Journal of Case Reports in Practice (JCRP) 2014; 2(1): 15-18

CASE REPORT

Role of autogenous mandibular bone graft in maxillary alveolar cleft reconstruction

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ABSTRACT

Secondary alveolar bone grafting is a well established technique in the management of patients with cleft lip and alveolus. The goals of bone grafting determine the selection of grafting material such as cortical or cancellous, membranous or endochondral. In addition, vascularity, host-bed, overall physiologic status of the patient, propensity of infection and surgical expertise needs to be considered. Thus success depends on panoply of variables including the physiologic and mechanical properties of the graft material and the biology of recipient site. Here we report a case of secondary alveolar bone grafting using autogenous mandibular bone graft from symphysis.

Key words: autogenous bone graft, maxillary alveolar cleft, reconstructive surgery.

INTRODUCTION

Reconstructive Surgery or the ability to make a patient 'whole' again is the basic principle of any surgical specialty. Oral and Maxillofacial Surgeons have a long history of providing hard and soft tissue reconstruction procedures in the maxillofacial skeleton from time immemorial. The gold standard for bony reconstruction in the maxillofacial region is currently the use of autogenous bone.[1] The various anatomical sites in the mandible like symphysis, ramus, coronoid process, lingual cortex, external oblique ridge are used as donor sites in grafting autogenous bone.[1,2] The purpose of this article is to provide a comprehensive insight into the use of mandibular autogenous bone grafting procedures in the reconstruction of maxillary alveolar cleft.

CASE REPORT

A 22-year-old woman with a history of cleft lip and palate presented with a complaint of malalignment of teeth for the past 6 years (Fig. 1). On examination malocclusion of teeth was presented with class III overjet. Intraorally maxillary alveolar cleft with oronasal communication was present. The face was symmetrical and dolicocephalic with incompetent lips and hypertonic scar (cleft repair). Collumella of the nose was collapsed. Routine radiographic examination confirmed the alveolar defect (Fig. 2). Medical history was not contributory and blood investigation were in normal limits. Secondary bone grafting with autogenous mandibular bone graft from symphysis was planned under general anaesthesia.

Figure 1, Pre operative occlusion

Figure 2, Pre operative - Oclusal view

Surgical Procedure: Under nasal intubation, general anaesthesia was administered. The amount of bone deficit was assessed during the procedure. Incision place in the cleft region of alveolus in relation to 12 region. Buccal and palatal flaps raised. Sutured with 2.0 vicryl and kept as nasal layer. Buccal advancement flap in the attached gingiva in relation to 13, 14

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made, raised and approximated over the cleft.

Under strict aseptic condition, local anesthesia with adrenaline in the ratio of 1:80,000 was administered in the lower buccal vestibule region. By using a 15 size blade, and electrocautery a degloving incision was placed in the vestibule. Layer by layer dissection was carried out and the donor site was exposed. The mental foramen, inferior border of the mandible, root prominences of the anterior teeth was carefully exposed. The osteotomy cuts were marked using a thin bur in a high speed hand piece under copious saline irrigation, in a stamp -box fashion. After assessing the correct margins, and the required volume of bone material the osteotomy cuts are joined and the osteotomy was competed in a mono-cortical fashion. Once the osteotomy was completed, using chisel and mallet the required amount of bone should be harvested. Bone curettes were used to remove any remaining cancellous bone from the osteotomy site. A saline soaked sponge was kept at the site to prevent dehydration of the tissues. The harvested bone was stored in a mixture of saline and patient's own blood.

After the required amount of bone was harvested, the bone graft material was carefully stored and monitored. The recipient site was re-examined and the bed for bone placement was prepared. The bone harvested from the donor site was checked for the measurements, and if needed the bone was trimmed and preformed to the recipient site, so that it had a better fit and adaptation. Once this was accomplished, a hole was drilled in the graft to facilitate lag screw fixation of the graft to the recipient site (Fig. 3).

The hole was made large enough to permit the fixation screw to slip passively through the graft, but not too large to allow passage of screw head. Thus the screw actively penetrates the recipient site, the smallest size screw should be chosen. After the graft was secured firmly, remaining defects should be filled with the remaining harvested bone marrow. The flap in the recipient site was closed primarily without tension using resorbable, 3-0 vicryl suture material. The saline soaked sponge was removed, the area was irrigated with saline and metrogyl and any bony irregularities should be trimmed and smoothened using bone files and rongeur forceps. Suturing of the donor site was carried out in layers; the periostium and muscle are sutured first followed by the overlying mucosa, using a resorbable 3-0 vicryl suture material. The patient was extubated uneventfully in all the three cases. Adequate pressure dressing was applied to the patient's chin, antibiotic, anti inflammatory, analgesic therapy is continued for 7 days post operatively. The patient was advised soft diet, to avoid severe physical activity and to use hexidine mouth rinses for maintaining good oral hygiene. Post-operative occlusion was satisfactory (Fig. 4).

Immediate post-operative (Fig. 5) and follow up occlusal radiograph after 6 months (Fig. 6) were promising.

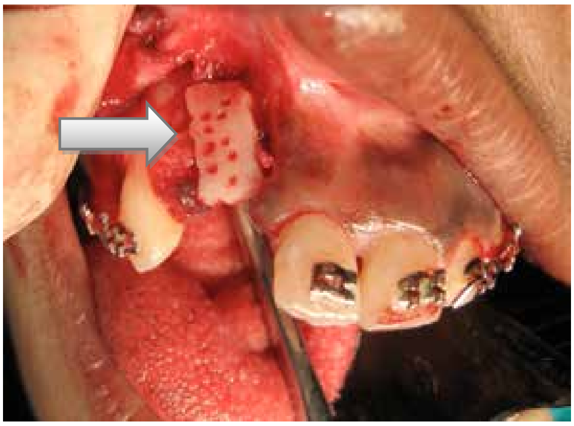

Figure 3, Bone graft in situ

Figure 4, Postoperative occlusion

Figure 5, Immediate postoperative view

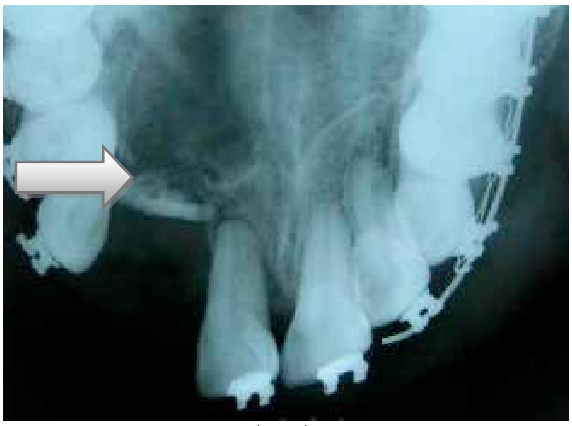

Figure 6, Late post operative view

DISCUSSION

A number of different modalities of treatment have been advocated for the management of the alveolar cleft. Before the 1970s primary alveolar bone grafting (before palatal closure) was commonly performed until its adverse developmental effects on maxillary growth were highlighted by Koberg and others. Although a case continues to be made for such an approach long-term follow-up results are awaited. With the advent of modern presurgical orthopaedics gingivoperiosteoplasty has been proposed as an alternative to primary alveolar grafting.[3] However, its effect on maxillary growth and the need for subsequent bone grafting has yet to be determined. Since the original work of Boyne and Sands and the subsequent reports of others. Secondary alveolar bone grafting has become the method of choice. Secondary bone grafts are performed when the root of the cleft canine is 50% completed.[3,4] This corresponds to a chronological age of 9–12 years before which most mid-facial growth is complete.[5]

Historically bone grafts have been used to treat patients with alveolar clefts since the beginning of twentieth century. Bosker and van Dijik in 1980 were the first to report the use of mandibular symphysis as a bone graft for secondary alveolar clefts with good results.[6,7]

Pedersen, Enemark et al have stated that the cleft defects can be successfully treated with less bone when intra membranous bone is used as compared with iliac crest bone. They also documented that the intra membranous bone grafts maintain more of their volume in recipient site than the endochondral bone. The primary objectives of secondary bone grafting are the formation of a continuous and stable dental arch and the provision of an osseous environment which encourages canine eruption, is responsive to the orthodontic movement of teeth and facilitates complete dental rehabilitation or prosthodontic reconstruction.[8,9] Other objectives include the elimination of oronasal fistulae, the provision of greater periodontal support for teeth adjacent to the cleft and the augmentation of bony support for the lip and alar base. These objectives depend on satisfactory bone formation within the alveolar cleft. The three main processes involved in physiology of bone graft are osteoconduction, osteoinduction and osteogenesis.[10,11]

Advantages of mandibular bone grafting:

- The bone harvested is mainly cortical
- Provides good contour and primary stability
- Can be easily shaped and carved to intimately fill in defects
- Has osteoconducting, osteoinducting, osteogenic property
- The method of harvesting is simple, predictable
- Does not require any special surgical expertise
- Is of the same ectomesenchymal origin as of the recipient site
- Low morbidity and less resorption rate
- No cutaneous scarring
- Good patient compliance

Disadvantages of mandibular bone grafting:

- Limited amount of bone available for harvesting
- Not effective to reconstruct large volume defects
- Transient paresthesia of lip
- Fractures of the area of mandible from where it is harvested.

CONCLUSION

The goals of bone grafting determine the selection of grafting material such as cortical or cancellous, membranous or endochondral. The recipient site requirements of bone rigidity and bone regeneration need to be considered as well as mechanical and physiologic characteristics. All of these broad parameters will have an impact on the bone graft – host bed and determine whether complications will occur. In addition, vascularity, host-bed, overall physiologic status of the patient, propensity of infection and surgical expertise needs to be considered. Thus success depends on panoply of variables including the physiologic and mechanical properties of the graft material and the biology of recipient site. Autogenous bone grafting is a means to an end. Oral and maxillofacial surgeons should always consider loco – regional autogenous mandibular bone graft as a viable donor source in reconstruction of minimal to moderate osseous defects in maxillofacial region.

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