GRACILIS MUSCULOCUTANEOUS FLAP

The first description of the Gracilis muscle to be transferred as a flap was in 1956 by Pickrell et al.[1] when they reported its use as a pure muscular flap to treat rectal incontinence. Later, in 1972, Orticochea[123] was credited with the idea of transferring a skin paddle of the thigh vascularized by the Gracilis muscle.

The Gracilis is an expendable muscle that can be transferred as a pedicled or free flap, without causing a functional impairment for the leg.

Indications

As a pedicled flap it can be used to repair defects at the groin, ischial and perineal areas[86,150] as well as for vaginal reconstruction[103,107]. As a free flap it has also been extensively used for functional repair of the elbow and hand[95] and particularly face palsy[50].

Anatomy and vascularization

Gracilis muscle is a flat, thin muscle that originates at the pubic symphysis and inserts at the medial condyle of the tibia. It extends subcutaneously in the medial thigh over the adductor magnus and between the adductor longus and the Sartorius anteriorly, and the semimembranosus posteriorly. It acts as an accessory thigh adductor and is innervated by an anterior branch of the obturator nerve. This nerve courses obliquely between the adductor longus and magnus muscles, superiorly to the vascular pedicle[103]. The nerve has to be preserved if a functional transfer is planned. The Gracilis muscle is vascularized by a major main pedicle, the *Medial circumflex femoral artery* that enters the muscle on its deep surface at the junction between the upper and medial thirds, approximately at 8-10 cm distal to the inferior pubic tubercle. A secondary pedicle from the superficial femoral artery enters the muscle at the middle of the thigh, and a third somewhat minor pedicle enters the muscle distally; at the level of the medial condyle of the femur[25]. These two fasciocutaneous branches emerge between the Gracilis and semimembranosus muscles at approximately 8 and 15 cm proximal to the knee joint plane[27]. Musculocutaneous perforators vascularize the overlying skin that extends beyond the muscular borders. The musculocutaneous flap can be safely raised based on its main pedicle. However, if there is division of the distal pedicles, the distal third of the skin island over the muscle is seriously compromised. The saphena vein, (which is an important landmark for raising the cutaneous flap) is found obliquely crossing the line between the pubic tubercle and the medial knee joint.

Markings

Medial condyle of the femur and pubic tubercle are first identified and a line is traced between them as a reference for the anterior edge of the Gracilis muscle (see picture and legend below). The main pedicle is localized 8 to 10 cm distally to the pubic tubercle, while distant pedicles enter the muscle at approximately 8 and 15 cm from the knee joint plane. The Myocutaneous flap's distal third (red lines) will not be completely reliable if these distal pedicles are divided. An important landmark that has to be localized and identified is the saphenous vein.

Elevation

Elevation of the flap starts by a distal incision on the cutaneous paddle to localize an important anatomical reference: the saphenous vein. The vein has to be preserved and is the main landmark to localize the Gracilis muscle.

Though in the case shown below the distal part of the flap has been partially detached from the muscle, it is safer to keep the whole skin paddle attached to the muscle. It is advisable to secure the dermis of the skin paddle to the muscle with sutures to prevent accidental tearing. See pictures and legends below.

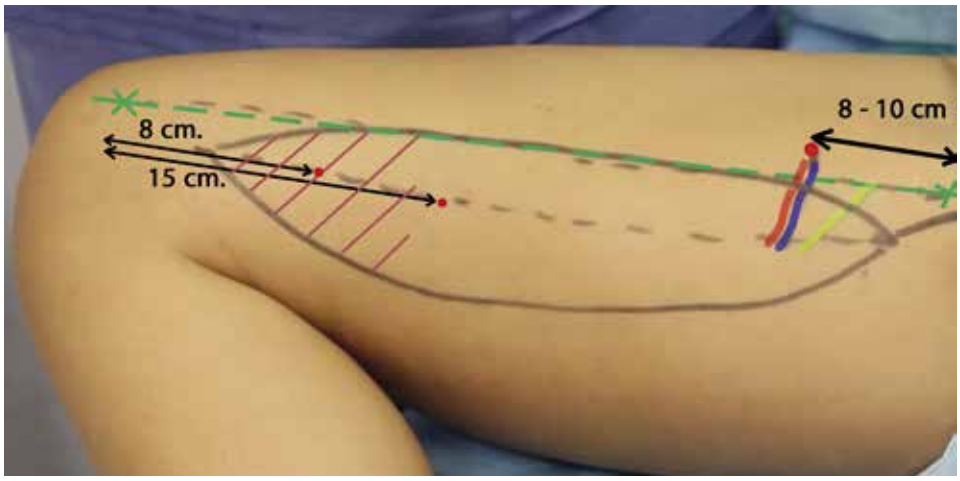

Figure 7.34. A dotted line (grey line) is traced between the medial condyle of the femur and the pubic tubercle. 2 cm posterior to this line, another line (grey line) is traced representing the anterior edge of the Gracilis muscle. 8cm to 10 cm distal to the pubic tubercle, the main pedicle enters the deep surface of the muscle. The cutaneous paddle is outlined beyond the margins of the Gracilis muscle. For pedicled flaps where distant pedicles have to be divided, the distal third of the cutaneous island is not reliable.

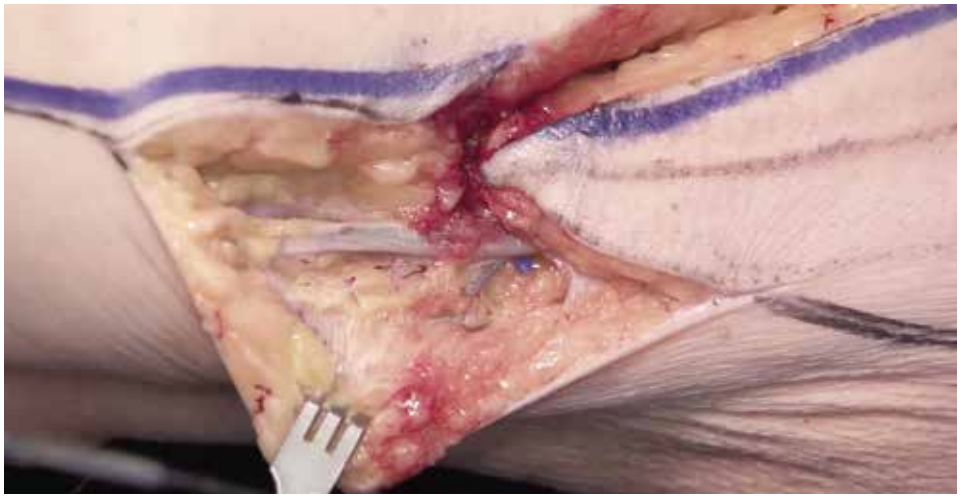

Figure 7.35. Surgery starts by incising the skin distal to the flap to localize and identify the saphenous vein, which has to be preserved and used as a landmark to localize the distal body of the Gracilis muscle. Anterior to this vein, coursing distally between the Vastus Medialis and the Gracilis muscle, runs the saphenous nerve (branch of the femoral nerve) that also has to be preserved (not shown here, see 7.40a).

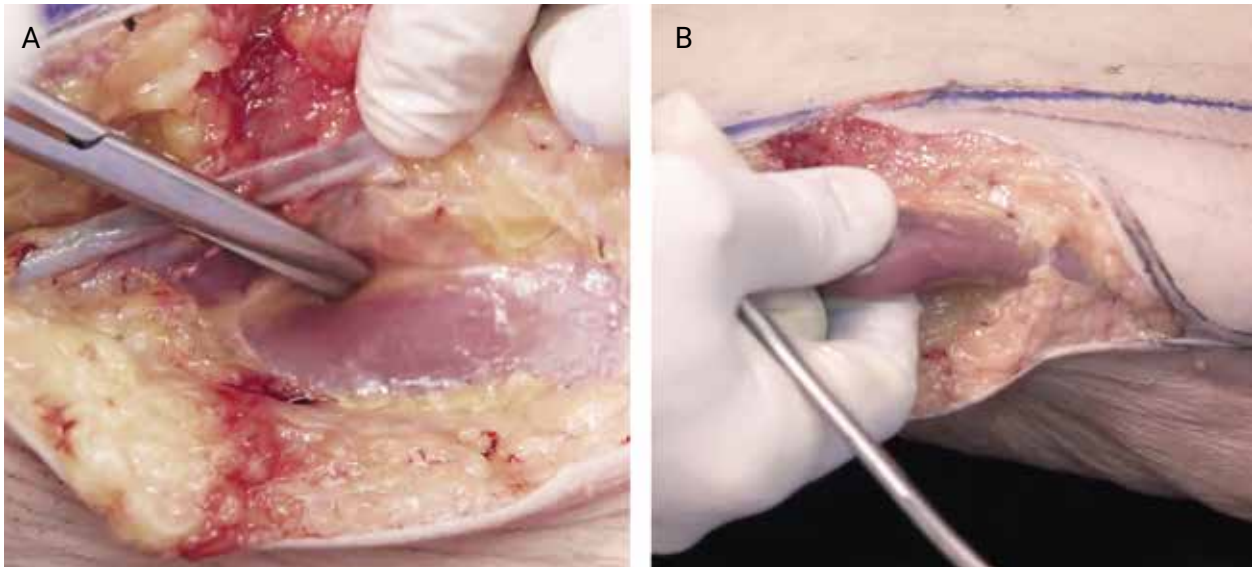

Figure 7.36. Posteriorly to the saphenous vein, the fascia is opened to identify and isolate the lower body of the Gracilis muscle. Subfascial dissection will preserve the vein and nerve. By traction of the distal muscle, the upper part of the Gracilis, as well as its cutaneous territory can be accurately identified.

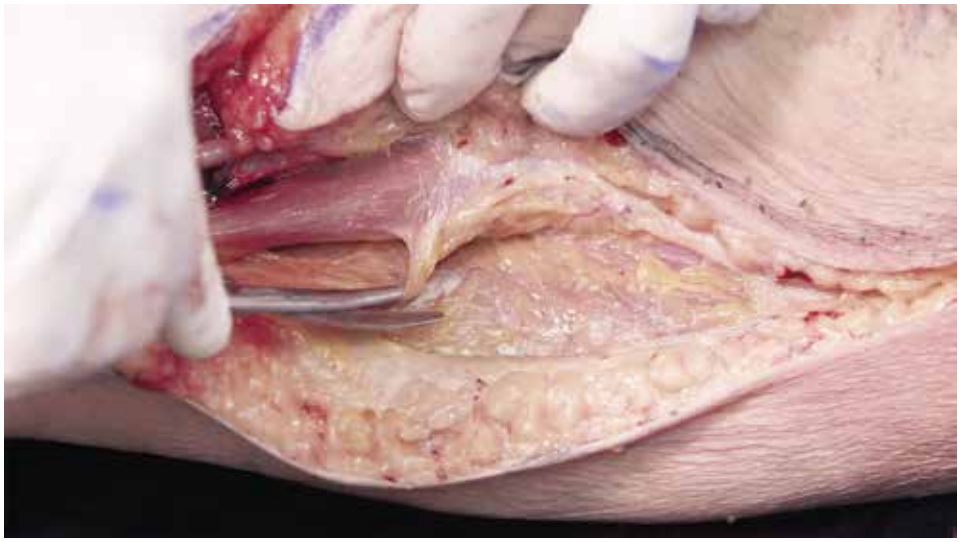

Figure 7.37. With the Gracilis muscle body identified along its course, posterior attachments to the adductor longus muscle are divided.

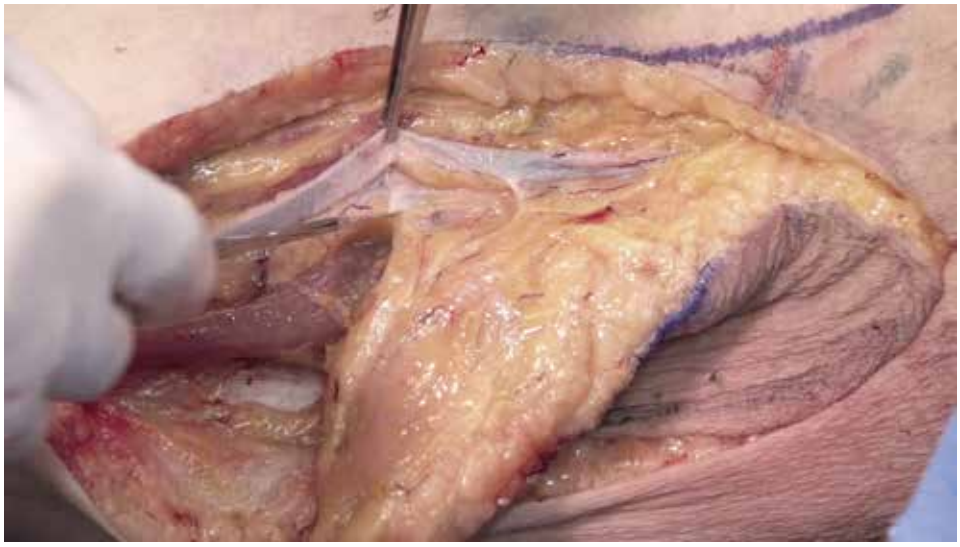

Figure 7.38. Anteriorly, the Gracilis is detached from the adductor longus. Lateral branches from the saphenous vein are divided and ligated. Although in this case, the distal part of the flap has been partially detached from the muscle, it is safer to keep the whole skin paddle secured to the muscle with sutures.

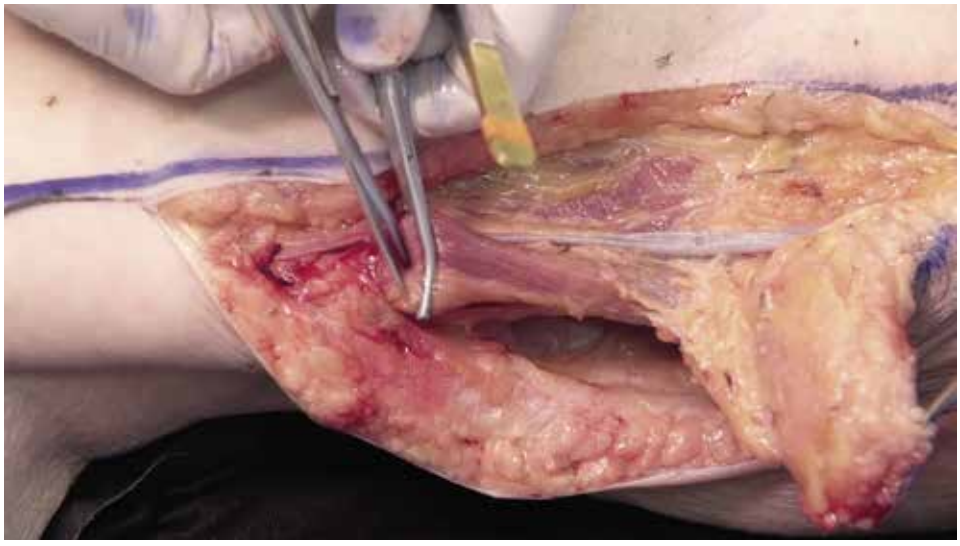

Figure 7.39. The gracilis muscle is divided distally at the desired length.

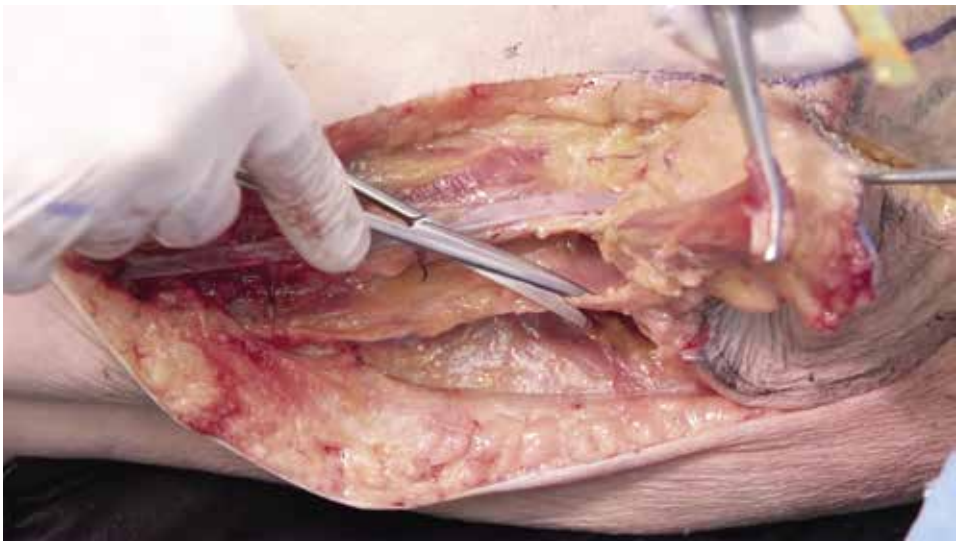

Figure 7.40. The deep aspect of the Gracilis muscle is freed subfascially from the adductor magnus.

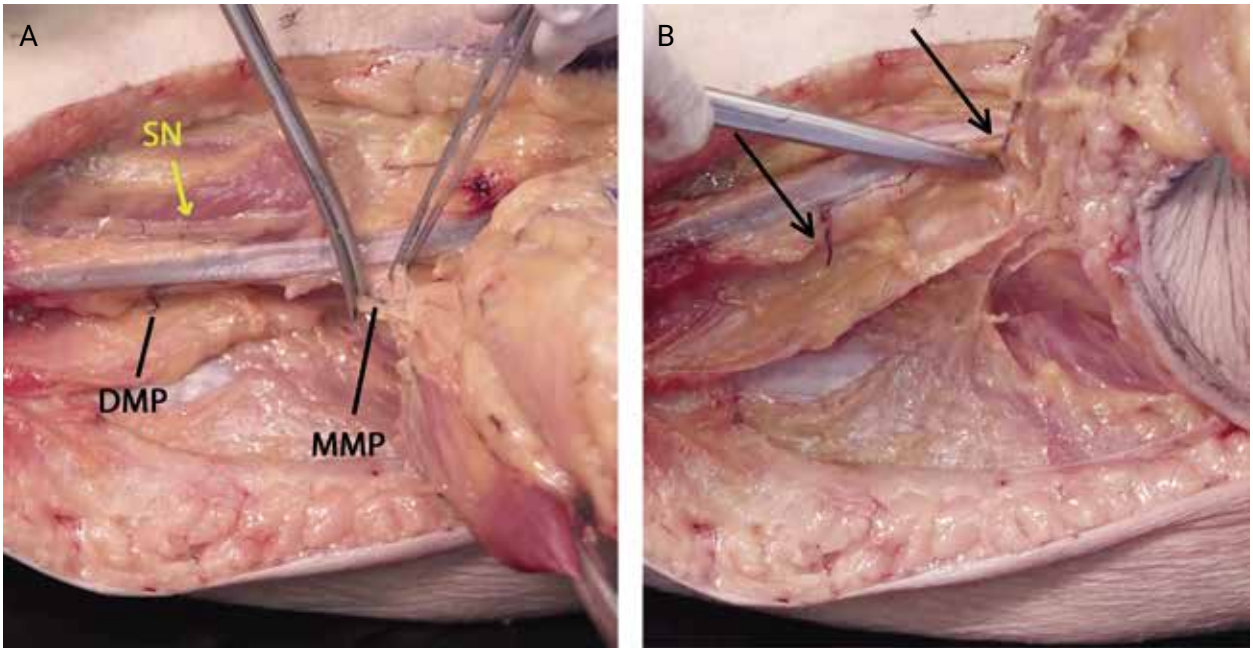

Figure 7.41. A) Secondary pedicles are identified, distal minor pedicle (DMP) and medial minor pedicle (MMP). Saphenous nerve (SN) is seen coursing down between the vastus medialis and gracilis muscles. B) Minor secondary pedicles are divided (black arrows) to allow further upward elevation of the muscle.

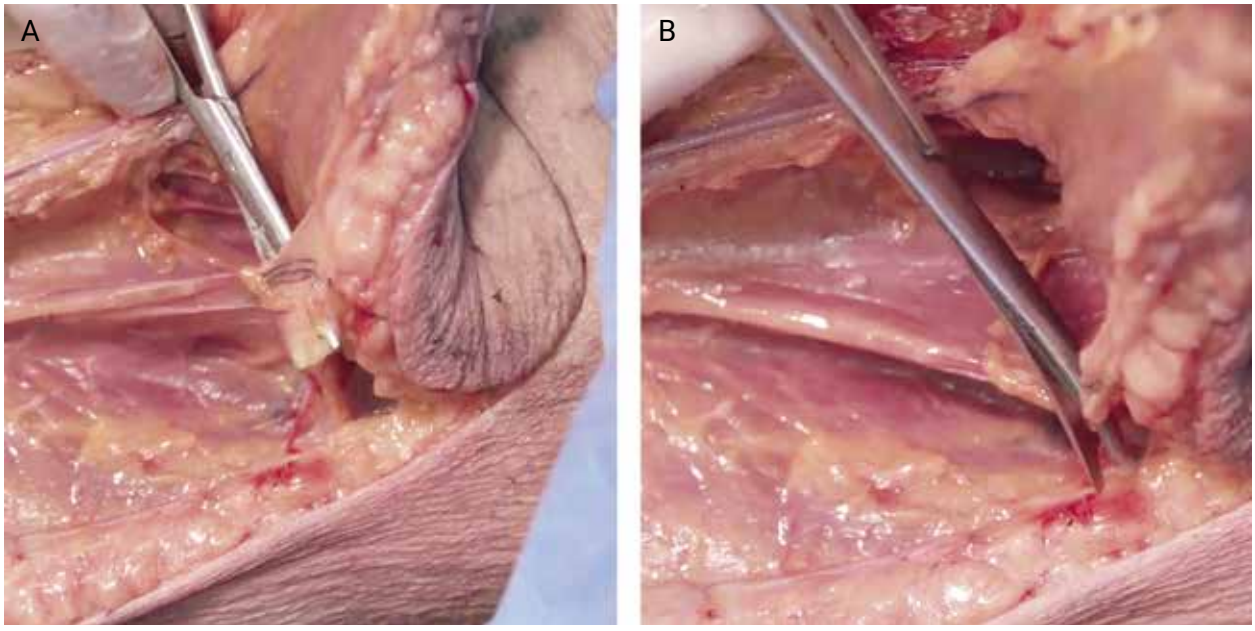

Figure 7.42. Fibrous attachments as well as secondary muscular or septocutaneous perforators entering the muscle from the posterior border of the Gracilis are localized and divided.

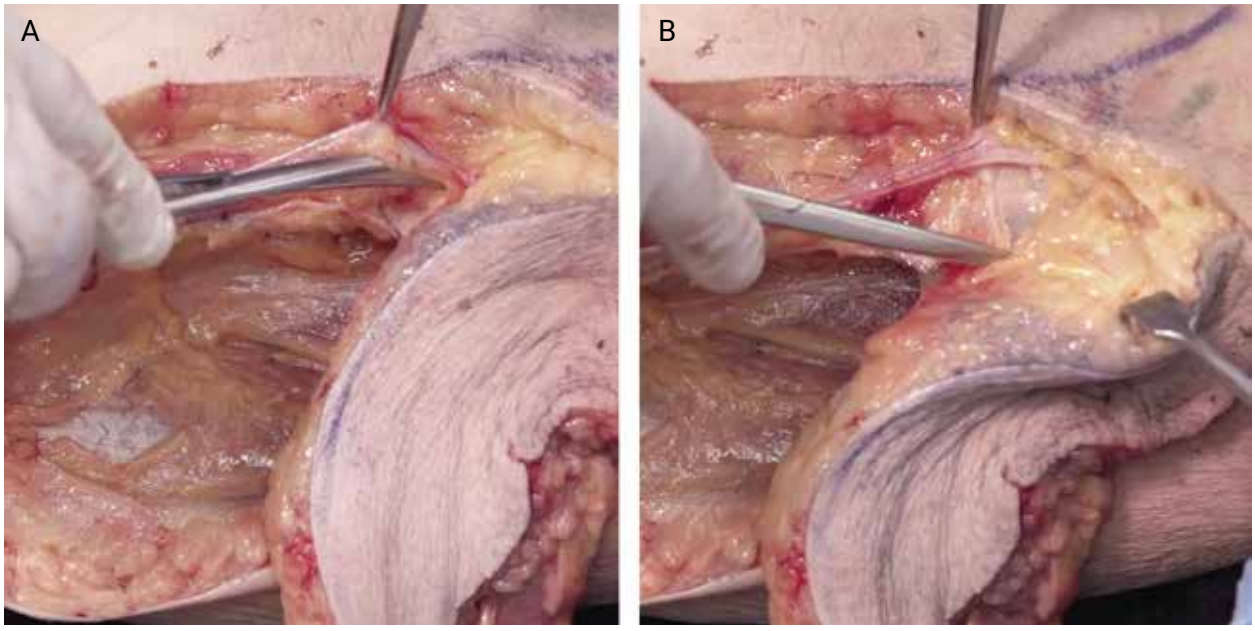

Figure 7.43. Anteriorly, elevation of the musculocutaneous flap follows the course of the saphenous vein.

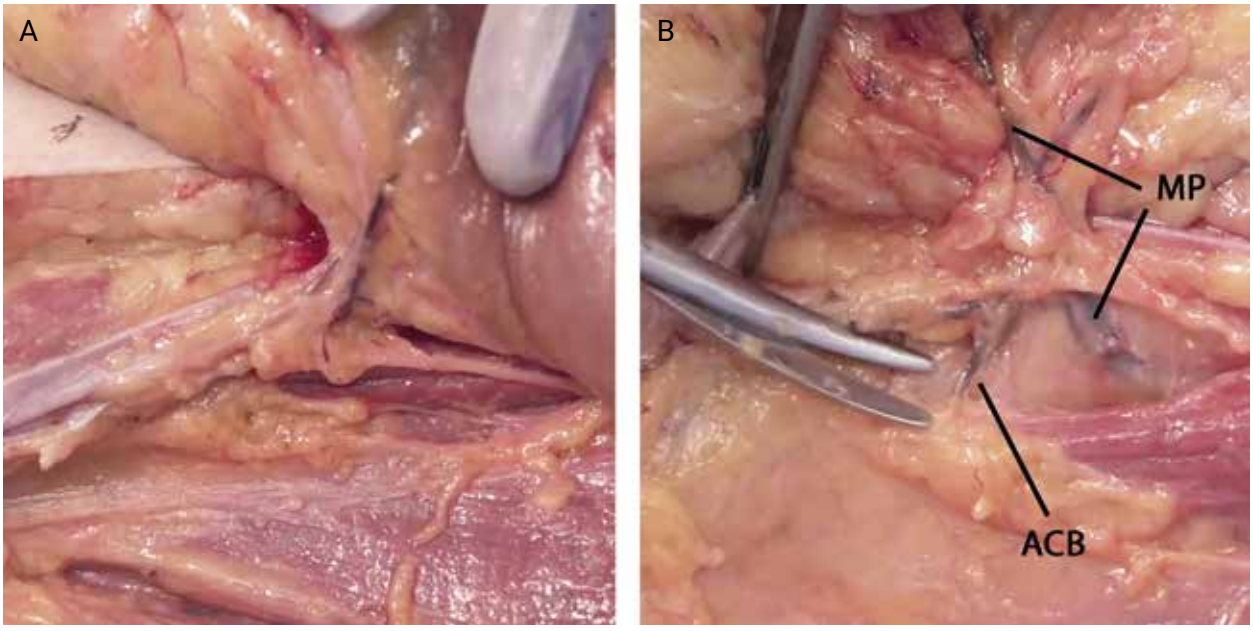

Figure 7.44. Referring back to the pedicle, if more rotation or a longer pedicle is needed, the main pedicle (MP) can be freed by dividing adductor collateral branches (ACB).

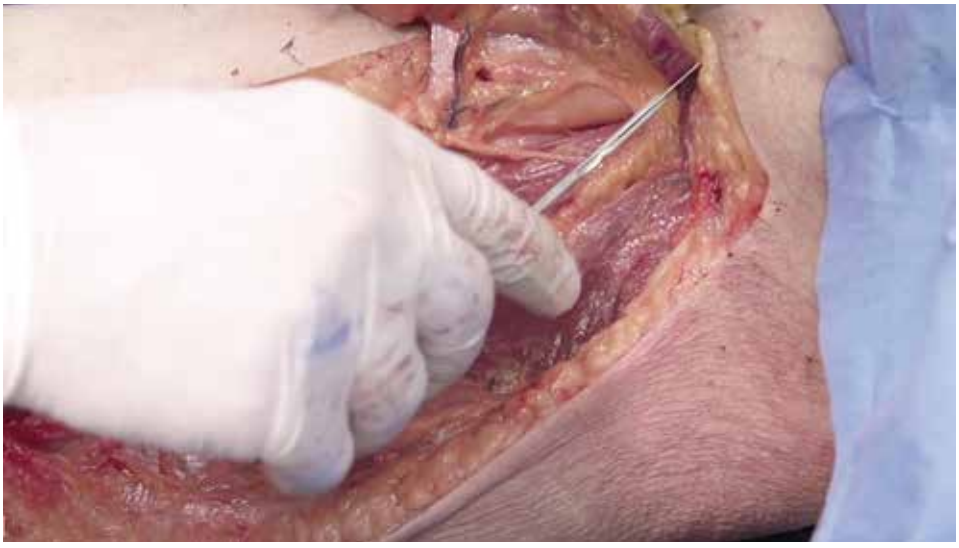

Figure 7.45. Once the pedicle has been completely freed, Gracilis muscle is divided proximally.

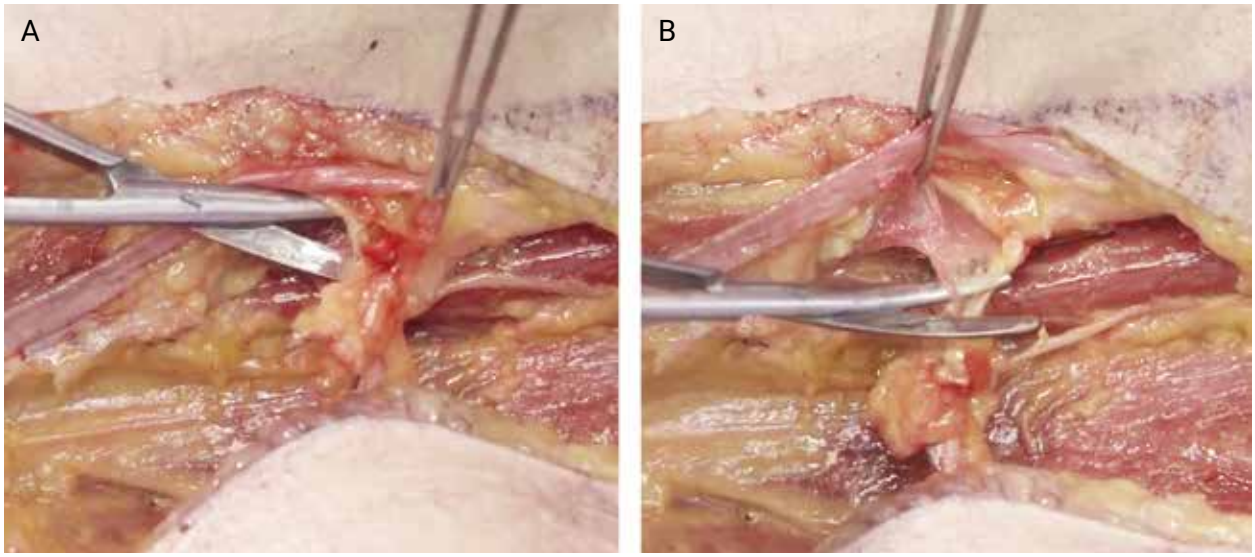

Figure 7.46. If extra length is still needed or free transfer is planned, vessels of the pedicle can still be liberated further from surrounding structures, taking extreme care in doing so.

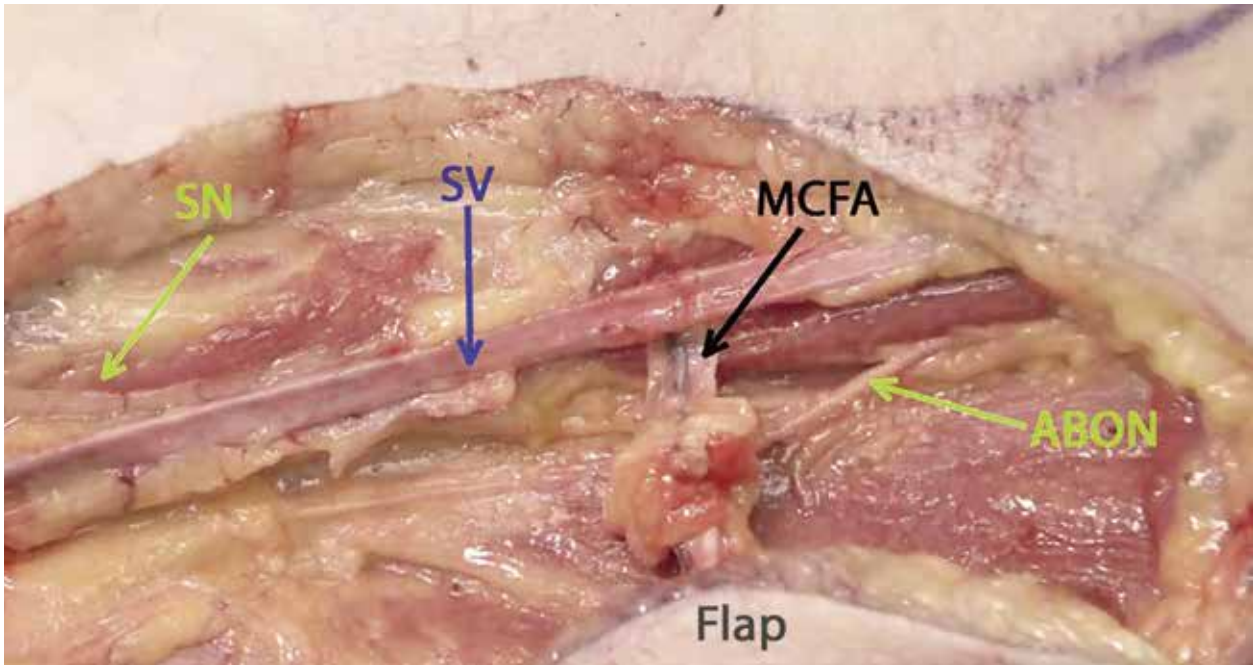

Figure 7.47. Gracilis muscle elevation can be performed accurately respecting all the important structures that surround the pedicle: the Medial circumflex femoris artery (MCFA); Saphenous nerve (SN), Saphenous vein (SV) and Anterior branch of the obturator nerve (ABON).

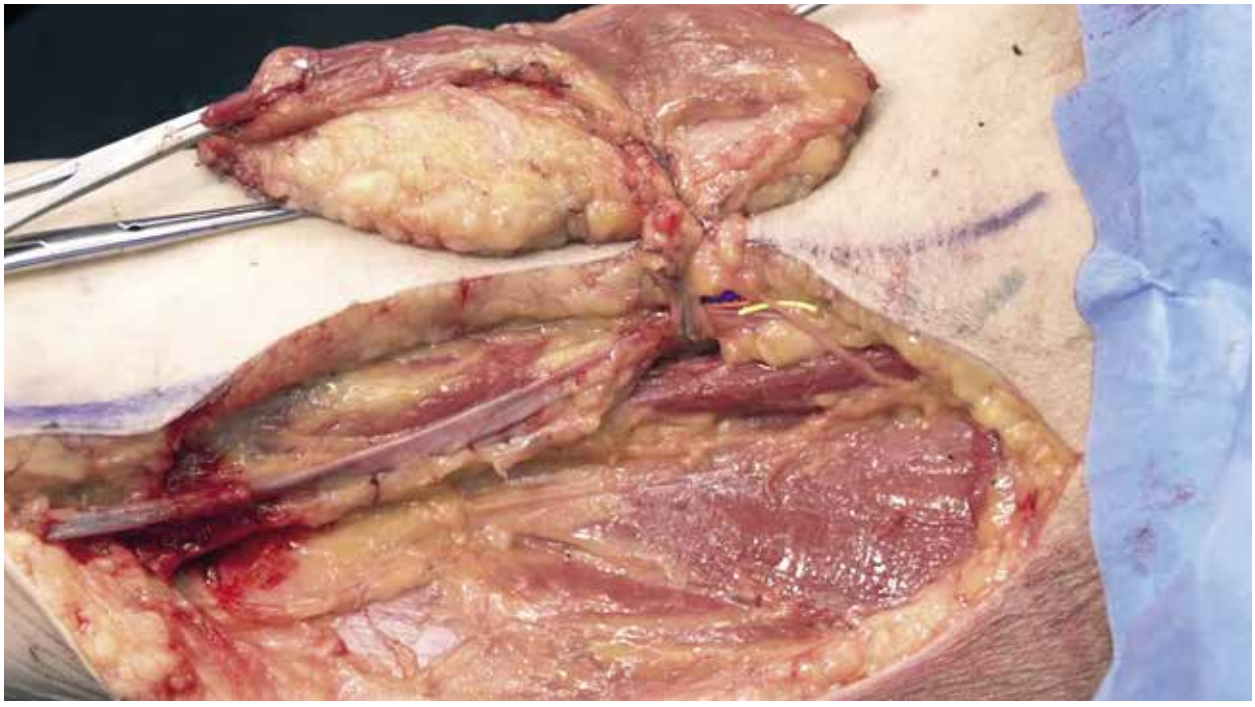

Figure 7.48. Musculocutaneous Gracilis flap already elevated, ready to be transferred.