Influence of PRF in the healing of bone and gingival tissues. Clinical and histological evaluations

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Abstract. – INTRODUCTION: The healing of bone tissues around dental implants is based primarily on a correct osseointegration.

BACKGROUND: Typically, implants stability and peri-implant tissues health are anticipated to decrease during the early weeks of healing; this is followed by an increase in stability.

AIM: The aim of the present study is to assess a predictable protocol in order to increase the peri-implant tissues maintenance around post-extractive dental implants, thanks to the use of Platelet-Rich Fibrin (PRF) membrane.

MATERIALS AND METHODS: This is a retrospective observational study of 127 tapered dental implants placed in the immediate post-extraction sites of maxillary bone of 59 patients.

Atraumatic dental extraction and flapless implant surgery was performed in all reported cases. The cortical bone position relative to the implant reference point was evaluated at implant placement and 10 to 24 months following implantology. The gap between bone tissue and the implant surface was measured up to a maximum of 3 mm. After placing implants we have filled the surgical site with a PRF gel, so as to fill the gap between bone tissue and the implant surface, and then we have covered the surgical site with a PRF membrane, so as to coat the gap between the alveolar crest and the implant.

RESULTS: In all cases, we observed the complete covering of the dental implants, with newly formed soft tissue of variable thickness between 1 and 3 mm. Cortical bone adaptation from the time of implant placement up to 30 months following prosthetic restoration ranged from 0.4 mm to 1.7 mm.

CONCLUSIONS: Our study showed a series of successful rehabilitations, with post-extraction implantology technique, in 99.8 percent of cases, despite the success rates in the medium and long-term post-extraction implantology reported in the literature range between 92.7 percent and 98.0 percent. Long-term maintenance of crestal bone and the rapid healing of soft tissue dimension with maintenance of peri-implant papilla were observed as outcomes after post-extractive implants insertion.

Key Words: Post-extractive implants, Peri-implant tissues maintenance, Platelet-Rich Fibrin.

Introduction

The healing of bone tissues around dental implants is based primarily on a correct osseointegration. Placement of dental implants in both maxillary bones leads to a series of healing events, including necrosis followed by resorption of the traumatized bone around the implant surface concomitant with new bone formation. Typically, implants stability and peri-implant tissues health are anticipated to decrease during the early weeks of healing; this is followed by a new increasing of implant stability.

This is related to the biologic reactions of the bone and soft tissues to surgical trauma. After implant insertion, one millimetre of the bone around the implant undergoes to necrosis; this process is followed by new bone apposition initiated by osteoblastic activity. Early crestal bone loss of about 1.5 mm is often observed during the first year after implant loading: crestal bone loss of course produces several changes in soft tissues level around implant.

Considering that hard and soft tissues modifications may cause aesthetic and biological concerns, the planning of a protocol that improves the peri-implant tissues maintenance provides the best approach to an immediate post-extractive implantology highly predictable.

Background

Platelet-Rich Fibrin

A new supplement to procedures of tissues regeneration is represented by a platelet concentrate
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Atraumatic dental extraction and flapless implant surgery was performed in all cases.

The cortical bone position relative to the implant reference point was evaluated at implant placement and 10 to 24 months following implantology. Cone beam computed tomography were performed respectively at 10 and 24 months following implantology and the tomographic images were assessed using a software for the managing of the images. The gap between bone tissue and the implant surface was measured up to a maximum of 3 mm, instead the implant diameters used for each fixture were 3.5 or 4.5 mm (Table I).

The relationship of the peri-implant mucosa to the incisal edge of the definitive prosthesis was recorded.

The factors that influence success of post-extractive implantology are varied, however, the Authors agree to give the greater importance to the achievement of primary stability and to the management of peri-implant hard and soft tissues. During the planning of implant placement is important to assess an adequate implant length: we think that the height of the cortical bone, measured from the base of the socket to the marginal ridge, must be at least 3 mm longer than the length of the dental implant. All these parameters were fulfilled in our reported case series. Finally, after placing implants we have filled the surgical site with a PRF gel, so as to fill the gap between bone tissue and the implant surface, and then we have covered the surgical site with a PRF membrane, so as to coat the gap between the alveolar crest and the implant; the coverage of PRF was sutured by means of separate stitches. Antibiotic (Amoxicillin 1000 mg every 12 hours) and anti-inflammatory (Ketoprofen 100 mg every 12 hours) therapy was prescribed for 72 hours after surgery, in addition, an anti-edema therapy (Bromelain 40 mg were administered every 4 hours) was given to reduce postoperative swelling.

Results

In our study we have evaluated 127 immediate post-extractive dental implants placed in maxil-
lary bone of 59 patients; our follow-up for each of the cases assessed, is at least 24 months.

In all cases, we observed the complete covering of the dental implants, with newly formed soft tissue of variable thickness between 1 and 3 mm (Figure 1).

In one case the newly formed tissue was excised by means of circular scalpel and was analyzed under optical microscope confirming the formation of gum-like tissue.

Cortical bone adaptation from the time of implant placement up to 30 months following prosthetic restoration ranged from 0.4 mm to 1.7 mm (average, 1.1 ± 0.6 mm mesially and 0.7 ± 0.3 mm distally). The mean cone beam computed tomography (CBCT) measurements from the interproximal crestal bone to the contact point were 5.2 ± 0.9 mm (mesial) and 4.2 ± 1 mm (Figure 2).

Moreover, the mesial and distal papilla showed an initial decrease, even if < 1 mm (0.4/-0.3 mm), then instead, 10 months after the surgery, a slow stabilization of the variation of papilla was observed in all the evaluated patients.

With regard to the clinical cases analyzed, the respect of surgical protocols and the correct planning of the case allow us to achieve a successful rehabilitation, with post-extraction implantology technique, in 99.8% of cases. The single case of implant failure has occurred with a 4.5 mm diameter implant inserted into bone quality D4, according to Misch classification. The reason was a bacterial peri-implantitis due to low patient compliance with oral hygiene instructions (Table II).

The evaluations of the clinical, histological and radiographic responses of peri-implant tissues suggest that a proper immediate post-extractive implant placement is followed by a supracrestal biological width formation along the abutment. The use of PRF helps to achieve the preservation of tooth-like tissue contours and a mature bone tissue around placed implants (Figure 3).

**Discussion**

Our study showed a successful rehabilitation, with post-extraction implantology technique, in 99.8% of cases, despite the success rates in the medium and long-term post-extraction implantology reported in the literature (range between 92.7% and 98.0%)
Immediate implants shorten the time to completion of rehabilitation while also reducing bone reabsorption of the residual alveolus and avoiding the need for a second surgical intervention. Several studies have analyzed resorption patterns following tooth extraction. The literature reports highlighted as the width of the alveolar ridge can decrease up to 50% in the 10 months following extraction.

Moreover, several clinical works have demonstrated the effectiveness of PRF in promoting the healing of extraction sockets, the PRF has, in fact, platelet growth factors that can improve the vascularization of the surgical site, promoting neoangiogenesis.

<table>
<thead>
<tr>
<th>Bone quality (According to Misch Classification)</th>
<th>No. of implants</th>
<th>No. of implants with Diameter 4.5 mm</th>
<th>No. of implants with diameter 3.5 mm</th>
<th>No. implant failure</th>
</tr>
</thead>
<tbody>
<tr>
<td>D1</td>
<td>48</td>
<td>39</td>
<td>9</td>
<td>0</td>
</tr>
<tr>
<td>D2</td>
<td>34</td>
<td>27</td>
<td>7</td>
<td>0</td>
</tr>
<tr>
<td>D3</td>
<td>34</td>
<td>30</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>D4</td>
<td>11</td>
<td>10</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>127</td>
<td>106</td>
<td>21</td>
<td>1</td>
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</table>
Conclusions

The achievement of implant success is subject to a correct management of each case, from the planning of the implant insertion to the management of intra- and post-operative phases, and this management should be even more accurate in the case of post-extraction implants.

Long-term maintenance of crestal bone and the rapid healing of soft tissue dimension with maintenance of peri-implant papilla were observed as outcomes after post-extractive implants insertion.

Compliance with the protocols and the use of modern technology allow us then to perform a post-extractive implant surgery highly predictable, capable of ensuring both the function and aesthetics to our patient.

Conflict of Interest

The Authors declare that they have no conflict of interests.

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References


