

Transfemoral Amputation

Pre-Op:

42 year old male who sustained severe injuries in a motorcycle accident. Note: he is a previous renal transplant recipient and is on immunosuppressive treatments.

His injuries include:

- Open pelvis fracture
- Rectal Injury and need for diverting colostomy
- Mangling injury to left leg
- Disruption of the tibial and peroneal nerves
- Open knee joint and significant loss of soft tissue
- Partial loss of patella and of the patellar tendon
- Exposed and colonized tibia and knee joint

Continued salvage efforts were offered with a full discussion of the infection risks and possible impact of his immunosuppressive treatments. He and his wife asked us to proceed with above the knee amputation.

Wounds

Pointing out the gluteal and peri-rectal wounds

Exposed tibia

Pointing out the exposed tibia and loss of soft tissue

Exposed knee joint

Loss of patella and patellar tendon

X-rays

The significant fracture and how it was stabilized.

The pelvis fracture and the internal fixation used to stabilize the open pelvis fracture

External fixator wounds

The wounds from the temporary external fixator: he already has early heterotopic bone and very dense scars palpable at the external fixator insertion sites.

Irrigation

Irrigation of the proximal wounds

Flap length

Drawing the incisions: length of the flaps is 1/2 the diameter of the limb at the level of the planned bone cut plus 1cm

Anterior flap level

Level selection for the anterior flap, above the zone of injury

Tourniquet

Application of the sterile tourniquet for limiting the blood loss during the amputation

Incisions

Incisions made in a decisive fashion to avoid feathered edges, through skin, subq tissue, and fascia. Anterior and lateral incisions through the muscle to the bone.

Heterotopic bone

Interestingly, very early formation of heterotopic bone is evident at the external fixator pin sites. This bone must be excised.

Dissect through periosteum

The goal is to dissect down to the level of the periosteum, then to dissect the soft tissues proximally off of the femur, and finally to divide through the periosteum at the level of the planned bone cut.

Excise heterotopic bone

Posterior medial incision

Isolate the adductor

The adductor muscle and its tendon are protected and isolated because these are used for the adductor myodesis.

Posterior lateral incision**Divide muscles**

Divide the vastus lateralis and lateral hamstring muscles. The use of the tourniquet allows early transection of the vessels.

Cobb elevator

Use the cobb elevator to clear soft tissue off of the femur circumferentially.

Use the cobb to work through the very thick posterior fascial attachments on the femur, the linea aspera

Reveal attachment of adductor muscle

Elevate the distal medial skin and subq to reveal the attachment of the adductor muscle. Preserve the adductor longer than the other muscles so an adductor myodesis can be performed over the end of the femur.

Dissect the adductor off the femur**Large retractors**

Large retractors hold the quadriceps up and out of the way.

Divide femur

Use oscillating saw to divide femur perpendicular to its long axis. Cool with saline.

Divide the posterior tissues**Resect more heterotopic bone****Test positioning of adductor myodesis**

Shows the adductor tendon/fascia and test positioning of the adductor myodesis

Sciatic nerve

The sciatic nerve has already divided into the **tibial, peroneal, and sural** nerves. The small sural branch is seen on top of the nerve. The nerves are dissected proximally.

Ligate nerve

The nerve is pulled distally to allow ligation with an absorbable suture. The sciatic nerve is quite large and has small vessels that can and do bleed. Ligation with an absorbable suture prevents this intra-operative and post-operative bleeding.

Transect nerve

Cut suture, inspect site, transect nerve.

Use finger to ensure the nerve moved up proximally and was not tethered.

Femoral vessels

The vessels, artery and two veins.

Dissect vessels proximally**Clamp and cut for ligation**

Clamp the vessels for double ligation.

Small peripheral vein

Ligate small peripheral vein with absorbable suture.

Double ligate femoral vessels**Stick tie:**

A stick tie of 0 silk suture is used first. The stick tie will not slip or pulse off of vessels, but does leave a hole that could bleed or lead to a pseudo aneurysm or an arterial/venous fistula.

Free tie:

A free tie is placed proximal to the stick tie. The proximal free tie prevents bleeding at the site of the stick tie and also minimizes the chance of an arterial/venous fistula forming.

Ligate another small peripheral vein

Tie off muscular vessels

Rasp bone to smooth edges

Test position the adductor for the myodesis

Shorten adductor

Clean cut and shorten the adductor tendon.

The medial hamstring

Drill holes for myodesis

Using a 2.5mm drill bit, 4 unicortical drill holes are made in the distal femur. Irrigation is used to cool the drill bit.

First hole is on the anterior-most portion of the femur. The three other holes move laterally from the first.

Four holes allows for the placement of three independent sutures: Anterior (A), Anterior Lateral (AL), and Lateral (L). The suture is of number 2 ticon; a strong non-absorbable suture.

Tourniquet down

Let down the tourniquet, use laps for pressure and early hemostasis.

Hemostasis

Obtain hemostasis with electrocautery.

Irrigate

Irrigate to remove debris and blood and bone dust.

Place 1st suture (A)

Suture is first passed from the outside of the cortex into the medullary canal. Suture is often easier to pass then from inside the bone with the blunt end of the needle as the sharp end gets caught in the trabeculi of the bone. This suture is placed in the first and second holes, starting medially. It is the most superior/anterior suture – anterior suture “A”.

Clamp suture.

Place 2nd suture (AL)

The second suture (anterior lateral, “AL”) is passed using the blunt end of the needle in order not to damage the first suture and weaken it. The sutures share space within the second hole. This suture is placed in the second and third holes.

Place 3rd suture (L)

The third suture (lateral, “L”) is placed in the third and fourth holes.

Adductor myodesis

The adductor myodesis is completed with the Krakow locking suture technique. The illustration shows the placement and locking points for the Krakow technique to secure the adductor tendon.

The “L” suture is used for the posterior portion of the adductor fascia. It is tied.

Medial hamstring myodesis

The illustration shows the placement and locking points for the Krakow technique to secure the medial hamstring fascia. The “A” suture is used to secure the medial hamstring fascia.

The femur is held in a posterior and medial position as the “A” suture is tied.

Reinforce myodesis

The “AL” suture (white) is used to reinforce both the adductor and the medial hamstring myodesis, and to keep femur centered in the muscle mass.

The illustration shows the Krakow suture technique locking points for this reinforcement.

Remove thick scar

Remove more thick scar that is possible heterotopic bone growth.

Deep fascial closure

Close the deep fascia of the quadriceps to the deep fascia of the hamstrings at the myodesis site.

Superficial fascial closure

Close the superficial fascia medially.

Place drain

Bring the drain out anteriorly and laterally. The drain is pushed out of the skin, then cut between holes and pushed deep with the finger.

Close the lateral fascia**Superficial fascial closure**

Centrally, suture the superficial and deep fascia of the lateral hamstring up to the quadriceps fascia to bury the muscle.

Trim excess skin

Trim excess skin with a scalpel.

Complete the fascial closure**Subcutaneous closure**

Complete subq closure with dermal suture, horizontal placement, using 2-0 absorbable suture.

Trim “dog-ear”

Fix the corner to avoid a dog eared appearance.

Nylon skin closure

Start the nylon skin closure with a 3-0 nylon suture placed in the figure 8 fashion.

Suture drain in place

Suture the drain in place to prevent it from being pulled out, dislodged, or removed early. In an AKA, the dressing is a soft ACE wrap spica around the waist, but the soft dressing can be easily opened to cut the stitch and remove the drain anytime it is ready.

Pack wounds

Pack open the gluteal and peri-rectal wounds with kerlex roll gauze.

Bandaging

Non-stick Adaptic gauze

4x4 gauze is opened up and laid across the incision, and then one by one laid over the wound. Gauze should not be in a large lump that can put pressure on the skin and cause skin breakdown.

Fluff gauze to add padding and some compression

Kerlex roll gauze to secure the dressing and apply gentle compression to the end of the amputation site. 2 rolls.

Apply mongo extra long 6 inch ace wrap around the above knee amputation site, the proximal limb, and the waist in a spica fashion. The gauze is wrapped in an angled fashion to avoid proximal constriction of the limb and avoid the “tourniquet effect”. Avoid pressure on the colostomy site.

Secure the spica ace with tape to keep it from getting tangled, displaced, or becoming tourniquet-like.

Pelvis external fixator seen.

Day 5

Dressing change at day 5 shows the dramatic improvement with early healing, dramatic loss of edema, and no sign of infection

