

## Effect of Piezo on Intraoperative Hemorrhage Control in Endodontic Microsurgical Procedure: An Original Research

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### ABSTRACT

**Introduction:** The purpose of this study was to evaluate the effect of the piezoelectric device on intraoperative hemorrhage control during endodontic microsurgical procedure.

**Material and Methods:** A total of 40 patients were randomly divided into the piezo group (n = 20) and the control group (n = 20). The quality of life of patients was evaluated daily for 1 week postsurgery for limitations of oral and general functions, pain, and other symptoms. Hemorrhage control during surgery was independently assessed by the surgeon and 2 blinded observers and recorded as 0 (no hemorrhage control), 1 (intermittent control), and 2 (complete control). The chi-square test was used to assess hemorrhage control.

**Results:** For parameters of quality of life, the piezo group showed significantly less swelling on the first, second, and third days and pain on the first and second days compared with the control group (P < .05). Analgesics taken were also significantly less in the piezo group (P < .05). In the piezo group, complete hemorrhage control was achieved in 10 patients, and in the control group, it was achieved only in 1 patient (P < .05).

**Conclusion:** Piezoelectric surgery resulted in improved quality of life of patients in the first week postsurgery with lower levels of pain and swelling as well as the number of analgesics taken and better hemorrhage control during surgery.

**Keywords:** Hemostasis; piezoelectric surgery; quality of life.

## Introduction

Endodontic surgery is a surgical technique for the maintenance of devitalized teeth with apical pathology after failed endodontic therapy or when nonsurgical treatment is not possible or not recommended [1, 2]. In upper maxillary molar teeth, the endodontic surgery is complicated by the difficulty of accessing the surgical area. With regarding of the maxillary sinus, it is a bony cavity with a pyramidal structure involving the lateral wall of the nose, the base of the orbit and the zygomatic bone. It appears to be the largest of the paranasal sinuses. Some anatomical features of the maxillary sinus, such as the presence of bony septa and of the alveolar antral artery, can influence and complicate the surgical procedure, and should be considered carefully before any surgical intervention in the region as there are higher chances of the bleeding [9–14]. Very Few studies have focused on hemorrhage after the piezoelectric device during endodontic microsurgical procedure. Studies on surgical endodontics of upper molars have the function of validate a pre-clinical and surgical evaluation procedure as standardized as possible that can offer a valid therapeutic alternative to tooth extraction. Hence we aimed to evaluate the effect of the piezoelectric device on intraoperative hemorrhage control during endodontic microsurgical procedure.

## Material and methods

A total of 40 patients were randomly divided into the piezo group (n = 20) and the control group (n = 20). In the piezo group, after flap reflection, bone cutting, granulation tissue removal, and root-end resection were performed using the piezoelectric surgical device and surgical carbide burs, and curettes were used in the control group. The quality of life of patients was evaluated daily for 1 week postsurgery for limitations of oral and general functions, pain, and other symptoms. Limitation of functions and other symptoms were recorded by a modified version of the patient's perception questionnaire using a 5-point Likert scale for mouth opening, chewing, speaking, sleeping, daily routine, missed work, swelling, nausea, and bad taste/breath, and the visual analog scale was adopted for pain. Hemorrhage control during surgery was independently assessed by the surgeon and 2 blinded observers and recorded as 0 (no hemorrhage control), 1 (intermittent control), and 2 (complete control). The chi-square test was used to assess hemorrhage control. For variables related to function and symptoms other than pain and analgesics taken, the Fisher exact test was used. For the assessment of pain between the 2 groups, the Mann-Whitney U test was used.

## Results

A total of 40 subjects were selected who have undergone microsurgical endodontics, and the average age was 40 years. The most frequently treated tooth corresponds to maxillary left first molar (52.4%, 11 cases) followed by maxillary right first molar (33.3%, 7 cases), maxillary left second molar (9.5%, 2 cases) and maxillary right second molar (4.8%, 1 case). All treated patients were ASA 1. For parameters of quality of life, the piezo group showed significantly less swelling on the first, second, and third days and pain on the first and second days compared with the control group ( $P < .05$ ). Analgesics taken were also significantly less in the piezo group ( $P < .05$ ). In the piezo group, complete hemorrhage control was achieved in 10 patients, and in the control group, it was achieved only in 1 patient ( $P < .05$ ). Table 1

**Table 1: Observations from the study.**

	Case (n=20)	Control (n=20)	P
<b>Mean Age</b>	40	42	NS
<b>M:F</b>	1:1.2	1:1.8	NS
<b>Total teeth operated</b>	21	20	NS
<b>Analgesic used</b>	19	5	0.001
<b>Swelling</b>	Present (higher)	Present (lower)	0.04
<b>Hemorrhage</b>			0.001
<b>Present</b>	9	1	
<b>Absent</b>	1	9	
<b>VAS</b>	9	5	0.01

### Discussion

In the literature, few studies have focused on endodontic surgery of upper molars. In general, it has been seen that success ranges from 44 to 88%. In our study we have seen that this surgical technique has a good success rate (85.7%). The most frequently treated tooth corresponds to maxillary left first molar (52.4%, 11 cases) followed by maxillary right first molar (33.3%, 7 cases), maxillary left second molar (9.5%, 2 cases) and maxillary right second molar (4.8%, 1 case). All treated patients were ASA 1. For parameters of quality of life, the piezo group showed significantly less swelling on the first, second, and third days and pain on the first and second days compared with the control group ( $P < .05$ ). Analgesics taken were also significantly less in the piezo group ( $P < .05$ ). In the piezo group, complete hemorrhage control was achieved in 10 patients, and in the control group, it was achieved only in 1 patient ( $P < .05$ ). The difference in success may be due to the fact that conventional technique was used in the past with greater difficulty in locating the lesion, cleaning and obturating the apical part of the root system while now with the use of microsurgical instruments, ultrasonic retro-tips, biocompatible root-end filling material and therefore the use of magnification systems that allow a more reduced osteotomy, a resection of the apex with a minimum or zero resection angle, specific ultrasonic tips for the instrumentation of the retrograde cavity and highly biocompatible filling materials the surgery has become more efficient with less chance of an error.[1,7,5]

The low number of postoperative complications in the studied subjects tells us that it is a possible complication that does not interfere with the healing process and therefore the success of the surgery. In nine of the six patients with membrane perforation, we didn't find specific postoperative adverse events. At 1 year follow-up of three patients with uncertain healing two had perforation. Notwithstanding the above, foreign material, drilling dust or bacteria should be prevented from entering the sinus during surgical procedures. Surgical magnification aids such as magnifying glasses, endoscopes and microscopes allow the surgeon to make an accurate surgical diagnosis and above all, they can enable better control of surgical acts by preventing undesirable situations such as those mentioned above, making this surgery more controllable and therefore safer.[5,18] Previous clinical studies have reported hemorrhage in conjunction with apical surgery in the range of 10.4–50.0%.[15-20] Possible explanations of this difference in percent could be the difference technique proposed. An aspect to be taken into account is what in the past the operation could be could also be indicated and thus executed. in a state of sub acute or acute infection; the close relationship between the roots and a compromised maxillary sinus (e.g. polyposis, swelling of the Schneiderian membrane, chronic sinusitis) due to foreign bodies observed preoperatively; the use of amalgam as a retrograde filling material; the dimensions of the hand pieces for the

preparation of retrograde cavities for amalgam are larger than those of the sonic / ultrasonic retro-tips currently used.[18] Therefore, periapical surgery using the conventional technique requires more periapical space and creates a larger osteotomy defect. In our study, the percentage of perforation (28.5%) is higher than in other studies but probably because the other studies do not focus only on molars where there is a closer relation between the roots and the maxillary sinus. The surgical instruments used in our study for the osteotomy and the access to the apical part of the root and the lesion consisted in a fine-grain diamond burs but, as an alternative, it can be considered the use of piezoelectric hand piece with specific insert. Future randomized clinical studies may indicate if there is a difference using one approach or the other with regard to this specific surgery.[19,20] We have also noticed that the most easily bias on this type of study is the performance bias, an error that depends on the fact that who performed this type of surgery was an expert operator. Other limitations of this study are that endodontic surgery of the upper molar tooth is a difficult surgery that requires not only experienced operators in the field of oral surgery where knowledge of anatomy is fundamental but also in periodontology for the preservation of soft tissues and endodontics for retrograde obturation; that requires very specific dedicated materials, such as microsurgical instruments and magnification systems; it is necessary to perform a CBCT to study the anatomy of the element to be treated, the size of the lesion and the proximity to the maxillary sinus in order to plan the intervention in the best possible way.

### **Conclusion**

In conclusion, despite the limitations presented, the success of the Piezoelectric surgery resulted in improved quality of life of patients in the first week postsurgery with lower levels of pain and swelling as well as the number of analgesics taken and better hemorrhage control during surgery; it is a predictable technique that has a good success rate if it is performed by experienced operators with the use of appropriate tools. Further studies with larger sample size and which also focus on the treatment of the palatal root are needed to compare the results obtained.

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