencies. Treatment can be done by mucopain and hexigel. Corticosteroids can be helpful as well. Multiple Enchondromas : The cranial bones

and mandible are involved in this condition. Patients are involved before the fifth year. The disease is congenital. Cleidocranial Dysostosis : Head and clavicle are chiefly affected. 30percent patients have a receeding face. The defective membranous ossification is also associated with disturbances in dentition. Retarded eruption (25 per cent), incompletely formed dental arches (33 per cent,), osseous irregularities (46 per cent), and caries (25 per cent) have been observed. Aclaondvoplasia (chondrodystrophia hypoplastica) is a true developmental skeletal disease of congenital and heriditary nature characterized essentially by dysplastic and degenerative / sclerotic processes in the epiphysial cartilage with premature synostosis (fusion) of the bones of cartilaginous ossification in the base of the skull. Periosteal ossification is normal or even increased. Structural effects follow these changes in direct sequence. Ateleiosis is a type of congenital dwarfism dependent on imparments in the proliferation of epiphysial cartilage and ossification of the long bones. Other factors are aplastic and nondeveloping centers of ossification. The skull is affected and is of brachycephalic form resulting from the lack of growth of bone at the base and the persistence of the cartilage of conjugation throughout life. Recurrent Herpes Labialis : The lesions resolve completely within 2 weeks. RHL results from reactivation of HSV, which lies in quiescent stage in sensory neurons, often of the trigeminal nerve. Usually, the vermillion mucosa are affected. RHL may be accompanied by a prodrome of paresthesia, burning, or itching at the site. The lesions appear as red macule, which become vesicles before breaking down into pustular scabs or ulcers oozing out fluid. As there is a risk of transmission of HSV to the orthodontist while a lesion is active, it is essential to wear personal protective equipment. Moreover, there may be a benefit in delaying all but urgent treatment until the lesion has resolved to prevent infection risk[9,10,11,12,13]. Geographic tongue also known as median rhomboid glossitis. Epulis is a benign inflammatory tumor of the gingiva and develops in response to a local chronic irritative factor (brackets, tartar, and interdental spaces). Clinically, epulis appears as a localized nodule appearing on the marginal gingiva. Inflammatory epulis is most common following orthodontic treatment. Its size can be significant. The mucoid cyst is a pseudocyst, often of traumatic origin, resulting from the extravasation of saliva after the rupture of the excretory canal. It develops mainly in the accessory salivary glands and particularly on the lower lip. Angular cheilitis is a particular form of candidiasis. It is characterized by bilateral involvement of the labial commissures on the cutaneous and mucous slopes. It is affected by salivary flow and maceration in the commissural folds and maintained via a licking behavioral pattern. Hand, foot, and mouth disease , caused by a virus (coxsackie virus A16), particularly affects young children aged less than 5 years. White sponge nevus (or Cannon's spongy white nevi) is a hereditary dyskeratosis localized preferentially to the jugal mucosa, which takes on a white-gray, slightly wrinkled appearance, similar to an opalescent veil. The mucosa remains supple. These white spots, slightly raised, are detached by scratching in the form of scales, revealing an intact submucosa underneath. Oral mucosal pathologies encountered by the orthodontist are often benign and acute. Treatment-related lesions are mostly reactive and require correction of causal factors, improvement of oral hygiene, and/ or mucosal protection. Pathologies not associated with treatment are most often viral and clinically manifest as vesicles. The child who falls ill quickly will get better quickly. The persistence of

lesions or deterioration of the child's general condition necessitates their referral to a specialized department for further examinations in search of an underlying general pathology. The well-established relationship of dental trauma behind the cause of papilloma, particularly in the common hypertrophies affecting the oral mucosa, has orthodontic significance, however[14,15,16]. Leukokeratosis and the leucoplakia that follow them are of more serious consequences because of their potential carcinogenic transformations. It is through prophylactic and preventive measures designed to prevent such injuries that the orthodontist may offer a valuable service. The osteoma has more definite roentgenographic characteristics than the other neoplasms and, like the odontoma, produces considerable local deformity but may resemble the hyperostotic dystrophies and require special clinical investigation before surgery. Sarcomas are frequently more confusing in their clinical setting than the benign mesoblastic tumours. Their tendency to rapid growth with more extensive involvement of adjacent tissues, secondary infection, and hemorrhage usually predominates over their effects on the arches. Yet sclerosing forms of osteogenic sarcoma of relatively slow spread, producing constitutional symptoms of leucocytosis and elevation of the temperature, may be associated with displaced teeth, mistaken for osteomyelitis and attributed to malocclusion. This is also true of endothelial myeloma. Both these malignant neoplasms may involve the jaws and are not, in young subjects. Their prognosis is unfavorable at best, but depends on the careful evaluation of symptom and early diagnosis. A consideration of representative mucous lesions affecting the oral cavity and masticatory apparatus has been presented with the intention of correlating them both as primary and as secondary mechanisms. Developmental anomalies of hereditary and familial type have been confined largely to those associated with fairly well-defined pathologic tissue variations. This relatively small but it was emphasized because it depicted fundamental changes producing malocclusion through structural', growth and tissue effects. Trauma was considered with respect to its main etiologic factors, complications, and algorithm, as both a cause and an effect, of disturbances in the arches. Dental aspects of oral pathology and the relationship of the units to the integrated system were demonstrated[17]. Endocrine disturbances affecting growth, derelopment, and differentiation with particular refercnce to the teeth and jaws were restricted to those proved by well-authenticated evidence based on pathologic, physiologic, and clinical research. Nutritional and metabolic derangements were similarly defined. Calcium, phosphorus, and phosphatase were mentioned in particular instances to substantiate the reliability of interpretations supported by physiological chemistry. Orthodontic significance were presented because of their frequent, association with constitutional disorders of which the oral manifestations. Inflammation and infection were particularly emphasized because their operation was indicative of causative and sequential processes in both oral pathologies and orthodontics. Cystic lesions were described with the intention of relating their initiating stimuli to orthodontic problems. Their pathologic significance and their histogenesis were illustrated on this basis, although orthodontic sequelae were also discussed. Neoplastic disease of various types was considered, more particularly with respect to its effects on the arches. The prophylactic value of orthodontic control of lesions predisposing to benign and malignant tumors was emphasized. The progress of orthodontics depends in a large measure on advancing the ability to coordinate its

theory and practice with a broader understanding and appreciation of oral pathology. A consideration of representative lesions affecting the oral cavity and masticatory apparatus has been presented with the intention of correlating them both as primary and as secondary mechanisms. Developmental anomalies of hereditary and familial type have been confined largely to those associated with fairly well-defined pathologic tissue variations. This relatively small but instructive group was emphasized because it illustrated fundamental changes producing malocclusion through structural', growth and tissue effects. Trauma was considered with respect to its etiologic factors, complications, and sequelae, as both a cause and an effect, of disturbances in Ihe arches. Dental aspects of oral pathology and the relationship of the units to the integrated system were demonstrated[18]. Endocrine disturbances affecting growth, derelopmcnt, and differentiation with particular rrfercnce to the teeth and jaws were rest,rictrd to those proved by well-authenticated evidence based on pathologic, physiologic properties. Nutritional and metabolic derangements were similarly defined. Calcium, phosphorus, and phosphatase were mentioned in particular instances to substantiate the reliability of interpretations supported by physiological chemistry. Other dystrophies of idiopathic etiology but with orthodontic significance were presented because of their frequent, association with constitutional disorders of which the oral manifestations were secondary but occasionally revealing. Inflammation and infection were particularly emphasized because their operation was indicative of causative and sequential processes in both oral pathologjr and orthodontics. Cystic lesions were described with the intention of relating their initiating stimuli to orthodontic problems. Their pathologic significance and their histogenesis were illustrated on this basis, although orthodontic sequelae were also discussed. Neoplastic disease of various types was considered, more particularly with respect to its effects on the arches. The prophylactic value of orthodontic control of lesions predisposing to benign and malignant tumors was emphasized. The progress of orthodontics depends in a large measure on advancing the ability to coordinate its theory and practice with a broader understanding and appreciation of oral pathology. Well-advanced cases with these changes have them as secondary manifestations incidental to the progress of the disease. In other instances of slow growth with absence of other symptoms the orthodontic aspects may first appear prominent. They may actually become normal after surgical intervention or radiotherapy. Ameloblastoma has been mentioned in connection with the odontogenic cysts because of its potential origin from the epithelium of these structures. This is of sufficiently variable and pleomorphic nature that the ameloblastomas. Acute apical periodontitis, and the apical granuloma when large size the cysts may impair the structural integrity of the attachments of adjacent members of the arch [19].Secondary infection and the need for extensive operative intervention are other features that give this common lesion. Additional orthodontic significance in young subjects lies mainly. The lining membrane is usually of polyhedral or well-differentiated, stratified, squamous epithelium. Follicular odontogenic cysts of dentigerous or paradental type are also likely to be the effects as well as the causes of disturbances of the dental apparatus .They are of more serious pathologic significance because of their relationship to multiple types ,the possibility of the development of other cysts, and ameloblastoma. This is particularly evident in those with atypical epithelium of reticular

stellate and ameloblastic characteristics Nasopalatine cysts are of different origin and structure, occur less frequently, and usually do not reach the size of those of odontogenic origin. Suppurative inflammation in the gingiva and the periodontium is associated with more exudation, hyperemia, edema, and necrosis where extension to the underlying bone is more real. Prognosis as to restitution of the tissues to their previous status is less favorable. This is particularly important when such lesions occur in the deciduous dentition .Abscess formation may supervene in cases with sufficient exudation and necrosis. The loss of teeth and bone structure in the course of surgical intervention may have definite orthodontic significance in young subjects. Lipoma, connective tissue pathoogy is the least common category of soft-tissue disease found in children. Where tumors of endothelial origin; however, a small number of lipomas is observed in children.It may also be present in the parotid or submandibular glands. Most present as asymptomatic soft submucosal masses with an average diameter of just 2 cm.Although there are many histologic variants, most are classical lipoma, which comprises lobules of mature adipocytes with a fibrous capsule. Recurrence is rare after conservative excision. Rhabdomyosarcoma is the most common pediatric sarcoma of the head and neck and accounts for approximately 60% of sarcomas in children[20]. Although rhabdomyosarcoma can present anywhere, the most frequent site is the head and neck. Intraoral presentations are uncommon; however, extraoral examination may identify lesions outside the oral cavity. The clinical presentation is usually a painless submucosal mass; it may present with symptoms such as nasal congestion and ear or facial pain. Where, cranial nerve deficits are reported, including facial palsy. The most common histologic types are embryonal rhabdomyosarcoma (ERMS), which is the most common in children, and alveolar rhabdomyosarcoma (ARMS), which is more common in older children and young adults. ERMS comprises round to spindle cells with hyperchromatic nuclei and scant cytoplasm with occasional rhabdomyoblasts. Ewing's Sarcoma -Although commonly presenting as primary bone tumors, soft-tissue Ewing sarcomas are also seen in up to 30% of patients with head and neck Ewing sarcoma. Most head and neck Ewing sarcomas occur in children and young adults They may present with pain, a mass, or weakness, or as incidental findings. The histology of these tumors is sheets and groups of small, round, uniform cells. A diagnosis of Ewing sarcoma is confirmed with molecular studies demonstrating an EWSR1 gene fusion. Most are treated with a combination of resection and radiotherapy, with others with surgery or radiotherapy alone. Five-year survival for multimodal treatment is up to 87%. Squamous cell carcinoma is the most common malignant tumor of the oral cavity in adults,8 and its incidence is rising. It usually presents as a firm lump, a nodular lesion, or an ulcer with raised margins , although it can also present as leukoplakia or erythroplakia.62 It may cause erosion of bone, trismus, mobility of the teeth, or pain depending on the site involved.57 Moreover, the initial presentation may include a neck lump in which the tumor has metastasized to the neck lymph nodes. Early referral is essential. Bacterial superinfection can occur due to the impossibility of brushing due to pain. Healing occurs in 2 weeks without sequelae. During this period, the patient is contagious through direct contact with infected secretions (saliva). The first contact with the HSV usually goes unnoticed[21]. Symptoms are triggered in only 10% of cases. Differential diagnoses include other viral pediatric diseases: herpangina; hand, foot, and

mouth disease; and chicken pox. Others that should also be considered are infectious mononucleosis, bacterial angina, oral aphthosis in its miliary form (without GSA oradenopathy), rarely erythema multiforme, or drug toxicity. The treatment of a primary herpes infection is based on a symptomatic component (analgesic, antiseptic, and antibiotic) and an etiological component (antiviral in the replicative phase, acyclovir type, systemically). Recent literature reports quite a small number of studies dealing with frequency and type of oral mucosal lesions during orthodotic treatment. Conversely, clinical experience shows that lesions of oral mucosa in wearers of orthodontic appliances are pretty common findings in everyday practice, thus affecting the motivation and duration of orthodontic therapy. Therefore, the aim of this study was to examine the frequency and type of mucosal lesions in the wearers of orthodontic appliances and to compare these results with a control group of patients who were diagnosed malocclusion, and were not actively involved in orthodontic treatment. The severity of oral mucosa inflammation was determined and graded based on the following clinical criteria indicates barely visible localized inflammatory reaction presented by a lighter red colour . Better oral hygiene was observed in wearers of orthodontic appliances who previously acquired oral hygiene instructions from their orthodontist, before even such an orthodontic treatment commenced. Ay et al. 21 showed that the oral hygiene motivation method performed by patients under the supervision of their clinician allowed more successful elimination of plaque as well as inflammatory symptoms in patients with fixed orthodontic appliances. In the wearers of orthodontic appliances, the use of adjuncts such as electric toothbrushes, interproximal brushes, chlorhexidine mouthwashes, fluoride mouthwashes, and regular professional cleaning should be introduced in an everyday hygiene regimen[22]. However, in performing oral hygiene measures, the patient's motivation is the key to assessing satisfactory oral hygiene status. Patients who were unable to maintain a healthy oral environment in the absence of orthodontic appliance had even worse oral hygiene when fixed orthodontic appliances were placed on the teeth. Among the studies we assessed, very few were dealing with the frequency and type of oral mucosal lesions in wearers of orthodontic appliances. Therefore, this research was undertaken to determine the frequency and type of these lesions in both wearers of orthodontic appliances and in children with malocclusion. More mucosal lesions were present in patients with orthodontic appliances as a result of trauma. Clinical appearance of mucosal lesions and their localization were associated with the type of orthodontic appliance. Being able to prevent and treat these lesions would consequently reduce pain and increase patients' motivation. Following good oral hygiene instructions acquired prior to starting the treatment is vitally important in order to subsequently avoid gingival inflammation and hard tissue damage. Travess et al.1 , ulceration or hyperplasia, in the fixed orthodontic patients, resulted from irritation caused by the arch wire and bonds, or wire resting against the lips. In the wearers of removable orthodontic appliances, mucosal inflammation was the most frequent finding. Inflammation of the palatal mucosa under palatal plate was related to yeast infection, whereas erosions mostly occurred as a result of irritation caused by interdental clasps or unsuitable habit caused by tongue pushing the palatal screw and consequently resulting in tongue injury. Damaged epithelium of oral lesions in which nerve endings are exposed provokes painful sensation. Data from the literature mostly

focuses on pain as a consequence of application of forces to induce tooth movement rather than pain resulting from oral mucosal lesions. According to Bergius et al., motivation is the willingness to endure pain during orthodontic treatment. Therefore, preventing oral lesions means preventing pain and increasing patient's motivation. Gingival inflammation was more frequently observed in 77% of subjects from both groups[23]. The severity and frequency of gingival inflammation was higher in patients with poorer oral hygiene status. In the experimental group, the intensity of gingival inflammation was higher in wearers of fixed orthodontic appliances compared with wearers of removable orthodontic appliances. This complies with other studies, which proved that almost all patients' wearers of fixed orthodontic appliances experienced gingival inflammation. The localization of gingival inflammation in these patients was present in marginal gingiva of the upper and lower jaws. According to Rafe et al. This site is where plaque is usually accumulated in wearer of fixed orthodontic appliances. Gingival inflammation was more present in boys and younger patients as a result of poor oral hygiene. Conversely, data from the literature suggested that younger patients cooperate better[24,25].

Conclusion

Pathologies in oral cavity might be of benign or acute category encountered in orthodontic practice. Management include removal of etiology and oral prophylaxis. Mostly the lesions are of reactive in nature. Viral pathologies might manifest as vesicles. Referral to oral and maxillofacial pathology is necessary to perform next level investigations in realtion to the pathology in order to arrest the further propagation of disease and deterioration of the health of patient.

References:

1) Sicard, Ludovic & Benmoussa, L. & Moreau, Nathan & Salmon, Benjamin & Anne-Laure, Ejeil. (2018). Orthodontics and oral mucosal lesions in children and teenagers. Journal of Dentofacial Anomalies and Orthodontics. 21. 207. 10.1051/odfen/2018056.
2) Raymond Gettinger. Relationship of orthodontics to oral pathology. American Journal of Orthodontics and Oral Surgery. Volume 24, Issue 12,1938,Pages 1124-1161,ISSN 0096-6347,https://doi.org/10.1016/S0096-6347(38)90334-5.
3) Kuhlberg A.J.Norton L.A.Pathologic findings in orthodontic radiographic images.Am J Orthod Dentofacial Orthop. 2003; 123: 182-184https://doi.org/10.1067/mod.2003.4
4) Cedro M.K.Moles D.R.Hodges S.J.Adult orthodontics—who's doing what?.J Orthod. 2010; 37: 107-117https://doi.org/10.1179/14653121042966
5) Keim R.G.Gottlieb E.L.Nelson A.H.Vogels 3rd, D.S.2013 JCO Orthodontic Practice Study. Part 1: trends.J Clin Orthod. 2013; 47: 661-680.NO DOI AVAILABLE
6) Hankinson P, Brierley C, Brierley D. A review of oral pathology in orthodontics. Part 1: soft-tissue pathology. Am J Orthod Dentofacial Orthop. Epub 2023 Nov 6.https://doi.org/10.1016/j.ajodo.2023.09.012
7) Jones A.V.Craig G.T.Franklin C.D.Range and demographics of odontogenic cysts diagnosed in a UK population over a 30-year period.J Oral Pathol Med. 2006; 35: 500-507https://doi.org/10.1111/j.1600-0714.2006.00455.x

8) Jones A.V.Franklin C.D.An analysis of oral and maxillofacial pathology found in children over a 30-year period.Int J Paediatr Dent. 2006; 16: 19-30https://doi.org/10.1111/j.1365-263x.2006.00683.x
9) Jones A.V.Franklin C.D.An analysis of oral and maxillofacial pathology found in adults over a 30-year period.J Oral Pathol Med. 2006; 35: 392-401https://doi.org/10.1111/j.1600-0714.2006.00451.x
10) Odell E.Cawson's essentials of oral pathology and oral medicine.Elsevier Health Sciences, London, England2015.NO DOI AVAILABLE
11) Mortensen H.Winther J.E.Birn H.Periapical granulomas and cysts. An investigation of 1,600 cases.Scand J Dent Res. 1970; 78: 241-250.NO DOI AVAILABLE
12) Martin L.H.C.Speight P.M.Odontogenic cysts: an update.Diagn Histopathol. 2017; 23: 260-265https://doi.org/10.1016/j.mpdhp.2017.04.006
13) Al-Groosh DH, Abid M, Saleh AK. The relationship between orthodontic treatment and temporomandibular disorders: A dental specialists' perspective. Dental Press J Orthod. 2022 Apr 11;27(1):e2220406. doi: 10.1590/2177-6709.27.1.e2220406.oar.
14) Sonnesen L, Bakke M, Solow B. Temporomandibular disorders in relation to craniofacial dimensions, head posture and bite force in children selected for orthodontic treatment. Eur J Orthod. 2001;23(2):179–192https://doi.org/10.1093/ejo/23.2.179
15) Suvinen TI, Reade PC, Kemppainen P, Könönen M, Dworkin SF. Review of aetiological concepts of temporomandibular pain disorders Towards a biopsychosocial model for integration of physical disorder factors with psychological and psychosocial illness impact factors. Eur J Pain. 2005;9(6):613–633. https://doi.org/10.1016/j.ejpain.2005.01.012
16) Casanova-Rosado JF, Medina-Solís CE, Vallejos-Sánchez AA, Casanova-Rosado AJ, Hernández-Prado B, Ávila-Burgos L. Prevalence and associated factors for temporomandibular disorders in a group of Mexican adolescents and youth adults. Clin Oral Investig. 2006;10(1):42–49. https://doi.org/10.1007/s00784-005-0021-4
17) Loster JE, Osiewicz MA, Groch M, Ryniewicz W, Wieczorek A. The Prevalence of TMD in Polish Young Adults. J Prosthodont. 2017;26(4):284–288. https://doi.org/10.1111/jopr.12414
18) Motghare V, Kumar J, Shivalingesh KK, Kushwaha S, Anand R, Gupta B. Association between harmful oral habits and sign and symptoms of temporomandibular joint disorders among adolescents. J Clin Diagnostic Res. 2015;9(8):ZC45–ZC48. https://doi.org/10.7860/jcdr/2015/12133.6338
19) Gauer RL, Semidey MJ. Diagnosis and treatment of temporomandibular disorders. Am Fam Physician. 2015;91(6):378–386.NO DOI AVAILABLE
20) Thilander B, Rubio G, Pena L, Mayorga C. Prevalence of temporomandibular dysfunction and its association with malocclusion in children and adolescents An epidemiologic study related to specified stages of dental development. Angle Orthod. 2002;72(2):146–154. https://doi.org/10.1043/0003-3219(2002)072%3C0146:potdai%3E2.0.co;2

21) Manfredini D, Stellini E, Gracco A, Lombardo L, Nardini LG, Siciliani G. Orthodontics is temporomandibular disorder-neutral. Angle Orthod. 2016;86(4):649–654. https://doi.org/10.2319/051015-318.1
22) Fernández-González FJ, Cañigral A, López-Caballo JL, Brizuela A, Moreno-Hay I, Río-Highsmith JD. Influence of orthodontic treatment on temporomandibular disorders A systematic review. J Clin Exp Dent. 2015;7(2):e320–e327. https://doi.org/10.4317/jced.52037
23) Conti A, Freitas M, Conti P, Henriques J, Janson G. Relationship between signs and symptoms of temporomandibular disorders and orthodontic treatment A cross-sectional study. Angle Orthod. 2003;73(4):411–417. https://doi.org/10.1043/0003-3219(2003)073%3C0411:rbsaso%3E2.0.co;2
24) Amadori F, Bardellini E, Conti G, Majorana A. Oral mucosal lesions in teenagers: a cross-sectional study. Ital J Pediatr 2017;43(1):50. https://doi.org/10.1186/s13052-017-0367-7
25) Baricevic M, Mravak-Stipetic M, Majstrorovic M, Baranovic M, Baricevic D, Loncar B. Oral mucosal lesions during orthodontic treatment. Int J Paediatr Dent 2011;21(2):96-102. https://doi.org/10.1111/j.1365-263x.2010.01078.x