

Chapter I. Calvarial Bone Harvest

- **Indications:** The calvarium provides an excellent donor source when bone is necessary for reconstruction. It may be safely harvested to reconstruct a nose with deficient structural support. The adult skull consists of outer and inner tables of dense cortical bone separated by the diploic space, a layer of cancellous bone. Either the full outer table of bone or a thinner shaving of the outer table can be safely obtained as graft material.
- **Markings:** Bone from the skull is best harvested from the flatter lateral areas of the parietal bone. Care should be taken not to harvest bone over the midline to avoid serious injury to the intracranial sagittal sinus. A gentle zig-zag incision is drawn parallel to the supraorbital neurovascular bundle to minimize postoperative paresthesia and visibility of the incision, especially when the hair is wet (Figure 11-1).
- **Approach:** The skin of the scalp does not need to be shaved prior to the incision but surgical lubrication is useful to keep the hair against the scalp. Liberal use of local anesthetic with epinephrine should be infiltrated and allowed time to work before beginning. The skin is incised with a scalpel and dissection proceeds down to the periosteum with electrocautery to minimize bleeding. The skin incision within the hair-bearing tissue can be beveled to minimize damage to the hair follicles and resultant postoperative scar alopecia. The desired amount of bone is outlined on the periosteum with the electrocautery.
- **Partial cortical harvest:** For thinner bone, the periosteum should be left intact so that it serves to hold smaller fragments of bone together. A wide, sharp osteotome is directed at the skull and advanced at roughly a 45-degree angle. The graft that is produced will fragment and tend to curl on itself but should be sufficient for areas where thin, non-weight-bearing bone is required.
- **Full cortical harvest:** To obtain a full table of calvarial bone, a thin channel is made with a fissure burr around the periphery of the area of bone desired (Figure 11-2). It is advisable to make sure the hair is lubricated and against the scalp and to use the shortest shaft possible on the drill. Additionally, a malleable retractor can be placed between the rotating drill shaft and the hair. The surgeon needs to be diligent to avoid getting loose hair caught in a rapidly spinning drill during this part of the harvest. The desired graft dimension is then outlined and drilled to the level of the diploic space. Careful inspection of the bony architecture will determine the appropriate depth. The diploic space tends to bleed more readily than the overlying cortical bone and visualization is easier when the bone is copiously irrigated while the surgeon is drilling. The posterior table of bone is left intact to prevent dural injury.

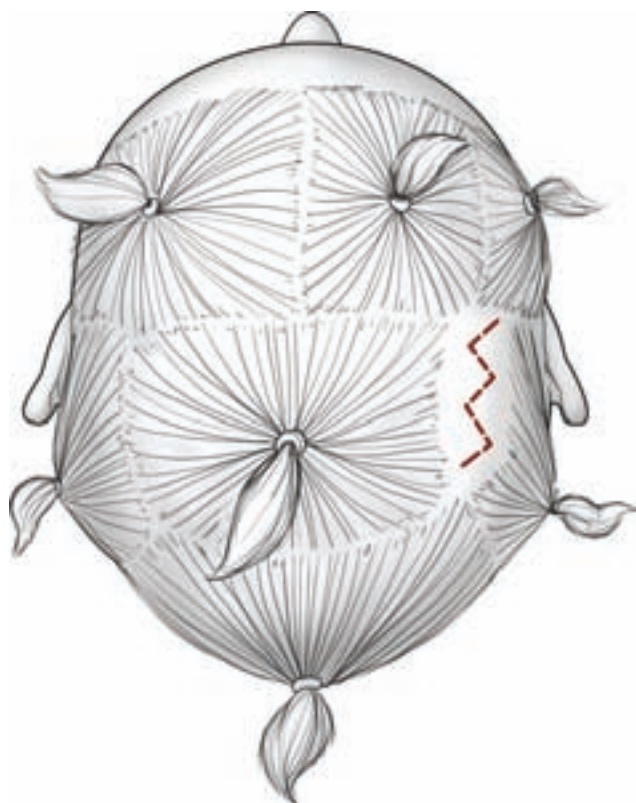


Figure 11-1. Location of a scalp incision for calvarial bone harvest.

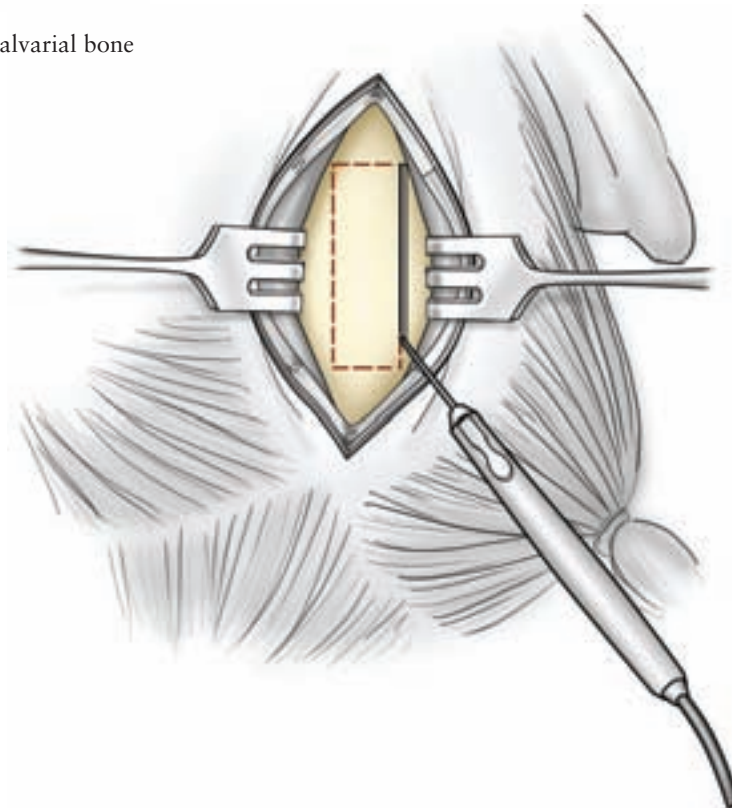


Figure 11-2. Incision through the periosteum of the calvarium with the electrocautery.

After the fissure burr has been used to outline the graft, a contouring burr is used along the outside edge of bone to create a bevel down to the interdiploic space (Figure 11-3). This bevel allows tangential placement of the osteotome during harvest, reducing the chance on intracranial exposure. The graft is carefully removed with a series of straight or curved osteotomes directed parallel to the surface of the bone to minimize penetration of the inner table (Figure 11-4).

Care should be taken to not over-chisel bone from one isolated area of the graft but rather advance the osteotome equally across all portions of the graft by moving the osteotome up and down the graft as harvest proceeds. This will minimize inadvertent fracture of the desired piece of bone. Care should also be taken to protect the graft from flying out of the operative field as the last connections to the diploic space are osteotomized. When the graft is removed, the underlying calvarial bone should be inspected and palpated for integrity of the posterior table (Figure 11-5). Hemostasis is achieved with either the electrocautery or a conservative amount of bone wax.

- *Inadvertent intracranial exposure:* Suspected violation of the posterior table and dural injury warrants wider exposure of the dura and primary repair of any lacerations. This should be done in concert with a neurosurgical colleague. The bone surrounding the accidental violation may be safely removed with a Kerrison rongeur or curette. It may be replaced once the dura is repaired with interrupted, braided 4-0 nylon sutures. Areas where the dura cannot be repaired primarily may require autogenous or alloplastic replacement material covered by hardening liquid sealant.
- *Closure:* A thin self-suctioning drain may or may not be used depending on the quality of the wound. The scalp is closed in layers: interrupted for the galea and either interrupted or running sutures for the skin. A running, locked suture will provide better hemostasis.

A standard pressure dressing around the head is added to minimize fluid collection beneath the scalp.

- *Postoperative management:* If a drain is left postoperatively, it can typically be removed the next day. The pressure dressing may be removed in the office at the first postoperative visit.
- *Pitfalls:*
 - The normal architecture of the adult skull may not be developed in younger patients and the individual cortices may be too thin in the elderly patient to warrant use of a calvarial bone graft in these populations.
 - Scar alopecia will result from injury to the subcutaneous follicles at the wound margins.
 - Injury to the underlying dura is of greater concern. Attempt to keep the angle of the osteotome tangential to the calvarium. Curved osteotomes that stay close to the underside of the outer cortex are helpful.
 - Bone grafts are prone to resorption and have a rigid feel.
- *Tips:*
 - A careful, beveled incision and generous use of local anesthetic with epinephrine to limit the need for electrocautery will minimize the risk of alopecia.
 - Aggressive cautery of the hair-bearing subcutaneous tissues should be avoided.
 - Care should be taken to adequately burr out the corners of the desired graft since these are areas where removal is commonly held up.
 - Place surgical lubricant in the hair at the periphery of the incision to keep it out of the way and thus minimize the chance of hair getting caught in the spinning drill.
 - The cutting edge of the osteotome should be kept as flat and as parallel as possible to the calvarial surface within the diploic space.
 - Bone wax may be used to control bleeding from the edges of the calvarium but it is a foreign body and its use should be minimized to reduce the risk of postoperative infection.

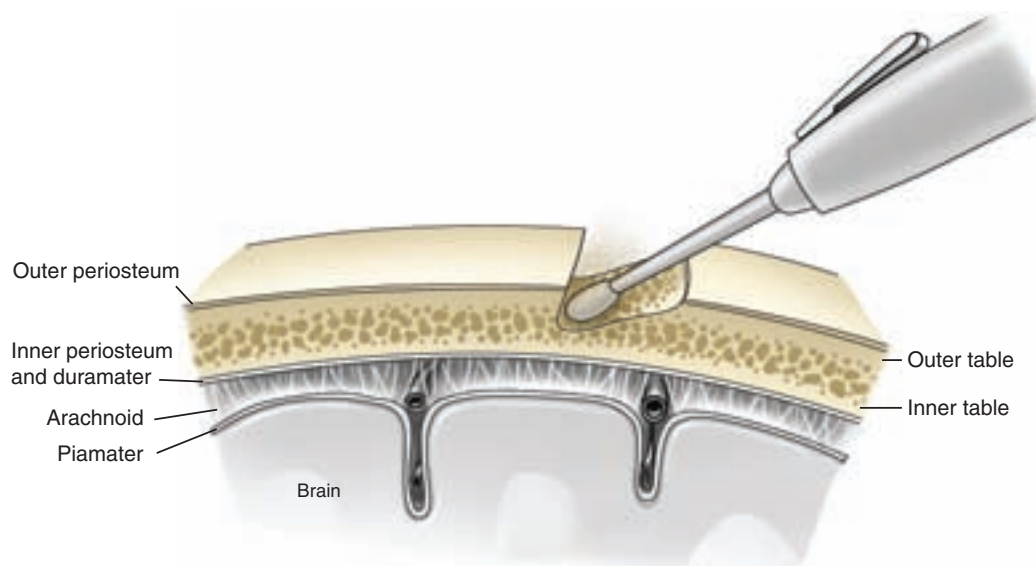


Figure 11-3. Contouring burr mold to create a beveled edge down to the diploic space.

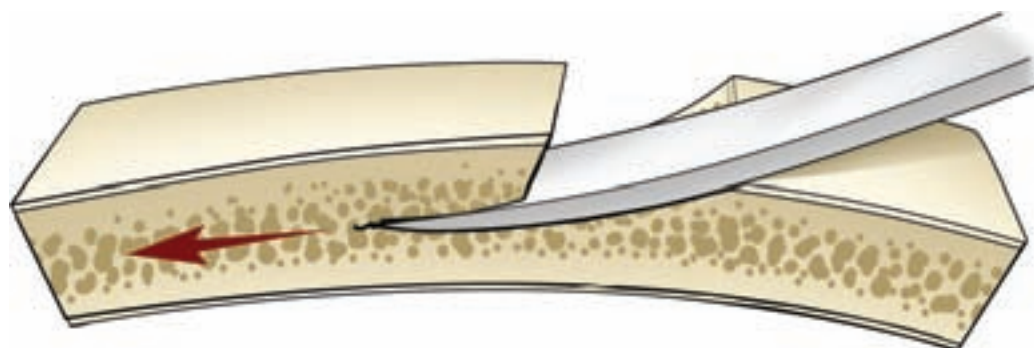


Figure 11-4. Horizontal direction of the osteotome.

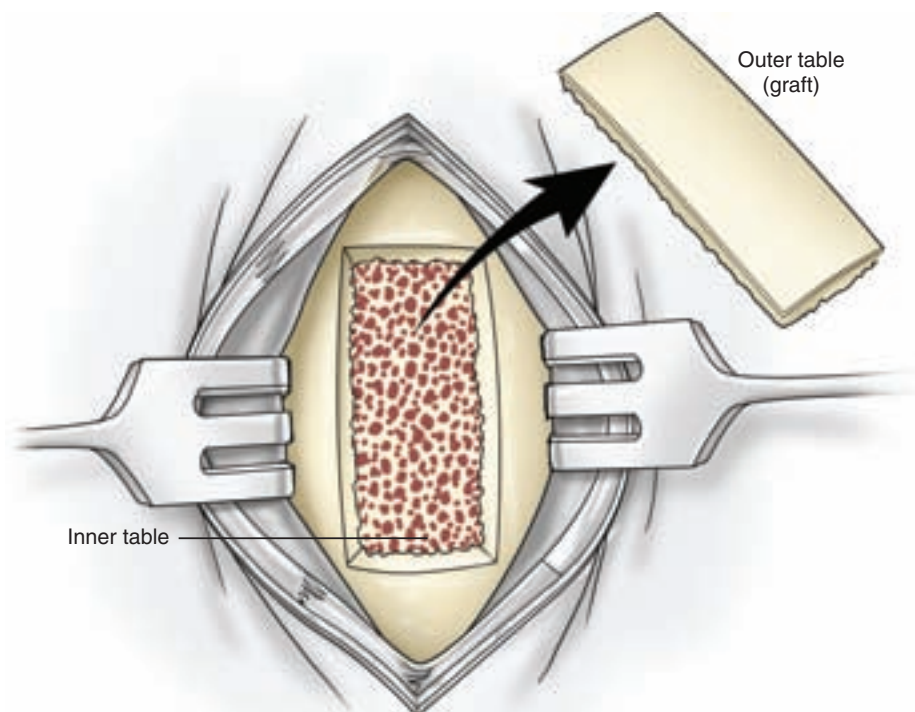


Figure 11-5. Removed outer table calvarial graft and resultant donor site.