

Preliminary Report

Complications of Facial Suspension Sutures

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Background: Barbed suture suspension has gained popularity as an inexpensive, “non-surgical” facial rejuvenation procedure. Initial studies on this procedure have reported minimal complications.

Objective: In this article, we review and evaluate several cases involving complications resulting from barbed suture suspension.

Methods: Four case histories of patients who required removal of suspension sutures because of symptomatic suture, failure, settling, or infection are summarized. The suspension sutures involved were examined after removal and compared to suture withdrawn through bovine muscle.

Results: Two patients reported chronic foreign body sensation. One patient had facial weakness. One patient had obvious dimpling. One patient had localized infection resulting from suture placement. On removal, the barbs on the suspension sutures appeared to be reflected against the direction of lift. Additionally, some sutures were clearly mobile. Forced withdrawal of new suture through bovine muscle did not result in similar anteversion of suture barbs. This would suggest the barb orientation noted at surgery was not the result of the removal process. Identification can be difficult, as the suture in some cases is clear. Once the sutures had been identified, they were easily pulled out without the need for additional surgical access.

Conclusions: Suture suspension may gradually fail due to eversion of suture barbs or migration through tissues. Although the complication rate for this technique has been reported to be low, we believe that surgeons performing this procedure should be aware the rate may be higher than indicated in the literature. (*Aesthetic Surg J* 2007;27:155–161.)

Suture soft tissue elevation was pioneered in the late 1980s by Sulamanidze et al.¹ In 1999 Sulamanidze obtained worldwide patents for the subdermal “Aptos” thread product. The technique of barbed suture lift was subsequently published by Sulamanidze et al¹ in December 2001, with a formal series presented in 2002.² The current variations of this technique include Contour Thread, also referred to as Thread Lift or (with a looped suture) Loop Lift (Surgical Specialties Corp., Reading, PA), and the APTOS lift or Feather lift (Kolster Methods, Inc., Anaheim CA). Although most suture lifting data have been reported in the dermatologic literature, practitioners of various specialties increasingly perform this procedure.

Both barbed suture design and treatment have evolved since their introduction. The original Aptos suture was a multiple-dented suture meant to provide additional traction on tissue. This design was modified to be bidirectional, with the barbs oriented so that tissue would be retained in the central region of the suture without the need for anchoring at either end (Figure 1). It was then redesigned as a multiple-barbed polypropylene suture intended to provide traction and suspension unidirectionally (Figure

2). Approval from the Food and Drug Administration for the extended length unidirectional barbed suture was obtained by two different companies in 2004 and 2005, respectively. No other variants have approval from the Food and Drug Administration at this time.

The technique for placement is to advance a small trocar from the area to be “lifted” to a scalp access incision. At this incision, the suture is drawn inferiorly using the trocar and then readvanced to the access incision. The suture is set to tension to elevate the tissue and tied or anchored in place. Botulinum toxin (Botox) is commonly administered concurrently when sutures are used to elevate the forehead.

In the Thread Lift physicians training manual,³ management of complications (dimpling, asymmetry, visible suture, infection, extrusion and pain) is mentioned, although the incidence of these complications is not reported. There is a standardized physician course for use of barbed suture suspension that does review these issues.

Methods

In this article, 4 patients who presented to the senior author’s practice were reviewed as a retrospective case

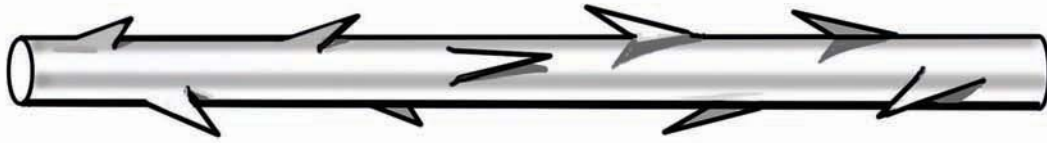


Figure 1. Bidirectional barbed suture.

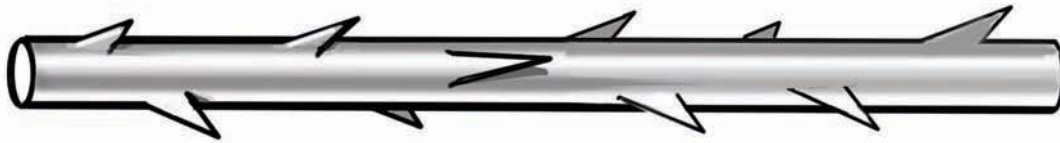


Figure 2. Unidirectional barbed suture.

series. All patients had undergone procedures by other providers and were subsequently referred to us over a 4-month period.

Findings at the time of suture removal were evaluated. The removed suture was compared with a new barbed suture withdrawn through bovine muscle to determine whether suture withdrawal causes changes in suture barb orientation.

Case 1

A 44-year-old woman presented with complaints of brow ptosis. She underwent placement of 2 contour thread sutures per lateral brow by means of a standard hairline incision with a distal introducer. Simultaneously, the patient received Botox injections. She was given oral antibiotics for 5 days after surgery.

The patient experienced 1 month of persistent post-treatment drainage from the left temporal insertion wound. On examination, the patient complained of bifrontal discomfort and pressure, which she described as “two popsicle sticks pressing on my forehead,” specifically in the lateral superior brow region. The threads were minimally palpable on examination. Additionally, she complained of brow asymmetry, with the right side being lower than left side; this was also evident.

The sutures were removed in the operating room. Incisions were made in the temporal scalp scars, with a small ellipse at each site to remove the scar. The clear suspension sutures were initially difficult to identify visually. Once the suture was localized, gentle traction

allowed removal without a second incision or additional dissection. The suture was essentially 2 individual barbed sutures anchored (tied) together superiorly. Each suture appeared to have barbs that were bent backward, resulting in minimal traction to retain the suture. Formal brow lifting was performed. The following morning the patient was examined and stated that she had complete relief from the prior suture symptoms.

Case 2

A 56-year-old woman underwent barbed suture lifting of her midface approximately 1 year before consultation at our office. She stated that she did not appreciate any improvement from her prior procedure. She had palpable sutures and complained of a foreign body sensation.

The patient underwent standard endoscopic brow lift and rhytidectomy. During rhytidectomy the suture was identified within the wound and retrieved. There were 2 individual sutures per malar region.

Case 3

The patient, a 53-year-old woman, underwent mid-facial suspension with suture lifting. Shortly after the procedure, it was noted that the patient had a unilateral buccal branch facial nerve paresis. The patient underwent formal surgical removal of the suspension suture via face lift approach. The suture was found to be partially intra parotid, with a portion passing deep and anterior to Stenson’s duct. After removal of the suture, the buccal paresis resolved.



Figure 3. Barbed suture lift with skin dimpling of right cheek.

Case 4

A 54-year-old woman underwent suture lifting approximately 5 months before presentation. After the procedure, the patient complained of facial asymmetry and dimpling of the right mid-cheek. She underwent mesotherapy and 4 separate fat injections, as well as steroid injections, by the same provider in an attempt to improve the result. She presented in our office with persistent indentation of the right cheek and localized telangiectasia in the same region (Figure 3).

Suture removal technique

The senior author (R.L.) contacted the manufacturer of the Contour Thread (Gregory Ruff, MD, oral communication) for advice on thread removal. It was suggested that gentle continuous traction would disengage the barbs in the surrounding tissue. Traction was maintained on the proximal suture while the area around the suture was massaged to advance tissue sequentially over the barbs.

Our experience with suture removal was uneventful, except for the difficulty in identifying clear suture. Clinically, the sutures were easily pulled through the tissue; other than identification of the proximal anchor knot, no additional dissection was required (Figure 4). During removal, it appeared that the suture barbs had relatively little traction strength and all were bent backwards (anteverted against expected traction). The proximal barbs returned to their normal retroverted orientation shortly after withdrawal. After 1 month of storage in a dry specimen container, the middle and distal barbs maintained a progressively anteverted (against expected traction) position (Figure 5). The barb orientation did not appear to be changed from the position noted shortly after withdrawal.

Suture analysis

A new barbed suture (Contour Thread) was passed through 5 cm of bovine muscle. The suture was then



Figure 4. Contour Thread suture emerging from wound (patient 1).

forcibly withdrawn along its normal direction of traction (Figure 6). Substantially increased effort was required for withdrawal compared to withdrawal *in vivo*. On removal, it was noted that the barbs retained their normal orientation and had retained bovine muscle on the barbs. There was no evidence that the barbs folded backwards against traction due to withdrawal (Figure 7). Thus it appears that forcible withdrawal through tissue is not the reason for the orientation noted in the *in vivo* sutures.

Discussion

The introduction of new technology and procedures typically undergoes a classic cycle: initial skepticism, generous acceptance, and finally cautious implementation. It appears that barbed suture lifting techniques are entering wide acceptance at this time.

Most suture lifting has been discussed in the dermatologic literature. Complication rates for barbed suture suspension have been reported to be low. The original series by Sulamanidze et al² reported 186 patients followed up for 2 to 30 months. During that time period, 4 “thread failures” were reported, for a complication rate of 2.5%. The largest series to date by Lycka et al⁴ in 2004 reported on 350 procedures during 43 months. In that article, the authors reported “procedural success” in 348 cases, although 2 patients requested thread removal, and 52 patients required “some form of postoperative adjustment or touch up.” What this procedure entailed was not defined. Furthermore, the longest cohort in the group (3 years) was reported to have maintained only 60% of their original correction. More recently, in 2005, a case of Aptos thread migration and partial extrusion was reported by Silva-Siwady et al.⁵

The published reports may underestimate the actual incidence of complications. For instance, an additional extrusion case in a series of 80 patients was reported by Isse.⁶ However, Isse reported substantially more problems with extrusion and other complications, including skin dimpling, a relapse rate of 70% for frontal suspension, and symptomatic sutures, in a presentation at the American Society for Aesthetic Plastic Surgery meeting (The Aesthetic Meeting 2005) in New Orleans.

Additionally, he reported that only 20 patients from his practice were treated in a totally “closed fashion and that most had some type of surgical dissection before suspension.” We believe that suture lifting should be defined to refer to soft tissue elevation only, without coexisting tissue dissection. We do believe that suture anchoring of dissected tissue planes (such as performed during endoscopic brow lift) may be effective, because it maintains lift until the tissue planes heal in their new orientation.

Examination of the removed sutures reveals some interesting findings. The distance to the distal end of the suture and eversion during retrieval may account for the memory of the distal barbs, which maintain their anteverted orientation; however, we do not believe this to be the case. In removal of an identical suture through bovine muscle, there appeared to be no evidence of anteversion of the barbs. It seems unlikely that the removal of the *in vivo* suture would influence the resting barb position after extraction. Our belief is that the distal barbs are anteverted during gradual tissue migration along the length of the suture and are held in that position (Figure 8). Initially, the suture engages the tissue, which is tensioned and anchored at a fixed point. The tissue proximally bunches together and becomes a zone of compression (A), while a similar zone of tension (B) is created at the distal end of the suture. When initially anchored, the engaged portion of tissue along the suture (C) has evenly distributed tension. Distal tension then causes gradual barb failure and eversion with tissue migration starting from distal to proximal (zone C migrates to zone B). At some point equilibrium is reached as tissue from zone C is distributed distally reducing tension. The degree to which limited versus total failure occurs is likely due to overall tension, fibrous encapsulation of the suture, and the number of individual barbs supporting tension. In cases of total failure, tissue from zone A could also migrate distally, but the greatest degree of migration will always occur at the distal end. This tissue migration pattern could explain the progressively anteverted barb position shown in the *in vivo* suture.

Given that the tissue along the suture is bunched to some degree during elevation and anchoring, the length

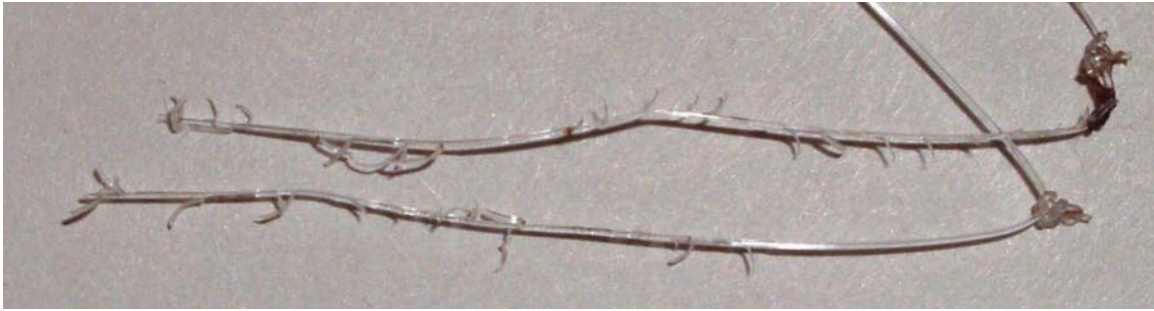


Figure 5. Contour Thread lift with barbs bent (patient 1).



Figure 6. New suture withdrawn through bovine muscle.



Figure 7. Suture after removal.

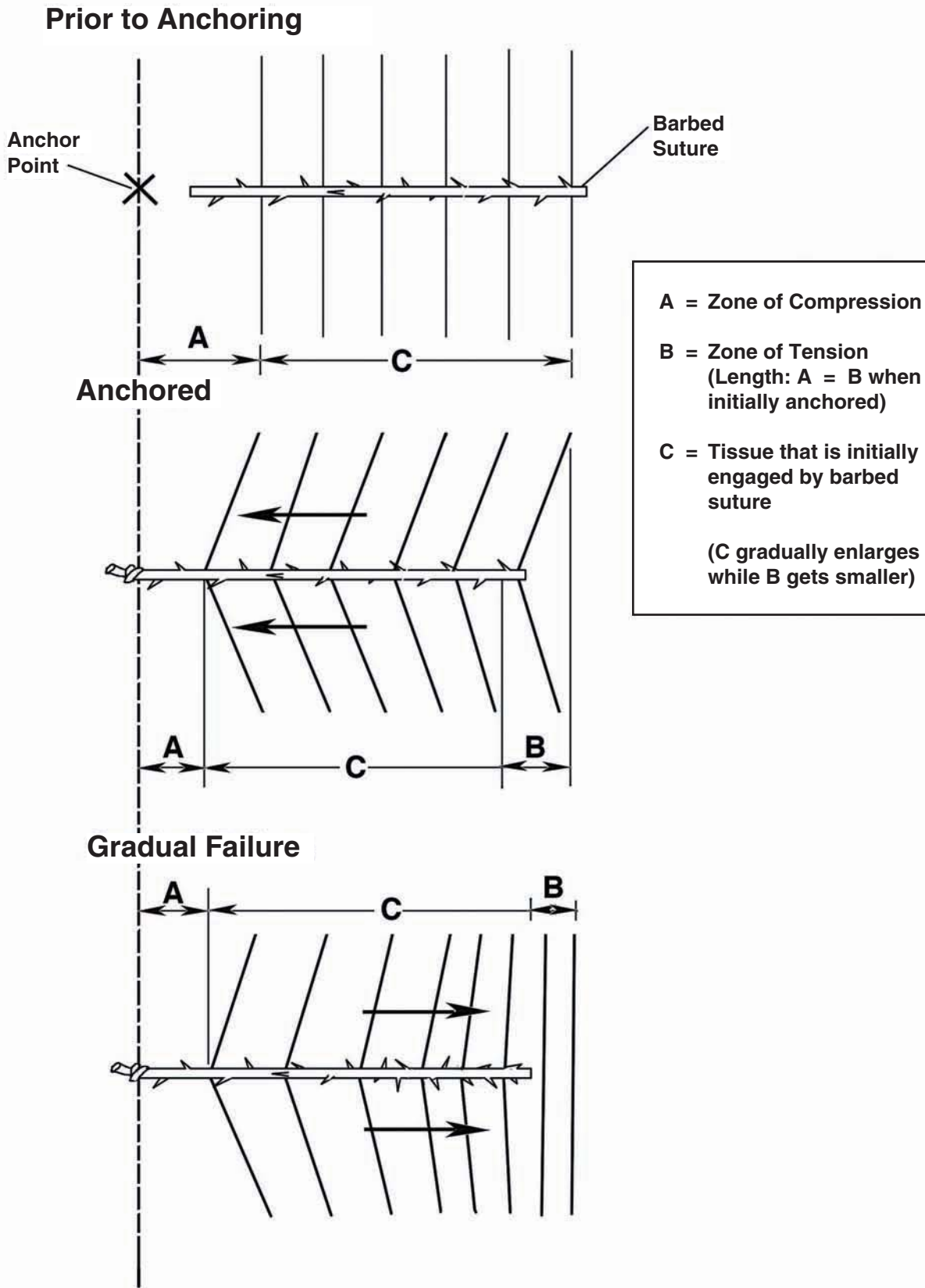


Figure 8. Hypothesis of distal to proximal barb failure.

of tissue migration would be greatest at the most distal point (with respect to a static suture). If the degree of tissue migration is highest at the distal portion, this could explain how the barbs could be progressively more anteverted along its length. With variable tissue migration (less proximal, more distal), the barbs are most likely held in a progressively anteverted state from proximal to distal, which could account for the persistent barb orientation after withdrawal.

Sutures can migrate even when firmly anchored to soft tissue with knots, and it is difficult to understand how these barbs would provide long-lasting traction. Even the Thread Lift physician training book³ acknowledges that the loop lifts have a “relatively high risk of failure as the loop may cut through deep tissue.” It has also been suggested that some type of undermining or tissue mobilization should be performed to allow scar fibrosis to ensure lasting suspension.⁷

It is unclear how skin dimpling occurs, especially if our suggestion that these sutures pull through is accepted. Our hypothesis is that in select patients a fibrous encapsulation forms around the suture or that the suture becomes anchored in the dermis, either of which would allow it to maintain tension. This would be consistent with the variable degree of capsule formation and contracture that occurs around other implants.

It is difficult to imagine that this type of suspension would provide any sustained lift in a dynamic area such as the forehead. It is common for patients who undergo suture lifting of the forehead to concurrently receive Botox. This may allow an adynamic brow to initially maintain elevation and decrease the “cheese wire effect.” Again, in his presentation at The Aesthetic Meeting 2005, Isse⁶ reported a relapse rate of 70% in the brow. We suspect that the written literature is overly optimistic with respect to results in this anatomic area.

Although the procedure may seem benign, symptoms may also be an issue. Patient 1 was relieved of the constant, low-grade pressure over her lateral brows immediately after surgery. Our series has a selection bias in that the patients we encountered sought us out after procedures by other providers. It may be possible that other low-grade complaints exist, but the patients do not seek a second opinion.

Our experience with barbed suture complications suggests that the complication rate is higher than reported in the literature. The occurrence of complications in 4 patients seen in a single plastic surgery office during a 4-month period seems higher than statistically expected. On the basis of a complication or failure rate of 2.5% as

reported in the literature,² a cohort of 640 patients would be needed to produce 4 failures, assuming that no other complications presented to any other provider (including the provider performing the procedure) from this cohort. We are skeptical that such a high volume of suture lifting is being performed in our community; consequently, the most logical explanation is that the complication rate is higher than reported. Unfortunately, we do not know the actual number of suture suspension lifting procedures in our community and so cannot present a conclusive report on complication incidence.

Conclusion

Suture suspension techniques are becoming more common. We believe that the complication rate may be higher than initially reported. Contour Thread sutures can be clear and difficult to identify when attempting removal. Once identified, they are easy to pull through. Barbed sutures clinically seem to provide little traction on tissue after 1 month of healing, especially in dynamic areas such as the forehead. Although barbed sutures may be another useful tool in our armamentarium, we recommend cautious evaluation and acceptance during this time of their increasing use. ■

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