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Canine Impaction and Other Dental Anomalies – What is the Connection?

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Abstract

Background: Canine impaction is one of the most challenging anomalies treated in orthodontics, requiring a lot of time and resources. The most efficient method of canine impaction treatment is preventing it, so we need much more clinical data to diagnose it as soon as possible. The purpose of this study is to assign other visible dental anomalies with canine impaction and to study the frequency of these anomalies in patients with canine's impaction.

Methods: This is a retrospective study conducted on a total number of 380 orthodontic records; between 2013-2021. The inclusion in the study criteria was any patient regardless of age or sex presenting at least one impacted canine. There were 14 patients matching these criteria and these cases were investigated for: Age, sex, type of inclusion, skeletal class, occlusal transverse relation, vertical anterior relation, palate form, and other associated dental anomalies.

Results: In our study the prevalence of canine impaction is 3.68%, slightly more males – 57.1%. 64.3% of the impacted canines cases had another dental anomaly was also present, whether it involved the anodontia, supernumerary teeth, ectopy or nanic incisors. The rate of occurrence for impacted canines and anodontia are 21.4%, supernumerary teeth - 14.3%, canine ectopy - 14.3%, nanic lateral incisors - 14.3%.

Conclusion: Most frequent dental anomaly found in impacted canines patients was the pathology of lateral incisor: – 35.7%. Moreover, the percentage of any dental anomaly among patients with at least one impacted canine was very high – 64.3%.

Keywords: Canine impaction; Hyperdontia; Anodontia

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Introduction

Canine impaction is one of the most challenging anomalies treated in orthodontics, requiring a lot of time and resources. Canines are among the most important teeth both for smile design and dental occlusion, so their lack on the dental arches is quite visible for the patient and quite problematic for the dental practitioner.

The treatment for canine impaction may never elude the orthodontist, as the lack of bone after its odontectomy would never be replaced by grafts or any other surgical or prosthetic methods. The most efficient method of canine impaction treatment is preventing it or treating it as soon as possible [1].

The purpose of this study is to assign other visible dental anomalies with the inclusion of the canine and to study the frequency of these anomalies in patients with canine impaction.

Materials and Method

This is a retrospective study and was conducted in a private orthodontic practice in Bucharest. The study group consisted of a total number of 380 orthodontic records with: Facial pictures, dental pictures, orthopantomograms and teleradiographs - all of these being studied and analyzed by the same person - the author of this article. The considered records were gathered on an 8 year period of time, between 2013 to 2021.

The inclusion in the study criteria was any patient regardless of age or sex presenting at least one impacted canine (upper or lower). There were 14 patients matching these criteria. All these matching patients were considered eligible for the present study, so the following data was resumed in a table: Age, sex, type of inclusion (horizontal or vertical), skeletal class, occlusal transverse relation, vertical anterior relation, palate form, other associated dental anomalies. Statistical processing of the data

from the present study needed the following programs: The Microsoft Excel from Microsoft Office 2015, Google Docs and Google Drive.

All patients eligible for the present study signed a consent form in which they agree to the use of their pictures, radiographs, and other investigations for scientific research.

Results

Taking into consideration all the patients with at least one impacted canine, we found only 14 patients out of 380, meaning the prevalence of canine impaction is 3.68% among the patients in an orthodontic practice. Our findings are like the studies conducted in the literature: Eriksson et al. [2], Thilander [3], Rafflenbeul et al. [4].

Most of the patients were aged between 9 and 16 years old - 57.1% and 35.7% were aged between 17 to 23. Only 8.2% f the patients were aged above 23 years old. On a surprising note, the sex distribution is slightly different than what we mostly found in the literature [4], meaning our majority was made of male subjects - 57.1% and the rest (42.9%) were females. But still, the difference is not enormous and perhaps on a bigger sample would be different, this being the reason of further enlargement of this study. Nevertheless, some other studies revealed no significant difference among males and females - 42.6% [5,6]. Other studies indicated greater male predilection (as we also did): The study achieved in King Khalid University in Saudi Arabia where the male to female ratio was 43:12 [7] and the study in the United Arab Emirates where a percentage of 77% of canine impaction cases were detected amongst men [8].

As for the location of canine impaction, we had no lower canine among the investigated patients, result which is similar to the other studies showing the most cases in upper canines [1,3,4]. The type of impaction was mostly vertical - for 78.5% - so these are supposed to be the easiest cases to treat. Only 21.5% of the cases were horizontal canine impaction (taking into consideration the α angle). The inclusion criteria for whether horizontal or vertical impaction was the α angle on panoramic X-rays: α-angle is measured between the long axis of the impacted canine and the midline [9,10] as it is shown in Figure 1.

The next point of analysis on our agenda was the skeletal class, so we found that half of the patients were class I Angle and 35.7% was class II, while 14.3% was skeletal class III Angle. This result is somehow expected as most of the patients in our country are class I or II, the prevalence of skeletal class III patients is low in Romania. The molar occlusal relations are mostly class I in a percentage of 57.1% and molar class II was found in 42.9%. None of the subjects had a molar class III. The transverse occlusal relations in molars and premolars were mostly neutral - 57.1%. 21.4% of the impacted canine patients had at least one cross-bite. 14.2% were found to have an incomplete cross-bite, while only 7.1% had a lingual relationship. These findings may be explained as the canine impaction is a matter of the frontal width of the arch, but still, as the arch is narrower, the more the lack of space, and so the more probability for the canine impaction. The anterior vertical relationship is a deep bite for 71.4% - different degrees (Figure 2). The neutral frontal vertical relationship is found in 28.6%. No open bite cases were found in our research.

The palatal vault was neutral in most cases: 85.7%; we found a deep palatal vault in only 14.3%. Further in our study, we looked for the dental anomalies associated with canine impaction, to evaluate how often it is met in one patient to find both anodontia or supernumerary

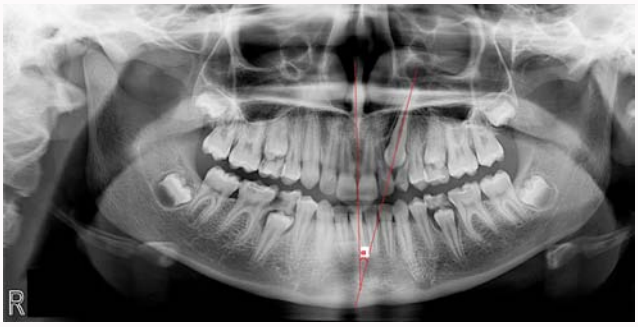

Figure 1: α-angle measured between the long axis of the impacted canine and the midline.

Figure 2: Canine impaction on a deep bite patient.

Table 1: The types of dental anomaly in our impacted canine study group.

Dental Anomaly Associated with Canine Impaction	Percentage of patients
Anodontia (lateral incisors)	21.4%
Supernumerary teeth	14.3%
Canine Ectopy	14.3%
Nanic lateral incisors	14.3%
No Dental Anomaly Detected	35.7%

teeth or another dental anomaly with the canine impaction. So, in other to find that, we conceived a table in which we gathered the type of dental anomaly found in our impacted canine study group of 14 patients. The results table with the calculated percentages is shown in Table 1. Looking at this chart, we can easily see that in 64.3% of the impacted canine's cases another dental anomaly was also present, whether it involved the anodontia, supernumerary teeth, ectopy or nanic incisors (Figure 3).

Discussion

Similar findings in the literature are available but still, not very recent, and not complete, therefore the need of this present investigation.

Figure 3: Anodontia and impacted canine case.

Taking into consideration our present results there is a real connection between canine impaction and dental anomalies. Our findings concur with the previous work of Carvahlo et al. [11], Paschos et al. [12], Peck et al. [13], Sacerdoti et al. [14], Leifert et al. [15], Langberg et al. [16], Mesotten et al. [17], Nagpal et al. [18]. The reason for this occurrence in the literature about this association is that the oversupply of space in the maxilla could be a contributing factor for the canine displacement and subsequently impaction as it enables enough space for the canine to deviate its normal direction of eruption. On the other hand, the absence of eruption guidance from the lateral incisor permits a new path for the canine to take to the palatal side. Another possible explanation is the potential biological link between impacted canine and tooth size reduction. The concept is that dental anomalies of number, tooth size reduction and impacted canines are three of the alternatives in a genetically controlled intricate dental disorders appearing regularly together. It is likely that the gene (or genes) to blame for the control of teeth eruption and subsequently for the palatal displaced canines are related to the gene (or genes) that determine hypotonia or incisor agenesis.

Hyperdontia (having supernumerary teeth) determines a delay in tooth eruption, a delay that may help the tendency of a canine to remain impacted [19]. This may be the reason why our results showed that canine impaction and hyperdontia occur together in 14.3% of cases.

Regarding the prevalence of ectopic canines among patients with impacted canines, our results indicate a rather small percentage – 14.3% but previous studies have a higher number of occurrences – 27.5% - Shumar [20].

The present study has several limitations such as the small number of the sample studied, but the correlation with other studies from the literature shows that our findings are quite accurate.

The growth of unintended discoveries of impacted canines should inspire the dental community to raise awareness and to inform the people about the clinical allegations and the significance of applying prophylactic and interceptive orthodontic procedures.

Conclusion

In our study, sex distribution for the impacted canine is slightly in favor of men – 57.1% - fact also found in several recent studies but not in most studies on this theme, so there is need for further investigation on a bigger sample and territory. Most frequent dental anomaly found in impacted canine's patients was the pathology of lateral incisor: Whether it was the size or shape or its agenesis – 35.7% of the impacted canine's patients had a sort of lateral incisor pathology. Moreover, the percentage of any dental anomaly among patients with at least one impacted canine was very high – 64.3%. More studies are necessary to assess the clinical pattern of canine impaction and its associated different dental anomalies and in other areas of Europe and of the world.

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