# Computerized prediction of lower third molar eruption

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## Abstract:

One of the problems in Orthodontics and Oral Surgery is determining when to extract third molars or when it is advisable to let them complete their eruption. This study attempts to establish a computerized prediction method using lateral cephalometric radiographs to decide whether removal or leaving third molars to erupt. The result showed that there is a significant difference in the accuracy of manual and computerized method of prediction of lower third molar eruption in that the computerized method proved to be more accurate in the prediction.

## Key words:

Third molar, molar extraction, molar eruption, computerized prediction method, unerupted molars.

## Introduction:

Many members of the most civilized races exhibit a disproportion between jaw size and tooth size. In that theory posses jaws which are too small to accommodate their teeth. Among these teeth lower third molar (M3) is the most frequent tooth in dental arch remain impacted rather than erupted [1]. Times of eruption of M3 are varied among the population ranging from 14-24 years [2]. So that prediction of M3 to erupt or remain impacted is beneficial clinical issues because M3 retention might be important for orthodontic anchorage, prosthetic abutment or transplant in addition to extraction of M3 after complete eruption reduces the intensity of the surgical procedure thereby decreasing morbidity [3].It has been a matter of concern to the dental professional to predict when the M3 will erupt into proper occlusion [4, 5] The factors that must be taken into account are:

1- Patient uncertainly about having the procedure
2- The tales and mythus people believe about third molar eruption. The rate of impaction is varied as reported by authors ranging (25- 50%) [6, 7, 8].

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In an attempt to predict the probability of third molar eruption, many studies have been done most of them using dissected skulls or lateral cephalometric radiographs. The lateral cephalometric radiograph is not an excellent aid in performing cephalometric diagnosis because of image super imposition is not very precise when trying to measure the third molar position and it is probability of eruption .It was decided to make the prediction by using panoramic radiographs. This allowed one to visualize both sides of the dental arch and measuring the structure with least amount of super imposition [9]. Olive&Basford [10] showed that the reliability and validity of panoramic tomograph in the measuring of space condition of M3 are superior to these of lateral cephalogram, bite wing and lateral oblique projection.

Kaplan [11] propose that the impaction of M3 is by establishing an index space which could be measured by the mesio -distal width of M3 and the percentage of space between anterior edge of the ramus and the second molar.

Bjork [6] used cephalometric radiographs to measure the distance which separated the anterior edge of the ramus and distal surface of second molar and suggested that the probability of impaction decreased as the distance increased.

Rickets [5] evaluated approximately 100 skulls and felt that a successful eruption could be directly correlated with the portion of the third molar that goes beyond the anterior edge of the ramus. When half of the third molar lies behind the ramus, the possibility of eruption is 50%. According to the same principle to space available of M3 it has been found that average distance was 21 mm, for the impacted molars, 25 mm, for the erupted molars but out of position was 30 mm. for molars in occlusion. The prediction could be performed from the age 8 or 9 years of age with 90% accuracy.

Richardson [7], reported that the small values that could be appreciated, "in the initial mesial inclination angles" helps the eruption process. The author thought that most of the impacted third molars have been straightening out to some extent and that the degrees of their angles have been augmented.

## Materials &Methods:

The present study proposes a new method that is based on the result of previous study by applying them to the lateral view radiographs. They were projected to the computer through using of digital computerized camera in addition to tracing elements and direct comparison between both measurements accuracy were established, so that the lateral view

radiographs of (20) patients were measured.

*Radiographical projection:*

The position of patient is important in such extra oral radiographs, in that the patient seated in up right position with teeth in occlusion and the occlusal plane parallel with the floor. The chair headrest is placed fairly high on the head and the patient asked to project the chin as far as in comfortable to separate the mandible from vertebral column. The central ray is directed at a point just medial to the ramus and about 0.5 inch above the angle of mandible on the side of face nearer the x- ray machine. The film is positioned so that the central ray is perpendicular as possible to the plane. The patient instructed to hold the film between the heel of hand and the malar of zygomatic bone Fig (1).

**Fig. (1):** Patient position on cephalogram

Then the radiographical film is processed and prepared for the computerized photographical image.

*Digital computerized camera:*

Digital computerized camera (DC 215 zoom digital camera) Fig (2) was adjusted and placed on camera stand against the radiographic film attached to film viewer for radiographic image and the later was subsequently introduced to computer for analysis through use of ACDSee, power point and paint brush programs.


**Fig. (2)** Digital computerized camera

*Analysis of computerized radiograph:*

Analysis of computerized radiograph performed by drawing horizontal line through the most superior points of the occlusal surface of the first and second molars. This was taken as a reference line. Another

reference line was drawn perpendicular to the horizontal line and was tangential to the distal surface of the second molar .The most important point in the overlay was the intersection of the horizontal reference line and the anterior boarder of the ascending ramus [8]. Fig (3).

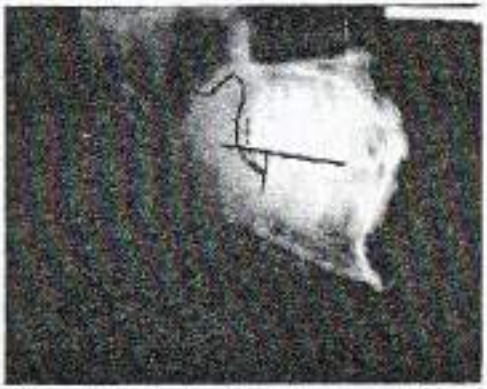

**Fig. (3)** Analysis of computerized radiograph

The prediction points as follows:

1- If the distance from second molar ≤ or = 9.5mm then probability of impaction=100%.

2- If the distance from second molar < 14.5 mm then probability of impaction=76%.

3- If the distance from second molar >14.5-16.5mm then probability of eruption =72%.

4- If the distance from second molar >or = 16.5 mm then probability of eruption =100%.

The same criteria of prediction and analysis of computerized radiograph were used on transparent device. Statistical comparisons between both data were undertaken.

## Result:

The number of patients upon which the comparisons were taken is (20). The mean age of the patients are (22.21) years with the age range (20-25) years. There were (12) males and (8) females (table 1).

**Table (1):** Sex distribution, range and mean age of patients.

| No. of patients | Age range | Mean age | Sex | |
|---|---|---|---|---|
| | | | M | F |
| 20 | 20-25 | 22.21 | 12 | 8 |

Statistical comparison between both reading data (manual and computerized) t-value was used and the results showed statistically significant differences between them ($p<0.0001$) (table 2).

**Table (2):** Comparison between manual and computerized prediction.

| No. of cases | Mean | | T value |
|---|---|---|---|
| | Manual | Computerized | |
| 20 | 16.50 | 17.79 | 5.001* |

* Statistical significant $p<0.0001$.

Correlation coefficient showed that there was significant correlation between computerized and manual prediction (table 3).

**Table (3):** Correlation coefficient between Computerized &manual prediction.

| Number of cases | Correlation Coefficient of computerized and manual prediction |
|---|---|
| 20 | 0.954 |

## Discussion:

Computer technology is already assuming an important role in the usage for diagnosis, treatment planning and treatment-record keeping. The past several years have witnessed the development of a number of systems for the computer-aided in dentistry.

In an attempt to predict the probability of third molar eruption, many studies have been done; most of them using dissected skulls or lateral cephalic radiographs. The benefit of this new method for prediction lower third molar eruption is that it is very simple to use and requires no cephalographic measurements. The method is applicable to most widely used lateral radiographic projection more than a panoramic tomogram because the later may cause a 6% error in the condylar area. Therefore, as apart of the interpretation of panoramic radiograph, attention should be paid to any discrepancy in symmetry between the right and left sides of the jaw. Such asymmetry may have resulted from an eccentric position of the head of the patient when the film was exposed.[12]

Ganss *et al.*[13] concluded that when the amount of the available mesiodistal space (mm) divided by the mesiodistal width of the tooth is more than or equal to 1, almost 70% of third molars erupt. Applied to the present study, this would mean that if the amount of the space were as much as, or more than 15.2mm (the mesiodistal width of lower third molars), then the probability of eruption in the present study would be a little more than 70%.

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