Reconstruction of Traumatic Anterior Maxillary Ridge Deficiency Using Autogenous Chin Graft for Implant placement

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Abstract:
Background:

Horizontal alveolar ridge deficiency following trauma presents significant challenge, for ideal implant placement especially in aesthetic zone. Autogenous bone grafts remain gold standard for ridge augmentation due to their osteogenic, osteoinductive and osteoconductive properties. The mandibular symphysis region(chin) serves as a reliable intraoral donor site for localized alveolar defects.

Case Presentation:
This case report describes an 18-year-old male patient with a missing maxillary right central incisor secondary to trauma due to road traffic accident. Cone bean computed tomography revealed inadequate horizontal bone width with 11 regions. Horizontal ridge augmentation was performed using an autogenous chin graft harvested under local anaesthesia with a piezoelectric surgical unit. Graft was secured at recipient site using two titanium screws. Four months postoperatively, CBCT evaluation demonstrated satisfactory graft integration and significant improvement in ridge width. A dental implant was successfully planned and placed.

Conclusion:
Autogenous chin grafting using piezoelectric surgery is a predictable and effective technique for horizontal ridge augmentation in the aesthetic zone, providing adequate bone volume for implant placement with minimal morbidity.

Keywords: Chin graft, Mandibular symphysis, Horizontal ridge augmentation, Dental implant, Piezoelectric surgery, Autogenous bone graft.

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INTRODUCTION:

Traumatic loss of anterior teeth often leads to rapid alveolar ridge resorption, compromising ideal implant placement, particularly in the aesthetic zone**.** Adequate horizontal bone width is essential to ensure primary implant stability, proper implant positioning and long-term functional and aesthetic success.[1–3]

Among various bone augmentation materials, autogenous bone grafts are considered the gold standard because of their osteogenic, osteoinductive, and osteoconductive properties.[1,3]The mandibular symphysis (chin) is a reliable intraoral donor site for localized ridge defects, providing sufficient corticocancellous bone with favourable healing and minimal resorption.[4,5,17]Recent advances such as piezoelectric surgery have further enhanced graft harvesting by improving precision and reducing trauma to adjacent soft tissues and vital structures.[10–12]

This case report describes the management of a traumatic horizontal alveolar ridge deficiency in the anterior maxilla of an 18-year-old male patient using an autogenous mandibular symphysis graft harvested with a piezoelectric surgical unit, followed by successful implant placement.

CASE REPORT:

An18-year-old male patient reported to department of oral and maxillofacial surgery department with chief complaint of missing upper right front tooth since 3 months. Tooth was lost due to road traffic accident 3 months back. Patient was otherwise healthy with no any medical history.

Clinical and Radiographic Examination:

Extraoral examination showed no any significant findings. Intraoral examination revealed a missing maxillary right central incisor with reduced buccolingual ridge width. CBCT was advised with same region which revealed horizontal bone deficiency (buccolingual width was 3mm) rendering immediate implant placement unfeasible. (Fig.1)

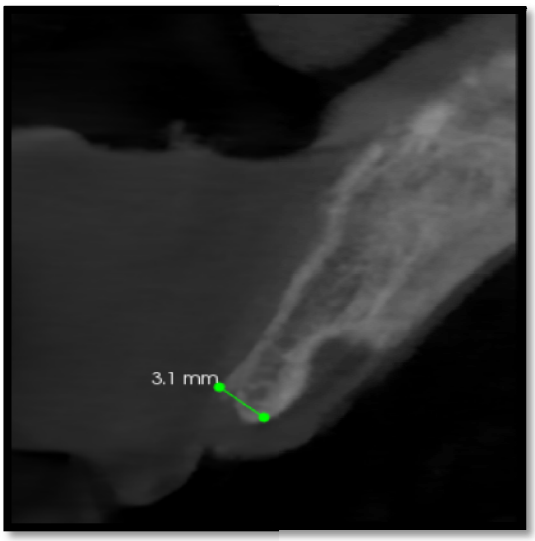

Fig. 1: CBCT section showing deficient bone width buccolingually (3mm)

Considering the patient's young age, localized defect, and aesthetic demands, horizontal ridge augmentation using an autogenous chin graft was planned. Procedure was explained in detail to the patient and written informed consent was obtained.

Treatment Plan:

Horizontal ridge augmentation using chin graft followed by implant placement on subsequent follow up.

Procedure:

Under local anaesthesia, crestal incision was made at maxillary anterior region (recipient site) and full thickness mucoperiosteal flap was elevated. The recipient site was then prepared with round bur (no.8) using straight handpiece (Fig. 2). After this a crevicular incision was given in mandibular anterior region (33-43) with two vertical releasing incision and full thickness mucoperiosteal flap was elevated to expose symphysis region (Fig. 3). Using a piezoelectric surgical unit, a corticocancellous bone blockof size 6mm x 8mm x 5mmwas harvested from the mandibular symphysis, maintaining safe margin of 5mm from the apices of mandibular incisors, mental nerve and inferior border of mandible (Fig. 4). Harvested graft was then contoured with bone file and secured at recipient site using two

titaniumscrews measuring 1.5mm x 8mm (Fig. 5).The donor and recipient sites were closed primarily with 4-0 vicryl. Postoperative medications and instructions were given.

Follow-Up:

Healing was uneventful, with no donor-site morbidity or neurosensory disturbances. Four months postoperatively, CBCT evaluation revealed excellent graft integration with significant improvement in horizontal bone width, indicating successful graft acceptance. Width was increased about 3 mm in thickness. (Fig. 6).

Based on the augmented ridge dimensions, a dental implant measuring 3.5 × 11.5 mm was planned and placed in an ideal prosthetic position. (Fig. 7).

Fig. 2: Preparation of Recipient Site with round bur

Fig. 3: Crevicular incision (33-43) with two vertical releasing incisions.

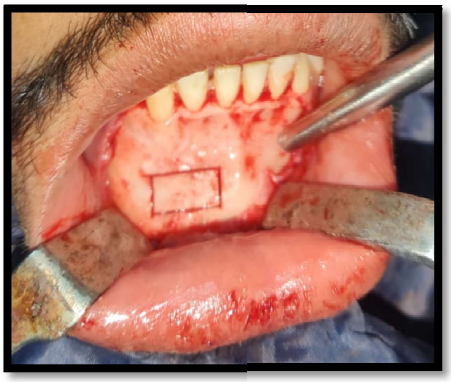

Fig. 4: Graft harvested from chin region using piezo surgery unit.

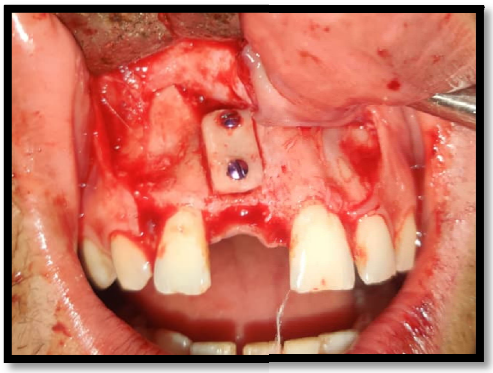

Fig. 5: Graft secured on recipient site using titanium screws.

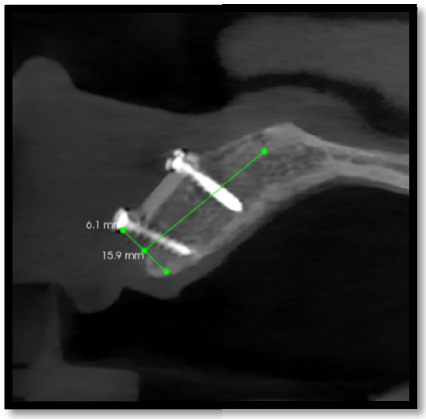

Fig. 6: Four months postoperative CBCT section showing increased width of ridge.

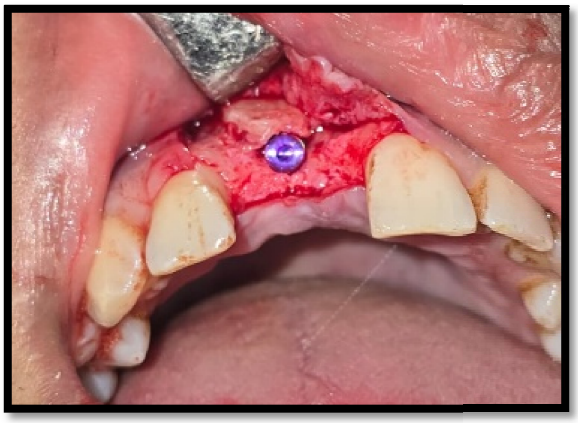

Fig. 7: Implant placed over augmented ridge 4 months post operatively.

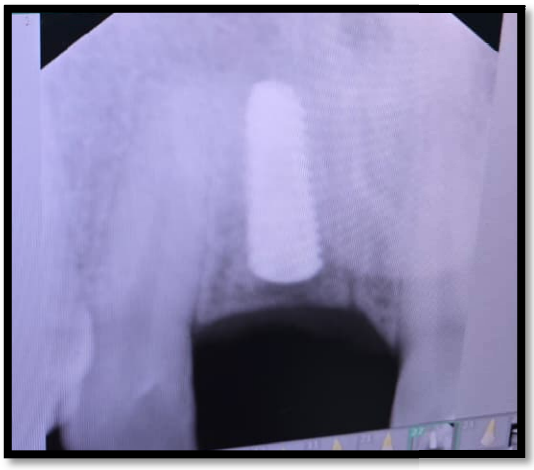

Fig. 8:Post operative IOPA of implant placement.

DISCUSSION:

Horizontal alveolar ridge deficiency is a common sequela following traumatic tooth loss, particularly in the anterior maxilla, where thin labial cortical plates are prone to rapid resorption. This deficiency poses a major challenge for ideal implant placement, as inadequate ridge width can compromise primary implant stability, implant positioning, peri-implant bone health, and long-term aesthetic outcomes.1_3 A minimum buccolingual bone width of 6–7 mm is generally recommended to allow placement of a standard-diameter implant with at least 1–1.5 mm of bone surrounding the implant on both buccal and palatal aspects.13

Various ridge augmentation techniques have been described to address horizontal deficiencies, including guided bone regeneration (GBR), ridge splitting, distraction osteogenesis, and autogenous block grafting.3,13,14 Among these, autogenous bone grafts remain the gold standard due to their inherent osteogenic, osteoinductive, and osteoconductive properties, which no substitute material can fully replicate.1,3,13 Intraoral donor sites such as the mandibular symphysis and ramus offer several advantages over extraoral sites, including reduced surgical time, absence of visible scarring, lower morbidity, and excellent patient acceptance.4,5,8 The mandibular symphysis is particularly well suited for localized horizontal ridge augmentation in the anterior maxilla, as it provides a sufficient volume of corticocancellous bone with favourable biological behaviour.4,5

The corticocancellous nature of chin grafts allows rapid revascularization and incorporation into the recipient site, while the cortical component provides mechanical stability and resistance to resorption.□,18 Previous studies have demonstrated predictable increases in ridge width ranging from 3 to 5 mm using symphyseal block grafts, enabling successful implant placement in prosthetically ideal positions.□,8,13

Donor-site morbidity is an important consideration when harvesting chin grafts. Reported complications include temporary neurosensory disturbances, altered chin contour, and mentalis muscle dysfunction.[1]□ However, multiple studies have shown that when appropriate safety margins are maintained—typically 5 mm from tooth apices, mental foramen, and inferior border of the mandible—the incidence of permanent complications is low.[1]□,[1]□ In the present case, no neurosensory deficits or aesthetic concerns were observed, corroborating previous findings.

The use of piezoelectric surgery for graft harvesting represents a significant advancement in bone surgery. Piezoelectric devices selectively cut mineralized tissue while preserving soft tissues, thereby reducing the risk of injury to nerves, blood vessels, and adjacent structures.[1]□–[12] Additionally, piezosurgery produces minimal heat generation and improves surgical precision, which is particularly

beneficial in anatomically sensitive regions such as the mandibular symphysis.10,12 These advantages likely contributed to the uneventful healing and excellent graft integration observed in this case.

Rigid fixation of the graft using a titanium screw is another critical factor influencing graft success. Stable fixation minimizes micromovement, promotes revascularization, and reduces the risk of fibrous encapsulation or graft resorption.,8,13 In the present case, secure fixation facilitated successful graft incorporation within four months.

Radiographic assessment using CBCT plays a vital role in both preoperative planning and postoperative evaluation of grafted sites. CBCT provides accurate three-dimensional assessment of ridge dimensions, graft integration and proximity to vital structures, making it the imaging modality of choice in implant dentistry.15,16 The postoperative CBCT in this case confirmed a significant increase in ridge width and uniform bone density, indicating successful graft acceptance.

The four-month healing period before implant placement aligns with existing literature, which suggests that intraoral autogenous block grafts typically achieve sufficient revascularization and remodelling within 3–4 months.4,13 This relatively short healing time is advantageous, particularly in young patients with high aesthetic expectations.

Implant placement following ridge augmentation in the anterior maxilla requires meticulous prosthetically driven planning. Successful augmentation in this case allowed placement of a 3.5 × 11.5 mm implant in an ideal position, ensuring favourable emergence profile and long-term aesthetic predictability.19,20

Overall, this case reinforces the reliability of mandibular symphysis grafting for horizontal ridge augmentation and highlights the benefits of combining autogenous grafts with piezoelectric surgery to achieve predictable outcomes with minimal morbidity.

CONCLUSION:

Mandibular symphysis grafting is an effective and predictable technique for horizontal ridge augmentation in the anterior maxilla. When combined with piezoelectric surgery, it ensures precise graft harvesting, reduced morbidity, and excellent graft acceptance, facilitating successful implant placement in aesthetically demanding regions.

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