

Single ultra-short implant rehabilitation of posterior atrophic maxillae with 5 years follow-up

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SUMMARY

Rehabilitation of edentulous ridges, in some cases, can represent a challenge for both the oral surgeon and the patient. After teeth loss, posterior sectors of the maxilla can shrink because of both the crestal resorption and sinus pneumatization. The implant placement in such cases requires invasive procedures of sinus lift and bone augmentation. In cases where these steps are not possible, short implant placement should be considered to offer a fixed rehabilitation. We report a case of rehabilitation with a short 5mm length implant in the posterior maxillae atrophic area. A documented follow-up of 5 years is reported, showing a good biologic and functional performance.

Keywords: ultra-short implant; platform switching; implant rehabilitation; atrophic ridge rehabilitation; short implant stability; crestal sinus lift.

INTRODUCTION

After teeth loss, the bone undergoes resorption and can make implant rehabilitation complex. In particular, after extractions in posterior regions of maxilla, bone resorption can be associated with maxillary sinus pneumatization, reducing the height of alveolar process to few millimeters. Implant rehabilitation of such conditions may require invasive bone augmentation procedures (1) that, in some cases, are declined by patients because of the cost, invasiveness and a prolonged timing of treatment. In such cases it is important to offer patients an alternative treatment modality, one of which is to use implants with non conventional dimensions (2).

Not unique terminology has been used until now to define the various dimensions of dental implants. Al-Johany *et al.* (3) proposed a classification scheme based on the frequency of use of singular terms in scientific literature. According to them, based on diameter, the implants can be divided in: extra-narrow, narrow, standard and wide; based on the length: extra-short, short, standard and long.

Standard implants, with a length about 10 mm, are used in the largest part of clinical conditions.

They have been extensively studied, resulting to be a reliable and effective option for replacement of missing teeth. Shorter implants (<10 mm) have been proposed for edentulous areas lacking vertical bone volume (4). At the beginning, various doubts had arisen about the duration and success of these implants (5), gaining over the years an increasing confidence (6, 7).

The aim of this case report is to present a case of rehabilitation with an extra-short implant (5 mm) in the upper posterior area, showing a long and successful follow up of 5 years.

CASE PRESENTATION

In 2013 the patient, a 48-years-old female referred to the authors with pain in the upper right posterior area. At radiologic and clinical examination, first molar (1.6) was identified to cause such symptomatology. The tooth, with an old root canal treatment, presented a vertical fracture with a huge infection, extended to the maxillary sinus (Fig. 1). The patient was treated with extraction and an implant rehabilitation was proposed after complete recovery of post-extractive alveolus. A general periodontal evaluation and treatment were also performed. The patient's general health history was noncontributory.

After 9 months the patient came back to plan the rehabilitation. An Orthopantomography (OPT)

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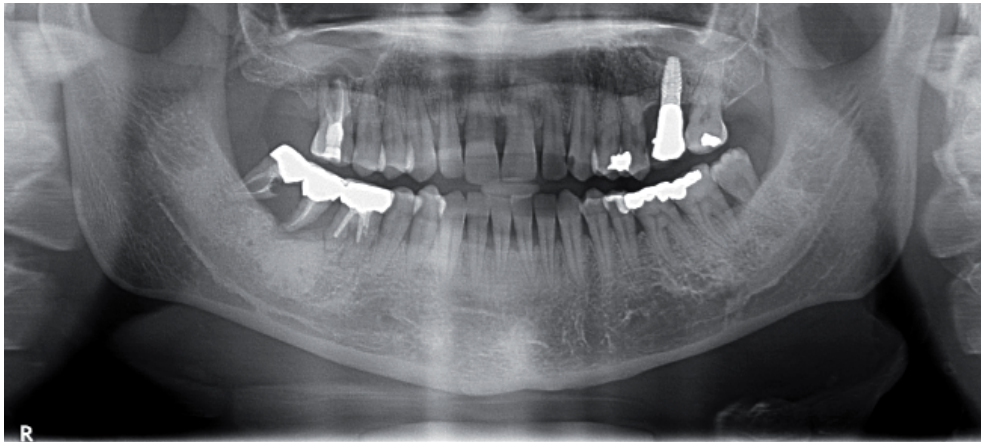


Fig. 1. Orthopantomography showing the involved first right superior molar (1.6) with evident infection

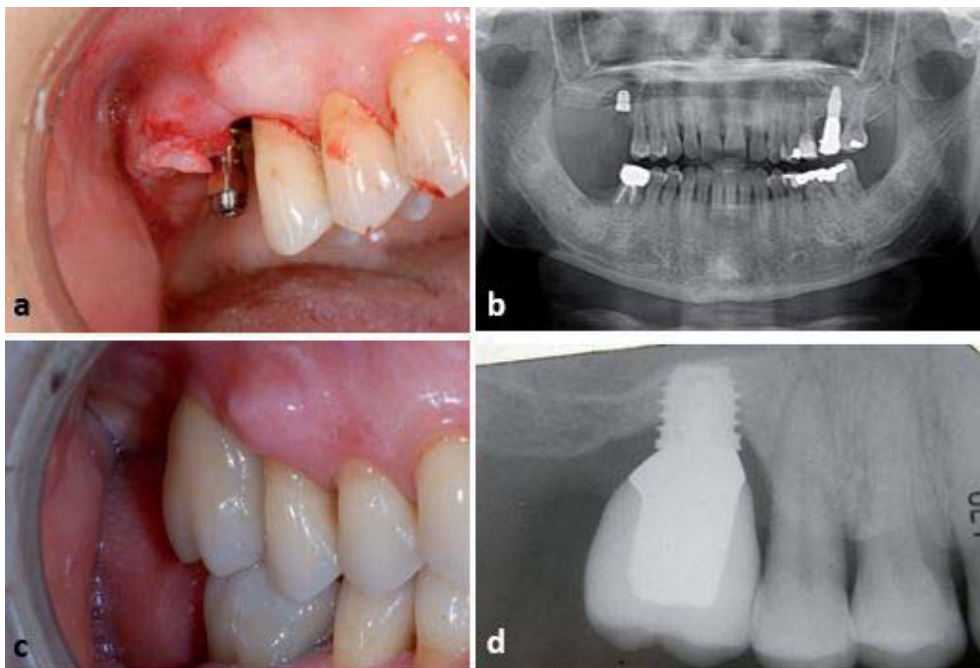


Fig. 2. A – intra-operative surgical step of implant placement; B – orthopantomography after implant insertion; C – definitive crown restoration; D – periapical radiography of final restoration immediately after placement.

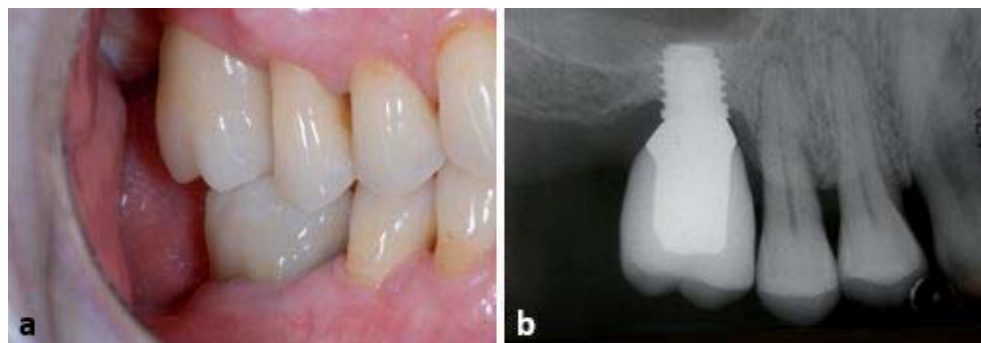


Fig. 3. A – intra-oral view at 5-years follow-up check; B – periapical radiography at 5-years follow-up check.

was performed and the patient subjected to periodontal reevaluation with subsequent oral hygiene treatment and motivation. The OPT revealed a

reduced bone height in the area of interest and a Cone Beam Computer Tomography (CBCT) was requested. CBCT confirmed a severe atrophy of the alveolar ridge. The patient refused the bone graft, so a rehabilitation with an extra-short implant associated with a crestal sinus lift was chosen. The preparation of the surgical site was performed using a series of surgical drills and a manual osteotomic sinus floor elevation, without use of any bone graft. After that, an implant 5×5 mm (OSSEOTITE®, BIOMET 3 i™) was inserted reaching a good primary stability. Three months later, the implant was uncovered and a 4mm diameter healing abutment fixed, using the platform switching technique. An impression was taken two weeks later and a definitive cemented prosthesis was placed, tightening the gold screw of the abutment at 35 Ncm and fixing the crown with temporary cement. The prosthesis were checked in occlusion, eliminating some precontacts on 1.6 and 4.6. The clinical crown-implant ratio was of 2.5/1 (Fig. 2).

A rigid oral hygiene protocol was established and the patient was recalled every 4 months for professional dental hygiene, occlusal and radiologic checks.

After 5 years of follow-up, no signs of inflammation, mobility or pathological probing pocket depth were observed. (Fig.3)

DISCUSSION

Dental implant rehabilitation became a usual and predictable practice in recent years. The surgical procedures as well as the implant materials have been deeply investigated and standardized. However, the clinical conditions are extremely variable, requiring, sometimes additional expertise of the practitioner, making the rehabilitative procedures longer and more invasive. In particular, implant placement in atrophic bone areas may require bone regeneration or other procedures, such as maxillary sinus elevation in the case of implants in the posterior areas of the maxilla. These interventions have been studied extensively, the procedures well defined, showing lasting results over time. However, these are invasive procedures that lead to an increase in costs and times of implant prosthetic rehabilitation. To stem these drawbacks, the use of short implants has been proposed (8, 9). Short or also defined as extra- or ultra-short implants, accordingly to the literature, are implants with a length less than 10 mm (3). In our case, the rehabilitation has been performed with a 5mm long implant, which represents the minimum length reported for oral implants. In this way, more invasive procedures were avoided because rejected by the patient. While from a biological point of view, the principles of osseointegration remain unchanged, the main problem is that of bio-mechanical nature, that may influence the duration over time of such a rehabilitations. Misch *et al.* have shown that the prosthetic load is absorbed more by the more crestal part of the osseointegrated implant, giving a rationale for the use of short implants (10). However, utmost attention must be paid to all those factors that determine the health of peri-implant tissues, including: surgical procedures, oral hygiene, periodontal disease and smoking, since, with short implants, it becomes even more important to avoid inflammation and resorption of peri-implant bone. The patient of this case report was included in a rigid oral hygiene protocol for the whole time of the follow-up and the general periodontal status was kept under control, eliminating any possible source of infection.

Second fundamental issue regard the biomechanical aspects of such rehabilitations. This mainly concerns the relationship between the length of the prosthetic crown and that of the implant that supports it. Several scientific papers have demonstrated the importance of this relationship for two reasons: peri-implant bone loss (11) and other mechanical complications, such as screw loosening, fractures and debondings (12). An interesting review, performed by Cruz *et al.* (12), summarizes the major complications that characterize the rehabilitations with short Implants, comparing them with those of Longer Implants With Maxillary Sinus Lift. They conclude that the maxillary sinus augmentation is associated with a higher rate of biological complications, while a higher prosthetic complication rate is reported for short implants. The crown/implant ratio, in the case of using short implants, becomes a critical feature, since rehabilitation with short implants is typical in conditions of large bone resorption. This condition leaves a large occlusal gap that must be bridged by the prosthetic crown, as showed in our case reported as well. However, it seems that a crown/implant ratio less than 3.1 may prevent biomechanical complications (13). The correct and repeated adjustment of the occlusion, verifying centric and eccentric movements at every follow-up visit, remains of fundamental importance.

CONCLUSIONS

The rehabilitation described in this paper, despite being a single case report, demonstrates a long follow-up of 5 years, in which it was possible to observe an excellent performance that the rehabilitation is carrying out from a biological and mechanical point of view. This can encourage a reasoned use of short implants, which prove to be a valid alternative when the patient's local or general conditions exclude the use of traditional implants.

STATEMENT OF CONFLICTS OF INTEREST

All the authors declare no conflict of interest.

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