

Republic of Iraq
Ministry of Higher Education
And Scientific Research
University of Baghdad
College of Dentistry



Buccally Displaced Canine In Iraqi Students (Clinical Comparative Study)

A Project

Submitted to the College of Dentistry, University of Baghdad,
Department of Orthodontics In Partial Fulfillment For The Bachelor
Of Dental Surgery

By

Riyam Luay Hamandi

Supervised by:

Prof. Dr. Dhiaa Jaafar Nasir

B.D.S., M.Sc. (Orthodontics)

May, 2023

Certification Of The Supervisor

I certify that this project entitled " Buccally Displaced Canine In Iraqi Students(Clinical Comparative Study)" was prepared by fifth-year student Riyam Luay under my supervision at the College of Dentistry/University of Baghdad in partial fulfilment of the graduation requirements for the Bachelor Degree in Dentistry.



Prof. Dr. Dhiaa Jaafar Nasir

Date: 30-4-2023

Dedication

First of all, I thank “**Allah**” almighty for granting me the will and strength to accomplish this study, and I wish that his blessings upon me may continue throughout my life...

To the kindest hearts in my life **my mother** and **my father**... for their love and for their endless giving, They give me all the support and care in my life. I can never really thank them enough...

To the closest person to me, **my brothers (Dr. Ahmed and Dr. Yousef)** and my **sister (Ban)**. They did not leave me in my difficult moments.

To my best friend (**Fatima Al_Zahraa**) to give me strength, and continued to support me and give me positive.

All friends for their unlimited encouragement and help. Finally, to all who encouraged me even through a word.

Riyam Luay

Acknowledgement

First and foremost, praises and thanks to **Allah** Almighty for helping me fulfill my dream, for his blessings throughout my work to complete it successfully.

I would like to thank **Prof. Dr. Raghad Abdulrazaq Alhashimi**, the dean of the College of Dentistry, University of Baghdad, for his interest, motivation and continuous support for his students.

My sincere appreciation, thankfulness and respect goes to **Prof. Dr. Dhea Hussein AlGrosh** , the Chairman of the department of Orthodontics for his interest, help, scientific support and encouragement.

A million words would be too short to express my genuine appreciation to my supervisor **Prof. Dr. Dhiaa Aldabagh** who supported me throughout this project and introduced me to the wonders of science. Thank you for your invaluable guidance and for your tremendous effort to help me finish this thesis.

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List Of Abbreviation	
Palatally displaced canine	PDC
Bucally displaced canine	BDC
Buccally canine retractor	BCR

Introduction

Human beings have four pointed teeth one on labial portions of the roots, called the canine or cuspids . Each side of the dental arch called canine or cuspid. Each canine represents the third tooth from the median line after the central and later incisors forming the corner stone or the key stone of the dental arch (**Kraus BS, 1969**).

They are the longest teeth in the mouth , the crowns are usually as long as those of maxillary central incisors and the single roots are longer than those of any of the other teeth. The middle labial lobes have been highly developed incisally into strong ,well-formed cusps.

The shape and position of the canines contribute to the guidance of the teeth into the intercuspal position by "canine guidance" (**Nelson and Ash, 2015**). Canines play a key role in facial aesthetics, development of the dental arch and occlusion (**Russell, 2000**).

Canine teeth are located on the sides of the incisors and are used to grasp food and other objects. The lower canines help retain the tongue within the mouth (**Kanavakis, G. et al., 2015**).

Aims of the study

The aim of this study was to clinically evaluate the prevalence of buccally displaced canines among students of College Of Dentistry in University Of Baghdad in both arches and genders.

Chapter One

Review Of Literature

1.1 Definition of Malposition

Any tooth which is not in its normal position should be called malposed. Slight malpositions (irregularities) of erupted teeth belong to the field of the orthodontist, malposed unerupted teeth to both the orthodontist and oral surgeon, if their malposition is to be corrected. Canine malposition is known to be one of the most common abnormalities in the teeth (**Blum, 1923**).

Canine teeth are located on the sides of the incisors and are used to grasp food and other objects. The lower canines help retain the tongue within the mouth

Moreover, buccally displaced canine (BDC) tend to have maxillary transverse constriction and variation in palatal vault morphology. The morphometric variation of the palatine vault and arch dimensions can be considered a clinical factor associated with the presence of BDC (**Mucedero *et al.*, 2020**).



Fig1.1: Buccally Displaced Canine (Manor *et al.*, 2009)



Figure 1.2: Buccal ectopia of maxillary canines with no crowding (Manor *et al.*, 2009)

1.2 Development of the dentition

Eruption is the developmental process that moves a tooth from its crypt position through the alveolar process into the oral cavity and to occlusion with its antagonist (**Gurkeerat, 2007**). The development of primary teeth begins while the baby is in the womb. At about 5 weeks' gestation, the first buds of primary teeth appear in the baby's jaws. At birth, the baby has a full set of 20 primary teeth (10 in the upper jaw, 10 in the lower jaw) hidden under the gums. Primary teeth are also known as baby teeth, milk teeth or deciduous teeth (**Alkarimi *et al.*, 2014**). The primary cuspids (canines) erupt from 16-23 months, while permanent canine teeth erupt between 9 and 13 years, however during eruption of succedaneous teeth primary tooth resorbs, roots of the permanent teeth lengthen, increase in the alveolar process height, permanent teeth move through the bone. Teeth do not begin to move occlusally until crown formation is complete. It takes 2-5 years for posterior teeth to reach the alveolar crest following crown completion and 12-20 months to reach occlusion after reaching alveolar margin (**Gurkeerat, 2007**).

1.2.1 Factors determining tooth position during eruption (Gurkeerat, 2007).

1. Pre-eruptive Initially position of tooth germ is dependent on heredity.
2. Intra-alveolar tooth position is affected by presence or absence of adjacent teeth, rate of resorption of primary teeth, early loss of primary teeth, localized pathologic conditions.
3. intraoral stage Tooth can be moved by lip, cheek, tongue muscles or external objects and drift into spaces.
4. Occlusal stage Muscles of mastication exert influence through interdigitation of cusps. The periodontal ligament disseminates the strong forces of chewing to the alveolar bone .

1.2.2 Sequence of eruption

There is wide variability in the sequence of arrival of teeth in the mouth. Maxilla **6-1-2-4-3-5-7 or 6-1-2-4-5-3-7** (most common), while in mandible **6-1-2-4-5-3-7 or 6-1-2-3-4-5-7** (most common).The sequence of eruption according to the age as following : **(Gurkeerat, 2007)**

_ At 6 years of age

Considered as first stage of eruption, eruption of mandibular central incisor and permanent first molar, mandibular molar eruption precedes maxillary molar.

_ At 7 years of age

Eruption of maxillary central and mandibular lateral incisor, root formation of maxillary lateral incisor well advanced, crown completion of canines and premolars.

_ At 8 years of age

Eruption of maxillary lateral incisor, delay of 2-3 years before any further tooth eruption (remission period).

_ At 9 years of age

One-third root formation of mandibular canine and first premolar is complete, root development of mandibular second premolar begins.

_ At 10 years of age

One-half root formation of mandibular canine and first premolar is complete, significant root development of maxillary and mandibular second premolar as well as maxillary canine, root completion of mandibular incisors and near completion of maxillary laterals, mandibular canine erupts between 9 and 10 years.

_ At 11 years of age

Eruption of mandibular canine, mandibular first premolar and maxillary first premolar, maxillary first premolar erupts ahead of canine and second premolar.

_ At 12 years old

Remaining succedaneous teeth erupt, second permanent molars nearing eruption, early beginnings of third molar.

_ At 13, 14, 15 of age

Completion of roots of permanent teeth, third molars apparent on the radiograph Change in eruption sequence is a reliable sign of disturbance in normal development of the dentition.

1.2.3 Development of the canine

The maxillary canine begins its development (calcification) high up in the maxilla at around the age of 4–5 months and by the end of the first year it can be seen high in the maxilla above the bifurcation of first deciduous molar and below the floor of the orbit. From this position to the occlusal plane the path of eruption is more tortuous and difficult than any other tooth, as the root begins to form approximately at 7 years of age the canine moves towards the occlusal plane, the crown lying in close proximity to the root of the lateral incisor and emerging into the mouth at the age of 11 and 12 years. By 12 years the canine has usually reached occlusion, the lateral incisor has been (**Al-Sheakli *et al.*, 2021**)The canine has a long path of eruption where it passes along the distal root surface of the lateral incisor and buccal to the deciduous canine, with eruption into its final position at around the age of 11–12 years and it's root completed at the ages of 13-15 years (**Brand and Isselhard , 1986**). Canines should be palpable high in the buccal sulcus by the age of 10 years (**Davies *et al.*, 2020**). And thus it is suggested that if maxillary canine has not appeared by the age of 13.1 in males or by 12.3 in females, the eruption may be considered late (**Belma *et al.*, 2014**).

1.2.4 Developmental consideration

Anatomically canines have the longest period of development, as well as the longest and most difficult course to travel from the point of formation, lateral to the piriform fossa, until they reach their final destination. During the course of development, the crown of the permanent canines are intimately related to the roots of lateral incisors. Many authors have cautioned against the early correction of the flared & distally tipped lateral incisors for fear of either impacting the canines or resorbing the roots of the lateral incisors (**Hossain MZ1 *et al.*, 2020**).

1.2.5 Normal variations of eruption of the dentition (Gurkeerat, 2007).

1. Eruption of second molars ahead of premolars in the mandibular arch. This decreases the space for second premolars, which get partially blocked out.
2. Eruption of maxillary canines ahead of premolars will cause the canines to be forced out labially.
3. Asymmetries in eruption between the right and left sides occurs when there is lack of space to accommodate erupting teeth due to different pattern of mechanical obstruction, decreased space on one side compared to the other.

1.2.6 Post eruption problems and defects (Russell, 2000)

1. Tooth structure related defects
 - Tooth size defects e.g (microdontia and macrodontia).
 - Tooth number defects e.g (supernumerary teeth, hypodontia, oligodontia).
 - Tooth shape defects e.g (dilacerations, talon cusp, dens in dente, fusion, germination).
2. Space related problems
 - Crowding
 - Ectopic eruption
 - Premature loss of primary teeth
 - Prolonged retention of primary teeth
 - Delayed eruption of permanent teeth
3. Others:
 - Ankyloses
 - Trauma
 - Impaction

1.3 The prevalence of malposed canines

In Iraqis, the total prevalence of malposed canine in both arches and gender was 11%; however, concerning arch difference, the distribution of malposed canines in the lower arch was higher (12%) than in the upper arch (10%) while regarding gender difference, the distribution of malposed canines was higher in male (11.3) than in females (10.7) per arch. Unexpectedly, the prevalence of malposed canine was higher in the lower arch than in the upper arch for both sexes (**Yaseen and Aldabagh, 2020**). Moreover in Sammawa city the prevalence of buccally malposed canine found to be (9.72%) of total sample have buccally malposed maxillary canines. (**Al-Atabi et al., 2016**). The prevalence of PDC was reported to be about 2%–3% in a White population (**Thilander and Jakobsson, 1968**). In other population, reported (2_3%) canine malposition in white population. (**Ericson and Kuroi, 1987**).

1.4 Importance Of The Canine

Most of clinicians agree that permanent canines are important for both esthetic and functional points of view and therefore, should be preserved whenever possible (**Bishara et al., 1976**). However **Dewell (1949)** mentioned that no tooth is more interesting from a developmental point of view than the upper cuspid, of all teeth it has the longest period of development, the deepest area of development, and the most devious course to travel from its point of origin to full occlusion which makes it susceptible much longer to environmental influences, whether favorable or unfavorable. It is rarely congenitally missing and it is the final factor in securing contacting relations between all the teeth. This means it has to be prepared by wedging action, part of space it requires in the dental arch. **Hunter (1981)** stated that "crowding of the permanent teeth and insufficient space may exacerbate a primary

displacement on the facial or palatal side of the arch in addition it may displace the canine". On the other hand, **Tulley and Cryer (1969)** mentioned that the unerupted and displaced canine is quite a common problem, while **Foster (1975)** stated that the permanent upper canine is probably the tooth which is most commonly developed in a wrong position. The positions and forms of the permanent canine and their anchorage in the bone, along with the bone ridge over the labial portions of the roots, called the canine eminence, have a cosmetic value. The maxillary canine is an important tooth within the dentition, having a role in aesthetics, lip support, and masticatory efficiency (**Counihan and Hegarty, 1997**).

Canines help form a foundation that ensures normal facial expression at the corners of the mouth. Loss of all of these teeth makes it extremely difficult, if not impossible, to make replacements that restore that natural appearance of the face for any length of time. It would therefore be difficult to place a value on the canines, and their importance is manifested by their efficiency in function, stability, and aid in maintaining natural facial expression. In function, the canines support the incisors and premolars, since they are located between these groups. The canine crowns have some characteristics of functional form, which bears a resemblance to incisor form and also to the premolar form. Canines are unique teeth because they have certain characteristics and responsibilities. They are located in the corner of the mouth, assist the incisors in cutting and tearing food, help the posterior teeth by guiding the mandible during the action of mastication (**Al-Atabi et al., 2016**).

1.5 Etiology

According to (Littlewood and Mitchell, 2019) the etiology of canine displacement as following :

1. Displacement of the crypt: displaced crypts can result in severely displaced canines.
2. Long path of eruption: the canine can go off course due to the long path of eruption.
3. Short-rooted or absent upper laterals: the canines use the distal aspect of the lateral incisors to find their path. If they are absent or small, the canines can find it difficult to reach their destination.
4. Crowding: not enough room for the canines can result in them being displaced buccally, palatally, or less commonly horizontally.
5. Genetics: studies show that impacted canines is an inherited trait.
6. Retention of primary deciduous canine.

While (Fearne *et al.*, 1988) reported that, ectopic canines are believed to occur with a wide variety of systemic and local etiologies [table 1]. No single etiology has been shown to explain the occurrence of a majority of ectopic eruptions or to allow differential explanation of those occurring either labially or palatally. Environmental factors may contribute to this anomaly during the long, tortuous eruption path of a canine. Another possible explanation is that a disturbance associated with the follicle of the unerupted tooth may influence the direction of eruption and contribute to the displacement of the maxillary canine (Fearne *et al.*, 1988).

Table 1: Etiology of malposed canine (Fearne *et al.*, 1988).

Genetics	Local environmental	Systemic environmental
Heredity	Prolonged retention of primary teeth	Endocrine deficiency
Malposed tooth germ	Reduced root length of adjacent lateral incisor	Febrile diseases
	Ankylosis of permanent canine	
Shortened arch length	Degree of dental crowding and spacing	
Alveolar cleft	Failure of primary canine root to resorb Small or congenitally missing lateral incisors	

Two major theories have been proposed to explain the occurrence of palatally displaced maxillary canines (PDC), ie, the “guidance” theory and the “genetic” theory. According to the guidance theory, local conditions are responsible for the displacement of the canine (**Sacerdoti et al., 2004**). While (**Peck et al., 1994**) mentioned that during erupting, the canine lacks the guide that, in normal conditions, would be provided by the root of the lateral incisor because of hypoplasia or aplasia of this tooth. The genetic theory assigns the eruption anomaly of the upper permanent canine to a multifactorial complex that controls the expression of other, possibly concurrent, tooth anomalies. Moreover (**Sacerdoti et al., 2004**) indicated multiple evidential categories for the genetic origin of PDC, ie, familial occurrence, bilateral occurrence (17–45%), sex differences (indicating involvement of the sexual chromosomes), differences in prevalence rates among different populations, and increased occurrence of other concomitant dental anomalies .

1.6 Diagnosis

(**Moss et al., 1972**) stated that diagnosis of permanent canine eruption irregularities begins with clinical observations of the patient. The first sign of ectopic eruption is seeing unerupted permanent canines when a patient's dental development appears average relative to the chronologic age. The following must be considered during clinical evaluation of the patient:

- ✓ the amount of space in the arch for the unerupted/erupted ectopic canine.
- ✓ the morphology and position of the adjacent teeth.
- ✓ the contours of the bone.
- ✓ the mobility of teeth.
- ✓ the radiographic assessment to determine the position of the canine; its apex, crown, and direction of longitudinal axis.

1.7 Treatment

Alkhal *et al*, (2009) reported that orthodontic tooth movement of buccally placed canines is usually difficult as it is always related with problems of severe crowding, midline deviation, involvement of long root movement along with its angulations, risk of damage to adjacent tooth structures and risk of gingival recession.

There are many techniques to align the malposed upper canine reported three categories of management, these are:

- Removable appliance.
- Fixed appliance.
- Canine extraction.

1.7.1 Removable Appliance

It is used when only tipping movement is required, which is found in 51% of cases of Iraqi orthodontic patient. These appliance are used when the buccally malposed canine was mesially inclined and space was available naturally or orthodontically prepared (**Nelson *et al.*, 2015**).

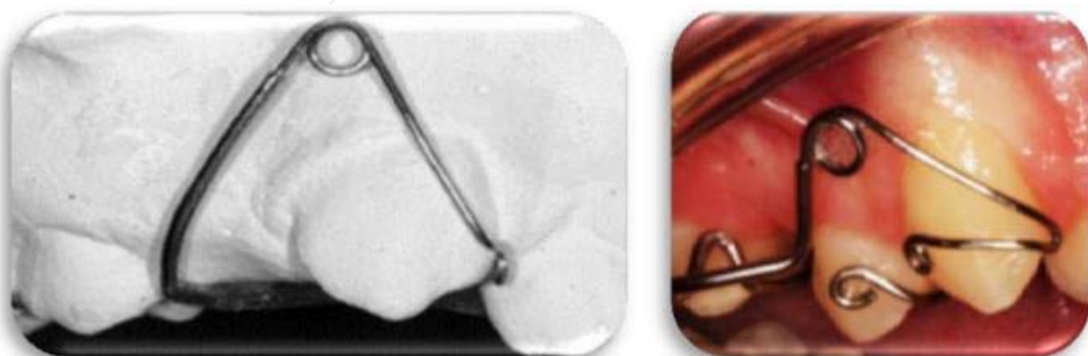


Figure 1.7.1: Buccally canine retractor (BCR) (Nelson *et al.*, 2015).

1.7.2 Fixed Appliances

This is a more complicated appliance and can be used only by orthodontists that's why it is beyond the level of general dental practitioner, it was used when root movement was needed especially in vertically or distally angulated canines with the use of full arch multi bands or brackets or by sectional arch wires the alignment was accomplished (Ghaib *et al.*, 1992).

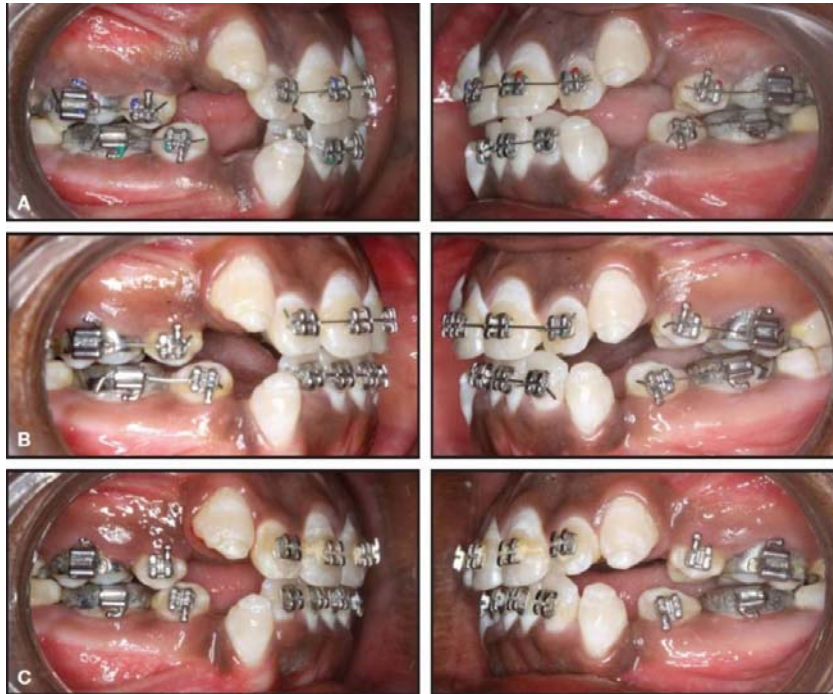


Figure 1.7.2 Sequential drifting of canines after one (A), three (B), and five (C) months of treatment with MBT* fixed appliances, transpalatal arch, and nickel titanium archwires. (Ghaib *et al.*, 1992)

Chapter Two
Materials And Method

2.1 Material

2.1.1 The Sample

After the research purpose was explained to the students and an agreement was obtained from them to participate in this study 313 adult students (120 males and 193 females) their age ranged from 18_24 years in the College of Dentistry, University of Baghdad were selected.

2.1.2 Criteria for the sample selection

Before sampling, the following criteria were used to constitute the eligibility of sample' individuals to the dental examination carried out by the researcher.

1. Any gross facial asymmetry was excluded.
2. No history of orthodontic treatment.
3. No history of systemic disease or regular drug used for chronic disease that affects the growth of the body.
4. Cases of cleft lip and palate were excluded.

2.1.3 Instruments and equipment

The following materials were used during dental examination of the sample individuals and considered in this research work:

- ✓ Disposable mirror for clinical investigation.
- ✓ Medical gloves.
- ✓ Portable torch-light.
- ✓ Case sheet to register the information obtained.
- ✓ Ordinary chair bench for examination.



Figure 2.1: Torch-light



Figure 2.2: Disposable gloves



Figure 2.3: Disposable dental mirror

2.2 The Method

The sample was selected from the University of Baghdad, College Of Dentistry students from January 2023 to April 2023, all were subjected to clinical dental examination. Each student was seated on an armed chair whose height is suitable for examination. In case of insufficient light, a portable torch_light is used to enable the examiner continue his examination. An examination was designed to meet the aim of this study mentioned previously. Canines considered as malposed if they are located buccally out of occlusal line. Number, position in the arch (maxilla or mandible), and affected side (right or left) were registered. Each piece of information on the examination sheet was numerically coded and arranged in tables, then statistical analysis was done to find final results.



Chapter Three

Results

Results:

3.1 Descriptive analysis of buccally mal-posed canines in females

Table 3.1: Descriptive analysis of buccally mal-posed canines in females for both arches

Sample		Max.			Mand.			Total
Female		R	L	Total	R	L	Total	
193	No.	17	12	29	16	22	38	67
	%	8.8%	6.2%	15 %	8.3%	11.4%	19.7 %	34.7 %

Table 1 shows the prevalence of malposed canine in both arches of females (34.7%), regarding arch difference, the distribution of malposed canines in the lower arch (19.7%%) was higher than upper arch (15 %) , regarding side difference , the prevalence of maxillary malposed canine was higher in the right side (8.8%) than the left side (6.2%), while mandibular malposed canine was higher in the left side (11,4%) than the right side (8.3%).

3.2 Descriptive analysis of buccally mal-posed canines in males

Table 3.2: Descriptive analysis of buccally mal-posed canines in males for both arches

sample		Max			Mand			Total
Male		R	L	Total	R	L	Total	
120	No.	13	8	21	5	18	23	44
	%	10.8%	6.7%	17.5 %	4.1%	15%	19.1%	36.6%

Table 2 represents the prevalence of malposed canine in both arches of males (36.6%), concerning arch difference, the distribution of malposed canine in the maxillary arch (17.5 %) which is less than the mandibular arch (19.1%), concerning side difference, found to be in the right side (10.8%) more than the left side (6.7%) ,regarding maxillary arch , while in the mandibular arch found to be in the left side(15%) more than the right side (4.1%).

3.3 Descriptive analysis of buccally mal-posed canines in both gender

Table 3.3 : Descriptive analysis of buccally mal-posed canines in both gender

Sample		Females			Males			Total
		Max.	Mand.	Total	Max.	Mand.	Total	
313	No.	29	38	67	21	23	44	111
	%	9.3%	12.1%	21.4%	6.7%	7.3%	14%	35.4%

Table 3 shows the prevalence of totally malposed canine in both gender (35.4%) which is higher in females (21.4%) than in males (14%). Moreover, the prevalence of malposed canines in each arch (separately) found to be higher in females than in males.

Chapter Four

Discussion

Discussion

4.1 Regarding arch difference

Unexpectedly, the prevalence of malposed canine was higher in the lower arch than in the upper arch for both sexes. This may be due to higher tendency for crowding in the lower than the upper arch which is coincided with (Abdulla, 1996; Batayina, 1997; Al-Huwaizi *et al.* 2002a; Aldabagh *et al.* 2003; Yaseen and Aldabagh, 2020) as crowding of the teeth is considered as one of the common etiological factors that cause malposition of the canines, on the other hand the result of the current study was found to be in contrast to the finding of Al-Huwaizi *et al.* (2002b) who found that malposed canines were more prevalent in the upper arch than the lower arch and this contradictory finding may be because of their younger age sample (13 years).

4.2 Regarding gender difference

On the other hand it was found that canine malposition was higher in females than males which is coincided with Ghaib (1992), Aldabagh *et al.* (2003), Aldabagh (2011), Yaseen and Aldabagh, (2020). This is may attributed to the fact that crowding in females is more common than in males (Salonen *et al.*, 1992), however the current results contradicts those of Alhuwaizi *et al.* (2002b).

Chapter Five

Conclusion And Suggestions

5.1 Conclusion:

1_ The prevalence of malposed canines in Iraqi dental students of College of Dentistry, University of Baghdad was found (35.4%).

2_ The prevalence of malposed canine in the current study was found higher in females than males, and in the mandibular arch than in the maxillary arch.

5.2 Suggestions:

1_ Increase the sample number to include all Iraqi colleges.

2_ Increase the range of the age of selected sample.

References

A

- Al-Atabi, H. S., Hara'a, S., & Nahidh, M. (2016) Buccally malposed maxillary canines in intermediate schools students of sammawa city. *Iraqi Dental Journal*, 38(1), 21-27.
- Aldabagh, D. J., Ali, F. A., & Al-Huwaizi, A. F. (2003) Buccally Malposed Canines in Yemen. *J Coll Dent*, 15, 18-21.
- Al-Huwaizi, A. F., Al-Mulla, A. A., & Al-Alousi, W. S. (2002) Anomalies of tooth eruption and development in Iraqi 13-year olds-a national survey. *J Coll Dent. 2002b*, 14, 48-60.
- Al-Huwaizi, A. F., Al-Mulla, A. A., & Al-Alousi, W. S. (2002) Dental crowding or spacing in 13 year olds. *J Coll Dent. 2002a*, 14, 126-36.
- Ali, M. I. (2020). *Biomechanical Analysis of Orthodontic Correction of Buccally Malposed Canine: A Finite Element Analysis* (Doctoral dissertation, University of Baghdad).
- Alkarimi, H. A., Watt, et al. (2014) Dental caries and growth in school-age children. *Pediatrics*, 133(3), e616-e623.
- Alkhal, H. M., Rabie, B., & Wong, R. W. (2009). Orthodontic tooth movement of total buccally blocked-out canine: a case report. *Cases Journal*, 2(1), 1-4.
- Al-Sheakli, I. I., & Ali, M. I. (2021) Angulation and Height of Canine in Different Type of Malocclusion. *Indian Journal of Forensic Medicine & Toxicology*, 15(4), 408-414.
- Ash, M. M., & Ramfjord, S. P. (1995) Occlusal adjustment. *Occlusion. 4th ed. Philadelphia: WB Saunders Company*, 291-323.

B

- Baccetti, T., Franchi, et al. (2011) Orthodontic forces released by low-friction versus conventional systems during alignment of apically or buccally malposed teeth. *The European Journal of Orthodontics*, 33(1), 50-54.
- Batayine, F. A. M. (1997) Occlusal features and perception of occlusion of Jordanian adolescents: a comparative study with an Iraqi sample. *Sc thesis of Dentistry. Baghdad University*.
- Bazargani, F., Magnuson, et al. (2013) Palatally displaced maxillary canines: factors influencing duration and cost of treatment. *The European Journal of Orthodontics*, 35(3), 310-316.
- Belma Işık Aslan and Neslihan Üçüncü. (2014) *Clinical Consideration and Management of Impacted Maxillary Canine Teeth*.
- Bishara, S. E., Kommer, et al. (1976) Management of impacted canines. *American journal of orthodontics*, 69(4), 371-387.
- Blum, T. (1923) Malposed teeth: Their classification, pathology and treatment. *International Journal of Orthodontia, Oral Surgery and Radiography*, 9(2), 122-137.

References

- Brand, R. W., & Isselhard, D. E. (2017) *Anatomy of orofacial structures: a comprehensive approach*. Elsevier Health Sciences.

C

- Counihan, D. R., & Hegarty, D. J. (1997) In defence of transplants: a case report. *Dental update*, 24(4), 138-142.

D

- Davies - John Wiley & Sons – (2020) *Textbook for orthodontic therapists* (69_75).
- DJ, A. D. (2011) Buccally malposed mandibular canine in Iraqi Kurdish population. *Iraqi Orthod J*, 7(1), 8-11.
- Dewel, B. F. (1949). The upper cuspid: its development and impaction. *The Angle Orthodontist*, 19(2), 79-90.

F

- Fagade, O. O., Gillbe, G. V., & Wastell, D. G. (1988) Radiographic pattern of root resorption in autotransplanted maxillary canines. *Journal of Dentistry*, 16(2), 80-84.
- Fearn, J., & Lee, R. T. (1988) Favourable spontaneous eruption of severely displaced maxillary canines with associated follicular disturbance. *British Journal of Orthodontics*, 15(2), 93-98.
- Foster TD.A (1990) *Textbook of Orthodontics. 3rded.* Blackwell Scientific Publications, Oxford.
- Foster, T. D. (1975) *A textbook of orthodontics*. Wiley-Blackwell.

G

- Grace, Richardson and Kathy, A. Russell (2000) A Review of Impacted Permanent Maxillary Cuspids: Diagnosis and Prevention. *Can Dent Assoc*, 66, 497-501.
- Ghaib NH. (1992) *Buccally malposed maxillary canines a survey of school children aged 13-14 years*. Master Thesis, University of Baghdad, Iraq
- Gurkeerat, S., & Tapasya, J. (2007). *Textbook of orthodontics*.

H

- Hossain, M. Z., Mamun, M. S. A., & Haque, S. (2010) Impacted Maxillary Canines, Premolar and Central Incisor-Surgical Exposure and Orthodontic management. *Bangladesh Journal of Orthodontics and Dentofacial Orthopedics*, 1(1), 24-26.
- Hunter, S. B. (1981) The radiographic assessment of the unerupted maxillary canine. *British Dental Journal*, 150(6), 151-155.

K

References

- Kanavakis, G., Curran, et al. (2015) Evaluation of crown-root angulation of lateral incisors adjacent to palatally impacted canines. *Progress in orthodontics*, 16, 1-6.
- Kraus, B. S., Jordan, R. E., & Abrams, L. (1969) *Dental anatomy and occlusion: a study of the masticatory system*. Williams & Wilkins.

L

- Littlewood, S. J., & Mitchell, L. (2019) *An introduction to orthodontics*. Oxford university press.

M

- Manor, Y., Oubaid, S., Mardinger, O., Chaushu, G., & Nissan, J. (2009). Characteristics of early versus late implant failure: a retrospective study. *Journal of Oral and Maxillofacial Surgery*, 67(12), 2649-2652.
- Moss, J. P. (1972) The unerupted canine. *The Dental Practitioner and Dental Record*, 22(6), 241-248.
- Mucedero, M., Rozzi, et al. (2020) Morphometric analysis of the palatal shape and arch dimension in subjects with buccally displaced canine. *European Journal of Orthodontics*, 42(5), 544-550.

N

- Nelson, S. J. (2015) *Wheeler's Dental Anatomy, Physiology and Occlusion: 1st SAE-E-book*. Elsevier Health Sciences.
- NH, G. (1992). *Buccally malposed canines: a survey of school children aged 13-14 years* (Doctoral dissertation, Master Thesis, College of Dentistry, University of Baghdad).

P

- Peck, S., Peck, L., & Kataja, M. (1994) The palatally displaced canine as a dental anomaly of genetic origin. *The Angle Orthodontist*, 64(4), 250-256.

S

- Sacerdoti, R., & Baccetti, T. (2004) Dentoskeletal features associated with unilateral or bilateral palatal displacement of maxillary canines. *The Angle Orthodontist*, 74(6), 725-732..
- Sachan, A., & Chaturvedi, T. P. (2012) Orthodontic management of buccally erupted ectopic canine with two case reports. *Contemporary clinical dentistry*, 3(1), 123.
- Salonen, L., Mohlin, et al. (1992) Need and demand for orthodontic treatment in an adult Swedish population. *The European Journal of Orthodontics*, 14(5), 359-368.
- Scerri, E. S., McDonald, F., & Camilleri, S. (2016) Comparison of the dental anomalies found in maxillary canine-first premolar transposition cases with

References

those in palatally displaced canine cases. *European Journal of Orthodontics*, 38(1), 79-84.

Y

- Yaseen, A. A., & Aldabagh, D. J. (2020) Canine malposition in Iraqi dental students. *Journal of Baghdad College of Dentistry*, 32(1), 16-18.