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Original Article

The association of buccally impacted maxillary canine with other teeth anomalies and transalveolar maxillary arch width

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Abstract

Background: The impacted maxillary canine is commonly encountered problem for a dentist and sometimes it is challenging to manage. The aetiology of the buccally impacted canine is always thought to be tooth size arch length discrepancy whereas the aetiology of palatally impacted canine is already found to be multifactorial. There is distinct type of buccally impacted canine which occurs without any apparent space deficiency. We suspect that this kind of impaction does not share the similar aetiology with the commonly found buccal impaction.

Aim and objective: The aim of our study was to find the association between buccally impacted maxillary canine with minimum crowding and other teeth anomalies and as well as compare the transalveolar maxillary arch width of buccally impacted canine samples with that of normally erupted canine samples.

Materials and methods: Total 33 patients having buccally impacted maxillary canine with crowding less than 2 mm were assigned into the experimental group (EG) and 32 randomly selected patients with normally erupted canines were assigned into the control group (CG). The anomalous teeth were searched in both the EG and CG.The transalveolar maxillary arch width was measured at fisrt premolar and fisrt molar level.The data were analysed by pearson's chi square test and independent t test to find the statistical significance by using SPSS16.0 software.

Result: The pearson's chi square test showed the statistically significant association between buccally impacted maxillary canine with minimum crowding and other tooth anomalies. The comparison of transalveolar maxillary arch width between EG and CG did not show any statistical significance.

Conclusion: The buccally impacted maxillary canine with minimum crowding is associated with other teeth anomalies and the transalveolar maxillary arch width is not deficient.

Key words: Buccally impacted canine, Minimum crowding, Maxillary arch width, Teeth anomalies.

Introduction

The tooth which fails to erupt into the oral cavity even after crossing the expected time of eruption is known as impacted tooth. In normal condition, the tooth erupts into the oral cavity when two third of the root is developed. After 2-3 years of eruption, the root formation is complete. In other words, the impacted tooth can be defined as the tooth whose eruption is significantly delayed and there is minimum possibility of further eruption. The maxillary canine is the second commonest tooth to be impacted, the first being mandibular third molar. However the clinical significance of maxillary canine impaction is many folds in compare to mandibular third molar. The maxillary canines are the longest tooth having longest and sturdiest root. They are situated on the angle of the mouth. They play very vital role during the function of the jaw, giving canine guidance. Their role in aesthetics is very important, that is why the impacted canines are rarely extracted. On the contrary impacted third molars are rarely preserved for any purposes.

The incidence of the maxillary canine impaction is reported to be 1.6% by Mead[1], 0.92% by Dachi and Howell[2], 1.2 % by Kramer and Williams[3], and 2.84% by Grover and Lorton[4]. More recently, Aydin et al[5] found the incidence of canine impaction to be 3.58%. 70-85% of the impaction occurs on palatal side and

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15-30% of the impaction occurs on the buccal side[6-8]. Usually the buccal impaction occurs in space deficiency where as palatal impaction occurs in space adequacy. The palatal impaction is more common in females than males[9-11]. Right sided impaction is more common than the left[10-12] and interestingly, the bilateral occurrence of the palatal impaction is reported to be 19-45%[13]. There are enough studies on the palatally impacted maxillary canine and its characteristics. Palatal impaction occurs in association with other teeth anomalies, commonly associated with lateral incisor aberrations, missing teeth, transpositions and infraocclusion[14-17]. The overall reduction of the tooth size is found in palatally impacted maxillary canine samples[17-19]. The dental age in palatally impacted samples are found to be delayed according to Becker et al[20]. In addition to this, the palatally impacted canine is usually associated with adequate maxillary arch width[21]. Due to these features, the palatal impaction has gained much interest among the researchers and has been extensively studied. Currently there are two prominent theories regarding the cause of palatal impaction. Becker's guidance theory believes that, the usual guidance provided by the lateral incisor for the eruption of maxillary canine is lost when there is small, peg shaped or missing lateral incisor and this results into the palatal canine impaction[22]. Where as Peck et al put forwarded the genetic theory for the same[13,23,24]. They have published papers correlating the palatally impacted maxillary canines with other teeth anomalies. More recently PAX2 gene mutation is found to be associated with oligodontia[25] and the agenesis of premolars and molars are found to be associated with MSX1 gene mutation[26]. Nevertheless the association of these genes with palatal impaction has been found to be very weak[15]. But if we look back to the history, the buccally impacted maxillary canine has been always blamed to the tooth size arch length discrepancy or narrowed maxillary arch width[7,27,28]. There are very few researches done on purely buccal canine impaction. In some researches the buccal and palatal impactions are mixed together. Though the most of the buccal canine impaction occurs with space deficiency, we have encountered some buccal canine impaction without space deficiency. Becker has described a distinct type of buccal ectopia as primary tooth germ displacement which occurs irrespective of arch length or width[22]. Very recently Chaushu et al did a study on buccally ectopic canine with no crowding[29]. The main purpose of our study was to find the association between buccally impacted maxillary canine with minimum crowding and other teeth anomalies as well as compare the transalveolar maxillary arch width of buccally impacted canine samples with that of normally erupted canine samples. We hypothesized that there is distinct type of buccal impaction which doesn't share the same aetiology with commonly found buccal impactions with space problem. We will try to find the association between the above mentioned buccally impacted maxillary canine and other teeth anomalies.

Materials and methods

This study was carried out at the Department of the Orthodontics of the Stomatological hospital of Zhengzhou University, Henan, China. Before starting the study, the approval was taken from the ethical committee of Zhengzhou University. The research consisted of two study groups, the experimental group (EG) and control group (CG). The EG consisted of 33 buccally impacted maxillary canines (Males: 8, Females: 23) with crowding less than 2mm. The patients having good study cast and enough radiographs were only included in the study where as patients in mixed dentition, with associated syndromes and without quality radiographs and study casts were excluded from the study. The age range in the EG was 12-25 years. The CG consisted of randomly selected 32 patients having normally developed and erupted maxillary canines from the pool of the records of the patients in orthodontic department of Zhengzhou University. The age range of the patients in control group was 12-30 years old. To find the association between buccally impacted maxillary canine and other teeth anomalies the following anomalous conditions were selected:

1. Anomalous upper lateral incisors: Peg shaped laterals and small shaped laterals. Becker's criteria for small and peg shaped lateral incisors were followed[14].
2. Missing teeth
3. Other impacted teeth
4. Transposition
5. Supernumerary teeth

However in our study, the third molars were not included as they are most commonly missing and impacted. That might have biased our purpose of the study.

The arch form of the patients and Angle's inter arch relationship was also recorded for each patients in EG and CG.

The transalveolar maxillary arch width was measured at the first premolar and fisrt molar level called interpremolar arch width and intermolar arch width respectively as shown in Fig 1. Digital vernier calliper was used to measure the distance with minimum reading of 0.01mm. Each measurement was done twice and average was taken as final measurement.

Statistical Analysis

The data was recorded in excel worksheet then it was transferred to SPSS 16.0 software for the statistical analysis. The descriptive analysis was done for Arch

form and Angle's inter arch relationship whereas person's chi square test was done to find the statistical association between buccally impacted maxillary canine and other teeth anomalies. Independent t test was done to compare the transalveolar maxillary arch width between EG and CG. The α value was set below 0.05 for the statistical significance.

Result

The distribution of buccally impacted canine was most common on left side (45.5%). Bilateral impaction was seen in 33.3% of the patients. The interarch relationship in the EG showed high occurrence of buccally impacted canine in class I malocclusion. Class I malocclusion was found in 63.6% of the EG, whereas Class III and class II malocclusion was found in 21.2% and 15.20% respectively. In control group class I malocclusion was most common (65.6%) followed by class II (28.1%) and class III (6.2%). The most common arch form in EG was ovoid (63%) followed by tapered and square. However in CG, the tapered arch form was most common (47%), followed by ovoid (44%) and square (9%). The Pearson's chi square test showed the statistically significant association between buccally impacted maxillary canine with minimum crowding and other teeth anomalies (p 0.03) (Table 1). The distribution of anomalous teeth is shown in Fig 2. The comparison of interpremolar and intermolar arch width between EG and CG doesn't show any statistical significance.

Discussion

We found that the buccally impacted maxillary canine with minimum crowding is statistically associated with other teeth anomalies. Our finding gives some clue that buccal impaction without space problem may have different aetiology than the commonly seen buccal impaction with space deficiency and narrowed arch width. The study of Chaushu et al has also pointed that buccally ectopic maxillary canine with no crowding is distinct than the buccally ectopic maxillary canine with crowding[29]. In their study they found that buccally ectopic canine with no crowding have significantly small size of lateral incisor but the other teeth are normal. In our study, we found that the buccally impacted canines with minimum crowding was significantly associated with other teeth anomalies. The frequently seen anomalous tooth however was upper lateral incisor. The anomalous lateral incisors were either small/peg shaped or were missing.

The comparison of transalveolar maxillary arch width at first premolar and first molar level between EG and CG didn't show any difference. However, the study of Schindel and Duffy has shown that there may be chance of potential maxillary canine impaction in cases with narrow maxillary arch width[30].

If we try to find the aetiology of buccally impacted maxillary canine with minimum crowding, we can rule

Table 1: Chi square test

Anomaly:overall	EG N -33	CG N-32	p-value	Significance
Anomalous	20	9	0.03	*
Non anomalous	13	23		
Total	**33**	**32**		

* < 0.05

Fig 1: Interpremolar and intermolar arch width.

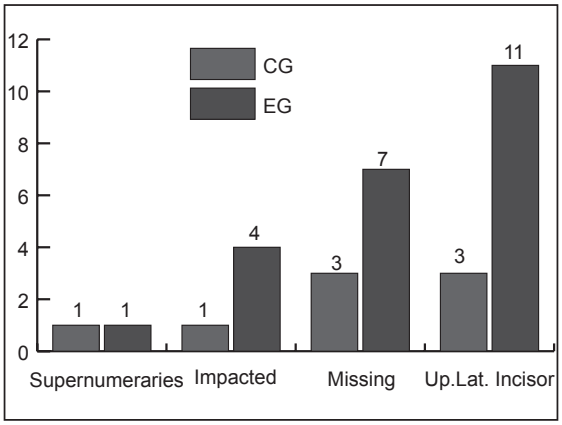

Fig 2: Distribution of anomalous teeth in EG and CG (Up.Lat. Incisor- Upper lateral inciosr, Impacted- other impacted teeth)

out the possible aetiology of tooth size arch length discrepancy and arch width deficiency. To the remote possibility, the aetiology of buccally impacted maxillary canine with minimum crowding might be due to lack of guidance or be due to genetic link. As upper lateral incisor is the most common anomalous tooth associated with buccally impacted canine with minimum crowding, this condition may lead to the lack of guidance needed for upper canine eruption. However, the association of other teeth anomalies and buccally impacted canine may be due to some genetic link. Peck et al have shown evidences to link palatally impacted canines with genetic aetiology[13,24,31]. They have gathered some sources to prove the genetic link of palatally impacted canine. According to them the associated other teeth anomalies, bilateral occurrence of canine impactions, sex difference, familial occurrence and population difference are the evidences in favour of genetic link and palatal impaction of canine. In our study, there are associated teeth anomalies, bilateral occurrence and sex difference in buccally impacted canine with minimum crowding, consistent with the findings of Peck et al and Becker[22,32] have suggested that the cause of buccal displacement of maxillary canine tooth may be due to genetically determined aberrant position termed as 'primary tooth germ displacement'. So we can not deny the possibility of genetic aetiology for this distinct type of buccal canine impaction. Basdra et al[33] have pointed out that class II division 2 malocclusion is associated with numerous congenital tooth anomalies. But our result does not support their finding.

Conclusion

The buccally impacted maxillary canine with minimum crowding is associated with other teeth anomalies and the transalveolar maxillary arch width is not deficient.

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