

Piezosurgery vs. Sonosurgery: Assessment of Two Techniques in Third Molar Surgery and Comparison with the High-Speed Rotary Handpiece: A Preliminary Study

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Abstract

Objectives: The aim of this preliminary study is to compare piezosurgery with sonosurgery, to verify the possibility of having alternatives in the use of the current reference standard (high-speed handpiece), evaluating the intraoperative time required for odontotomy cutting and postoperative pain control.

Methods: Our experimental protocol involved the selection of 15 patients aged 21 to 27 years with at least one lower third molar requiring surgical extraction with odontotomy. The 15 patients were divided into three equal groups: the first group was treated with a high-speed handpiece, the second group with piezosurgery, and the third group with sonosurgery. To assess pain control during the postoperative period, each

patient was asked to record the perceived intensity on a pain scale ranging from 0 (no pain) to 10 (excruciating pain).

Results: High-speed handpiece reported the fastest intraoperative times, but with less satisfactory pain control, especially in older patients; Sonosurgery, on the other hand, recorded the longest intraoperative times, but a better analgesic response at every age. Finally, Piezosurgery obtained intermediate values in terms of cutting speed and pain control. According to our preliminary data, sonosurgery appears to be an effective alternative for third molar extractions. The high-speed handpiece, thanks to its effectiveness in cutting hard tissue, confirms its validity due to its increased speed of

execution.

Conclusions: Further studies will be needed to confirm our hypotheses and to further explore the properties and specificities of surgery with sonic instruments.

Keywords: Sonosurgery, Odontotomy, Third Molar, Oral Surgery

INTRODUCTION

The purpose of this preliminary study is to compare piezosurgery and sonosurgery in the context of lower third molar extraction, comparing them with the use of a high-speed handpiece, in order to identify possible valid alternatives to the use of traditional rotary instruments. For each of the three instruments mentioned above, the intraoperative times required to perform the odontotomy cut on the third molars were evaluated, studying postoperative pain control in treated patients. Our goal was to evaluate possible alternatives to the use of traditional rotary instruments (1, 2), also to meet the needs of less experienced oral surgeons (1, 3).

MATERIALS AND METHODS

For our preliminary study, we selected 15 male patients, aged 21 to 27, free of systemic and periodontal disease, non-smokers, and not undergoing any chronic systemic drug therapy. All patients were operated on by the same surgeon to standardize the procedure. Each presented to us with a third molar requiring surgical extraction after preparation of a mucoperiosteal flap and subsequent odontotomy. To better compare the three instruments under study, the 15 patients in our preliminary sample were divided into three groups of five: the first group was treated with the high-speed handpiece, and the odontotomy was performed with a high-speed rotary handpiece with tungsten carbide burs manufactured by Sweden & Martina. The

bur models were: long-shank round bur: code 141rs/027caxL; Short-shank cross-cut cylindrical burr: code c31rL/016fg; long-shank cross-cut cylindrical burr: code c31rL/016fgxL. The second group underwent piezosurgery and the third group underwent sonosurgery. Both handpieces used dedicated inserts, manufactured by Mectron (Fig.1) for Piezosurgery (4, 5) and by Komet (Fig.2) for the Sonic Handpiece (6, 7).



Figure 1. Piezosurgery inserts, which, unlike those used in Sonosurgery, feature cutting blades exclusively on the active working portion



Figure 2. Sonosurgery inserts. Note the cutting surface extending along the entire perimeter of the blade, specifically designed to provide precise and efficient cutting performance

technique to the inferior alveolar nerve. For postoperative analgesic control, paracetamol 1000 mg twice daily was prescribed for 5 days, along with rinses with 3% 10-volt hydrogen peroxide starting the day after surgery and continuing until the sutures were removed (day 14). Finally, each patient was asked to record the intensity of pain perceived on day 0 (evening of surgery), 7 days later, 14 days later, and 30 days later using the "Happy Face Pain" scale, (Fig. 3) a subjective numerical scale ranging from 0 (no pain) to 10 (excruciating pain).

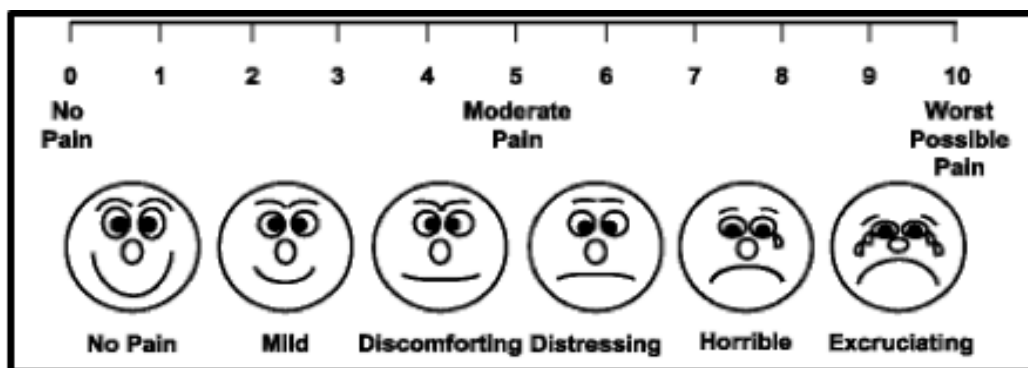


Figure 3. Wong-Baker Scale. A visual self-assessment tool used in oral surgery.

The same operator was used for all procedures (8). Operating time was recorded starting from the flap incision and ending once the last suture was tied, which for all patients was 4/0 polypropylene (7, 8). All patients received the same preoperative analgesia technique, consisting of infiltration of 1.9 ml of 4% articaine without vasoconstrictor, with local-regional infiltration using an indirect nerve-truncal

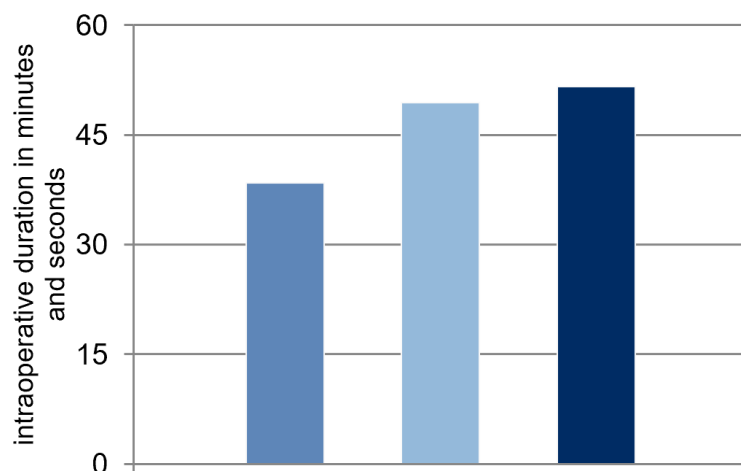
RESULTS

The high-speed handpiece had an average operating time of 39':41", piezosurgery 49':45", and sonosurgery 51':58" [Graph. 1]. Therefore, a significant gap emerges between the high-speed handpiece, sonosurgery, and piezosurgery. Although piezoelectric and sonic instruments are not that far apart in terms of performance, there is a significant difference between them in terms of

cost and investment, including for the purchase of inserts, strongly favoring sonosurgery. From the perspective of postoperative pain control, sonosurgery objectively achieved the best results, ensuring more effective pain control at every stage of healing compared to piezosurgery and the high-speed handpiece [Graph. 2]. Furthermore, during the evaluation and development of the results obtained, one

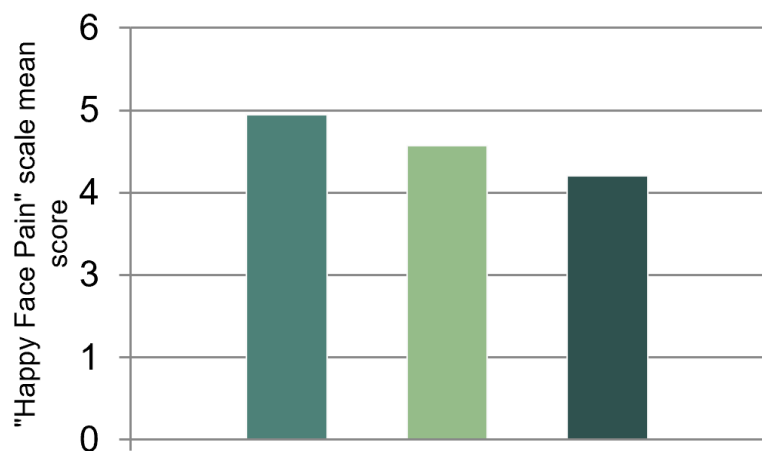
sequence of data caught our interest: the intensity of postoperative pain in patients treated with the high-speed handpiece. It appears to be directly proportional to their age, increasing significantly in older patients, especially in the days immediately following surgery, and decreasing proportionally in younger patients.

This correlation, however, is almost entirely absent in patients treated with sonosurgery: the



Graphic N.1

■ High-speed handpiece 38',41" ■ Piezosurgery 49',45" ■ Sonosurgery 51',58"



Graphic N.2

■ High-speed handpiece ■ Piezosurgery ■ Sonosurgery

sonic instrument ensured minimal levels of postoperative pain regardless of age, a result that confirms our initial hypothesis, namely the unquestionable validity of this technique. Furthermore, although the sample analyzed is still extremely limited in terms of numbers, we noted that patients treated for the extraction of tooth 4.8 complained of more pronounced discomfort in the postoperative period than those treated for tooth 3.8, raising the question of whether this is simply a coincidence or a phenomenon supported by some scientific basis, which needs to be verified with more in-depth studies and certainly more significant numbers.

DISCUSSION AND CONCLUSION

Although the high-speed handpiece objectively offers a faster cutting speed, currently the gold standard for its effectiveness on hard tissue and significant reduction in intraoperative time (9, 10, 11), our preliminary study has offered interesting insights that will undoubtedly spark further discussion: sonosurgery exceeded all expectations in terms of postoperative pain control (10).

Although it requires more time to perform the odontotomy cut than the high-speed handpiece, sonosurgery remains the instrument of choice when prioritizing patient comfort and maximum respect for surrounding and residual tissue during the healing period, especially in older patients (11). It also ensures greater control near delicate anatomical structures, making it suitable even for less experienced operators. According to our

results, piezosurgery ranks intermediate in terms of both speed and clinical impact, offering highly selective cutting of mineralized tissue and greater surgical precision than the high-speed handpiece, while also providing comparable postoperative pain control. In conclusion, the data analyzed in this preliminary study, although limited in number, highlighted results of potential clinical relevance, representing a promising basis for further research.

Therefore, future studies on a larger and more representative sample of subjects are needed to better understand the operating characteristics of the high-speed handpiece, piezosurgery, and sonosurgery, and their association with intraoperative and postoperative outcomes. We reserve the right to further explore this research with additional data to evaluate the actual properties of these instruments, which may represent valid alternatives to the use of the traditional high-speed handpiece.

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Conflict of Interest Statement: The authors declare that they have no conflict of interest.

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