

Surgical protocol

CALF ATROPHIES

3D Custom-Made Implants technique



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PREFACE

The aesthetic defect in congenital calf atrophy most often involves the gastrocnemius muscles.

The deformity can also be acquired as a result of a disease such as poliomyelitis, Spina Bifida, Charcot-Marie Tooth; or as a consequence of injury or surgical treatment such in clubfoot, Achille's tendon rupture, and foot amputation. The atrophy can also affect skeleton.

The functional impact might be moderate but the aesthetic appearance due to the loss of volume in the leg, often leads to significant complexes and strong impact on quality of life.

Corrective surgery using standard prefilled cohesive gel calf implants is possible, however, customised 3D silicone elastomer implants are more accurate in correcting the shape and volume of the calves, set up for life, with no risk of rupture in the long-term.

The procedure gives an immediate and definitive result. It is quick, one-off (only one operation), with a low risk of complication.

PHOTOS AND SCAN

Photos front and back of the legs (standing, parallel feet) have to be taken to get the real shape of the calves.

A CT scan of the leg is performed under the following conditions to obtain the best data for the design:

- The patient is in supine position (dorsal decubitus), legs extended, wedge is placed under the heels to avoid calves muscle compression and distortion,
- The feet need to be vertical and parallel.



PRE-OP

Measurement and marking of the prototype and implant

The non-sterile implants prototype, a permanent marker and a measurement tape are used to draw on the skin the location of the implant's pocket:

- Draw the intermuscular saphenous midline (between medial and lateral gastrocnemius).
- Mark the distance between the medial malleolus and the lower end of the implant (marked on the prototype) on both sides.
- Place of the prototype(s) on the calf in the right direction («prox» upwards), tracing its outline with the permanent marker.
- Draw the surgical incision, 1 cm below the popliteal fold, as a 8cm horizontal line (depending on the number of implants), in the central or lateral part.



Digital image of the implants



Prototypes on the skin and Pre-operative draw

Case operated by Dr. Facchini (Italy)



Dorsal view



Frontal view

Patient preparation

- Standard shower, scrubbing of hands and feet, short nails with no nail polish.
- Intravenous antibiotic cefazolin 2G at induction, 30' before incision.
- Patient in prone (decubitus) position, with support, arms along the body.
- Antiseptic preparation, drapes, checks, light adjustment.

SURGERY

Insertion of a single medial implant

Incision

- A 6 cm popliteal skin incision is made with a cold knife (no adrenaline infiltration).
- The surgical assistant separates the skin edges with two Gillies hooks.
- The incision is continued from the subcutaneous plane to the aponeurotic plane with an electric scalpel, short guarded electrode (ideally Stryker Colorado tips); otherwise sheath the electrode to avoid burning the edges of the skin.



Dissection

- At the aponeurotic plane, a 4 cm caudal suprafascial dissection is made.
- The surgical assistant uses two Farabeuf retractors.
- A 2cm incision is made in the medial gastrocnemius fascia using the electric scalpel then extended to 5cm using scissors.
- The avascular space between the premuscular and retrofascial avascular space is easily

identified and separated. The dissection is facilitated by the use of a long «Lambotte lever».



Landanger Medical Device «Lambotte lever double L : 290MM - J52150»

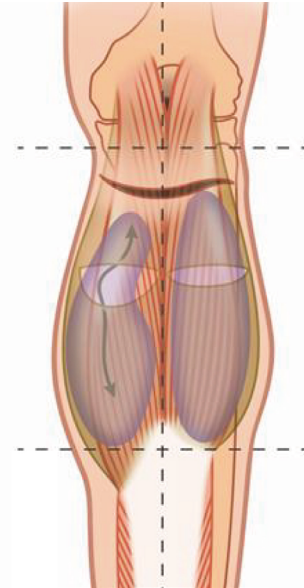
- The boundaries of the pocket drawn on the skin and the intermuscular septum must be respected to protect the perforating vessels of the intermuscular septum and avoid lodge compression.
- No haemostasis is required in the avascular space.

Insertion

- The surgeon changes his gloves, the skin is cleaned, clean drapes are placed and the implant is requested.

The instrumentalist takes the second sterile pouch containing the implant (in case of accidentally dropping it, the implant could still be recovered sterile).

- The surgeon checks the cavity and its limits one last time and completes the haemostasis if necessary. The surgeon then asks the scrub nurse or assistant to open the pouch containing the implant, and takes it.
- The semi-rigid implant is inserted in the accurate position: the tapered part downwards («prox» upwards), to the caudal limit of the outline marking.
- A 5 cm pocket is finger-dissected under the popliteal subaponeurotic and the popliteal (proximal) end of the implant is inserted into this pocket for stabilisation.



Stitches

- 2-layers closure with 3/0 Monocryl, intra-dermal overlay on the skin.
- The incision of the aponeurosis is not stitched: the cranial pole of the implant is self-locked in the short popliteal pocket.

The use of absorbable braided stitches such as Vicryl or Polysorb is not recommended for subcutaneous use, as they are more likely to pick up saprophytic germs from the skin, especially if the numerous knots lead to the formation of a rigid «braid» which risks moving outwards, a real highway for saprophytic skin germs with rapid seeding of the entire stitch line and then of the implant.

- The dermal plane is stitched with 3/0 Monocryl in a continuous intradermal suture.
- The continuous suture must flow well: it is blocked by making a single small knot at one end which will be locked in place by a longitudinal pull.
- The thread is cut 3 cm from its exit and held in place by a steri-strip.
- Standard dressing is used (Cicaplaie).
- Light circular restraint with Terylene felt bands (Rolta) and then Velpeau bandages.

Succion drainage is not required.

Insertion of 2 or 4 implants

- Atrophy correction can involve only one calf muscle (gastrocnemius medialis described) or two with the gastrocnemius lateralis.
- In the case of two muscles, the surgical incision is extended to 8 cm and the same procedure is performed on the lateral compartment, respecting the intermuscular partition and the skin marking lines. The caudal poles of both implants are at the same level.
- The placement of four implants, two on each side, is used for bilateral calf aesthetic augmentation or Charcot-Marie-Tooth disease (CMT).
- The surgery time ranges from 30 to 45 minutes depending on the number of implants.

Advantages of customised implants:

- The elastomer is semi-rigid: it is easily inserted under the muscle fascia.
- Its adapted shape stabilises it distally in the funnel of the aponeurotic lodge and in the proximal detachment (no popliteal migration).
- No risk of rupture in the long term.
- Its chosen consistency and shape guarantee a satisfactory result.
- No risk of compartment syndrome if the space is accurate for the implant (easy insertion).

POST-SURGERY

- **D+1:** progressive stand up with the help of the physiotherapist after massage and gentle mobilisation, cautious assisted walking then with forearm crutch.
- **D+2:** Control: the base dressing is changed to a Mepilex border EM 9x15 Monlyncke hydrocolloid dressing. The dressing is maintained for 8 days without being changed (no home nurse). The patient can take a shower without it being changed.
Walking range is increased, discharge in the evening with painkillers.
It is recommended that patients walk carefully and rest with their legs elevated.
- **D+8:** Check-up consultation. Dressing is changed, check for seroma.
- **D+15:** Check-up consultation. Dressing is removed, painkillers are stopped as appropriate.
- 3-month and 1-year check-ups or in case of direct trauma (risk of haematoma and then infection).

COMPLICATIONS AND THEIR PREVENTION

Skin suffering

The skin of the calf is vascularised by the aponeurosis of the gastrocnemius muscles and by the perforans of the septum that separates them. It is important to ensure the integrity of this vascular supply.

The introduction of a large implant in a subcutaneous position can lead to insufficient vascularisation and necrosis.

The subaponeurotic placement of two medial and lateral implants described by Glicenstein prevents this serious complication.

Compartment syndrome

This acute ischaemic syndrome is caused by excessive tension due to the narrowness of the compartment in relation to the size of the implant.

Prevention is ensured by preparing a sufficiently large subfascial compartment using a separator so that the implant can be inserted without difficulty or tension.

In case of early signs of oedema and venous stasis. The implant must be removed urgently

SILICONE ELASTOMER PROPERTIES

The implant is made from a medical grade silicone elastomer and chosen according to its firm consistency in the medial part, flexible laterally and ending in "airplane wing". The insertion via a short incision is made possible by the possibility of folding it. The edges of the implant are very

thin and therefore not visible.

This material is a foreign body, there is no immune rejection or reaction. A classic fibrous encapsulation occurs which is an exclusion reaction and removes the risk of further contamination by blood.

It is a solid rubber silicone elastomer: there is no risk of tearing, perforation or rupture, even in the long term. There is never any capsular contracture.

Unlike silicon-gel-filled breast implants, these implants can be kept for life. With the implant being a smooth surfaced silicone elastomer and in the absence of a macro-textured surface, the long-term development of anaplastic large-cell lymphoma recently described for some breast implants has not been reported to date.

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VIDEOS

Step by step surgery guide

(bit.ly/Calf-Atrophy-Surgery-Training-video)



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