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Guided rescue technique for the replacement of failing implants while preserving the existing prosthetic construction – Part 1: proposed protocol with the ins and outs of the clinical challenge

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Abstract

If the success rates in implantology display scores envied by many other medical and dental disciplines, the fact remains that the negative feeling is around 100% for the practitioner and for the patient in case of 'failure, especially when this failure occurs after prosthetic placement. The management of these situations rarely addresses the possible recovery of the prosthesis. This article proposes an original protocol making it possible to avoid having to redo the prosthesis following an implant loss and its replacement.

Keywords: Dental implant failure, Implant replacement, Implant prosthesis, Prosthetic failure, Failure management, Prosthetic preservation.

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INTRODUCTION

Implant failure, like any failure, generates at least a feeling of disappointment in both the patient and the treating practitioner. The frustration is even greater when the failure is accidentally observed without any warning signs when all the therapeutic phases had gone well, leading to the final prosthesis which satisfies the two protagonists (patient-practitioner). As practitioners, we are unfortunately used to dealing with these situations as best we can clinically and psychologically; we manage to accept it and integrate it into our professional routine insofar as these clinical failures represent only a low statistical rate in all of our therapeutic achievements. For the patient, it is a more difficult test since he (she) is 100% concerned by this failure!

We speak of primary implant failure when the latter is noted before the implant is clinically functional: it is a defect in osseointegration which will again lead to the removal of the concerned implant and its possible immediate or deferred replacement. The secondary failure is more pernicious and more consequent because it is noted after the prosthetic loading; in many cases it generates not only the removal of the implant but also that of the prosthesis deprived of its fundamental support.

Insofar as fixed prostheses on implants result from a "tailor-made" construction process involving the clinical, biological, anatomical and physiological parameters specific to each patient and to each site concerned, implant failure most often results in the loss of the supported prosthesis, except in the case of removable plural prostheses having been designed with more implants than necessary and which can therefore do without one or more implants in a situation of failure.

Even if the recurrence of implant failures remains relatively low within our exercise, it is our duty to manage these situations as well as possible, if only out of respect for the patients who have placed their trust in us. The surgical procedures for removing and replacing an implant in failure have been widely described and discussed [1-5].

On the other hand, the problem of the prosthesis relating to this implant has only been touched upon a little while it is part of the overall treatment in question and it contributes to its overall cost. In 2003, Glavas and Moses [7] proposed a surgical stage-indexing impression technique allowing the laboratory to make the

final prosthesis in advance, a technique they recommend to "save time" in cases of placement of primary or secondary implant (following implant failure). In this they use an indexing technique recommended in 2001 [6] to optimize the shape of the prosthetic bed by placing a provisional prosthesis directly at surgical stage 2 (instead of the healing screw).

It is also on the basis of this indexing principle that we propose here an original implant replacement technique with preservation of the existing prosthetic structure. Even if it is not applicable in 100% of cases, the suggested procedure has the advantage of being reproducible and not operator-dependent.

Statement of the problem

Since the implant-supported fixed prosthesis is the result of a custom-made construction, its durability in the event of implant failure can only be imagined by replacing the implant in question with an identical implant not only in terms of prosthetic connection, but also in terms of in situ positioning in the 3 directions of space. Several difficulties emerge from these specifications:

1. The most frequent implant failure consists in the loss of osseointegration, with the formation of a fibrous tissue in contact with the implant, tissue which should be carefully curetted after the removal of the implant... leading to deformation of the initial implant socket, therefore unsuitable for the primary stability of a new identical implant;

2. If implant the failure consists of a fracture of the fixture (more rare), surgical removal of the latter also most often leads to deterioration of the bone site concerned, bringing us back to the same situation as the previous point;

3. In the two aforementioned cases, we can consider a new deferred implant placement (after bone healing): the only difficulty will then be to reposition an identical implant in a situation identical to that which allowed the prosthetic construction that we wish to preserve ...

4. We can also consider the option of immediate replacement of the failed implant [1, 2], but we must then find a solution that addresses the 3 above problems:

- Primary stability of the new implant
- Prosthetic platform compatible with the existing prosthesis
- Three-dimensional positioning also compatible with the existing prosthesis

MATERIALS AND METHODS

The rescue technique described below was designed using the two features below.

1. Use of large diameter implants

Commonly known as WP (Wide Platform) implants, these implants were first designed in the early 1990s, because practitioners and manufacturers sought a certain proportionality between the implant root and the prosthetic crown on the one hand, as well as the optimization of the potential osseointegration surface on the other hand. These implants were thus mainly intended for the molar areas. Large implants have also been shown to be useful for extemporaneous replacement of RP (Regular Platform) or NP (Narrow Platform) implants in failed situations, as long as the bone context allows [8, 9]. Large and short implants have appeared more recently, with studies demonstrating their reliability as alternatives to therapeutic processes using bone reconstructions when the volumes involved are considered to be classically insufficient [10-12].

In most cases, the first generation wide implants sported prosthetic connections that were also wider than the RP and NP implants… and therefore incompatible in terms of prosthetic constructions. But in recent years, several systems (including Alphabio-Tec and Cortex, as illustrations in this article) have designed implants with variable dimensions but incorporating the same universal internal hexagon connection.

In the context of the problematic of this article, such a technological opportunity allows us to consider the immediate replacement of a failed implant by an implant of larger diameter (allowing good primary stability) with the same connection, therefore compatible with that of the prosthesis involved. It only remains to solve the question of in situ repositioning in the 3 directions of space.

2. Use of the Cortex Surgical Guide

Since its launch by Gerald Niznick in the early 80s (CoreVent implants), the internal hexagonal connection has consolidated its reputation and use with a large-scale study sporting eloquent statistics published in 1997 [13]. It has then acquired the status of "standard", adopted by many implant systems.

The Cortex range has a double advantage:

1. It offers implants of different diameters (and lengths) with 2 universal prosthetic connections of your choice (internal hexagon and conical Astra-like);

2. It has an original, very reliable guided surgery system that allows implant positions to be ideally predetermined as part as the pre-implant study.

RESULTS

1st case: *loss of osseointegration on implant 27; the challenge is to retrieve the failed implant and carefully remove the granulation tissue that has formed, then to place an immediate implant (wider, with the same prosthetic connection) in the same spatial configuration as the initial implant .*

Figuer 1, 2: Radiological observations

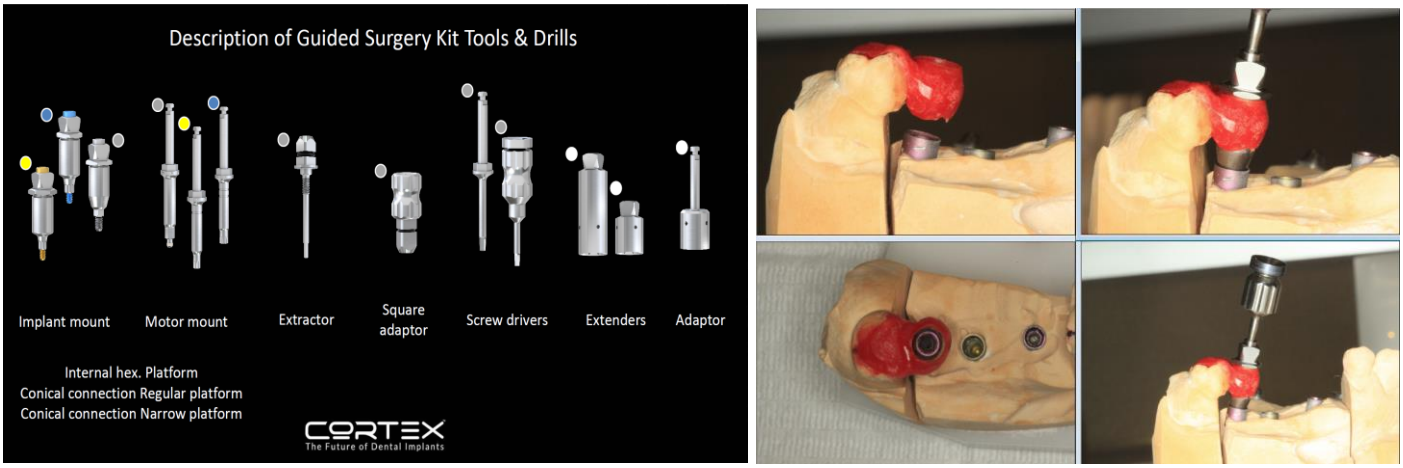

Figure 3, 4: Tailored preparation of the Rescue-guide (on the initial model which was used for the prosthetic work) using the Cortex Kit © (available for internal hexagonal connections type CoreVent, as well as for conical internal connections Astra-like)

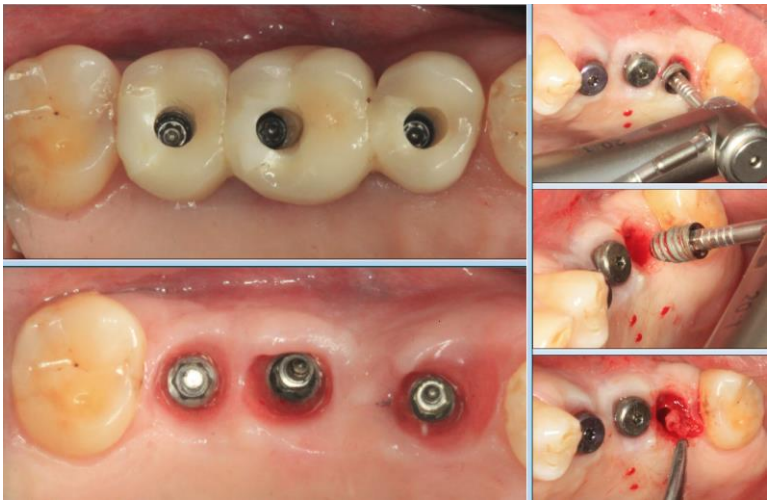

Figure 5: Prosthetic removal + implant removal (with Cortex hex-driver) + curettage of granulation tissue

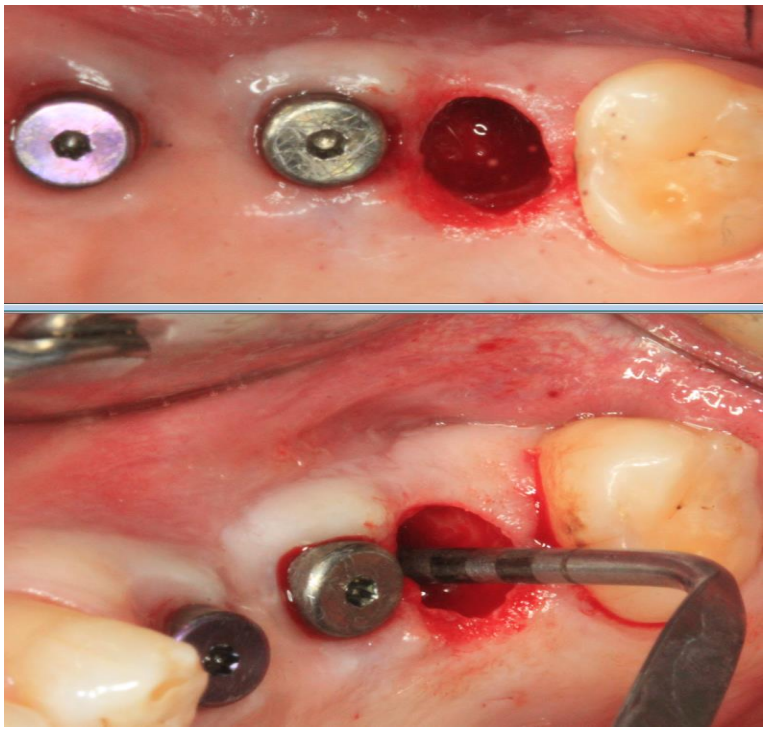

Figure 6: The cleaned implant socket appears with a diameter greater than the initial diameter which had allowed the insertion of the AlphaBio implant (Ice 4.2mm)

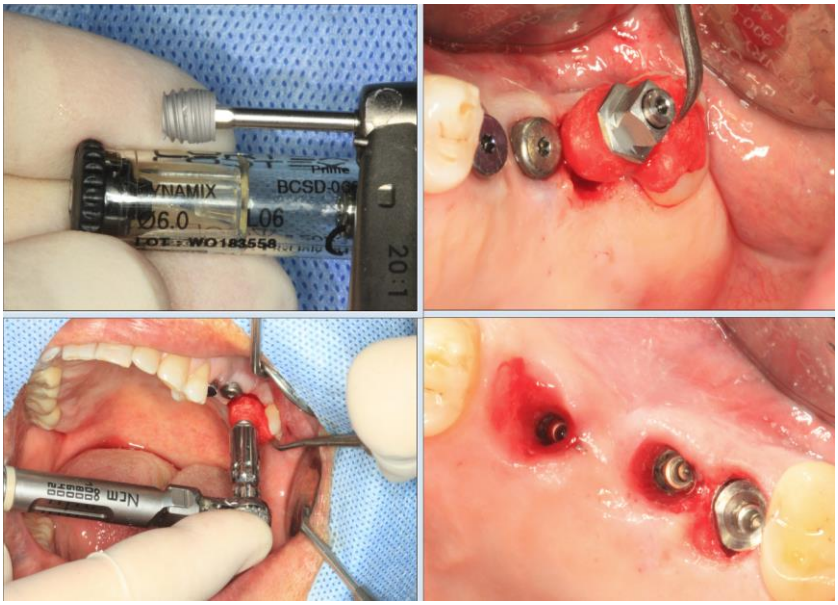

Figure 7: Placement of a self-tapping Cortex Dynamix® implant (internal hexagon) 6X6mm using the Surgi-Guide which allows to find the prosthetic connection identical to that of the initial implant in the 3 directions of the 'space.

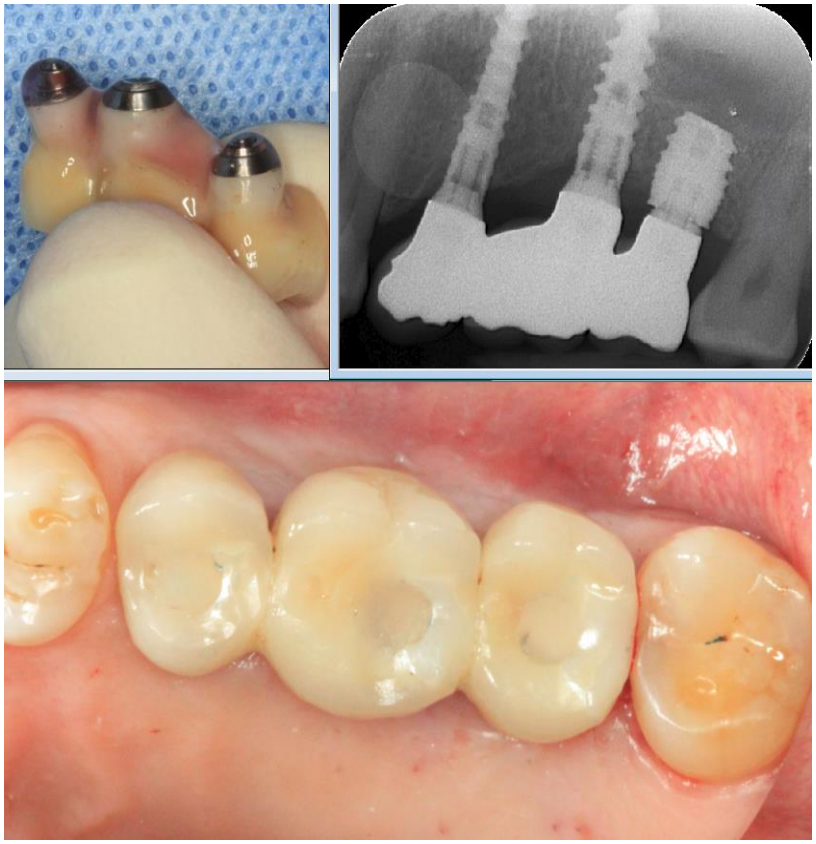

Figure 8: The fixed existing prosthesis is immediately replaced and the radiological control testifies to its perfect adaptation, with a prosthetic emergence type of shifting platform due to the increased diameter of the new implant

DISCUSSION

From a purely clinical point of view, this indexing technique already proven for a long time in other circumstances [6, 7], gives us great satisfaction. Several parameters are nevertheless to be taken into consideration:

1. What about the methods of prosthetic fixation at the level of the newly replaced implant? ... Should we screw and tighten the prosthetic screw to the maximum recommended by the manufacturer or simply screw it manually, or even not screw it there but only on the adjacent implants ?

For now, we have made the choice to screw-lock as for the other implants involved in the prosthesis; we justify this option by the following arguments:

- This maximum screwing makes it possible to reinforce the apparent the implant-prosthetic fit

- Studies have shown that the plasticity of the bone at its interface with the freshly placed implant allows the micro movements necessary for ideal repositioning within the limit of 150 µm [14], while remaining favorable to bone reorganization such as it must occur during the osteogenesis and osseointegration processes [15, 16]

- Finally, the contained mechanical stimulation (thanks to the adjacent rigid supports) which will be generated by physiological chewing forces is likely to promote the differentiation of mesenchymal stem cells into osteoblasts inducing the reformation of bone tissue in contact with the implant [17, 18]

2. This new clinical protocol implemented with the authorization of the patients is certainly conceptually satisfactory and relatively easy to be set. We must wait for large-scale results with medium and long-term statistics to confirm its validity.

3. The Cortex surge-guide concept already allows the production of surgical guides developed by a CAD/CAM process during the pre-implant study; insofar as we will probably have to use more and more to these guides in first intention, the protocol described in this article will be simplified by the possible re-use of the initial guide in case of failure, while only change the diameter (and length eventually) of the implant.

CONCLUSION

The original protocol described and argued in this article allows the preservation of existing prosthetic work despite the loss of its implant support. The reuse of the prosthetic work is thus made possible in many cases if one takes care to replace the lost implant(s) by respecting the indications of this protocol. This original approach is likely to be refined technically over time and with the participation of other operators. It will also evolve in parallel with the increasing involvement of the digital flow in our surgical-prosthetic approaches. Finally, its effectiveness will also have to be measured in terms of future statistical publications.

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Conflict of Interest

The authors declare no conflict of interest.

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