

## Calf Augmentation with New Solid Silicone Implants

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**Abstract.** Calf augmentation has been standardized by the use of banana-shaped silicone gel implants for almost 20 years. Capsule formation and resulting distignement, dislocation, gel bleeding, and implant rupture are rare but unpleasant complications. A new implant of solid silicone (McGhan, Santa Barbara, CA, USA) in the anatomical shape of one belly of the *M. gastrocnemius* placed subfascially appears to overcome these problems.

**Key words:** Calf augmentation — Silicone implants

In modern times legs have become secondary gender characteristics in women as well as in men. It is, therefore, understandable that an increasing number of patients are seeking advice from the plastic surgeon. Not only women with unilateral muscle atrophy may be unhappy about their slim calf, but young male athletes as well. Some of the causes of unilateral or bilateral calf hypoplasia are (1) congenital hypoplasia and aplasia; (2) clubfoot, cerebral palsy, and spina bifida; (3) poliomyelitis and osteomyelitis; and (4) trauma following fractures of the femur and contractures resulting from burns.

Patients understand that there will be no restoration of impaired function. They would like to wear skirts or be inconspicuous at the swimming pool. Until now most implants are preshaped in an ellipsoid [1, 4, 8, 9, 10] (Fig. 1). They are soft and pliable and give a rounded shape to the calf, as long as no capsule formation occurs. Theoretically, this should

happen no more than in submuscular breast augmentation. The pressure within the pocket is equal on all points of the ellipsoid. Most patients, however, prefer more width to the implant in the upper portion. This cannot be achieved easily with soft gel implants, especially if capsular contracture occurs (Fig. 2). Glicenstein [5], who has inserted more than 250 calf implants since 1967, reported no encapsulation of his soft gel implants and no deformation of the calf or dislocation of the implant. Aiache [2] found a 4% occurrence of capsular contracture, and Szalay [8] observed only one mild capsular contracture among 20 patients. In our earlier series of 17 patients with Glicenstein implants (Mentor

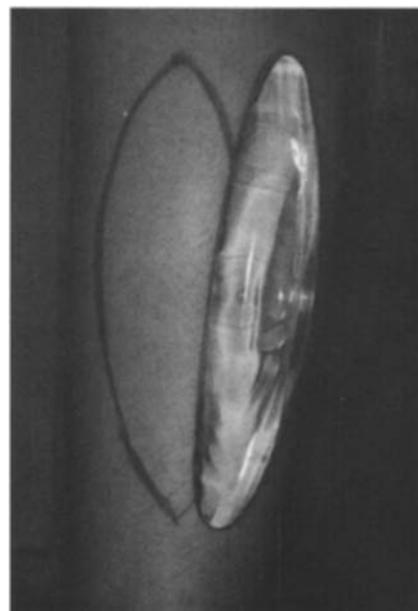
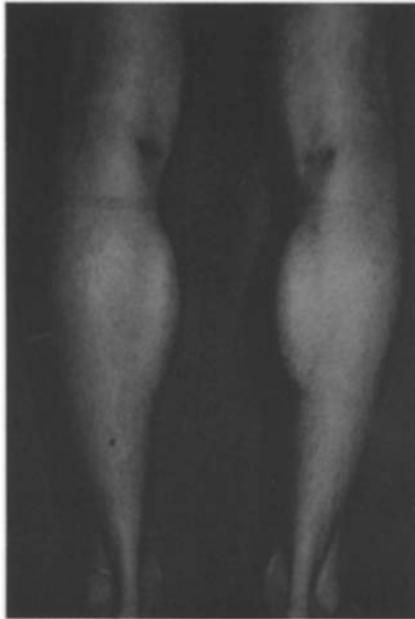


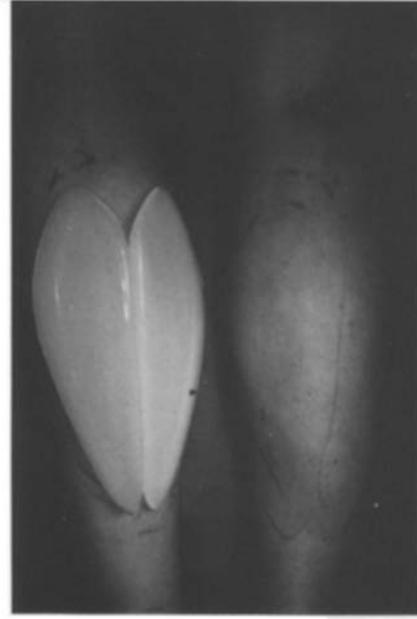
Fig. 1. The earlier used Glicenstein implant

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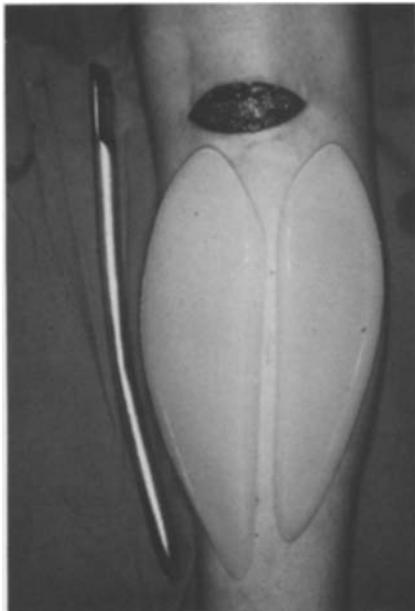
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**Fig. 2.** Capsule contracture epifascial after augmentation of the medial gastrocnemius with soft gel prosthesis. The fascia must have been disrupted



**Fig. 4.** The proper size of the implants has been determined by marking the outer limits on the standing patient



**Fig. 3.** The new “male” and “female” calf implants. Use of an elongated Hegar bougie No. 7 facilitates the development of the subfascial pocket

Corp.), the capsule formation rate was 23%. In two patients the four implants had to be exchanged for solid ones, one patient benefitted from manual decompression, and another benefitted from mechanical decompression with a blood pressure cuff.

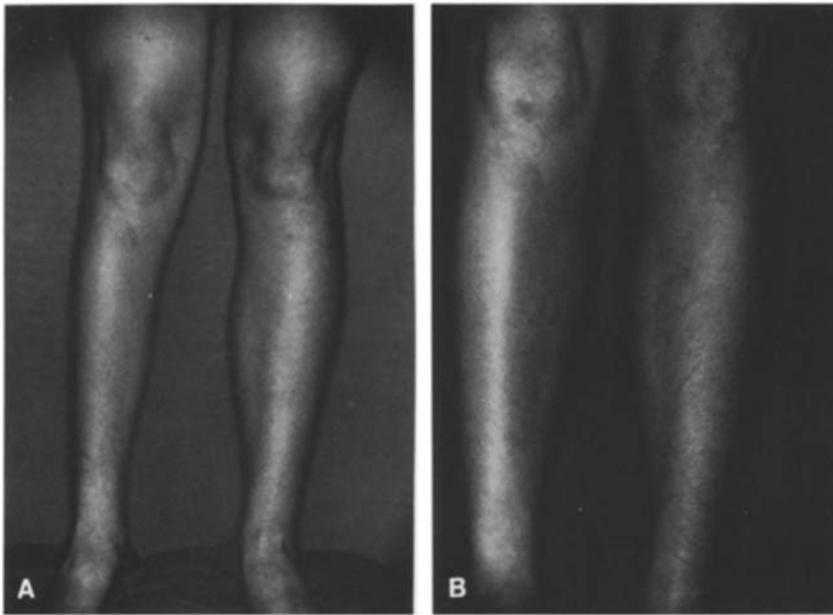
### Solid Implants

Since we experienced complications, such as visibility of the banana-shaped implant due to capsule contracture, dislocation, and rupturing (three cases!), as well as slow leakage from the implant, a solid implant was designed in the shape of one gastrocnemius head. Moldings and measurements were taken of the calves of 15 females and 8 males of our theater staff and two different sized “female” and “male” implants were designed accordingly (Fig. 3).

The implants were manufactured as soft as possible (McGhan). Since they are solid they can be cut down on any of the three surfaces according to need in order to obtain a pleasant contour. On a single implant the thick inner ridge can be cut down to the level of the outer ridge. This practice may be suitable for extreme genu varum (O legs) with a rather concave inner contour of the calf (Fig. 7A).

### Technique

The incision used is determined by the natural popliteal fold. A 4–6-cm cut as well as the extent of the pockets to be created should be outlined with the patient standing (Fig. 4). Surgery should be performed with the patient prone and under general anesthesia. The upper rim of the crural fascia is incised vertically beneath the midline in order not to disrupt the sural nerve below the upper quadrant of the fascia, or the minor saphenous vein above



**Fig. 5(A)** Unilateral calf hypoplasia in a 34-year-old woman after polio. **(B)** Correction with two “female” solid calf implants

the fascia in the midline. Two separate pockets should be created by blunt dissection. Since few vessels cross between muscle and fascia, bleeding has not been a problem.

The subfascial pocket is created over both medial and lateral bellies of the gastrocnemius muscle down to the Achilles tendon, first with the middle finger, thereafter with the aid of an elongated Hegar bougie No. 7 [6] or any other dissector [10] used for augmentation mammoplasty. In order to enlarge this pocket the overlying fascia is incised at 3 cm both medially and laterally from the midline of the calf to a length of 10–15 cm. This can be done easily with the fingertip, a mitral valve ring dissector, or any other blunt dissector. An alternative procedure may be to make many 2-cm incisions which would allow the fascia to extend like a mesh skin graft [9].

The implants are chosen and shaped according to the preoperative markings and inserted medially and laterally, only medially, or directly under the midline. Gentamicin (80 mg) is applied before closing the wound. Tubigrip or any other elastic stocking is applied for two weeks and patients are encouraged to walk the next day. Postoperative periods are usually *not very* painful. Patients may leave the hospital after four days and walk normally and without complaints within about two weeks.

### Patients

Fourteen patients (13 females, 1 male) have had this type of surgery in Frankfurt between 1988 and 1990. The ages ranged from 18 to 52 years. The indications

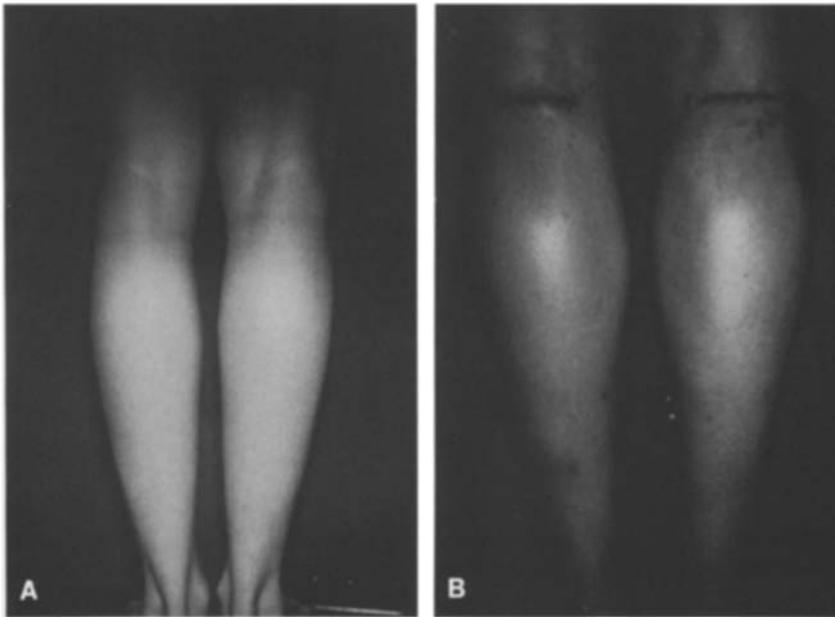
for calf implants were post-trauma due to compartment syndrome (5), poliomyelitis (2), club foot (2), meningocele (1), and purely aesthetic reasons (4).

### Complications

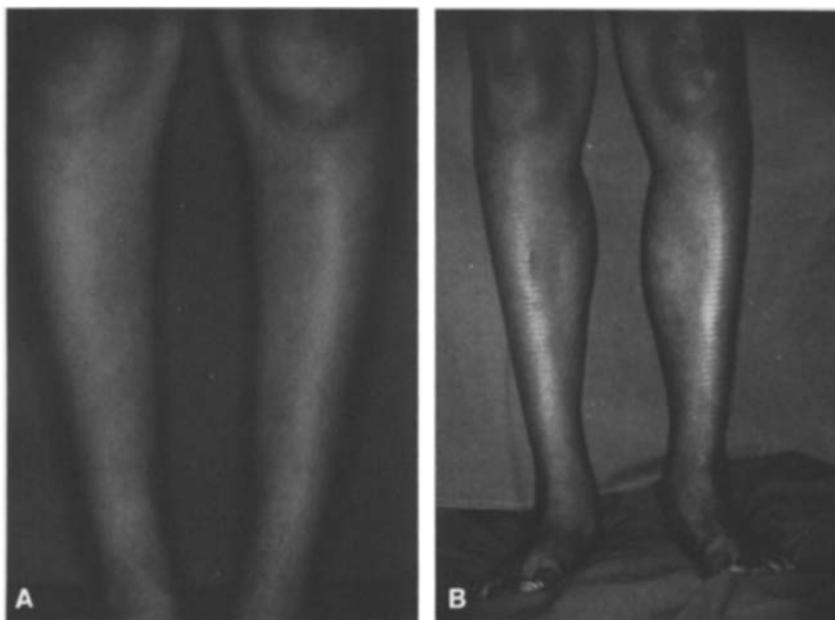
The aesthetic results were satisfactory in all patients (Figs. 5–7), aside from a certain firmness of the calf which could be felt through the skin. There were no complaints of functional impairment or easy fatigue following long-distance walks. The patients were as satisfied with their calf augmentation as those patients who have had mammary augmentation. One female patient with extremely thin skin was not happy with the transition of the implants to the Achilles tendon. The slight concaveness at these locations was contoured by the injection of 2 cc of Arteplast [7] suprafascially. One patient who had surgery for aesthetic reasons developed a serome on one leg after two months. The punctured fluid showed *Staphylococcus epidermidis* which was treated effectively by twofold irrigation with vancomycin. Dislocation, upward displacement, or implant rupture did not occur as had been observed when using the soft gel implants.

### Discussion

In our first 14 patients there was no need to obtain a larger volume than that achieved with the prefabricated implants. If necessary or desirable the implants can be stacked, however, by putting a “fe-



**Fig. 6(A)** Twenty six-year-old patient with aesthetic problems of her slim calves. **(B)** Result on the operating table. Note the width of the calves



**Fig. 7(A)** Forty three-year-old female patient with calf hypoplasia following bilateral club foot. **(B)** After insertion of two “female” calf implants

male” under a “male” implant. Aiache [2] has reported the development of similarly shaped implants of hard silicone in five different sizes which fit the *whole* gastrocnemius muscle, not only one belly as ours does. Similar results may be achieved but a larger popliteal incision is required for insertion. Since they have the shape of a soleus muscle, they might better fit *under* the M. gastrocnemius.

Zenteno and Montellano [10] have improved the shape of the soft gel prostheses by flattening the head. A special metal loop for the creation of the pocket has been designed so this prosthesis may be inserted through a 2.5-cm incision in the popliteal area.

Calf augmentation has become a safe, efficient, and aesthetically pleasing procedure with few side effects. The development of two implants—“female” or “male”—from soft solid silicone in the shape of a gastrocnemius muscle gives the desired width of the calf. This is an important improvement especially in regard to the view from the front.

#### References

1. Aiache AE: Calf augmentation. *Plast Reconstr Surg* 83:488, 1989
2. Aiache AE: Calf augmentation—new hard implants. *Plastic Surgical Forum*, 59th Meeting of the ASPRS, Boston, MA. ASPRS 1990, p 186

3. Carlsen LN: Calf augmentation: a preliminary report. *Ann Plast Surg* **2**:508, 1979
4. Glicenstein J: Correction of the amyotrophies of the limbs with silicone prosthesis inclusions. *Rev Bras Cir* **69**:117, 1979
5. Glicenstein J: Calf augmentation (220 cases): Abstract booklet of the First Meeting of the European Association of Plastic Surgeons, Strasbourg, France. EURAPS 1990, p 71
6. Höhler H: Breast augmentation—the axillary approach. *Br J Plast Surg* **26**:373, 1973
7. Lemperle G, Pietz R, Lemperle M: First clinical experiences with PMMA microspheres injected beneath wrinkles and dermal defects. *Ann Plast Chir* (in press)
8. Serra JM, Mesa F, Paloma V, Ballesteros A: Use of a calf prosthesis and tissue expansion in aesthetic reconstruction of the leg. *Plast Reconstr Surg* **89**:684, 1992
9. Szalay L: Calf augmentation: a new calf prosthesis. *Plast Reconstr Surg* **75**:83, 1985
10. Zenteno SA, Montellano L: Plastica de aumento da panturrilha. *Cir Plast Ibero-Latinam* **12**:239, 1986