

## Maxillary canines impaction: prevalence and radiographic localization for orthodontic patients in a selected Syrian population, Damascus.

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### Abstract:

**Background and Objectives:** Impacted canines is a frequent problem in orthodontic clinics, and their early diagnosis is important to prevent further complications. The objective of this study is to determine the prevalence and radiographic localization of the impacted maxillary canines in selected Syrian sample in Damascus, Syria.

**Materials and methods:** Retrospective analysis of the Panoramic radiographs of 1692 patients [592 male (35%) and 1100 female (65 %)] attending in an outpatient orthodontic clinic from January 2000 to January 2015 were performed for this study. The ages of patients ranged between 13 to 35 years.

**Results:** The incidence of maxillary canine impaction was 3.7% out of 80 impacted maxillary canines. 69.84 % were in female patients and 30.16 % were in male patients. Bilateral impaction was seen in 28% of the cases, palatal impaction in 30%, and buccal impaction in 31 % of the cases.

**Conclusions:** Impacted maxillary canines were found in the 3.72% of the 1692 patients. Female patients showed more incidence for maxillary canine impaction as compared to male patients, with high percentage for bilateral palatally impacted canines.

**Key words:** Canine, Impaction.



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## انطمار الأنياب العلوية: الانتشار والموقع الشعاعي لمرضى تقويم الأسنان في سورية - دمشق

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### الملخص:

**خلفية وهدف البحث:** يعد انطمار الأنياب مشكلة متكررة في مجال تقويم الأسنان، ومن المهم التشخيص المبكر لمنع حدوث الاختلاطات التالية. الهدف من هذه الدراسة تحديد الانتشار و التوضع الشعاعي لأنياب الفك العلوي المنطمرة لدى عينة سورية مختارة في دمشق، سورية.

### المواد و الطرائق:

تم إجراء تحليل راجع لصور بانورامية تابعة ل 1692 مريضاً ذكراً (35%) و 1100 أنثى (65%) [تابعين لعيادة تقويم أسنان خارجية من شهر كانون الثاني عام 2000 حتى شهر كانون الثاني عام 2015. تراوحت أعمار المرضى من 13 حتى 35 عاماً.

**النتائج:** كانت نسبة حدوث انطمار أنياب الفك العلوي 3,7% وكانت نسبة 69,84% إناث و 30,16% ذكور. شوهد الانطمار ثنائي الجانب في 28% من الحالات، والانطمار الحنكي 30%، والانطمار الدهليزي 31%.

**الخلاصة:** نسبة حدوث انطمار الأنياب العلوية 3,7 من مراجعي حالات تقويم الأسنان (1692 مريضاً) وهو أكثر حدوثاً لدى الإناث مع نسبة عالية من الانطمار ثنائي الجانب.

**الكلمات المفتاحية:** إنطمار، أنياب.

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Maxillary canines are among the last teeth to develop and have the longest path of eruption from their bony crypts near the external border of the nasal fossae to the final position in the oral cavity.<sup>1</sup> Therefore, there is a greater possibility for developmental alteration resulting in crowding and impaction. Maxillary canine impaction is diagnosed by clinical examination that includes extraoral palpation, and radiographic examination such as periodic panoramic and selective periapical radiographs.<sup>2</sup>

Previous studies reported various definitions of “impaction”. *Kokich and Mathews (1993)*<sup>3</sup> mentioned that when a tooth does not erupt in at its appropriate site in the dental arch, at the right time, it is considered as an impaction. *Andreasen et al (1997)*<sup>4</sup> defines impaction as a cessation of the eruption of a tooth caused by a clinically or radiographically detectable physical barrier in the eruption path or by an ectopic position of the tooth. Other reports stated that when a tooth is unerupted more than 1 year after the normal age for eruption, it is then defined as “impacted”.<sup>1, 5, 6</sup>

The guidance theory and the genetic theory are the two major theories used to explain the cause of canine impaction. The guidance theory mentioned that the distal surface of the lateral incisor root play as a guide for canine eruption. Thus, an absent or malformed lateral incisor root causes the canine to erupt in an erroneous way.<sup>1</sup> The genetic theory denotes that multiple gene expressions are responsible for the different dental anomalies such as peg shaped lateral incisors, infraocclusion of primary molars, and enamel hypoplasia including palatally impacted maxillary canines.<sup>7, 8</sup> A Study by *Peck and Peck* reported that prevalence of other dental anomalies in patients with palatally impacted canines, bilateral occurrence of palatally impacted canines, sexual dimorphism, familial trend, and different racial spread are the main factors that stand up for genetic theory.<sup>9</sup>

Maxillary canines are considered among the most vulnerable teeth for impaction, where preceded only by the lower third molars. Different researches indicate that impaction of maxillary canines occur in 1% to 2% of population.<sup>10, 11</sup> The incidence of impaction are twice in women than men. *Ericson and Kurol in 1987* mentioned that 85% of impacted canine occurs palatally while only 15% of impactions occur labially.<sup>12</sup> According to *Al-Nimri and Gharaibeh* palatal canine impaction occurred mostly in Class II division 2 occlusion.<sup>13</sup> Unilateral impaction appear to be more common than bilateral one. Furthermore, maxillary canine impaction 20 times more recurrent than those in mandible.<sup>14</sup>

The clinician needs to know the incidence of the impacted canine in the patients referred. Thus, they can predict the possibility of its incidence to monitor the patient. However, in spite of the available information about the prevalence of impacted canines in different ethnic groups, studies on impacted maxillary canines have not yet been performed in Damascus, Syria. The purpose of this study was to determine the incidence of impacted maxillary canines in selected Syrian population, Damascus.

## Materials and methods:

This study is retrospective, descriptive study depend on the panoramic radiographs and complete records of 1692 patients [592 (34.99%) male and 1100 (65.01%) female]. The radiographs were collected from patients who presented in our outpatient orthodontic clinic from January 2000 to January 2024. The age of patients ranged from 13 to 35 years.

Individuals younger than 13 years old were excluded in the study. Because maxillary canines might still erupt at this age group. Moreover, patients with any pathological conditions, trauma, syndromes or hereditary diseases such as Down's syndrome, or those who had history of jaw fracture that could have affected permanent canines eruption were rejected from this report.

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Bishara SE, 1992<sup>11</sup> and Manne R et al, 2012<sup>15</sup> mentioned four clinical signs as indicative of canine impaction:

- Delayed eruption of the permanent canine or prolonged retention of the deciduous canine after 14-15 years of age.
- Absence of a normal labial canine bulge.
- Presence of a palatal pulge.
- Distal tipping, migration or delayed eruption of the lateral incisor.

The records of 1692 patients were fully examined in order to identified impacted maxillary canines by using visual inspection, palpation, and radiographs. Clinical examination was started by taking a review regarding chronological age and history of dental eruption/exfoliation patterns for every patient. Splaying of the lateral incisors, lost space, crowding or fibrous tissue overlaying the canine region, and mobility of the primary canines were examined as a part of visual inspection. Clinical palpation was done by checking any retained deciduous canine, and presence of canine bulge in buccal or palatal region. *Ericson and kurol in 1986* declared that an accurate diagnosis can be produced through the strengthening of the clinical examination by radiographic evaluation.<sup>12</sup>

Panoramic radiographs were taken using a Soredex-Cranex D (Tuusula, Finland). The exposure setting values were fixed according to each patient, ranged from 60-66 KVP, 6-10 mA. The exposure time was set at 17.6 s. Other radiographs were used to determine impacted canine position by parallaxing, such as periapical and anterior occlusal radiographs. All radiographs were assessed independently on a transparency projector under constant lighting conditions. To assess reliability, all radiographs were reexamined after a month of the primary examination for the reliability of the results.

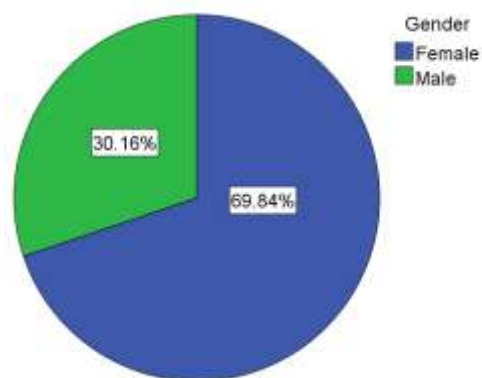
Data were analyzed by SPSS version 14.0 software. Related graphs and tables were prepared using Microsoft Excel 2007. Chi-square test was used for statistical analysis to evaluate the differences in gender, age, location (right and left), and position of impacted maxillary canines.

**Table 1:percentage distribution of impacted maxillary canines according to gender**

		Frequency	Percent
Valid	Female	44	69.84%
	Male	19	30.16%
	Total	63	100.0%

## Results:

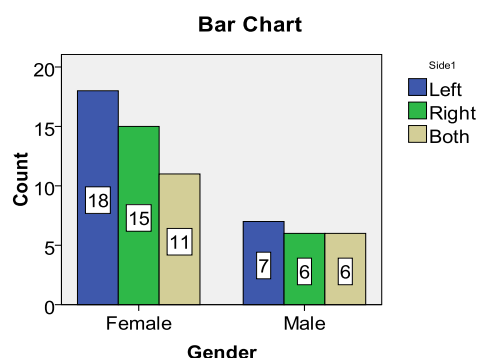
Out of 1692 patients, only 63 (3.72 %) patients have impacted maxillary canines.



**Figure (1): percentage distribution of impacted maxillary canines according to gender**

Of these, female patients encountered maxillary canine impaction (69.84 %) than male patients (30.16 %) (Fig 1). The distribution of impacted canine according to gender were shown in table 1.

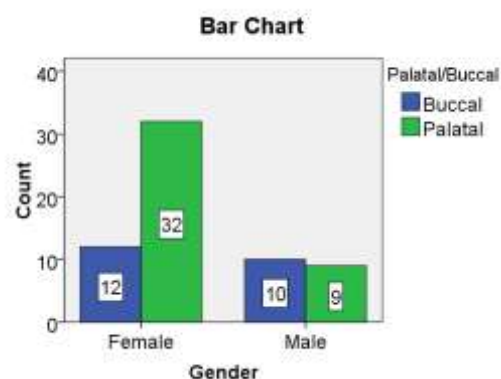
80 impacted maxillary canines found in 63 patients. 39.7 was present in left side only, 33.3% in right side only, and 27.9% in both sides (Fig 2). The distribution of maxillary impacted canines according to the sides were insignificant ( $P > 0.05$ ) (Table 2).



**Figure 2: distribution of impacted maxillary canines according to side**

Study the distribution of maxillary canine impaction according to location showed palatal canine impaction was more in female patients. While male patients have shown almost equal numbers of buccal and palatal canines impaction.

Table 2: percentage distribution of impacted maxillary canines according to side					
		Side			Total
		Left	Right	Both	
Gender	Female	18 (40.9%)	15 (34.1%)	11 (25.0%)	44 (100.0%)
	Male	7 (36.8%)	6 (31.6%)	6 (31.6%)	19 (100.0%)
Total		25 (39.7%)	21 (33.3%)	17 (27.9%)	63 (100.0%)
Chi-Square test		0.293			
P		0.864			



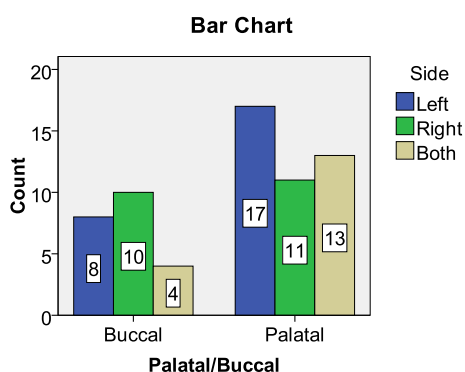
**Figure 3: distribution of impacted maxillary canines according to location**

The palatally impacted maxillary canines occurred in 32 female and 9 male patients. the buccal side of maxillary arch had 10 impaction in male and 12 in female. However, distribution of maxillary canine impaction according to location (buccally or palatally) were insignificant ( $P > 0.05$ ) in Chi-Square test (table 3).

Of forty-one patients (65.1%) have palatal canine impaction, 13 of them were bilateral impaction, whereas, 17 and 11 in left and right position, respectively (Fig 4). A further 22 patients (34.9%) buccal canine impaction, only four of

Table 3: percentage distribution of impacted maxillary canines according to location				
		Palatal / Buccal		Total
		Buccal	Palatal	
Gender	Female	12 (27.3%)	32 (72.7%)	44 (100.0%)
	Male	10 (52.6%)	9 (47.4%)	19 (100.0%)
Total		22 (34.9%)	41 (65.1%)	63 (100.0%)
Chi-Square test		3.755		
P		0.053		
Fisher's test		0.051		

them have bilateral buccal canine impaction. The highest number of canines impaction were palataly in left side in male patients (Table 4).



**Figure 4: distribution of impacted maxillary canines according to location and side of impaction**

Table 4: Palatal / Buccal x Side distribution						
			Side			
			Left	Right	Both	Total
Buccal	Count	8	10	4	22	
	% of total	12.7	15.9	6.3%	34.9	
Palatal	Count	17	11	13	41	
	% of total	27.0	17.5	20.6	65.1	
Total	Count	25	21	17	63	
	% of total	39.7	33.3	27.0	100	

CHI-square test revealed no significant relation between buccal or palatal canine impaction and side of impaction either right or left side (Table 5).

**Table 5: chi-square test for palatal/buccal impaction in relation with side of impaction**

**Chi-Square Tests**

Side	Chi-square	Palatal / Buccal
right/left		2.555
/both	Sig.	0.279

## Discussion:

The permanent canines were considered the cornerstone for an esthetic shape and functional occlusion. It has unnatural eruption process comparing with other tooth in the oral cavity due to its long and complicated pathway of eruption. many authors stated that the most frequently impacted tooth in the dental arch were maxillary canines.<sup>16, 17</sup>

Previous studies showed clear variation in the prevalence and incidence of canine impaction due to the difference in the selected population and ethnic origin.<sup>5, 16, 17</sup> the prevalence of maxillary canine impaction was 3.72% in this study, which is higher than that mentioned in other studies (1% to 3%).<sup>16-18</sup>

However, the lowest prevalence of canine impaction were shown in the Japanese with only 0.27% of the sample population.<sup>17</sup> Numerous studies found higher prevalence of canine impaction, *Fardi et al*<sup>19</sup> reported 8.8% as a prevalence of canine impaction in Greek population, which is in the line with the findings of *Patil and Maheshwari*<sup>17</sup> in the Indian population (9.7%).

In coincidence with other studies,<sup>16, 20</sup> we found that maxillary canine impaction occur more frequently in female patients than male patients. Two thirds of our sample population were female, this is probably due to the fact that female seeking orthodontic treatment more than male. Thus, there is a greater opportunity to discover impacted canines in females.<sup>20</sup> It is possible that the incidence of canine impaction have been increased because of the smaller cranium and facial skeleton for female patients.<sup>18, 21</sup> Moreover, male arches grow wider than female arches which may lead to lack of space for canine in the female dental arches.<sup>22, 23</sup> In addition, Females' growth tends to slow two years earlier compared to males, which may hinder the eruption of the canines.

Occurrence of unilateral or bilateral maxillary canine impactions is a variable phenomenon, most studies showed that unilateral impaction are more

frequent<sup>16, 24</sup> Similarly, the left maxillary canine were the most commonly impacted teeth in both males and females. There was no statistically significant difference between the impacted tooth location (unilateral/ bilateral) and gender. The maxillary canines were impacted bilaterally in 27.9 %, while it is only 8-10% in others.<sup>25</sup>

Accurate radiographs are important to determine the position of maxillary impacted canines, *Ericson and Kuroi*<sup>12</sup> stated that 92% of the impacted maxillary canines were located accurately by periapical radiographs. The best evaluation of Mesiodistal location of maxillary canines done by occlusal radiographs. Nowadays, computed tomography examined maxillary canines position in three dimensions.<sup>26</sup> In this study, it was not possible to make computed tomography for routine examined patients, so panoramic and periapical radiographs were used to locate the correct position of upper impacted canines.

Racial difference of the skeletal structure can affect the buccal or palatal location of impacted canines. For example, Chinese and Korean population exhibit more labially impacted canines than others.<sup>27, 28</sup> In contrast to results of this study, 65.1% of impacted canines occurred palatally, considering the gender distribution, more buccal canines impaction presented in male patients. European population showed more palatal canine impaction than Asian population according to *Peck et al*<sup>29</sup>. Wide arches in male and Asian population may explained these findings. There was no statistically significant difference between buccal/palatal canine impaction according to gender after using Fisher's test.

The present study showed that most bilateral canine impaction occurred palatally without statistical

significant. Palatal canine impaction usually associated with other anomalies such as hypoplastic enamel, peg shaped or missing lateral incisors.<sup>30</sup> Since there is a difference in the methodology used to evaluate the prevalence of maxillary canines' impaction, and selection of the patients and their ages, Thus, comparison between this study and other studies in the literatures was difficult. Small sample size in this study was not adequate for proper evaluation of the maxillary canine impaction prevalence rate in the Damascus area for Syrian population. Wide and randomized sample is required for an accurate representative of the general population. Age may be a factor in the impaction of canines, especially since dental age differs from chronological age between males and females. However, studying this factor was not one of the objectives of the current study. The study was limited to one main clinic in Damascus, as the geographical distribution was not one of the study objectives.

## Conclusions:

Impacted maxillary canines were found in the 3.72% of the 1692 patients. Female patients showed more incidence for maxillary canine impaction as compared to male patients, with high percentage for bilateral palatally impacted canines. The information presented in this study can be added with others in order to achieve early recognition of the maxillary canine impaction to constitute the proper orthodontic treatment plan for impacted canines.

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