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Abstract

Patient: A 67-years-old female with root fracture of the maxillary central incisor underwent implant placement immediately after extraction, with the goal of shortening the treatment period. The superstructure was placed on the implant after a 4-month healing period. Review five years after implant loading revealed no clinical problems.

Discussion and Conclusion: The treatment time was shortened effectively by the flapless immediate post-extraction placement procedure. Immediate post-extraction implant placement based on proper examination and diagnosis would reduce the patient burden.
1. Introduction
As a result of improvements in implants and surgical techniques, implant therapy is now widely used for tooth replacement in clinical practice. Until recently, implants were placed only after tooth extraction and complete healing of the affected region of the alveolar ridge, but the suitability of implant placement is now considered even before the extraction of a hopeless tooth. Therefore, to shorten the undesirably long waiting period before conventional implant therapy, implant placement is possible immediately after extraction based onappropriative preoperative clinical examination.

Here, we report a successful case of immediate post-extraction implant placement in the site of upper left central incisor diagnosed hopeless due to root fracture.

2. Outline of the case
A 67-year-old female visited practice of Oral and Implant, Suidobashi Hospital, Tokyo Dental College in March 2005 requesting implant therapy to replace a tooth diagnosed by her home dental doctor as hopeless. She was a non-smoker, and has a history of allergy to gastrointestinal drugs.

The upper left central incisor had a crown restoration about 40 years ago with no subsequent problems until March 2005 when the metal core and facing crown dropped out at the same time. On examination, her home dental doctor diagnosed that the tooth was hopeless due to root perforation or fracture. After dropped out the restoration, the patient had slight pain in the site but no gingival swelling.

The intra-oral findings were as follows: 27 teeth were present, 2 teeth were missing; Eichner classification: A1. The oral hygiene was good, and there was no gingival inflammation around the remaining teeth. Intercuspal position was stable with a canine-guided occlusion (Fig. 1).

The upper left central incisor had no dental caries, but the root canal was filled with
soft tissue. There was no obvious inflammation, and there were no deep pockets at surrounding soft tissue (Fig. 1, 2).

The root length of upper left central incisor was approximately 10 mm and there was high radiolucent image inside the root on dental X-ray imaging. Also, the root filling material was not visible, and there was no apical radiolucency suggesting apical periodontitis or enlargement of periodontal ligament space. The adjacent teeth had been devitalized, and restored with facing crowns. There were no remarks of marginal or apical periodontitis in the soft tissue around these adjacent teeth (Fig. 3).

In the panoramic X-ray imaging, there were no marked alveolar bone resorption around the remaining teeth, and no malformations in the maxillary bone in the area from the root apex of the upper anterior to the nasal cavity floor (Fig. 4).

On CT X-ray imaging, there were no alveolar bone resorption, and no malformations in the jawbone around the root of upper left central incisor. The labiolingual width of the alveolar bone nearby root apex was approximately 7 mm, increasing in width towards the base. Distance from the root apex region to the base of the nasal cavity was 17 mm (Fig. 5).

We discussed the treatment plans with the patient, and she did not allow removable restoration and wanted the predictable outcome for this prosthetic treatment and the treatment period to be as short as possible. First, the bridge as conventional prosthetic treatment was planned to use the adjacent teeth for abutment teeth. However, the adjacent teeth were devitalized, and they had been treated in the same time as the upper left central incisor. Therefore, we considered that the prosthetic treatment plan with bridge had poor prediction. Second, the implant treatment was considered. Furthermore, we explained the advantage and disadvantage of each prosthetic treatment. We planned for immediate post-extraction implant placement and finally, patient decided the plan of implant
In May 2005, we carefully extracted the tooth with the patient under intravenous sedation. The extracted root had a vertical fracture, and the root canal contained soft tissue (Fig. 6). There was no granulation tissue in the extraction socket and no damage at the labial alveolar bone. Vertical height from labial gingival margin to the alveolar crest was 3 mm (Fig. 7). We diagnosed that immediate post-extraction placement is possible.

We choose a non-invasive flapless approach for implant placement, which did not involve elevation of a flap in the surrounding soft tissue. We decided the starting point of drilling at the centre of the extraction socket in the palatal wall, and we drilled the implant placement site slightly towards the palatal side. After preparation of the placement site, a root-form roughened-surface implant 4.7 mm in diameter, 13 mm long (Tapered Screw-Vent: TSVWB13, Zimmer Dental Inc.) was placed with the platform positioned about 1 mm below the labial bone crest (Fig. 8). Initial torque value was 50 N. The distance from the labial surface of the implant to the labial alveolar bone wall was about 2 mm. Bone grafting was performed at the same time using autogenous bone fragments collected during implant site preparation (Fig. 9). A healing abatment (THCW3/5, Zimmer Dental Inc.) 5 mm in diameter, 3 mm long was then attached in a one-stage procedure.

After surgery, patient had mild swelling, and no discomfort during the healing period. After a healing period of about 4 months, a screw-type implant-supported provisional restoration was placed in October 2005, and the implant was started occlusal loading (Fig. 10).
In January 2006, the final superstructure, a platinum-gold alloy cast-on abutment fabricated at our dental laboratory, after which a porcelain-fused-to-metal facing crown was cemented (Fig. 11a–c). We had adjusted the superstructure just after cementing. Routine check-up was performed by monthly for the first 3 months. Thereafter, the patient was recalled once six months, and received supportive therapy, consisting mainly of oral hygiene instruction and professional plaque control.

Nearly five years after implant loading, the soft tissue had been clinically healthy (Fig. 12 a, b), with no marked changes in the surrounding tissue on the dental X-ray imaging (Fig. 12 c). Therefore, on cone beam-type CT X-ray imaging in the sagittal plane (Fig. 12 d), the supporting bone was present at the cervical part on the labial surface of the implant, however, the supporting bone was not observed from the central area through the tip on the labial surface of the implant.

3. Discussion

In general, implant therapy is considered only after complete healing of the extraction wound,[1] and proper healing period is required after implant placement, therefore the overall treatment period is long.

Recently, implant placement in fresh extraction sockets has been reported, and clinical guidelines involving immediate implant placement have been proposed to give patients options to achieve the ideal outcome.[2] After immediate placement, the implant survival rate for over 1–5 years was high at $\geq 95\%$,[3,4] suggesting that when used appropriately this is a highly effective procedure. On the other hand, in the case of immediate implant placement with chronic apical periodontitis, it has been reported that the survival rate of the implant after 12-months was inferior to the staged procedure.[5] It seems to be suggesting that to reflect the state of the tooth to treatment plan is effective.
In our patient, preoperative examination revealed no inflammation around the affected tooth root. In addition, there was no granulation tissue indicative of infection in the socket after extraction, and no damage to the alveolar bone around the socket. Therefore, we diagnosed that immediate post-extraction placement is possible, in order to shorten the post-extraction wound healing period, which is usually 3–6 months.

In maxillary central incisors, the labio-lingual width of the neck is usually greater than the mesio-distal width. Sometimes when placing an implant in an extraction socket, the labial face of the implant near the neck does not fit tightly to the labial alveolar bone wall with gap. If the gap is wide, there is risk for ongoing resorption of the labial bone wall and exposure of the implant surface. According to Buser et al,[6] if the width between implant and labial bone wall exceeds 2 mm, a considerable amount of horizontal bone resorption can be expected, and therefore simultaneous bone graft is necessary to promote bone regeneration.

In our patient, the gap was about 2 mm. We therefore performed bone grafting at the same time, using autologous bone collected during implant site preparation in order to minimize labial bone resorption as far as possible.

We also used a flapless surgery for implant placement. Flapless surgery has the benefit of avoiding the recession of surrounding hard and soft tissues associated with the invasive procedure. This method has therefore been proposed as a treatment option for obtaining good aesthetic results.[7] However, because flapless surgery is a ‘blind’ procedure, the risk of complications increases with less bone volume. In our patient, local examination including CT diagnostic imaging confirmed the presence of adequate bone volume at the anticipated site of implant placement, and there were no anatomical structures considered to carry a risk in immediate post-extraction placement. We therefore selected flapless surgery, taking advantage of its aesthetic benefits. In this case, the patient had very little post-operative discomfort, and the selection of flapless
surgery was effective in avoiding the burden on the patient.

Nearly five years after loading, there was no significant recession of soft tissue around adjacent teeth, and no obvious alveolar bone resorption on dental X-rays examination (Fig. 12 c). On the other hand, on cone beam-type CT X-ray examination in the sagittal plane (Fig. 12 d), a part of the supporting bone was not observed on the labial surface of the implant. Therefore, it is considered that the autogenous bone graft to the dead space is effective, and the selection of narrower body implant might be favorable for existing of the supporting bone on the labial surface of the implant. And it is also considered that it is difficult to evaluate labial bone condition of the implant by dental X-ray examination, and cone beam-type CT X-ray examination is so useful in diagnosis of the treatment plan as well as postoperative care on the implant treatment.

The patient’s clinical condition over the last five years has been excellent. The soft tissue around the superstructure is harmonious with around adjacent teeth. This outcome indicates that the immediate implant placement procedure in post-extraction socket is effectively to shorten treatment periods.

4. Conclusion

Within the limitations of this case, the procedure of immediate implant placement in extraction socket based adequate pre-operative examination and to reflect their findings on the treatment plan properly would be effective in easing the patient’s burden in implant treatment.

Conflict of interest

The authors declare no conflicts of interest.

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No funding was received for the study.

References


Legends for figures and tables

Fig. 1: Intra-oral photographs taken before surgery

a. Front view
b. Occlusal view

Fig. 2: Maxillary left central incisor before surgery
Fig. 3: Dental X-ray before surgery
Fig. 4: Panoramic X-ray before surgery
Fig. 5: CT X-ray before surgery
Fig. 6: Extracted maxillary left central incisor

Fig. 7: Examination of labial alveolar bone crest
Fig. 8: Implant placement by flapless surgery

Fig. 9: Autologous bone grafting in labial implant gap
Fig. 10: Dental X-ray at the time of loading

Fig. 11: Fitting of superstructure
a. Cement fixation of superstructure

b. Gingiva at implant site showing mild recession
c. Dental X-ray

Fig. 12: Intra-oral photographs taken five years after loading
a. Gingiva at implant site with height maintained

b. No marked gingival recession
c. Dental X-ray
d. CT X-ray