The effect of piezosurgery on the oxidative stress and immediate post extraction discomfort following complex teeth extractions prior to implant placement

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Background: Following tooth extraction, the alveolar ridge undergoes dimensional changes due to the resorption processes. Moreover, traumatic damage to the dento-alveolar housing during complex exodontia can result in significant vertical and horizontal ridge reductions, compromising available bone for implant placement. Additionally, mechanical stress during extraction procedures may cause oxidative stress to alveolar bone and the surrounding soft tissue. Consequently, post-extraction alveolar bone loss and soft tissue damage can cause the patient discomfort and lead to esthetic, functional, and prosthetic complications. Over the past decade, minimally invasive piezosurgery has become widely available. When properly used, this ultrasonic bone-cutting device is able to help overcome limitations of conventional extraction procedures and minimize extraction-associated damage to alveolar bone and patient discomfort.

Aim/Hypothesis: The aim of this study was to investigate and compare multiple variables (total operation time, time needed for tooth section and osteotomy, post extraction pain, and superoxide dismutase (SOD) enzyme activity in bone specimens) after utilizing conventional and piezo surgical techniques following complex multi-rooted teeth extractions.

Material and Methods: The prospective, single-blind split-month study design was conducted on 30 randomly selected patients from the outpatient unit at the Department for Oral Surgery, School of Dental Medicine, University of Belgrade, Serbia. The patients enrolled were referred for bilateral multi-rooted teeth extractions and implant rehabilitation in the same site. On one side, tooth sectioning and extractions were performed utilizing piezosurgical unit (test side), whereas extraction on the contralateral side was performed using the conventional approach with burs, elevators and forceps (control side). Intraoperatively, the individual times for extractions, root sectioning, and osteotomy were recorded for each side. Postoperatively, the time of the first reported pain (expressed in minutes) and first pain intensity (VAS) were evaluated as parameters of post extraction discomfort. The bone specimens obtained during the surgeries were used for the SOD enzyme activity spectrophotometric analyses. For statistical analysis, Paired t-test was used and statistical significance was set at P < 0.05.

Results: All extractions sites healed uneventfully and without complications. The time needed for tooth sectioning and osteotomy was significantly longer in piezosurgical group (P < 0.05), whereas the total extraction time was similar in both groups. The time of the first pain reported was shorter in the conventional group, with no statistically significant difference (P > 0.05). The first pain intensity (VAS), as well as the SOD enzyme activity (%) were significantly higher in the conventional group compared with the piezo group (P < 0.05).

Conclusions and Clinical Implications: Despite the additional procedure time for the micrometric cutting, significantly less reported post extraction pain and decreased SOD activity in piezosurgical group indirectly indicates diminished local tissue trauma and decreased oxidative stress at the extraction sites. Results suggest that piezosurgery may be a relevant treatment option in complex tooth extractions prior to implant placement.