Evaluation of Association between Skeletal Facial Form and Impacted Maxillary Molar Teeth

S. Umayal[1], Dr. M.P. Santhosh Kumar[2*]

Article History: Received: 12.12.2022 **Revised:** 29.01.2023 **Accepted:** 15.03.2023

Abstract

Objectives: A pathological condition known as dental impaction occurs when a tooth is unable or unable to erupt into its natural position for function. The first choice method for determining how the third molars relate to anatomic formations is to use panoramic radiographs. To reduce the likelihood of complications during the surgical extraction of impacted teeth, it is crucial to conduct the required radiological and clinical examinations and obtain a complete medical history prior to the procedure. The aim of the study was to evaluate the association between Maxillary impacted teeth and Skeletal Facial types.

Materials and Methods: The third molar locations of patients with cephalometric and panoramic radiographs, as well as their relationships with the facial extraoral view, were examined in the current retrospective investigation. With ethical consent, the data was gathered from patients who were reported to our esteemed hospital between March 2021 and April 2023.Using SPSS, the obtained data were assessed. Statistical analysis was done using SPSS software.

Results: From the obtained results we can say that class 1 maxillary third molar impactions were mostly seen with patients with mesocephalic skeletal profile, class 2 maxillary third molar impactions were mostly seen in dolichocephalic and patients with brachycephalic shows class 3 type of maxillary third molar impactions.

Conclusion: According to the findings of this study, it was found that Class 1 maxillary third molar impactions are more common in patients with mesocephalic skeletal profiles, class 2 impactions are more common in dolichocephalic patients, and class 1 impactions are more common in brachycephalic patients. Thus, it can be concluded that maxillary impacted third molars are significantly associated with Skeletal facial types.

Keywords: Impacted teeth, Facial aspects, Third molars, Cephalometrics

[1]Graduate student,Department of Oral and Maxillofacial Surgery,Saveetha Dental college and hospital, Saveetha Institute of medical and technical science, Saveetha University, Chennai - 600077 Tamil Nadu,India.
[2*]Professor, Department of Oral and Maxillofacial Surgery, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Saveetha university, Chennai - 600077Tamil Nadu, India

DOI: 10.31838/ecb/2023.12.s2.191

1. Introduction

The term "impacted tooth" refers to teeth that have been partially or totally retained in the bone or soft tissue after having failed to erupt into their proper position in normal occlusion after the typical eruption period [1]. A pathological condition known as dental impaction occurs when a tooth is unable or unable to erupt into its natural working position [2]. Although the timing of wisdom teeth eruption varies depending on factors like a person's genetic make-up, eating habits, the teeth's functional role, and racial differences, it typically happens between the ages of 17 and 23 years [3]. Inadequate space, mechanical obstacles (cysts, tumors, tissue hyperplasias, local infections, etc.), traumas, and the persistence of postorthodontic treatment results are some local and systemic variables that might induce incomplete eruption of wisdom teeth [4,5].

Maxillary Impacted teeth can be classified based on Archer's classification. According to the Archer classification, the relation between the upper third molar and the second molar was also categorized [5,6]. Class A third molars have their occlusal planes between the cervical line of their contouring second molars, Class B third molars have their occlusal planes between the middle third of their adjacent second molar roots, and Class C third molars have their occlusal planes within the apical third of their adjacent second molar roots [7,8].

The first-choice method for determining how the third molars relate to anatomic formations is to use panoramic radiography [9,10]. Before the surgical removal of impacted teeth, the required radiological and clinical evaluations, as well as a detailed medical history, must be performed to avoid potential complications [11]. Cephalometric pictures have been used in the planning of orthodontic and surgical procedures as well as the cephalometric analysis of craniofacial structures [12,13]. In order to determine the correlation with both cephalometric measurements and anatomical formations in the area and to provide more accurate information prior to surgical treatments, they are used to assess the location of the upper third molars and their relationship to anatomical formations [13–15].

Face vertical abnormalities are brought on by a variety of factors that interact during the growth phase. The maxilla and mandible's different rates of growth, the functions of the tongue and lips, thumb sucking, long-term pacifier and bottle use, environmental and functional elements such nasal airway obstruction, and the formation of the dentoalveolar bone after tooth eruption are among these factors [16]. According to the patient's potential for growth, maxillary development has been documented to vary in direction. Given that the maxilla and mandible keep growing in harmony, it has been observed that the maxillary growth in patients with decreased vertical dimension tends to move further forward than among patients with greater vertical dimension [17–19].Our team has extensive knowledge and research experience that has translate into high quality publications[20–29]. The aim of the study was to evaluate the association between Maxillary impacted teeth and Skeletal Facial types.

2. Materials and Methods

Cephalometrics and the Facial view of the patients with impacted third molars mostly in the maxillary region. About 50 data samples were collected, from the clinical records of our esteemed institution. They were grouped according to the types of impaction given by archers, Class 1, Class 2, Class 3. The skeletal facial types are mesocephalic, Brachycephalic and dolichocephalic and respectively (Figures 1-3). The analysis was done and it was proved statistically with SPSS software using Chi - Square test.

Figure 1: Patient with mesocephalic profile and impacted maxillary third molar

Figure 2: Patient with brachycephalic profile and impacted maxillary third molar

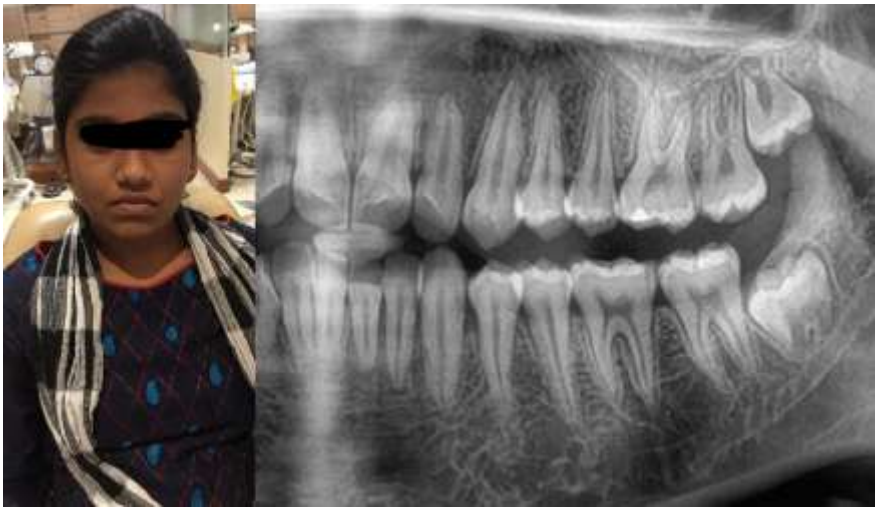


Figure 3: Patient with dolichocephalic profile and impacted maxillary third molar

3. Results

In this study, we have assessed about 50 patient's cephalometrics and skeletal facial types with their extra oral profile and the results were analyzed using SPSS software and the results are represented as graphs. From Figure 4, we can see that Among 50 patients, 46% of them were females and 54% were males. In this following pie chart, it shows that red color indicates females and yellow color indicates males.

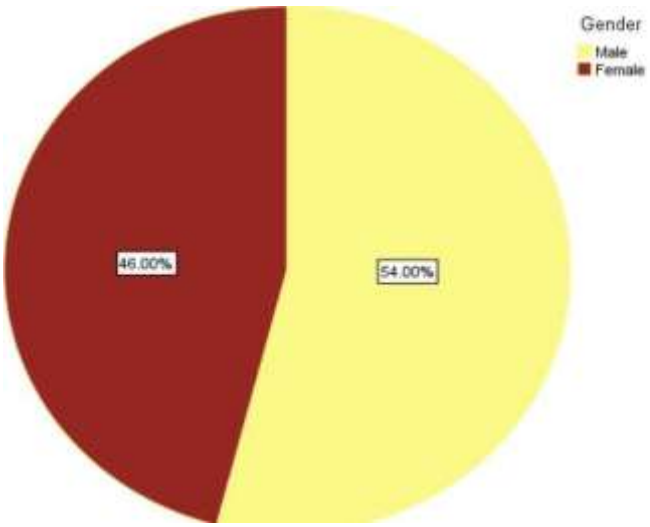
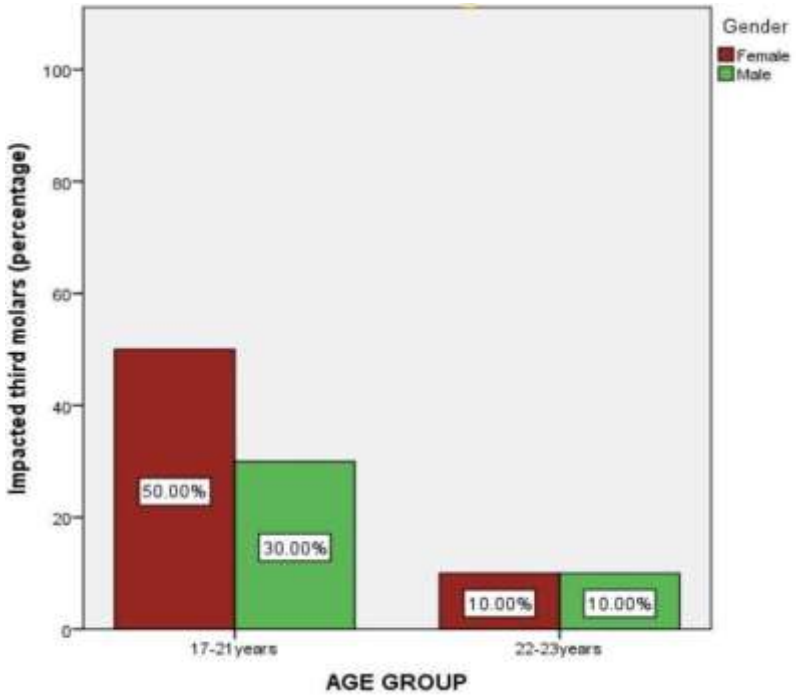


Figure 4 depicts the gender distribution of our study participants.

Figure 5 shows about 50% of them were female, 30% were males between the age group 17-21 years and 10% of them are females and males between the age group 22-23years. Here the red colour bar indicates females and green colour bar indicates males



. Figure 5 depicts age and gender of our study participants.

Figure 6 represents the types of impactions based on archer's classification, class 1, 2 and 3. Here red colour denotes class 1 maxillary third molar impactions, green colour shows class 2 maxillary third molar impactions. and yellow colour shows class 3 maxillary third molar impactions. From this graph we can see that 52% of them were class 1 impaction, 36% were class 2 impaction and 12% were class 3 impaction.

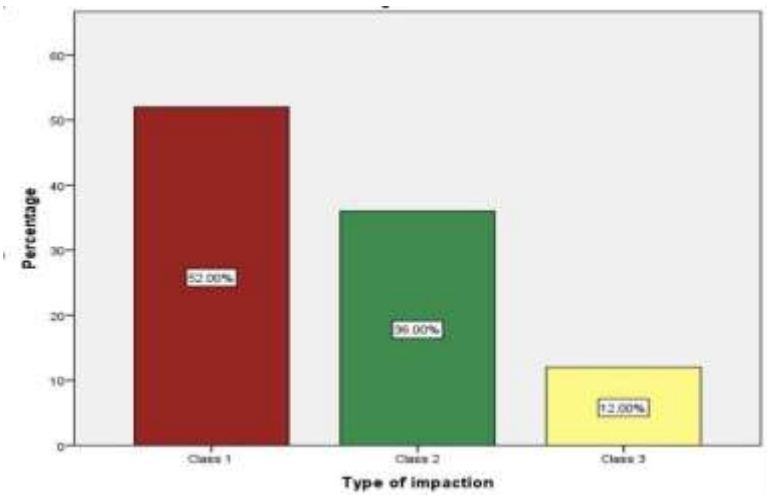


Figure 6 depicts types of impacted maxillary molar teeth in our study.

From Figure 7, we can see that about 45% of them were Mesocephalic, 40% were Dolichocephalic and 15% Brachycephalic. In this graph Dark blue colour shows Mesocephalic and light blue colour shows Dolichocephalic and Purple colour shows Brachycephalic.

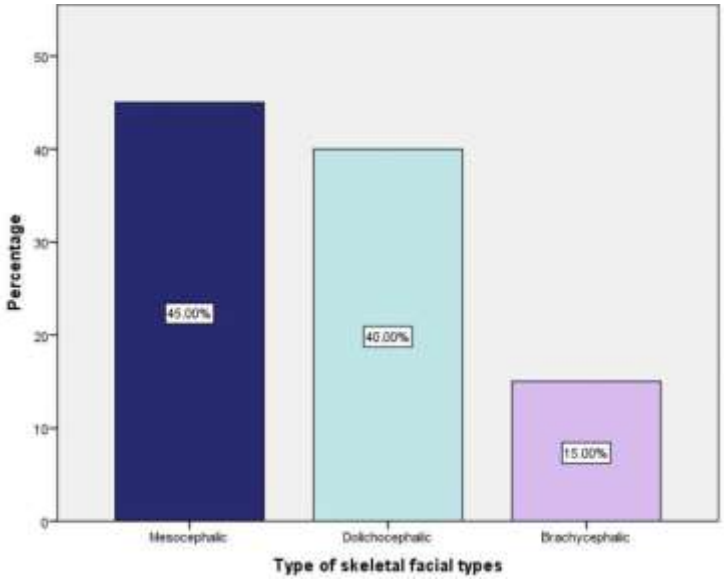


Figure 7 depicts skeletal facial types in our study.

From Figure 8, we can see that mostly 32% of the male population were with class 1 type of maxillary third molar impactions, and at least 4% of the male population with class 3 type of impaction. Among the female population 20% of them were with class 1 impaction and 8% were with class 3 impaction. Red colour denotes class 1, green colour denotes class 2 and yellow colour denotes class 3 type of maxillary third molar impactions.

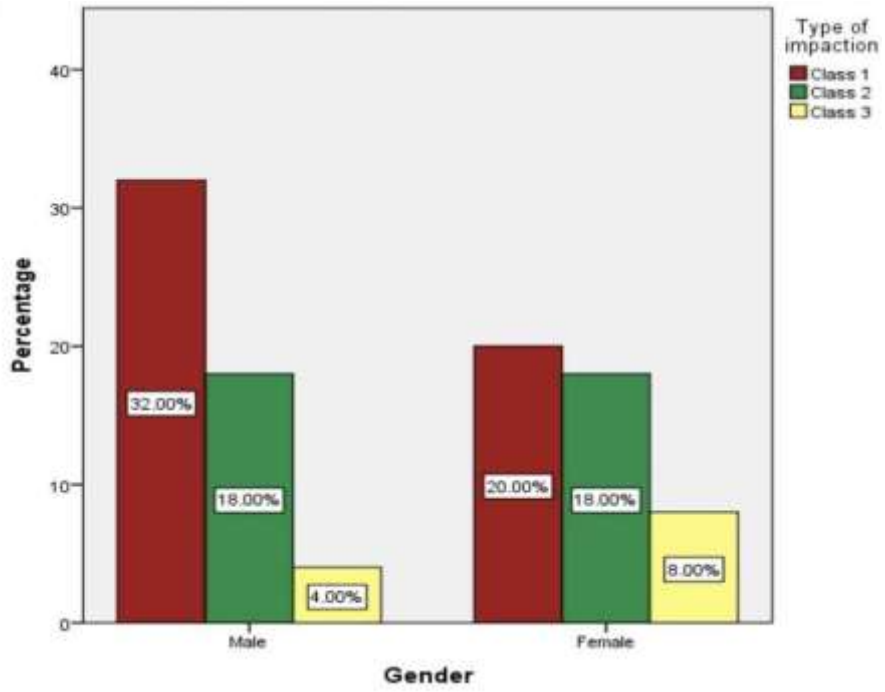


Figure 8 depicts association between gender and type of impaction.

From figure 9, we can see that patients who are with mesocephalic skeletal profile are more prone to class 1(25%) type of third molar impactions and least with class 3 (5%) third molar impactions. In dolichocephalic patients were mostly with class 2 (15%) third molar impactions and least with class 3 (5%) type of third molar impactions. For brachycephalic, class 1 type of impaction was higher (10%) and least with class 3 (5%). In figure 6, Red colour denotes mesocephalic, Green colour denotes dolichocephalic and Yellow represents brachycephalic.

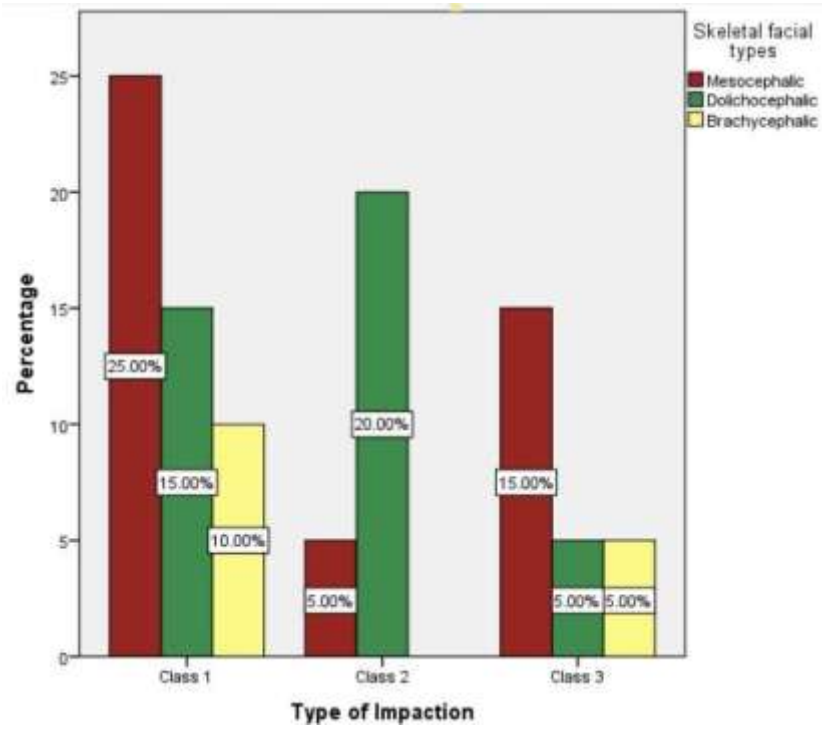


Figure 9 depicts association between skeletal facial types and type of impaction.

From the obtained results we can say that class 1 maxillary third molar impactions were mostly seen with patients with mesocephalic skeletal profile, class 2 maxillary third molar impactions were mostly seen in dolichocephalic and patients with

brachycephalic shows class 1 type of maxillary third molar impactions.

4. Discussion

Impacted teeth are those that did not emerge into the dental arch in time to fit into a normal occlusion and are either entirely or partially held in the bone or soft tissue [3]. Insufficient room, the wisdom tooth's unique dentition and eruptive circumstances, and the distance and orientation they traveled during eruption from other teeth all contribute to the difficulty in third molars settling into the dental arch. The eruption of the upper third molars is completed with an entirely opposite movement since they do not fit within the parameters of orthodontic theory. While the top wisdom teeth can migrate three ways—downward, backward, and outward—the upper second molar emerges in a downward and forward manner.

Cha et al. classified the patient groups based on their vertical dimensions using the SN-GoMe angle. On the contrary, Pavoni et al. classified patients with malocclusion of Class III based on the vertical development of the SN-MP angle [30]. Yoshida et al. categorized the cases depended on the FMA angle [11] while Koh and Chung did so depending on the FMA angle and periorbital height [11,31].

The Jarabak [32–34] ratio is also intended to be included in the criterion because the SNGoMe angle is also influenced by the skull base plan, which can differ between individuals. The vertical development patterns of the face are studied in three ways: hyperdivergent (high angle), hypodivergent (low angle), and normal divergent (normal angle), and these patterns vary based on numerous conditions during development. A clockwise rotation of the mandible occurs if the rate of vertical development in the condyles is slower than the rate of vertical development in the facial incisions (maxilla) and/or alveolar processes. These factors include the development of the jaws, dentoalveolar development, tooth eruption, and the function of the lips and tongue (hyperdivergent growth model).

Based on the findings of the cephalometric analyses conducted in our study, it is believed that the rise in maxilla skeletal unit in males is what causes the increase in maxillary anterior face height and S-GO length measurement. Contrary to our findings, Costa et al are three-dimensional KILT studies [35] found no relationship between both the anterior face height and the maxillary posterior vertical alveoli and subsequently PTM. Contrarily, Rothstein and Yoon-Tarlie observed in their longitudinal study [36], a statistically positive link among anterior face heights and maxilla posterior heights in people aged 10 to 12 years, which is also consistent with our findings. Population differences are regarded to be the root cause of this.

According to Tsunori et al. [36], there is a connection between increased muscular activity and the growth of the maxillofacial complex in the vertical and transverse dimensions. Chin soft-tissue measurements were shown to be lower in hyperdivergent people compared to normal and hypodivergent adults by Macari and Hanna [37,38]. Similar findings were made by Celikoglu et al. [37] who found that both male and female high-angle individuals had thinner soft tissue. The number of impacted upper wisdom teeth has been found to be higher in females than in males in the majority of cases as a result of the PTM fissure evaluations based on the localizations of patient populations who were categorized according to gender and the presence of wisdom tooth, though the difference in question was not found to be statistically significant ($P > 0.05$) [37].

According to Grippaudo et al.[39] persons with high angles had longer upper arcs than those with low angles. No gender disparity was discovered in our investigation. Tusel etal [40] a similarly to other research in the literature do not highlight a variation within incidence of impacted teeth according to gender. The incidence of impacted teeth was discovered to be higher in females than in males in the study conducted by Dural et al, [32] and this finding was statistically supported. In line with the findings of Tusel et al., maxillary third molar teeth were most frequently detected in mesioangular and vertical positions, whereas upper third molar teeth were most frequently observed in vertical position [41,42]

Fewer distoangular positions and fewer horizontal positions were seen, according to their observations. Insufficient retromolar space was found to be significantly connected to tooth impaction, according to Hattab and Alhaija, and even in cases where there was adequate retromolar space, a 17% impaction rate was still seen [41,43]. Our team has extensive knowledge and research experience that has translate into high quality publications in this domain (34-43).

5. Conclusion

Within the limitations of the study it is concluded that there is correlation between Maxillary molar impaction and Skeletal facial types. Class 1 maxillary third molar impactions are more common in patients with mesocephalic skeletal profiles, class 2 impactions are more common in dolichocephalic patients, and class 3 impactions are more common in brachycephalic patients. Further studies with more sample size can be conducted for significant results.

6. References

Shepherd JP, Brickley M. Surgical removal of third molars. *BMJ* 1994; 309: 620–621.

van der Linden W, Cleaton-Jones P, Lownie M.

Diseases and lesions associated with third molars. Review of 1001 cases. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 1995; 79: 142–145.

Mercier P, Precious D. Risks and benefits of removal of impacted third molars. A critical review of the literature. *Int J Oral Maxillofac Surg* 1992; 21: 17–27.

Walker L, Enciso R, Mah J. Three-dimensional localization of maxillary canines with cone-beam computed tomography. *Am J Orthod Dentofacial Orthop* 2005; 128: 418–423.

Winter GB. *Principles of Exodontia as Applied to the Impacted Mandibular Third Molar: A Complete Treatise on the Operative Technic with Clinical Diagnoses and Radiographic Interpretations*. 1926.

Liedholm R. *Mandibular Third Molar Removal: Patient Preferences, Assessments of Oral Surgeons and Patient Flows*. 2005.

Hasegawa T, Tachibana A, Takeda D, et al. Risk factors associated with oroantral perforation during surgical removal of maxillary third molar teeth. *Oral Maxillofac Surg* 2016; 20: 369–375.

Ogle OE. *Advanced Intraoral Surgery, An Issue of Oral and Maxillofacial Surgery Clinics of North America*. Elsevier Health Sciences, 2021.

Tweed CH. Indications for the extraction of teeth in orthodontic procedure. *Am J Orthod Oral Surg* 1944; 42: 22–45.

Williams S, Melsen B. Condylar development and mandibular rotation and displacement during activator treatment. An implant study. *Am J Orthod* 1982; 81: 322–326.

Yoshida I, Shoji T, Mizoguchi I. Effects of treatment with a combined maxillary protraction and chincap appliance in skeletal Class III patients with different vertical skeletal morphologies. *Eur J Orthod* 2007; 29: 126–133.

Rahaim JA. *Craniofacial Changes Following Non-extraction Orthodontic Treatment: A Long-term Cephalometric Analysis*. 2011.

Greear HH, St. Louis University. School of Dentistry. *A Lateral Cephalometric Longitudinal Growth Analysis of Craniofacial Patterns of Children Ages 6.5-11.4 Years*. 1972.

Archer WH. *Oral and Maxillofacial Surgery*. W.B. Saunders Company, 1975.

Moore UJ. *Principles of Oral and Maxillofacial Surgery*. Wiley-Blackwell, 2001.

Southard TE, Marshall SD, Bonner LL. *Orthodontics in the Vertical Dimension: A Case-Based Review*. John Wiley & Sons, 2015.

Henderson D. *Color Atlas and Text of Orthognathic Surgery: The Surgery of Facial Skeletal Deformity*. Mosby Incorporated, 1986.

Kumar MS, Vamsi G, Sripriya R, et al. Expression of matrix metalloproteinases (MMP-8 and -9) in chronic periodontitis patients with and without diabetes mellitus. *J Periodontol* 2006; 77: 1803–1808.

Felicita AS, Chandrasekar S, Shanthasundari KK. Determination of craniofacial relation among the subethnic Indian population: a modified approach - (Sagittal relation). *Indian J Dent Res* 2012; 23: 305–312.

Ramesh A, Varghese S, Jayakumar ND, et al. Comparative estimation of sulfiredoxin levels between chronic periodontitis and healthy patients - A case-control study. *J Periodontol* 2018; 89: 1241–1248.

Vijayashree Priyadharsini J. In silico validation of the non-antibiotic drugs acetaminophen and ibuprofen as antibacterial agents against red complex pathogens. *J Periodontol* 2019; 90: 1441–1448.

Priyadharsini JV, Vijayashree Priyadharsini J, Smiline Girija AS, et al. In silico analysis of virulence genes in an emerging dental pathogen A. baumannii and related species. *Archives of Oral Biology* 2018; 94: 93–98.

Teja KV, Ramesh S, Priya V. Regulation of matrix metalloproteinase-3 gene expression in inflammation: A molecular study. *J Conserv Dent* 2018; 21: 592–596.

Manohar MP, Sharma S. A survey of the knowledge, attitude, and awareness about the principal choice of intracanal medicaments among the general dental practitioners and nonendodontic specialists. *Indian J Dent Res* 2018; 29: 716–720.

Nandakumar M, Nasim I. Comparative evaluation of grape seed and cranberry extracts in preventing enamel erosion: An optical emission spectrometric analysis. *J Conserv Dent* 2018; 21: 516–520.

Varghese SS, Ramesh A, Veeraiyan DN. Blended Module-Based Teaching in Biostatistics and Research Methodology: A Retrospective Study with Postgraduate Dental Students. *J Dent Educ* 2019; 83: 445–450.

Panchal V, Jeevanandan G, Subramanian E. Comparison of instrumentation time and obturation quality between hand K-file, H-files, and rotary Kedo-S in root canal treatment of primary teeth: A randomized controlled trial. *J Indian Soc Pedod Prev Dent* 2019; 37: 75–79.

Nair M, Jeevanandan G, Vignesh R. Comparative evaluation of post-operative pain after pulpectomy with k-files, kedo-s files and mtwo files in deciduous molars-a randomized clinical trial. *Braz Dent J*, https://bds.ict.unesp.br/index.php/cob/article/view/1617 (2018).

Felicita AS. Orthodontic extrusion of Ellis Class VIII fracture of maxillary lateral incisor - The sling shot method. *Saudi Dent J* 2018; 30: 265–269.

Pavoni C, Masucci C, Cerroni S, et al. Short-term effects produced by rapid maxillary expansion and facemask therapy in Class III patients with different vertical skeletal relationships. *Angle Orthod* 2015; 85: 927–933.

Koh S-D, Chung DH. Comparison of skeletal anchored facemask and tooth-borne facemask according to vertical skeletal pattern and growth stage. *Angle Orthod* 2014; 84: 628–633.

CAN IMPACTION OF THE THIRD MOLAR BE PREDICTED? *The Lancet* 1937; 229: 579.

Baker SB, Patel PK, Weinzweig J. *Aesthetic Surgery of the Facial Skeleton - E-Book*. Elsevier Health Sciences, 2021.

Hamdan AL, Sataloff RT, Trollinger V, et al. *Dentofacial Anomalies: Implications for Voice and Wind Instrument Performance*. Springer Nature, 2021.

Mahasantipiya PM, Savage NW, Monsour PAJ, et al. Narrowing of the inferior dental canal in relation to the lower third molars. *Dentomaxillofacial Radiology* 2005; 34: 154–163.

Tsunori M, Mashita M, Kasai K. Relationship between facial types and tooth and bone characteristics of the mandible obtained by CT scanning. *Angle Orthod* 1998; 68: 557–562.

Celikoglu M, Buyuk SK, Ekizer A, et al. Assessment of the soft tissue thickness at the lower anterior face in adult patients with different skeletal vertical patterns using cone-beam computed tomography. *The Angle Orthodontist* 2015; 85: 211–217.

Macari AT, Hanna AE. Comparisons of soft tissue chin thickness in adult patients with various mandibular divergence patterns. *Angle Orthod* 2014; 84: 708–714.

Grippaudo C, Oliva B, Greco AL, et al. Relationship between vertical facial patterns and dental arch form in class II malocclusion. *Prog Orthod* 2013; 14: 43.

Sandhu S, Kaur T. Radiographic Evaluation of the Status of Third Molars in the Asian-Indian Students. *Journal of Oral and Maxillofacial Surgery* 2005; 63: 640–645.

Kato C, Watari I, Aida J, et al. Factors associated with the eruption of the impacted maxillary third molars after second molar extraction. *Am J Orthod Dentofacial Orthop*. Epub ahead of print 14 July 2022. DOI: 10.1016/j.ajodo.2021.05.018.

Sadry S, Ok U. An evaluation of the relation between the maxillary third molars and facial proportions using cephalometric image. *Journal of Oral and Maxillofacial Radiology* 2019; 7: 49.

S14: Efficacy of molar distalization associated with second and third molar eruption stage. *Evidence-Based Orthodontics* 2018; 118–119.

Gayathri MM. Knowledge and awareness among patients about dental implants. Journal of Pharmaceutical Sciences and Research. 2016 May 1;8(5):351.

SK M. Knowledge, attitude, and practices regarding infection control among undergraduate dental students. Asian J Pharm Clin Res. 2016;9(1):220-4.

Flores-Mir C, McGrath L, Heo G, Major PW. Efficiency of molar distalization associated with second and third molar eruption stage. The Angle Orthodontist. 2013 Jul;83(4):735-42.