

## The relation between hereditary factor and palatally impacted maxillary canine

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### Abstract

**Background:** it has been well known that there are different etiologies for palatal impaction of maxillary canine ,and one of the most important is the hereditary factor ,but all the previous studies have dealt with the hereditary factor as a presence of ; family history of palatal impaction of maxillary canine , and or missing or peg shaped upper lateral incisor[s]. In this study it was dealt with hereditary factor as if there is a relativity of parents of the patients who have palatally impacted canine.

**Materials and methods :** the data were collected during a thirty months interval by the examination of 2800 orthodontic patients in Baghdad city and Al-Faluja distinct, 867 male and 1933 female, age ranged between 14 and 29 years .

**Results:** 44 patients had PIMC, it was found that 63.6% of them had a related parents (cousin marriage), 70.% of them were not presented with clinically diagnosed etiological factors, the majority of these factors were the congenital absence or malformation of maxillary lateral incisor, and the incidence of occurrence were different between male and female .

**Conclusion:** these observations made us to embark on genetic theory a major role in production of this phenomenon.

**Keywords :** palatally impacted maxillary canine PIMC, cousin marriage, genetic factor

### Introduction :

malocclusion is a manifestation of genetic and environmental interaction on the development of orofacial region . ,orthodontist may be interested in genetics to help understand why a patient has a particular occlusion.<sup>(1)</sup>

Impacted teeth are those with a delayed eruption time or that are not expected to erupt completely based on clinical and radio graphical assessment <sup>(2)</sup>. apart from the third molar, the maxillary canine is the most frequently involved tooth with abnormal developmental position <sup>(3,4,5)</sup> , due to denser palatal bone and thicker palatal mucosa , as well as amore horizontal position ,palatally displaced cuspids rarely erupt without requiring complex orthodontic treatment.<sup>(6)</sup>

The prevalence of palatally impacted maxillary canine is low , but it seems to have a variable distribution with regard to ethnic origin <sup>(7)</sup> ,the incidence of impacted maxillary canine is around 2-3% <sup>(8,9,10)</sup> ,whereas Dachi and Howell <sup>(11)</sup> reported that the incidence is about 0.92% , and they occur more commonly in females than males in the ratio of 2:1.

**Etiology:** the exact etiology of palatally impacted maxillary cuspid is un known; however, 2 common theories may explain the phenomenon : the guidance theory and the genetic theory<sup>(12,13)</sup>. The guidance theory of palatal canine displacement proposes that this anomaly is a result of local predisposing causes including congenitally missing lateral incisors , supernumerary teeth , odontomas , transposition of teeth and other mechanical determinants that all interfere with the path of eruption of the canine <sup>(2,14,15,16)</sup>,maxillary canine develop high in the max-

illa ,are among the last teeth to develop and travel along path before they erupt into the dental arch <sup>(17)</sup>.

these factors increase the potential for mechanical disturbances resulting in displacement and , thus , impaction.<sup>(13)</sup>

the second theory : focuses on genetic causes for impacted cuspids <sup>(12,13)</sup>,given the strong hereditary influence in palatal canine displacement , there are those who believe that this is the principal factor involved and dismiss other relationships as secondary or as similarly linked hereditary factors, in another words , the palatal canine is another link in the chain of genetically linked phenomena <sup>(7)</sup>.palatally impacted maxillary cuspids often presents with other dental abnormalities including tooth size , shape ,number, and structure which Baccetti <sup>(18)</sup> reported to be linked genetically .

In a study of the families of children affected by palatally displaced maxillary canines , a search was made on the parents and the siblings for the related anomalies , The prevalence of small, peg shaped and missing lateral incisors, late developing dentitions and other missing teeth among these close relatives was very high, in addition to palatally impacted canines ,This evidence points to heredity as the causal agent for these associated phenomena<sup>(10)</sup>, We have contended that their presence creates an environment favorable to the development of palatally displaced canine <sup>(18)</sup>

Other factors : crowding; Hichin { 1956}<sup>(16)</sup> considered that crowding of the dentition was the reason for this condition , although he offered no evidence to support his contention .in general, crowding of the dentition results in the exaggerated displacement of a tooth from its developmental position in the arch <sup>(7)</sup> Trauma:in a recent clinical report Brin et al [ 1993b ] <sup>(15)</sup> have illustrated how trauma , which leads to a cessation in the development of a lateral incisor root , may be associated palatal canine impaction.

Non- resorption of the root of the deciduous canine : this usually results in mild displacement of the permanent tooth buccally .However, if the permanent canine itself is displaced, normal resorption of the deciduous tooth will not occur ,in this situation the retained deciduous tooth is an indicator , rather than the cause , of displacement <sup>(14)</sup>

**Materials and methods**

the data were collected during a thirty months interval by the examination of 2800 orthodontic patients in three orthodontic clinics in Baghdad city and Al-Faluja distinct, 867 male and 1933 female, age ranged between 14 and 29 . For every patient diagnosed preliminarily to have one or two PIMC(s) [non eruption of canine beyond its normal time of eruption] the followings were done :

**1-clinical examination** by inspection and palpation to reveal the followings:

a- bulging of the soft tissue at the area of impaction to give primary diagnosis about the direction of the

- impacted canine .
- b-unilateral or bilateral missing or peg shaped maxillary lateral incisor(s)
- c-presence of supernumerary teeth or transposition of teeth.
- d-presence of crowding

**2-radiographic examination** which include two types of radiographs:

a-orthopantomograph(OPG):for the primary assessment of the position of the impacted canine, diagnosis of supernumerary teeth, confirm diagnosis of maxillary lateral incisor missing and diagnosis of any abnormality or odontoma.

b-periapical radiograph: A parallax technique were used to localize the impacted canine(if it is impacted palatally or buccally ), by using two periapical radiographs and a horizontal tube shift <sup>(19)</sup>

-Patients *history* :

1- the parents were asked if they are related (cousin marriage) or not by detailed questions about the relation (they should belong to the same grand father or mother).

2- the patients were asked about the presence of previous history of trauma , patients with history of previous trauma were excluded .

**Results:**

The total number of patients had PIMC was 44(32 in Al-Faluja ,12 in Baghdad), these patients arranged in 4 tables considering the following variables; gender, parents relation, and clinically found etiological factors.

**Table(1)** represents the distribution of patients with PIMC according to parents relation and frequency of etiological factors:

Total number of patients with PIMC(44)	Patients with not related parents Group2		Patients with related parents Group1	
	Not presented with etiological factors	presented with etiological factors	Not presented with etiological factors	presented with etiological factors
	10	6	21	7

**Table (2)** grouping of percents of patients according to parents relation and presence of etiological factors:

Group1: patients with related parents	63.6%
Group2: patients with not related parents	36.3%
Group3: patients presented with etiological factor	29.5%
Group4: patients not presented with etiological factor	70.4%

Table(3) represents the distribution of occurrence between males and females and frequency of occurrence(unilateral or bilateral):

Total number of patients with PIMC(44)	Female(35)		Male(9)	
	Bilateral	unilateral	Bilateral	Unilateral
	6	29	1	8

Table(4) distribution according to the type of etiological factors in G1and G2

Total number of patients (44)[ # ]	Missing lateral incisors	Peg shaped lateral incisors	Crowding	Super -numerary teeth	Transposition
Group 1	2.2%	2.2%	0%	4.5%	4.5%
Group 2	2.2%	2.2%	0%	4.5%	4.5%

[ # ] no odontoma was found in all patients.

### Discussion :

the displacement of any tooth in the dental arch is usually related to the presence of a single or multiple obstructive factors interfering with normal development and eruption , for the impacted maxillary canine ; a new character is added which is the loss of guidance represented by the absence of maxillary lateral incisor , even though , many cases of impacted canine are not associated with one of these factors . on a parallel line , the researches was found that in some cases the impaction occur in more than one member of the same family in association , some times ,with malformed or missing teeth, which turned the light on the genetic factor as being a major factor in the occurrence of this abnormality ,and for this reason this study was conducted .

By comparison of numbers and percents of group 1 with group 2 ,we notice that the rate of occurrence is higher in group 1,tables (1and2) which indicates the presence of something different from the known causes of palatal canine impaction( like the loss of guidance ,space adequacy, and long path of eruption) . This high rate of occurrence in the group of related parents might support the theory of genetic origin of PIMC <sup>(10,13,15,19)</sup> , and it can be explained as the appearance of some recessive hereditary features in the siblings of parents who are related(cousin marriage) [cousin marriage has genetic aspects that do not arise in the case of other marriage –related political and social issues like interracial marriage . this is because married couples possessing higher than normal consanguinity have ,on average, an increased chance of sharing genes for recessive traits] <sup>(20)</sup> . So that for this

difference in the frequency of occurrence between the two groups ,we can say that it may be a phenotype that appear more frequently in relatives( consanguinity can cause unmasking a hidden recessive gene , mating between relatives , or inbreeding causes an increase in the frequency of homozygote's among the offspring , recessive phenotype appear with greater frequency among the progeny of inbred mating than in the general population <sup>(21)</sup> .

on the other hand, the difference between groups 3 and 4 indicates the greater possibility of occurrence in the absence of obvious clinical predisposing factors, which means, there is a hidden factor that cause the problem , which is most probably genetic in nature .

beside that ,we can notice that there is a gender difference in the prevalence of PIMC,(table 3), in which male to female ratio was 1:4, and there is a difference in the frequency of bilateral occurrence ,male to female ratio was 1:6, this difference might be an indicator to a hereditary problem occur in female more than male.

The findings of this study also indicate that, the PIMC may be a separated phenomenon since 79.3% of the cases of PIMC are not associated with missing or peg shaped lateral incisors, which differ from that of Brin I et al 1986 <sup>(6)</sup> who found that 47.7% of patients with palatally impacted canine have small ,peg-shaped or missing lateral incisors ,but in the same time, we can notice that the higher percents of predisposing factors

were occupied by the missing or peg shaped lateral incisors which are basically blamed to be genetically determined .table(4)

Finally ,from the results of this study ,it was found that

the percent of patients with PIMC who have enough space was 97.6% , which agree with the findings of ,becker 1984 <sup>(7)</sup>and Brin et al1986]<sup>(15)</sup> who pointed out that the likelihood of palatally impacted canine is much reduced where crowding is present.

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