

Extraction of an upper premolar due to a root fracture and subsequent implant positioning: a case report

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Abstract

Objectives: Root fracture, from an etiological point of view, constitutes the progression of the incomplete lesion. The treatment of this type of lesion involves the root fragments extraction, as in the case below, in their entirety. Vertical fractures can in fact include the entire thickness of the root, if complete. They may involve the buccal surface, the lingual surface or both surfaces, also extending to the periodontal attachment. In this case there was a fistula at the buccal level, in fact the presence of fistulas in this type of lesions can be detected in 35-42% of cases of root fractures¹. The following article presents the clinical case of a patient who had the fractured root residue of element 1.5 with vestibular fistula that required masti-catory and element aesthetic restoration.

Keywords: Dental implant, root fracture, pre-surgical antibiotic therapy, buccal bone defect, prosthetic crown.

Materials and methods

A 48-year-old male patient, non-smoker and without any systemic disease, presented fractured root residue of element 1.5 requiring functional and aesthetic restoration of the element. The technique adopted in this surgical procedure was "one stage", in which the extraction was

then contextual to the insertion of the implant; The procedure took place with the extraction of the premolar, which left the presence of a bone defect of the buccal alveolar wall. Subsequently, after prescribing pre-surgical antibiotic therapy, (with Levofloxacin 500 mg once a day for ten days, Medrol 0.16 mg 1 tablet on the morning of surgery, 3/4 the morning following the day of surgery, 1/2 two days after surgery and 1/4 three days after surgery) implant insertion was carried out. A Winsix KT implant was inserted, 3.8 mm in diameter and 11 mm in length, which has the characteristic of having a platform with a diameter greater than the implant body (4.5 mm) that adapts perfectly to the post-extraction bone spaces going to optimize prosthetic rehabilitation. A healing screw was then placed after repairing the bone defect, in fact a mixture of autologous bone taken from the implant positioning site and biomaterial, bio bone, was made, all covered by a resorbable membrane in equine-derived collagen to contain the material inside the bone defect. After 3 months, a prosthetic crown was placed.

Results and conclusions

At the end of the work, a perfect osseointegration of the Winsix KT implant is observed 3.8 mm in diameter x 11 mm in length with a maintenance of bone thickness, healing of the defect and good healing of soft tissues, even at 10 years of follow-up.

Introduction

The prognosis of a dental element should be evaluated based on various factors; Although some types of fractures are believed to have an uncertain prognosis, such as incomplete fractures or fractures of the crown only, there are some types of injuries, such as vertical fractures of the root or fractures of the middle third of the root whose prognosis is considered poor. In fact, vertical fractures often have periodontal ligament involvement and among the symptoms, in addition to pain and swelling, a periodontal abscess can also occur in a third of cases³. For what concerns the timing of implant insertion, it is based on clinician experience and on the characteristics of the patient and the implant site. The consensus report published in 2014, describes the timing of implant placement after an extraction⁴. Hammerle et al. considered necessary to develop a classification to describe advantages and disadvantages of various positioning timings, based on clinical observa-

tion. In particular, the decision to insert or not the implant immediately after extraction is determined both by the characteristics of soft and hard tissues and by the characteristics of the healing of the alveolus. Among the various timings, therefore, the positioning immediately after the extraction of the element is taken into consideration; the advantages include both the reduced number of surgical procedures and the reduction of the time of the treatment plan, with the possibility of making the most of the residual bone that is just extracted from the element⁵. The disadvantages includes the morphology of the site that could complicate the implant placement, as well as tissue biotype and lack of keratinized mucosa. It has also been argued in literature that implant placement after extraction could stimulate new bone formation and osseointegration, as well as preserve alveolar bone tissue. It was recommended in a 2004 review by Chen et al.⁶ that implant insertion immediately after extraction helps to avoid bone atrophy.

Case Report

A 48-year-old male patient, non-smoker, in good systemic health, comes to our attention for a fistula at the level of the first quadrant.

In the first instance, a careful intra- and extra-oral objective examination was performed, which revealed the presence of a residual root at the level of 1.5 and a buccal fistula (Fig. 1).

Subsequently always in the first visit, first-level radiographic examinations were performed: Orthopantomography and Endoral Rx near the root residue.

After careful evaluation of the patient's clinical and systemic situation, "one stage" surgery technique was proposed as the operative technique, in which extraction was concurrent with implant placement.

The patient was prescribed the antibiotic prophylaxis (with Levofloxacin 500 mg once a day for ten days, Medrol 0.16 mg 1 tablet on the morning of surgery, 3/4 the morning following the day of surgery, 1/2 two days after surgery and 1/4 three days after surgery).

At the next appointment after signing informed consent and local anesthesia with articaine 4% and adrenaline 1:100,000 (Ubistesin 40 mg/ml, 3M ESPE, Italy) avulsion of the element has been performed, leaving however a bone defect on the buccal side (Fig. 2).

At the same stage, after extracting the element, revising the cavity, and raising a full-thickness flap, a Winsix KT implant is placed in the post-extraction site (Fig. 3). A



Figure 1. Fractured root element with buccal fistula in place 1.5

Winsix KT implant was inserted, 3.8 mm in diameter and 11 mm in length, which has the characteristic of having a platform with a diameter greater than the implant body (4.5 mm) that adapts perfectly to the post-extraction bone spaces going to optimize prosthetic rehabilitation. Buccal bone defect is then managed with the insertion of both autologous bone taken from implant site mixed with biomaterial, biobone (Fig. 4).

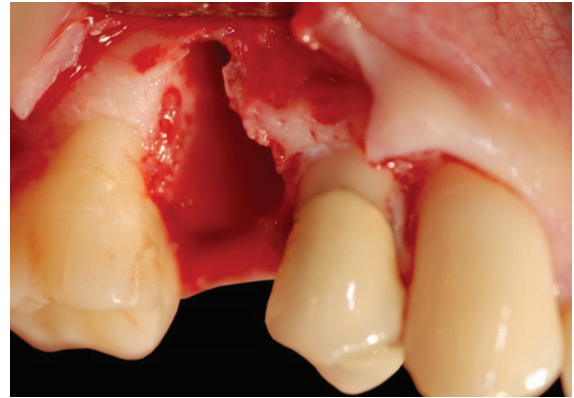


Figure 2. Post-extraction site, with buccal bone defect.

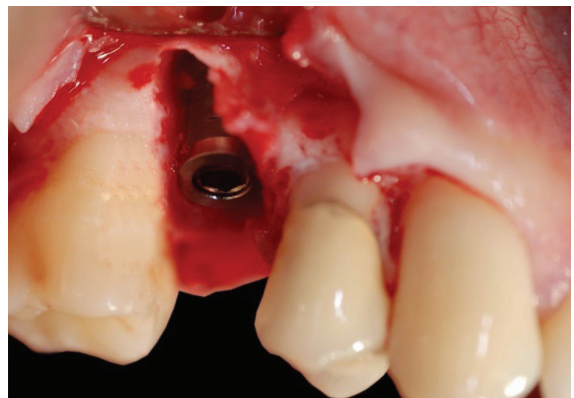


Figure 3. Winsix KT 3,8 mm diameter x 11 mm length insertion in post-extraction site.

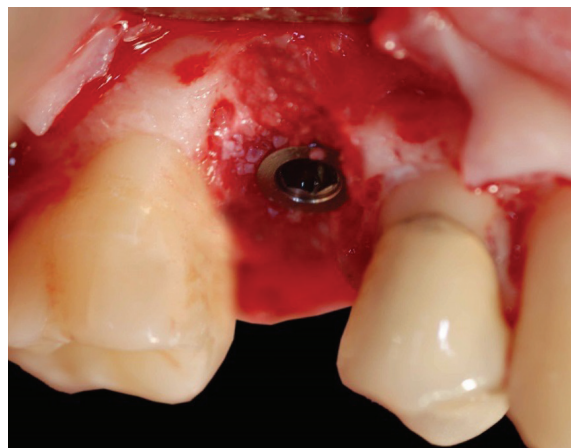


Figure 4. Bone defect management using autologous bone and biobone biomaterial

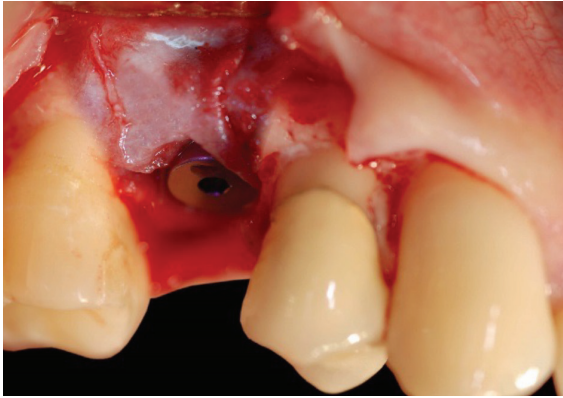


Figure 5. Positioning of a resorbable membrane on the bone defect by means of the healing screw.



Figure 7. Post- extraction implant healing with "one stage" technique.



Figure 6. Positioning of a resorbable membrane in Parasorb collagen 0.3 mm thick



Figure 8. Prosthetic abutment.

Next, a resorbable membrane was placed on the bone defect and the healing screw was also placed at the same time (Fig. 5).

To conclude the surgery, the placement of a 0.3-mm-thick Parasorb collagen resorbable membrane to cover the healing screw was also opted for, in order not to let the flap slide coronally to cover the placed and regenerated implant and to achieve soft tissue healing (Fig. 6). Finally, flap closure was performed with a detached stitch suture with 3/0 resorbable thread (Vicryl, Ethicon, Johnson & Johnson, New Brunswick, NJ, USA). Post-operative instructions were reported to the patient. The patient was reexamined 14 days after surgery to remove the sutures, and good tissue healing could be observed. After 3 months, prosthetic rehabilitation was performed, which included removal of the healing screw with subsequent insertion of the abutment. Impressions were taken for fabrication of the prosthetic restoration. One week later, the patient was able to receive the ceramic gold crown (Fig. 7-9).

The patient was placed on a follow-up protocol with annual professional hygiene and radiographic checks at the implant site. The final follow-up is at 10 years (Fig.10)



Figure 9. 3 months follow-up after surgery and placement of the ceramic gold crown.

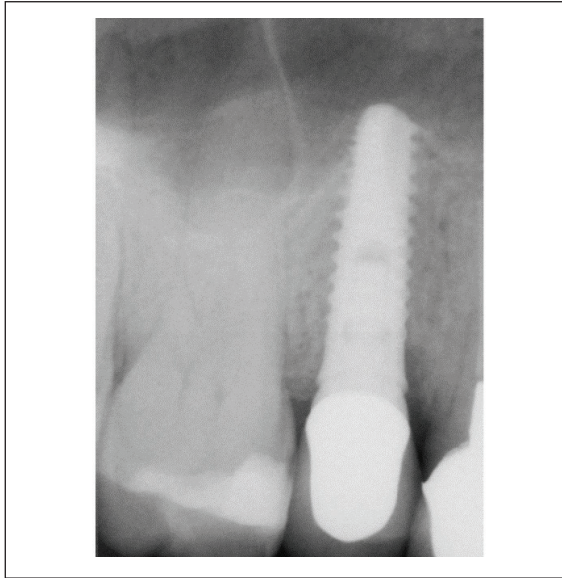


Figure 10. 10 years follow-up from the implant functional load

Discussion

The vertical fracture of the root itself has a poor prognosis, as reported by various scientific works, including Khansis et al. 2014⁷; vertical fractures in fact tend to involve the root and periodontium and involved tooth are usually extracted, although there are studies that speak of an attempt to reunite the root but with a low or variable success rate. The early diagnosis of a fractured root and tooth extraction can maintain the integrity of the alveolar bone allowing a correct implant positioning, making optimal then the restoration of both aesthetic and masticatory function.

In a 2014 systematic review, Corbella S.⁸ develops a classification for bone defects resulting from the extraction of a vertically fractured tooth and evaluates the existing literature on the treatment of this type of defect analyzing dental implants in combination with regenerative procedures. In cases of vertical root fractures a quick decision is relevant in safeguarding the residual bone. Even if, even in these cases, a conservative approach can be adopted, the prognosis of these elements is often poor⁹⁻¹⁰⁻¹¹⁻¹². In these circumstances, in fact, implant treatment seems to be the treatment of choice. Even the success of the latter procedure seems to be at risk if it is not performed with the correct timing and the right clinical evaluation of bone and soft tissues, in fact it may be necessary to incur a regenerative procedure¹³. Many studies have evaluated the success of immediate implant placement after extraction of the dental element with vertical fracture and it has been reported that success rate in these cases is comparable to successful placement in a healthy site¹⁴. It is in fact known that communication between the root canal and the periodontal space can lead to an abscess process and rapid bone resorption, again depending on the extent and severity of the fracture³.

As regards the association of this type of fractures with bone dehiscences and fenestrations, twenty-three articles (for a total of 814 implants) have been analyzed

in this review, concerning implant positioning associated with dehiscence regeneration following the extraction of the fractured tooth. Most of the works considered used non-absorbable membranes, unlike the type of membrane used in the clinical case described above, in association or not with the insertion of biomaterial (whether it was a xenograft of bovine or autologous origin)¹⁵⁻¹⁶ and the success rate at a 5-year follow-up was around 76.8%¹⁷ up to 100%¹⁶⁻¹⁸. In 14 studies, the insertion of absorbable membranes for a total of 406 implants was evaluated and the success rate ranged from 95.4% to 100% with a follow-up varying between 5-7 months and 5 years¹⁹⁻²⁰⁻²¹.

For what concerns the decision to go to perform a “one stage” technique of implant positioning following the element extraction, the patient’s age and systemic health condition can be the so called protective factors. These factors, together with the patient’s medical and dental history, seem to be factors to be evaluated before implant placement. The factors that can negatively affect implant positioning following extraction can in fact be mainly anatomical or biological (alveolar conformation, gingival biotype, periapical lesion or periodontal disease)²².

Conclusions

At the end of the work, a perfect osseointegration of the Winsix KT implant is observed 3.8 mm in diameter x 11 mm in length with a maintenance of bone thickness, healing of the buccal defect and good healing of soft tissues, even at 10 years of follow-up.

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