# Use of the magnet mallet in a case of extraction and post-extraction implant site preparation, in combination with regenerative therapy on hypertensive patient: a case report and literature review

**Oddi C.***
**Collina G.***
**Ceresoli L.***
**Ferri S.***
**Grassi A.***
**Nagni M.****

*Dental School, Vita-Salute San Raffaele University, Milan, Italy and Department of Dentistry, IRCCS San Raffaele Hospital, Milan, Italy

**MSc, Dental School, Vita-Salute San Raffaele University, Milan, Italy and Department of Dentistry, IRCCS San Raffaele Hospital, Milan, Italy
Corrisponding Author: Giorgio Collina
email: giorgio.collina95@gmail.com

## Abstract

**Objectives:** over the years a device has been developed, the Magnetic Mallet, which allows a very high control and stability of the applied forces, able to perform procedures that were the safest possible for the patient and the surgeon himself. The handpiece has been designed so that different shock waves are emitted according to the type of surgery, with the possibility of inserting different inserts according to the technique / procedure that is being applied. The Magnetic Mallet can be used in different surgical procedures; Dental extractions, implant placement, implant site preparation (osseodensification), maxillary sinus lift procedures or crestal expansion procedures.

**Materials and methods:** In the following clinical case, the extraction of element 2.7 is conducted with the simultaneous insertion of two implant fixtures in place 2.6 and 2.7 and simultaneous regenerative therapy. The implant in site 2.6 was positioned with a traditional method, with the help of the implant motor, while the post-extraction implant in site 2.7 was inserted with the use of the Magnetic Mallet.

**Results:** At one week the sutures were removed and the tissues showed good healing. The patient is then placed in a maintenance and follow-up program to monitor healing after some time.

**Keywords: Magnetic Mallet, Implant positioning, Tooth extraction, CBCT, Regenerative surgery**

## Introduction

The first electrified dental hammer was projected in 1873 by William Bonwill, in order to fill the cavities with gold **[1]**. Over the years this hammer has been modified and improved in order to make the most of its qualities. It is a device that allows an high control and stability of the applied forces, allowing to perform procedures that are as safe as possible for the patient and the surgeon himself [2-3].
Magnetodynamic technology exploits the physical principles of electromagnetism to be able to apply controlled forces on a body, in order to minimize the impact time [4]. Nowadays, in fact, the Magnetic Mallet (MM) is used in oral surgery, in many different fields [5]. It is characterized by a handpiece powered by a power control device, which has the ability to deliver forces according to the application time, precisely four force modes 75, 90, 130 and 260 daN with an impact time of 80 μs. Different shock waves are emitted from the handpiece depending on the type of surgery. In addition, on this handpiece you can go to insert different inserts according to the technique / procedure that is being applied.
The Magnetic Mallet is thus used in different oral surgical procedures, such as: dental extractions, in the placement of implants, in the preparation of the implant site (osseodensification), in sinus lift procedures or in ridge expansion procedures. [6-7-8-9-10]

## Materials and methods

In October 2022, a 58-year-old female patient, suffering from hypertension, came to our attention for pain located near the second quadrant. During the first visit after a careful intra- and extra-oral clinical examination, a first-level orthopantomography (OPT) radiographic examination was performed in order to evaluate the patient's oral condition even more carefully (Fig. 1).
In the second quadrant there was a prosthetic bridge that extended from element 2.4 to element 2.7 with element 2.6 bridge. The prosthetic artifact had some mobility perhaps due to the carious lesion that extended below the prosthetic crown of element 2.7, previously devitalized and covered with a Richmond crown (Fig. 2).

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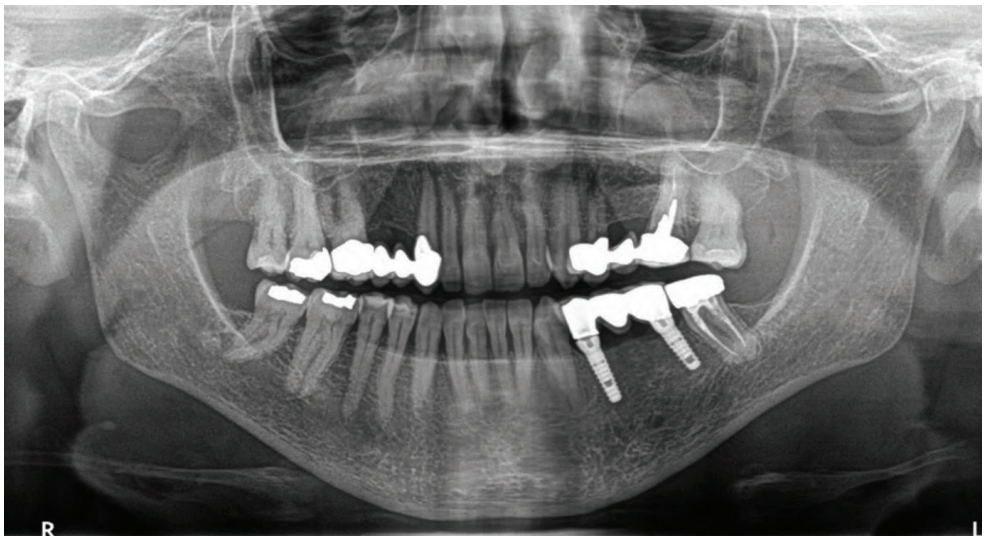

**Figure 1.** OPT

**Figure 2.** Carious lesion in position 2.7.

The patient was explained the situation and the fact that it was considered necessary to remove the prosthetic bridge in order to assess whether element 2.7 was salvageable or not. Already assuming the disastrous condition of the element and the difficulty in being able to save it, the patient was prescribed a second level CBCT examination in order to evaluate three-dimensionally the amount of bone for the possible insertion of implant fixtures (Fig. 3).
At the next appointment, the prosthetic artifact was removed and the disastrous condition of element 2.7 came to light.

After evaluating the condition of the element and preparing a treatment plan that was as predictable as possible, it was agreed to extract element 2.7 with the simultaneous insertion of two implant fixtures in place 2.6 and 2.7 and simultaneous regenerative therapy (Fig. 3-4-5).
After signing the information form, local anesthesia was carried out with 4% articaine and adrenaline 1:100,000 (Ubistesin 40 mg/ml, 3M ESPE, Italy), element 2.7 was estracted with the aid of the Magnetic Mallet (MM).
This tool has allowed a safe, predictable and fast extraction, reducing the possible complications in which it could be incurred (Fig. 6).
Subsequently, two implants were placed in place 2.6 and 2.7 at the same time as regenerative therapy, by elevating a full-thickness flap with parasulcular incision and insertion of a biomaterial, a xenograft of bovine origin (Bioss collagen) (Fig. 7). [11]
The implant in site 2.6 was positioned with a traditional method, with the help of the classic implant motor, while the post-extraction implant in place 2.7 was inserted with the Magnetic Mallet. The 2.6 site plant is a 3.8X11

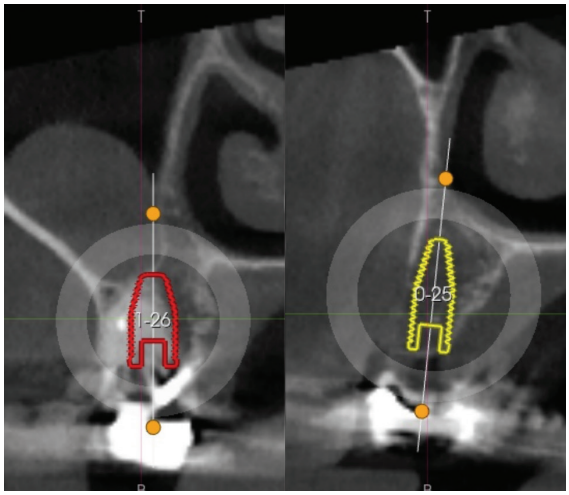


**Figure 3.** CBCT and implant treatment plan planification.



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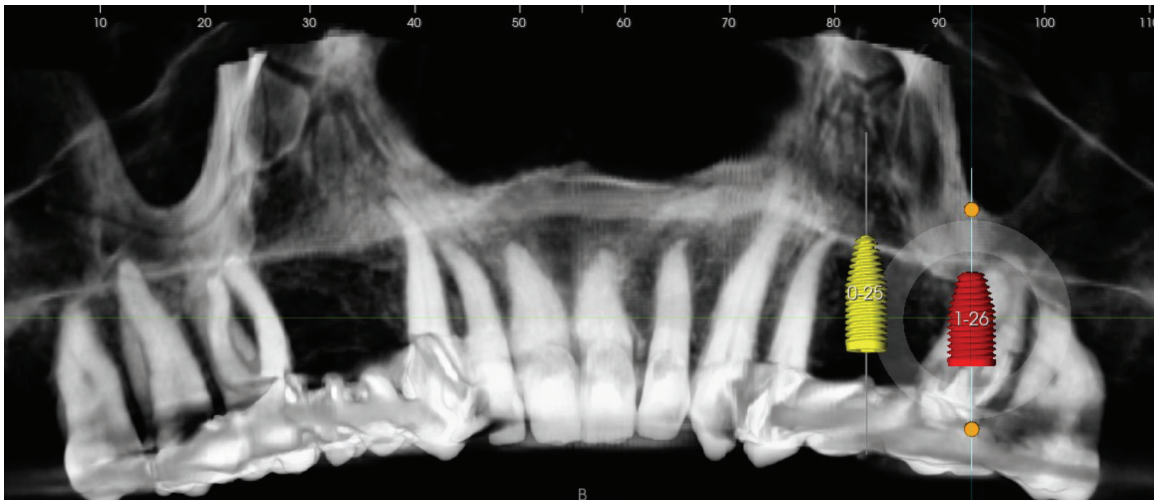



**Figure 4.** CBCT and implant treatment plan planification.

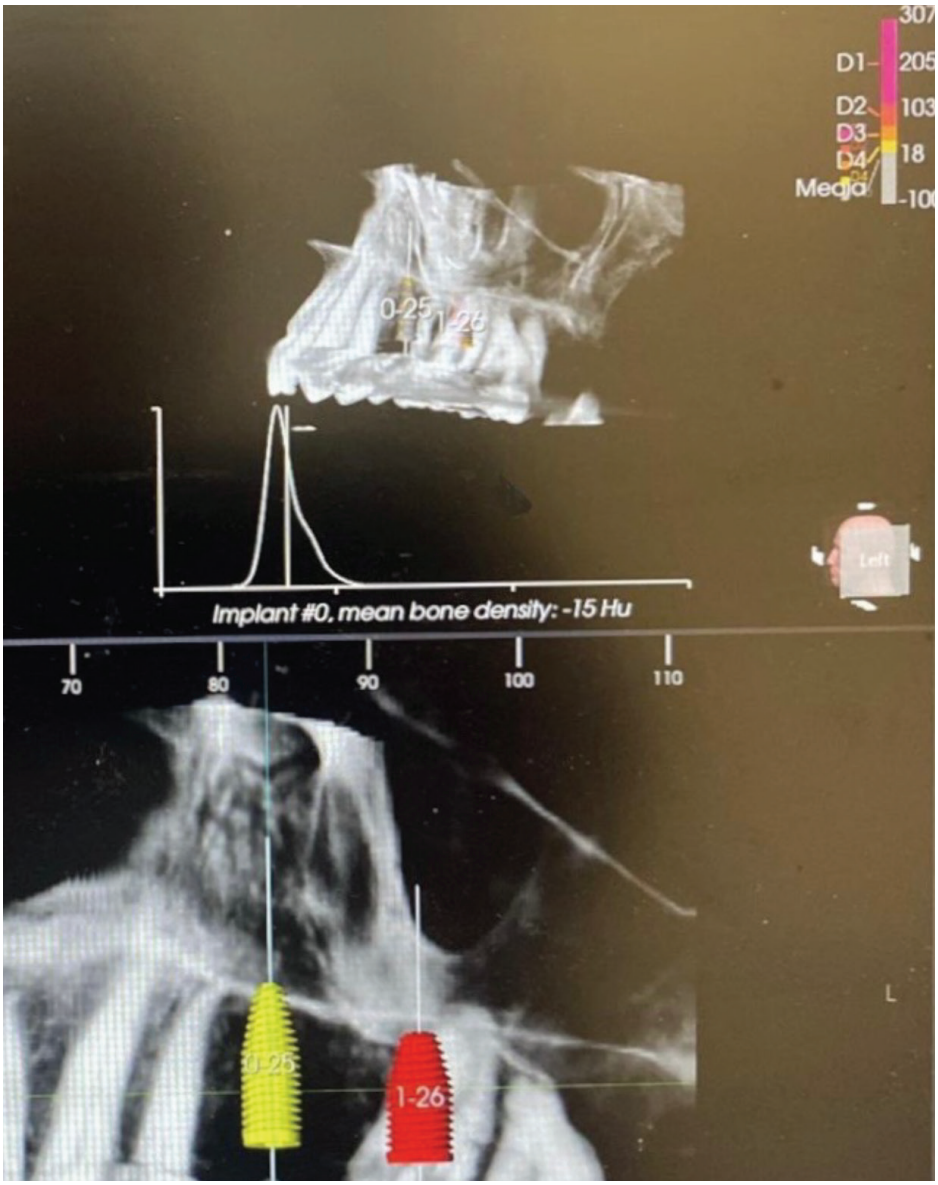
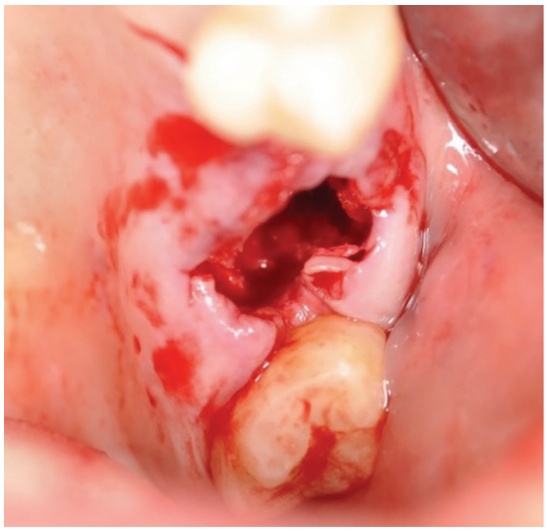



**Figure 5.** CBCT and implant treatment plan planification.



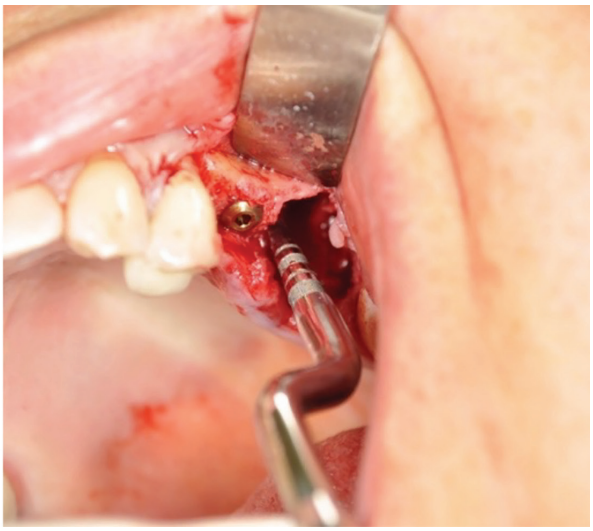


**Figure 6.** Extraction of the element in position 2.7 and implant positioning in position 2.6. post-extractive implant positioning in association with the use of Mangnetic Mallet in position 2.7.

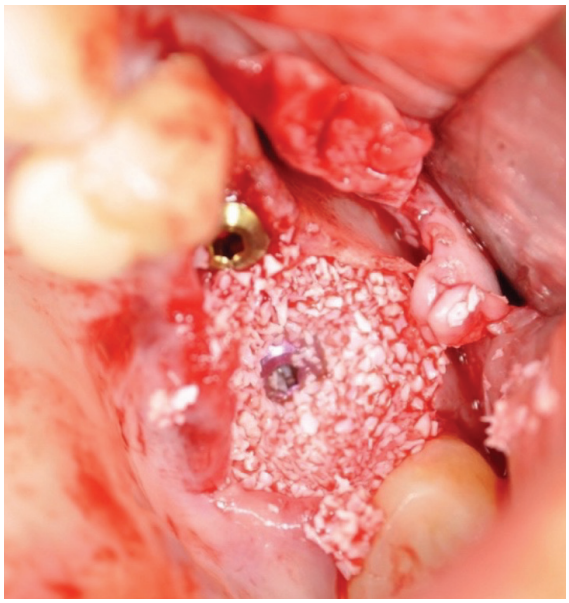


**Figure 7.** Regenerative therapy on site 2.7 with insertion of biomaterial (xenograft of bovine origin).

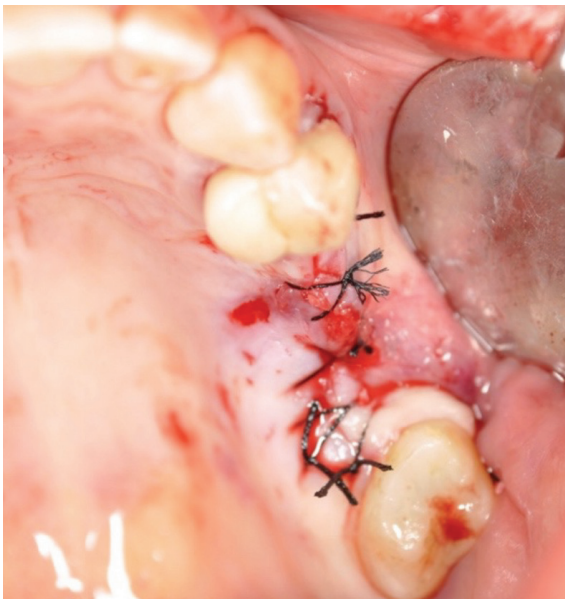


**Figure 8.** Flap suture with detached stiches with 4/0 absorbable thread.

Winsix TTI system, while the 2.7 on-site plant is a 4.5X9 Winsix TTI.
The flap closure was carried out with a suture with detached stitches with 4/0 absorbable thread (Vicryl, Ethicon, Johnson & Johnson, New Brunswick, NJ, USA) (Fig. 8-9).

## RESULTS

One week after surgery, the sutures were removed and the tissues were in a good state of healing. Finally, the patient was placed within a maintenance program with periodic clinical and radiographic checks to assess healing and bone regeneration over the years.

## DISCUSSION

Patient's medical hystory is foundamental to state the correct treatment plan, especially when we are talking about surgery. When implant surgery is performed in patients with cardiovascular disease, concerns are related to the possible bad consequences of the use of anticoagulants preoperatively or to changes in blood pressure caused by vasoconstrictors contained in local anesthetics.
The retrospective study by Tonini KR. et al., investigates the association of hypertension and the use of antihypertensive drugs with dental implant failure rate. 1877 implants were placed in a total of 602 patients. 71.43% of the patients were normotensive, while 28.36% were hypertensive. The success rate of implant positioning in



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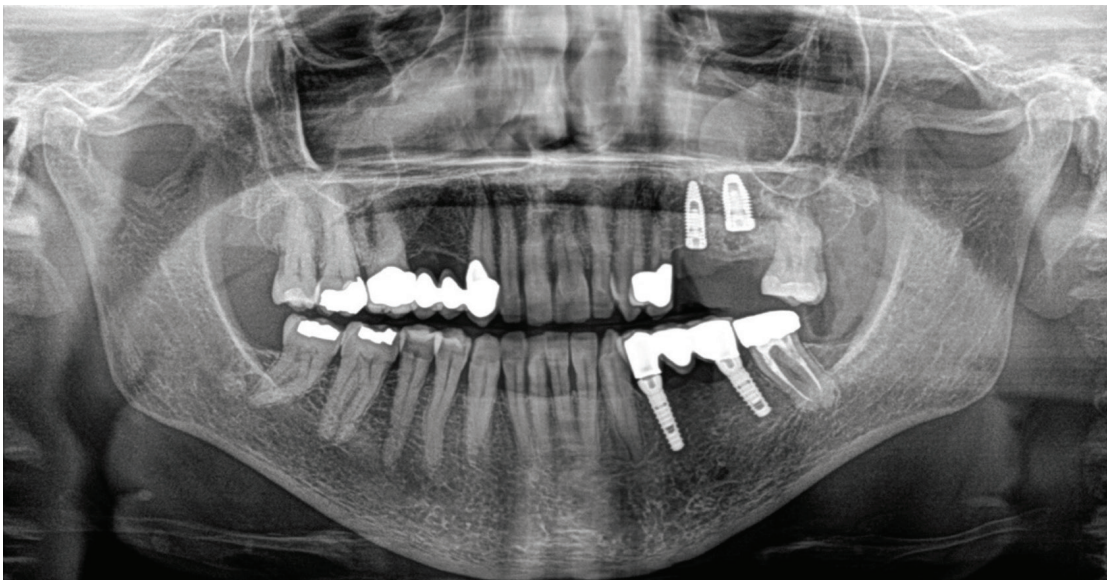

**Figure 9.** Post-surgical control OPT

the normotensive group was 93.98% while in the hypertensive group was 92.99%, and their success rate was similar whether they had taken antihypertensive drugs or not. It is possible to assume that hypertensive pathology, also in combination with the use of antihypertensive drugs, cannot be associated with implant failure [12].
Wu X. et al., in their review, discuss how hypertensive drugs such as beta-blockers, thiazide diuretics and ACE inhibitors can have a positive effect on implant survival rate [13].
The use of vasoconstrictors in anesthetics do not appear to be contraindicated. In fact, Montebrugnoli L. et al. showed how the presence of adrenaline does not cause an increase in pressure, because its use produces less stress than would occur with the production of endogenous catecholamines released following the administration of anesthesia without vasoconstrictors [14].
Failure to control intra-operative pain could create the activation of important cardiovascular responses [15]. The administration of approximately two vials of local anesthetic with adrenaline 1:100,000 or 1:80,000, in hypertensive patients, does not significantly alter blood pressure [16]. Following the injection of one vial of lidocaine (1.8 ml) at 2% with epinephrine 1:100,000 (0.018 mgr), plasma levels of epinephrine increase two to three times without causing significant changes in blood pressure and heart rate; three vials increase levels five to six times and are accompanied by hemodynamic changes without symptoms; on the other hand, stress itself can increase plasma levels of endogenous catecholamines 40 times [17]. Cardiovascular response that occurs as a result of stress can be related to the dental procedure rather than to the use of anesthetics containing vasoconstrictors [18]. Becker DE et al., on the other hand, suggests that despite the properties of vasoconstrictors, in patients with cardiovascular diseases and in hypertensive patients, involuntary intravascular injection of adrenaline is associated with adverse cardiovascular effects. [19]
Dental implants are currently a successful therapeutic alternative that can also be applied in patients with systemic diseases, which are nowadays increasing with the rase of average age [20][21].
Although in some cases the insertion of axial implants in basal bone may be hindered by insufficient residual bone height, the insertion of implants in native bone should be always preferred. [22]
Type of fixtures choice and prosthetics can influence the success rate in the short and long term; It follows that pre-surgical planning represents a fundamental starting point for rehabilitation[23][24]. All the procedures were carried out in compliance with the rules provided for the Covid-19 pandemic situation, to promote the safety both of patients and staff [25]. Professional and home hygienic maintenance is one of the main prerequisites for successful implants. [26][27]
A recent systematic review of 2022 aimed to answer the question of whether the use of Magnetic Mallet was effective or not used in oral surgery, in terms of tissue healing, and complications, comparing it to the use of traditional instruments.
Of 252 articles, 14 were included in the review (3 for tooth extraction and 11 for dental implantology). Out of a total of 619 tooth extractions (256 patients) performed with the magnetic mallet, no complications were reported. The implants included were 880 (525 patients): 640 in the Magnetic Mallet group (382) and 240 in the control group (133). The survival rate of the implants was 98.9% in the Magnetic Mallet group and 95.42% in the control group. Seven patients experienced benign paroxysmal positional vertigo after implant surgery, all in the control group. The results are not sufficient to establish the effectiveness of the Magnetic Mallet but it seems to be an effective option in oral and implant surgery procedures [28].
The usefulness of the Magnetic Mallet had already been studied in 2014 by Crespi, R. et al. in a work whose purpose was to evaluate its effectiveness in the field of tooth extractions and in maintaining the integrity of the alveolar bone after the extraction. The extractions were conducted using a Magnetic Mallet, which moving the blade in a longitudinal movement along the central axis up and down towards the space of the periodontal ligament, providing a mechanism for guiding longitudinal movements. No fracture or loss of cortical bone has been observed in

tooth extractions conducted with Magnetic Mallet. All the sockets showed complete secondary soft tissue healing 2 weeks after complete root extraction. At the follw-ups, there were no signs of inflammation or exposed bone in any of the cases. A clinical study is also reported, showing how maximum alveolar preservation and related gingival structures can be maintained after atraumatic tooth extraction by Magnetic Mallet [29].
In the context of oral surgery, Magnetic Mallet seems to be a suitable alternative, but other studies should be conducted with a larger sample to confirm this hypothesis.

## Conclusion

As we can see from this clinical case, the use of the Magnetic Mallet (MM) in the dental field is useful in different oral and implant surgery procedures, because it is a safe, predictable, fast to use and manageable tool.

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