

## Transmetatarsal Amputation

### Pre-Op Plan:

Patient positioning:

- Left hip towel bump to roll the patient slightly and keep the left leg from externally rotating
- Black foam ramp pad to elevate the operative site above heart level and to minimize venous bleeding
- Padded thigh level tourniquet
- TED hose and sequential compression device on the non-operative leg to minimize the chance of deep venous thrombosis (DVT)
- Foam pad under the non-operative leg to minimize pressure on the heel, malleolus, and proximally where the peroneal nerve is near the fibular head

Transmetatarsal Amputation can be performed with bone cuts from the level of the metatarsal (MT) heads all the way proximally to the MT cuneiform and cuboid joints. The critical decision is where exactly to cut the MT bones 1 through. While several factors must be taken into consideration in choosing where to cut the bone, the *number one* factor is the quality of the available soft tissue to cover, pad and close over the amputation site.

- Soft tissue is the primary determinate for MT length. It is far better to have very short MTs and better padding than longer MT length and scarred, thin, or damaged tissue coverage.
- One should cut the MT bones in a way that provides the partial foot a similar contour and shape to MT heads in a non-amputated foot.
- Typically, the 2nd MT is cut first, perpendicular to its axis in the ML plane, and beveled slightly to remove more bone on the plantar surface than dorsally.
- The 1 st MT is cut to match the length of the 2nd. However, it is beveled away from the second with more bone removed medially than laterally, and more plantarly than dorsally.
- MTs 3, 4 and 5 are cut on a line that starts at the length of the 2nd MT but slopes proximally so that MTs 3, 4, and 5 are progressively shorter than the 2nd MT. All are cut to remove more bone laterally than medially, and more plantarly than dorsally.

### Skin incisions and flaps:

The skin incisions are drawn out based on the available soft tissue, and the level of the MT bone cuts will also be based on the tissue available.

1. **Lateral:** Identify the lateral malleolus, the lateral side of the 5th MT head, and the lateral aspect of the base of the 5th MT. The lateral incision is on a line between the 5th MT head and the lateral malleolus and goes just dorsal to the base of the 5th MT.
2. **Medial:** Identify the medial malleolus and the medial edge of the 1st MT head. The medial incision is on a line between these two points.
3. **Plantar & Dorsal:** The plantar and dorsal incisions are drawn out to the level that will preserve relatively healthy tissue and remove the damaged tissue.

The dorsal flap is elevated directly off the top of the MT bones. This provides a flap of maximum and uniform thickness. The flap must be elevated back far enough to provide dorsal access to MT 1-5 at the level of the bone cut and allow for the contour or slope of the cuts which slope medially in the 1 st MT and laterally in MT 3-5.

\*Do NOT try to elevate the Plantar Flap off of the MTs

The plantar and dorsal flaps are treated differently. While the dorsal flap can be easily elevated off of the tops of the MT, the goal for the plantar flap is different. If possible, it is wise to attempt to keep the interosseous tissue with the plantar flap. This is very difficult to do by dissecting the flap off of the bones, but is far easier to do by first cutting the MTs, and then carefully dissecting each MT up off of the plantar flap in a proximal to distal direction, carefully preserving the tissue between the MTs.

A longer plantar flap than dorsal flap is the ideal situation. However, in many cases the flaps are by necessity approximately equal in length.

Skin incisions:

The skin incision should be made in a decisive fashion to provide a clean and pure incision through skin, subcutaneous tissue, down to fascia and bone. One should avoid feathered or beveled edges, and avoid irregularly cut surfaces that can lead to devitalized tissue that may be a focus for non-healing or infection.

### **Bones:**

Clean periosteum and soft tissue off of the MT at the level of bone cut.

Metatarsals:

- #1. Cut MT2
- #2. Cut MT1: this is the largest and thickest of the 5 MTs.  
- Identify the desired slope for the cuts of MT3, 4, & 5
- #3. Cut MT3
- #4. Cut MT4
- #5. Cut MT5

Dissect Metatarsals off plantar flap:

MT1: Dissect and elevate MT1 off of the plantar flap, preserving the interosseous tissue on the plantar flap. The sesmoids may make this dissection a bit difficult. They are left with the plantar flap initially.

MT2: Dissect and elevate MT2 off of the plantar flap, preserving the interosseous tissue on the plantar flap. The dissection proceeds to where the skin incision was made on the plantar flap. Having a deep and full initial skin incision helps in identifying the correct plane to aim the dissection from the underside of the MTs to the skin incision.

MT3

MT4

MT5

Complete the dissection from under the distal ends of the MTs cleanly to the plantar skin incision. Care is needed to work around the sesmoid bones under the 1 st MT head. Care is also needed in this case to create a smooth plane near the area of blast in the midfoot.

Use the saw to better contour and round the dorsal edges and to remove the top corners of the bones.

Sesmooids:

There is no consensus on retaining or removing sesmoids. I have traditionally removed them.

### **Vessels:**

The major vessels are the common digital artery and veins which run with the common digital nerves. The vessels are small and frequently have spasmed down and do not bleed. Bleeding that does occur is treated either with bovie electrocautery or ligation with absorbable suture.

### **Nerves:**

The common digital nerves in the plantar flap should be identified, drawn down, and divided so they can retract away from areas of incision, pressure, and scar. These nerves can sometimes be difficult to identify. A balance must be made between identifying the nerves and excessive dissection and trauma to the posterior flap. In some injuries, some of these small nerves may simply no longer be present or identifiable.

### **Tendons:**

Pull the relatively avascular tendons down, divide them, and allow them to retract.

Tendon Achilles Lengthening (TAL):

In order to prevent equinus, a TAL is often performed. A three hemitendon section technique can be used.

- Make 3 cuts in the tendon:

- distal cuts the medial half
- central cuts the lateral half
- proximal cuts the medial half

- Gently stretch the foot and step cuts into dorsiflexion

- Close the three incisions with steri-strips

### **Closure:**

Hemovac drain:

Place a hemovac drain and bring it out through the lateral dorsal side of the foot. The drain should be positioned under the metatarsals.

**Flaps:**

The plantar flap is wider than the dorsal flap, so the closure must be done to equally divide and position the two flaps. The extra width is equally spread out over the entire incision – the “divide and conquer” method of closure.

**KEY:**

Place the 1st suture to oppose the center of the plantar and center of the dorsal flaps. Sew the fascia on the plantar flap to the periosteum that was elevated off the dorsum of the MTs on the dorsal flap.

**2nd Suture:**

The 2nd deep suture centers the lateral half of the plantar flap to the lateral half of the dorsal flap.

**3rd Suture:**

The 3rd deep suture further centers the remaining portion of the lateral plantar flap with the remaining portion of the lateral dorsal flap.

**4th Suture:**

The 4th deep suture begins to center the remaining medial plantar flap to the remaining medial dorsal flap.

**5th Suture:**

Similarly, the 5th suture centers the central medial plantar to the central medial dorsal.

The subcutaneous closure is continued around the entire incision using horizontal sutures and distributing the extra tissue/width in the plantar flap against the dorsal flap.

**“Accordion” skin folding:**

Sometimes an “accordion” appearance occurs when extra plantar tissue bunches up. This tissue should be treated with the “divide and conquer” method: place the first stitch to divide the tissue in half, and then continue the closure, bringing the plantar flap up to the dorsal.

**Nylon skin closure:**

Use 3-0 nylon suture.

**Bandaging:**

- Nonstick gauze
  - Regular gauze
  - Achilles gauze
  - Posterior fluff gauze
  - Anterior/distal fluff gauze
  - Kerlex roll gauze
  - Removal of drapes and tourniquet
  - Web-ril cotton cast padding rolled on
  - Foam Pads: Posterior over the Achilles
- Plantar over bottom of foot and end of amputation site
- Medial and lateral over the malleoli
- Strips of cotton cast padding
  - Plaster strips: 5 ply thick lateral, medial, posterior and plantar

- Bias cut stockinet to wrap the rigid dressing
- Mold on pillow to avoid denting the plaster
- Mold so foot slightly dorsiflexed
- Tape to keep from unraveling

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