



Intra-oral Autogenous Bone Grafting for Dental Implant Site Preparation

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Background

Reconstruction of our patients' dentition is a very rewarding and fulfilling aspect of dentistry. Our abilities as dentists in enabling patients to chew appropriately or smile confidently can at times be life changing for the patient. Dental implants are an exciting portion of our armamentarium with which to reconstruct the partially or fully edentulous jaws. Many patients present after tooth loss with alveolar defects that will not accommodate a dental implant prosthesis. The defect may range in size from that seen with a small loss of the buccal cortex from an avulsed tooth to a resected jaw as a result of cancer or an odontogenic tumour.

Autogenous bone remains the "Gold Standard" for grafting. Although allogenic bone, xenogeneic bone, bone substitutes, and alloplasts have shown some promise over the years, they do not transplant any osteocompetent cells¹. Patients are often concerned when presented with the need for bone grafting and tend to become nervous when learning how and where the new bone will come from. I have found that patients usually become more acceptive of an autogenous graft when presented with the other option of using bone from a human tissue (cadaver) bank or bovine bone.

Treatment Planning

Prior to bone graft harvesting and augmentation of the defect, one must have a full appreciation of the defect. A preoperative 3-D CT scan is often imperative and some would argue the standard of care. This enables the clinician to have a full map of the missing bone volume, i.e. the vertical and horizontal nature of the defect. The scan can also be used to evaluate the cortical thickness from the potential donor sites. Study models and a diagnostic wax-up with the final crown or prosthesis morphology are important so that you "know where you are going." This permits the surgeon to appreciate how much bone augmentation is needed so that the final prosthesis is in the correct location.

A thorough past medical history should be obtained. Poorly controlled Insulin Dependent Diabetes Mellitus, cigarette smoking, and history of IV Bisphosphonate therapy are a few examples of contraindications².

The patient should exhibit good oral hygiene. A

patient presenting with atrophy of the alveolar ridges with remaining moderate to severe periodontitis will likely later develop peri-implantitis. Why put this type of patient through extensive grafting if the future implant is destined to fail?

It is of paramount importance for the surgeon to know all potential risks and complications of the grafting procedures and fully explain these to the patient preoperatively. No one desires complications but without informed consent the clinician may be open to litigation.

Donor Site Selection

The graft may be harvested from many intra-oral sites. The maxillary tuberosity, anterior nasal spine, and zygomatic buttress have been reported for the upper jaw^{3,4,5}. The mandibular symphysis, ascending ramus, coronoid process, and horizontal ramus are useful sites from the lower jaw⁶.

The harvested bone may be placed in an extraction site, an implant site defect, a buccal alveolar defect, and the maxillary sinus^{7,8,9,10}. It may also be used for a vertical onlay graft of the ridge or as an inlay graft¹¹. Particulate grafts may be stabilised with a membrane whereas block grafts should be secured to the recipient site with screws.

Ideally, the surgeon would like to harvest bone from a site that is close to the defect site. This essentially affords the possibility of one surgical site rather than two. Examples of this would be a tuberosity graft in conjunction with an ipsilateral sinus lift or bone from the anterior nasal spine for a maxillary central incisor site. In reality, the patient's bone quality or quantity often necessitates grafting from another area and precludes the surgeon's ability to have the donor bone come from a nearby area.

Case Presentation

A 38 YO Chinese male presented with a periapical abscess and fractured upper right central incisor #11. The tooth had Class I mobility and was deemed non-restorable by an endodontist. The tooth was atraumatically extracted and a periapical granuloma was curetted from the apex of the extraction site. The patient wore a flipper partial denture as an interim prosthesis. The patient was treatment planned for

future bone grafting and implant restoration of the #11 site.

Six weeks post-extraction a CT scan was taken which revealed full loss of the buccal cortex. [see Figures 1 and 2]. A cortico-cancellous block graft from the ascending ramus was deemed suitable for augmentation of the defect. [see Figure 3 for pre-op view]. The ramus graft harvest is as described by Misch¹².



Figure 1

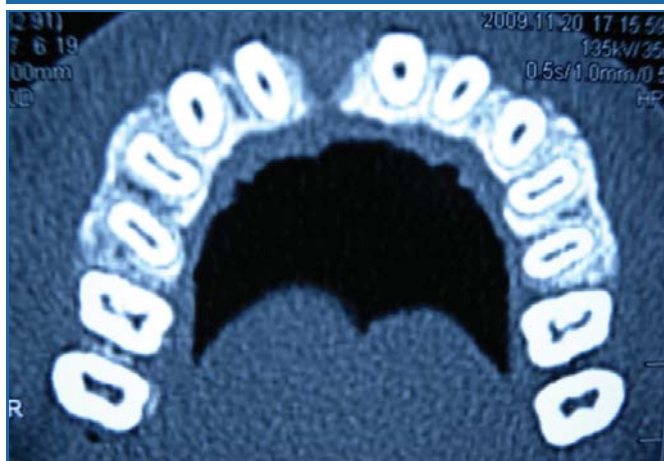


Figure 2



Figure 3

Graft Procedure:

A sulcular incision is placed from the right canine to the left lateral incisor. A palatal "finger extension" is placed at the edentulous central incisor site. Vertical releases are placed to include the papillae. A full-thickness flap is repositioned apically to fully expose the defect. [see Figure 4]. The periosteum is incised horizontally to help

release tension for later primary closure over the bone graft. Sterile aluminum foil is adapted into the defect to simulate the size of the graft needed. The flap is adapted/extended over the foil so that closure may proceed in a quicker fashion after the graft is placed. Once it is determined that a tension free closure may be obtained, the graft is harvested.



Figure 4

A buccal "hockey-stick" incision is placed and the ramus is exposed. This is almost identical to the flap design to remove an impacted 3rd molar. [see Figure 5]. A surgical hand piece with a small fissure bur is used to create a "block" through the cortex into the bleeding cancellous bone. A periosteal and 301 elevators are used to greenstick fracture the graft from the ascending ramus. [see Figures 6 and 7].



Figure 5



Figure 6

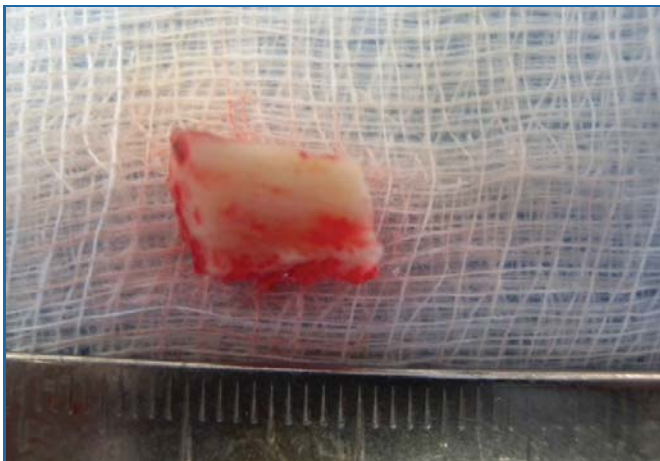


Figure 7

The graft is modified and secured to the defect with bone screws (Osseofix, Bio-met 3i, Jacksonville, Florida, USA). [see Figure 8]. The remainder of the defect is packed with cortico-cancellous chips and cancellous bone curretted from the ramus. The graft is covered with an adapted resorbable membrane (Biomend Extend, Zimmer Dental, Carlsbad, California, USA).



Figure 8

Both wounds are closed primarily with interrupted sutures.

The patient was placed on analgesics, antibiotics, and an antimicrobial mouthrinse for 1 week.

The site will be re-entered after 6 months for removal of the fixation screws and placement of the implant.

Future Possibilities and Alternative Treatment Options

Many studies and clinical trials show promise for the future. Recombinant bone morphogenetic protein (rhBMP-2) has been used with great success in clefts, large reconstructions, ridge augmentation, and sinus lift procedures^{13,14,15}. Initially this was used in spinal fusion surgery before its benefits were realised for the oral cavity. It is known as INFUSE and manufactured by Medtronic (Memphis, TN, USA). This technique utilises synthetic BMP in a liquid form mixed with an absorbable collagen sponge. The sponge is placed into the defect site and closed primarily. After six months

healing, the site is re-entered and implants may be placed into newly formed bone. Utilising this technique avoids a donor site. The material does have cost limitations.

Other tissue-engineered materials have been tried with some success¹⁶.

Alternative treatment plans include distraction osteogenesis for vertical defects, ridge-splitting techniques, short implants, and angled implants^{17,18,19,20}. Cadaver bone may be used for patients who do not mind the idea of it²¹. Chen et al describe success in sinus lifts without grafting and simultaneous implant placement²².

In conclusion, there are many tools to be used for this patient population. The clinician must stay within his or her scope of training as well as his or her comfort zone when performing these grafting techniques.

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