

AUTOGENOUS BONE RIDGE AUGMENTATION USING THE MANDIBULAR SYMPHYSIS AS A DONOR

*A. Norman Cranin, DDS, DEng
Michael Katzap, DDS
Edmond Demirdjan, DDS
John Ley, DDS*

KEY WORDS

**Mandible
Symphysis
Augmentation
Bone
Lag screw**

Potential host sites often present less than optimal dimensions or quality than are required for implant placement. This paper emphasizes a variety of surgical technique designed to optimize these areas. There are a number of anatomic sites available to serve as donors for autogenous bone grafting. They include the tibial plateau, the calvarium, the mandibular rami, the iliac crests and the symphysis of the mandible. Although each has the potential of presenting risks, the symphysis serves a singularly beneficial source. The techniques of harvesting bone, and utilizing it for a variety of grafting procedures is described, the benefits of such utilization are emphasized and the risks of such operations are reviewed.

INTRODUCTION

Squela of tooth loss caused by biological or physical factors is bone loss. The best way to reconstruct that bone to ensure adequate support for an implant and the prosthesis it will support is to use the patient's own bone. The symphysis is a source of cortical and cancellous bone that can be used as a predictable donor site. The technique of harvesting bone from the symphysis and using it to augment deficient ridges is a significant and beneficial procedure.

A careful evaluation of the host site is necessary to determine the need and extent of the required augmentation. A radiographic and clinical examination of the symphysis is necessary to decide whether enough hard tissue exists to supply the deficient ridge. The sym-

physis can provide adequate bone to augment a site that had been occupied by two to six teeth. It will never offer a quantity sufficient to augment an entire arch. If full-arch augmentation is required, if the patient has a deficient chin, or if the extent of periodontal or alveolar bone loss is significant, another source of bone must be considered. The calvarium, the tibial plateau, or the iliac crests are all viable sources. Autogenous and allograft sources may be combined to enhance graft quantity.¹

The patient is to be made aware of the risks and benefits of every procedure. A chance exists of transient parasthesia of the lip, and larger grafts can introduce temporary and sometimes permanent anesthesia to the lower incisors. If the operator is not careful or is overly aggressive, parasymphyseal fractures can occur as well.

The authors are in the Brookdale Implant Group, Department of Dental and Oral Surgery, Brookdale University Hospital and Medical Center, Brooklyn, New York.

Address correspondence to Dr Cranin.

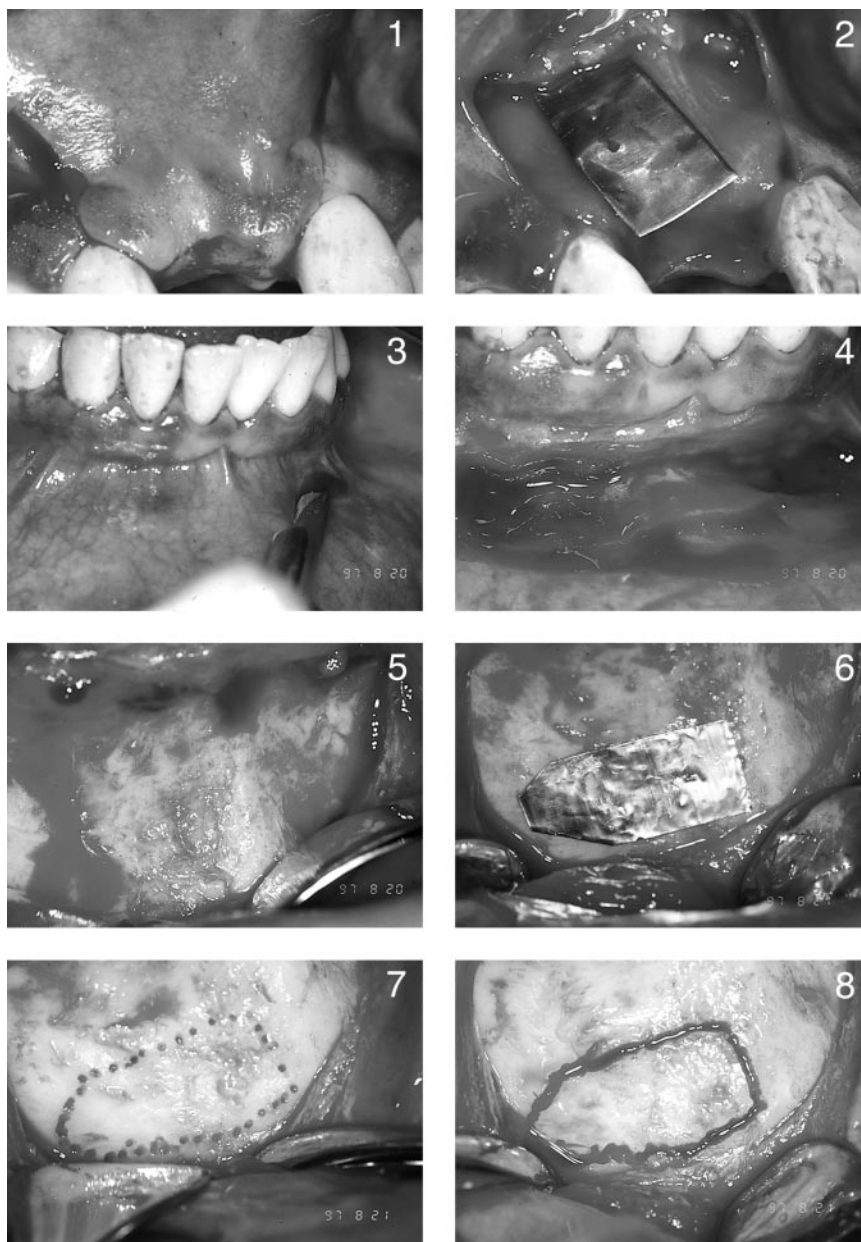
MATERIALS AND METHODS

A clinical examination and panoramic and periapical radiographs are required. After the host site is examined, the clinician must decide whether vertical or horizontal augmentation is required. After the operative requirements are ascertained, the symphysis, as a potential donor site, is evaluated. If teeth are present, the distance of the roots from the mandibular inferior border are noted, as are the locations of the mental foramina. These critical landmarks are obvious limiting factors. Mandibular bulk also plays a critical role in donor site selection. If the available bone seems adequate, the anterior mandible may be selected.

Strict surgical protocol should be followed when harvesting bone from the symphysis. The patient should have adequate blood levels of antibiotic at the time of incision. In addition, the patient should have been rinsing with chlorhexidine for at least 3 days before surgery. At the surgery appointment, the patient is asked to rinse with diluted 50% betadine and 50% normal saline before being prepared and draped with sterile covers. The host site and the symphysis are anesthetized. Bilateral inferior alveolar nerve blocks and local infiltrations down to the inferior border are introduced for the requisite anesthesia.

By using a number 15 blade, a crestal incision and two releasing incisions are made to expose the host site (Fig 1). The flap should be broad based and include a full tooth at either end. The host site is exposed, and a sterilized piece of lead foil (from a periapical film) is placed over the site (Fig 2). The foil, which will serve as a surgical template, is manipulated, cut, and adjusted to record the configuration of bone required for the site. Once the template has been made, the host site is irrigated with saline, and the flap is replaced and maintained by wedging a saline-soaked sponge over it. The symphysis is the next site of operation.

The area has been infiltrated with 1:



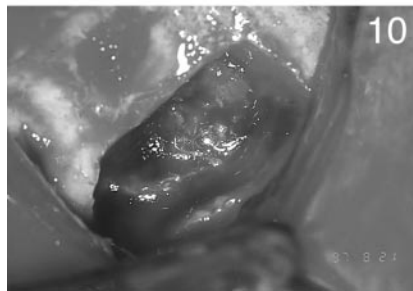
FIGURES 1-8. FIGURE 1. A crestal incision with two releasing incisions is made wide enough so that the incision is not over the graft. FIGURE 2. A sterilized piece of lead foil is shaped to the morphology recipient site to serve as a surgical template at the donor site. FIGURE 3. With the lower lip retracted anteriorly, the incision is initiated to expose the symphysis. FIGURE 4. The incision has been carried through the mucosa and muscle layer, leaving the periosteum exposed. FIGURE 5. After reflection of the periosteum, the mandibular symphysis is exposed. FIGURE 6. The preformed template placed on the donor site to allow defining the dimensions of the graft. FIGURE 7. Outline of the graft made by penetrating the full thickness of the cortex with a 1/2 round bur. FIGURE 8. After outlining the donor site with a 1/2 round bur, a 701 fissure bur is used to "connect the dots."

50,000 epinephrine to aid in hemostasis. The locations of the mental foramina must be noted. The incision is performed with a number 15 blade and made in the mucosa at least 5 mm be-

low the gingival attachment. This allows adequate tissue to permit a closure in layers. The incision is made with the lip drawn anteriorly, thus placing the soft tissues under tension

(Fig 3), and should penetrate the mucosal and muscle layers (Fig 4). The second, deeper incision is carried through periosteum to bone. Periosteal elevation to the inferior border follows, and this exposes the symphysis (Fig 5). Careful, gentle, blunt dissection bilaterally will expose the mental foramina.

Once the symphysis is exposed, the template is placed over the bony cortex (Fig 6). It should be located at least 5 mm away from the inferior border of the mandible, 5 mm from a mental foramen, 5 mm from the midline spine, and 5 mm from the apices. The midline protrusion (or spine) should be preserved to ensure the sanctity of the posture of the lower lip and preservation of the labio-mental fold. A ½ round, high-speed bur under copious irrigation is used to outline the periphery of the template at a right angle to the bone surface (Fig 7), followed by a 701 surgical-length bur to “connect the dots” (Fig 8). When the outline is complete, the osteotomy is deepened into the marrow space. Tactile sense, as well as bleeding from the outline form, will indicate penetration into the marrow space. Once this communication is completed, a spatula osteotome (KLS Martin) is tapped into the outline with a mallet. The patient should be asked to clench his teeth in centric occlusion, and the surgical assistant must support the chin during the tapping phase, which should be started in one of the vertical cuts. The inferior osteotomy should be avoided or reserved for last to prevent endangering the border. If, during the tapping, the osteotome refuses to advance, it is probable that the marrow space has not been reached. The osteotome might be too thick. After tactile purchase has been achieved around the entire periphery with the osteotome, it is used as a lever that will elevate the graft. When slight mobility is noted at the first site, the same strategy is used on the opposing side. This maneuver is employed at a variety of sites until the block becomes mobilized. This permits it to be elevated from the donor site (Figs 9, 10). The



FIGURES 9 AND 10. FIGURE 9. A spatula osteotome is used to mobilize and elevate the graft from the symphysis. FIGURE 10. The donor site after the graft has been elevated and removed, exposing the marrow space.

graft is stored in a mixture of saline and the patient's blood, with the addition of 80 mg gentamicin. A gouge (KLS Martin) is used that will harvest the marrow that does not come away with the block. A moistened sponge is placed into the donor site, and the flap is replaced passively.^{2,3}

To maximize success, the graft will have to be immobilized, and it should be offered adequate blood supply. Once the graft is secured, the flap will have to be undermined to adequately cover the newly expanded area of the graft.

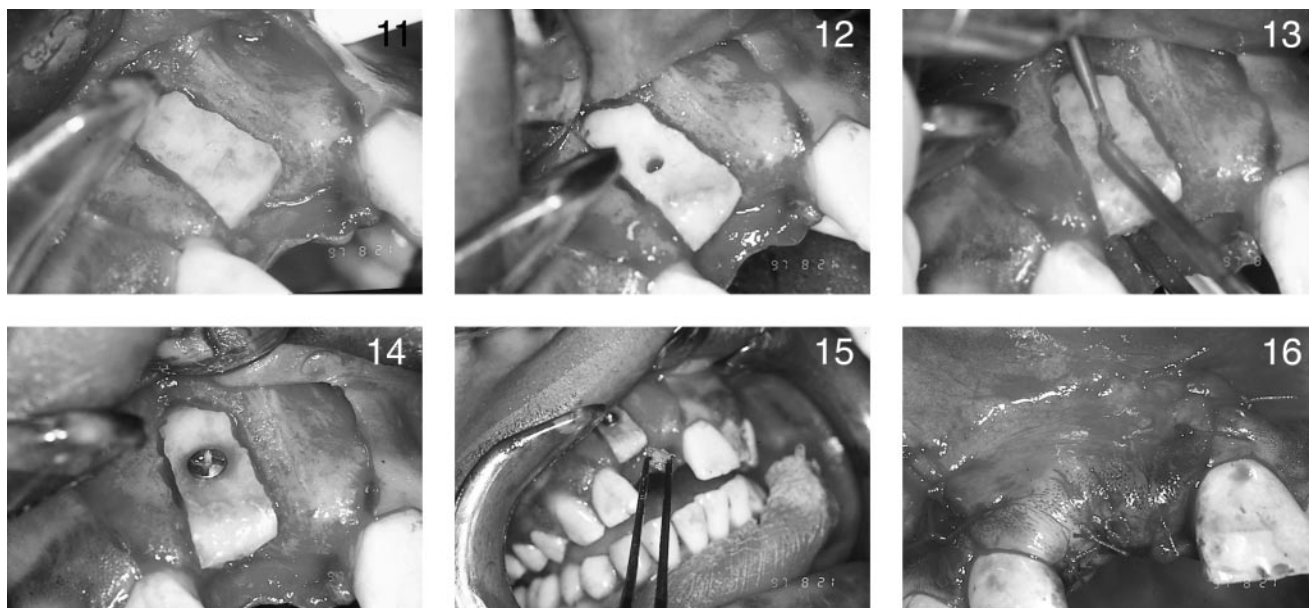
The graft is taken to the host site. Before it is manipulated, the host site must be contoured to receive the graft; it responds best to decortication which, it is thought, will stimulate active bleeding. The graft and the host should be modified to fit as closely as possible in or on the host site (Fig 11). Once this is accomplished, a hole is drilled in the graft to facilitate lag screw fixation of the graft to the host. The hole is made large enough to permit the fixation screw to slip passively through the

graft, but not large enough to allow passage of the screw head (Fig 12). Thus, as the screw actively penetrates the host (which requires tapping; Fig 13), its head will passively lock the graft, rivet-style, into position (Fig 14). The smallest size screw that is effective should be chosen. If the graft is large, several intelligently placed screws will be required. After the graft is secured firmly, remaining discrepancies should be filled with the remaining harvested marrow (Fig 15). The flap, as a result of the undermining, can be sutured without tension with polyglactic suture. Interrupted, box-lock, or vertical mattress techniques can be used. Primary closure is mandatory (Fig 16).^{4,5}

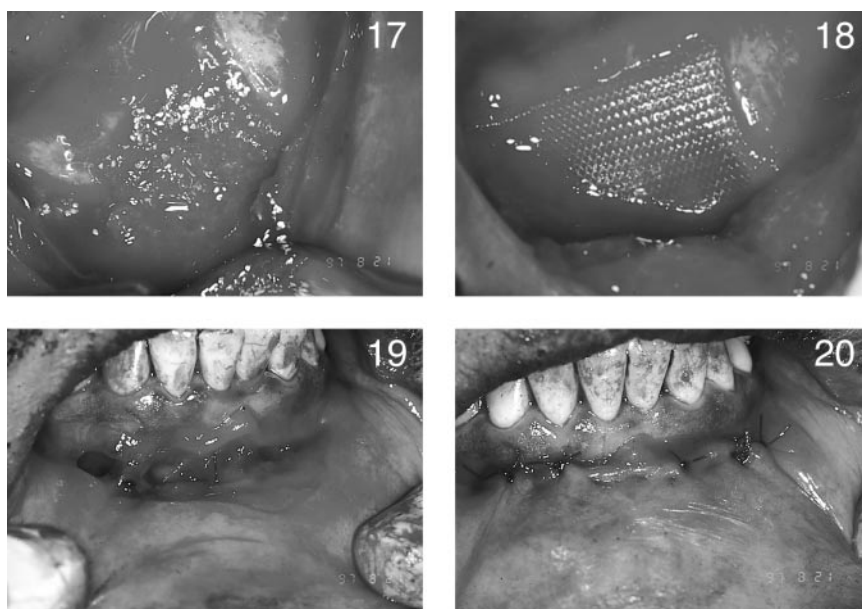
After the host site is completed, closure of the donor site is undertaken. The saline-soaked sponge is removed, the area irrigated with saline, and any bony irregularities adjusted with bone files or rongeur forceps. For the missing bone to regenerate (to the site to be used again), a resorbable graft material should be placed (*ie*, Osteograft N-300, 700). Enough graft should be placed to restore the contour of the mandible to its initial outline (Fig 17). After the graft has been infiltrated with the patient's blood, a resorbable membrane is placed over it (*ie*, Vicryl mesh) (Fig 18). Suturing of the donor site is done in layers. The periosteum and muscle are sutured first (Fig 19), followed by the overlying mucosa. Primary closure must be obtained (Fig 20). Adequate retraction and toothed tissue forceps (Adson or Gerald forceps) are of benefit. A pressure dressing is applied to the patient's chin, antibiotic therapy is continued, and anti-inflammatory and analgesic agents are prescribed. The patient is directed to avoid severe physical activity, to continue with the chlorhexidine rinses, and to stay on a puréed diet.

DISCUSSION

People who have lost permanent teeth in their adolescence or adulthood because of trauma, caries, or periodontal disease find benefits from dental im-



FIGURES 11–16. FIGURE 11. The graft sitting in the host site after it is modified to fit in the defect. FIGURE 12. A hole is made in the center of the graft to allow the threads of a fixation screw, but not its head, to pass through it passively. FIGURE 13. It is necessary to tap the recipient site for the fixation screw. FIGURE 14. The graft is secured in place with a bone fixation screw. FIGURE 15. Voids and discrepancies should be filled with marrow bone. FIGURE 16. The recipient site must have primary closure.



FIGURES 17–20. FIGURE 17. A resorbable alloplastic graft material is placed in the donor site to restore the contours of the symphysis. FIGURE 18. Vicryl mesh membrane covering the grafted donor site. FIGURE 19. Suturing is done in two layers: first the periosteum and muscle layer, then the mucosa. FIGURE 20. The donor site after primary closure is achieved with the horizontal mattress technique.

plants. However, such procedures often require ridge augmentation. When necessary, the symphysis can provide an adequate amount of bone to allow

implant placement. The procedure can be done in the office, and this keeps the cost of treatment under control. Harvesting bone from the symphysis is a

predictable procedure, and the site can be made to regenerate so that it may be used again.

Strict surgical protocol must be observed when performing bone surgery. Powderless surgical gloves, drapes, and sterile solutions are to be used. Careful dissection and surgical management of the host and donor sites are of paramount importance. Considerations of the soft tissues, the bony anatomy, and techniques of primary graft coverage must be planned before surgery. Radiographic and clinical assessment must be satisfied before surgery.

CONCLUSION

Autogenous grafting has always been the gold standard when predictable viable bone is sought. The symphysis provides both cortical and medullary bone necessary for osteoinduction and conduction, and it is in an area familiar to clinicians. The approach is simple and does not require extensive dissection, nor is there significant morbidity. In addition, it limits the discomfort to just one area of the body. Pain and infection management is simple, and the

patient can be discharged the same day.

The procedure of harvesting mandibular symphyseal bone is predictable if performed in the correct manner, with the patient's care in mind. A knowledgeable, experienced clinician can provide his patients with this valuable service.

REFERENCES

1. Cranin AN. *Atlas of Oral Implantology*. 2nd ed. St Louis, MO: Mosby; 1999:137–140.
2. Cranin AN. *Atlas of Oral Implantology*. 2nd ed. St Louis, MO: Mosby; 1999:142–143.
3. Misch CE. *Contemporary Implant Dentistry*. 2nd ed. St Louis, MO: Mosby; 1999:500–502.
4. Cranin AN. *Atlas of Oral Implantology*. 2nd ed. St Louis, MO: Mosby; 1999:147–148.
5. Misch CE. *Contemporary Implant Dentistry*. 2nd ed. St Louis, MO: Mosby; 1999:457–461.