Surgical Treatment of Impacted Teeth Using Piezoelectric Technique

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Abstract

The surgical removal of impacted third molars still represent a challenge for Oral and Maxillofacial Surgeons. Traditionally, impacted third molars are removed using conventional rotary technique, but this kind of surgery may lead to various postoperative side effects, such as pain, swelling, trismus, nerve injury, bleeding and dry socket. In order to reduce these complications, recently, piezo surgery has been introduced in Oral and Maxillofacial Surgery. The aim of this study is to show the piezo surgery approach in third molar removal, performing a literature review and presenting a case series.

Keywords: Piezosurgery; Wisdom Teeth; Impacted Teeth

Introduction

The surgical treatment of included (total or partial) teeth is a most common procedure in Oral and Maxillofacial Surgery. This procedure could be simple or more difficult in relation to many variables about to the element to be extracted such as localization, anatomy of the dental and the roots, depth and type of inclusion, etc. It is essential to perform a correct treatment planning to minimize the risk of post-surgical complications (pain, edema, trismus, alveolitis) and always with the lowest biological cost for the patient. In recent years, many technological innovations are introduced in oral surgery, in particular, the use of ultrasound applied to surgery has changed some of the most frequent clinical procedures, such as the extraction of the dental elements included, introducing a new concept: piezoelectric surgery or piezosurgery [1-12].

The indications for the extraction of third molars can be divided into 3 categories:

- **Therapeutic**: In all cases in which the tooth has an inflammatory pathology and for the treatment of an acute pathology.
- **Strategic**: To facilitate other treatments when the tooth has a location such as to create a nova to the adjacent teeth.
- **Prophylactic**: To reduce the risk of future damage, not to be performed in the absence of symptoms or injuries (potential greater damage then benefits).

Contraindications

- **General**: Concern the patient’s state of health.
- **Relative**: Low compliance by the patient and the cited opening of the oral cavity. In these cases it is necessary to conduct the surgical procedure under anesthetic assistance (conscious sedation or general anesthesia).

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Surgical technique

Standard protocol

Patients are prescribed antibiotic prophylaxis with 2gr of amoxicillin 1h before surgery, then a truncular anesthesia is performed with lidocaine without vasoconstrictor, then infiltration with adrenalin at the buccinator nerve. A full-thickness triangular flap is then sculpted with a horizontal incision at the base of the papillae between the sixth and seventh and a distal discharge incision with a vestibular pattern. Then we proceed with the osteotomy that can be performed with rotating instruments mounted on a straight handpiece or with a piezoelectric terminal with the dedicated inserts. If necessary, dentotomy and root separation are performed with tungsten carbide burs mounted on a turbine, then the dental element is luxated and avulsed. The alveolar cavity is revised with abundant washing with saline solution, collagen filling and suture stitches separated in 4/0 with analgesic and supportive antibiotic therapy.

Figure 1: Initial OPT.

Figure 2: Initial clinical situation.

Figure 3: Flap design and bone skeletrization.

Figure 4: Ostectomy with piezoinsert.
Figure 5: Clinical view after ostectomy.

Figure 6: Odontotomy.

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Figure 7: Crown cutted.

Figure 8: Crown removed.

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*Figure 9: Roots separation.*

*Figure 10: Roots dislocation.*

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Figure 11: Roots removed.

Figure 12: Residual alveolar cavity.

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Figure 13: Suture.

Figure 14: OPT initial.

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Figure 15: TAC cone beam.

Figure 16: Surgical Kit by Angelo Cardarelli.

**Materials and Methods**

**Use of piezoelectric instruments**

The first clinical trials using piezoelectric bone surgery date back to the late 1980s. This is an innovative surgical method based on the use of instruments consisting of various types of ultrasonic inserts which, replacing the traditional rotating one, is able to achieve the same objectives for which the latter is used.

One of the most important operational advantages of ultrasonic instrumentation is that of allowing a selective cut, exploiting micro vibrations, for the bone tissue without damaging the soft tissue, thus safeguarding the anatomical vascular - nervous structures that could accidentally come into contact with the terminal during osteotomy. This property, in addition to decreasing intra and post-operative complications in maxillary sinus augmentation operations and in those in close relationships with neuro vascular bundles, allows to improve a surgical technique, to perform osteotomies in previously inaccessible areas and to carry out a surgical protocol minimally invasive, all to the benefit of a postoperative easier for the patient.

Ultrasounds allow a micrometric and very precise osteotomy in all directions, recording a minimal loss of bone tissue. This characteristic of cutting with ultrasonic instruments is very advantageous when micro-osteotomies are performed to allow the bone wall to be expanded to be mobilized. The handpiece of the current ultrasonic instrumentation is very manageable and the inserts allow access to the operating field much easier than traditional instruments. During the cutting action a sound is produced that can be used as acoustic feedback to adjust the force to be used. The remarkable cutting precision and the good control of the ultrasonic instrumentation are obtained both due to the reduction of pressure necessary to perform the osteotomy, and thanks to the absence of the displacing moment (typical of traditional rotary instruments). Thanks to the use of ultrasonic instruments, it is possible to greatly reduce the detachment of...
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...the access flap and, consequently, to reduce the edema following a lower bleeding, so we will have a postoperative course that is clearly more comfortable for the patient.

The frequencies of the ultrasounds used (25 - 29 khz) do not allow damage to underlying or adjacent soft structures and tissues. The cutting action is less invasive, producing less damage to the surrounding tissues thus allowing a better healing process. Thanks to the cavitation effect on the physiological solution used (for example, blood), piezosurgery creates a clean and contamination-free surgical site.

Finally, it seems that the cavitation effect of the ultrasound on the bone is able to decrease the bleeding of the operated site. The maximum efficiency of this instrument is obtained by using it at maximum power and with the minimum pressure of the operator, reducing the risk of overheating and damage to the soft structures. One of the limitations of the piezoelectric is instead the slowness with which the instrument works.

What are the advantages of ultrasonic instrumentation? Selective cut for hard tissues

- Micrometric and precise cutting
- Handy handpiece
- Improved accessibility of inserts
- Availability of inserts with a complex shape
- Micro vibration action
- Cavitation action (energy release phenomenon) which in turn: Facilitates the separation between soft and hard tissue
- Promotes hemostasis
- Removes debris from the surgical field

Figure 18: 3D reconstruction.

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**Figure 19:** Initial clinical situation.

**Figure 20:** Lateral view.

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Figure 21: Occlusal view showed the persistence of deciduous tooth.

Figure 22: Flap design and ostectomy with piezo insert foto.

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Figure 23: Canine exposed.

Figure 24: Orthodontic traction.

Conclusion

We can therefore conclude that the piezo is an instrument that allows you to safely perform very delicate surgical procedures, thanks to the precision of cut and to the ineffectiveness on soft tissues. Many advantages are also offered by the ability to maintain an operating field with hemostasis control, a clinical aspect of considerable importance especially when operating in deep bone portions with small root residues.

The problem, however, has always been related to the slowness of cutting, even if the inserts are currently more and more efficient on different types of fabric. Many authors describe the many advantages and qualities of this instrument, especially when used in conjunction with traditional rotating instruments.

Bibliography


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