

THIRD MAXILLARY MOLAR ASSESSMENT USING ORTHOPANTOMOGRAPHY

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ABSTRACT

Aim of the study. The aim of this study was to assess the third maxillary molar status, its eruption prognosis and to evaluate possible correlations between posterior available space and angulation. **Material and methods.** We examined panoramic radiographs of 250 orthodontic patients, aged between 11 and 25 years, mean age 13,96 and we measured the mesiodistal diameter, the available posterior space distal to second molar and upper third molar angulation with the occlusal plane and with the adjacent tooth. **Results.** 75 (15%) third upper molars were congenitally missing; considering the available space we found a considerable increase in those patients with previous first molar extraction compared with the group without extractions; there is no or very weak correlation between posterior space and third molar angulation ($p > 0,05$), but strong inverse proportionally correlation between the angle formed by the long axis of the second and third molar and the angle of the third molar with the occlusal plane ($p = 0,0002$). **Conclusions.** Third maxillary molar potential of eruption depends in many cases by the type of orthodontic treatment and there is no correlation between the posterior space and third molar angulation.

Key words: maxillary third molar; orthopantomography; prognosis

INTRODUCTION

Maxillary third molars impaction is less frequently seen in clinical practice compared to the lower third molars. But for the surgeons and orthodontics the assessment of their status and probability of eruption or impaction is very important^(1,2). In orthodontics the upper third molars with favorable conditions for eruption may be aligned in the dental arch, especially in those cases with first molar extraction or sometimes with upper premolars extraction; on the other hand, a maxillary third molar with uncertain prognosis for eruption can disturb second molar development or eruption or can be a major factor for orthodontic relapse^(3,4).

Third maxillary molar impaction is determined mainly by an insufficient development of the maxillary tuberosity,

small maxilla or increased dental size. Usually, all the maxillary third molars exhibit different degrees of distal tipping at the beginning of their development; once the roots begin their formation, the third molars upright in order to be able to erupt. Only 12% of the upper third molars present mesial inclination which will lead to early impaction of this teeth⁽⁵⁾.

The aim of our present study is to find out if there is any possibility to predict third upper molar eruption using measurements on panoramic radiographs and if there is any correlation between available space and third molar angulation.

MATERIAL AND METHODS

The study sample consisted of 250 patients from the Orthodontic Department of the University of Medicine and Pharmacy of

Iasi, aged between 11 and 25 years, mean age 13,96 years. For all the subjects we assessed the maxillary third molars presence, status and prognosis for eruption or impaction using panoramic radiographs taken with the same X-ray device, STRATO-X (produced by Villa Sistemi Medicali Spa). Considering the method described by Hattab and co.⁽⁶⁾ and Yun-Hoa and co.⁽⁷⁾, we measured on the radiographs the following:

- The mesiodistal diameter of the third molar, right and left
- The distance (DU) from the tangent to the distal face of the upper second molar to the projection of the pterygoid apophysis, right and left (Fig.1).

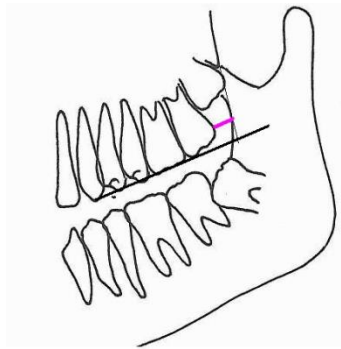


Figure 1. Distance from the tangent distal face of the second upper molar to the pterygoid apophysis (DU)

For younger patients we added growth expectation of 1 mm/year up to 15 years for girls and 17 years for boys according to Langlade⁽³⁾.

- Angle θ between the long axis of the upper third and second molar, right and left (Fig. 2)

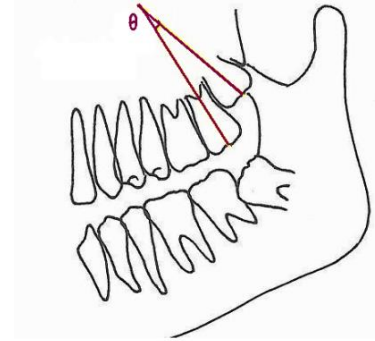


Figure 2. The angle θ between the long axis of the upper third and second molar

- Angle δ between the long axis of the maxillary third molar and the occlusal plane (Fig.3)

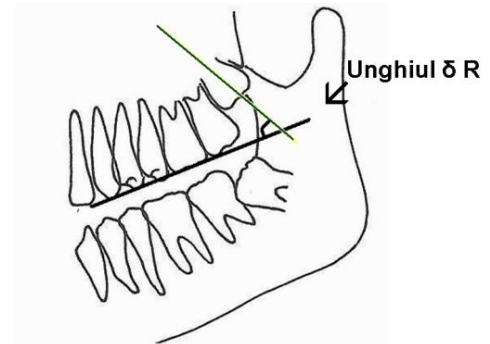


Figure 3. Angle δ

In order to evaluate the available space for the maxillary third molar we calculated the difference between DU and the mesiodistal diameter and we marked it with ΔU . We divided the ΔU values in 4 groups: $\Delta U > 0$; $\Delta U = 0$; $-2 \leq \Delta U < 0$; $\Delta U < -2$. *Statistical Package for Social Science SPSS 18* was used for statistical analysis.

RESULTS AND DISCUSSIONS

In 250 panoramic radiographs taken into study we found 425 maxillary molars

present with 75(15%) missing. In 17 quadrants the upper first molar was already extracted at the beginning at the treatment and in 28 molars the measurements were considered to be irrelevant because early development stage of the bud. Table 1

presents distribution of ΔU values (difference between available posterior space and mesiodistal diameter of maxillary third molar) in all four groups.

Table 1. Difference between the posterior available space and mesiodistal third upper molar diameter

M1 extractions		ΔU				Total
		< -2	[-2, 0]	= 0	> 0	
No	Cases	49	65	48	218	380
	%	12.9%	17.1%	12.6%	57.4%	100%
Yes	Cases	2	1	2	12	17
	%	11.8%	5.9%	11.8%	70.6%	100%
Total	Cases	51	66	50	230	397
	%	12.8%	16.6%	12.6%	57.9%	100%

According to Richardson^(8,9) the maxillary third molars have good prognosis for eruption when $\Delta U \geq 0$, but there still are chances for eruption for those with $-2 \leq \Delta U < 0$, depending on the type of orthodontic treatment applied. In Table 1 the third molars in cases with previous first molar extraction exhibit a much higher prognosis of good eruption (70,6%) compared with the ones in the nonextraction group, which means that for the maxillary wisdom teeth anterior teeth removal is beneficial in many cases. Our findings confirm the studies of Bayram et co.⁽¹⁰⁾ and Seddon et co⁽¹¹⁾ regarding the improvement in upper third molar prognosis of eruption after first molar or premolar extractions.

The next analysis regards the possible correlation between the available posterior space and the angle between the second and the third upper molar (angle θ). According to Hideo Mitani et co⁽¹²⁾, the upper third molar should develop a rotational movement through the occlusal plane from distal to mesial if there is sufficient posterior space, decreasing the angle between the second and the third molar. In Table 2 we presented the

Pearson's chi-squared test to see if there is any correlation between two variables with $p > 0,05$ (0,770), which means that there is a very weak correlation between two variables, almost inexistent.

Table 2. Correlation ΔU /angle θ

		Angle θ	ΔU
Angle θ	Pearson Correlation	1	-.015
	Sig. (2-tailed)		.770
	N	394	385

We determined the regression coefficient in order to see how much the change in the value of dependent variable corresponds to the unit change in the independent variable (table 3).

Table 3. Linear regression coefficient

Model	R	R Square	Std. Error of the Estimate
1	.015(a)	.000	15.29243
a Predictors: (Constant), ΔU			

The inclination of the regression line is closed to zero (Fig. 4), which means that there is no statistically correlation between available posterior space and angle θ .

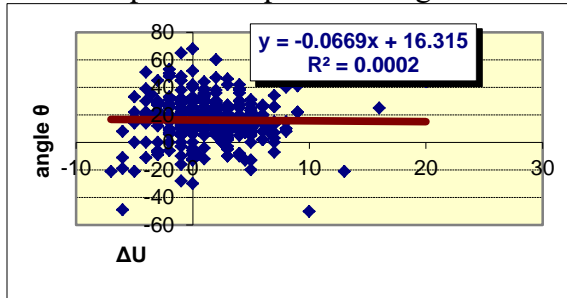


Figure 4. Regression line ΔU /angle θ

The relation between available space (ΔU) and angle δ formed by the long axis of the maxillary third molar and the occlusal plane was analyzed with Pearson's chi-square test (Table 4).

Table 4. Chi-square test ΔU / Angle δ

		(ΔU)	Angle δ
ΔU	Pearson Correlation	1	.126(*)
	Sig. (2-tailed)		.013
	N	397	387

* Correlation is significant at the 0.05 level (2-tailed).

$p < 0,05$ (0,013), which means that there is correlation statistically significant between these variables. The regression line has a very slight inclination as it is shown in Fig. 5.

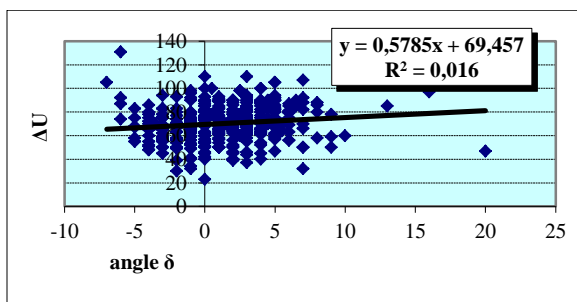


Figure 5. Regression line ΔU /angle δ .

We analyzed if there is any correlation between the angle θ formed by the long axis of the second and third molar and angle δ

formed by the long axis of the wisdom tooth with the occlusal plane. Table 5 and Fig. 6 show that, in this case, there is a strong correlation between this two values.

Table 5. Chi-square test angle θ / angle δ

		Angle δ	Angle θ
Angle δ	Pearson Correlation	1	-.705(**)
	Sig. (2-tailed)		.000
	N	396	394

** Correlation is significant at the 0.01 level (2-tailed).

$p < 0,05$ (0,000), which means that there is a strong correlation, inversely proportional between these two variables⁽¹³⁾.

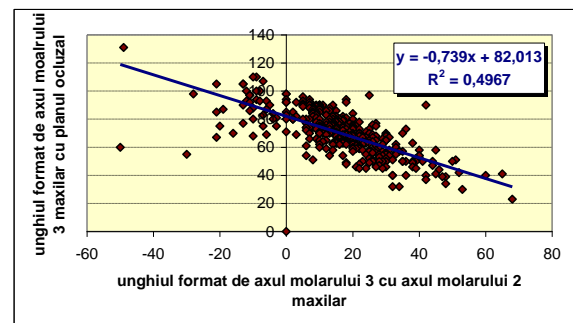


Figure 6. Regression line angle θ / angle δ

CONCLUSIONS

Panoramic radiographs can be used for early assessment for third maxillary molar prognosis for eruption or impaction, but the result may be considerable influenced by the orthodontic management of the case, but for surgeons the new CBCT exam would be more relevant in order to evaluate the third molar relation with the adjacent tooth^(14,15).

There is no statistically significant correlation between the dimension of the posterior space and third upper molar inclination, probably because its variable rotational movements during eruption from distal to mesial.

The value of the angle formed by the long axis of the second and third molar correlates inverse proportionally with the angle between the upper third molar and the

occlusal plane measured on panoramic films.

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