

Prevalence of impacted canines in Arab Population in Israel

Nezar Watted^{1,*}, Muhamad Abu-Hussein²

¹Center for Dentistry Research and Aesthetics, Jatt, Israel

²Department of Pediatric Dentistry, University of Athens, Athens, Greece

Email address

abuhusseinmuhamad@gmail.com (M. Abu-Hussein)

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Abstract

Aim: Dental impaction is a very frequent problem and the canine tooth is one of the most affected. Impacted canines result in many complications and their early diagnosis by radiographic evaluation is imperative. The aim of the present study was to determine the prevalence of impacted canines in the Arab population in Israel (48 Arabs). *Materials and Methods:* The panoramic radiographic records of 2200 patients attending the Center for Dentistry Research and Aesthetics, Jatt/Israel, between June 2006 and December 2013 were examined for the study. The age of the patients ranged from 10.5 to 39.5 years, with a mean of 16.2 years. *Results:* The prevalence of canine impaction in males was 1.6% and 2.1% in females in maxillary and 0.6% mandibular. The overall prevalence was 4.3%. Maxillary left canines were the most frequently impacted. Only 13 cases showed impaction of the mandibular canine. Unilateral impaction was seen in 0.5% of the patients. *Conclusion:* Canines play a vital role in facial appearance, dental esthetics, arch development, and functional occlusion. If signs of ectopic eruption are detected early, every effort should be made to prevent impaction and its consequences. Early intervention eliminates the need for surgical intervention and complex treatment.

Keywords

Impacted Canines, *Panoramic Radiography*, Prevalence, Unilateral

1. Introduction

The canine is the cornerstone of the dental arch. It plays a vital role in facial appearance, dental esthetics, arch development, and functional occlusion. It has the longest period of development and the most tortuous route to full occlusion, and it is for this reason that it is considered to be the third most common tooth to be impacted, next to mandibular and maxillary third molars. The prevalence of impacted maxillary canines ranges from a minimum of 0.92% to a maximum of 4.3%. [1,2,3] Impaction is a pathological condition defined by the lack of eruption of a tooth in the oral cavity within the time and physiological limits of the normal eruption process. Treatment options for this condition include observation, extraction, autotransplantation, and orthodontic alignment. Accurate assessment of the position of the impacted canine, in three

planes of space, is essential for determining the most appropriate treatment and benefit of the patient. This is based on a combination of clinical and radiographic findings. [3,4,5,6]

The eruption of permanent maxillary canine is a complex series of events, mostly genetically related, and the long tortuous path of eruption before the canine reaches the occlusal plane. Apart from the eruption process, the successful development of permanent canine involves the synchronized forward and lateral growth of the maxilla. As the eruption process is so complex, it is inevitable that problems may arise, leading to complications including tooth retardation or failure of eruption. The most common etiology for canine impaction are the local factors and the result of any one, or combination of the following factors: (1) tooth

size-arch length discrepancies, (2) abnormal position of the tooth bud, (3) the presence of an alveolar cleft, (4) ankylosis, (5) prolonged retention or early loss of the deciduous canine, (6) associated cysts or tumors, (7) dilaceration of the root, (8) iatrogenic causes, and (9) idiopathic condition with no apparent etiology.[2,5,6,7,8]

The permanent maxillary canines develop deep within the maxilla, complete their development late and emerge into the oral cavity after the neighbouring teeth have erupted. Due to these circumstances, eruption disturbances are more common with maxillary canines than with other teeth, except for third molars. Unerupted canines occur 20 times more frequently in maxilla than in mandible. They are almost rotated from 60 to 90 degree on their longitudinal axes.[5,6]

Natural development Mineralization of the primary canine starts at 4 - 12 months of age and is complete by 6 - 7 years of age. During eruption the canine moves down along the distal aspect of the lateral incisor, not in very close contact with it. The palpation of the buccal surface of the alveolar process distal to the lateral incisor may reveal the position of the maxillary canine about 1- 1/2 yrs before its emergence.[4,7]

During the active phases of eruption i.e. 1 - 2 years before oral emergence, the width of the dental follicle increases, whereas the size of the follicle decreases in cases of impacted teeth. Aside from their importance in ideally mutually protected occlusal scheme, the maxillary canine also plays role in esthetics and continuity of dental arch.[8]

According to axial inclination Class I: Impacted canine located in the palate Horizontal Vertical Semi-Vertical Class II: Impacted canine located in the buccal side Horizontal Vertical Semi-Vertical Class III: Impacted canines located in both palatal as well as buccal alveolar bone. Class IV: Impacted canines located vertically between incisors and premolars Class V: Impacted canines located in edentulous maxilla Class VI when canine is placed in abnormal position,antral wall,intraorbital region.[2,3,4]

Diagnosis of Canine Impaction The clinician can investigate the presence and position of the cuspid using 3 simple methods: visual inspection, palpation and radiography visual inspection Palpation Radiography.[1,2,3]

Visual Inspection Clinical signs that may indicate ectopic or impacted succedaneous canines include lack of a canine bulge in the buccal sulcus by the age of 10 years, over retained primary canines, delayed eruption of their permanent successor and asymmetry in the exfoliation and eruption of the right and left canines. Primary canines that are retained beyond the age of 13 years.[1,4,5]

Palpation of the buccal and lingual mucosa, using the index fingers of both hands simultaneously, is recommended to assess the position of the erupting maxillary canines. Clinical Evaluation •It has been suggested that the following clinical signs might be indicative of canine impaction •Delayed eruption of the permanent canine or prolonged retention of the deciduous canine beyond 14–15 years of age •Absence of a normal labial canine bulge •Presence of a palatal bulge and •Delayed eruption, distal tipping, or

migration (splaying) of the lateral incisor.[7,8]

Radiographic Evaluation Although various radiographic exposures including occlusal films, panoramic views, and lateral cephalograms can help in evaluating the position of the canines, in most cases, periapical films are uniquely reliable for that purpose.[2,7]

Periapical films A single periapical film provides the clinician with a two-dimensional representation of the dentition. In other words, it would relate the canine to the neighboring teeth both mesiodistally and superoinferiorly. To evaluate the position of the canine buccolingually, a second periapical film should be obtained by one of the following methods.[5]

Tube-shift technique or Clark's rule or (SLOB) rule Two periapical films are taken of the same area, with the horizontal angulation of the cone changed when the second film is taken. If the object in question moves in the same direction as the cone, it is lingually positioned. If the object moves in the opposite direction, it is situated closer to the source of radiation and is therefore buccally located.[6]

Buccal-object rule If the vertical angulation of the cone is changed by approximately 20° in two successive periapical films, the buccal object will move in the direction opposite to the source of radiation. On the other hand, the lingual object will move in the same direction as the source of radiation. The basic principle of this technique deals with the foreshortening and elongation of the images of the films.[1,3]

Occlusal films Also help to determine the buccolingual position of the impacted canine in conjunction with the periapical films, provided that the image of the impacted canine is not superimposed on the other teeth[3,5].

Extraoral films Frontal and lateral cephalograms These can sometimes aid in the determination of the position of the impacted canine, particularly its relationship to other facial structures [6,9].

Panoramic films These are also used to localize impacted teeth in all three planes of space, as much the same as with two periapical films in the tube-shift method, with the understanding that the source of radiation comes from behind the patient; thus, the movements are reversed for position.[2,8]

CT/CBCT Clinicians can localize canines by using advanced three-dimensional imaging techniques. Cone beam computed tomography (CBCT) can identify and locate the position of impacted canines accurately. By using this imaging technique, dentists also can assess any damage to the roots of adjacent teeth and the amount of bone surrounding each tooth. However, increased cost, time, radiation exposure, and medicolegal issues associated with using CBCT limit its routine use. The proper localization of the impacted tooth plays a crucial role in determining the feasibility of as well as the proper access for the surgical approach and the proper direction for the application of orthodontic forces.[6,7,8,9]

Treatment Planning Each patient with an impacted canine must undergo a comprehensive evaluation of the malocclusion. The clinician should then consider the various

treatment options available including the following •No treatment if the patient does not desire it. In such a case, the clinician should periodically evaluate the impacted tooth for any pathologic changes. •Prophylactic Space augmentation •Age of individual and dental maturation. •Space condition •Position of canine •Patient demand for treatment.[7]

It should be remembered that the long-term prognosis for retaining the deciduous canine is poor, regardless of its present root length and the esthetic acceptability of its crown. This is because, in most cases, the root will eventually resorb and the deciduous canine will have to be extracted. •Autotransplantation of the canine. •Extraction of the impacted canine and movement of a first premolar in its position.[3,9]

The exact position and localization of these teeth are essential factors in planning the treatment procedures. Methods of diagnosis that may allow for early detection and prevention should include a proper family history, visual clinical examinations, and palpation, by the age of 9-10 years and a thorough radiographic evaluation. In this regard, the panoramic radiography is of a great clinical significance, to establish a correct surgical procedure[3,4,7,8,9,10]. The objective of the present study was to determine the prevalence of impacted maxillary and mandibular canine in the Arab population in Israel.

2. Materials and Methods

The records of 2200 patients attending the *Center For Dentistry, research & Aesthetics, Jatt, Israel*, between , between Jan 2006 to Dec 2013 were examined by intraoral examination, palpation, and patient records, followed by panoramic radiographs for the study. Ethical clearance was obtained from the Institutional Ethical Committee. A written informed consent was obtained from all the patients. The age of the patients ranged from 10.2 to 39.5 years, with a mean of 16.2 years. The inclusion criterion was based on the dentition present. Only those with permanent dentition were included in the study. It was established that the minimal age of patients from whom the radiographies were taken was 15 years old, as by this time all the permanent teeth would be erupted.

Radiographs such as intraoral periapical radiographs which follow the Clark's rule and panoramic radiographs or dental CT scans were advised (Fig 1a, b; Fig 2a-c, Fig 3a-c). The mandibular canine is much less of a concern because it is almost 10 times less frequently impacted. After the examination of the patient records, patients who exhibited one or more of the following pathological situations were excluded from the study:

- a. Any hereditary diseases or syndromes such as Down's syndrome or cleidocranial dysostosis.
- b. Any disease, trauma or fracture of the jaw that might have affected the normal growth of permanent dentition.

Data was gathered and analyzed using the SPSS statistical package (version 12 software). The differences between the groups were tested using the Chi-square test, and Mann

Whitney test.

3. Results

Of the 2200 patients, 846 were males (38,4%) and 11354 were females (61,6%) (Table 1); the mean age was 16,2 years, ranging from 10,2 to 39,5 years. A total of 82 impacted maxillary canines were found of which 46(56,1%) were in females and 36 (43,9%) were in males. The prevalence of impacted canines in males was 1.6% and in females was 2.1% (Table 2). The prevalence for maxillary impacted canines in all the cases was found to be 3,7%, which suggest that it is much higher than previous studies. From these 95 impacted canines, 82(86.3%) cases occurred in the maxillary arch. There were only 13 (13,7%) impacted canines in the mandibular arch. The left side of the maxillary arch had 1,6% impacted canines, whereas the right side had 0,01% impacted canines. The mandible had lower frequency of cases, with 0,018% cases having left side impacted canines and 0,031% had right side canines impacted. The bilateral impaction occurred in 1,18% of the patients, being less common than the unilateral impactions, which accounted for 3,1% of the total cases. Most of the canines were palatally placed (80% and only 20% were located buccally (Table 3).

4. Discussion

Dental impaction is frequently found in dental practice in teenagers and adults with the third molar and in children with the upper canines. The canine tooth has a complicated eruption pattern and is one of the last teeth to erupt in dental arch. According to these conditions, this tooth may not have an eruption process in a natural way. Functionally and esthetically aspects related to the canine are of great importance; however, it appears frequently impacted. The greatest number of impacted teeth occurs with the lower third molar, followed by the upper third molar. Dental impaction occurs mostly in those teeth that erupt late, as the canine. It occurs in a 3:1 ratio for female gender and with a higher frequency on the left side of dental arch. The retained canine is more frequent in the maxilla and has a tendency of being unilateral.[9,10,11,12]

In any population, the prevalence of impacted maxillary canines is low, but there seems to be a varied distribution in respect to ethnic origin. The Japanese have shown to have the lowest frequency as reported in the literature, where the anomaly occurred in only 0.27% of the study population. Similar to these findings, study of a large series of full mouth dental radiographs in the United States revealed a figure of 0.92%. Although Brin *et al.*¹ in their study of an Israeli population, found a level of 1.5%, an even higher figure for the impaction of maxillary canines was reported in the study of an Icelandic population with a prevalence of 1.8%. A strong prevalence of impacted canines is found among females, with a ratio of 2.3:1 in the group of American patients, 2.5:1 in an Israeli orthodontic group, and 3:1 in both

a Welsh orthodontic group and in a US orthodontic sample. The prevalence of female to male was 2.4:1 in Greek population as per the observations of Fardi *et al*. In the same study, the impacted canine prevalence was also found to be increased (8.8%). However, a random Israeli population study has shown an approximately equal male-female occurrence of the anomaly. The prevalence of female to male in the present study was found to be 1.4:1, which is lower than the findings of these studies. The different results from these studies may arise from racial differences and differences in the methodology of the study. In a similar study, 4898 Saudi patients who were 13 years and older were examined and the results indicated that 3.6% had at least one impacted cuspid. Another study analyzed 1858 patients of the 11-18 year age group who were presented for orthodontic treatment. The results revealed 101 cases of impacted canines with a prevalence of 5.43%. These results indicate that the incidence of canine impaction may be higher in some populations.[1,7,13,14,15,16,17]

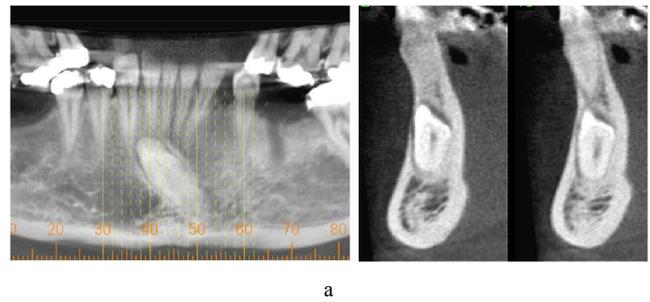
Early detection of impacted maxillary canines may reduce treatment time, complexity of treatment procedures, further complications, and expenditure to be borne by the patient. Ideally, patients should be examined early by the age of 8 or 9 years to determine whether the canine is displaced from the normal position in the alveolus and assess the further potential for its impaction. The clinician can investigate the presence and position of the canine using three simple methods: Visual inspection, palpation, and radiography. Impactions if unresolved, may increase the risk of disease and formation of cystic follicular lesions and may compromise the lifespan of neighboring lateral incisors due to root resorption. Various clinical studies have demonstrated that 12% of lateral incisors that are adjacent to ectopically erupted canines exhibit some degree of external root resorption, whereas 0.7% of lateral incisor show root resorption in 10-to 13-year-old children.[18,19]

The present data indicated that the prevalence of maxillary canine impaction was more than those reported in other studies. The present study has shown the prevalence of maxillary canine impaction to be 4.3%, which is much higher than the range of 0.2%-2.5% reported in other studies. The incidence of impacted upper permanent canines is approximately 1.5%-2% within the general population, with majority of these (85%) being palatal impactions. The present study showed 80% palatally impacted canines and 20 % were buccally placed. Palatally erupting or impacted maxillary canines occur twice as often in females than males, have a high family association, and are five times more common in Caucasians whites than Asians. The canines are observed on the palatal region by their lower force to erupt associated to the alveolar bone. The early loss of the temporary tooth can be an etiologic factor in some cases. However, what is more observed is that the later impaction of the temporary canine root causes a movement of the permanent to the palatal region. Features of canine impaction either buccally or palatally include lack of canine bulges in the buccal sulcus, which indicates a lingual path of

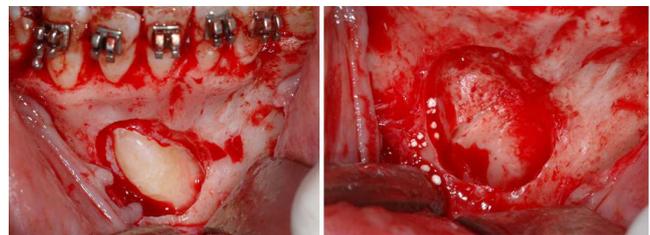
eruption and possible impaction. The lack of symmetry between the exfoliation and eruption of canines may also serve as an indication for palatal or lingual impaction, along with abnormal mesiodistal location and angulation of the developing permanent maxillary canines during radiographic examination .[7,6,18,19,20]

5. Conclusions

The results of this study showed increased prevalence of impacted canines than data reported in other studies, whereas the dissimilarities may be attributed to the sample selection, method of the study, and area of patient selection, which suggest racial and genetic differences. Indeed, most of the impacted canines were located in the maxilla, which is also the predominant location. The early recognition of canine impaction is very important from a therapeutic point of view.



a



b

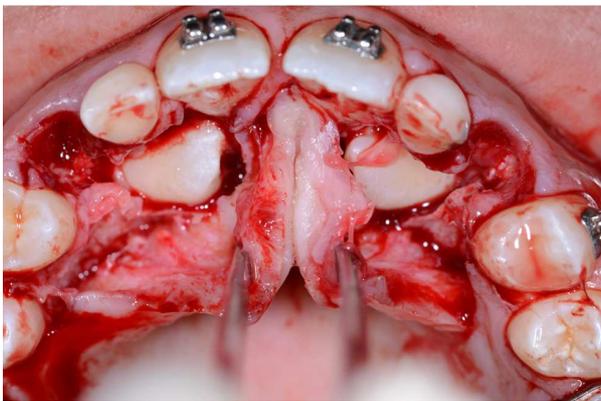
Fig. 1a,b. Unilateral mandibular impacted canine



a



b

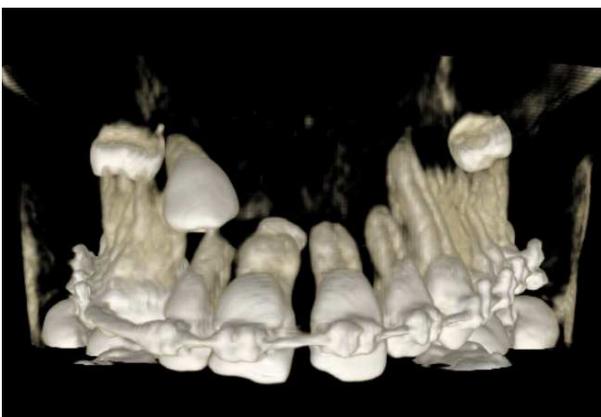


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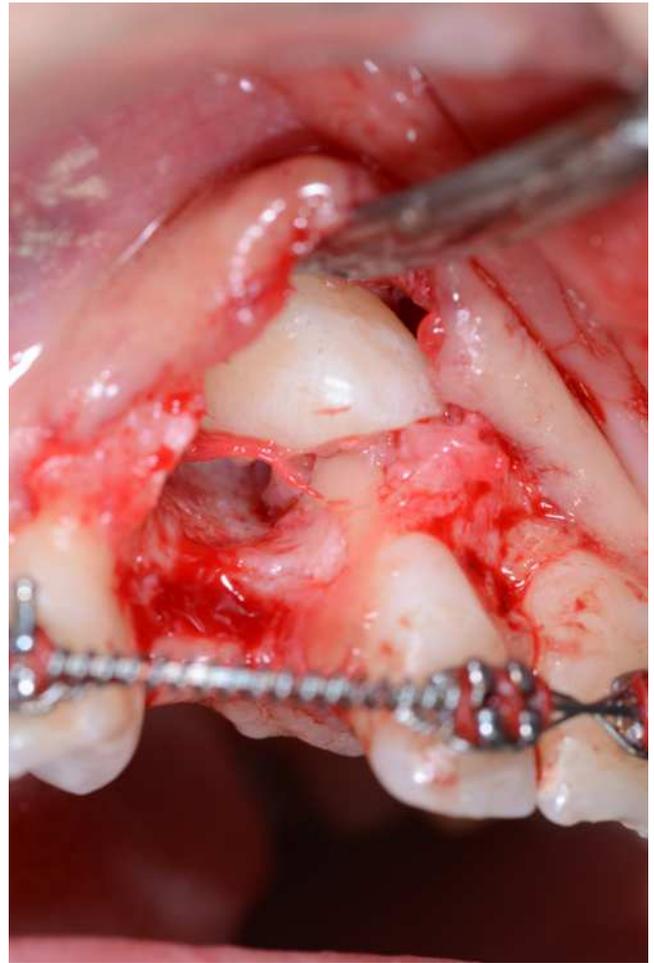
Fig. 2a-c. bilateral palatally impacted canine



a



b



c

Fig. 3a-c. Unilateral buccally impacted canine

Table 1. Distribution of patients according to gender

Treated (Orth.)	N=2200	%
Female	1354	61.6%
Male	846	38.4%

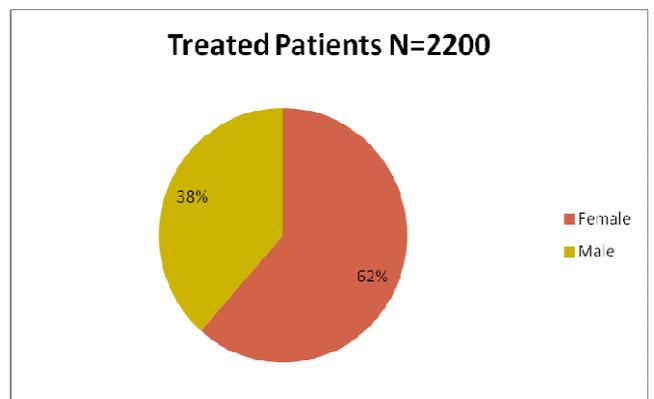


Table 2. Distribution of impacted maxillary canines according to gender

Impacted	N=82	%	Prevalence (%)Treated (2200)
Female	46	56.1%	2.1%
Male	36	43.9%	1.6%

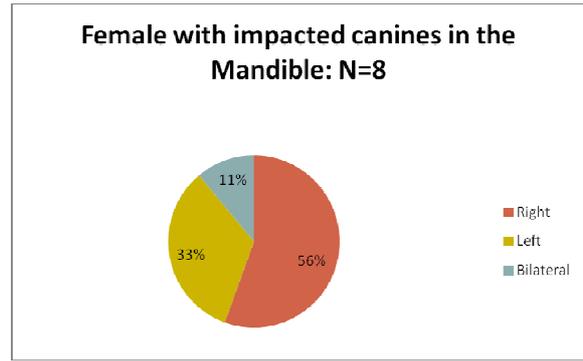
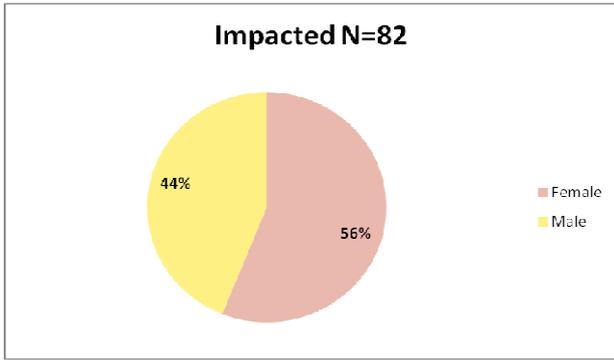
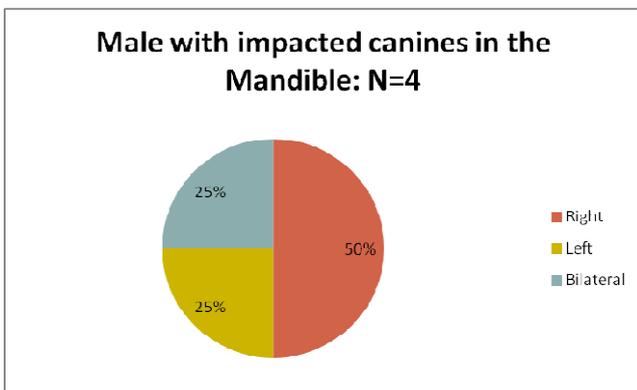
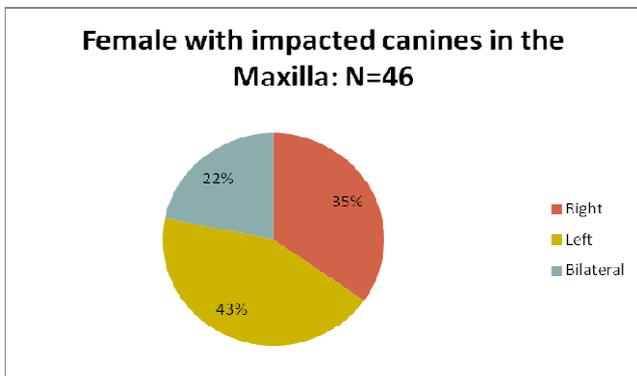
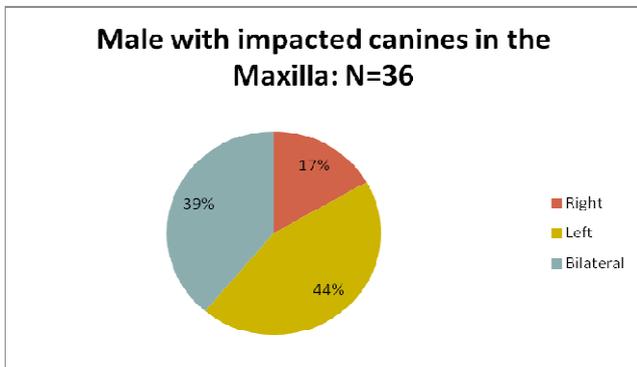


Table 3. Distribution of patients with impacted canines

Gender	Maxilla			Mandible		
	Right	Left	Bilateral	Right	Left	Bilateral
Male	6	16	14	2	1	1
Female	16	20	10	5	3	1
Total	22	36	24	7	4	2

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