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Subfascial Calf Augmentation Using Cohesive Silicone Gel Implants Combined with Autologous Fat Grafting: A Retrospective Study of 56 Cases

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Abstract

BACKGROUND: Calf augmentation using cohesive silicone gel implants is an effective surgical procedure designed to enhance the volume and contour of the lower limbs in patients presenting with calf hypoplasia or asymmetry. To achieve comprehensive aesthetic harmony, the integration of calf and ankle contouring via autologous fat grafting is emerging as a significant trend in lower extremity aesthetic procedure.

OBJECTIVE: To evaluate the clinical outcomes and safety profile of subfascial calf augmentation using cohesive silicone gel implants combined with autologous fat grafting, with particular emphasis on the strategic role of medial compartment implant placement and selective fat grafting in optimizing calf–ankle contour continuity.

Methods: This retrospective descriptive study was conducted on patients who underwent aesthetic calf augmentation surgery between August 2018 and December 2024. All implants used were asymmetrical cohesive silicone gel implants and were consistently placed in the medial compartment. Implant size selection was individualized based on calf circumference, lower leg length, degree of volume deficiency, soft-tissue thickness, and patient aesthetic expectations. In selected cases presenting lateral calf deficiency, thin soft-tissue coverage, or ankle disproportion, adjunctive autologous fat grafting was performed to optimize contour harmony and create a smooth calf–ankle transition.

RESULTS: A total of 56 patients (48 females and 8 males) were included. They underwent 109 calf augmentation surgery. The mean age was 34.6 ± 5.01 (26-51 years). All silicone implants were placed in the subfascial plane (volume range: 120-180 ml) without postoperative drainage. The mean operation duration was 61.8 ± 4.92 minutes. Thirty cases (53.6%) were combined with autologous fat grafting on lower extremity. The volume of fat grafted was 146.3 ± 22.89 ml. The mean follow-up duration was 13.3 ± 1.42 months. No early or late complications were recorded. Regarding patient satisfaction: 64.3% reported being “very satisfied” and 35.7% were “satisfied".

CONCLUSION: Calf augmentation using cohesive silicone gel implants is a safe and reliable technique. Consistent medial compartment implant placement combined with selective autologous fat grafting, particularly in the lateral calf and ankle regions, facilitates superior aesthetic transitions, enhances lower limb proportionality, and improves overall patient satisfaction by addressing localized contour irregularities.

Introduction

Calf augmentation is an aesthetic procedure indicated for patients seeking to correct calf hypoplasia, asymmetry, or a lack of gastrocnemius definition. Over several decades, this procedure has seen significant advancements in both surgical technique and implants [1], [2], [3]. Currently, the primary modalities include silicone implantation and autologous fat grafting. Calf augmentation with silicone implants remains the gold standard due to its ability to provide predictable, significant volume enhancement and long-term stability [6], [7], [8].

The anatomical plane of implant placement is a critical determinant of the surgical outcome. Sub-fascial or sub-muscular placement is often preferred as it provides adequate soft-tissue coverage, thereby minimizing the risks of implant visibility, displacement, and sensory disturbances [2], [5]. Although calf augmentation yields high aesthetic efficacy, the procedure may be associated with complications such

as seroma, infection, chronic pain, sensory disturbances and capsular contracture with varying rates reported across different studies [4], [7]. Consequently, evaluating the clinical outcomes and safety profile of this procedure is essential.

In Vietnam, scientific reports on calf augmentation are currently limited, particularly studies involving mid-term follow-up and patient satisfaction assessments. Therefore, we conducted this study to evaluate the clinical outcomes and safety profile of subfascial calf augmentation using silicone implants while simultaneously evaluating the role of concomitant autologous fat grafting in improving lower limb contour.

Beyond safety assessment, this study further aims to clarify a refined surgical strategy based on consistent medial compartment implant placement combined with selective autologous fat grafting to enhance lateral calf contour and ankle proportionality. The concept of achieving a smooth and continuous volumetric transition between calf projection and distal lower limb contour represents a key aesthetic consideration in our operative planning.

1. Methods

1.1. Study design

A retrospective descriptive case series was conducted.

1.2. Patient Selection

This study included all patients who underwent aesthetic calf augmentation surgery using cohesive silicone gel implants at two centers between August 2018 and December 2024.

Inclusion criteria:

- Adults over 18 years of age presenting with calf hypoplasia or asymmetry.
- Absence of systemic comorbidities contraindicating surgery.
- Calf augmentation performed for aesthetic indications.
- Minimum follow-up period of 12 months.

Exclusion criteria:

- Lower limb deformities secondary to neuromuscular disorders.
- History of prior surgical intervention or infection in the calf region.
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1.3. Surgical Technique

All procedures were performed under general anesthesia with patients in the prone position. A small incision of approximately 4 cm was made at the popliteal crease. The surgeon meticulously dissected the sub-fascial pocket over the gastrocnemius muscle.

Although implant placement may theoretically depend on whether medial or lateral calf deficiency predominates, in our series all implants were placed in the medial compartment, as medial volume deficiency was the primary aesthetic concern among our patients. No lateral implants were used in this study. In cases with concomitant lateral calf deficiency, correction was achieved through autologous fat grafting rather than lateral implant placement.

Cohesive silicone gel implants (120–180 ml) were selected based on each patient's anatomical requirements.

All implants were asymmetrical in design to better replicate the natural contour of the medial gastrocnemius muscle. Implant size selection was individualized based on calf circumference, lower leg length, degree of soft-tissue deficiency, tissue thickness, and patient aesthetic expectations. Final intraoperative assessment ensured overall lower limb proportionality rather than isolated calf projection.

No drains were placed. Incisions were closed in multiple layers followed by the application of compression bandages.

In patients presenting with minimal subcutaneous fat or contour irregularities at the knees, calves, or ankles, concomitant autologous fat grafting was performed within the same operative session.

Fat was harvested from the abdomen or thighs using low-pressure liposuction and injected into the subcutaneous plane. Recipient areas included implant margin coverage, medial contour depressions, lateral calf regions in selected cases, and particularly the posterior–medial ankle region. Ankle fat grafting was performed to enhance distal lower limb volume and prevent abrupt contour discrepancy between the augmented calf and a relatively thin ankle, thereby creating a smooth and continuous lower limb silhouette. In our strategy, fat grafting functioned primarily as a contour-modulating technique rather than a primary volumizing method.

1.4. Study Variables

- Patient demographics: age and sex.
- Surgical parameters: implant volume, placement location, and operative time.
- Fat grafting data: number of patients and volume of fat injected.
- Complications: early and late postoperative complications.
- Patient satisfaction levels.

1.5. Statistical Analysis

Data were processed using SPSS 21.0.

Quantitative variables are presented as mean ± standard deviation.

Qualitative variables are presented as frequencies and percentages.

Due to the descriptive nature of this case series, no comparative analysis was performed.

2. Results

Between August 2018 and December 2024, 56 patients underwent aesthetic silicone calf augmentation at two centers. The majority of patients received bilateral calf augmentation, with only 3 cases of unilateral procedures. This study consisted predominantly of young females (Table 1).

Table 1: Patient demographics and clinical characteristics (N=56)

Characteristic	Value
Female, n (%)	48 (85.7%)
Male, n (%)	8 (14.3%)
Age range	26-51
Mean age (Mean ± SD)	34.6 ± 5.01
Surgical Indication	100% aesthetic

All patients underwent subfascial cohesive silicone gel implant placement with a mean volume of 155.7 ± 19.9 ml, and no postoperative drainage was utilized.



Figure 1: A 38-year-old male patient – Calf augmentation with 140 ml cohesive silicone gel implants combined with bilateral ankle fat grafting. Top row: Preoperative views; Middle row: One-week postoperative follow-up; Bottom row: Six months postoperative follow-up

Implant placement was performed exclusively in the medial compartment in all cases. No lateral implants were used in this series. In patients presenting additional lateral contour deficiency, correction was achieved with selective fat grafting.

Table 2: Characteristics of calf augmentation surgery

Surgical parameters	Value
Implant volume (ml)	120-180 ml
Implant placement	100% subfascial
Operaton time (minutes)	61.8 ± 4.92

Furthermore, 30 out of 56 patients received concurrent autologous fat grafting to enhance the overall aesthetic harmony of the lower limbs (Table 3).

Table 3: Combined calf augmentation and fat grafting procedure

Distribution of grafting sites		Quantity (n)	Percentage (%)
Patient underwent calf augmentation and fat grafting procedure	Bilateral ankles	15/56	26.8%
	Bilateral ankles and calves	14/56	25.0%
	Bilateral ankles and knees	1/56	1.8%
Total		30/56	53.6%

No patient required secondary fat grafting during the follow-up period. Clinical evaluation demonstrated stable contour integration without visible implant edges, contour irregularity, or disproportion between calf and ankle regions.

Table 4: Characteristics of lower extremity fat grafting

Parameter	Value
Number of patients, n (%)	30 (53.6%)
Donor sites	Abdomen / Thighs
Mean graft volume (ml)	146.3 ± 22.89
Donor site complications	None
Recipient site complications	None
Re-intervention	None

No early or late complications were recorded during the mean follow-up period of over 12 months (Table 5).

Table 5: Follow-up duration and postoperative complications

Parameter		Value
Mean follow-up duration (months)		13.3 ± 1.42
Early complications	Hematoma	None (0%)
	Seroma	
	Infection	
Late complications	Implant displacement	
	Implant exposure	
	Capsular contracture	

Patient satisfaction levels were remarkably high, with 100% of participants reporting results

ranging from "satisfied" to "very satisfied," specifically achieving a "very satisfied" rate of 64.3%.



Figure 2: A 40-year-old female patient – Calf augmentation using 160 ml cohesive silicone gel implants combined with bilateral ankle and calf fat grafting. Top row: Preoperative views; Middle row: One-month postoperative follow-up; Bottom row: Twelve months postoperative follow-up

3. Discussion

Calf augmentation with cohesive silicone gel implants is a highly effective aesthetic procedure for enhancing lower limb morphology [1], [3]. In our study, the majority of patients were female, which aligns with existing literature indicating a higher demand for calf augmentation among women [2], [6].

To date, the ideal anatomical plane for implant placement in calf augmentation remains a subject of ongoing debate. Submuscular placement provides superior implant coverage and reduces certain complication risks; however, it is often associated with more significant postoperative pain [2], [4]. According to a meta-analysis by Escandón et al. encompassing 48 studies and 2.455 patients, subfascial and submuscular techniques were the most prevalent approaches, accounting for 70.2% and 10.1% of cases, respectively [4]. Melita and Innocenti, in a meta-analysis of 26 studies involving 1.929 patients, reported a 5.7% complication rate for the subfascial technique [6]. Jury-Santibañez et al. also reported low complication rates and high patient satisfaction levels with subfascial placement [5]. In the present study, we opted for the subfascial technique over the submuscular approach due to its less invasive nature while maintaining comparable clinical efficacy. Furthermore, for patients with minimal subcutaneous fat in the calf region, we performed concurrent fat grafting to minimize the risk of implant visibility and to achieve more harmonious lower extremity contours.

In addition, a distinctive characteristic of our series is the consistent placement of implants in the medial compartment. Although compartment selection can theoretically depend on whether medial or lateral deficiency predominates, medial volume insufficiency was the principal aesthetic concern in our cohort. Therefore, all implants were placed in the medial compartment, and no lateral implants were used. In cases presenting concomitant lateral contour deficiency, we preferred selective autologous fat grafting rather than lateral implant placement. This strategy allowed refined contour modulation while avoiding the additional risks associated with multiple implants and maintaining a more conservative implant-based approach.

The complication rate in our study was 0%, which may be attributed to the limited sample size. In contrast, international studies have reported complication rates ranging from 4% to 10%, including seroma, infection, sensory disturbances, and capsular contracture [4],[6]. Our favorable outcomes may also be linked to meticulous patient selection, standardized surgical techniques, and the selection of appropriate implant volumes. Additionally, the mean follow-up period in our study was 13.3 ± 1.42 months, which may not be sufficiently long to fully evaluate late-onset complications such as capsular contracture or implant displacement.

Moreover, all implants used were asymmetrical cohesive silicone gel implants designed to replicate the natural contour of the medial gastrocnemius muscle. Careful implant size selection based on calf circumference, lower leg length, degree of deficiency, and soft-tissue thickness may have contributed to improved anatomical conformity and reduced implant visibility.

The integration of autologous fat grafting in more than half of our cases facilitated the correction of minor contour irregularities and the softening of anatomical lines. Autologous fat grafting is widely regarded as a safe and effective modality in calf augmentation, while simultaneously contributing to enhanced patient satisfaction levels [8], [9]. In our study, no postoperative complications were recorded following either the calf augmentation or the fat grafting procedures. Our findings also indicate high levels of postoperative patient satisfaction, consistent with the results reported by various international authors [4], [6].

Importantly, in our surgical concept, fat grafting functioned primarily as a contour-modulating adjunct rather than a primary volumizing technique. Beyond correcting minor contour irregularities and enhancing soft-tissue coverage over implant margins, fat grafting of the lateral calf improved symmetry in selected cases. Furthermore, ankle fat grafting played a crucial role in establishing proportional balance between calf projection and distal lower limb contour. From an aesthetic perspective, harmonious lower limb

morphology depends not solely on maximal calf projection but also on gradual volumetric transition toward the ankle. By enhancing the posterior–medial ankle region, we aimed to prevent abrupt contour discrepancy between an augmented calf and a relatively thin ankle, thereby creating a smooth and continuous lower limb silhouette. This principle of calf–ankle continuity represents an important refinement compared with traditional implant-only augmentation.

The limitations of this study include its retrospective design, the absence of a control group, a relatively small sample size, and a limited follow-up period. Nevertheless, this research provides valuable clinical data within the context of limited domestic literature on the subject.

Additionally, fat graft survival was assessed clinically rather than through objective volumetric imaging methods, which may limit precise quantification of long-term retention. Future prospective studies with longer follow-up and comparative cohorts could further clarify the relative contributions of implant-only versus combined implant–fat grafting techniques.

4. Conclusion

Calf augmentation surgery utilizing subfascial cohesive silicone gel implants implants is a safe and effective procedure that yields favorable aesthetic outcomes and high patient satisfaction. Consistent medial compartment implant placement combined with selective autologous fat grafting, particularly in the lateral calf and ankle regions, enhances contour continuity and lower limb proportionality. This combined strategy represents a refined and comprehensive approach in contemporary calf aesthetic surgery.

Ethics & Compliance

Ethics Statement

This retrospective study was conducted in accordance with the principles of the Declaration of Helsinki. Patient data were collected from routine clinical practice and anonymized prior to analysis. According to institutional and local regulations, formal ethical approval was not required for this retrospective study.

Written informed consent was obtained from all patients for the use of their clinical data and images for scientific publication.

Informed Consent Statement

Written informed consent was obtained from all participants for the publication of their clinical information and photographic materials.

Data Availability Statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Author Contributions

All authors contributed to the study conception and design. Material preparation, data collection, and analysis were performed by the authors. All authors read and approved the final manuscript.

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