

Canine Impaction Among Orthodontic Patients - A Retrospective Study

Research Article

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Abstract

Treatment of Canine impactions is one of the most complex procedures in orthodontic treatment. The aim of this study was to present detailed information regarding the impacted maxillary and mandibular canines and their patterns in the oral cavity the prevalence of various canine anomalies, like ectopic canine, transmigration, transposition and agenesis of permanent canines among South Indian population. A total of 500 patients OPG's were thoroughly evaluated and therefore the prevalence of various canine anomalies like impacted maxillary and mandibular canine, transmigration, transposition, agenesis and ectopic canine eruptions were evaluated. The canine angulation, vertical position in reference to the occlusal surface of adjacent tooth's and therefore the overlapping of adjacent teeth's crown by impacted canine was evaluated by tracings. Out of 500 subjects, 11 patients had impacted canines. The prevalence of canine impaction was 2.21%, with maxillary canine impaction of 1.53%, mandibular canine impaction of 0.68%, canine agenesis 0.06%, transmigration 0.12%, canine transposition 0.18% and the ectopic canine was 5.5%. There is no gender difference in canine impaction. The prevalence of canine impaction is 2.21%.

Keywords: Agenesis; Ectopic Canine; Impacted Canine; Transmigration; Transposition.

Introduction

The different sorts of canine anomalies like ectopic canine eruption, canine transmigration, canine transposition, agenesis, impaction, usually occur because of the disturbances during development and eruption. Since the canines are the longest teeth within the oral cavity and therefore the shape, position of the canines contribute to the guidance of the teeth into the intercuspal position, the canine teeth should be evaluated thoroughly in order to deliver the best treatment to the patients.

The impaction of tooth have been studied by many authors and various terminologies have been given in the literature to define impaction including delayed eruption, primary retention, submerged teeth, impacted teeth etc [1]. According to Abron et al, impaction can be defined as a deceleration of the normal eruption process of the tooth¹ and according to Lindauer et al, it can be defined as a impaction if it was not erupted after completion

of the root development or if the eruption of the contralateral tooth was there for at least 6 months with completion of root formation.

The ectopic eruption is a condition where because of deficiency of growth in the jaw or segment of jaw, a primary tooth assumes a path of eruption that intercepts its premature loss and produces a consequent malposition of the adult permanent teeth. Tooth transposition, is also a special type of ectopic eruption. It can be defined as a condition where the position of two teeth is interchanged or a condition where a tooth develops in the place of another tooth [2]. It can be divided into two types, complete and incomplete transposition. Complete transposition is when the crown and root surface of the teeth is completely transposed in different positions. In incomplete transposition, only the crown is displaced in another tooth position but the root remains in their normal positions [3].

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The transmigrating refers to a condition where a tooth crosses a midline. Previously, transmigrating term was used where the whole impacted canine had migrated and crossed the midline of the mandible [4]. But according to Javid, transmigrating can be defined as a condition where one half or more of impacted canine crosses the midline [5, 6]. According to various studies the prevalence of transmigrating is suggested to be 0.1 to 0.34% in different populations [7-9].

Overall, the incidence of impacted maxillary canine is suggested to be 0.9–2.2% [10, 11]. But the incidence for mandibular canine impaction is at least 20 times lower than that of maxillary canine impaction [12]. However, the transmigrating of canine, canine agenesis and canine transposition are even rarer anomalies.

The aim of our study was to determine the prevalence of impacted canines and its pattern among orthodontic patients.

Materials And Methodology

This is a retrospective clinical study. The subjects for this study were selected from the patients who had come to the department of Orthodontics. All the patients who came to the department of Orthodontics were thoroughly examined and checked for any missing permanent canine, retained primary canine and other canine anomalies. A total number of 500 patients were evaluated for this study.

Patients were advised for OPG x-ray for confirmation of the clinical examination. Different canine anomalies were determined from the Orthopantomogram. The method given by Lindauer et al was used to consider canine as impacted.

The tracings were made on acetate paper. The impacted canine, central incisor, lateral incisor on the impacted side were traced by lead pencil.

The impacted canines were evaluated for level, angulation and overlapping in relation to adjacent tooth. The angulation of the impacted canine was evaluated by tracing the long axis of the impacted canine in reference to mid-sagittal plane. The angulations were classified into mesioangular, vertical, distoangular and horizontal.

Since there were no exact criteria to classify according to the degree of angulations between the long axis of the impacted canine and the mid-sagittal plane, we performed a survey to decide the exact criteria; 10 senior resident orthodontists were asked to classify different angulations between mid-sagittal plane and long axis of impacted canine ranging from 5° to more than 75°. After the survey the following angulation classification was used.

Mesioangular

When the long axis of the impacted canine was directed towards the mid sagittal plane and therefore the angle is made near the coronal area of the impacted canine with a range of angle between 15–70 degree. Distoangular: when the long axis of the impacted canine is far away from the mid-sagittal plane and forming the angle above the apical region of impacted canine. Vertical: when the long axis of the impacted canine is almost parallel with

the mid-sagittal plane and if the angle was between 0–15 degree. Horizontal: when the long axis of the impacted canine meets the mid sagittal plane at an angle of about more than 70 degrees.

Level A, The impacted canine crown is touching the cervical line of the adjacent teeth. Level B, The impacted canine crown is positioned between the adjacent teeth cervical line and the adjacent teeth root apex. Level C, The impacted canines crown is positioned below the root apex of the adjacent teeth .

To determine the overlap of the adjacent incisor root by the impacted canine the following classification was used in this study [13, 14]. Grade 1, no overlapping of the adjacent teeth; Grade 2, overlapping of adjacent roots less than half width; Grade 3, overlapping of greater than half root width, but not the whole root; Grade 4, overlapping of complete root width or greater than that (Figure .1).

For this study, complete transposition was considered when the crown and root surface of teeth was completely transposed in the different positions.

Javid's definition for transmigrating was used for this study according to which a canine was considered transmigrated when the one half of impacted canine or more than that of the impacted canine crosses the midline 4. To further classify the transmigrating canines, the classification given by the Mupparapu was used [15]. The classification is as follows: Type 1, canine positioned mesioangularly across the midline, labial or lingual to the anterior teeth. Type 2, canine horizontally impacted near the inferior border of the mandible inferior to the apices of the incisor teeth. Type 3, canine erupting on the contra lateral side.

Type 4, canine horizontally impacted near the inferior border of the mandible below the apices of posterior teeth. Type 5, canine positioned vertically in the midline with the long axis of the tooth crossing the midline.

Results And Discussion

Out of 500 subjects, 23 (twenty three) patients had at least one impacted maxillary or mandibular canine. Among the eleven subjects the total number of impacted canine teeth found was 35 and one missing permanent canine. The distribution of different patterns of 35 canine anomalies were as follows: transmigrating, 3 teeth and only in the mandibular arch; canine transposition, 5 teeth (1 complete, 2 incomplete), 26 impacted canine (16 in the maxillary arch and 10 in the mandibular arch). The present study, the prevalence of overall (both maxillary and mandibular) canine impaction found was 2.21%, only maxillary canine impaction was 1.53% and mandibular canine impaction 0.68%, canine agenesis 0.06%, canine transmigrating 0.12% and only within the mandibular arch, canine transposition was 0.18% and only unilateral. The ectopic canine was found in 5.5% of patients. More than 95% of ectopic canines were present in the maxillary arch. Almost all the patients that took part in the study were not conscious of the condition but only two patients had complained of bulging of the soft tissues, because the tooth was erupting in the upper buccal mucosa.

Figures 2, 3 and 4 depicts the patterns of impacted canines, which

include the angulation, level of impaction and grade (overlapping of adjacent teeth). In the angulation category the mesioangular angulation was the most common finding, followed by vertical, then horizontal. In this study none of the impacted canine showed distoangular angulation. In the presentation of vertical heights (Level) of impacted canine, the level B was the most prevalent and level A and level C showed almost equal frequency. Grade 1 and grade 2 again showed almost equal incidence and most prevalent in the grade's category, followed by grade 4, while grade 3 was the least finding.

It has been observed that canine impaction is more in males (52.2%) than females (42.8%) [Figure.5]. It has also been observed that the prevalence of canine impaction was more in the maxilla (62.9%) than mandible (37.1%) [Figure.6].

The association between gender and angular measurement of impacted canine showed no statistical significance (p value= 0.410) with Pearson's chi square value of 1.782 [Figure. 7].

The association between gender and level of impacted canine

showed no significance. (p value= 0.57) with Pearson's chi square value of 1.124 [Figure.8].

The association between gender and grade of impacted canine showed no significance. (p value= 0.984) with Pearson's chi square value of 0.158 [Figure.9].

In the present study the prevalence of impacted canines among the central Indian population was estimated to be 2.21%. The prevalence of impacted maxillary canine was 1.53%, which is lower than the study by Chu et al. where they did find the prevalence of 2.1% in Caucasian and Chinese populations.

The prevalence of impacted mandibular canine in this study was found to be 0.68%, which is higher than the study done by Rohrer A [12, 15] where they have found the ratio of maxillary and mandibular impacted canine 20:1 ratio (2.06% and (0.1%)), Grover and Lorton [16] reported 0.22%, Chu et al reported 0.07% among 7486 patients. In other studies by Aydin et al. [17] among Turkish population, the incidence reported was higher than the present study 0.44% which was studied among 4500 patients.

Figure 1. Showing the different levels of impacted canine.



Figure 2. Bar chart representing the frequency distribution of angular measurements of impacted canines. The X-axis represents the various types of angular measurements of impacted canines. The Y-axis represents the number of impacted canines. Mesioangular impacted canine (red colour) was the most common compared to vertical and horizontal impaction.

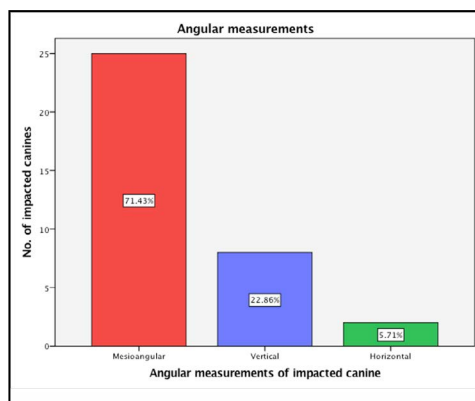


Figure 3. Bar chart representing the frequency distribution of the level of canine impaction. The X-axis represents the levels of canine impaction. The Y-axis represents the number of impacted canines. Level B (blue colour) was the most common type of impacted canine and Level C (green colour) was the least common.

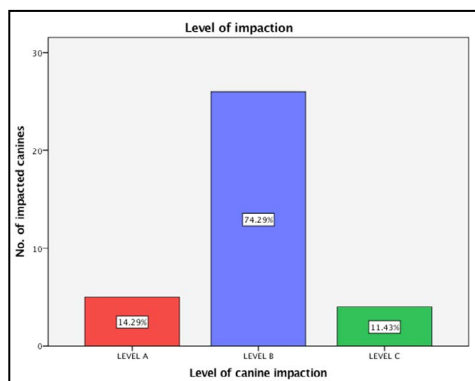


Figure 4. Bar chart representing the frequency distribution of grades of canine impaction. The X-axis represents the grades of canine impaction. The Y-axis represents the number of impacted canines . Grade - 2 (blue colour) of canine impaction was most common and Grade-3 (green colour) was least common.

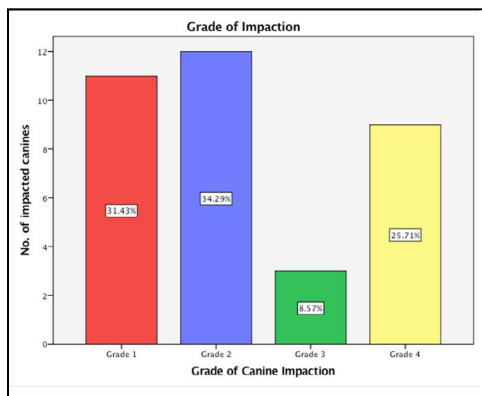


Figure 5. Pie chart showing frequency distribution of impacted canines based on Gender. The chart shows female subjects who have greater canine impaction than male.

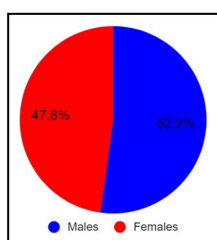


Figure 6. Pie chart showing frequency distribution of impacted canines according to the jaw involved. It shows that maxilla were greater than mandible.

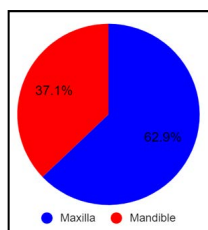
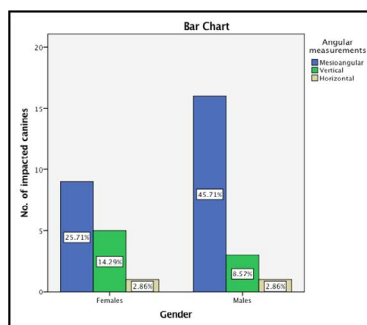


Figure 7. Bar chart showing association between gender and angular measurement of impacted canine. X axis represents gender. Y axis shows the number of impacted canines. Association between the gender and impacted canine was done using Chi-square test and was insignificant. Mesio angular is more common than vertical or horizontal impaction in both males and females. Pearson Chi-square test = 1.782, p value= 0.410 (>0.05) statistically not significant.



According to Takahama and Aiyama [18] the unilateral impaction was the most common finding, and according to Harzer the side mostly affected was the left one. Other studies had different views, the higher incidence side being the right side [19, 20]. In our study the most common impaction found was the unilateral canine impaction, which was observed in 14 subjects and the most common side affected was the right side in both genders, similar to the studies by Takahama and Aiyama [18], while Bass [21] found that the bilateral impaction was the most common finding.

But in our study only 8 (eight) subjects out of [23] (twenty three) were found with bilateral canine impaction.

When it comes to the distribution of the prevalence of impacted canine according to the gender then the majority of studies found the higher prevalence to be among the females [9]. But equal occurrence of impacted canine in both the genders was reported by some studies [22]. In the present study we have also found almost equal prevalence among male and female subjects.

Figure 8. Bar chart showing association between gender and level of impacted canine. X axis represents gender. Y axis shows the number of impacted canines. Association between the gender and impacted canine was done using Chi-square test and was not significant. Among both genders, level B type of impaction of canine is more common. Pearson Chi-square test = 1.124, p value= 0.57 (>0.05) statistically not significant.

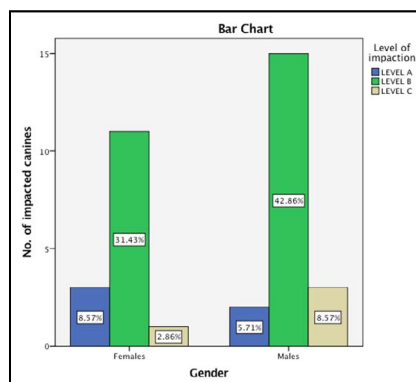
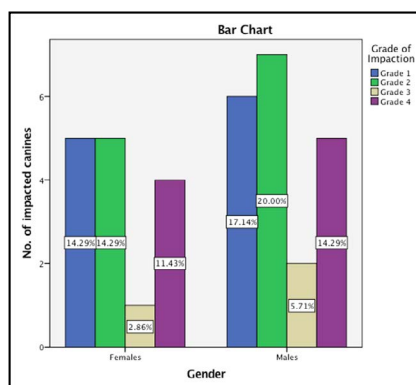


Figure 9. Bar chart showing association between gender and grade of impacted canine. X axis represents gender. Y axis shows the number of impacted canines. Among both genders, grade 2 canine impaction was more common than other grades of impaction. Association between the gender and impacted canine was done using Chi-square test and was statistically not significant. Pearson Chi-square test = 0.158. p value= 0.984 (>0.05) statistically not significant.



The tooth transposition occurs most frequently on the left side then the right side, in the maxillary arch, unilateral then bilateral and in females. Various studies finding the most common transposition occurrence to be between the canine and first premolar [23, 24] and less frequent with the lateral incisor [23]. In this study one complete transposition and two incomplete canine transpositions were observed. The complete canine transposition occurred between the canine and the lateral incisor and primary canine was also retained. In the other two cases no retained deciduous canine and also the lateral incisor was in normal shape. The prevalence found was 0.18%, the side involved in all three cases was the right side. This study does not agree with other studies which are in favor of the left side to be the most common affected side by canine transposition.

The present study found the prevalence of canine transmigration within the mandibular arch 0.12% and in the maxillary arch none. This study result shows less incidence compared to the study done by Sharma G, Nagpal A [23, 25], where they did the study among 3000 panoramic radiographs of north Indian population. The study by Aktan et al. [7] among Turkish subpopulation also shows a higher prevalence of 0.34% among 5000 subjects. [26-40].

Conclusion

From the limitation of the study the prevalence of canine im-

paction among Orthodontic patients was greater in females compared to male and higher in maxillary arch then mandibular arch. Among gender mesio angular is common among male and level B impaction is higher among female subjects. Grade 2 impaction is common among both gender. Knowledge of canine teeth development and eruption is necessary for the dentist to diagnose the incidence of impaction at an early age in order to reduce the malocclusion probability.

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