

# THE EFFECT OF SEX ON THE WIDTH OF THE IMPACTED LOWER THIRD MOLAR AREA IN ADULTS FROM THE SYRIAN COAST WITH SKELETAL MALOCCLUSION IN THE SAGITTAL PLANE: A CEPHALOMETRIC STUDY

Fadi Khalil<sup>1</sup>

1. Associate Professor, Department of Orthodontics, Faculty of Dentistry, Tishreen University, Lattakia, Syria.  
Lecturer.al andalus university

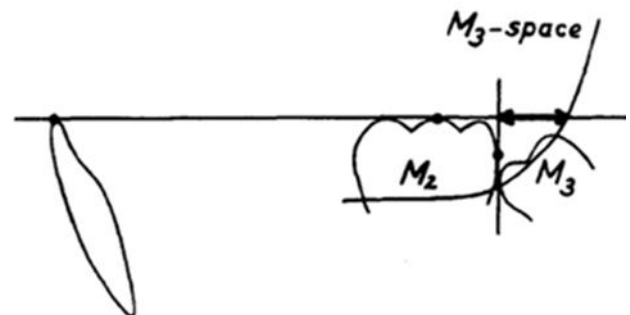
## ABSTRACT:

Impacted mandibular third molar area (retromolar space) has been a topic of interest for a long time, and one of the most investigated parameters for two reasons: 1- the lower third molars are the second most frequently impacted teeth 2- the lack of space is considered to be the major cause of this. so the radiographic diagnosis for this area is an important issue for orthodontists because of its important role in mandibular third molar eruption which play an impact on lower arch crowding and stability of orthodontic treatment. *Objective:* to evaluate the effect of sex on the width of the impacted lower third molar area in adults from the Syrian coast with skeletal malocclusion in the sagittal plane by using lateral cephalometric radiographs. *Materials and methods:* subjects with skeletal class I relationship and subjects with skeletal class II, None of them had a history of previous orthodontic treatment. the width of the impacted mandibular third molar area. Correlation Coefficient Pearson, t-test and analysis of variance ANOVA was calculated. *Results:* , Gender had no statistically significant effect in the width of the impacted lower third molar area both in adults with skeletal Class I and skeletal Class II

**Key Words:** impacted mandibular third molar area - skeletal malocclusion.

## INTRODUCTION

Mandibular third molar area (retromolar space) was defined as the distance between the distal surface of the second molar and the anterior edge of the ramus, on a level with the occlusal line of the mandibular dental arch. The occlusal line was defined as a line through the incisal edge of the lower central incisors and the center of the occlusal surface of the second molar. <sup>[1]</sup>. ( Fig 1 )



**Fig 1: Determination of third molar space (retromolar space) from cephalometric profile x-ray films <sup>[1]</sup>.**

The mesiodistal crown width of the third molar should be smaller than this space if its eruption is to be expected. Ganss et al<sup>[2]</sup> claimed that in this case, almost 70% of wisdom teeth would erupt. However, this space is insufficient in a significant number of individuals.

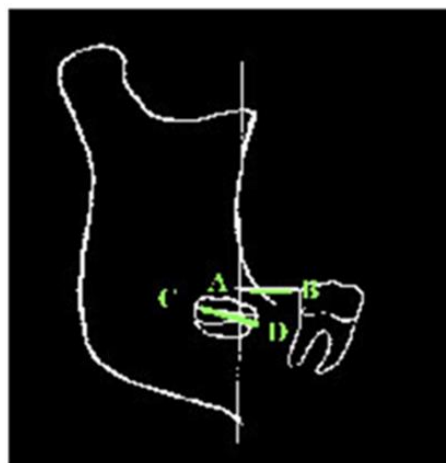
The radiographic diagnosis for this space is an important issue for orthodontists because of its important role in mandibular third molar eruption which play an impact on lower arch crowding and stability of orthodontic treatment<sup>[3]</sup>.

Many studies have been done by using lateral cephalometric radiographs to evaluate the lower third molar area<sup>[1,2,4,5,6]</sup>, and two main methods have been used for estimation of the available retromolar space: measurement of the distance between the center of the ramus (Xi point) and the distal aspect of the lower second molar<sup>[4,5]</sup> and measurement of the distance between the anterior edge of the ramus and the distal surface of the lower second molar<sup>[1,2,6]</sup>. Olive and Basford<sup>[6]</sup> reported that the use of the first method could not be supported.

Bjork<sup>[1]</sup> measured, by using cephalometric radiographs, the distance which separated the anterior edge of the ramus and the distal surface of the second molar and suggested that the probability of impaction decreases as the distance increases.

Olive and Basford<sup>[6]</sup>. In a lateral cephalometric radiograph, the occlusal plane and two perpendicular tangents to

the distal face of the second molar and the external edge of the ramus are traced and the mesiodistal width of the third molar is measured. If this is the same or lower than the available space, the eruption possibilities are good, when it is not, impaction is likely (Fig 2).



**Fig 2: Olive and Basford method to determine the third molar space<sup>[6]</sup>.**

Niedzielska et al<sup>[7]</sup>. reported the retro molar space/crown width ratio and third molar angulations in relation to second molar inclination and to the lower border of the mandible are determinants of the ultimate third molar position in the dental arch.

Mandibular third molar development starts in the ramus at about the age of seven years<sup>[8]</sup>. At this stage, there is no space for it in the dental arch. Richardson<sup>[3]</sup> found space still deficient at age 13 by an average of 8mm. It was considered that the growth of lower retromolar space should not be expected after the age of 16.

Various factors have been suggested as contributors to the development of space for the third molar prior to its eruption. Among these are resorption of bone from the anterior border of the ramus<sup>[9]</sup>, the backward slope of the anterior border of the ramus in relation to the alveolar border<sup>[10]</sup>, forward movement of the dentition<sup>[11,12]</sup>, growth in length of the mandible<sup>[1]</sup>, sagittal direction of mandibular growth<sup>[1]</sup>, and sagittal direction of eruption of the dentition<sup>[1]</sup>.

Ricketts<sup>[13]</sup> believed that the direction of tooth eruption plays a critical role for third molar space. This agrees with the findings of Bjork<sup>[14]</sup> and Bjork et al.<sup>[1]</sup> who stated that distal direction of eruption is associated with lack of space for third molar. It also agrees with the observations of Begg<sup>[15]</sup> who attributed impaction to insufficient forward movement of the teeth of modern man due to the lack of interproximal attrition that was observed in ancient skulls.

Bjork et al<sup>[1, 14]</sup> consider that eruption of M3 is associated with the amount of retromolar space. It is directly connected with the direction of condylar development, which determines resorption of the anterior border of the ramus. Dominant vertical growth of the condyle is connected with reduced resorption of the anterior edge of the ramus and anterior rotation of the mandible. If, on the other hand, the condyle grows more posteriorly, then resorption of the anterior border of the

ramus is greater and the mandible rotates posteriorly.

Farzanegan and Goya<sup>[16]</sup> showed that there was a considerable difference in the retromolar space among different types of vertical growth patterns. The greatest distance was determined in patients with normal vertical growth pattern, followed by open bite and deep bite groups. This result confirms the findings of Kaplan<sup>[17]</sup>, who concluded that the lack of enough resorption in the anterior border of the ramus was accompanied with skeletal deep bite tendency.

It can be assumed that facial growth, jaw size and tooth size differ among races and populations<sup>[18]</sup>, and It has been suggested that different skeletal relationships might have an impact on the retromolar space<sup>[19-21]</sup>. Since there have been no research articles on this issue based on the Syrian coast population, it might be interesting to compare some of those variables in our material with results from studies reported for other populations.

**Aim:** The purpose of this study is to evaluate the effect of sex on the width of the impacted lower third molar area in adults from the Syrian coast with skeletal malocclusion in the sagittal plane using lateral cephalometric radiographs.

## MATERIALS AND METHODS

**Subjects:** The study was carried out on diagnostic (pre-treatment) lateral

cephalometric (LC) films available in the archive of the Clinic of Orthodontics, Faculty of Dentistry, Tishreen University. A total of subjects (24 skeletal class I, 46 skeletal class II). between 18 and 24 years. The samples were based on prior studies that Mandibular growth is completed normally by the age of 16–17 years of age [22].

The investigation of Bjork [1] showed no increase of posterior dental arch after the age of 14 for girls, and the age of 16 for boys. Ledyard [23] also found no expanding of this area after the age of 16. Niedzielska et al. [7] confirmed this observation and concluded that eruption or non-eruption can be adequately predicted in young adults.

The selection of the subjects was based only on the skeletal relationships regardless of the dental relations, and that is because the class II malocclusion according to Angle classification might be of a pure dental origin with any of the sagittal skeletal relationships between jaws [24], so the decision was to give the priority to skeletal relations of class II and class I and to study the width of the impacted lower third molar area associated with it. We utilized ANB angle suggested by Riedel in 1952 [25], because it is one of accepted method of assessing the sagittal jaw base relationship [25-29].

The inclusion criterion for Class II, Class I subjects was:

1) - at least 18 years of age

2)-skeletal relationship with (ANB angle > 4) for skeletal Class II and (0° to 4) for Skeletal Class I [30, 31].

3) - subjects of adults with permanent teeth. All the lower permanent teeth are present and presence of impacted mandibular third molars

4)-no previous orthodontic or orthognathic surgical treatment

5)-no missing or extracted permanent teeth

6)-no history of medical conditions that could have altered the growth of the apical base

7)-Patients with pathological conditions related to mandibular second and third molars such as cysts or extensive caries were excluded.

8)-the sample patients Syrian father and mother, from the Syrian coast exclusively

Lateral cephalometric radiographs LC were taken for each patient in centric occlusion with the lips in repose and the Frankfort plane horizontal, according to the natural head position.

Since all the cephalometric radiographs were taken from the same source, correction for the magnification factor was not considered during the measurement of the study.

LC were used to allocate subjects to their groups based on ANB angle and to measure the width of the impacted third molar area (retromolar space)

which have been measured by drawing the occlusal plane and measure the available space between the two perpendicular tangents to the distal face of the second molar and the external edge of the ramus. All lateral

cephalometric landmarks and the linear and angular cephalometric measurements are shown in (Tables 1 and 2)

Table 1.CEPHALOMETRIC LANDMARKS USED IN THE STUDY [32-36].

Point		Author /year	Description
N	Nasion	Downs,1948	Most anterior point of the frontonasal suture in the midsagittal plane
S	Sella	Bjork,1947	Center of the pituitary fossa of the sphenoid bone
A	Subspinale	Downs,1948	the deepest midline point on the premaxilla between the anterior nasal spine and prosthion
ANS	Anterior nasal spine	Sassouni,1955	Tip of the anterior nasal spine
Pog	Pogonion	Downs,1948	Most anterior point on the mid-sagittal symphysis
B	Supramentale	Downs,1948	the deepest midline point on the mandible between infradentale and pogonion

Table 2.THE LINEAR AND ANGULAR CEPHALOMETRIC MEASUREMENT USED IN THE STUDY

Abbreviation	Description
SNA	The anteroposterior position of the maxilla with regards to the cranial base. [32]
SNB	The anteroposterior position of the mandible in relation to the cranial base [32]
ANB	The anteroposterior relationship between the maxillary and mandibular apical bases [25-29]
Reteomolar space	The width of the impacted third molar area which was measured by drawing the occlusal plane and measure the available space between the two perpendicular tangents to the distal face of the second molar and the external edge of the ramus [6]

*Error of method:* All lateral cephalometric measurements were repeated twice with a month interval, by the same calibrated investigator using the same workstation, Paired t-test at  $\alpha=0.05$  was applied to check the differences between the first and second measurements and determine the systematic error. The comparison did not show any statistical significance.

*Statistical method :* : Using IBM SPSS Statistics 20, independent samples' t-test was calculated to compare the width of the impacted lower third molar area between skeletal Class I and Class II adult patients , and then to compare these width of the impacted lower third molar area in both sexes in skeletal Class I and skeletal Class II

**RESULTS:**

(Tab3) descriptive statistic for the width of the impacted lower third molar area for skeletal class I and class II subjects. Our results indicate that the width of the impacted lower third molar area was significantly larger in the skeletal class.

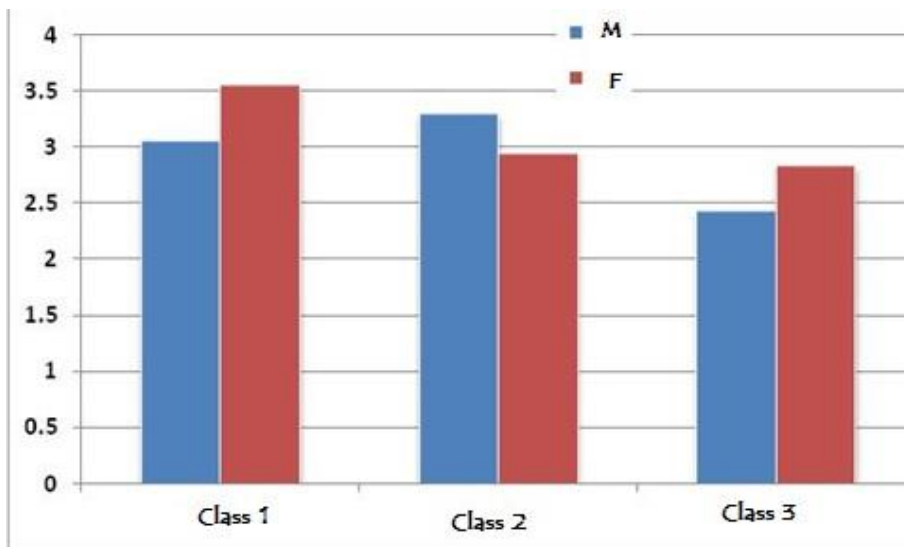
Mean and standard deviation of the width of the impacted lower third molar area in both sexes in skeletal Class I(10 male ,14 female)and skeletal Class II( 26 male , 20 female ) are shown in(Tab 4).

Statistical comparison of the width of the impacted lower third molar area (mean±SD) in the male and female according to skeletal Class I and skeletal Class II (Fig 4) was performed with independent samples't-test. Our null hypothesis was there is no difference in impacted lower third molar area width between male and female according to skeletal Class I and skeletal Class II. . And the results showed that this hypothesis was accepted ( $\alpha = 0.05, p > \alpha$ ).

**Tab4 . MEAN AND STANDARD DEVIATION OF THE WIDTH OF THE IMPACTED LOWER THIRD MOLAR AREA( RETROMOLAR SPACE) IN BOTH SEXES IN SKELETAL CLASS I AND CLASS II**

	Gender	N	Mean	Std. Deviation	t	Sig. (2-tailed)
ClassI	Male	10	3.0600	.75895	-1.114	.277
	Female	14	3.5571	1.25251		
	Male	26	3.3000	1.02995	1.221	.228
	Female	20	2.9550	.83255		

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ClassIII	Male	14	2.4429	.39752	-1.292	.208
	Female	14	2.8429	1.08820		



## DISCUSSION :

This study was carried out to study the relationship between the width of the impacted mandibular third molar area (retromolar space) and the length of the mandibular jaw in skeletal Class I and Class II adult orthodontically untreated subjects from the Syrian coast and to investigate the effect of sex on this area in these subjects by using cephalometric radiographic.

The subjects were divided according to their ANB angle into Skeletal Class I and Skeletal Class II

The age range of the subjects used for this study was between 18 years and 24 years of age.

It has been suggested that different skeletal relationships might have an impact on the retromolar space. Since

there have been no research articles on this issue based on the Syrian coast population, it might be interesting to compare some of those variables in our material with results from studies reported for other populations.

In the current research, we found a difference in the size of the impacted lower third molar area between skeletal Class II and Class I subjects. The reduced retromolar space width found in skeletal Class II subjects compared with skeletal Class I. This finding was in agreement with the results of Richardson (1977) who suggested that a skeletal Class II dental base relationship with a shorter mandible was found in association with impacted third molars

Janson et al.<sup>[23]</sup> reported less space for mandibular third molars on the Class II sides compared with Class I sides. Similarly, we observed the greatest lack of space among Class II subjects. We support the opinion of Janson et al.<sup>[23]</sup> that the distal position of the first mandibular molar and shorter mandibular length in skeletal Class II might be the cause of differences between skeletal Classes II and I.

This result was in contrary to the results of Aleksandar Jakovljevic who suggested that the greatest available retromolar space was found in Class III subjects compared with skeletal Class I and skeletal Class II but no statistically significant differences were found between skeletal Class II and Class I subjects. The patterns of facial growth,

jaw development, and tooth size are inherited and differ between populations and races.<sup>[7]</sup> We assume that different genetic backgrounds might be the reasonable explanation for opposite results, as well different radiology methods 16, 17 might be the reasons for inconsistency among findings where we used in our study Lateral cephalometric radiographs to measure the width of the impacted mandibular third molar area, while it measured in these studies by using the panoramic radiographs.

Gender had no statistically significant effect in the size of the impacted lower third molar area both between skeletal Class I and skeletal Class II

However, the number of females with impacted mandibular M3s was higher than that of males. Many researchers such as Abu Alhaija et al,<sup>[1]</sup> Breik and Grubor,<sup>[2]</sup> Hattab et al,<sup>[3]</sup> and

Brown et al<sup>[19]</sup> reported no sex predilection in mandibular M3 impaction. In contrast, Hugoson and Kugelberg<sup>[4]</sup> and Murtooma et al<sup>20</sup> found a higher frequency in women than men.

Generally, the number of women was more than men in our study, possibly because women are more willing to receive orthodontic treatment for esthetic reasons. That is why the number of recorded impacted M3s in women was greater than men in our study.



## CONCLUSIONS:

Retromolar space width was reduced in skeletal Class II subjects compared with skeletal Class I subjects.

Gender had no statistically significant effect in the size of the impacted lower third molar area both in adults with skeletal Class I and skeletal Class II

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