

PREVALENCE OF MAXILLARY CANINE IMPACTION AND ASSOCIATED FACTORS IN CLASS I AND AND CLASS II MALOCCLUSION- A RETROSPECTIVE STUDY

¹Shalini Sathiyamoorthy, ²Ravindra Kumar Jain

¹Saveetha Dental College and Hospital, Saveetha Institute of Medical and Technical Science, Saveetha University Chennai - 600077.

²Associate Professor, Department of Orthodontics, Saveetha Dental College and Hospital, Saveetha Institute of Medical and Technical Science, Saveetha University Chennai - 600077.

¹151501087.sdc@saveetha.com

²ravindrakumar@saveetha.com

ABSTRACT:

The aim of the study was to determine the prevalence of maxillary canine impaction in Class II Division 1 malocclusion. Impacted teeth are defined as teeth that remain incompletely or completely embedded in the jaw bone or mucosa. The maxillary canine is one of the most important teeth in terms of aesthetic and function. The maxillary canine impaction is more frequent than mandibular canine impaction. After the third molars the maxillary canines are the second most frequently impacted teeth. This retrospective study was conducted in a university setting. Data was collected from the patients who visited Saveetha Dental College between June 2019 and March 2020. Among 980 patients who had reported for orthodontic treatment and prevalence of maxillary impaction was calculated. From this data 100 case records of class 1 and 100 case records of class 2 malocclusion cases were selected randomly and variables like age, gender, and frequency of maxillary canine impaction were recorded. The prevalence of maxillary canine impaction was 2.4% according to this study. Gender distribution was 41.6% males and 58.4% females. The results of this study showed that Maxillary canine impaction was more prevalent in females when compared to males (6.6% : 5.2%). Maxillary canine impaction was higher in class I malocclusion when compared to class II division I (8% : 4%) and with higher prevalence in females with Class I malocclusion. However prevalence of canine impaction was not significantly associated with gender and type of malocclusion

KEYWORD: Canine impaction; Class I malocclusion; Class II Division I Malocclusion; Delayed eruption.

INTRODUCTION:

Impacted teeth are defined as those which have delayed eruption or that are not expected to erupt in a correct position based on clinical or radiographic assessment. Various reasons for impaction include presence of adjacent teeth, dense overlying bone, excessive soft tissue and genetic abnormalities (Alejos-Montante *et al.*, 2019). The maxillary canine is one of the most important teeth in terms of the esthetics and function. After the third molars maxillary canines are the second most frequently impacted teeth (Juvvadi *et al.*, 2012)(Kamisetty, 2015). The most common causes for canine impaction are usually localised and are the result of any one or combination of the following factors A) a tooth size - arch length discrepancies B) prolonged retention or early loss of the deciduous canine C) abnormal position of the tooth bud D) presence of the alveolar cleft E) ankylosis F) cystic or neoplastic formation G) Dilaceration of the root H) Iatrogenic origin I) Idiopathic condition (Bishara and Ortho., 1992) Mandibular canine impaction is less frequent compared to maxillary canines (Al-Zoubi *et al.*, 2017).

Sequelae of canine impaction are labial or lingual malpositioning of the impacted tooth, internal resorption, migration of the neighbouring tooth, Dentigerous cyst formation, referred pain. It is estimated that in 0.7% of children in the 10-13 years age group, permanent incisors have resorbed because of ectopic eruption of maxillary canines(Samantha, 2017). On the other hand the presence of impacted canine may cause no untoward effects during the lifetime of the person.(Shafer, Hine and Levy, 1974; Ericson and Kuroi, 1986). Orthodontic movement of a dilacerated tooth is a very challenging situation. Such a clinical situation along with the partially erupted canine and skeletal deep bite requires proper treatment planning to produce a favourable prognosis (Felicita and Sumathi Felicita, 2017)(Felicita, Chandrasekar and Shanthasundari, 2012). The treatment of an impacted canine usually involves surgical exposure of the impacted tooth and orthodontic extrusion of the tooth. Orthodontic extrusion of the tooth can be done in several ways with several advantages and disadvantages (Felicita and Sumathi Felicita, 2018)(Rubika, Sumathi Felicita and Sivambiga, 2015). The lack of treatment can lead to a number of risks including resorption of the roots of neighbouring teeth , cyst formation and development of malocclusion (Watted *et al.*, 2014)(Ramesh Kumar *et al.*, 2011). The impacted teeth will also move through the alveolar bone when adequate forces are delivered (Krishnan, 2015)(Krishnan, Pandian and Kumar, 2018) . Elastic traction can be given by an acrylic plate supported on the maxillary dentition and palate (Vikram and Raj Vikram, 2017)(Felicita, 2017). Implants have become an essential armamentarium component in orthodontic treatment (Sivamurthy and Sundari, 2016))(Dinesh *et al.*, 2013) and Mini screws have been successfully used as temporary anchorage devices for moving impacted teeth (Jain, Kumar and Manjula, 2014)(Viswanath *et al.*, 2015).

The aim of the present study was to determine the association and prevalence of maxillary canine impaction in various malocclusions.

MATERIALS AND METHOD:

The retrospective study was conducted in a university hospital setting, the available data with similar ethnicity was collected from the particular geography location. The trends in other locations were not assessed in this study setting. Ethical approval was given by the institutional ethical committee. This Retrospective study was conducted in a university setting. Data was collected from the patients who visited Saveetha Dental College between June 2019 and March 2020. Among 980 patients who had reported for orthodontic treatment at the Department of Orthodontics, saveetha dental college, prevalence of maxillary canine impaction was calculated. From this data 100 case records of class 1 malocclusion and 100 case records of class II malocclusion were selected randomly and variables like Age, gender, and frequency of maxillary canine impaction were recorded. Case sheets were reviewed and cross verification was done by another examiner to avoid errors. This data was entered in the Excel sheet for tabulation and SPSS importing was done, Chi - Square association test was performed. Frequency of maxillary Canine impaction was the dependent variable and age , gender and type of malocclusion were independent variables.

RESULT AND DISCUSSION:

Out of 200 patient case records selected for the analysis (41.6% Male and 58.4% female)100 were of class I Malocclusion and the rest 100 records of class II malocclusion. The frequency of maxillary canine impaction was more in females when compared to males (6.6% : 5.2%) (Figure 1). The frequency of canine impaction in class 1 and class 2 was 8 and 4 respectively Class I malocclusion was predominantly high when compared to class II division I malocclusion (Figure 2).In class 1 malocclusion group the number of favourable canine impactions were 3 unfavourable were 5. In Class II division I malocclusion group the number of favourable canine impaction was 3 ; and 1 unfavourable. The prevalence of

maxillary canine impaction was not significantly associated with gender and type of malocclusion ($P > 0.005$).

Previous studies (Ramesh Kumar et al., 2011; Sivamurthy and Sundari, 2016), case report analysis (Samantha et al., 2017) (Felicita, Shantha Sundari and Chandrasekar, 2012; Jain, Kumar and Manjula, 2014; Felicita, 2017, 2018; Felicita and Sumathi Felicita, 2017; Krishnan, Pandian and Kumar, 2018) and research like (Dinesh and Saravana Dinesh, 2013; Kamisetty, 2015; Krishnan, 2015; Rubika, Sumathi Felicita and Sivambiga, 2015; Viswanath et al., 2015; Vikram et al., 2017) were conducted which helped us work on the current topic.

Many epidemiological studies regarding the prevalence of impacted maxillary canine have given a vast amount of information on the different types of malocclusion. Different results have been obtained by different authors showing a wide range of variety.

Muhammad Abu Hussein et al..., studied a sample size of 2200 patients in which 38.4% male and 61.6% of female assessed for canine impaction, 3.7% of these had impacted canine. The distribution of malocclusion in his study for Class I malocclusion was 46% and Class II division I malocclusion was 40.24%. In his study the rate of canine impaction in females were predominantly more than men (56% : 43%). Patients with Class I malocclusion were more compared to Class II division I malocclusion (46% : 40.2%). However there is no statistical significance among gender and canine impaction and significant association between type of malocclusion and canine impaction (Watted *et al.*, 2014). Hence the overall consensus was in concordance with the present study.

Gabriele Di Carlo et al...., studied a sample size of 58 patients with canine impaction in which 32 subjects were Class I and 26 were Class III groups. The two groups had a similar age and gender distribution. In his study class I malocclusion patients with impacted canine was more compared to Class II division I malocclusion. However there is no statistically significant association (Carlo *et al.*, 2019). Hence the overall consensus was in concordance with the present study.

Jose Ruben Herrera Atoche et al...studied a sample size of 860 patients, in their study in the 12 to 39 age group 32.6% were males and 67.3% were females. Total of 65 numbers of impacted maxillary canines were identified. In this study, the prevalence of maxillary canine impaction is 6.04%. No statistical significant association was identified in relation to gender.(Herrera-Atoche *et al.*, 2017) but in the present study the overall prevalence was 2.4% this may be due to population variation.

Michele Laurenziello et al..., studied a sample size of 109 patients ,a total of 54 maxillary canines were impacted. The frequency of maxillary canine was more in Male when compared to female (59% : 41%). In this study the prevalence of maxillary canine impaction was 5.4%. There is no statistical significant association with the gender (Laurenziello *et al.*, 2017)). But in the present study the overall prevalence was 2.4% and this may be due to population variation.

There are certain limitations for this study. The sample size and the duration of the study can be expanded to get better results and interpretation.

CONCLUSION:

Within the limitation of this study, the overall prevalence of maxillary canine impaction among patients reported saveetha dental college was 2.4%. The prevalence of canine impaction was higher in females but

not significant statistically. The frequency of canine impactions was significantly higher in class I malocclusion when compared to class II malocclusion.

AUTHOR CONTRIBUTIONS:

Author 1 (Shalini Sathiyamoorthy) carried out the retrospective study by collecting data and drafted the manuscript after performing the necessary statistical analysis. Author 2 (Dr. Ravindra Kumar Jain) added in conception of the topic, has participated in the study design, statistical analysis and has supervised the preparation of the manuscript.

CONFLICT OF INTEREST:

No conflict of interest

REFERENCE:

- [1] Alejos-Montante, K. et al. (2019) 'Early identification of permanent maxillary canine impaction: A radiographic comparative study in a Mexican population', *Journal of clinical and experimental dentistry*, 11(3), pp. e282–e286.
- [2] Al-Zoubi, H. et al. (2017) 'Frequency of impacted teeth and categorization of impacted canines: A retrospective radiographic study using orthopantomograms', *European journal of dentistry*, 11(1), pp. 117–121.
- [3] Bishara, S. E. and Ortho., D. (1992) 'Impacted maxillary canines: A review', *American Journal of Orthodontics and Dentofacial Orthopedics*, pp. 159–171. doi: 10.1016/0889-5406(92)70008-x.
- [4] Carlo, G. D. et al. (2019) 'Prevalence of maxillary canine impaction in skeletal Class III malocclusions compared to Class I malocclusions', *Journal of Clinical and Experimental Dentistry*, pp. 0–0. doi: 10.4317/jced.55478.
- [5] Dinesh, S. P. S. et al. (2013) 'An indigenously designed apparatus for measuring orthodontic force', *Journal of clinical and diagnostic research: JCDR*, 7(11), pp. 2623–2626.
- [6] Ericson, S. and Kurol, J. (1986) 'Longitudinal study and analysis of clinical supervision of maxillary canine eruption', *Community dentistry and oral epidemiology*, 14(3), pp. 172–176.
- [7] Felicita, A. S. (2017) 'Quantification of intrusive/retraction force and moment generated during en-masse retraction of maxillary anterior teeth using mini-implants: A conceptual approach', *Dental press journal of orthodontics*, 22(5), pp. 47–55.
- [8] Felicita, A. S., Chandrasekar, S. and Shanthasundari, K. K. (2012) 'Determination of craniofacial relation among the subethnic Indian population: a modified approach - (Sagittal relation)', *Indian journal of dental research: official publication of Indian Society for Dental Research*, 23(3), pp. 305–312.
- [9] Felicita, A. S. and Sumathi Felicita, A. (2017) 'Orthodontic management of a dilacerated central incisor and partially impacted canine with unilateral extraction – A case report', *The Saudi Dental Journal*, pp. 185–193. doi: 10.1016/j.sdentj.2017.04.001.
- [10] Felicita, A. S. and Sumathi Felicita, A. (2018) 'Orthodontic extrusion of Ellis Class VIII fracture of maxillary lateral incisor – The sling shot method', *The Saudi Dental Journal*, pp. 265–269. doi: 10.1016/j.sdentj.2018.05.001.

- [11] Herrera-Atoche, J. R. et al. (2017) 'Impacted Maxillary Canine Prevalence and Its Association with Other Dental Anomalies in a Mexican Population', *International Journal of Dentistry*, pp. 1–4. doi: 10.1155/2017/7326061.
- [12] Jain, R. K., Kumar, S. P. and Manjula, W. S. (2014) 'Comparison of intrusion effects on maxillary incisors among mini implant anchorage, j-hook headgear and utility arch', *Journal of clinical and diagnostic research: JCDR*, 8(7), pp. ZC21–4.
- [13] Juvvadi, S. et al. (2012) 'Impacted canines: Etiology, diagnosis, and orthodontic management', *Journal of Pharmacy and Bioallied Sciences*, p. 234. doi: 10.4103/0975-7406.100216.
- [14] Kamisetty, S. K. (2015) 'SBS vs Inhouse Recycling Methods-An Invitro Evaluation', *JOURNAL OF CLINICAL AND DIAGNOSTIC RESEARCH*. doi: 10.7860/jcdr/2015/13865.6432.
- [15] Krishnan, S. (2015) 'Effect of Bisphosphonates on Orthodontic Tooth Movement—An Update', *JOURNAL OF CLINICAL AND DIAGNOSTIC RESEARCH*. doi: 10.7860/jcdr/2015/11162.5769.
- [16] Krishnan, S., Pandian, K. and Kumar, S. (2018) 'Angular photogrammetric analysis of the soft-tissue facial profile of Indian adults', *Indian Journal of Dental Research*, p. 137. doi: 10.4103/ijdr.ijdr_496_16.
- [17] Laurenziello, M. et al. (2017) 'Determinants of maxillary canine impaction: Retrospective clinical and radiographic study', *Journal of Clinical and Experimental Dentistry*, pp. 0–0. doi: 10.4317/jced.54095.
- [18] Ramesh Kumar, K. R. et al. (2011) 'Depth of resin penetration into enamel with 3 types of enamel conditioning methods: a confocal microscopic study', *American journal of orthodontics and dentofacial orthopedics: official publication of the American Association of Orthodontists, its constituent societies, and the American Board of Orthodontics*, 140(4), pp. 479–485.
- [19] Rubika, J., Sumathi Felicita, A. and Sivambiga, V. (2015) 'Gonial Angle as an Indicator for the Prediction of Growth Pattern', *World Journal of Dentistry*, pp. 161–163. doi: 10.5005/jp-journals-10015-1334.
- [20] Samantha, C. (2017) 'Comparative Evaluation of Two Bis-GMA Based Orthodontic Bonding Adhesives - A Randomized Clinical Trial', *JOURNAL OF CLINICAL AND DIAGNOSTIC RESEARCH*. doi: 10.7860/jcdr/2017/16716.9665.
- Shafer, W. G., Hine, M. K. and Levy, B. M. (1974) *A Textbook of Oral Pathology*.
- [21] Sivamurthy, G. and Sundari, S. (2016) 'Stress distribution patterns at mini-implant site during retraction and intrusion—a three-dimensional finite element study', *Progress in Orthodontics*. doi: 10.1186/s40510-016-0117-1.
- [22] Vikram, N. R. and Raj Vikram, N. (2017) 'Ball Headed Mini Implant', *JOURNAL OF CLINICAL AND DIAGNOSTIC RESEARCH*. doi: 10.7860/jcdr/2017/24358.9240.
- [23] Viswanath, A. et al. (2015) 'Obstructive sleep apnea: awakening the hidden truth', *Nigerian journal of clinical practice*, 18(1), pp. 1–7.
- [24] Watted, N. et al. (2014) 'Incidence Of Canine Impaction In Palestinian Population', *Journal of Advanced Oral Research*, pp. 5–11. doi:

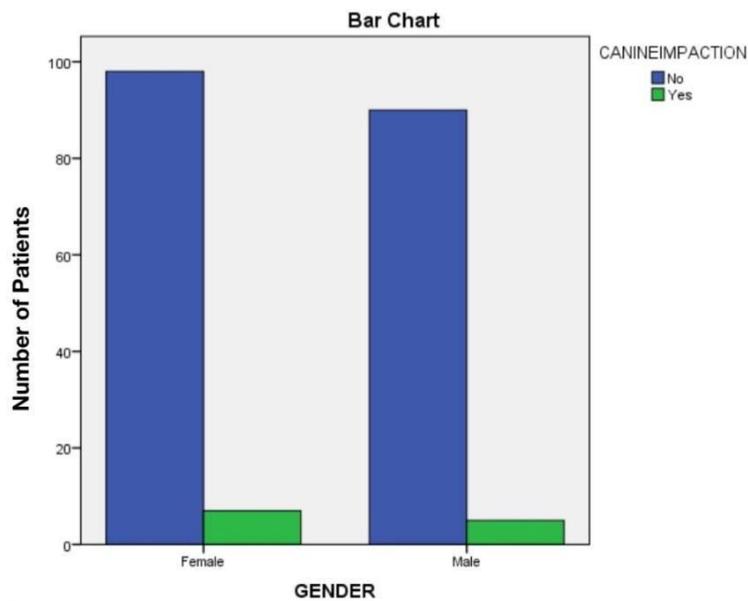


Figure 1: Bar chart represents the association between Gender and canine impaction. X axis represents the gender and Y axis represents the number of patients with class I and class II malocclusion. Blue colour denotes patients with no canine impaction and Green colour denotes patients with canine impaction. Chi square test was done but was not significant. Pearson chi square Value - 0.174, DF: 1, p value - 0.676 (>0.005). The frequency of maxillary canine impaction was not different in males and females.

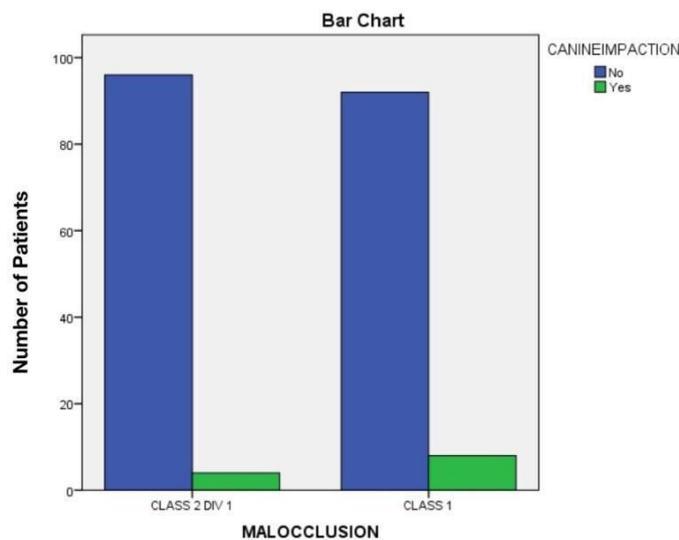


Figure 2: Bar chart represents the association between type of malocclusion and canine impaction. X axis represents the type of malocclusion and Y axis represents the number of patients with canine impaction. Blue colour denotes patients with no canine impaction and Green colour denotes patients with canine impaction. Chi square test was done and association was found to be statistically significant. Pearson chi square Value -1.418, DF: 1, p value - 0.234 (<0.005). Hence proving that class I malocclusion are highly prevalent. Hence, canine impactions were more common in Class I malocclusion than in class II division I malocclusion.