

# Leg Augmentation Surgical Procedures: A Review

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## Abstract

**Background:** Different studies have been published over time for leg augmentation, but, to the best of our knowledge, no comprehensive literature review and complications analysis have been published.

**Objectives:** The aim of the study is to analyze the leg augmentation surgical procedures and complication rates associated with the investigated techniques, namely subfascial and submuscular implant placement, fat grafting or lipofilling, and Muscular Sculpting (MS).

**Materials and methods:** A literature review on the PubMed database was performed for clinical studies regarding leg augmentation surgical procedures. The authors selected and analyzed articles among the actual literature on this field and reported personal experience in leg augmentation surgery for an athletic look. Four different surgical techniques have been reviewed, excluding medical procedures: subfascial and submuscular implant augmentation (n patients = 166), fat grafting (n patients = 266) and MS (n patients = 6).

**Results:** Legs augmentation present complications compared to other implant techniques for body contouring such as gluteal augmentation, breast augmentation and pectoral implants for male chest enhancement. The submuscular implant placement complication rate was 5.7%. Fat grafting and MS complication rate are not statistically significant.

**Conclusions:** Legs augmentation, with all reviewed surgical techniques, has a low rate of complications, but a high rate of satisfaction among patients. Muscular Sculpting (MS) has no statistically significant complications. Fat grafting and MS have the lowest rate of complications, but for Fat Grafting multiple sessions are required. Specific complications of implants, such as capsular contracture, malposition or rupture, are less common compared to the use of implants for other cosmetic purposes. Procedures should always be performed by experienced plastic surgeons.

**Keywords:** Body contouring, Sculpting, Liposuction, Legs, Muscle definition, Athletic body

## Introduction

Calf augmentation is indicated for cosmetic reasons or for reconstruction of a shrunken lower leg resulting from injury, illness, or congenital disability [1]. Historically, calf reshaping has been carried out with silicone implants, mainly in the subaponeurotic plane; nonetheless, as in other body sites it is possible to perform lipoinjection. Augmentation and remodeling of the calf is becoming more and more frequent, representing a challenge for the surgeon who must consider this body zone as a functional and aesthetical whole [2]. Several techniques are available: cosmetic procedures include injections of reabsorbable fillers such as hyaluronic acid [3]. Nowadays, there is an increasing demand for contouring of

the entire lower leg, in addition to corrections at the level of the muscle only. Accordingly, it becomes advantageous to use fat tissue for this purpose, for its availability in high quantities, potential for its easy implantation in all leg parts, biological compatibility, low antigen potential, and minimal donor morbidity [4]. Four different surgical techniques have been reviewed, excluding medical procedures: subfascial implant augmentation, submuscular implant augmentation, fat grafting and muscular sculpting (MS).

## Material and Methods

Authors illustrate the 4 techniques (principles outlined in the Declaration of Helsinki have been followed).

**Subfascial and submuscular implant augmentation (n patients = 166; n studies = 4; n female = 135; n male = 31)**

All the patients of Felicio et al. included in the study requested calf augmentation for aesthetic purposes. Asymmetric-base silicone elastomer smooth-surface implants are used or soft

silicone implants. The implants are placed over both heads of the gastrocnemius muscle or beneath the fascia cruris superficialis (**Figure 1**). The operation is performed under sedative and local anesthesia, with an incision of approximately 4 to 5 cm in the popliteal pleat, at the same height as the fascia cruris [5] (**Figure 2**).



**Figure 1:** The implants are placed over both heads of the gastrocnemius muscle or beneath the fascia cruris superficialis.



**Figure 2: Calf Implant Augmentation:** 2 years after calf implants, one medial and one lateral (2 implants in each leg. Great size and definition, yet natural in appearance).

**Fat grafting (n patients = 266; n studies = 5; n female = 173; n male = 88)**

A retrospective review of the senior author's experience with autologous fat grafting for calf augmentation was performed. Patients who underwent lower leg augmentation with autologous fat were included. Medial and lateral calf augmentation was accomplished with injection of prepared autologous lipoaspirate intramuscularly and subcutaneously

[6]. Clinical application of autologous fat and adipose-derived stem cells (ASCs) can be applied to patients suffering, i.e. from facial asymmetry, radiated defects, traumatic wounds etc. (**Figure 3**). Before lipoaspirate injection decantation could represent the technique which better preserves the structure of the extracellular matrix and the integrity of the mesenchymal cells and which represents greater margins of improvement [7] (**Figure 4**).



**Figure 3: Fat Grafting:** Injection of lipoaspirate after decantation.



**Figure 4: Fat Grafting:** A, C) Preoperative and (B, D) 46.4 month postoperative views of bilateral fat grafting. 168 and 180 cc of prepared lipoaspirate were injected into the right and left calf, respectively.

**MS (n patients = 6; n studies = 1; n female = 0; n male = 6)**

MS is a new technique of body contouring to achieve: tight skin that very well reveals muscular bulk, a muscular and athletic body with minimal observable scars (**Figure 5**). Muscle observation in contraction and at rest are basic moments for setting up the surgery and to perform preoperative drawing [8] (**Figure 5**). Surgical procedure included six steps: 1) defatting; 2) muscles definition; 3) bring the contour of the muscles up to the fascia, 4) irregularity removal; 5) dermal grasping; 6) last residues of fat removing.

**Results**

Rate of complications is relatively low compared to other implant techniques for body contouring such as gluteal augmentation [9], breast augmentation [10] and pectoral implants for male chest enhancement [11]. The most common complication is represented by seroma.

**Subfascial and submuscular implant augmentation**

There were no cases of rotation or displacement of the implant, and no cases of compartment syndrome or deep vein thrombosis, and no pulmonary embolisms occurred [1]. Calf augmentation with subfascial implants presented a

total complication rate of 5.702%. The submuscular implant placement complication rate was 0.92% [8].

**Fat grafting**

Autologous calf fat grafting is a viable alternative to traditional implant-based calf augmentation for congenital calf discrepancies and the aesthetic pseudo-varus deformity. This technique provides results comparable to those obtainable with traditional methods [5]. Fat grafting presented a global complication rate of 1.509% [8]. The quantity of absorption rate ranging from 20% to 50%. Absorption is more pronounced in the early postoperative months and stabilized in the third month [12].

**MS**

Authors consider the seroma a physiological response to the surgery. Seroma management are based on aspiration as outpatient procedure. The results remain constant over time, as well as the satisfaction. All patients were satisfied. Authors achieved excellent results with total patient satisfaction (**Figures 6 and 7**). Other prevalence of complications (delayed wound healing) showed in smoker patients (>15 cigarettes per day) [8].



**Figure 5: Muscular Sculpting: A)** anterior and posterior preoperative view; **B)** muscle course; **C)** 24 months postoperative view anterior and posterior view of MS.





**Figure 6: Thigh Muscular Sculpting:** before and 6 months after surgery.



**Figure 7: Thigh and calf muscular sculpting:** before and 6 months after surgery.

## Discussion

Legs are considered a very important unit to be considered, both functionally and aesthetically, and so-called skinny legs are commonly held to be aesthetically negative. Liposuction and liposculpture of the buttocks, thighs and legs are widely acknowledged in female contouring, but the aesthetic issues related to men do not receive adequate attention [13]. The

aspect that male patients want is an athletic body with muscle definition [14]. Calf augmentation procedures are indicated for patients with thin legs, as a personal habitus or as a result of previous disease or trauma, or patients with disproportion with tights volume (especially bodybuilders). Liposuction remains the number one aesthetic surgical procedure performed in the World.

## Subfascial and submuscular implant augmentation

Calf implants create cosmetic fullness, when required, in the lower leg and can help patients who, even after extensive physical activity, cannot achieve the look they desire and can help to repropportionate the whole body appearance. The authors' choice is subfascial augmentation because of its less invasive technique and reliability than submuscular.

## Fat grafting

Particularly indicated in trauma patients. The augmentation of certain circumferences of the lower leg at the 6-month follow-up examination is significantly related to preoperative circumference as well as to the quantity of infiltrated fat [3]. Underwent a second round of autologous fat injection for further calf augmentation because patients could desire more volume [5].

## Implants

For patients with muscle dystrophies or those with injuries, this technique could become the first choice for its minimal complications. To date, no functional problem or muscular dysfunction has been provoked by silicone prosthesis implants. Usually, patients walk 8 h after the surgery. No infection problems, prosthesis rupture or occurrence of hematomas, seroma were noticed [4].

## MS

In literature no techniques were described to accomplish aesthetic result in sculpting surgery of lower extremities in the male. In line with results obtained from other studies in overall liposuction and liposculpture outcomes [15], the satisfaction rate was great with all patients. The SM of the lower limb resulted in a good muscle definition and in an aesthetic improvement.

## Conclusions

Calf augmentation, with all reviewed surgical techniques, has a low rate of complications compared to other body contouring procedures, but a high rate of satisfaction among patients. Fat grafting and MS have the lowest rate of complications, but for fat grafting multiple sessions are required. Specific complications of implants, such as capsular contracture, malposition or rupture, are less common compared to the use of implants for other cosmetic purposes. Procedures should always be performed by experienced plastic surgeons [16].

## Conflict of Interest

The authors declare that they have no conflicts of interest to disclose.

## Consent

For this type of study informed consent is not required.

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