

## **Transtibial Amputation with Extended Flap and Bone Bridging**

### **Bones/Bridge:**

#### **Create tibial osteoperiosteal flap:**

A longitudinal incision is made to enable dissection of the skin and subcutaneous tissue off of the periosteum. The tibial periosteum is preserved to help build a reconstructive bone bridge across the distal tib-fib. The periosteum is divided on the anterior and posterior edges of the tibia, and transected distally.

A sharp osteotome is used to elevate an osteoperiosteal flap. The flap should be a full thickness periosteal flap with small pieces of cortical bone adherent to the flap.

The periosteum is transected proximally up past the area where the tibia will be transected. The flap is left attached proximally to maintain blood supply.

#### **Dissect lateral & posterior tibial periosteum:**

Soft tissue is cleared off of the lateral and posterior portion of the tibia with a Cobb elevator.

#### **Divide the tibia:**

Tibia – the tibia is typically divided at the level of the anterior skin incision. The tibia is initially transected with an oscillating saw perpendicular to its long axis. Take care to preserve the attachment of the osteoperiosteal flap. Just before closure, the tibia is shaped with an anterior bevel to better accommodate prosthetic fitting.

#### **Expose the fibula:**

Dissect the soft tissue away from the fibula, but take care to preserve the periosteum. An osteoperiosteal flap will be elevated for use in the reconstruction. Place retractors to protect the soft tissue.

#### **Divide the fibula:**

Fibula– the fibula is traditionally divided between 1 and 2 cm **proximal** to the level of the divided tibia. However, in the bone bridge procedure it is cut approximately 3cm **distal** to the cut of the tibia in order to have extra fibular bone available for the bone bridge. The fibula is cut perpendicular to its long axis.

#### **Place bone hook in fibula and dissect along back of bones**

#### **Incise distal end of flap**

#### **Squeeze test:**

The fibula moves in toward the tibia. This creates the potential for tissue getting caught between the bones.

#### **Measure resting distance:**

Typically 1.3cm to 1.6cm.

#### **Elevate fibular osteo-periosteal flap:**

Elevate an osteo-periosteal flap from the anterior and medial surface of the fibula. Hold the distal end of the fibula with a bone clamp to stabilize the fibula and facilitate elevation of the osteo-periosteal flap with the osteotome.

#### **Create segmental osteotomy:**

Use the saw to create two cuts in the fibula and remove the interval segment. The proximal cut is at the same level as the end of the tibia. The distal cut creates a 1.5cm soft tissue gap and leaves soft tissue attached to the distal piece of fibula which will be used as the bone bridge.

#### **Suture bleeding peroneal vein:**

- with absorbable suture.

#### **Cut graft to size:**

Mark the length of the fibular graft needed to fit the space (1.5cm). Cut the excess from the graft while keeping some soft tissue attachment.

#### **Plan for tibial bevel:**

Mobilize the soft tissue to plan for anterior bevel on the tibia. Dissect anterior periosteum proximally.

### **Bevel tibia:**

1. The tibia is triangular in shape, and the anterior corner can be quite sharp and lead to a painful bone prominence at the distal and anterior aspect of the amputation site.
2. A tibial bevel is created to re-shape the tibia and remove the anterior 1/3 of the tibia. I prefer to cut from the transected surface of the bone, starting just anterior to the medullary canal and beveling up at 45° to a point approximately 1.5 - 2cm proximal to the original cut. The edges of the tibia are then smoothed and shaped with a saw blade, a rasp, or the rongeur.

### **Smooth tibia with rasp and rongeur**

#### **Position the graft:**

Position the bone bridge graft between the fibula and tibia.

#### **Compress with bone clamp:**

Use a large pointed bone clamp to capture the strut graft and compress it between the tibia and the fibula.

#### **Drill fibula and graft:**

The fibula and graft are over drilled with a 3.5mm bit. This allows compression screw fixation to the tibia. Use irrigation to keep bit cool and minimize thermal damage.

#### **Drill tibia:**

Place drill sleeve into the 3.5mm fibular hole and then drill the tibia with a 2.5mm bit. Irrigate to keep cool.

#### **Depth gauge:**

Measure the necessary screw length with a depth gauge. In this case, it is found that the screw path is too far posterior. The decision to reposition the graft and to re-drill is made.

#### **Re-drill tibia**

#### **Depth gauge:**

Measure the necessary screw length.

#### **Tap the tibia:**

Tap the drill hole with a 3.5mm tap. The tibial cortex is very hard and tapping facilitates placement of the screw and its purchase for stronger resistance to pull out.

#### **Place screw:**

Because of over drilling (3.5mm) the fibula and graft and tapping the tibia, the screw will compress the graft between the fibula and tibia.

#### **Flap positioning:**

Position the fibular osteo-periosteal flap proximal to the bone bridge. Then position the tibial osteo-periosteal flap distally over the bone bridge.

#### **Suture flap in place:**

Suture the tibial osteo-periosteal flap in place with absorbable suture. The periosteum forms a surface below and above the bone bridge. In essence, a tube of periosteum around the fibular graft.

- suture over the beveled area
- suture over the fibula and then to its anterior surface
- suture to the posterior surface of the fibula

#### **Trim excess flap:**

If not trimmed, it will form excess bone in a problematic area.

#### **Trim flap at bevel:**

To avoid extra or hypertrophic bone growth in the area.

#### **Note graft and screw placement in x-rays**

