Reconstruction of osseous defect with symphysis block graft for implant placement

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ABSTRACT

Introduction: Symphysis being an autogenous bone graft serves as one of the best graft for augmenting osseous defects of alveolar process with excellent results. It has been favoured mainly due to its local availability, accessibility and lesser resorption compared to other bones in the region.

Case report: A 21/M reported to the department of Implantology with the complaint of missing tooth in the upper front tooth region since 1 year. History revealed extraction of upper left central incisor an year ago following trauma. Diagnosis was made as Siebert’s Class I with horizontal bone loss in the region with a bone defect of 10.54 x 5.08 x 4.85 mm. So a complete prosthetic rehabilitation protocol was made with an implant placement and grafting was planned with symphysis being most favourable.

Conclusion: The mandibular symphysis is a reliable intraoral graft site that can be used in the office setting with low morbidity. Because of the intraoral approach and lack of cutaneous scarring, patient acceptance is high.

1. Introduction

Bony defects may occur as a result of trauma, prolonged edentulism, congenital anomalies, periodontal disease and infection which often require hard and soft tissue reconstruction.1

Rehabilitation of such patients often requires a good alveolar ridge. Autogenous bone grafts have been used for many years for ridge augmentation and are still considered the gold standard for jaw reconstruction as it has osteogenic, osteoinductive and osteoconductive properties.

Of all the sites available intraorally, one of the most prominent bone grafting site is symphysis. Other than the local availability and accessibility, it has much lesser resorption than other bone grafts of the region.

However, the benefits of using this graft is not being utilized by surgeons and implantologists. This area has been neglected over the past years despite its many success reports in literature. So here we report a case of implant placement with symphysis graft to further strengthen and promote its use among practitioners.

2. Case report

A 21/M reported to the department of Implantology with the complaint of missing tooth in the upper front tooth region since 1 year (Fig. 1). History revealed extraction of upper left central incisor an year ago following trauma. Patient was self-motivated and had visited various centre for treatment. Medical history and personal history gave no contributory findings. On clinical examination, an edentulous area was seen in upper left incisor region.

Since Orthopantamogram will not give a 3D assessment, a CBCT was advised which would address the cubic deficiency and also availability of CBCT was there at our centre (Fig. 2).

CBCT revealed significant buccal cortical bone loss and on further volumetric analysis, the defect size was measured (Buccolingual width of 3.13 mm at crest) (Fig. 3). The study model revealed an inter-arch space of 12 mm. After evaluating the CBCT and study model, diagnosis was made as Siebert’s Class 1 with horizontal bone loss in the region with a bone defect of 10.54 x 5.08 x 4.85 mm. So a complete prosthetic rehabilitation protocol was made with an
Fig. 1. Pre-operative photo.

Fig. 2. CBCT cut showing bone deficiency in 21 region.

Fig. 3. Axial cut showing bone width of 3.13 mm.

Fig. 4. 3D Reconstructed view showing donor site and recipient site graft measurements.

Fig. 5. Graft harvesting from symphysis using piezoelectric device.
implant placement and grafting was planned with symphysis being most favourable. For a more precise planning, the defect size and donor site bone were measured and estimated on the CBCT (Fig. 4).

Routine blood investigations were done to rule out any systemic disease and were found to be within normal limits. Patient was subjected to procedure on the 5th day from the first visit having the time required for basic investigations.

3. Surgical procedure

3.1. Recepient site preparation

A crestal incision and 2 vertical releasing on either side of 22 region were given. Full thickness muoperiosteal flap reflected. Granulomatous tissue and other soft tissue were removed from the site giving the visibility of bare bone having defect.

3.2. Donor site preparation

A crevicular incision was given extending from lower first premolar to the other side. Mucoperiosteal flap was reflected. Osteotomy was performed using a piezoelectric device creating a unicortical cut (Fig. 5). The cuts were made atleast 5 mm inferior to root tips and 5 mm superior to inferior border of mandible. The graft was harvested with an osteotome and was recontoured to adapt it to the recipient site.

3.3. Graft placement

Graft was placed into the defect. It was stabilised with 2 self-tapping titanium screws (2 × 10mm) and osseograft placed around the margin of harvested graft (Fig. 6). It was then covered by an absorbable collagen membrane which was held in place using bone tacks (Fig. 7).

After stabilizing the collagen membrane, the site was closed with 3–0 black silk sutures (Fig. 8). The donor site was filled with a hemostatic collagen sponge and the periosteum and muscle attachment were carefully sutured in one layer and the mucosa closed as a second layer using resorbable sutures.

Post-operatively patient was given antibiotics, analgesics and anti-inflammatory medication. Patient was recalled on every alternate day to check for wound dehiscence and hematoma. Clinically, the operated sites showed good wound healing post-operatively after 10 days.

Patient was recalled once in 3 months to take radiographs to check for bone formation. After 10 months, the recipient site showed good wound healing and bone formation.

A new CBCT showed patchy to coarse bony trabecular pattern of D2-D3 type of bone in relation to recipient site and increased buccolingual width of 7.2 mm at crest (Fig. 9). So the implant size was selected as per CBCT measurements and was finalized as 4.3 × 13mm of Dentium Implant.

3.4. Implant placement procedure

After 1 year following symphysis graft placement, implant was placed. In order to place the implant, a crestal incision was given along with 2 releasing incisions around 22 region. Full thickness mucoperiosteal flap was reflected to expose the titanium screws and bone tacks which were then removed (Fig. 10). Following this, Dentium Implant (4.3 × 13mm) placed crestally over which coverscrew was placed and the site closed using 3-0 black silk suture (Fig. 11).

After 3 months, secondary stability was verified and crown prosthesis was delivered (Fig. 12).

However, the smile line of the patient was showing spacing between 11,21,22. So prosthetic rehabilitation of adjacent teeth were carried out. As the first step, impression was taken using irreversible hydrocolloid material. Diagnostic casts were poured in using type III dental stone.
Diagnostic wax-up was done for visible reference as to what changes are necessary for achieving the desired result for the patient. Putty index was made following that. Crown cutting done for 22, temporisation done using protemp and luted using freegenol. Indirect mock-up was done on the patient using the previously formed putty index (protemp used). Patient recalled for final cementation of zirconia crown irt 22 and composite restoration irt 11 for closing midline diastema, thus achieving the desired aesthetic results by the patient (Figs. 13 and 14).

4. Discussion

Defect management in the anterior maxilla especially in a young patient can be a real challenge for surgeons and clinicians. Various techniques like distraction osteogenesis, guided bone regeneration and onlay grafting has been suggested in the literature. However, autogenous bone graft remains the most sought after due to its incredible properties and uptake. These days most surgeons and patients prefer harvesting bone from an intraoral site due to close proximity, less donor site morbidity and convenient access. The most common intraoral sites for bone harvesting include ramus buccal shelf, symphysis, retromolar area and maxillary tuberosity.

Symphysis comprises of 65% cortical bone and 35% cancellous bone and has more cancellous bone than any other intraoral site. Literature suggest that it has lesser resorption rate due to intramembranous bone formation. Symphysis graft can be harvested from the midline as a block graft of size 1.5 x 6 cm(approx.) or as paramedian harvest of 2 blocks of size 1.5 x 3 cm(approx.).\(^2\) The graft thickness is 3–11 mm, with most sites providing 5–8 mm. The density of the graft is D-1 or D-2.\(^3\) These grafts are mainly used for horizontal/vertical ridge augmentation or for filling osteotomy gaps during orthognathic surgery and the cancellous part of this bone can be used for sinus augmentation procedures.\(^2\)

For harvesting the symphysis graft, osteotomy cuts were given conventionally according to Rule of 5’s by Misch\(^4\) who said that superior cut should be 5 mm below root apices and inferior cut should be 5 mm above the lower border and vertical cut should be at least 5 mm away from mental foramen.

But Pommer et al.\(^5\) in 2008 advised new safety margins for reducing the risk of injury to mandibular incisive canal and the safety margins were depth of graft should be 4 mm and distance to the tooth apices at least 8 mm. Lower border of mandible should be kept intact with the 5 mm safety distance from the mental foramen.

Various techniques to harvest graft include: 702 Fissure bur, Oscillating saw, Trephines, Disc, Piezoelectric instruments. Different patterns of graft that can be obtained are J-graft, Ring graft, Rectangular block graft, Cylindrical bone cores.\(^3\)

The advantages of symphysis graft include easy accessibility, cortico-cancellous bone morphology, more cancellous bone than any other intraoral site and can easily be harvested by less experienced implantologists and practitioners.

Disadvantages include increased donor site morbidity in comparison to ramus block graft and longer waiting period for rehabilitation since it...
is a 2-stage procedure.

Some of the contraindications include mandible with long anterior teeth, inadequate mandibular height or width, gross vertical bone loss and width augmentation spanning more than 4 teeth.

As with any other grafts, intraoperative complications include bleeding, mental nerve injury, block graft fracture, potential bicortical harvest. Other post-operative complications are pain, swelling, infection, neuro-sensory deficits including altered sensation of lower lip, chin, chin ptosis and dysesthesia of anterior mandibular dentition.¹

Various techniques have been employed to fix the grafted bone which include plate fixation, mesh, screws and pin to name a few. They often carry complications which include wound dehiscence and screw exposure.

In the current case, we used self tapping titanium screws to prevent micro-rotation of the graft which would result in compromised healing, resorption and graft non-union.¹

Osseograft was placed around the harvested graft to provide a good contour and to eliminate any dead space between the graft and recipient site.² Absorbable collagen membrane was used to cover the graft as it will prevent migration of epithelial cells and fibroblasts which could hinder the growth of bone.

As with the option of immediate vs delayed implant, immediate implant is always associated with higher failure rate, so naturally we decided to go for delayed implant post symphysis grafting.

So, we managed to treat a young patient having bone defect with the help of symphysis autograft which yielded a 100% success rate with subsequent placement of implant and a complete prosthetic rehabilitation to the patient without any morbidity.

5. Conclusion

Extraction following trauma usually leads to bone loss and it may be rehabilitated with an implant but will compromise the esthetics. In such scenarios, a bone grafting can be done to augment the bone horizontally or vertically before implant placement so that both function and esthetics are obtained. The mandibular symphysis is a reliable intraoral graft site that can be used in the office setting with low morbidity. Because of the intraoral approach and lack of cutaneous scarring, patient acceptance is high. Bone harvested from the mandibular symphysis is mainly cortical in nature, allowing application of rigid fixation in situ and thus providing good primary stability. These grafts can be easily carved to intimately fill in defects and provide good alveolar contour.

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Declaration of competing interest

None.
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