FIGURE 2. All fascial attachments are released, and through a stab incision the dissector frees the distal tendon of the muscle.

FIGURE 3. After dissecting of the tendon and cauterizing of the minor pedicle, the muscle can be retrieved easily into the proximal wound.

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A Safer Technique for In Situ Calvarial Bone Graft Harvesting Using the Metal Ruler

To the Editor:

Since the first description of the calvarium as a bone-graft donor site by Tessier,[1] the evolution of harvest techniques has revolved around safety considerations.[1–5] Initially, a formal craniectomy was recommended as neurosurgeons had by then developed safe techniques for craniectomy, and these were adopted for calvarial bone-graft harvesting. The outer and inner tables were then separated and a cranioplasty was performed with the inner table. While this approach was safe, it devascularizes a full-thickness portion of the harvested bone, with risk of resorption and avascular necrosis. The in situ technique was popularized when it became apparent that it was technically feasible to harvest just the outer table while leaving the inner table intact. However, the risk of dura and intracranial injuries remained significant barriers to widespread adoption of in situ harvesting.

Here, we describe a technique for in situ calvarial bone harvesting using a malleable metal ruler. The needed bone graft is marked out with a bone pencil. A contouring burr is used to burr around the area to be harvested until bleeding is encountered, indicating that the diploe has been reached. A curved osteotome is used to create a plane between the inner and outer tables. A 15-cm metal ruler is then placed in this plane parallel to the inner and outer tables and gently tapped with a mallet. As the edge of the ruler cuts along the diploe, the malleable ruler will bend to conform to the contour of the calvarium (Fig. 1). This allows the outer table to be harvested en bloc as a single piece (Fig. 2).

The malleable nature of the metal ruler affords 2 distinct advantages over conventional instruments once it is guided into the right plane, ie, the diploe. First, the ruler is able to dissect parallel to the inner table, minimizing the risk of fracturing the inner table and causing a dura tear. Second, the outer table can be harvested as a single piece without curling or greenstick fractures. This is in contrast to the more commonly used osteotome, which is unyielding. While the osteotome is safe and effective in experienced hands, its use is inherently more risky. The control of depth with the use of the conventional osteotome is entirely manual, with higher risk of intracranial extension in less experienced hands. Many authors have stressed the impor-

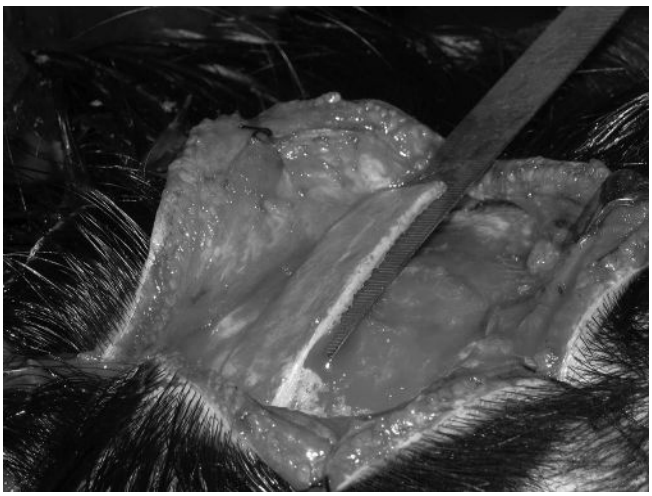

FIGURE 1. As the edge of the ruler cut along the diploe, the malleable ruler will bend to conform to the contour of the calvarium, minimizing risk of damage to the inner table and intracranial extension.

FIGURE 2. The outer table harvested as a single piece without curling or greenstick fractures using the metal ruler.

tance of keeping the osteotome parallel to the inner table. However, this may not be possible all the time with these conventional instruments.

We have used the metal ruler technique for in situ harvesting of calvarial bone since 1998 in over 10 patients. No fracture of the inner table or dural injury was encountered. No other complications such as hematoma, seroma, or wound dehiscence were seen in our experience. Accurate placement of the edge of the metal rule in the diploe is important. It is important to appreciate the tactile feedback from the advancing edge during the procedure. The ruler should dissect through the diploe with relative ease. Excessive resistance encountered should prompt repositioning of the ruler before proceeding further.

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