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Two New Free Flaps Developed From Aesthetic Surgery. II. The Inferior Gluteal Flap

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Abstract. A new vascular musculocutaneous flap from the lower buttock is described that is based on the inferior gluteal vessels and includes skin from the gluteal fold and a part of the gluteus maximus muscle. The inferior gluteal flap has been clinically used either as an island flap for sacral repair or as a free flap. The results of 6 clinical cases are presented and the features of the flap are exposed. The minimum residual deformity of the buttock contour and, even in some cases of trochanteric lipodystrophy, the cosmetic improvement of the donor site appearance are emphasized.

Key words: Microsurgery — Plastic surgery — Buttock surgery — Island flap — Free skin flap — Musculocutaneous flap

We have previously described a free flap composed of soft tissues generally discarded in reduction mammaplasty. We now present another new flap, proceeding from cosmetic surgery of the thighs and buttocks. The inferior gluteal flap is raised from the lower buttock area and is supplied by a musculocutaneous pedicle based on the inferior gluteal vessels.

Anatomy

We performed dissection in 20 male and female cadavers. In all cases, the inferior gluteal vessels were present on both sides and nearly symmetrical. The

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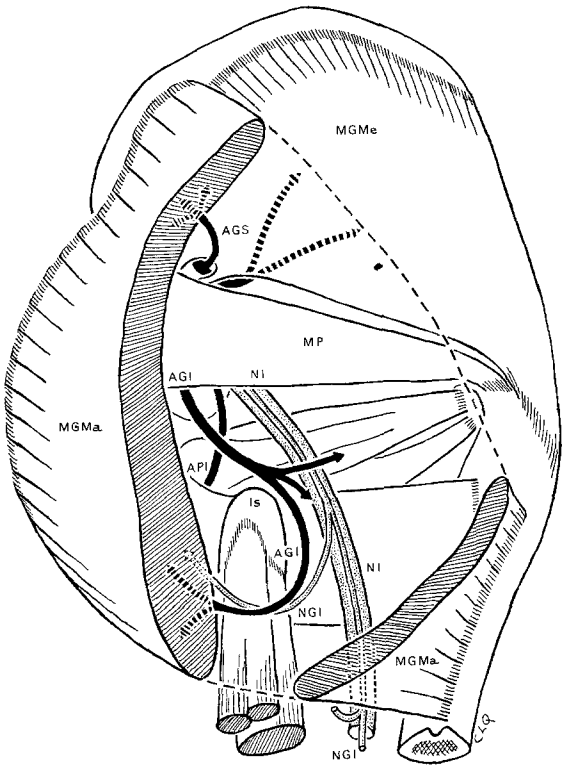

Fig. 1. Vascular anatomy of the buttock. AGI: inferior gluteal artery; AGS: superior gluteal artery; API: internal pudendal artery; NI: nervus ischiadicus; NGI: nervus gluteus inferior; MGMa: musculus gluteus maximus; MGMe: musculus gluteus medius; MP: musculus piriformis; Is: ischium.

inferior gluteal artery, a branch of the internal iliac artery, arises from the greater sciatic notch and crosses superficially the internal pudendal vessels and the pudendal nerve. Then the artery runs downward and outward just medially to the nervus ischiadicus (Fig. 1) and gives off one or several nutrient branches to this nerve. At the level of the ischium, the inferior gluteal artery partially divides into muscular branches, which enter the inferior part of the gluteus maximus muscle and, by mean of perforating branches, nourish also the overlying skin. These muscular branches penetrate into the undersurface of the gluteus maximus muscle within an area delimited medially by the ischium, laterally by the nervus ischiadicus, and extending vertically 3 or 4 fingerbreadths above the inferior border of the muscle. The external diameter of the artery after arising from the greater sciatic notch averages 2 mm. One or two venae comitantes course in parallel with the artery. The vascular pedicle is accompanied by a motor nerve from the gluteus inferior nerve, which gives off many branches to the gluteus maximus muscle. A sensitive nerve for the overlying skin crosses the inferior border of the muscle.

Dye injection shows that the skin area supplied by the musculocutaneous branches of the inferior gluteal artery spreads over a large surface on both sides of the guteal fold (20 cm vertically). The inferior gluteal artery may be demonstrated by arteriography, but this is not usually necessary.

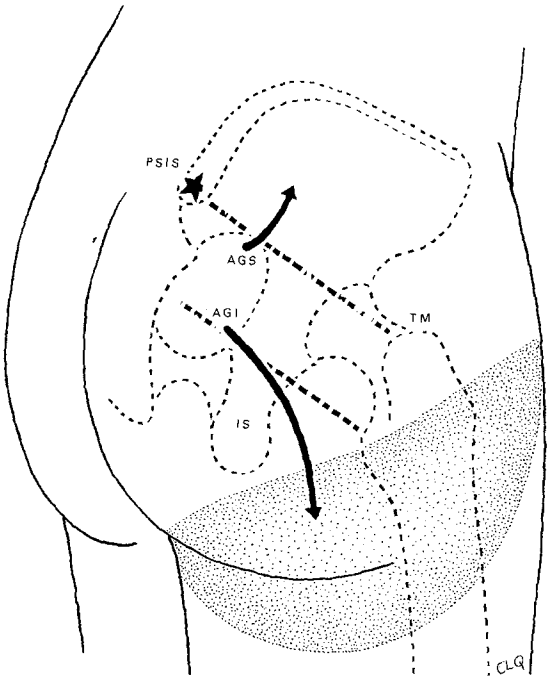

Fig. 2. Design of the inferior gluteal flap. AGI: inferior gluteal artery; AGS: superior gluteal artery; PSIS: posterior superior iliac spine; TM: trochanter major; IS: ischium.

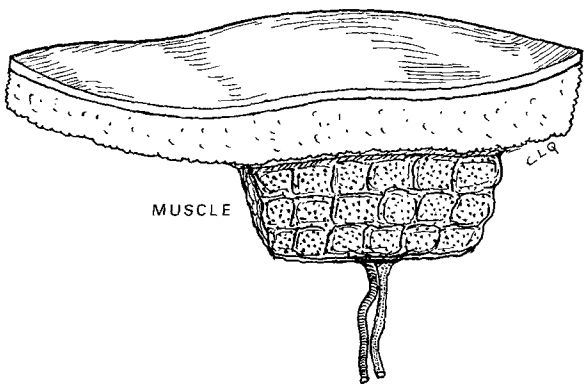

Fig. 3. Schema of the inferior gluteal flap with its musculocutaneous vascular pedicle.

Operative Technique

The design of the inferior gluteal flap is almost exactly identical to the resection for correction of the trochanteric lipodystrophy as described by Pitanguy [2]. The flap is outlined within a long, oblique, spindle-shaped area on the lower buttock and the upper thigh (Fig. 2). The gluteal fold represents the axis of the medial part of the design, and the medial extremity extends on the inner aspect of the upper thigh. The lateral part curves outward and upward on the lateral aspect of the hip toward the anterior superior iliac spine. The nutrient vessels penetrate the inner third of the flap, at its superior margin. The size of the flap

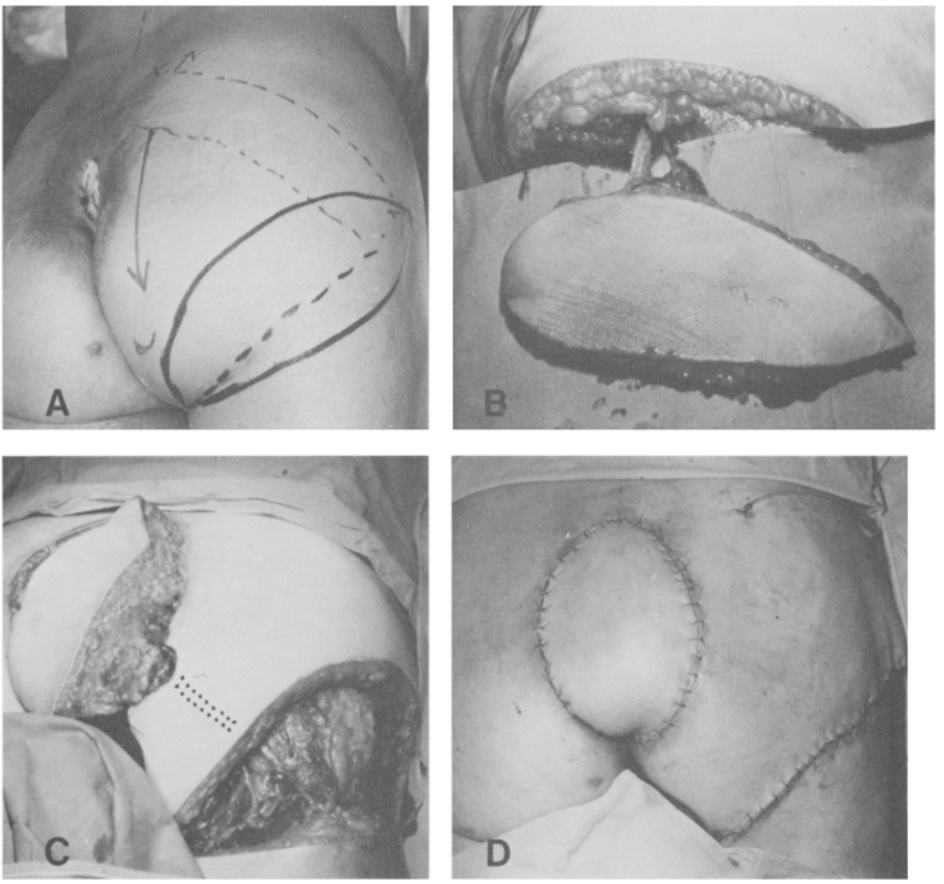

Fig. 4. Case 1. Inferior gluteal island flap. **A.** Radionecrosis of the sacral region in a male. The flap has been outlined. **B.** Inferior gluteal flap isolated as a vascular island flap. **C.** The island flap, passed through a subcutaneous tunnel to the sacral recipient site. **D.** At the conclusion of the operation, after direct closure of the donor site.

can be very large (35 cm × 20 cm) when there is notable hypertrophy of the region.

The flap is elevated from distal to proximal. Skin incision starts along the inferior margin of the flap and exposes directly the free inferior edge of the gluteus maximus muscle. The muscle is lifted by retractors with the upper border of the skin wound, so as to visualize easily the inferior gluteal vessels, which are elevated along with the undersurface of the muscle. One must be careful not to separate the subcutaneous and the muscular layers. Once the vascular pedicle is identified and located, the incision is extended along the superior margin of the flap, and the gluteus maximus muscle is transected at the same level without damaging the vascular bundle, which must be kept under direct vision. The flap is raised en bloc with a segment of muscle (10 cm × 10 cm), including the area where the nutrient vessels penetrate (Fig. 3). The vas-

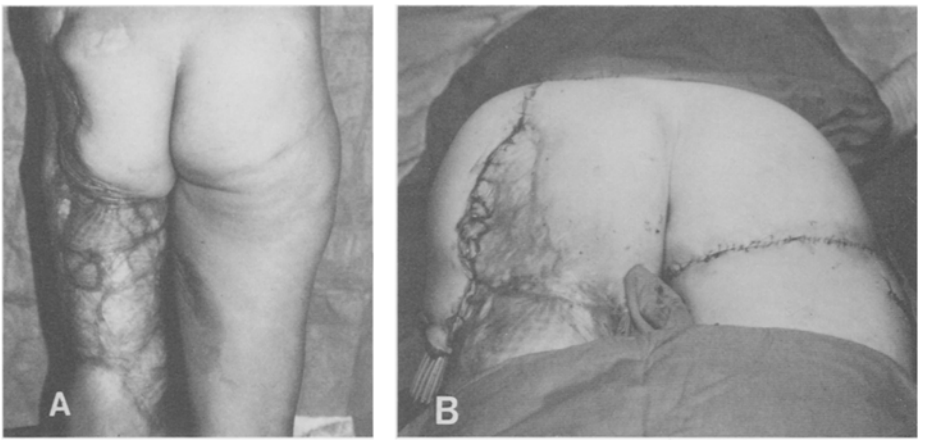

Fig. 5. Case 2. Free inferior gluteal flap. **A.** Traumatic defect of the lateral aspect of a buttock in a female with contralateral trochanteric lipodystrophy.
B. Buttock reconstruction by a free inferior gluteal flap from the opposite side. Eventual failure was caused by early postoperative rupture of the arterial anastomosis.

cular pedicle can be dissected upward between the ischium and the nervus ischiadicus, as proximally as necessary, but care is taken to preserve, when they are present, the nutrient branches to the nervus ischiadicus. Finally, the isolated musculocutaneous flap contains a smaller amount of muscle than of overlying skin.

Direct closure of the donor site is always possible by undermining and advancement of both edges of the wound. Closure of the muscular defect is not necessary. The scar is located in the new gluteal fold.

Clinical Results

We have used the inferior gluteal flap in 6 clinical cases since January 1977. We performed 1 vascular island flap and 5 free flaps with 1 failure.

Case 1 (Fig. 4).

A 52-year-old male had a sacral radiodermatitis with radionecrosis. The defect after excision exposing the sacrum was repaired by an island inferior gluteal flap, through a subcutaneous tunnel and with direct closure of the donor site.

Case 2 (Fig. 5).

A 23-year-old female had a traumatic amputation of the entire lateral aspect of the left buttock in a traffic accident. Primary repair was done by skin graft. The contralateral side was bulky and suitable as a source of a large free inferior

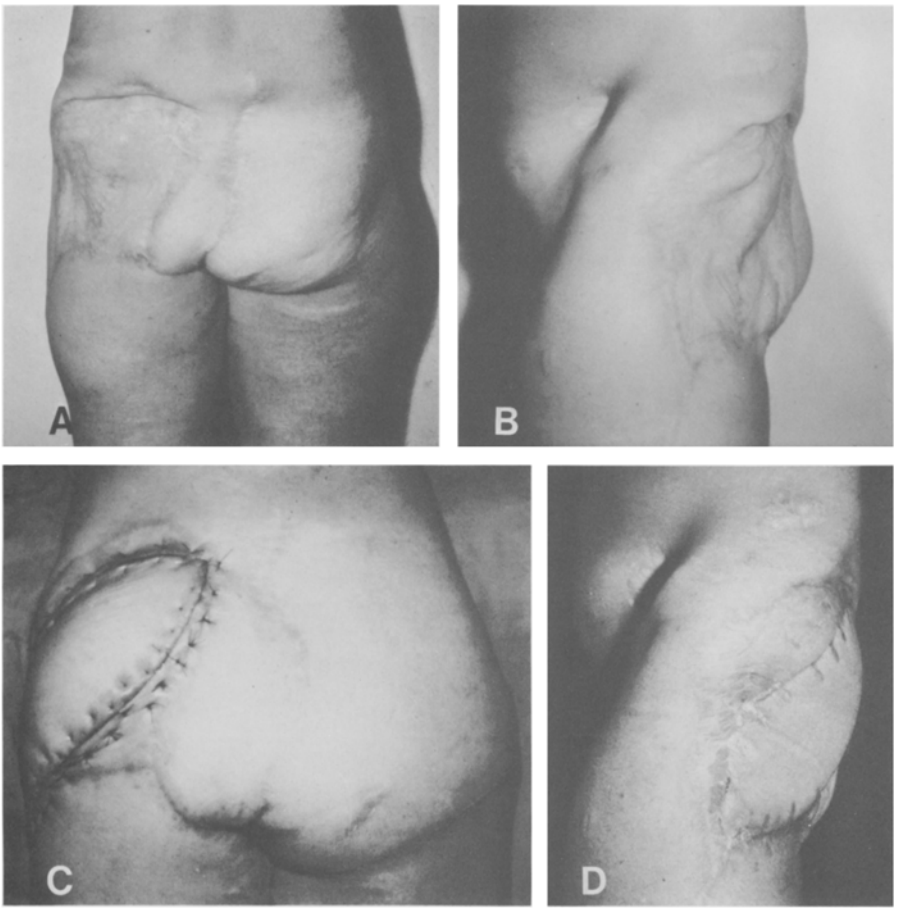

Fig. 6. Case 3. Free inferior gluteal flap. **A** and **B.** Traumatic mutilation of the left buttock in a female, posterior and lateral aspects, respectively. **C.** Early result of repair by a free inferior gluteal flap from the opposite hypertrophic side. **D.** Result at 2 years, lateral aspect.

gluteal flap. The flap was revascularized by end-to-end anastomoses to the superior gluteal vessels on the mutilated side. Unfortunately, during the night following the operation, the arterial anastomosis broke and, because of hemorrhagic shock, the flap had to be removed. The nutrient artery was probably severed by contractions of the gluteal muscles on the recipient site.

Case 3 (Fig. 6)

A 20-year-old female had a similar lesion of a buttock as in case 2. The mutilated buttock was reconstructed by a free inferior gluteal flap from the contralateral side. The recipient vessels were the superior gluteal vessels, with

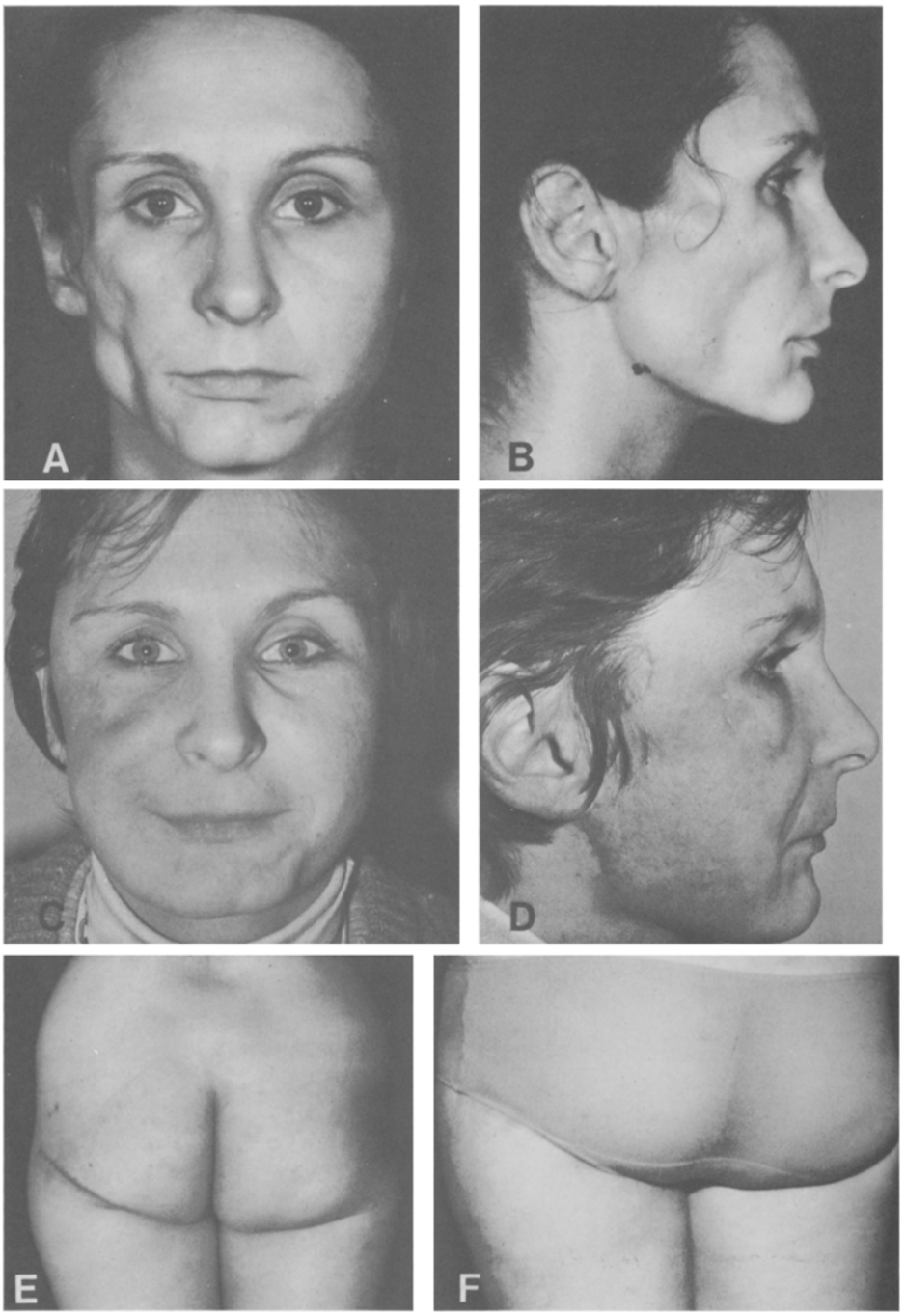

Fig. 7. Case 4. De-epithelized free inferior gluteal flap. **A** and **B.** right hemifacial atrophy in a female, full-face and right lateral views, respectively. **C** and **D.** Result at 2 years postoperatively. **E** and **F.** Scar on the donor site, in the left gluteal fold.

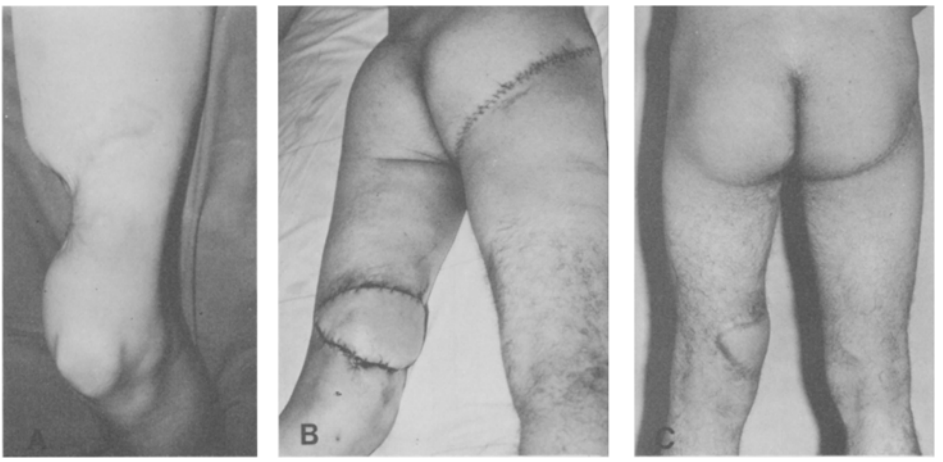

Fig. 8. Case 5. Free inferior gluteal flap. **A.** Traumatic defect of the inner side of the lower thigh in a male, anterior aspect. **B.** Repair by a free inferior gluteal flap from the opposite buttock. **C.** Result at 2 years, posterior aspect.

end-to-end anastomoses. The result after 2 years shows a bulky buttock on the reconstructed side and a cosmetic improvement of the donor side, which was hypertrophic.

Case 4 (Fig. 7)

A 32-year-old female required repair of an hemifacial atrophy. She had a free de-epithelized inferior gluteal flap, as a dermal-fat muscle flap, with end-to-end anastomoses to the facial vessels. Two defatting operations, along with removal of the muscular tissue, were performed. The result after 2 years is still satisfactory, and the donor site scar is easily concealed in the gluteal fold.

Case 5 (Fig. 8)

A 30-year-old male had a deep traumatic loss of soft tissues of the inner aspect of the lower thigh. The exposed femoral vessels were primarily covered by a split skin graft. When the patient was seen in consultation, the healing of the defect was achieved. Secondary repair was performed by a free inferior gluteal flap from the opposite buttock. End-to-end anastomoses were done with a muscular branch from the femoral artery and the internal saphenous vein. Although initially the donor site was not hypertrophic, the result after 2 years showed that the buttock was not made unsightly by the removal of the flap.

Case 6 (Fig. 9)

An 8-year-old boy was referred for treatment of sequelae of a Volkman's contracture with bone defect and loss of the soft tissues of a large part of the fore-

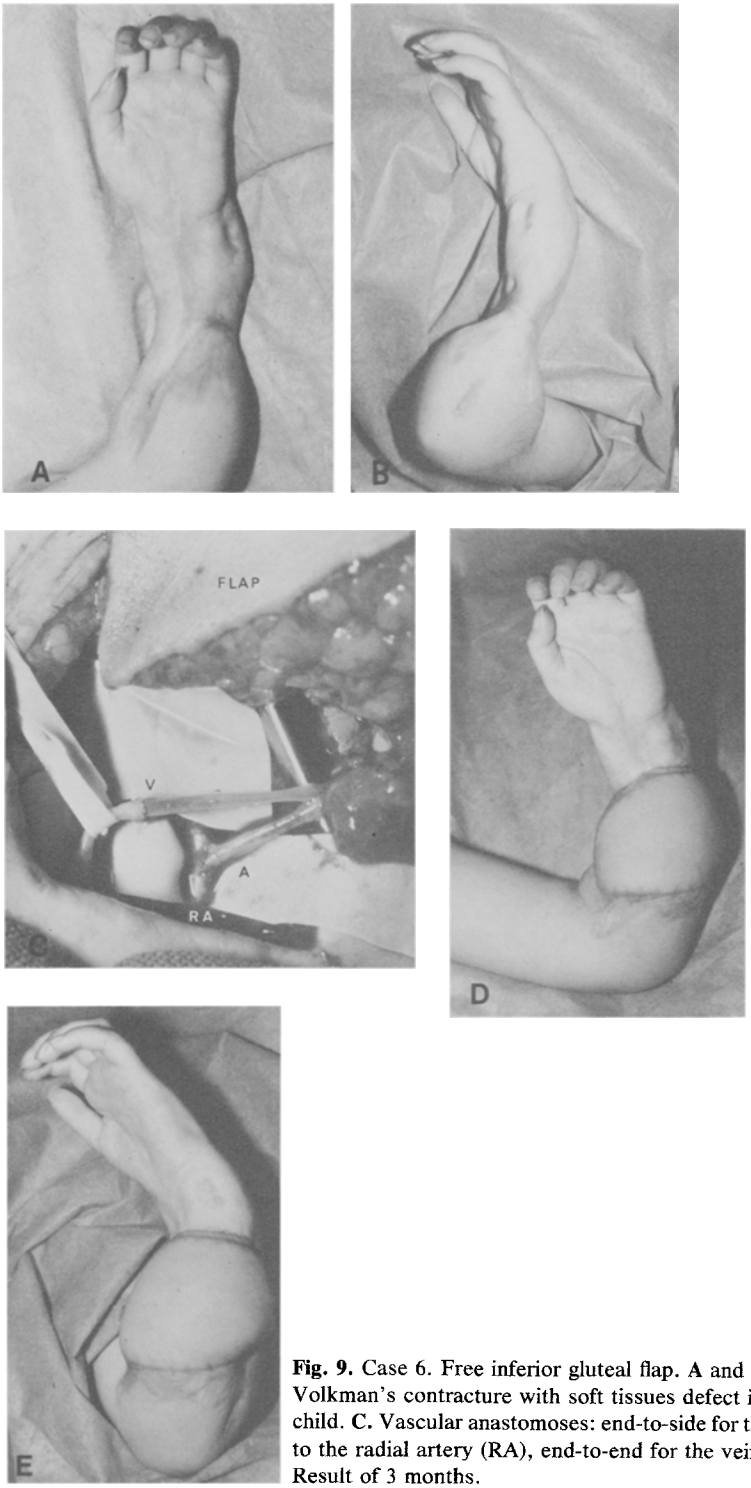

Fig. 9. Case 6. Free inferior gluteal flap. **A** and **B.** Sequelae of Volkman's contracture with soft tissues defect in an 8-year-old child. **C.** Vascular anastomoses: end-to-side for the flap artery (A) to the radial artery (RA), end-to-end for the vein (V). **D** and **E.** Result of 3 months.

arm. Skin defect was first repaired by a free inferior gluteal flap. The recipient vessels were the radial artery and a subcutaneous vein, with end-to-side arterial anastomosis. In this child 8 years aged, the inferior gluteal artery had nearly the same caliber as the radial artery. Direct closure of the donor site was done in the same way as in an adult.

Discussion

Many arterialized skin flaps and musculocutaneous flaps from various donor sites have been described with successful clinical use. In the buttock area, Fujino and colleagues [1] described a musculocutaneous flap that was first used as a free dermal-fat muscle transfer for reconstruction of the breast and pectoral region. This free flap was based on the superior gluteal vessels and included the upper third of the gluteus maximus muscle. The donor site scar and deformity were located in the region of the hip and of the upper buttock. The inferior gluteal flap contains the same muscle as Fujino's flap, but the vascular pedicle and the donor site are different.

The advantages of the inferior gluteal flap are:

1. A potentially large size, because the gluteal fold can open out and offer a great reserve of available skin. Our aim in studying and developing this new flap was to use the soft tissues that are discarded in cosmetic reduction surgery. Initially reserved for female patients with trochanteric lipodystrophy, the use of this flap was extended to women without notable hypertrophy of the buttock region, and finally extended also to male patients and even to children.
2. A reliable vascular pedicle including 1 artery and 1 or 2 veins. The vascular stalk is in the range of 4–10 cm long. The artery measures more than 1.5 mm in diameter at the proximal level. Moreover, the presence of a motor nerve for the gluteus maximus muscle accompanying the vascular bundle and a sensitive nerve for the overlying skin suggests the possibility of raising a neurovascular composite free flap.
3. A donor site scar well situated in the gluteal fold with a lateral extension easily hidden by the bikini and without conspicuous deformity of the buttock. Furthermore, a cosmetic improvement can be obtained in obese patients with "riding breeches" adiposity. Partial removal of the gluteus maximus muscle does not leave any residual functional disorder.

The disadvantages of the inferior gluteal flap are:

1. A large bulk because, even if a small amount of muscle is included, the subcutaneous fat layer is always very thick.
2. The necessity for the patient to lie on his stomach during the flap elevation. Flexion of the thigh is avoided for 1 week postoperatively.

Finally, the inferior gluteal flap is a vascular musculocutaneous flap that is reliable and available for sacral coverage as an island flap or for free transfer when a large and thick flap is needed.

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