

# Calf Augmentation with Silicone Gel-filled Implants: Retrospective Analysis of a Patient Series

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## Abstract

**Background:** There are few reports on the outcomes of calf augmentation procedures, which are becoming popular on account of evolving aesthetic trends.

**Objective:** The present study reports the outcomes of soft silicone gel-filled calf implants for calf augmentation in a patient series.

**Methods:** This retrospective study included patients who underwent implantation with the same type of symmetrical silicone gel-filled calf implant between January 2015 and April 2019. The data for the cases were obtained from their surgical and consultation reports.

**Results:** A total of 45 patients (44 females and 1 male) were included, and they underwent 87 calf augmentation procedures. The average implant volume was 79.0 cc. Complementary fat grafting was performed in 18 (40%) patients (average injected fat volume, 17.5 ml per calf). The implantation plane was submuscular in 29 patients and subfascial in 16 patients. Revision surgery was required in two cases: the implant was visible in one case, and the implant was displaced in the second case. There were no other complications. According to the surgeon's evaluation, the outcome was satisfying or very satisfying in 97.8% of the cases.

**Conclusions:** Calf augmentation with soft silicone gel-filled implants seems to be associated with a low risk of complications and a high satisfaction level. Further, this implant in combination with fat grafting may have added benefits in cases that require more coverage.

## Background

Calf augmentation procedures have gained popularity over recent years. With the evolution of beauty standards and dress codes, more attention is being paid to the aesthetics of the lower legs. Accordingly, there have been several attempts to morphologically characterize the calf in order to identify the morphological features of the calf that are considered as attractive [1]. Calf augmentation is performed for purely cosmetic reasons, in order to increase the volume of skinny legs [2], or for reconstructive reasons, with the aim of correcting lower limb deformities caused by congenital or acquired conditions such as poliomyelitis [3], clubfoot [4], and cerebral palsy [5]. Various techniques have been described for calf augmentation and reshaping, including injection of resorbable or permanent synthetic fillers [6], fat grafting [7], free flap placement [8,9] and silicone implants. Implant-based calf augmentation was first described by Carlsen et al. [10] and Glicenstein et al. [11] in 1979. Since then, several authors have proposed improvements that have led to the adoption of standardized techniques involving either subfascial or submuscular augmentation. With regard to the implants, various types and shapes of solid silicone rubber or silicone gel-filled implants are available and are still in use today. Solid silicone implants have been described as being more palpable and providing a less natural result than gel implants [12,13]. Some authors speculated about whether the use of silicone gel-filled calf implants would lead to an increased risk of capsular contracture [14]. However, modern silicone gel-filled calf implants have a so-called "low-bleed barrier" that prevents silicone bleeding and, thus, reduces the risk of capsular contracture [15]. In fact, the reported incidence of capsular contracture associated with calf augmentation is as low as 0.19% [16], which is much lower than the incidence rate reported for breast augmentation. The lower rate with calf augmentation might be the result of a "massage effect" produced by contraction of the calf muscles, which might have a protective effect against capsular contracture [17]. Therefore, the gel-filled implants might be advantageous for calf augmentation. Although

implant-based calf augmentation is now a rather widespread procedure, there are relatively few reports dealing with its safety and effectiveness. In a recent, exhaustive review of the literature, Melita et al. identified a total of 21 reports dealing with implant-based calf augmentation, but very few of them had a sufficient follow-up duration and significant sample size [16]. Additionally, only about ten of them dealt with silicone gel-filled implants. Therefore, the aim of this article is to fill in the research gap by reporting a retrospective series of patients who underwent silicone gel-filled calf implantation over a 4.5-year period.

## Material and Methods

This retrospective study included patients who underwent implantation with the same type of symmetrical silicone gel-filled calf implant (LS03; Groupe SEBBIN SAS, Boissy l'Aillierie, France) between January 2015 and April 2019. The same senior surgeon performed all the procedures. Before the start of the study, the senior surgeon already had 15 years of experience with calf augmentation and had already performed over 500 procedures. All patients were placed in the prone position for the procedure and were administered epidural anesthesia. The surgical approach was via a skin incision at the popliteal fossa crease. The insertion plane (submuscular or subfascial) for each patient was selected based on their clinical features and lower leg anatomy. No prophylactic antibiotic treatment was administered, but all the patients were prescribed oral antibiotics for 7 days after the

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procedure. No drainage was used, and all the surgical procedures were performed on an outpatient basis. Information was retrieved from the surgical and consultation reports. The outcome was evaluated by the operating surgeon as very satisfying, satisfying, moderately satisfying, dissatisfying, or very dissatisfying. Descriptive statistical analysis was first performed on demographic data, and the rate of complications was calculated using absolute risk calculation. The statistical analysis was performed using the Medcalc software (Mariakerke, Belgium).

## Results

The series comprised 45 patients (44 females and 1 male) who underwent implantation with the same type of silicone gel-filled calf implant. A total of 87 calf augmentation procedures were performed in these 45 patients: Primary augmentation was performed in 39 patients, and revision surgery was performed in 6 patients. The reason for revision surgery was implant visibility in three cases, and dissatisfaction with implant size in the other three cases. The average BMI was 22.5 kg/m<sup>2</sup> (range = 17.7-28.7kg/m<sup>2</sup>). The average follow-up period was 29.9 months (range = 1-52 months). In 41 patients, the procedure was performed for aesthetic reasons. In 2 patients, the reason was the correction of poliomyelitis sequelae; in 1 patient, it was the correction of spine atrophy sequelae; and in 1 patient, it was the correction of clubfoot sequelae [4].

The implantation plane was submuscular in 29 patients and subfascial in 16 patients. Fasciotomy was required before implant placement in two (reconstructive) cases. The average implant volume

was 79.0 cc (range = 40-140 cc). Complementary fat grafting was performed in 18 patients (40%), with an average injected fat volume of 17.5 ml per calf (range = 10-30 ml). No synthetic filler was used. The preoperative and postoperative images of a case of correction of clubfoot sequelae are presented in Figure 1. In case of primary surgery, the calf circumference increased from an average of 31.6 cm before the procedure to an average of 33.9 cm after the procedure. Revision surgery was necessary in one patient (2.2%) because the lower extreme of the implant was visible. The revision procedure was performed using custom-made calf implants with a refined tip. Implant displacement (2.2%) occurred in one case and was corrected surgically. However, it recurred and required a second revision surgery, which had good outcome as per information from the last follow-up. No functional impairment or other complications occurred in any of the cases. In particular, capsular contracture, implant rupture, or compartment syndrome did not occur in any of the cases. The surgeon's evaluation of the aesthetic outcome is depicted in Figure 2. The outcome was considered as "Satisfying" or "Very satisfying" in 97.8% of the cases.

## Discussion

In the present study, the authors report the outcomes of soft silicone gel-filled calf implants for calf augmentation. According to Melita et al.'s review [16], only about ten papers so far have described the use of silicone gel-filled calf implants comparable to the ones used in the present study. Therefore, the findings of this study make an important contribution to the current knowledge available about these specific types of implants. In the present series, revision surgery was required

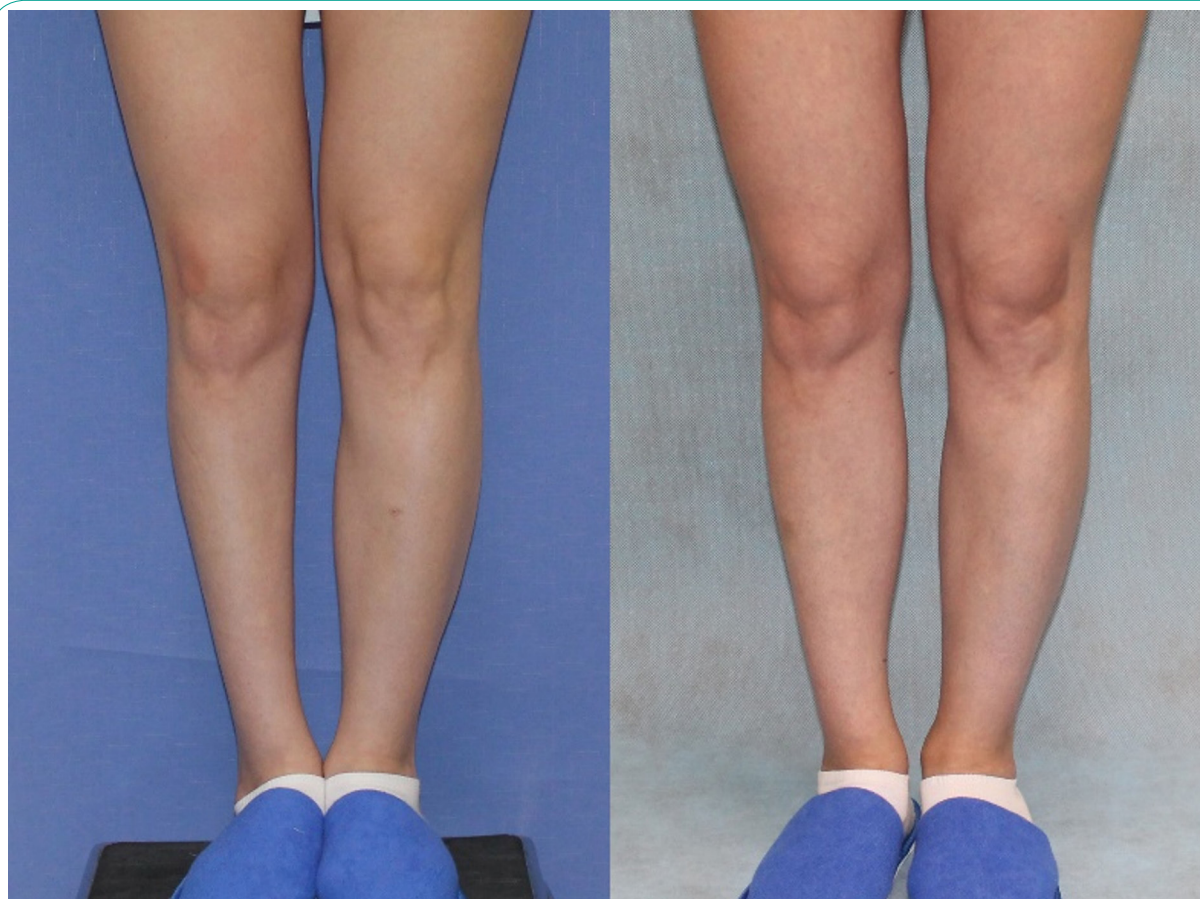


Figure 1: The preoperative and postoperative images of a case of correction of clubfoot sequelae.

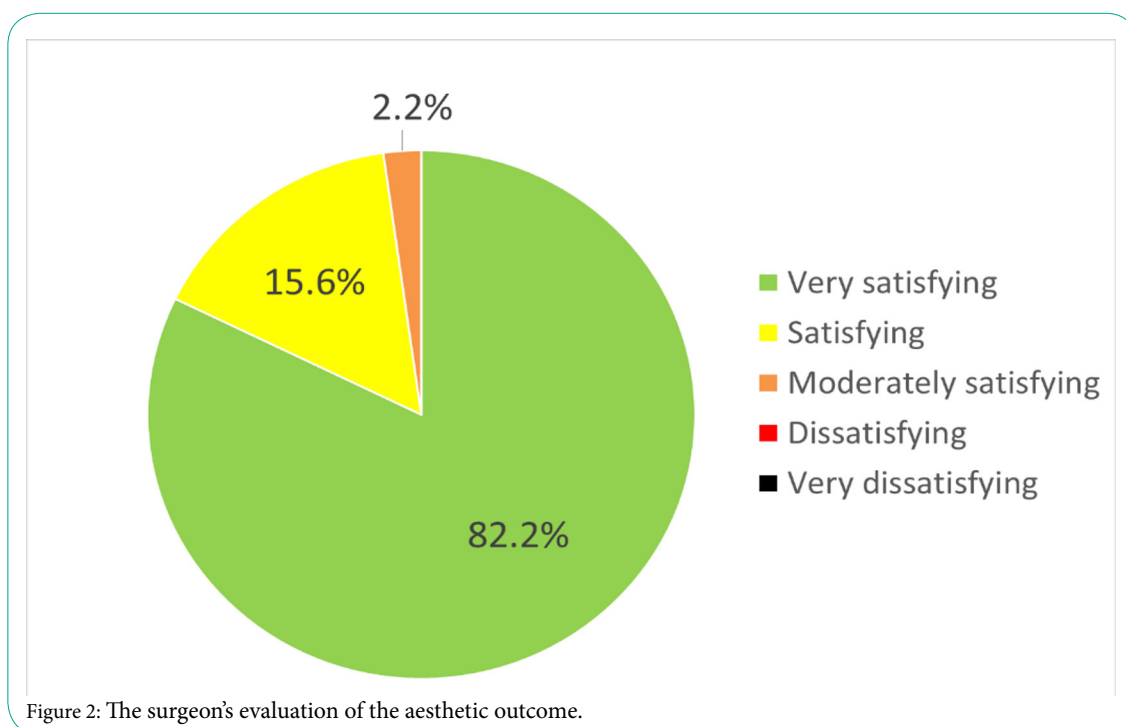


Figure 2: The surgeon's evaluation of the aesthetic outcome.

on account of significant implant visibility (in one case) and implant displacement (in one case). These complications are frequently reported in the literature [16]. Other commonly cited complications, although rare, are seroma, scarring, nerve damage, infection, implant rupture, implant extrusion, hematoma, compartment syndrome, and necrotizing fasciitis [16]. The average volume of implant used in this series (79 cc) was lower than that reported in other studies [4,12,16,18], and this might explain the low complication rate.

The ideal implant pocket in calf augmentation is still under debate. Submuscular placement is believed to provide better camouflage and to lower the risk of muscular and neurovascular injury; however, it is associated with greater postoperative pain than subfascial placement [2,12]. The authors of the present report are of the opinion that there is no "absolute rule" in this regard, and the decision should be made on a case-by-case basis. Submuscular placement was preferred in two-thirds of the cases in the present series as the authors believe that it decreases the risk of implant visibility. However, subfascial placement might be favorable in cases of reconstruction (for patients with clubfoot or poliomyelitis sequelae), possibly combined with fasciotomy, or even in cases of classical aesthetic augmentation. However, it is important to ensure that the thickness of the subcutaneous fat is sufficient enough to allow for implant coverage. In this series, "composite calf augmentation," which is analogous to composite breast augmentation [19] was performed in 40% of the cases. The use of both silicone and fat implants was proposed by Andjelkov et al. in a multi-staged procedure [4] and by Karacaoglu et al. in a single-stage procedure [2]. The latter single-stage procedure was adopted in this series. In this series, even small volumes of fat were found of great value in optimizing calf contouring in the upper third, and there were no complications associated with fat grafting. All these findings imply that the combined use of an appropriate surgical technique and reasonable implant size lowers the risk of complications in calf augmentation. According to the evaluation of the senior surgeon who performed all the procedures, the final outcome was found to be satisfying or very satisfying in nearly 98% of the cases. This high

level of satisfaction is a common feature of most series reported in the literature [18,20].

## Conclusions

Current data, including that of the present study, indicate that calf augmentation with silicone gel-filled implants has one of the most favorable risk/benefit balances of all body contouring surgeries. This procedure provides a high level of satisfaction while exposing the patient to a very low risk of complications. Further, it is important for surgeons to master both subfascial and submuscular techniques and choose the technique that would be most suitable and beneficial for a given patient based on their anatomy and expectations. Finally, the use of "composite" calf augmentation, involving both implant and fat grafting, may significantly improve the aesthetic outcome without increasing the risk of complication.

## Competing Interests

The authors declare that they have no competing interests.

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