An Improvised Technique for Medial Malleolar Osteotomy

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Abstract: The medial malleolar osteotomy has been a time-tested technique to approach the medial and anterior aspects of the talus for cases of talus fractures and the osteochondral lesions of the talus. The precision of osteotomy, safety to the inherent articular cartilage, and maintenance of vascularity to the talus are prime concerns of the procedure, failing which instability, early ankle osteoarthritis, or avascular necrosis of the talus become inevitable. Here we describe a couple of modifications to decrease the chances of such complications.

Level of Evidence: Diagnostic Level V. See Instructions for Authors for a complete description of levels of evidence.

Key Words: medial malleolar osteotomy, hemostat, talus

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HISTORICAL PERSPECTIVE

Ray and Coughlin initially described the medial malleolar osteotomy in 1947 for osteochondritis dissecans (OCD) of the talus.[1] It remains a regular approach to visualize the medial and anterior aspect of the talus. Several osteotomies are mentioned for the same too, the most frequently used being oblique and biplanar chevron osteotomies.[2,3] The oblique osteotomy is described to have several advantages, including adequate exposure of the talus, preservation of the deltoid ligament, and improved postfixation stability.

In concurrence with van Bergen and colleagues, the oblique osteotomy should be performed at an angle of 30 degrees to the longitudinal tibial axis. It should extend to the intersection between the tibial plafond and the articular facet of the medial malleolus (at the shoulder of the ankle joint), or else it could jeopardize exposure or stability.[4] Hence, while carrying out oblique osteotomy, the surgeon should be precise with the direction of osteotomy and should also be careful to avoid damaging articular cartilage of talus. As the key blood supply to the head and neck of the talus is by the vessels passing through the deep deltoid ligament,[5] which is, in turn, attached to the osteotomized distal fragment of medial malleolus; repetitive and vigorous retraction of osteotomized fragment should be avoided. Such maneuvers can jeopardize blood supply to the talus and can lead to avascular necrosis of the talus.[6] The need for some technical refinements to help the surgeon avoid these complications remains unfulfilled.

INDICATIONS AND CONTRAINDICATIONS

Medial malleolar osteotomy is indicated for surgical exposure of fractures and osteochondral lesions of talus to visualize the anterior and medial aspect of the talus. Osteotomy could also be used for the articular reduction of pilon fractures. Medial malleolar

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FIGURE 1. A biplanar ankle spanning external fixator provides adequate distraction at the ankle joint.

FIGURE 2. Skin incision extends 10 cm proximal to the medial malleolar tip and distally to the base of navicular and lies midway between tibialis anterior and tibialis posterior tendons.

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FIGURE 3. Saphenous nerve and great saphenous vein are at proximity to the anterior limb of the incision.

osteotomy is contraindicated in cases where soft tissue surgical exposure will suffice precise visualization.

PREOPERATIVE PLANNING

The preoperative mortise view of the ankle is used to analyze the morphology of the medial malleolus. An ankle mortise radiograph is taken with the patient's leg held in 15 degrees of internal rotation with the knee extended and x-ray beam directed horizontally positioned 1 m from the ankle, as described by Lamm and Paley.[7]

TECHNIQUE

The patient is positioned in a supine position on a radiolucent table with the limb internally rotated, with the help of a sandbag under the ipsilateral hip. A thigh tourniquet is inflated. For fracture cases, a biplanar external fixator is applied for availing distraction at the ankle (Fig. 1). The skin incision is an extension of the medial approach, which is halfway between the tibialis anterior and the tibialis posterior tendons. The incision is extended proximally over the center of medial malleolus for 7 cm and distally up to 1 cm proximal to the navicular tuberosity (Fig. 2). Thick bone-deep anterior and posterior flaps are raised to prevent flap necrosis. Care is exercised to protect the saphenous nerve and great saphenous vein while raising the anterior flap (Fig. 3).

Anterior exposure extends to the anterior aspect of the ankle joint. The anterior and medial capsule of the ankle joint is incised, the dome of the talus is visualized, and joint lavage is given. While carrying out posterior exposure, the sheath of the tibialis posterior tendon is carefully incised to avoid damage to the underlying tendon. Tendon of tibialis posterior is identified and held protected with Hohmann retractor throughout the procedure.

A 6-inch curved hemostat is gently passed in the ankle joint underneath the shoulder of medial malleolus through the medial gutter. It is held in an oblique manner such that the tip of the hemostat reaches the posteromedial tibial notch (Fig. 4). Its relative position can be confirmed using an image intensifier (Fig. 5). Insertion of hemostat serves 2 functions; first, it guides toward the direction of osteotomy, and second, it protects talar

FIGURE 4. A 6-inch curved hemostat is passed gently underneath the shoulder of medial malleolus.

FIGURE 5. The direction of osteotomy and placement of the hemostat is confirmed with an image intensifier.

FIGURE 6. Guidewires for two 4.0-mm cannulated screws are inserted perpendicular to the planned osteotomy site.

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FIGURE 7. Three 1.5-mm K wires are passed parallel to each other in the line of planned osteotomy to confirm angle of 30 degrees to the longitudinal axis of the tibia.

articular cartilage during the procedure. The intended line of osteotomy is marked with the help of a cautery tip. This is facilitated by the use of an image intensifier and also by the direction of a hemostat positioned at the shoulder of the ankle.

After osteotomy is marked, predrilling and tapping of osteotomy are carried out. Guidewires for two 4.0-mm cannulated screws are inserted perpendicular to the planned osteotomy site, drilled, and tapped (Fig. 6). Cautery marking of these holes is carried out, not to miss them later on.

Two to three 1.5-mm K wires are passed parallel to each other in the line of previously marked osteotomy line, at an angle of 30 degrees to the longitudinal axis of the tibia (Fig. 7). The osteotomy is performed using a thin oscillating saw in the same sagittal plane as that of the hemostat, till up to 3 to 4 mm away from the articular cartilage. The osteotomy is completed using a sharp osteotome and is reflected inferiorly (Fig. 8). All the while, the hemostat and Hohmann retractor remain in their initial positions. The hemostat remains instrumental in protecting the articular cartilage of the talus from direct injury by

FIGURE 8. The osteotomy is completed using a sharp osteotome.

FIGURE 9. Sutures are passed through each of the drill holes of the osteotomized distal fragment.

the oscillating saw or osteotome, over and above directing toward the osteotomy.

Strong, absorbable sutures are passed through each of the drill holes of the osteotomized distal fragment. These sutures are then used to retract the osteotomized fragment, thereby yielding ample exposure of the medial border of the talus and the dome of the talus (Fig. 9). We also like to tie these sutures to the external fixator if it is in place (Fig. 10). Suture-based uniform traction on the osteotomized fragment of medial malleolus reduces forceful traction and undue tension, thereby protecting the blood supply of talus. Moreover, neither the need for additional assistance for retraction nor transfixation of the distal medial malleolar fragment to the talus is required.

At the end of the procedure, the sutures are removed, and medial malleolus is reduced. Guidewires for 4 mm cannulated cancellous screws are passed through the corresponding predrilled screw holes. While the reduction is held with a bone clamp, 2 cancellous screws are passed to fix the osteotomy. We have routinely used partially threaded screws of 40 to 45 mm in length (Fig. 11). The bone clamp is removed, and the wound is closed in layers.

COMPLICATIONS

An intraarticular step can be created following inadequate reduction of the osteotomy, inaccurate angle of osteotomy, or

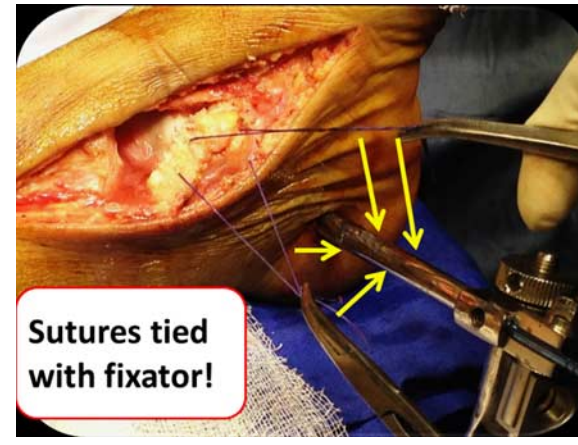

FIGURE 10. The sutures are tied to external fixator rods (if applied) to facilitate the controlled retraction of the distal fragment.

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FIGURE 11. Osteotomy fixed with 2 cancellous screws.

incorrect placement of screws, which in turn likely leads to osteoarthritis of the ankle joint.[8] The use of a large hemostat should be avoided as it could cause articular damage because of constrained space within the ankle joint medially. Due diligence is required while performing the osteotomy to prevent inadvertent damage to the articular cartilage, and an assistant can hold the hemostat down to prevent toggle as the oscillating saw approaches. Excessive retraction pressure on the distal medial malleolar fragment can still compromise vascularity of the talus.

POSTOPERATIVE MANAGEMENT

A below-knee plaster splint is applied over a compression dressing. The first inspection of a wound is done at the end of 48 hours, followed by the removal of sutures on the 10th day. The below-knee plaster splint is removed at the end of 4 weeks, and ankle series x-rays are taken for evaluation of the union of the osteotomy. Non–weight-bearing ankle and foot range of motion and strengthening exercises are started by this time. Gradual, progressive weight-bearing is advised after 6 weeks with serial radiologic monitoring of the union of the osteotomy.

POSSIBLE CONCERNS, FUTURE OF THE TECHNIQUE

Implant removal is usually not necessary unless symptomatic. As this technique is improvising of an existing procedure, no untoward circumstances are expected out of the described modification.

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