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Case Report

Alveolar ridge split technique for implant placement

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report presents missing 13 and 14 rehabilitated with ridge split and simultaneous implant placement.

Case report

A 37-year-old female patient reported with chief complaint of missing upper right teeth which gave a poor appearance and hampered her social interactions. Clinical examination revealed missing maxillary right canine and first premolar. She had been provided with the removable partial denture which she had been using for last 3 years. But she was never satisfied with the treatment being a removable prosthesis. The local examination of the edentulous ridge revealed a resorbed ridge with decreased bucco-palatal width. Prosthodontic treatment options were discussed with the patient, which included 06 unit fixed partial denture (FPD) using 16, 15 and 12, 11 as abutments or an implant supported prosthesis using ridge split technique. She was not ready for conventional FPD because preparation of sound teeth was involved. She accepted a treatment plan that would allow for implant supported crowns with implant placement using ridge split technique and delayed loading of implants. Two stage surgical procedure was planned and existing acrylic resin prosthesis was to be used as interim prosthesis. The patient was evaluated for the available bone using bone mapping procedure. Using this procedure, the width can be measured without reflecting the soft tissue flap. A clear

Introduction

Dental implants have become an integral part of various treatment modalities for replacement of missing teeth. Availability of adequate amount of bone in terms of vertical as well as horizontal dimension is first requirement for a successful implant therapy, but it becomes difficult to place the implant when adequate amount of bone is not available. Various techniques have been described in the literature to increase the bone volume which includes the autogenous or artificial bone grafting procedures, distraction osteogenesis, inferior alveolar nerve repositioning, sinus lift with bone grafts and guided bone regeneration. Ridge splitting technique can also be utilized to increase the width of bone by splitting and expansion of the existing residual ridge.^{1,2} This case

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acrylic template was fabricated over the edentulous region of the cast and 05 holes were made in template-02 on the buccal side, one at the crest and 02 on the palatal side to pass the endodontic files through these holes. The acrylic template was placed on the ridge in patient mouth and under local anaesthesia; soft tissue was penetrated with endodontic files till the tip of each file touches the bone. The stopper on the files dictates the thickness of template and soft tissue over the bone in five regions. Now the cast was sectioned and template was placed over the cast with the files. With the help of marking pencil, the tips of the file were joined on the cross section of the cast to find out the width of the available bone which was 3 mm.

However, OPG revealed adequate vertical height of the available bone. The case was taken up for ridge splitting with simultaneous implant placement.

The patient was prepared for implant surgery following the standard sterile protocol. Local anaesthesia was administered high into the buccal vestibule to avoid any change in the anatomy of the existing soft tissues over the residual ridge. Incision was given (Fig. 1) and minimum full thickness flap was raised just to expose the crest of the alveolar ridge. The surgical template was aligned intraorally to mark the implant position in 13 and 14 regions. Ridge was carefully split from the crest using fine chisels and gradually facial plate of the bone was expanded using tapered osteotomes with increasing diameter. After achieving the proper width of the bone (Fig. 2), two implants (Equinox plus) of dimension 3.8×11 mm were placed following the standard surgical procedure. Now a split thickness flap was raised to cover the increased volume of bone for primary closure. The DFDB bone graft was used to condense between the expanded bone plates (Fig. 3). The primary stability of implants was achieved and flap was closed after securing the resorbable barrier membrane. Post op healing was uneventful and patient was periodically reviewed with clinical examination and radiographs. After 06 months of healing period, the case was taken up for rehabilitation. The implants were exposed using a gingival punch and gingival former were placed for 10 days. Impression was made using

Fig. 1 – Application of crestal incision.

Fig. 2 – Expanded alveolar ridge. closed tray technique and finally individual PFM crowns were luted on abutments (Fig. 4).

Discussion

Ridge splitting for root-form implant placement was advocated by Dr. Hilt Tatum³ in 1970. Tatum developed specific instruments including tapered channel formers and D-shaped osteotomes to expand the resorbed residual ridge.

Clinical experience has shown that the ridge splitting technique can be a useful method for managing the narrow residual ridge. Careful preparation of the bone and maintenance of an attached periosteum are critical to the formation of new bone around the dental implants. The process of

Fig. 3 – Condensation of bone graft between implants and two cortical plates.

Fig. 4 – PFM crowns in situ.

formation of new bone in these cases is similar to the fracture repair of bone.⁴ The blood clot is formed between the two bone plates, which later organizes and is replaced with woven bone. This woven bone is then converted into load-bearing lamellar bone at the implant interface.

Scipioni has shown the average ridge width increased from 2.4 to 6.0 mm by using this technique. The amount of direct bone contact to the implants along the mesial and distal surfaces was similar to the buccal and lingual surfaces.⁵ Similar findings have been reported from the other studies.^{6,7}

During the surgical procedure, minimal mucoperiosteal flap is reflected just to expose the crest of the bone because intact periosteum on the lateral surface of the bone ensures adequate blood supply. Mid crestal incision is carefully made with the help of scalpel and mallet. After the crestal incision is made, the thin chisels, tapered osteotomes are used to expand the ridge. In case the bone is dense, a fissure bur can be used to give the crestal incision. If the bone expansion is difficult, vertical cut may be given at both the end of incision in facial cortical plate.

The bone graft is placed between the separated cortices and around the implants. If an interpositional bone graft is placed, then the fate of the graft is often improved compared with onlay grafting techniques.^{8,9} In general, interpositional grafts have an improved prognosis because they have an enhanced vascular bed in an osteogenic environment and are protected from masticatory function but some studies do not advocate of placing the graft.⁵ Platelet-rich plasma has also been advocated to enhance wound healing.¹⁰

To achieve primary closure of the soft tissue, a split thickness flap is raised along the facial flap. This dissection will allow advancement of the facial flap and primary closure of the soft tissues over the expanded ridge crest.

A prefabricated removable prosthesis has to be adjusted to allow for the expanded ridge dimension to prevent premature implant loading. Healing period after implant placement should be adequate which is generally between 4 and 6 months to allow regeneration of the bone between the separated cortical plates.

Indications of this technique include the ridge deficient in width with adequate amount of height with no vertical defects. Maxilla is preferred over mandible because of cancellous nature of bone and expansion of bone is easily achieved without any complications. Advantages include no second surgery is required to place implants, reduced overall treatment time, cost effective and increased implant stability because of new bone formation between cortical plates. Disadvantages include ridge defect is more severe in case of failure of the procedure because of poor case selection, primary closure is difficult to achieve and primary stability of implant is comparatively less.

Summary

Ridge splitting techniques provide the advantage of ridge expansion and simultaneous implant placement in management of narrower ridges. Although, this surgical approach may be used in both jaws, it is better suited for the maxilla. Proper patient evaluation and case selection is essential to achieve a successful surgical and prosthetic outcome.

Conflicts of interest

All authors have none to declare.

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