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MANAGEMENT OF THE EXTRACTIVE SOCKET IN
IMPLANT TREATMENT IN LIGHT OF THE MOST
RECENT DEVELOPMENTS

DR A. BERMOND DES AMBROIS

DR L. SAVIO

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AUTHORS:

ALESSANDRO BERMOND DES AMBROIS

Graduated in Medicine and Surgery at the University of Turin. Attended courses in Periodontics and Implantology at Pennsylvania University, Philadelphia (U.S.A.). Tutor at courses in Implantology and Periodontics. Speaker in both national and international events on Periodontics and Implantology. Co-author of scientific articles on international journals regarding Periodontology and Dental Implantology and specifically on the use of short implants. He works as a freelance in Turin (Italy), specialized in Periodontics and Implantology.

LUCA SAVIO

Graduated in Dentistry at the University of Wales College of Medicine (UK) in 1999. Obtained the Certificate in Restorative Dentistry at Eastman Dental Hospital in London in 2001. Annual course in Implantology and Periodontology in Turin. Attended courses in Implantology and Periodontics at Harvard University, Boston in 2004-2005 and Penn State University, Philadelphia in 2007-2008. Co-author of scientific articles on international journals regarding Periodontics, Implantology and specifically on the use of the short implants. Speaker in both national and international events on Implantology. Owns a private practice in Turin (Italy).

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DR. ALESSANDRO
BERMOND
DES AMBROIS
DR. LUCA SAVIO

INTRODUCTION

The replacement of compromised dental elements with osteointegrated titanium implants has been standard practice for many years, consolidated within protocols and extended to a growing number of practitioners. Osteointegration is today a well-known biological phenomenon which enables and supports the long-term success of implant rehabilitation.

The new frontier is not therefore to demonstrate that the implants work and are long-lasting, but to seek to obtain a natural harmony in the relationship between teeth and supporting tissues which is very often thwarted by the phenomena of remodelling that affects the socket following extraction, inevitably involving the aspect of the overlying gingival tissues.

Taking up the challenge today means managing the early and irreversible post-extractive resorption of the alveolus in such a way as to minimise the negative effects on the final aesthetics. With this document we aim to offer a model of rationale behaviour to be applied whenever we decide to replace a compromised dental element, with the intention of achieving

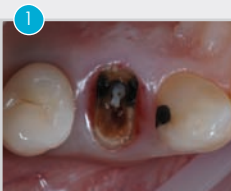
a final result that meets, as far as possible, the functional and aesthetic requirement that modern dentistry dictates.

DISCUSSION

In light of what we see in our daily practice, with strong confirmation expressed by the authoritative literature, the phenomenon that characterises the alveolar remodelling physiology following extraction, severely determines our operating choices that often need to cope with inadequate volumes of hard and soft tissues in order to achieve complete success (Amler, 1969) (Covani, 2011).

Shropp (2003) observed that the sudden morphological changes of the alveolar ridges in posterior sites can significantly reduce the possibility of inserting implants in a prosthetically-ideal condition. It was also noted that not all premolar and molar sites undergo the same resorption at the same speed. A vestibular cortical plate with a thickness of approximately 2 mm "resists" better to post-extractive resorption compared to that of less than one millimetre in thickness (Ferrus, 2010).

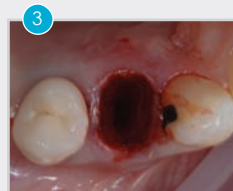
CASE 1. A classic clinical case of immediate post extraction is described. The root of the element has a poor prognosis but the socket still has an intact buccal cortical plate and being a thick gingival biotype, a greater thickness of 2mm is often assumed. Peri-implant regeneration is performed with biomaterial of bovine origin deproteinised and deantigenated and the socket covered by a slow resorption collagen membrane left exposed (Alpha-Bio's GRAFT, Israel). Primary healing is not intentionally sought since at the stage of initial healing the soft tissues will migrate by creating a greater amount of keratinised gingiva. It should be noted that having left the surgical screws in the implant it was possible to obtain complete closure of the tissues. An alternative would have been to insert a higher healing screw to achieve healing more similar to one stage implants.



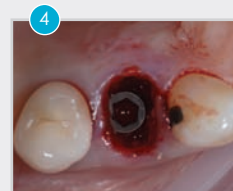
1 Pre-operative clinical situation



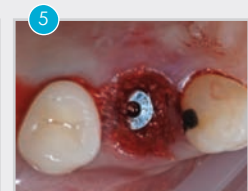
2 Pre-operative x-ray



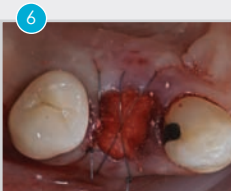
3 Immediate post-extractive regeneration



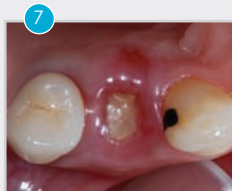
4 Post-extraction implant



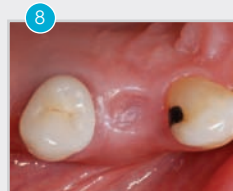
5 Filling of the alveolar gap



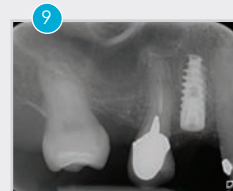
6 Membrane sutured in situ to cover the biomaterial



7 Healing after 10 days



8 Healing after 25 days



9 Post-operative x-ray

MATERIAL AND METHODS

Nevins (2006), with a multicentre randomised, controlled study stressed the importance and benefits of applying a technique of socket preservation upon extraction of teeth in the anterior maxillary area. In these sites, in fact, due to the inevitable loss of the thin bundle bone following extraction, in almost all cases a premature collapse of the root eminence with important impairment of natural morphology of the tissues occurs.

Recent anatomical studies which have made use of computed cone beam tomography confirm that the site with the highest aesthetic value in the oral cavity, i.e. the area of the anterior maxilla, is also that genetically predetermined to have the thinnest and therefore delicate buccal walls, especially when vestibularly placed teeth are present (Myamoto, 2011) (Braut, 2011).

In the past and still today socket preservation has been the subject of many studies with the use of different alveolar filling materials (Fugazzoto, 2005) (Cardaropoli, 2008) (Araujo, 2008) (Rasperini, 2010). The predictability of the method is certainly good but we believe that it is not such as to always ensure us a satisfactory result, in the

sense of ideal preservation of alveolar structures with bone neo-formation adequate for positioning of the implant. Often we see the infiltration of fibrous tissue in the intra-alveolar structure with inevitable deterioration of the final bone quality especially in the "open" variant, in which the cavity is filled with biomaterial with the aim of obtaining healing of the soft tissues by secondary intention (Ten Heggler, 2011). New filling materials and recent research on the use of centrifuged blood derived from blood taken from the patient is able to concentrate growth factors with the objective of tissue repair create motivated hopes in optimising this and other methods in the context of bone reconstruction (Rodella, 2010).

Grunder (2011) recently proposed a technique "anticipating" the collapse of the buccal cortical plate by grafting connective tissue on the vestibular aspect of the socket to maintain adequate soft tissue contours.

Brugnamì (2011) suggests a similar protocol to the previous one but with the use of slow resorption bio-granular material, situated in a pocket created on the buccal cortical plate at the time of extraction.

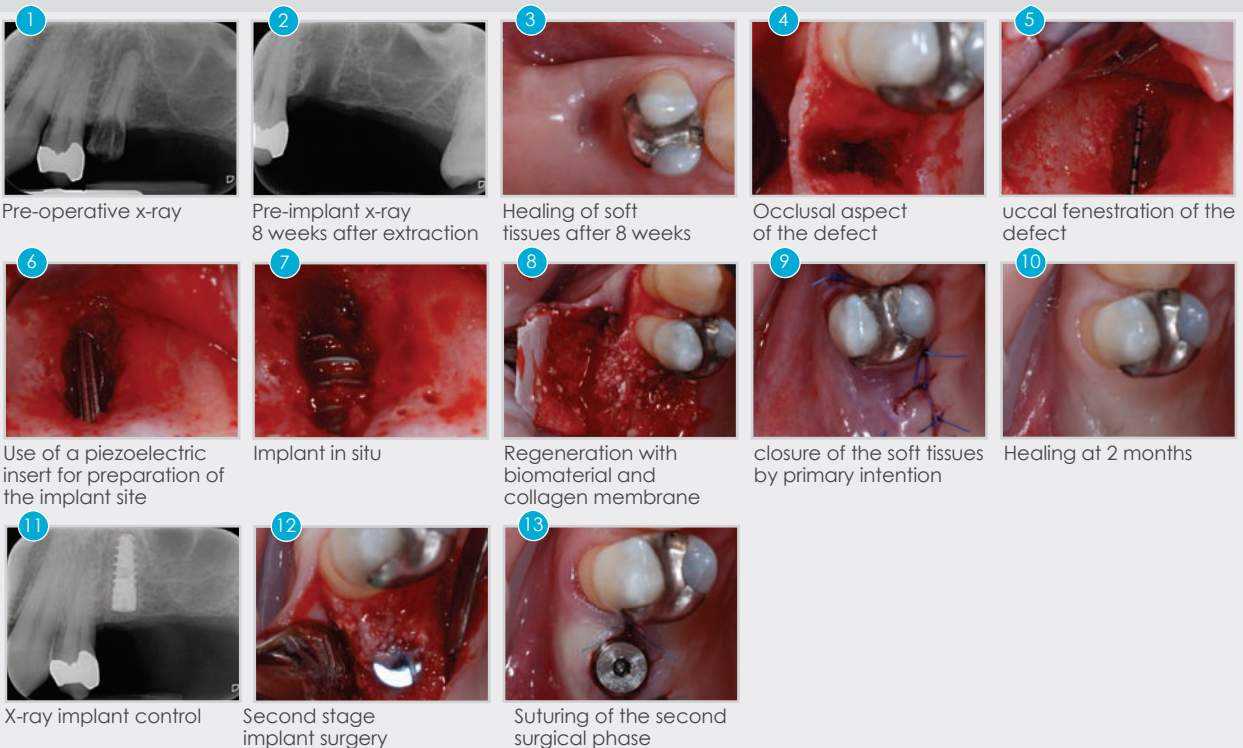
A synopsis is therefore proposed that encompasses the majority of clinical situations that we encounter on a daily basis.

It should also be reaffirmed that the goals to be achieved include the restoration of the buccal aspect, especially in the anterior maxillary area where the loss of the root eminence as a result of extraction penalises significantly the final result of an implant which, although integrated, can never simulate the natural element due to the absence of normal morphology of the peri-implant tissues.

In the proposed solutions, in addition to the application periodontal plastic surgery techniques and reconstructive bone surgery, it is often necessary to use technological aids provided on the market that facilitate and make the result to be achieved more predictable. Reference requirement is piezo-surgery (Surgybone, Silfradent, Italy) that allows us with remarkable precision and low impact surgery to prepare the implant site simply and quickly.

Another indispensable aid is to consider a type of implant suitable to be used in post extraction situations (SPI, Alpha-

CASE 2. A case of deferred post-extraction implant is described, operative choice linked mainly to the residual anatomy of the alveolus. Prior to the extraction, loss of the buccal plate was diagnosed assuming a very extensive and highly infected residual bone defect. With the aim of achieving a more predictable regeneration, insertion of the fixture and deferred peri-implant regeneration were opted for to have soft tissues suitable for obtaining submerged healing. It was possible to obtain optimal primary stability of the fixture in a very extended bone defect by virtue of the geometry of the implant and the use of piezoelectric inserts for a controlled under-preparation.



Bio Tec, Israel), which main features can be summarised in an aggressive spiral macro-geometry that creates the conditions for excellent primary stability in a few millimetres of bone; situation typical of immediate post-extractive implantology which reduces the overall treatment time, while keeping high the likelihood of success.

The principles that guide the techniques of bone reconstruction and those of plastic surgery are certainly required of

the practitioner wishing to offer patients a service in line with the times. It is thus recommended that the project is introduced at the correct location of the practitioner's learning curve.

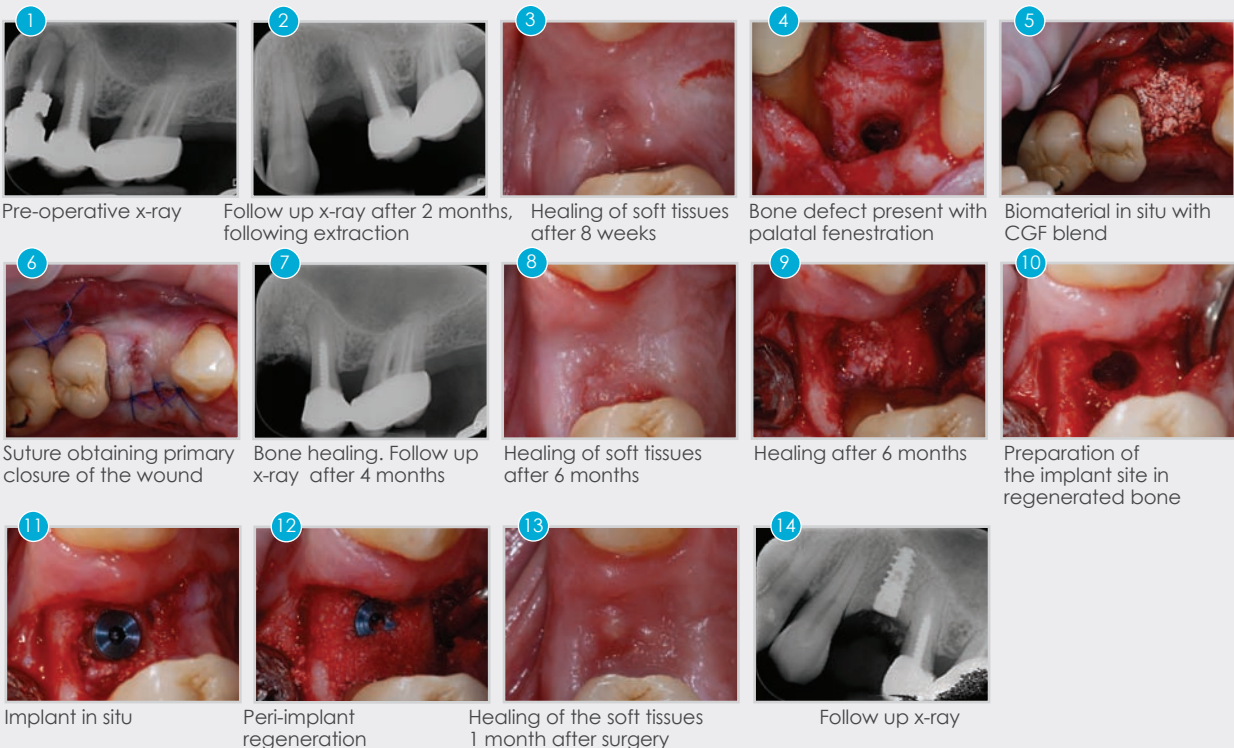
CONCLUSION

Considering the many anatomical-pathological variables of the extractive alveoli in sites to be rehabilitated to different "aesthetic stress", the most suitable approach to meet the biological-functional needs of the implant and the patient's aesthetic requests must be identified from time to time. The choice of modus operandi, in reality, should always take into consideration other variables such as the overall length of the treatment, the cost of the materials, management of the patient when surgery is to be performed. Whilst aiming for minimal invasion, it will be necessary in order to increase the availability of soft tissues with small free grafts from the palate and the amount of bone with the insertion of biomaterial (Nevins, 2006) (Buser, 2008).

	Intact Socket Buccal Plate > 2mm	Intact Socket Buccal Plate < 2mm	Non-intact Socket small bone defect	Non-intact Socket Severe bone defect
MOLARS	Implant insertion 4 months after extraction	DPEI + regeneration if the anatomy so permits; alternatively only GBR	DPEI + regeneration if the anatomy so permits; alternatively only GBR	GBR after 8 weeks of healing of the ;soft tissues implant after 6 months
PREMOLARS	IPE + vestibular regeneration	IPE + vestibular regeneration	DPEI + peri-implant regeneration	GBR after 8 weeks of healing of the ;soft tissues implant after 6 months
FRONTAL	IPE + vestibular regeneration + CTG (2% of cases)	IPE + vestibular regeneration + CTG (98% of cases)	DPEI + peri-implant regeneration + CTG	GBR after 8 weeks of healing of the ;soft tissues implant after 6 months + vestibular regeneration + CTG

- IPE:** Immediate post-extraction implant
- DPEI:** Deferred post-extraction implant (6/8 weeks after extraction)
- GBR:** Bone regeneration with 1° closure
- CTG:** Connective graft

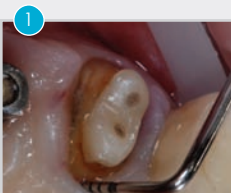
CASE 3. A clinical case that has a very extended post-extraction bone defect with a chronic infection is described. For this reason, a GBR intervention was planned using biomaterial of bovine origin (Alpha-Bio's GRAFT, Israel) associated with a CGF technique (Concentrated Growth Factors) obtained by a specific blood separator (Medifuge, Silfradent, Italy). It should be noted how the bone defect comprises the complete loss of the buccal cortical plate and wide palatal fenestration. After 6 months it was possible to insert an implant into the regenerated site with a further small peri-implant regeneration.



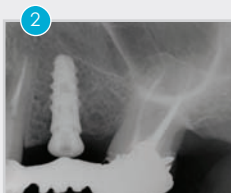
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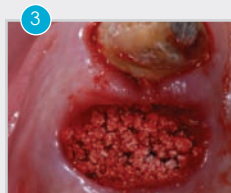
CASE 4. A case of immediate post-extraction regeneration with covering of the biomaterial (beta tricalcium phosphate 40% and hydroxyapatite 60%), is described by means of a collagen membrane (Alpha-Bio's GRAFT, Israel) left exposed in the oral environment according to the socket preservation technique described by several authors. This enabled the preservation of bone volumes in conjunction with the extraction, with healing of the soft tissues as secondary intention. The histology obtained after 5 months shows an initial bone healing with the presence of lamellar bone at depth and woven bone more superficially. The bone quality found allowed insertion of the fixture but, having practised open alveolar regeneration, a further peri-implant reconstruction at a coronal level was necessary, as is often the case when applying this method. These issues were well described by Dutch authors in their systematic review of the literature which concluded that probably still the best technique is to wait for healing of the soft tissues which makes closed regeneration possible, more protected and consequently more predictable (Ten Heggler, 2011).



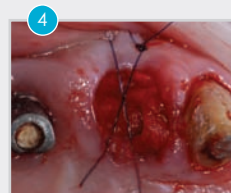
1 Palatal probing at a root fracture



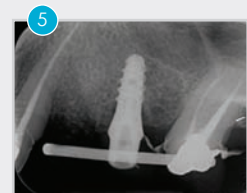
2 Pre-operative x-ray



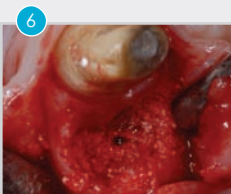
3 Immediate post extractive regeneration



4 Collagen membrane exposed with healing by second intention



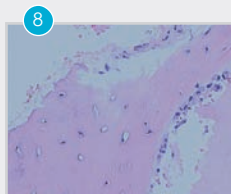
5 Follow up x-ray of post-extractive regeneration



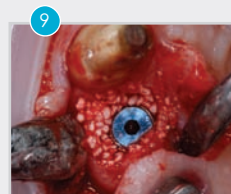
6 Surgery re-entry after 5 months following socket preservation



7 Coring of the regeneration obtained



8 Histology of the post-extractive regeneration obtained



9 Implant inserted and additional peri-implant regenerative



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Alpha-Bio Tec Ltd.

7 Hatnufa St. P.O.B. 3936, Kiryat Arye,
Petach Tikva 49510, Israel
T. +972.3.9291000 | F. +972.3.9235055
sales@alpha-bio.net

International

T. +972.3.9291055 | F. +972.3.9291010
export@alpha-bio.net

EC REP MEDES LIMITED

5 Beaumont Gate, Shenley Hill,
Radlett, Herts WD7 7AR. England
T/F. +44.192.3859810