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Prevalence and Localization of Impacted Canine Teeth in Both Jaws Using Panoramic Radiograph in a Selected Iranian Population, Shiraz, 2012

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Abstract

Background: Since there has been no published report on the impact of permanent canines in Shiraz population, this study was conducted to investigate the prevalence and the location of the impacted permanent canines in patients referred to the Department of Radiology of Shiraz Dental School in 2012. **Materials and Methods:** This was an analytic cross-sectional study on 1012 panoramic radiographs. For localization, the Canine Incisor Index (CII) was employed.

Results: A total number of 28 cases presented with at least one impacted canine. The prevalence of impacted canine (2.8%) was reported not differ significantly between the genders ($P>0.05$). Fifteen of the total of 28 cases could be included in the method of using CII and 6 were located palatally. **Conclusion:** According to the results of this study, the prevalence of canine impaction in the selected population is estimated to be 2.8%. Sixty percent of the impacted canines that could be located were in buccal area. [GMJ. 2014;3(1):24-28]

Keywords: Prevalence; Impacted Teeth; Panoramic Radiography; Shiraz; Dentistry; Canine Teeth

Introduction

Failure of eruption is a common dental anomaly in permanent dentition [1]. When a tooth does not erupt at its appropriate site in the dental arch, at the right time, it is considered as an impaction [2]. Taking the mean eruption time into account, teeth were defined as impacted when they have been remained in the jaw two years after the respective mean age of tooth eruption. Developmental disturbances such as dental impaction can happen because of genetic or environmental factors [1]. Association between canine impaction

and short-root lateral incisors, missing or peg-shaped lateral incisors has been confirmed [3]. Maxillary canine is the second most common impacted tooth following third molars [4, 5]. The permanent canines are well known as significant teeth, by virtue of their crucial participation in building of the arch form, their assistance to esthetic of the smile, and their role in the functional occlusion [6, 7]. Impaction of the maxillary canine could be diagnosed mostly between the ages of 10 to 14 years [8]. Complications may occur in the course of management of an impacted canine due to mismanagement or inaccurate diagnosis [9].

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Resorption of the maxillary lateral incisor root is the most prevalent complication of canine impaction. The central incisor root is less frequently involved and the roots of premolars are occasionally reported to be resorbed [10]. Most of the times, root resorption of the lateral incisor may be diagnosed in the radiograph at an early stage. However, the resorption process even in cases with pulp involvement usually remains asymptomatic. Root resorption can be clinically diagnosed at an advanced stage, when the treatment would be difficult and extraction of the affected tooth may be the only choice [6, 11].

Panoramic radiography is an accepted technique for localization of impacted canines but is not the gold standard technique. These days, almost all preliminary consultations of routine orthodontic practice need a panoramic radiograph. This single radiograph can be beneficial for prediction of position of an impacted canine. Therefore, no extra films would be necessary to be taken in patients receiving orthodontic treatment, saving time and money as well as reducing the dose of X-ray [12-14]. Different methods have been suggested for determining of impacted canine position. One of the most advocated methods is the Canine Incisor Index (CII). According to Nagpal *et al.* (2009) 77% of palatal canine impactions can be correctly predicted by differential magnification of a panoramic radiograph. CII is a radiographic method to predict the position of impacted canine comparing mesio-distal width of canine with that of ipsilateral central incisor [15]. In a perfect panoramic view, a 10% magnification is accepted for canine area compared to the central area, resulting in approximately identical mesio-distal dimensions to central incisors; this is the reason that the central incisor is used as the reference in determining of canine position [12, 16].

The prevalence of impacted teeth has been evaluated in some populations. According to Fardi *et al.* (2011) impaction is the most prevalent dental anomaly (8.8%) and among the 225 impacted teeth the most frequently affected teeth were the canines (59.6%) [1].

Since there is no published report on impaction of permanent canines in Shiraz, Iran, we conducted this study to investigate the prev-

alence and the location of the impacted permanent canines in a population selected from patients referred to the Department of Radiology, Shiraz Dental School, Shiraz University of Medical Sciences, Shiraz, Iran.

Materials and Methods

This survey was an analytic cross-sectional study. This study collected panoramic radiographs from patients who attended the Department of Radiology of Shiraz Dental School for different dental purposes between August and September 2012. Patients who had more than 13 years of age with Panoramic Radiographs of acceptable quality were included in the study [8]. Patients with any hereditary disease or syndromes or history of surgery of any impacted canine, any trauma or fracture of the jaw that could have affected the normal eruption of permanent canines were excluded. A total number of 1012 cases were included in the study considering the inclusion and exclusion criteria. All the Panoramic Radiographs were taken by an expert using a single panoramic radiograph machine (Proline XC, Planmeca, Finland). The images were prepared by a PSP (Phosphostimulable Phosphor Plates) cassette and read by laser imager and monitored on a LG™ monitor and analyzed in a standard condition by a senior dental student and an oromaxillofacial radiologist. CII technique was employed to localize impacted canines. Rotated impacted canines whose the widest mesio-distal dimension could not be measured were excluded from CII survey. The widest mesio-distal dimension of impacted canine was measured on a line perpendicular to its long axis using the Photoshop CS6 package (Adobe™, San Jose, California, U.S.). This was also done on the ipsilateral central incisor. The CII calculated as the ratio of the measured widest mesio-distal dimension of the impacted canine to the widest mesio-distal dimension of the central incisor in the same quadrant. On an average, the mesio-distal dimension of the canine is 90% of or 1 mm less than the mesio-distal dimension of the central incisor [15]. Previous studies demonstrated that the labiopallatal position of the impacted canines can be predicted accurately using

magnification method (CII) on the panoramic radiography [12, 16-19].

Based on the results of the study by Nagpal *et al.* we used a value of 1.16 as a cut-off point to localize the maxillary impacted canine [5]. If the CII of an impacted canine was higher than or equal to 1.16, the impacted canine was considered to be palatally. If the CII of an impacted canine was lower than 1.16, the impacted canine was considered to be buccally.

Data were analyzed by SPSS version 14.0 software. Related graphs and tables were prepared. Chi-square test was used to evaluate the correlations between prevalence of the canine impaction and sex of individuals.

Results

Out of 1012 attendants, 449 were male (44.4%) and 563 were females (55.6%). The age of subjects ranged from 13 to 77 with the average of 33.3 years. At least one impacted canine was found in 28 of the individuals. The total number of impacted canines detected in the affected 28 subjects was 33 with the mean number of 1.17 per individual. 16 impacted canines were detected in 14 males and 17 in 14 females. The prevalence of impacted canines was 2.8% which did not significantly differ between the two genders ($P=0.824$). Although the prevalence of the canine impaction was nearly the same for both sexes, there is a significantly different prevalence in Maxilla compared with Mandible ($P=0.04$).

In the male patients, left impaction overcomes the other side.

However, in the female ones right side of the jaws carried more impactions. Totally impactions were almost similar in both sides of the

jaws in the population.

Fifteen subjects of total impacted canines were located in the right side of maxilla and 16 in the left side of maxilla, 1 in the right side of mandible and 1 in the left side of mandible. Maxillary bilateral canine impaction was detected in 4 cases and in one case 3 impacted canines were recorded (Table-1). Locations of impacted maxillary canine were 6(40%) Palatally, and 9(60%) Buccally.

Discussion

The most frequently impacted tooth after third molar is the maxillary permanent canine and following that, are mandibular canines. The importance of canines in occlusion and esthetics and consistency of the dental arch is well known. Furthermore among all teeth maxillary canines have the longest and the most complicated pattern of eruption.

Impaction of teeth could result in some complications such as esthetic and phonetic problems and functional disturbances; therefore, canine impaction deserves special attention. Treatment of impacted canines are potentially long term and difficult, consisting of orthodontic forced eruption after surgical exposure and/or fixed prosthodontics or removable prosthodontics. The prevalence of the impacted permanent canines in both jaws according to our data was 2.8%.

Haqanifar *et al.* (2009) reported the prevalence of 17% for impacted maxillary canines and 1.5% for impacted mandibular canines. Their study was performed in Babol, in the North of Iran, using 663 panoramic radiographs during 2004-2006. They excluded patients under 20 years old. In our investigation we excluded

Table 1. The Prevalence of the Impacted Canines in Both Jaws Based on Sex in a Population Referred to Shiraz Dental School, 2012

Canine Impaction	N. (%)	Maxilla N (%)	Mandible N (%)	Left side N (%)	Right side N (%)
Sex					
Male	16 (48.5)	15 (48.4)	1 (50)	11 (64.7)	5 (31.3)
Female	17 (51.5)	16 (51.6)	1 (50)	6 (32.3)	11 (68.7)
Total	33 (100)	31 (100)	2 (100)	17 (100)	16 (100)

the subjects under 13 years old which is more comprehensive, because the age of eruption of maxillary permanent canine normally is 12 and mandibular permanent canine erupts usually at the age of 9. Therefore, more cases were included in our study. The prevalence of maxillary permanent canine impaction was reported 1.0% to 2.5% by Chapokas *et al.* (2012) in San Diego, CA, 2011 which had a similar result to our study. Fardi *et al.* (2011) found that among 225 impacted teeth the most frequently affected teeth were the canines (59.6%) in north Greece 2011. The study emphasizes on the need for investigation of impaction of permanent canine as a serious subject. We have also shown the importance of canine impaction and probable complications. In 2011, in Bangladesh, Alif *et al.* reported the prevalence of impacted maxillary canines to be 1.2% among 580 panoramic radiographs. The difference might be related to the quantity of the studied panoramic radiographs; in our study the studied panoramic radiographs were almost twice. The racial differences also should be considered.

According to Tavakoli *et al.* (2003) the prevalence of impacted maxillary canines was 5% and the prevalence of impacted mandibular canines was 2.5% using occlusal and panoramic radiographs in Tehran, Iran. Occlusal radiograph is not as routine as panoramic view and usually is ordered in special circumstances e.g. localizing an impacted canine, so it cannot be used as a screening view, because of false higher rate of impaction displayed. Our study showed that the prevalence of impacted canines is nearly the same in females and males. However, most of the studies displayed that canine impaction is more frequent in females than in males. Variation in the prevalence of impacted canines might be attributed to racial characters and also multifactorial etiology of impaction. In order to determine the possibility and difficulty of surgical approaches and orthodontic practices, an appropriate localization method is required. Wolf *et al.* reported that the buccopalatal position of nearly 90% of all cases can be detected accurately. They concluded that the magnification method (CII) on the dental panoramic radiography is quite accurate for us-

ing in the clinic [19]. According to Fox *et al.* by using differential magnification on dental panoramic radiographs, palatally unerupted maxillary canines could be correctly predicted in four out of five times [18]. A study by Bhuvaneshwari *et al.* (1948) showed that the correct prediction of buccal or palatal canine impactions, applying differential magnification (CII) on panoramic radiograph is achievable in about 85.1% of cases [17]. Also, Nagpal *et al.* (2009) reported 77% of cases could be correctly predicted [12], and a prior study by Chaushu *et al.* (1999) 87.5% was reported [16]. Based on these findings we decided to use CII for localization of impacted maxillary canines.

Accurate information of the location of an impacted canine could contribute to decide about the feasibility of the treatment procedure. In buccally impacted canines, the choice might be a periapical repositioning flap, whereas palatal impaction might require extensive bone removal. Only when the precise position of the impacted tooth is evident, the impaction prognosis can be estimated accurately [10]. Of 28 subjects who displayed canine impaction, 15 could be included in this method of localization. Using CII, 6 (40%) were located palatally and 9 (60%) were buccally. Our data was approximately similar to previous studies performed by Nagpal *et al.* (2009) and Bhuvaneshwari *et al.* (1948) [12, 17]. The reason for excluding about half of the samples was the rotation of impacted tooth which prohibits measuring of its mesio-distal width. This brings serious limitation for this technique.

Conclusion

According to the results of this study the prevalence of canine impaction in the selected population is estimated to be 2.8%. Although the prevalence of canine impaction is nearly the same for both sexes, there is a significantly different prevalence in Maxilla compared with Mandible. In male patients, left impaction was prominent. While, in female patients right side of the jaws carried more impactions. Total impactions were almost similar in both sides of the jaws in the population.

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Conflicts of interest

None declared

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