

Summary

Orthodontic arch expansion is bound with a risk of bone dehiscencies formation, which are considered to be factors leading to gingival recessions development. Therefore, while planning a treatment, one must take under consideration possibility of performing some additional procedures like corticotomy, including *piezocision*, which may lower the risk of the appearance of gingival recessions. The intention of the procedure is to make cuts between roots in buccal plate with use of surgery bur or piezosurgery device in order to provoke temporary osteopenia and increased bone turnover. The result of these reactions is reduction of bone resistance after applying orthodontic forces and possibility to move teeth with surrounding demineralized extracellular matrix. Root movement with adjacent bone minimalizes the possibility of forming lamina dura dehiscences and therefore gingival recessions. However, in available publications, there is no data considering assessment of changes in the alveolar process after orthodontic treatment assisted with corticotomy, including *piezocision*.

That is why, the aim of the study was to evaluate selected radiographic parameters in cone beam tomography scans performed before and after orthodontic treatment assisted with the procedure of minimal invasive corticotomy (*piezocision*).

The study was designed as a single-center, retrospective, a case series study. The study was based on 40 CBCT images of 20 patients – 13 women aged 23 to 52 and 7 men aged 22 to 56 consecutive treated in Private Practice in Białystok, Poland between June 2014 and June 2018. CBCT scans were executed twice with every patient; before the treatment due to diagnostic purposes and after, before removal of orthodontic appliances, to evaluate the position of the roots in alveolar process. The technical parameters of the study were set automatically based on the device software (Vatech, Korea), depending on the individual characteristics of the patients. The size of the imaged area was 10x8 cm. All files were exported and reconstructed using the EzDent-i program (Vatech, Korea) with a cross-sectional distance of 0.1 mm. The image of each tooth was placed in such a way as to gain full insight into its anatomy in the sagittal section. For molars, mesial and distal roots were measured separately. In cases where the parameter could not be reliably measured, it was omitted. To verify repeatability, five patients' CBCT performed before and after treatment were scored twice.

The following radiographic parameters were measured for each root: buccal/palatal bone plate thickness – measured perpendicular to the long axis of the tooth at three locations - 0.5 mm, 3.5 mm and 5 mm from the edge of alveolar process and the distance between CEJ and

the edge of buccal/palatal bone plate (CEJ-B/CEJ-P); measured parallel to the long axis of the tooth at the middle of the tooth crown. A distance of more than 2 mm was considered bone dehiscence.

One hundred eighty eight teeth (231 roots) in maxilla - 44 molars (43 mesial roots, 44 distal roots), 70 premolars, 35 canines, 39 incisors were evaluated.

CBCT analysis showed that before treatment, the buccal bone plate margin on most incisors (87.1%) was at least 2 mm from CEJ. After treatment, the percentage of incisors with bone margin above 2 mm from CEJ decreased to 66.6%. For canines and premolars the percentage of teeth with CEJ-B \leq 2 mm was 71.4% and 64.2%. After treatment, the percentage of teeth with CEJ-B $>$ 2 mm increased to 80% on canines and decreased to 67.1% on premolars. On mesial and distal molar roots, the CEJ-B also exceeded 2 mm for most teeth (67.4%, 52.2%). After treatment, the number of molars where the distance CEJ-B exceeded 2 mm remained the same as before treatment (59.7%).

At baseline the thickness of the buccal bone plate measured 0.5 mm from the margin was $<$ 1 mm in most teeth (incisors - 89.7%, canines - 97.1%, premolars - 57.1%, mesial molars roots - 69.7% and distal molars roots - 38.6%). After treatment there was an increase in the number of teeth with the buccal plate $<$ 1mm only in premolars to 78.5%. In other regions the percentage of teeth with buccal plate $<$ 1mm was: incisors - 84.6%, canines - 91.4%, mesial roots of molars - 69.7%, distal root of molars - 34/1%.

Based on the results obtained, the following conclusions were drawn:

- I. Buccal bone plate of alveolar process is usually very thin.
- II. Characteristic anatomic features of alveolar process are bone dehiscences in buccal and palatal bone plate, both in front and lateral teeth.
- III. Orthodontic expansion of upper arch assisted with the procedure of corticotomy does not cause evident negative radiographic changes in the CBCT examination.
- IV. Premolars may be more vulnerable to bone plate loss, more than incisors, canines and molars, during orthodontic arch expansion.
- V. On account of possibility of forming or increasing already existing bone dehiscences, orthodontic treatment in the area of premolars ought to be planned with additional caution.