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**CONE BEAM COMPUTED TOMOGRAPHIC ANALYSES OF ALVEOLAR BONE ANATOMY AT THE MAXILLARY ANTERIOR REGION**

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**Resume:** Sufficient labial bone is important for optimal esthetic results of implant treatment in the anterior region. Single-tooth implant placement in the esthetic zone is a highly reliable treatment option for replacing a failing tooth. Especially in the esthetic region, labial bone and its preservation is one of the key factors in esthetic outcome.

**Keywords:** cone beam computed tomography (CBCT), dental implant, cements/enamel junction (CEJ).

**Relevance:** Aesthetic restoration of anterior teeth with implant-supported restorations is one of the most difficult procedures to execute. Bone resorption following anterior tooth extraction often compromises gingival tissue levels for the implant restoration. The predictability of aesthetic success depends on the tissue loss present at the initiation of treatment. The greater the amount of bone and soft tissue loss, the more difficult it becomes to produce an ideal aesthetic result [3].

An esthetic implant restoration is one that resembles a natural tooth in all respects. Both dental and gingival esthetics act together to provide a harmonious smile [1].

For successful esthetic restoration of implants, the bony housing must have a three dimensional configuration that permits placement of an implant in a restoratively ideal position. Two anatomic structures are important in determining predictability of soft tissues after implant placement. The first is the height and thickness of the facial bony wall and the second is the bone height of the alveolar crest in the interproximal areas [2].

Misch and Judy classified available bone into 4 divisions: abundant, barely sufficient, compromised, and deficient (A-D). Abundant bone is bone volume is greater than 5 mm in width, 10 to 13 mm in height, and 7 mm in length. Barely sufficient bone is 2.5 to 5 mm in width, greater than 10 to 13 mm in height, and greater than 12 mm in length. Compromised bone is less than 10 mm in height, or width (less than 2.5 mm). Deficient bone is generally not amenable to implant rehabilitation [4].

**Aim:** The aim of this study was to evaluate the alveolar bone anatomy for implant planning at the maxillary anterior region using CBCT imaging technique.

**Objectives:**

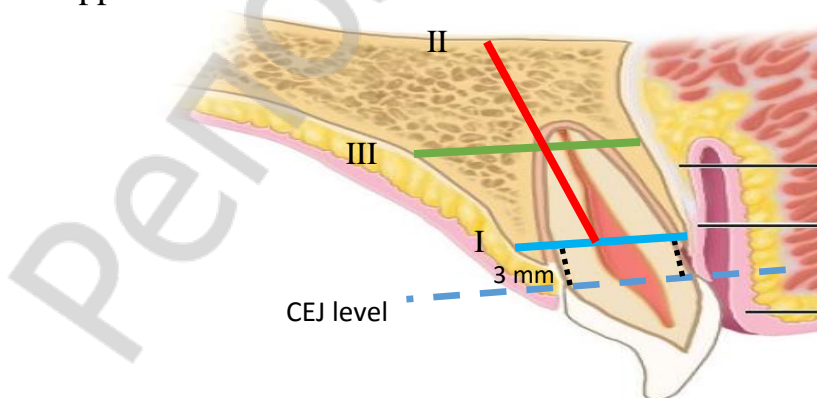
1. To measure the CEJ-3mm for target teeth.
2. To measure the root length (CEJ-3mm up to nasal / sinus floor).
3. To measure the mid-root level.

**Materials and methods:** 19 CBCT images were selected using specific inclusion and exclusion criteria: six maxillary anterior teeth (canine until canine) without crowding or spacing, caries, restorations, apical diseases, tooth trauma and periodontal diseases. CBCTs were studied and analyzed by the software GALILEOS Viewer ver. 1.9 (Sirona Dental System GmbH – All rights reserved). According to the aim of the study for each tooth 3 value were measured (figure 1):

I- CEJ-3mm (Labio-Palatal bone thickness within tooth for implant diameter determination).

II- CEJ-3mm up to nasal/sinus floor (for implant length determination).

III- Mid root (CEJ-3mm up to nasal/sinus floor divided by 2 for evaluation of the implant support).



**Figure 1** – Scheme of analyzed levels and points in teeth

Data collected and processed by software Microsoft Excel 2013 (Statistical calculations, graphs and charts).

**Results and discussion:** Values for each tooth and for all patients measured (19 patients, 6 teeth from each patient and 3 values for each tooth).

114 picture from CBCTs captured and 3 points in all of them have measured. As an example teeth number #21 and #22 for discussion have chosen.

In tooth number #21 the maximum value of CEJ-3mm belong to a 27 years old male and it's 9.36 mm (figure 2). The minimum of this value in this tooth is for a 41 years old female, 6.88 mm (figure 3).

Maximum value of CEJ-3mm up to nasal floor for this tooth recorded in a 39 years old male, 22.79 mm (figure 4). Minimum of this value is also recorded for a 58 years old female, 10.16 mm (figure 5).



Figure 3 – Maximum of CEJ-3mm in tooth #21



Figure 2 – Minimum of CEJ-3mm in tooth #21



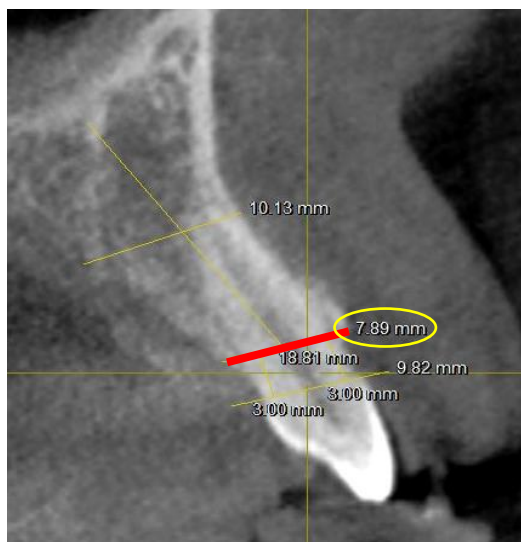
Figure 5 – Maximum of CEJ-3mm up to nasal floor in tooth #21



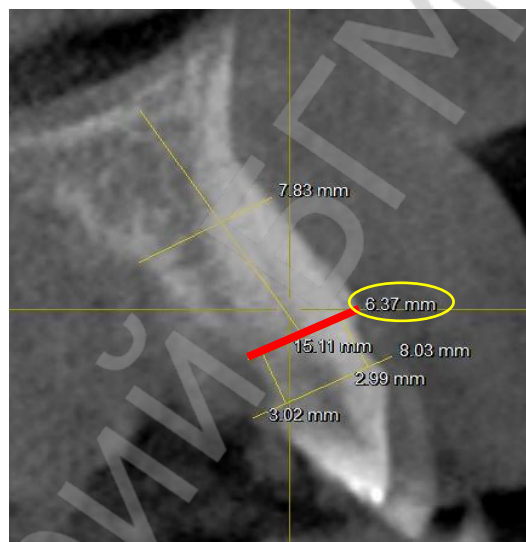
Figure 4 - Minimum of CEJ-3mm up to nasal floor in tooth #21

In tooth number #22 the maximum value of CEJ-3mm belong to a 54 years old female and it's 7.89 mm (figure 6). The minimum of this value in this tooth is for a 37 years old female, 6.37 mm (figure 7).

Maximum value of CEJ-3mm up to nasal floor for this tooth recorded in a 39 years old male, 23.44 mm (figure 8). Minimum of this value is also recorded for a 58 years old female, 12.17 mm (figure 9).



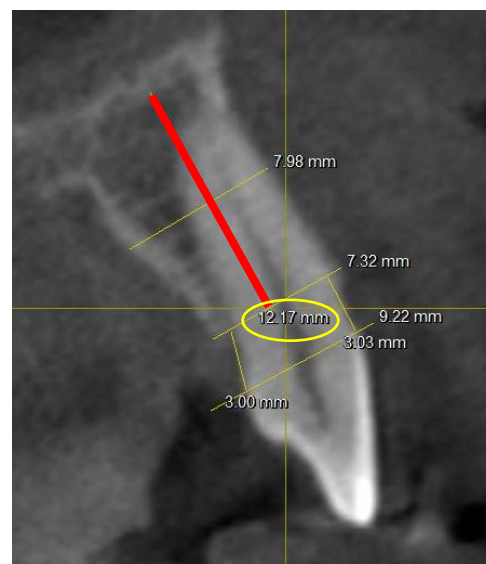
**Figure 7** – Maximum of CEJ-3mm in tooth #22



**Figure 6** – Minimum of CEJ-3mm in tooth #22



**Figure 8** – Maximum of CEJ-3mm up to nasal floor in tooth #22



**Figure 9** – Minimum of CEJ-3mm up to nasal floor in tooth #22

Average (figure 10) of the all measured values are shown in the graphs below (all measurements are in mm). Other different statistical calculations can be considered for data also.

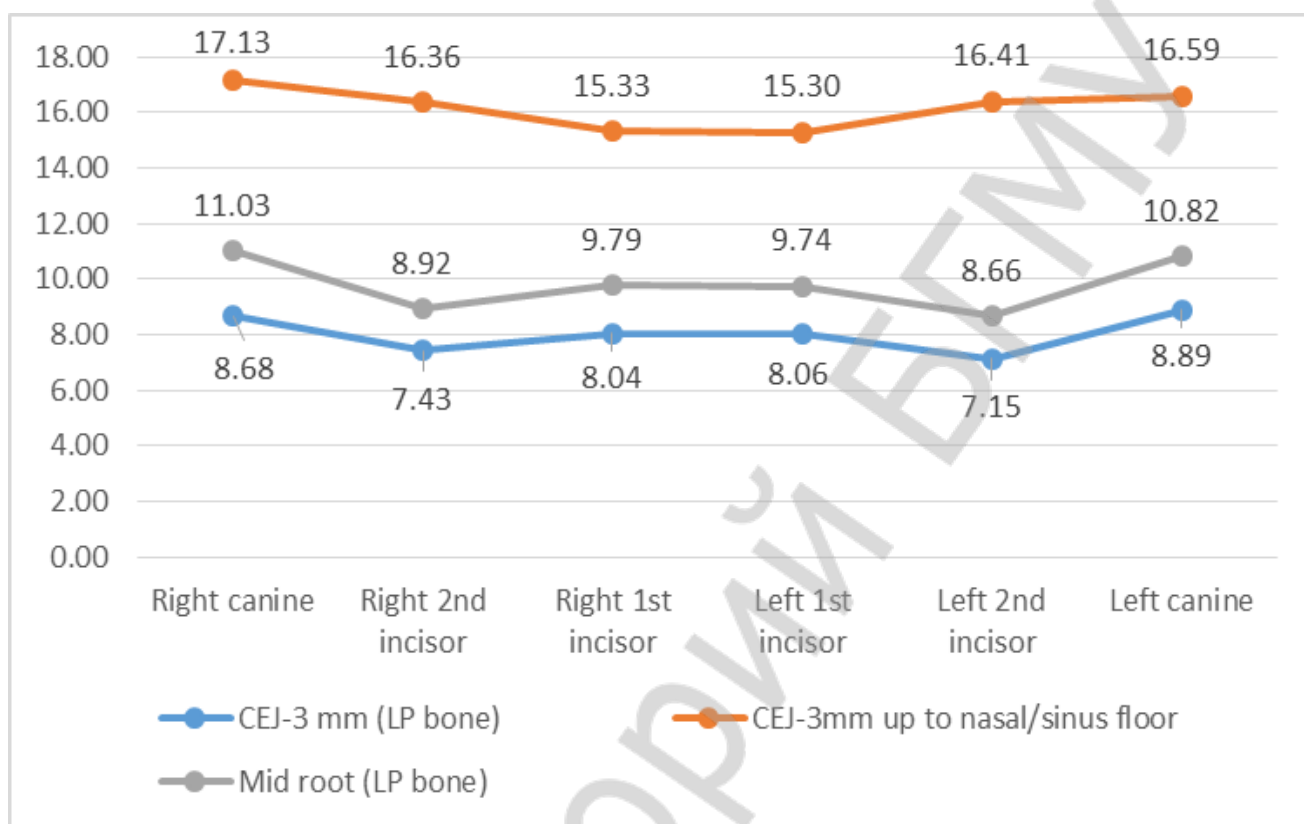


Figure 10 – Average of all measured values

### Conclusion:

1. Computerized tomography (CT) scans and cone beam CTs (CBCTs) are commonly used for pre-surgical planning and for prediction of the bone density and potential stability of dental implants.

2. In new dentistry, long survival time is one of the key factors of a successful implant. Measured dimensions are significantly important for designing a proper implant plan and as a result to achieve an acceptable implant survival time.

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