

Dental extraction: What else?

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The decision-making process leading to a dental extraction has changed a great deal in the history of dentistry. We have moved from the concept of elimination of the infective source to one of bone preservation and regeneration of the alveolus. With the advent of modern drugs and the collaboration between different medical specialties, today we can consider extraction to be a totally safe procedure for the patient,¹ even though it should be deferred as much as possible in favour of the increasingly advanced techniques of restoration, recovery or regeneration.

When, unfortunately for the patient, extraction is indicated, how is this situation managed? And what is the deci-

sion tree to which we can refer today? This type of therapy, which is often under-estimated but of relevance to every single dental specialty, and especially important for general practitioners, is too little considered but is of great importance for the patient in the present and the future (Fig. 1).

Anaesthesia

Anaesthesia is the initial phase of any dental treatment. Often poorly evaluated by the operator, it plays a key role—for more than only clinical reasons—in ensuring greater compliance on the part of the patient. The patient will, in fact, judge the work of his or her dentist almost exclusively on the basis of the pain suffered: first in the

Decision tree of extraction

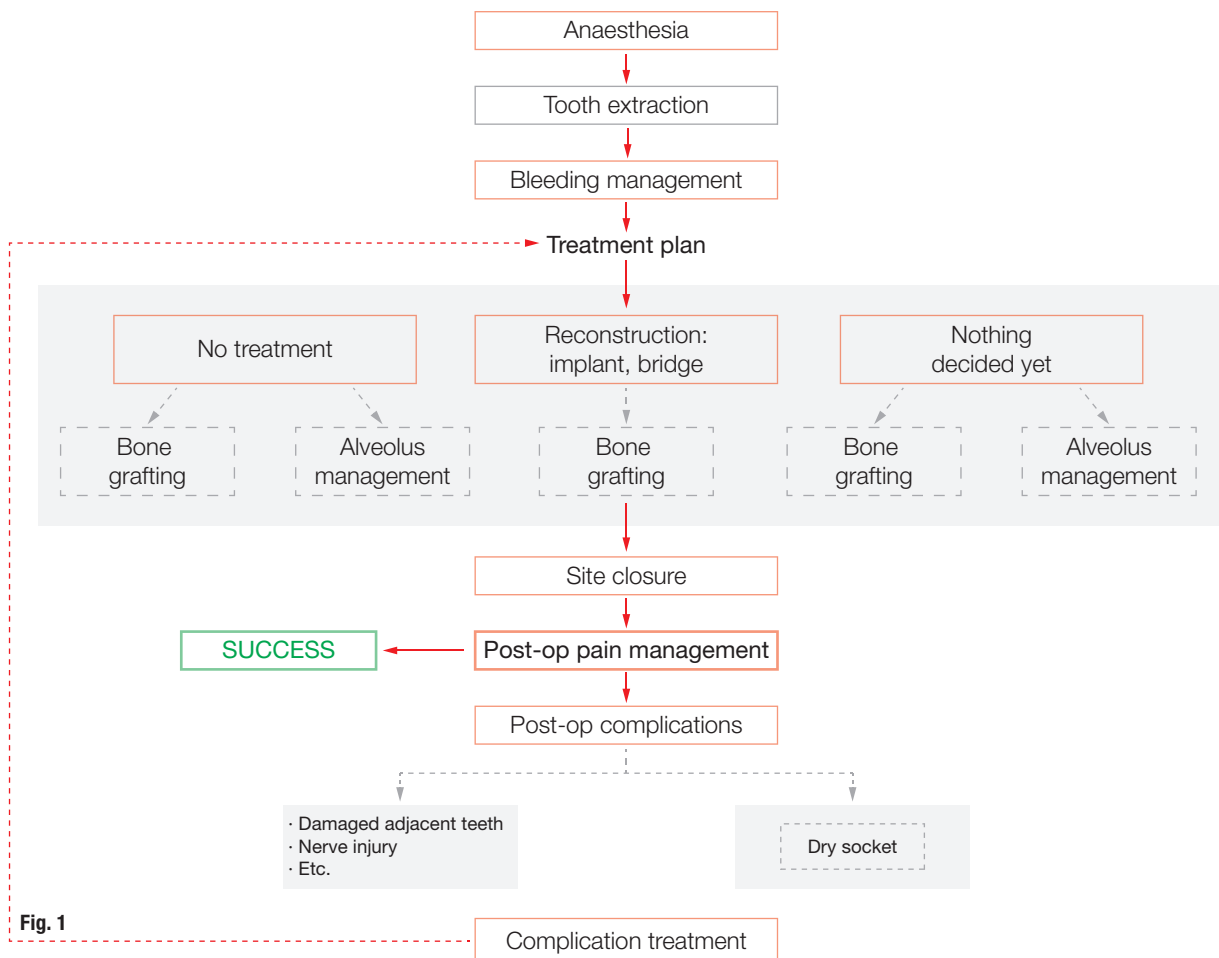


Fig. 1

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injection phase, then with regard to the pain felt during the operation and perceived after any type of treatment.

It is, therefore, essential that a topical anaesthetic is used to make the injection phase as least unpleasant as possible and that the injection is performed by applying the right pressure, so as not to overstretch the tissue (a cause of pain in itself) and in the right anatomical site (Figs. 2 & 3). Moreover, the recommended injection time is 1 ml/minute. Nevertheless, 84 per cent of dentists inject 1.8 ml in 20 seconds or less.² A compound suitable for the planned intervention must be used in terms of duration of its action and, therefore, of effectiveness, paying attention also to the quantity of vasoconstrictor present and the overall patient condition.

As far as the compound to be used is concerned, the absorption time and the duration time must, of course, always be carefully considered, and this must not be arbitrary, but linked to the type of extraction planned, in order to always have the most adequate pain coverage not only during the operation but also in the immediate postoperative period.

Articaine is one of the most recently developed local anaesthetic drugs available to dentists worldwide and the most widely used local anaesthetic in Europe. Articaine is closer to physiological pH and therefore its onset is quicker. Owing to its higher lipo-solubility, articaine is a potent dental anaesthesia molecule, and it has a longer duration than lidocaine owing to its higher protein binding. Being both an amide and an ester, its degradation starts as soon as it reaches the bloodstream, its metabolism is quicker and, therefore, it is safer to use. It has the lowest systemic toxicity, which is why it can also be used during pregnancy.

Lidocaine is one of the most widely used anaesthetics even though there are several other compounds of comparable efficacy; these drugs differ in terms of pharmacokinetic parameters.

For long procedures, bupivacaine is the most logical choice for its long anaesthetic duration in soft tissue, although, according to some studies, it is also the most painful during injection.³⁻⁶

It should be remembered that the presence of a vasoconstrictor is often fundamental not only for good control of haemostasis, but also and above all to antagonise the vasodilatory effect induced by any local anaesthetic. Inadequate use of the vasoconstrictor can make a simple extraction complex if the haemostatic effect is not induced. Indeed, the administration of a high concentration of vasoconstrictor (with the local anaesthetic) if used in an inappropriate manner (for example with an intraligamentous procedure) can create severe compli-

cations. For instance, that might contribute to the onset of dry socket, which could possibly result from an excessive vasoconstriction induced in the area of the intervention along with other possible factors.

Extraction and management of the alveolus

After having carried out adequate anaesthesia, the tooth or root can be extracted as planned. And obviously, as indicated, the dentist's choice regarding the treatment of the post-extraction alveolus will reflect what needs to be done in the site involved in the extraction.

After extraction, dimensional and aesthetic changes to the oral tissue occur. For this reason, it is important to contextualise the procedure (if it is not urgent) within a broader treatment plan.

The reasons for an extraction can be numerous. According to the directives of the Società Italiana di Chirurgia Orale ed Implantare (Italian Society for oral and implant surgery), the indications that lead to the decision to extract a tooth are as follows:

- the presence of ongoing dental caries that has led to a widespread destruction of the dental crown, affecting the gingival margin and making it impossible to recover the element;
- irreversible apical lesions;
- serious periodontal disease with non-reversible alveolar bone loss;
- fractured roots;
- orthodontic treatment;
- dysodontiasis of the third molars;
- management of infectious loci in patients having to undergo radiation therapy;
- immunodepressed patients;
- patients having to undergo treatment with bisphosphonates or anti-coagulants of the latest generation; and
- impacted teeth or continued presence of primary teeth in the mouth.

Once the extraction has been carried out, it will then be possible to opt for:

1. an immediate regenerative treatment;
2. a delayed regenerative treatment; or
3. no treatment.

The preservation of the alveolar process after a dental extraction is recommended to preserve the bone's volume and the soft tissue over it and to simplify the subsequent rehabilitation. It has been widely illustrated in the literature that, every time a dental extraction is carried out, a restructuring of the bone takes place in the site of extraction, leading to a decrease in volume, accompanied by qualitative and quantitative changes that affect the result of a prosthetic rehabilitation, especially if it is the anterior zone that is affected, which is further impacted

by the significant aesthetic changes.^{7,8} It should be remembered that, with the extraction of a tooth, the periodontium is eliminated and with it the rich vascular network that characterises it. The supply of blood and lymph is essential for the turnover of the gingival cells and of the periodontal ligament itself, and even if to a lesser extent, it also contributes to the nourishment of that portion of bone close to it. Another determining factor for bone resorption is the surgical technique that is adopted during extraction; indeed, if a full-thickness flap is raised, the blood supply in the external cortex is interrupted, inducing a remodelling of the affected area.

We should stress that the alveolar bone is a structure that is closely linked to dental survival, and it undergoes important changes where the latter is absent. There are numerous studies that show that the greatest reduction in bone volume occurs mainly in the first three months, continuing in lower percentages in the first year after surgery.

In the first six months, the volumetric variation is quantifiable as 3.80mm in width and 1.24mm in height, with displacement of the crestal profile by two-thirds with respect to the original position.⁷⁻¹³

Based on an analysis of correlation, the vestibular thickness of the bone wall of less than 1 mm has been identified as a critical factor associated with the extent of bone resorption. The thin-walled bone phenotype shows significant bone resorption with mean bone loss of 7.5 mm compared with the thick-walled bone phenotypes, with a predicted loss of 1.0 mm.

Benefits of a bone grafting material

Studies conducted on samples of patients who had to undergo dental extraction have confirmed that the placement of biomaterials in the alveolar site immediately after extraction, compared with the samples where nothing was inserted, showed a significant reduction in the reshaping process, with preservation of the bone volume after healing, validating the concept of ridge preservation.⁷⁻¹⁴

It has been demonstrated in numerous histological studies carried out on different samples of bone taken from sites treated with different types of biomaterials,^{15, 16} that beta-tricalcium phosphate is one of the few synthetic materials to be completely resorbable, with no trace remaining one year later in any of the samples examined. Moreover, an improvement of between 6 and 23 per cent was observed in the receiving site compared with the sites treated only with the presence of the coagulum (Figs. 4-12).¹³

Recently, in a systematic review, Ten Heggeler et al. demonstrated that the use of biomaterials in the post-extraction site resulted in alveolar volume preservation



Fig. 2



Fig. 3

Fig. 2: Anaesthesia administered to the alveolar inferior nerve. **Fig. 3:** Anaesthesia administered to the buccal nerve.

during healing.¹⁷ It should also be noted that alveolar sites filled only with fibrin sponges do not register any significant improvement.

The technique of preserving the extraction site thus has proved to be effective both in minimising the resorption of the bone tissue and in expanding the bone volume for subsequent treatment with implants.^{18, 19}

In some situations, when there is no implant or regenerative intervention planned directly after the extraction, it may be necessary and appropriate to control the haemostasis and the flap closure in an appropriate manner, in order to make the postoperative phase easier and thereby reduce the risk of infection of the site or the onset of dry socket. The control of haemostasis will be important, but at the same time, it will be essential for the dentist to verify at the end of the extraction that there is bleeding in the post-extraction alveolus. In case of a lack of bleeding, the site must be freshened in order to ensure the fundamental blood supply necessary for full healing of the site. A lack of spontaneous bleeding could instead be prodromal to a dry socket.

Bleeding management and collagen sponges

Several risk factors associated with post-extraction dental complications, including age, gender, drugs, ex-

traction site, smoking, poor oral hygiene and dentist experience, are reported in the literature. Some studies have suggested that the use of local antimicrobial, anti-fibrinolytic and anti-inflammatory substances at the post-extraction site minimises postoperative complications.

Excessive and uncontrollable bleeding of the alveolus is one of the most common complications and if not properly treated can lead to severe consequences. In the decision-making process leading to a dental extraction, it is therefore important to evaluate the patient's intake of anti-coagulant and anti-platelet drugs. The procedures to be implemented in these patients are well known, although the risks associated with bleeding are never completely absent.²⁰

Beyond the obvious need for appropriate suturing of the flap, it is well known that the insertion of Type I collagen sponges minimises the risk of complications by controlling bleeding, protecting the wound and stabilising the coagulum. Its resorption normally takes place in 10 to

14 days through the action of collagenase and peptidase.²¹ Sponges or any other material must be placed carefully in order to prevent excessive compression, which could cause ischemia and trigger a problem in the revascularisation (Figs. 13 & 14).

Post-extraction complications

Even though in most cases extraction is considered a non-major surgical operation, the possibility of more or less significant intra- and postoperative complications, which may be caused by incorrect procedures on the part of the dentist or systemic disease of the patient and which can interfere with the regular healing of the extraction site, should never be under-estimated.

Among the less serious but certainly more annoying complications that can arise after a dental extraction is dry socket. This occurs in very low percentages (one to five per cent of the cases) and is localised mainly in the molar region. The aetio-pathogenesis is caused by an in-

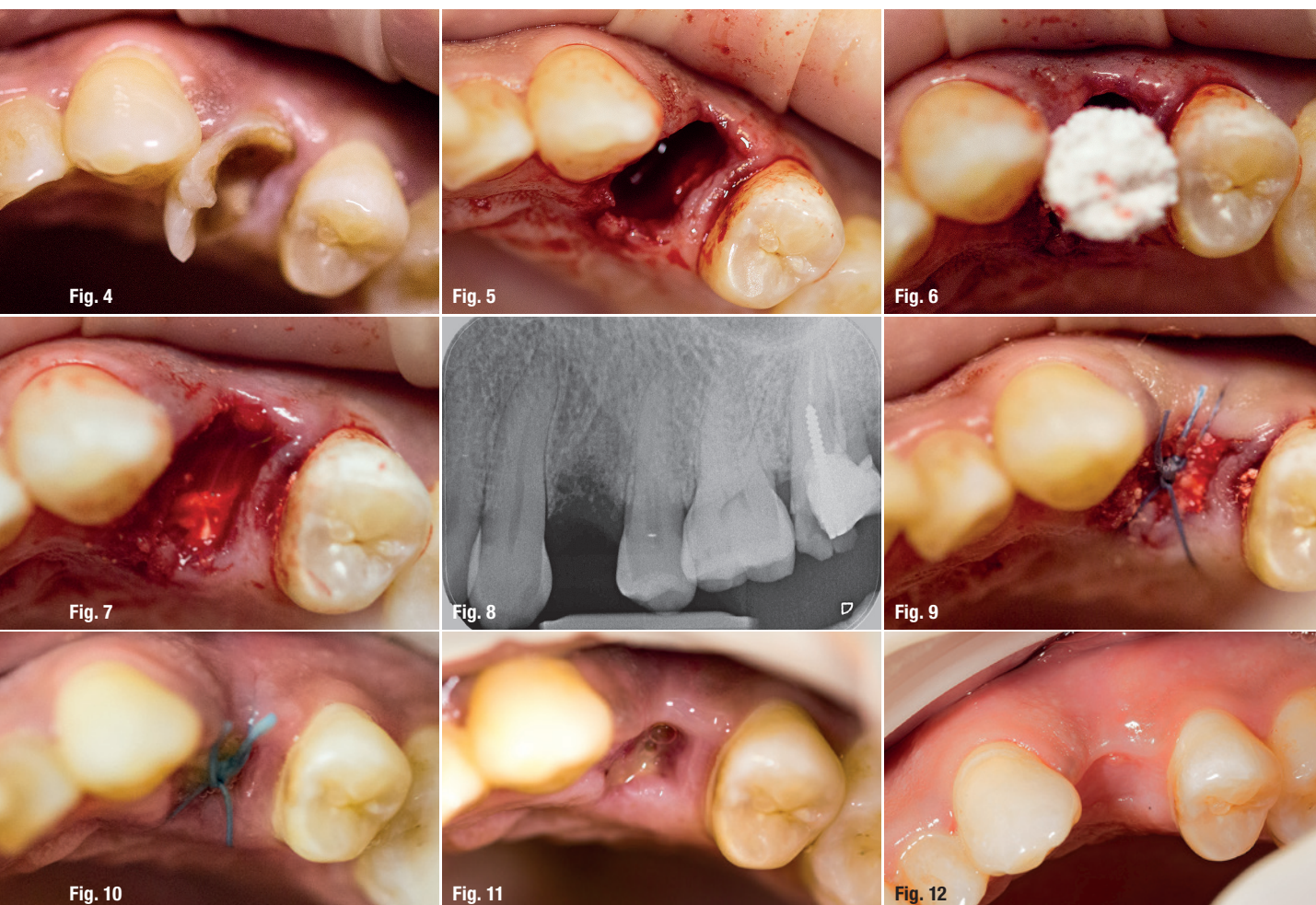


Fig. 4: First case example: fractured tooth #12. **Fig. 5:** Extraction of tooth #12. **Fig. 6:** Placement of biomaterial (R.T.R. Cone, Septodont) into the alveolus. **Fig. 7:** Biomaterial *in situ*. **Fig. 8:** Post-op radiograph showing the biomaterial *in situ*. **Fig. 9:** Post-op suture. **Fig. 10:** Situation after six days. **Fig. 11:** Suture removal after six days. **Fig. 12:** Situation two weeks later: good healing with no interference by the biomaterial.

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Figs. 13a & b: Second case example: teeth #33 and 34 were successfully extracted. **Fig. 14:** Haemostatic sponges (Hemocollagene, Septodont) were inserted into the extraction sites.

flammation of the alveolar bone due to a fibrinolysis process triggered by bacterial contamination, itself caused by several factors, such as poor oral hygiene, use of anaesthetics with vasoconstrictors often injected by the intraligamentous technique or the daily use by women of oral contraceptives.

The patient suffering from dry socket often reports excruciating and persistent pain, unresponsive to analgesics and with a peak in symptomatology after three to four days.

A local swelling is always associated with swelling of the local-regional lymph nodes and cutaneous hyperaesthesia, and above all, there is always the presence of halitosis due to the occurrence of malodorous pus.

The gingiva around the alveolus is relatively swollen with a smooth and shiny appearance. In severe cases,

the presence of a white or greyish pus secretion can be observed within the alveolus.

A study conducted by Poveda-Roda et al. showed that, in the case of dry socket, between 43 and 96 per cent of cases reveal the presence of viridans streptococci, which is very dangerous, especially for patients with bacterial or immunosuppressed endocarditis.²²

A common practice to prevent the onset of dry socket, especially when treating patients with diseases that may interfere with the normal healing process, entails suturing the edges of the wound or inserting active ingredients into the post-extraction alveolus to reduce the risk of postoperative infections. It is widely documented in the literature, that before carrying out any surgical procedure, the asepsis of the operating area and the instruments used should be strictly respected, if necessary undertaking a preliminary decontamination of the oral cavity with 0.2% chlorhexidine.²³

In the case of dry socket, Syrjänen and Syrjänen describe the local use of a small dose of Alveogyl, which, owing to the presence of Penghawar fibres, produces a soothing effect on the tissue.²⁴ In the nineteenth century, these fibres, obtained from the fine soft down of certain ferns, were already being used for their haemostatic effect, producing a discreet result.²⁵ It is also advisable to use chlorhexidine gluconate sponges for a week, after careful alveolar curettage.²⁶

Conclusion

Dental extraction has always been considered as a simple, carefree and minimal procedure. Nevertheless, this is an important procedure from the patient's point of view and from the clinical perspective. It is relevant to all categories of dentists independent of their specialties and always needs to be properly planned, in order to avoid risks and to obtain the expected results for a proper future rehabilitation. Today's patients expect this approach from dentists, and they deserve it.



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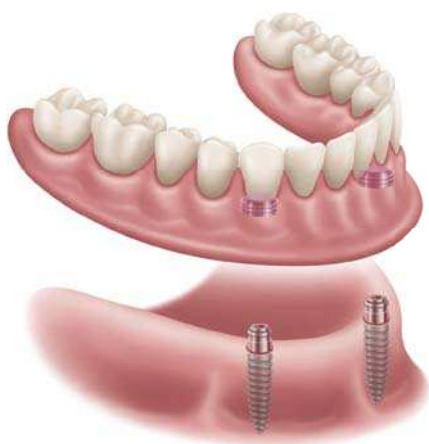
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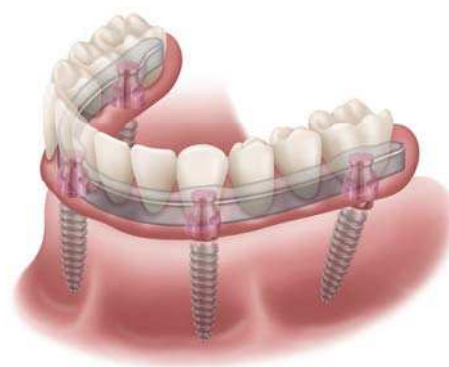


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