# PROFUNDA FEMORIS ARTERY (ADDUCTOR) PERFORATOR FLAP

The constant search for a flap that can best fulfil all requirements was pursued, particularly in the field of breast reconstruction. Microsurgical techniques and perforator flaps made the Deep inferior epigastric flap (DIEP) the first option of choice for breast reconstruction. A short time later, the buttocks seem to be a good and reasonable option when no good tissue was available on the patients belly, but the buttocks have also their own limitations. The Profunda artery Perforator flap seems to be a better option for some authors[23] than superior or inferior gluteal perforator flaps.

Some confusion appears in the literature as perforator branches of the profunda femoris artery are found to supply different flaps from different cutaneous territories:

- Baek in 1983[8] described the lateral thigh flap, which was based on the third perforator of the *Profunda femoris artery.*
- Maruyama et al, in 1984, described a flap, the lateral thigh fascio-cutaneous flap, from the first perforator of the *Profunda femoris artery.*
- A flap called "Profunda femoris artery perforator" is also seen described in the literature[109]. It corresponds, in fact, to what was described by Baek, but showing three different levels of the lateral aspect of the thigh, depending if it is based on the second, third or fourth perforator branches from the lateral branch of the *profunda femoris artery.*
- A different flap was described by Angrigiani et al. in 2001[4], the adductor perforator flap; based on the adductor magnus muscle cutaneous perforator that is the first medial branch of the *profunda femoris artery.*
- Another flap with a fairly similar name has been published as the "*Profunda artery perforator flap*"[23].

Description of local anatomy and skin vascularization of the posterior and medial skin of the thigh was described by Cormack and Lamberty in 1985[24], but it is Angrigiani et al. who are credited to be the first describing and utilizing this flap in 2001[4] under the name of the Adductor flap.

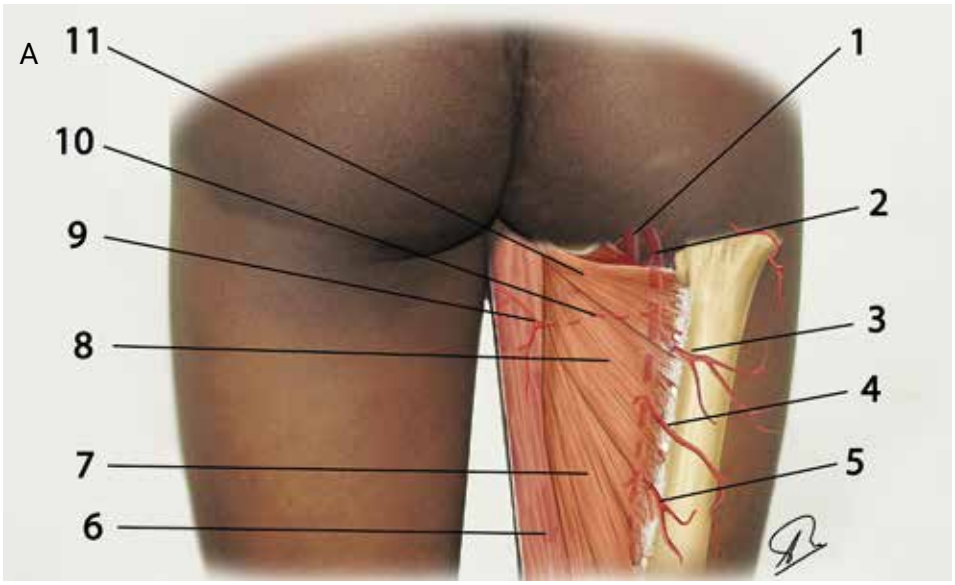
The Profunda femoris artery perforator flap (PFAP-first medial branch) basically transfers cutaneous adipose tissue from the medial posterior aspect of the thigh based on a perforator from the *profunda femoris artery* (or deep femoral artery)[4]. It is a relatively large flap (up to 30 x 23 cm) that is harvested from a hidden area that finally results in a more or less concealed scar on the groin or medial thigh, depending on the flap's design. It can be transferred as a pedicle or free flap. Despite these advantages, the flap can be rather narrow. According to McRae et al, it has an inconsistent dominant perforator location, which makes it mandatory to perform preoperative studies to localize the nourishing vessels[108].

## Indications

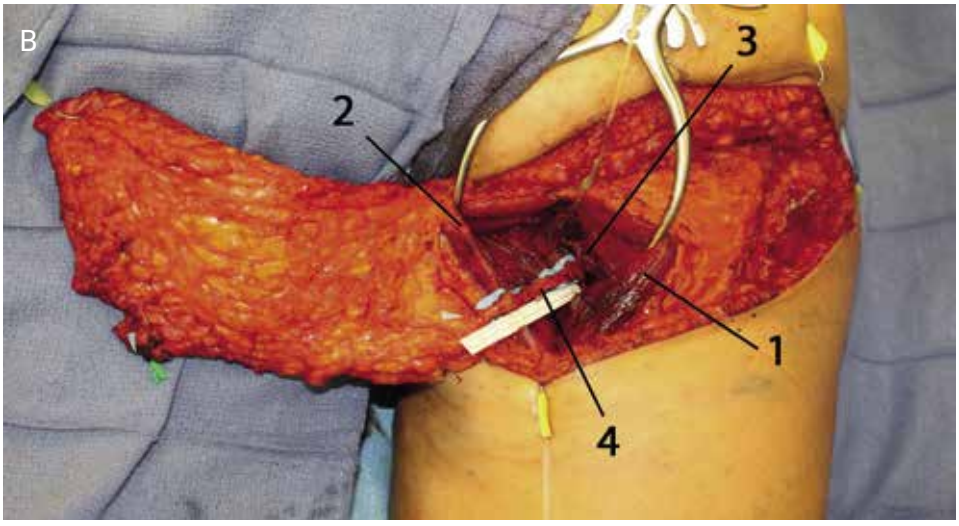
It can effectively cover and repair perineal defects or regional severe pressure sores as a pedicled or propeller flap[133]. As a free flap, it has been successfully used as a secondary option in small and medium size breast reconstruction.

## Anatomy and vascularization

The profunda femoris artery gives off lateral and medial branches. The lateral branches enter the adductor compartment at approximately 8 cm distal to the groin crease (see fig. 7.17). The first, or the more proximal, branch of the medial branches that originates from the *profunda femoris artery* (or deep femoral artery) vascularizes the integument of the medial subgluteal region. It courses medially and posteriorly between the Adductor longus anteriorly and the Adductor major and brevis muscles posteriorly to enter the mass of the Adductor magnus muscle. This is where it gives off multiple muscular branches. Finally, it traverses the muscle to enter the subcutaneous space, about 2-4 cm posterior to the posterior border of the Gracilis muscle. It runs in a postero-inferior direction, where its branches anastomose with those cutaneous branches coming from the Gracilis pedicle[3]. However, at the upper posterior thigh diverse angiosomes overlap themselves and consequently flaps from this area can be harvested based on different perforator systems, such as the inferior gluteal artery or medial circumflex femoral artery[108].




1. Superficial femoral artery
2. Deep femoral artery
3, 4 and 5: First, second and third lateral branches of the deep femoral artery
6. Gracilis muscle
7. Adductor Magnus
8. Adductor longus
9. Cutaneous perforator of the first medial branch of the deep femoral artery
10. First medial branch of the deep femoral artery
11. Adductor brevis




1. Adductor longus muscle
2. Gracilis muscle
3. Profunda femoris artery
4. Cutaneous perforator of the first medial branch of the deep femoral artery

**Figure 7.17.** Anatomical references and clinical dissection: A) Anatomical references. B) Clinical dissection of the PFAP flap.
First medial branch of the deep femoral artery (from Constance M Chen et al. (July 31st, 2013). Profunda Artery Perforator (PAP) flap for breast reconstruction, Breast Reconstruction- Current Perspectives and State of the art techniques, Aldona J Spiegel, IntechOpen, DOI: http://dx.doi.org/10.72/56332).

## Markings

The flap can be outlined in two ways, as a horizontal or a vertical ellipse, though the references are the same for both. It can be transferred as a pedicled flap, a propeller flap or a free flap. According to Angrigiani, the patient is positioned in supine position with the hip flexed and abducted and the knee also flexed. Under this position the adductor longus muscle is tensioned and the Gracilis muscle relaxed. When the leg is extended the Gracilis muscle becomes tensioned and can be easily palpated. A line is traced over the posterior border of the Gracilis muscle. Parallel to this line a new line is drawn 2 cm posteriorly. Over this line a point is marked 8cm distally to the inguinal crease.

The patient can also be accommodated (according to McRae) in the lithotomy position. Landmarks include the gluteal fold and groin crease, the Gracilis muscle medially and the posterior limit of the iliotibial band laterally. The skin paddle is harvested from the upper third of this area. The

Gracilis muscle is localized and the emergence for the pedicle is marked out in an area 2-4 cm posterior to the Gracilis muscle and about 8 cm inferior to the inguinal crease.

It will depend on the size and location of the defect and the convenience of a primary closing of the donor area, whether the flap will be harvest horizontally or vertically; as the flap can be designed in any direction and shape around the emergence point of the cutaneous branch of the posterior artery.

Doppler examination is highly advisable to localize the exact point of emergence for the artery.

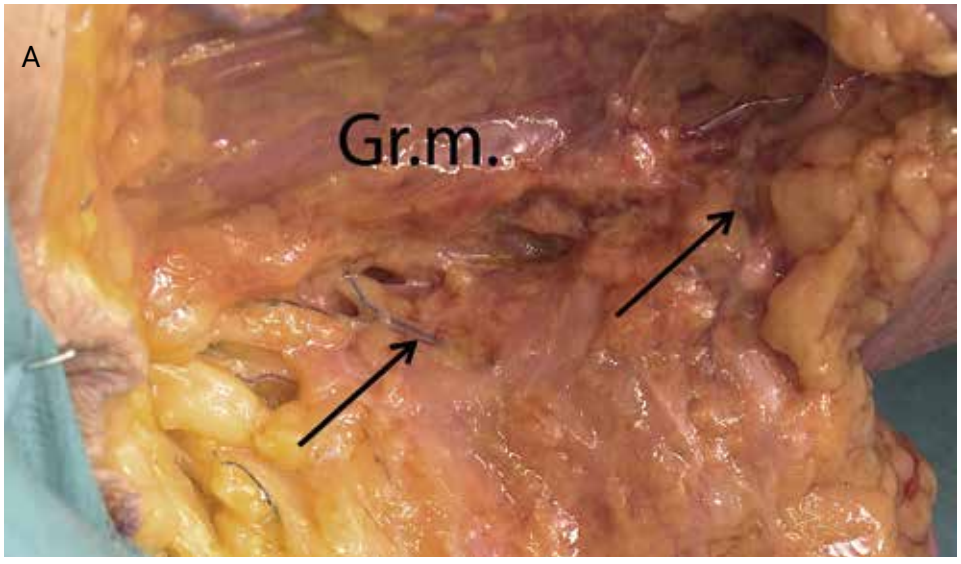
## Elevation

The flap can be elevated with the patient accommodated either in lateral decubitus supine position (3) or in supine-lithotomy position[108]. For technical details see legends below.

**Figure 7.18.** Profunda femoris artery perforator flap references: Adductor longus (AL) and Gracilis (G) muscles are localized as well as the inguinal crease. Between 2 to 4 cm posteriorly to the posterior border of the Gracilis muscle and 8 cm distal to the groin crease the PFA vessels are localized. In this Doppler examination (red cross) helps in localizing the exact point of emergence.

**Figure 7.19.** In this case the horizontal ellipse has been outlined. Incisions are made on the anterior aspect deep to the muscular fascia, over the Scarpa's aponeurosis. Continuing to proceed posteriorly over the fascia, the saphenous and pudendal veins are found. While the saphenous vein is respected, the pudendal vein is usually divided to gain access.


**Figure 7.20.** Dissection is made deep, to progressively expose the Gracilis muscle until its posterior border is visualised. This border is the reference surgical landmark to localize the perforator branches emerging from below.



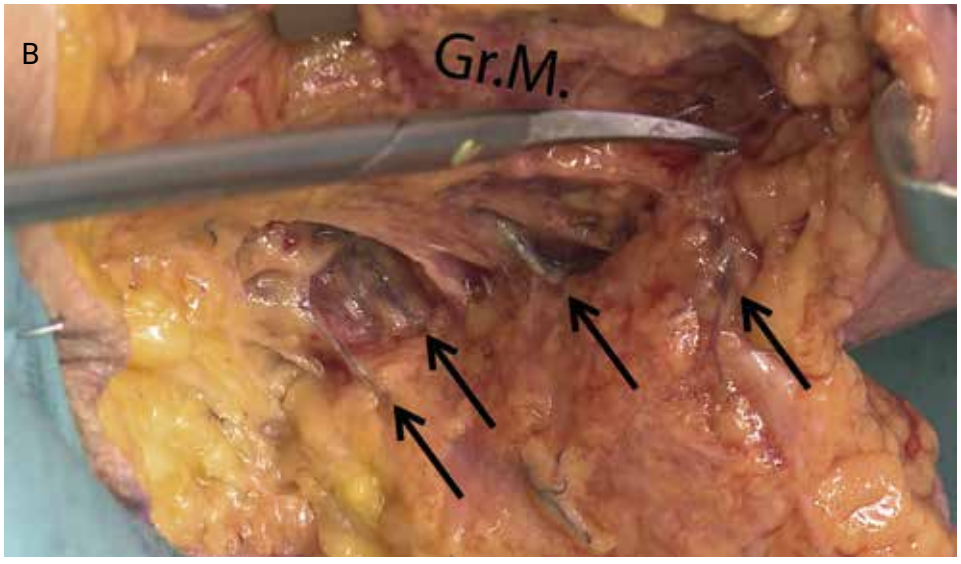




**Figure 7.21.** A) Cutaneous perforator branches reaching the subcutaneous tissue are seen emerging below the Gracilis muscle posterior border (Gr.m.). B) Upward retraction of the Gracilis muscle (Gr.M.) is elevated, allowing direct identification of more perforator branches, emerging through the Adductor magnus.

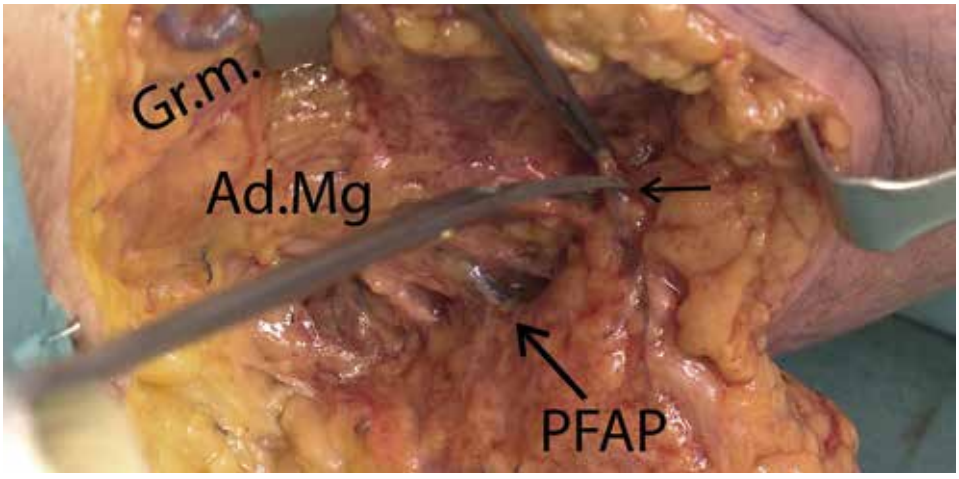



**Figure 5.22.** The smallest perforator vessels are discharged and divided (small arrow) while the larger branch (PAP) is preserved as the pedicle for the PAP flap. Gracilis muscle (Gr.m.), Adductor Magnus (Ad.Mg).

**Figure 7.23.** Once the selected perforator vessels entering the cutaneous paddle are isolated, the skin incision is completed.

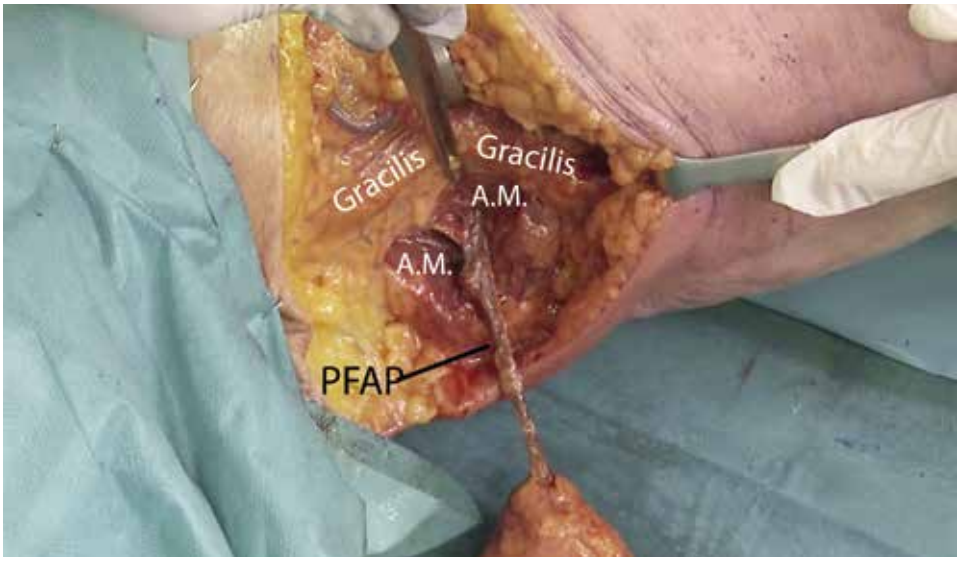



**Figure 7.14.** The flap is already elevated. The selected main perforator vessel from the Profunda femoral artery is seen emerging between the fibres of the Adductor Magnus (A.M.).

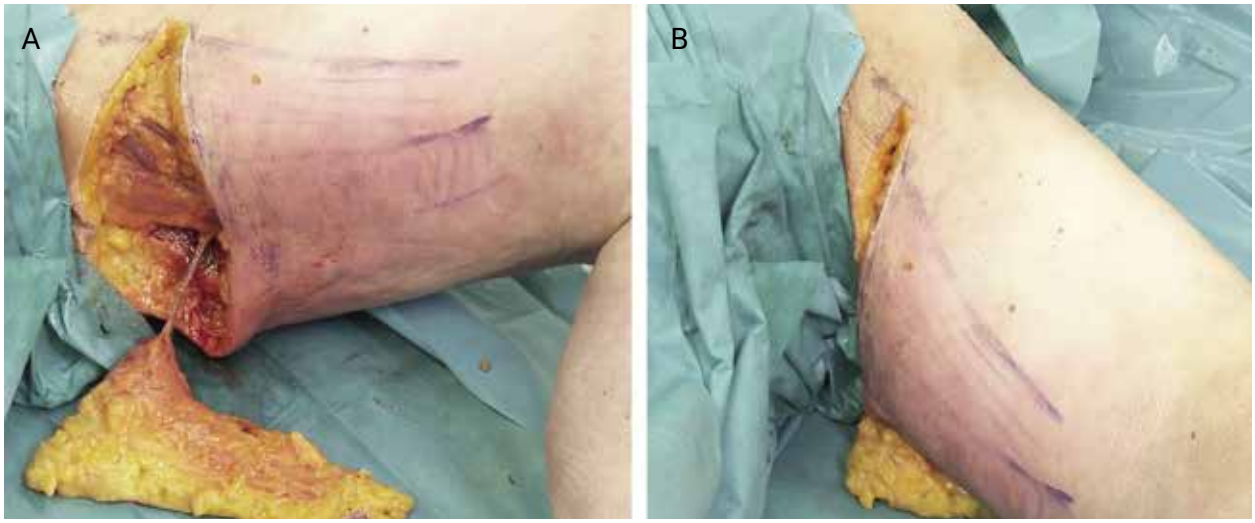



**Figure 7.25.** A) The Posterior femoral artery perforator flap is already elevated, based exclusively on one perforator. As can be seen, as a pedicled flap, it has a wide arch of rotation to cover defects on the gluteal regions, as well as along the entire groin. B) the donor area can be easily repaired and will be inconspicuous.