

## Transmetatarsal Amputation

### Patient positioning:

1. Left hip towel bump to roll the patient slightly and keep the left leg from externally rotating
2. Black foam ramp pad to elevate the operative site above heart level and to minimize venous bleeding
3. Padded thigh level tourniquet
4. TED hose and sequential compression device on the non-operative leg to minimize the chance of deep venous thrombosis (DVT)
5. 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

### Pre-op plan:

Evaluate quality of soft tissue for flaps and coverage.

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 5 for this particular individual. 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.

1. 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.
2. 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.
3. Typically, the 2<sup>nd</sup> 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.
4. The 1<sup>st</sup> MT is cut to match the length of the 2<sup>nd</sup>. However, it is beveled away from the second with more bone removed medially than laterally, and more plantarly than dorsally.
5. MTs 3, 4 and 5 are cut on a line that starts at the length of the 2<sup>nd</sup> MT but slopes proximally so that MTs 3, 4, and 5 are progressively shorter than the 2<sup>nd</sup> MT. All are cut to remove more bone laterally than medially, and more plantarly than dorsally.

### Draw 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 5<sup>th</sup> MT head, and the lateral aspect of the base of the 5<sup>th</sup> MT. The lateral incision is on a line between the 5<sup>th</sup> MT head and the lateral malleolus and goes just dorsal to the base of the 5<sup>th</sup> MT.
2. **Medial:** Identify the medial malleolus and the medial edge of the 1<sup>st</sup> 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.

In this particular case of trauma, the plantar tissue is better preserved than the dorsal tissue. That is the optimal situation because it allows a slightly longer plantar flap than dorsal flap. In many cases the flaps are by necessity approximately equal in length.

### Aesanguinate and Tourniquet:

If there is no infection or tumor, aesanguinate the leg then inflate the tourniquet.

### 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.

### Elevation of the dorsal flap:

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.

**Clear bones at Cut Level:**

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

**Cut the Metatarsals:**

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

**Dissect MTs 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 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.

**Trial flap positioning**

**Remove tissue that was severely blast damaged**

**Use saw to contour:**

Use the saw to better contour and round the dorsal edge and remove the top corner of the bone.

**C-arm Fluoroscopy:**

Use c-arm fluoroscopy to identify and remove remaining pellets from the blast injury.

**X-ray:**

Note contour of bones. Sesmoids are still in at this point.

**Tourniquet down:**

Deflate tourniquet and apply pressure for initial hemostasis.

**Irrigate with several liters of saline**

**Vessels:**

Clamp the small bleeding vein and use the bovie to coagulate other bleeding veins. Tie small vein.

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 blast injuries, some of these small nerves may simply no longer be present or identifiable.

#### **Debride blast area again**

#### **Another round of irrigation**

#### **Resection of the sesmoids**

No consensus on retaining or removing sesmoids. I have traditionally removed them.

#### **Tendon division:**

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

#### **Hemovac drain:**

Bring the drain out through the lateral dorsal side of the foot.

#### **Closure:**

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.

#### **Continue with subcutaneous closure**

#### **“Accordion” skin folding:**

Equally spreads out the tissue and helps to best match the larger and wider plantar flap to the smaller dorsal flap.

#### **Nylon skin closure:**

Use 3-0 nylon suture.

#### **Tendon Achilles Lengthening (TAL):**

- Check the dorsiflexion of the ankle
- Plan three small incisions to do a Hemi-tendon Transection
- Make 3 cuts in the tendon:

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

- Stretch the step cuts
- Steri-strip closure of the Achilles incisions

#### **Dressing and Plaster Rigid Dressing:**

- Nonstick gauze
- Regular gauze
- Achilles gauze
- Posterior fluff gauze
- Anterior/distal fluff gauze
- Kerlex roll gauze
- Removal of drapes and tourniquet
- Web-ri 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

©Prosthetics Research Study