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X-RAY MEASUREMENTS OF IMPACTED MANDIBULAR THIRD MOLARS

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SUMMARY

The X-ray diagnostics is essential in case of retention of teeth. An important condition for proper treatment plan for impacted third molars of the mandible is the determination of the type of retention in the jaw in accordance with their medio-distal inclination and the space available for eruption (retromolar space).

Purpose: The purpose of this article is to present an objective method for determination of the medio-distal inclination and the space for eruption of the third molars of the mandible.

Materials and methods: The studied patients with impacted third molars of the mandible are 127, aged 17 through 60. They were examined with Cone-beam Computed Tomography (CBCT). On the orthopantomography, obtained after the scanning as a reconstructed image, we defined the medio-distal inclination and space for eruption of the third molars of the mandible. For this purpose, we summarized several methods.

Results: The most common inclination of the third molars of the mandible with retained eruption is the medial one at 120 teeth (61.5% ± 3.5). Second in frequency is the vertical one-34 teeth (17.4% ± 2.7), followed by the distal inclination– 21 teeth (10.8% ± 2.2). With the lowest frequency are the teeth which are positioned horizontally –20 teeth (10.3% ± 2.2). Shortage of retromolar space is established for173 teeth (88.7% ± 2.3). In 22 teeth (11.3% ± 2.3) there is enough space in the jaw for eruption.

Conclusion: An objective method for determination of the medio-distal inclination of the teeth and the space available for eruption is introduced for the first time in Bulgaria. By determining the inclination of impacted wisdom teeth under this methodology one can avoid the subjective factor–the seventh tooth. It is not a reference plane, because it can also be tilted or missing. With the help of the developed method the retromolar point can be determined more objectively.

Keywords: CBCT, impacted wisdom teeth of the mandible, medio-distal inclination, retromolar space.

INTRODUCTION:

The retention of teeth is one of the most frequent pathologies in the dental practice. An impacted tooth is one that fails to erupt into the dental arch within the expected time [1, 2]. The retention of the third molars is pathology with high frequency that can be seen in 73% of the young people in Europe. [3]

Many authors make an analysis of the impacted teeth of the mandible on orthopantomography. They define their spatial location according to their medio-distal inclination, as well as the available space for eruption of these teeth in the jaw (retromolar space). Their aim is to predict the possibility of eruption. They determine the inclination of the impacted third molars in accordance with the longitudinal axes of the adjacent second molars. The authors also measure the angle formed between the straight lines passing along the long axes of the second and the third molar. These lines are drawn through the mid-point of the occlusal planes (fossae – F2 of the second molar and F3 of the third molar) and the mid-point of the bifurcations, respectively B2 and B3 [4, 5, 6, 7, 8]. Other authors measure the inclination of the impacted third molars in relation to the tangent of the edge of the body of the jaw [9]. Jaina S. et al. measured the inclination of third molars in degrees, in relation to a reference horizontal line of orthopantomography. This line passes through the anterior nasal spine (ANS) and the shadow, in which the hard palate is projected [10].

Many authors measured the ratio of the retromolar space to the medio-distal size of the crown of the impacted third molar in relation to the Ganss ratio. They measured the retromolar space at the occlusal plane – the tangent passing from the top of the tubercle of the first premolar and the tip of the medial tubercle of the second molar. Then, the authors moved down a perpendicular from the occlusal line tangential to the distal surface of the second molar. The available space for the third molars they defined by measuring the distance between the intersection of the occlusal plane and the perpendicular line to the front edge of the mandibular ramus. This distance they compared with the medio-distal size of the widest part of the crown of the impacted molar [6, 11, 12].

Chadina T. B. et al. developed a methodology for determining the position of the wisdom teeth in the mandible. They made analysis of the orthopantomography, through which they established the retromolar point. From this point they moved down a perpendicular to the tangent of the edge of the mandible and obtained a line that they conventionally defined as vertical clinical boundary be-

tween the body and the ascending branch of the mandible [13].

The purpose of this study is to present a summarized method for determination of the inclination and the space available for eruption of impacted wisdom teeth of the mandible on the basis of the available literature data.

MATERIALS AND METHODS:

The studied patients with impacted third molars of the mandible are 127. They were examined with CBCT within the period 2010–2015. CBCT equipment was used for the examination: Sirona GALILEOS compact/comfort.

We define the following points on the panoramically reconstructed image obtained after the scan:

T – temporal point, the lowest point of the articular tubercle of the temporal bone;

M – mandibular point, the intersection of the tangent lines on the edge of the body of the mandible, located low in the area under the chin;

Ang – angular point, angular intersection point of the tangents to the edge of the body and the ascending branch of the mandible;

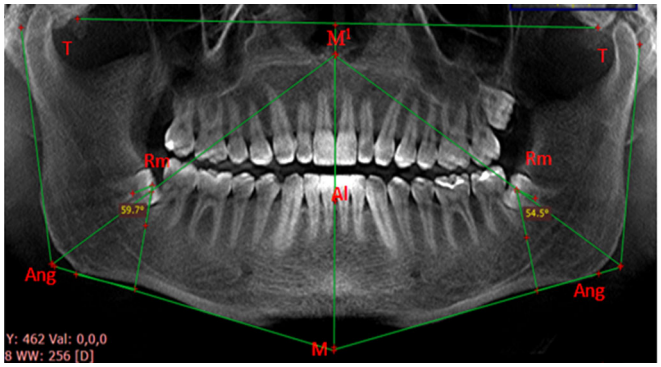
We define the line connecting the T points as general horizontal plane. From the middle of the T line we move down a perpendicular to the M point. Thus we find the median vertical line or the line of the aesthetic center. The intersection point of the median vertical line with the upper end of the alveolar ridge of the mandible we designate as point Al. We measure the distance between the Al point and the M point and we place it above the Al point on the median vertical line as M1point.

The angular point Ang we connect to the M1 point and the intersection point of the resulting line with the crest of the alveolar ridge of the mandible determines the position of the retromolar point–Rm. From the retromolar point we move down a perpendicular to the tangent at the edge of the mandible. This line we define as vertical anatomical boundary between the body and the ascending branch of the mandible ("stress–axis" line).

We determine the longitudinal axis of the third molars of the mandible by moving down straight lines passing through the mid-points of the occlusal plane and the mid-points of the bifurcations. After that we measure the angles between their long axis and the perpendicular lines moved down from the retromolar points to the tangent to the edge of the mandible. When the intersection points of the perpendicular lines and the long axes of the teeth are upward, we indicate the degrees with a "+" sign; when they are downwards–with the "-" sign. On the basis of the Winter's classification we determine the medio-distal inclination of the teeth according to the measured angles [14].

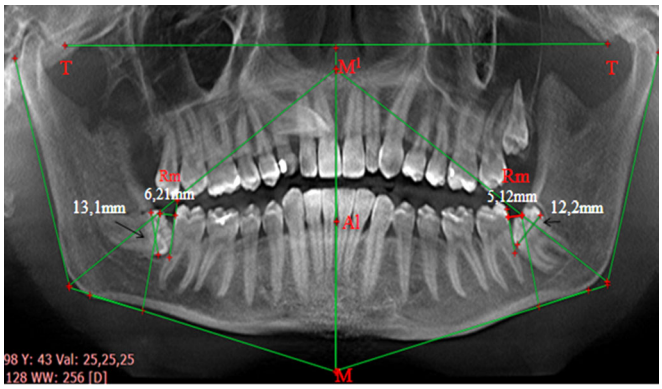
1. vertical position: from + 10º to - 10º;
2. medial inclination: from + 10º to + 70º;
3. distal inclination: from -10º to - 70º;
4. horizontal position: above ± 70º; (Fig.1).

Fig. 1. Measurement of the medio-distal inclination of the impacted third molars in degrees towards the vertical boundary.



After determining the retromolar points under the described method, we measure the medio-distal sizes of the crowns of the impacted teeth on the panoramas obtained after the scanning. We determine these sizes by measuring the distance between the most protruding medial and distal parts of the crowns in millimeters. On the distal surface of the second molars we draw tangent lines. The distances from these tangents to the perpendicular lines moved down from the retromolar points to the tangents at the edge of the mandible we measure in millimeters. These are the spaces available for the eruption of the third molars (retromolar spaces). These spaces we compare with the medio-distal sizes of the crowns of the impacted teeth. Thus, we establish whether there is enough space in the jaw for eruption of the wisdom teeth (Fig. 2).

Fig. 2. Measurement of the retromolar spaces and the medio-distal sizes of the crowns.



RESULTS:

From a total of 127 patients, 68 (53.5% ± 4.42) have bilateral retention. In 35 patients (27.6% ±3.96) the retention is unilateral, to the left. In 24 patients (18.9% ±3.47) it is unilateral, to the right. From a total of 195 impacted third molars, 103 (52.8% ±3.6) are on the left and 92 (47.2% ±3.6) of them on the right. Women in the study were 68 (53.5% ± 4.4) and men were 59 (46.5% ± 4.4). Depending on the degree of retention in the bone, 126 teeth (64.6% ± 3.42) are partially impacted and 69 teeth (35.4% ± 3.42)

are fully impacted.

The most common inclination of the third molars of the mandible with retained eruption, determined in relation to the conditional vertical, is the medial one–120 teeth (61.5% ± 3.5). Second in frequency is the vertical one–34 teeth (17.4% ± 2.7), followed by the distal inclination–21 teeth (10.8% ± 2.2). With the lowest frequency are the teeth which are positioned horizontally–20 teeth (10.3% ± 2.2).

After we compared the retromolar spaces to the medio-distal sizes of the crowns of the teeth, it was established under the method developed by us that in 22 teeth (11.3% ±2.3) there is enough space in the jaw for eruption. Shortage of retromolar space was established for173 teeth (88.7% ± 2.3).

DISCUSSION:

Similar to the results of Dudhia, in most patients, 68 (53.5% ± 4.42) was established bilateral retention [15]. In 35 patients (27.6% ± 3.96) the retention is unilateral, to the left. In 24 patients (18.9% ± 3.47) the retention is unilateral, to the right. Other authors have established in their research that the unilateral retention prevails [1, 16]. Like many other authors, we also established that the majority of the teeth are partially impacted– 126 teeth (64.6% ± 3.42), and 69 teeth (35.4% ± 3.42) are fully impacted [6]. According to other results, the incidence of wisdom teeth retention in women is greater than the retention in men: 53.5% to 46.5%. Other authors established greater incidence in men [6, 17,].

The most common inclination of third molars of the mandible is the medial one in 61.5% of the cases. Second in frequency is the vertical one –17.4%, followed by the distal inclination– 10.8%. With the lowest frequency are the teeth which are positioned horizontally–10.3%. These results are consistent with the results of other authors [4, 6]. Lübbers et al. also identified the medial and the vertical position of the teeth as the most common. But in their study the horizontal inclination of the teeth has the higher frequency when compared to the distal inclination [8].

After we compared the retromolar spaces to the medio-distal sizes of the crowns of the teeth, it was established under the method developed by us that in 22 teeth (11.3% ± 2.3) there is enough space in the jaw for eruption. Shortage of retromolar space was established for173 teeth (88.7% ± 2.3). According to Gupta S, the frequency of teeth, for which the retromolar space is enough for eruption of the third molars, is low (18.2%) and the lack of retromolar space is in larger percentages [6]. This conclusion is confirmed by other authors. According to them, in 90% of the cases the reason for the retention of third molars of the mandible is the lack of space for eruption [6, 12, 18].

CONCLUSION:

An objective method for determination of the medio-distal inclination of the teeth and the space available for eruption is introduced for the first time in Bulgaria. By determining the inclination of impacted wisdom teeth under this methodology one can avoid the subjective factor–seventh tooth. It is not a reference plane, because it can also be tilted or missing. With the help of the method of Chadina T.V. the retromolar point can be more objectively determined.

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