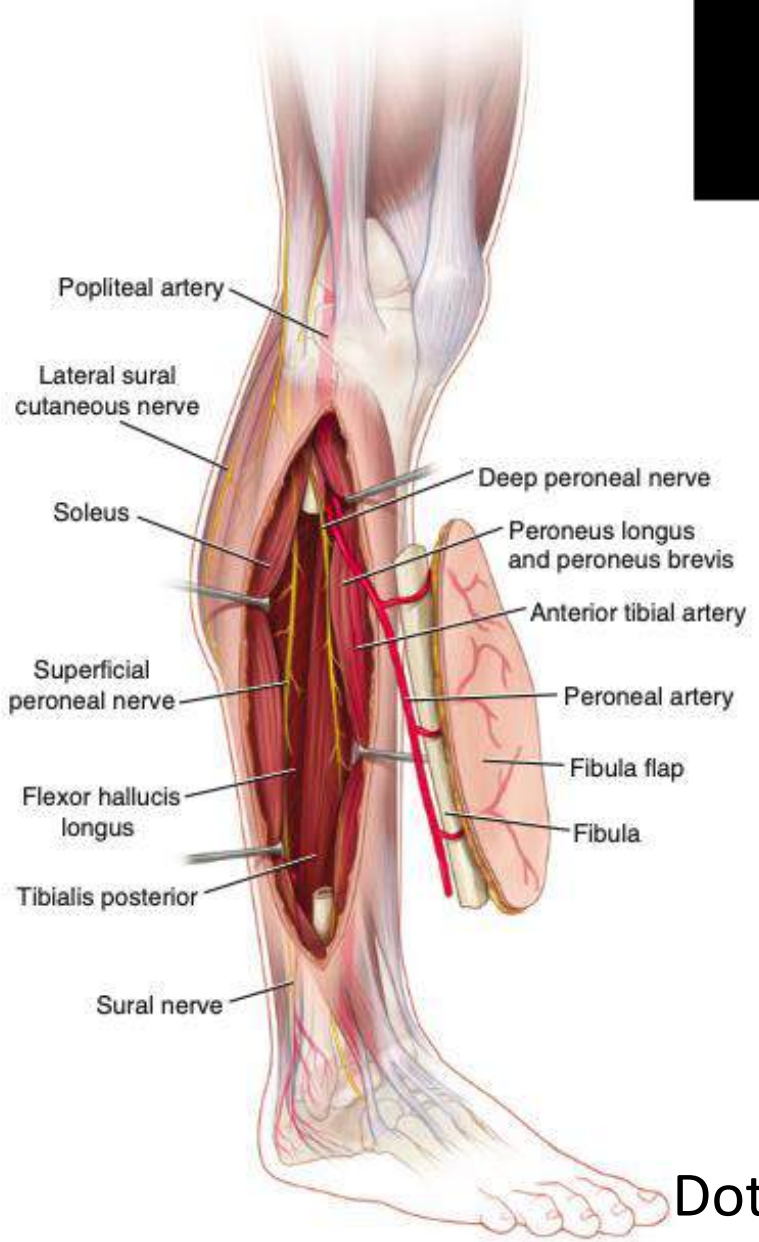
Co-funded by
the European Union



FIBULA OSTEOSEPTOCUTANEOUS FREE FLAP FOR MANDIBULAR RECONSTRUCTION

Dott. **D'Angelo Bozzi** - Dott. **Smaldino**

INTRODUCTION

Fibula Free Flap

- Osseus Flap
- Osteomuscolar Flap
- Osteoseptocutaneous Flap

INTRODUCTION

› Plast Reconstr Surg. 1975 May;55(5):533-44. doi: 10.1097/00006534-197505000-00002.

The free vascularized bone graft. A clinical extension of microvascular techniques

G I Taylor, G D Miller, F J Ham

Case Reports › Plast Reconstr Surg. 1989 Jul;84(1):71-9.

Fibula free flap: a new method of mandible reconstruction

D A Hidalgo [1]

Case Reports › Plast Reconstr Surg. 1994 Feb;93(2):294-304; discussion 305-6.

Fibula osteoseptocutaneous flap for reconstruction of composite mandibular defects

F C Wei [1], C S Seah, Y C Tsai, S J Liu, M S Tsai

- **1975** → **Taylor et al** described the fist two clinical cases of microvascular fibula flaps used for reconstruction of tibia bone gaps;
- **1989** → **Hidalgo** was first to report on a significant series of fibula free flap for mandibular reconstruction;
- **1994** → **Wei et al** were convinced of the reliability of the skin paddle of the osteoseptocutaneous fibula flap.

ANATOMY OF THE LEG

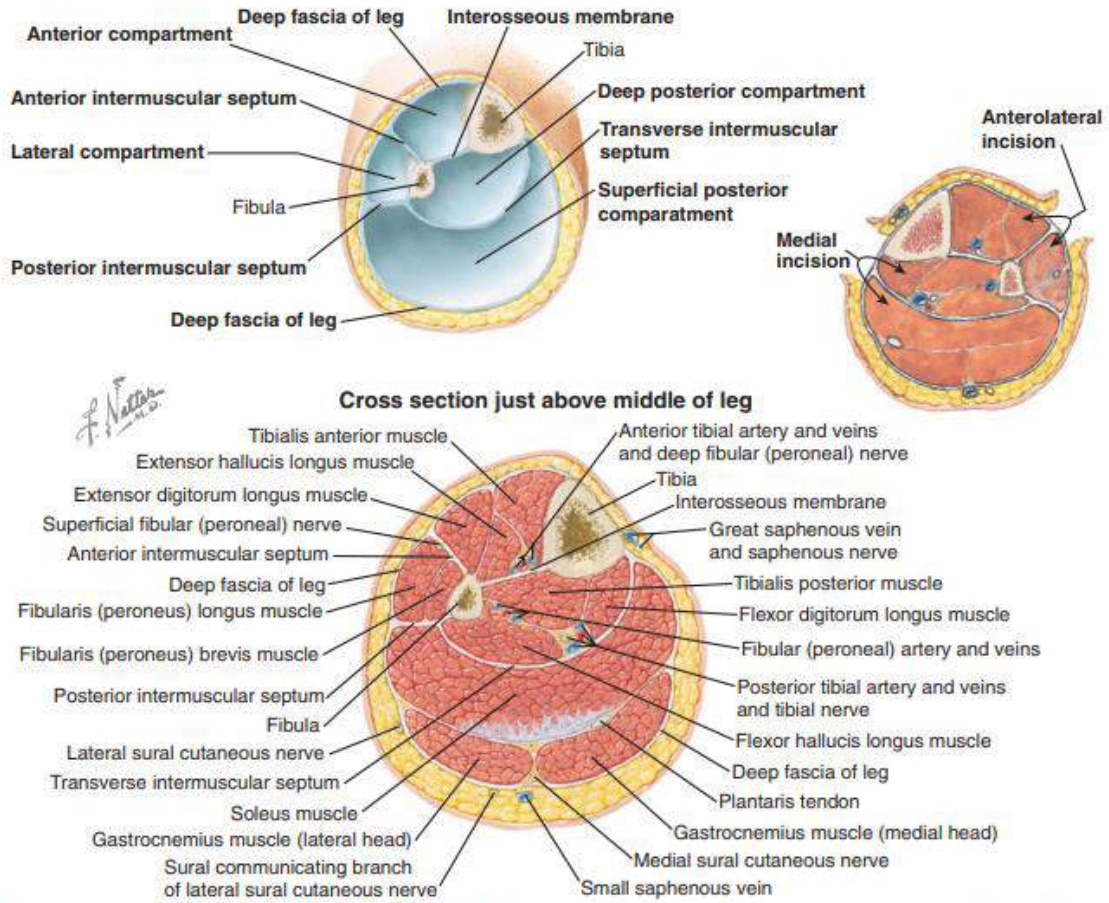


Figure 13.6 Cross-sectional anatomy of the lower leg. The four distinct compartments include the anterior compartment (tibialis anterior, extensor hallucis longus, extensor digitorum longus, deep peroneal nerve, anterior tibial artery); the lateral compartment (peroneus longus, peroneus brevis, superficial peroneal nerve); deep posterior compartment (tibialis posterior, flexor hallucis longus, flexor digitorum longus, peroneal artery, posterior tibial artery, tibial nerve); and the superficial posterior compartment (soleus, gastrocnemius, plantaris). (Reprinted from Netter Anatomy Illustration Collection. ©Elsevier Inc. All Rights Reserved.)

3 compartments:

1. **Anterior compartment**
2. **Posterior compartment (superficial and deep)**
3. **Lateral compartment**

ARTERIAL SUPPLY OF THE FLAP

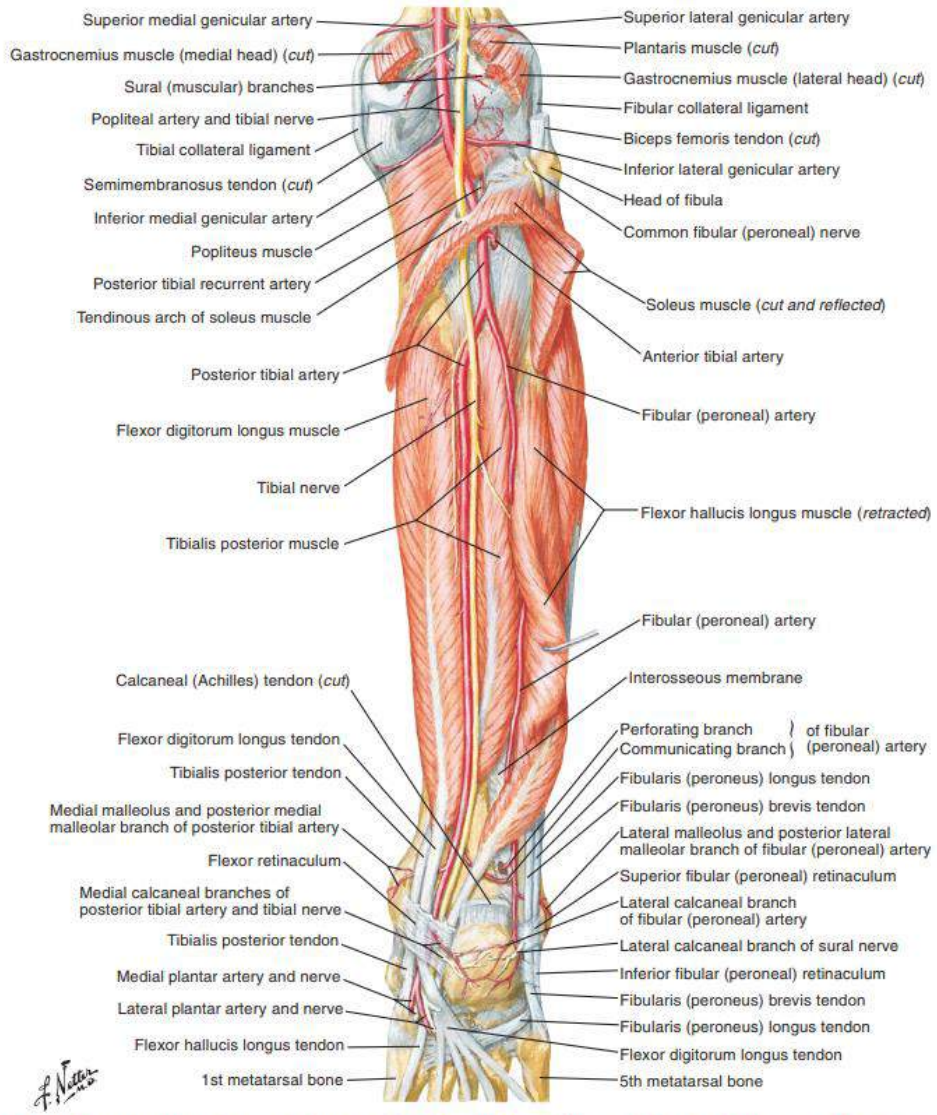


Figure 13.10 Branching pattern of the popliteal artery and the tibio-peroneal trunk (posterior). (Reprinted from Netter Anatomy Illustration Collection. ©Elsevier Inc. All Rights Reserved.)

Peroneal Artery

Dominant: nutrient artery from peroneal artery

- Length: 1–2 cm
- Diameter: 1.0 mm

Minor: periosteal and muscular branches from peroneal artery

- Diameter: from 0.8 mm to 1.7 mm

VENOUS DRAINAGE OF THE FLAP

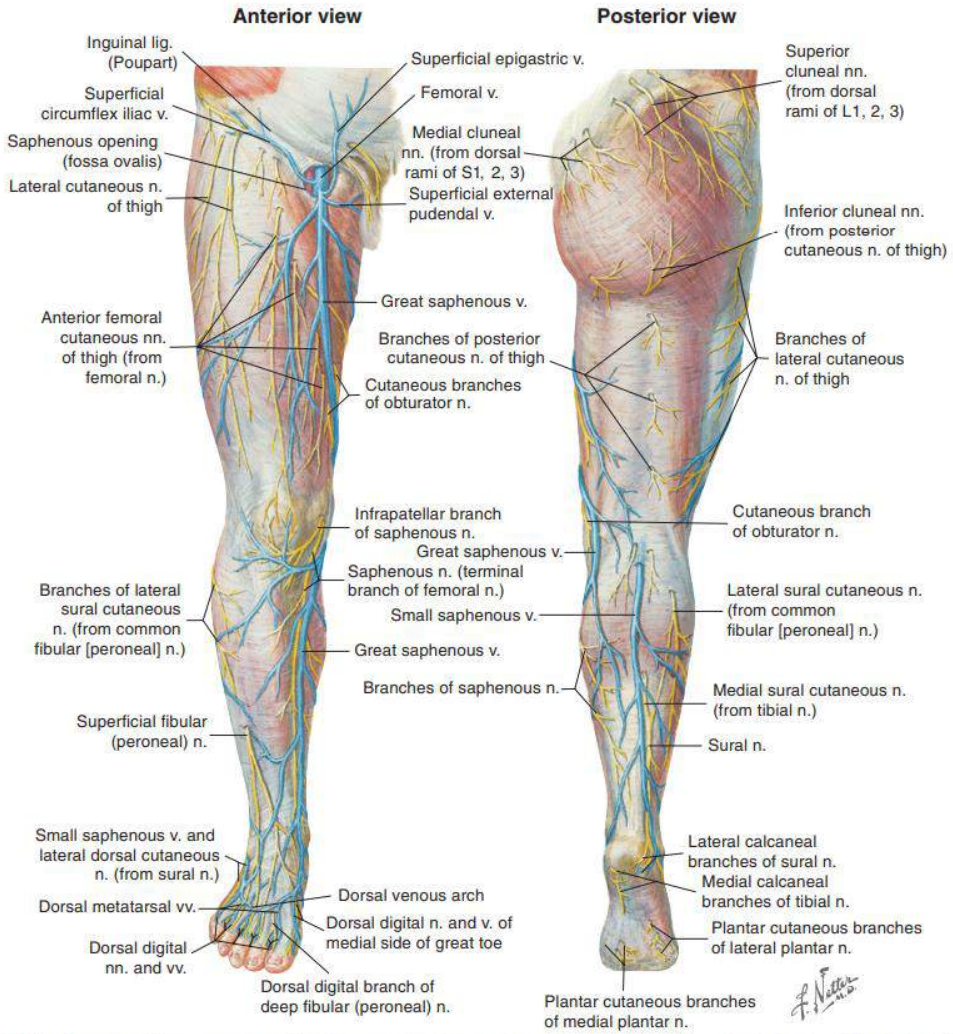


Figure 13.19 Anatomy of the great and small saphenous veins. (Reprinted from Netter Anatomy Illustration Collection. ©Elsevier Inc. All Rights Reserved.)

PRIMARY

- **Comitant veins** of the peroneal artery (often there are two venae comitantes)

SECONDARY

- superficial venous system

Note: In the case of a fibular osteoseptocutaneous flap a superficial vein (commonly the lesser saphenous) draining the skin paddle may sometimes be used as adjunctive drainage of the flap. This is particularly useful when a large skin island is harvested.

FLAP INNERVATION

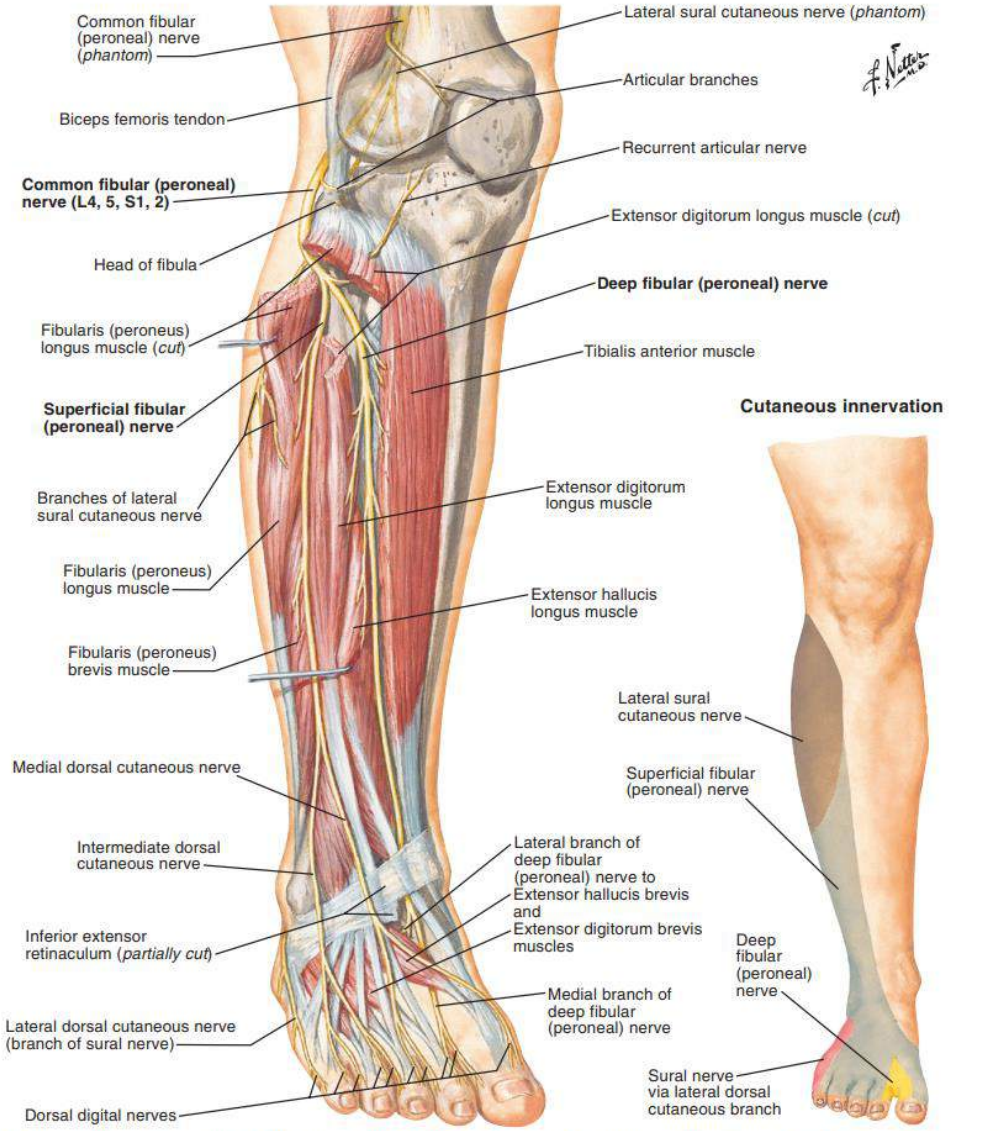


Figure 13.8 Anatomy of the common peroneal nerve and its branches. (Reprinted from Netter Anatomy Illustration Collection. ©Elsevier Inc. All Rights Reserved.)

SENSORY

- **The lateral sural nerve** and terminal sensory branch of the **superficial peroneal nerve**

MOTOR

- There are no indications for harvesting a functional muscle with this flap.

PREOPERATIVE STUDY

Medical history:

- peripheral vascular disease
- deep vein thrombosis
- Trauma
- venous stasis disease
- Arteritis
- **Peronea Magna**

Imaging:

- Doppler (foots Allen's test)
- CT angiograms

PERONEA ARTERIA MAGNA

- 8% of the population
- **hypoplasia or absence** of both the anterior and posterior **tibial arteries**
- peroneal artery as the sole artery supply for the foot
- **must be rule out**

Peronea arteria magna

Lisa H Betz [1], Bradford W Betz

Affiliations + expand

PMID: 19381624 DOI: 10.1007/s00247-009-1253-2

ADVANTAGES

- Fibula flap is suitable in cases of recipient site wound contamination, scarring, **radiation**, or infected bone cases following debridement;
- **Long segment bone** (up to 25 cm) can tolerate multiple osteotomies without compromising its blood supply;
- Diameter of peroneal artery (1.5 mm-2.5 mm; vein 2-4 mm) for anastomosis in head and neck reconstruction.

DISADVANTAGES

- Obvious donor **scar**
- Limitations and discomfort in ankle function and range of motion;
- The technique of flap harvest requires a **steep learning curve**;

OUR CLINICAL CASE

65-year-old **male** patient

PHYSIOLOGICAL HISTORY

- Drinking **wine** (a bottle/day)
- Smoking **cigar** for 40 years
- No allergies
- No comorbities

PATHOLOGICAL HISTORY

- **simil-leukoplasic lesion** at the right inferior tongue border
- extension to the floor of mouth and the medial face of the right alveolar arcade
- **CT-scan** (04/02/22) > “Focal thickening of sublingual space, more evident in the right side, with mucosal hyperemia and air bubbles within the context”
- **Biopsy** (03/03/22) > “Squamous cell carcinoma (G2), conventional type, moderately differentiated, T3N1”

OUR CLINICAL CASE

65-year-old **male** patient

PHYSICAL EXAMINATION

- **Leukoplasic lesion** at the right tongue border, **ulcerated lesion** at the right sublingual sulcus and **granulating mucosa** at the medial face of right alveolar arcade
- **Leukoplasic lesion** at the posterior one thirs of the left tongue border
- Preserved **tongue motility**
- No trisma
- Adenotonsillectomy outcomes

SURGICAL PLAN

TUMOR FEATURES

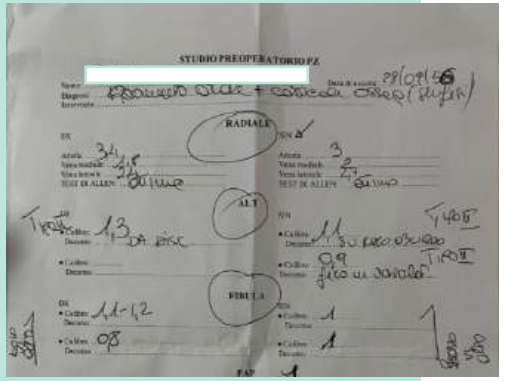
MEDICAL HISTORY

PHYSICAL EXAMINATION

RADIOLOGY

SEGMENTAL RIGHT MANDIBULECTOMY
+
SELECTIVE CERVICAL LYMPHADENECTOMY
(livel I-III bilaterally)
+
FIBULA FREE FLAP

PREOPERATIVE STUDY



MEDICAL HISTORY to confirm **reliability of the peroneal artery** as a pedicle for free tissue transfer

PHYSICAL EXAMINATION:

- Assessement of **knee and ankle joints** range of motion and laxity
- Foot **Allen's test**

RADIOLOGY:

- Duplex **ultrasonography**
- **CT-angiogram**

PREOPERATIVE STUDY

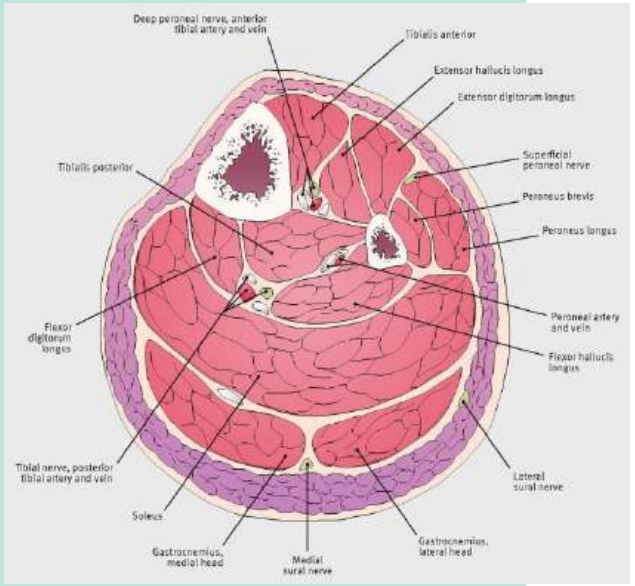
FLAP MARKINGS

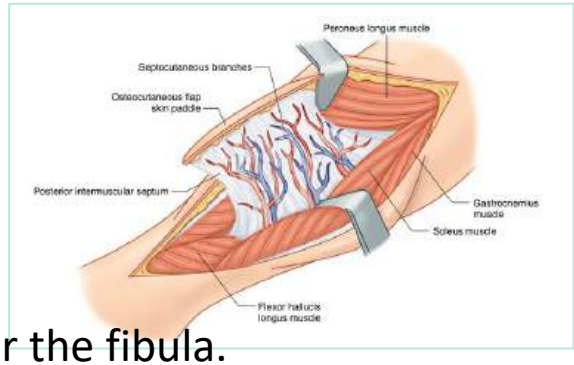
- Mark **head** of the fibula, **lateral malleolus** and fibula **posterior border**
- Mark a point **4 cm below** the head of the fibula and a point **6 cm above** the lateral malleolus
- Center the **skin island** over the **posterior intermuscolar septum**, which contains the Dopplered perforators.

PATIENT POSITIONING

- Position the **patient supine** with the **knee flexed 90°** and the **foot fixed** to the table
- Use a **tourniquet** around the mid-thigh

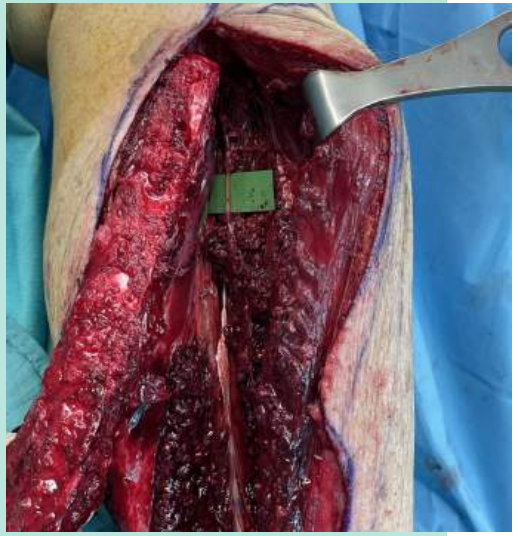
OPERATIVE TECHNIQUE





DISSECTION

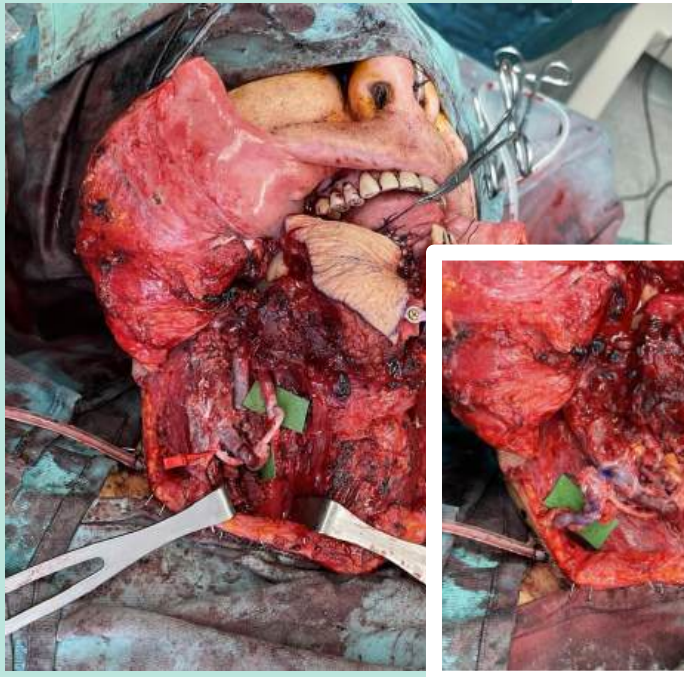
- Fibula harvest begins with a **midlateral incision** over the fibula.
- The skin flap is elevated in a suprafascial plane until reaching the **posterior intermuscolar septum**
- From the anterior approach, the **peroneal muscles** are elevated off the fibula and the **anterior intermuscolar septum** is incised
- The **extensor digitorum** and **hallucis longus muscles** are dissected, until reaching the anterior tibial vessels, the deep peroneal nerve and the interosseus membrane



OPERATIVE TECHNIQUE

DISSECTION

- Large arterial perforators to the soleus muscle are ligated to expose proximal peroneal vessels
- The fibula is **osteotomized** proximally and distally
- Proximally, identifiy the **common peroneal nerve**
- The interosseus membrane is incised and the peroneal vessels are dissected from the **tibialis posterior** and **flexor hallucis longus muscle**, up to the bifurcation from **the posterior tibial artery**
- Once the recipient site is ready, the vascular pedicle is legated and cut free.



OPERATIVE TECHNIQUE

INSETTING AND SHAPING

- The bone segment to be used is marked and the rest is excised, without injurying the vascular pedicle
- The flap is set in and shaped to cover the soft tissue and bone defect
- **Microanastomosis** are performed
- **Ostheosynthesis** of fibula and mandibular bones is done

DONOR SITE CLOSURE

- The flexor hallucis longus is sutured to the tibial posterior muscle and to the interosseous membrane, while the foot is in a neutral position
- The skin is closed **primarily** (if the defect is < 4 cm) or by a **skin graft**

POSTOPERATIVE CARE

RECIPIENT SITE

- **Clinical monitoring** of the flap color, temperature, turgor and capillary refill.
- Bone union may be evaluated with **serial radiographs.**

DONOR SITE

- A **posterior splint** is applied**.**
- Evaluate **suction drains** daily
- In case of skin graft, compresison is provided by circumferentially wrapping the leg with a **compressive dressing.**
- **No ambulation** is allowed within the first 2 weeks

TWO-YEARS OUTCOMES

THANK YOU!