Barbed Sutures in Facial Rejuvenation

Self-retaining barbed sutures, innovations for nonsurgical facial and neck rejuvenation, are currently available as short APTOS threads or long WOFFLES threads. The author uses APTOS threads for malar rounding, facial tightening and firming, and uses WOFFLES threads as a sling, suspending ptotic facial tissues to the firm, dense tissues of the temporal scalp. (*Aesthetic Surg J* 2004;24:582-587.)

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Nonsurgical facial rejuvenation is the Holy Grail of aesthetic surgery and has stimulated a decades-long, if not centuries-long, search for innovative techniques. Persistence of results and safety have been 2 major obstacles in achieving this goal.

Facial rejuvenation has traditionally included a face lift, neck lift, and upper and lower blepharoplasties. These procedures involve significant recovery time, potential complications, and results that may not restore patients to the way they looked when they were younger.

Treatments for eradicating wrinkles, such as Botox (Allergan, Irvine, CA), narrowing lower facial width (Botox facial sculpting), and improving facial sheen (Mesobotox); synthetic fillers for volumetric restoration or enhancement of facial contours; and a wide variety of *no downtime* facial treatments[1] have brought us closer to achieving the instant gratification that patients want. However, what has eluded us is a safe and effective "lunch hour" procedure for elevating and redraping the soft tissues in an upward direction, with minimal or no patient downtime.

The smooth suture elevations of Fernandes (oral personal communication, 2002), Graziosi,[2] and Erol[3] provided simple solutions to brow or midface elevation with little morbidity, but the results were unpredictable. Sutures tended to cut out too easily, and puckering and pleating of the surrounding skin were disturbing, resolving with a concomitant loss of lifting effect. Suture suspension techniques of Keller,[4] Sasaki and Cohen,[5] and De Cordier and Vasconez[6] have shown encouraging results but require some form of tissue dissection and belong in the surgical category because they have appreciable downtime.

In recent years, barbed sutures have been proposed as the method to achieve a nonsurgical face lift. This technique has captured the interest of patients and surgeons worldwide. However, experience has taught us that new techniques may emerge, become popular, and then quickly fade into oblivion when they do not live up to their promise or are replaced by newer and better technology. Here I will describe the current status of barbed sutures, with consideration as to whether they will stand the test of time and achieve what they promise. Since 2002 I have had experience with more than 200 APTOS and WOFFLES lift procedures using the WOFFLES threads (Kolster Methods Inc., Corona, CA).

Barbed Sutures

Barbed sutures, which are bidirectional and self retaining, currently exist in 2 primary forms: the short APTOS[7,8] or Featherlift thread and the long WOFFLES thread.[9-12] A third variation, the Isse Endo APTOS thread, is a unidirectional non-self-retaining thread used in conjunction with an endoscopic face lift and, as such, belongs in the surgical category.

The APTOS threads are barbed monofilament polypropylene threads available in #3-0 and #2-0 sizes with lengths of 10 to 14 cm. The WOFFLES thread is made of the same material and is available in the #2-0 size at a 60-cm length for optimal handling. APTOS threads have also been reported on by Lycka et al,[13] who document its use in several hundred patients.

The concept of barbed sutures was first pioneered by Alcamo in 1964,[14] followed by Fukuda in 1984[15] and Ruff in 1994.[16,17] These innovators conceptualized barbed sutures for wound closure without tying knots but did not discuss aesthetic applications. In 2000, Sulamanidze popularized the concept of barbed sutures in facial cosmetic surgery and devised the name APTOS

Figure 1. A, *Preoperative markings for APTOS malar rounding and elevation.* **B,** *Postoperative view after 24 hours.*

(Anti-PTOSis) for his system of treating facial ptosis. In 2002, I devised the nonsurgical, self-retaining barbed suture sling to achieve a more direct and longer lasting soft tissue elevation. Leung and Pritt[18] have reported on the integrity of barbed sutures.

APTOS Threads

Designed to elevate the tissues and achieve a face lift effect, this system uses several short, bidirectional barbed sutures (up to 12 per side) inserted in a curved fashion into sagging, flabby facial areas, to cinch and elevate the tissues. The barbs on either side of the thread, oriented towards the middle, open and engage the soft tissues once the ends are pulled in opposite directions. This makes the threads self-retaining or *locking*. The process is simple to perform under local anesthesia, takes 10 minutes for each area (cheeks, jowls, brow, or neck), and recovery is swift.

I have noted positive and negative effects using APTOS threads.

- Correct thread placement is essential to achieve the initial elevation and bunching of the soft tissues. If sutures are incorrectly placed, the skin becomes merely puckered or may even become depressed.
- The threads may be placed too superficially and cause visible dimpling and tethering, or may be placed too deeply and have little effect.
- The cinching of the tissues initially creates a volumetric restoration, most desirable in the malar mound, which appears rejuvenated once it becomes fuller and elevated (Figure 1). In other areas of the face, such as the brow and the jowls, such a bunching up of tissues is less desirable. However, with time, the APTOSed area flattens out, leaving firmer and tauter facial skin.
- Although very little persistent elevation is seen, facial tissues appear tighter, firmer, rejuvenated, and, importantly, patients seem happy with the results. I believe the improvement occurs because subsequent fibrous tissue production around the threads combined with the implanted threads act as a scaffold within the soft tissue matrix. This fibrocollagenous reaction enhances the collagen matrix of the dermis and subcutaneous tissue. Correctly oriented APTOS threads have the effect of making the face appear sleeker and tighter.

I have performed 102 APTOS procedures (in 32 men and 70 women) in the last 2 years. In the first 2 procedures I performed (May 2002), I placed APTOS #3-0 threads in the cheeks and jowls. The results were not encouraging. Both patients complained that there was little effect and I agreed. As a result, I stopped performing the procedure until I was introduced to the Featherlift (#2-0) threads in December 2002. With the Featherlift threads, the cinching power was greater and a visible tissue elevation could be seen initially without the barbs of the threads giving way. With time, although the elevation

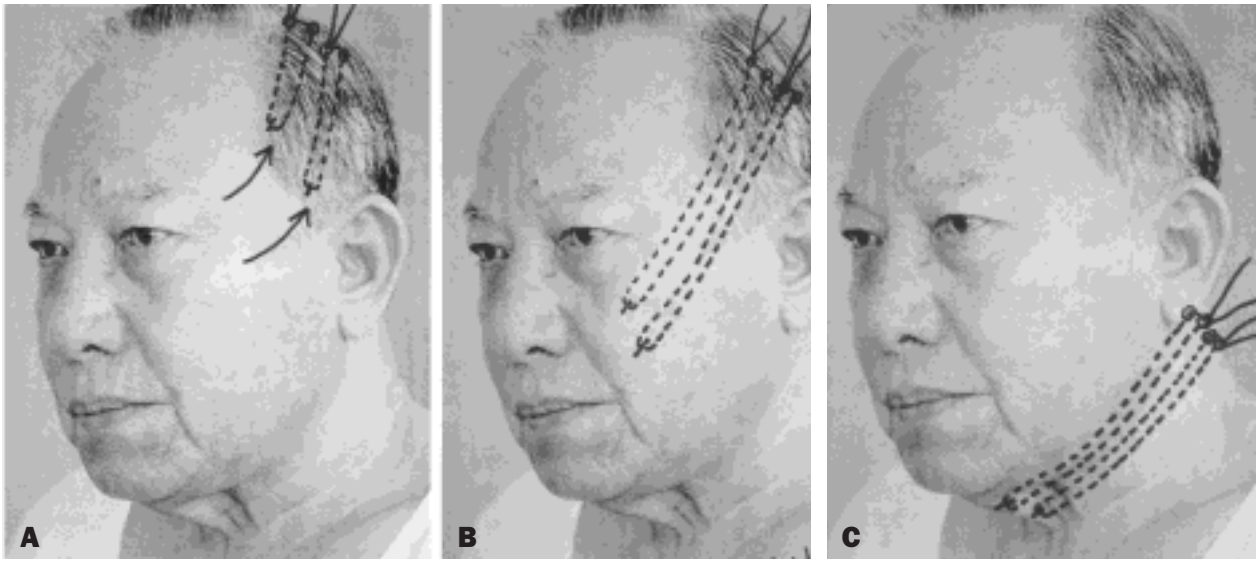

Figure 2. A, *Preoperative markings for WOFFLES anterior hairline temporal-midface lift.* **B,** *Preoperative markings for WOFFLES lift direct malar elevation.* **C,** *Preoperative markings for WOFFLES lift jowl elevation.*

Figure 3. A, *Preoperative view of a 70-year-old woman.* **B,** *Postoperative view 1 week after WOFFLES lift of the lateral brow, midface and jowls via anterior hairline placement of 4 WOFFLES threads on each side. Patient also received Botox to the glabellar and central forehead regions.* **C,** *One year after procedures.*

was lost, patients remained satisfied because they felt a tightening or firming in the areas that had been treated. In my experience, APTOS is less useful for face lifting, perhaps because there are no stable fixation points. However, it remains a useful facial rejuvenation technique because of its tightening and firming attributes.

APTOS Complications

The most significant problems have been palpability and extrusion of thread ends. Of 102 patients, there were 8 migrations, 5 infections/granulomas, and 11 palpable thread ends with pain. Five patients complained of dimpling and irregular waviness of the skin, which was caused by superficial placement. In all of these patients, APTOS threads had to be removed. A common complaint of patients who had undergone APTOS procedures with other surgeons was that their postsurgical appearance was "strange," uneven, bumpy, unusually dimpled, or older. On examining these patients, I discovered that, invariably, the threads had been placed in directions and

Figure 4. A, C, *Preoperative view of 37-year-old woman.* **B, D,** *Postoperative view 1 week after WOFFLES lift of the lateral brow, midface and jowls via anterior hairline placement of 3 WOFFLES threads on each side. Patient also received Botox to the glabellar and crow's feet regions.*

patterns that defied logic and reflected a lack of understanding of how the procedure works. Patients experienced removal of these threads with relief.

WOFFLES Lift

This technique uses a specially designed 60-cm thread that has a clear 4-cm central zone, a 20-cm length of spirally arranged barbs on either side of this zone, angled towards the midpoint, and a smooth thread portion that is 8 cm long. The WOFFLES thread is introduced into the sagging tissues of the face via a long, 18-gauge spinal needle and is doubled upon itself to form a sling whose ends emerge through the temporal scalp. The barbs of the thread engage the firm, dense temporal scalp tissue and, therefore, effectively suspend the sagging tissues of the face to the stable tissue of the temporal scalp.

The insertion technique in the WOFFLES lift is essentially the same regardless of where in the face or neck the lift is performed.

1. With the patient in the sitting position, first assess

Figure 5. A, *Preoperative view of a 54-year-old woman.* **B,** *Postoperative view after WOFFLES lift to neck using 5 WOFFLES threads spanning the mastoid regions and passing beneath the cervicomental angle.*

the degree of facial skin and soft tissue laxity and determine the correct vectors of suspension.

2. Determine the point of insertion and the point of exit. Mark the 2 points and join them with a dotted line. Infiltrate local anesthesia with linocaine 2% and adrenaline 1:200,000 along the line and into any other vectors that you have designated.
3. Make a small stab incision with a #11 blade to create an entry port at the point of insertion. Pass the long, 18-gauge spinal needle into this entry point, first subcutaneously and then more deeply into the deep temporal tissues, then emerge at the temporal scalp exit point. From below, pass one end of the WOFFLES thread into the needle until the clear, central zone is reached. Withdraw the needle, leaving one half of the thread in place and one half outside.
4. Reintroduce the needle into the scalp 5 mm adjacent to the first exit point and maneuver it in a retrograde direction along a parallel path down the deep temporal tissues and out through the previous entry point. Introduce the remaining end of the thread through the tip of the needle until it exits from the scalp.
5. Withdraw the needle and pull on both ends of the WOFFLES thread, thus elevating the sagging tissue. The reverse angled barbs on the side of the thread prevent the tissues from dropping back to their original position. The point of greatest tension or suspension is over the central clear zone. However, this tension is further distributed along the length of the barbed thread (compared with a smooth suture that merely glides within the tissues and has a greater tendency to "cut out" at the folded, central portion).
6. Tie the 2 ends together subcutaneously or cut both ends of the thread flush with the scalp. As many as 5 threads can be placed on each side of the face, each having a different vector to accommodate the unique needs of the patient. My current preference is to insert the threads through entry points just anterior to the hairline (Figure 2, *A*). In this way the hair can easily disguise dimples, bruises, or the entry point itself, and patients can return to activity and social situations within a day or so. Inserting the threads more distally in the face (Figures 2, *B* and *C*) leads to increased visibility of the entry points, dimples, and, therefore, to a longer downtime.

Having performed 112 WOFFLES thread lifts (in 17 men and 95 women), I can conclude that the results simulate a traditional face lift. There is dramatic elevation of the midface and jowls with smoothing and tightening of the peripheral face. Some folding and pleating of skin inevitably occurs above each entry point, necessitating more threads inserted superiorly to smooth out the skin folds. This results in lateral brow and eye corner elevation. The exaggerated eye slant settles within 2 to 3 weeks. There is a recurrence of about 30% facial laxity within 3 months, and then the improvement remains stable up to a year later (Figure 3). Several patients have requested additional thread insertion to enhance the tissue elevation.

WOFFLES Lift Complications

Most complications were minor, including knot palpability or knot exposure in the scalp, with or without a small granuloma (11 patients), and dimpling at the point of insertion, requiring secondary skin release (5 patients). Most patients had some minor dimpling that faded with time. The exposed knots were easily removed and the thread cut flush with the skin. Bleeding that occurred

during the procedure could always be staunched with palmar compression. No patients experienced nerve problems. None of the threads have been removed.

Current Applications

APTOS works better in patients who want subtle facial shape changes with priorities of midface and jowl tightness and firmness rather than tissue elevation. These patients do not want to change their eye shape and are unprepared for any radical change yet they still desire some improvement beyond Botox or fillers. APTOS is ideal for men.

With APTOS, I have not been able to achieve persistent facial elevation except for the malar area. In the malar area, soft tissue bunching and tightening is most appropriate because this region looks more youthful with volumetric enhancement. The initial elevation achieved with APTOS, largely due to the bunching and concertina effect on the soft tissues, is undesirable in the forehead, lateral face, and jawline—areas that should appear smooth and taut. The brow, which has little give and is relatively adherent, is a difficult region to elevate using APTOS sutures alone and appears to respond better to the firmer pull of WOFFLES threads.

The WOFFLES lift is capable of significant tissue elevation but invariably makes the eye more elongated and upwardly slanted, similar to a subperiosteal face lift. The tightening effect on the midface and jowls is significant and thus appropriate for patients desiring a true face lift effect who do not wish to undergo surgery with consequent downtime. These patients are prepared to trade a fast, predictable result for the longevity of a traditional open or endo face lift and might repeat the procedure in a few years or request additional thread insertion to offset the aging process.

I use WOFFLES threads to elevate the midface, brows, and jowls, smoothing the facial periphery and achieving facial tautness. I use the APTOS threads to round and elevate the malar mounds as well as to firm up the jowl and cheek areas. I still use APTOS in the brow in selected patients who want very subtle elevations between 1 to 2 mm. In the neck, I use the WOFFLES threads as a series of long slings spanning the mastoid fascia and passing under the cervicomental angle (Figures 2, *C* and 5).

My preferred strategy is to use APTOS threads to round the malar mounds, providing volumetric enhancement and 3-dimensionality to the front of the face, and the WOFFLES lift to elevate the midface, smooth out the jawline, and flatten the peripheral face. Both techniques are ideal for patients who are either not ready or reluctant to undergo traditional open techniques with consequent downtime.

Note: Dr. Wu receives royalties from the sale of WOFFLES threads. He has no financial interest in the manufacturer's or distributor's companies.

References

1. Wu WTL. Facial Rejuvenation without facelifts: Personal Strategies. Regional Conference in Dermotological Laser and Facial Cosmetic Surgery 2002, Hong Kong. September 13-15, 2002.
2. Graziosi AC, Beer SMC. Browlifting with thread: The technique without undermining using minimum incisions. *Aesth Plast Surg* 1998;22:120-125.
3. Erol OO, Sozer SO, Velidedeoglu HV. Brow suspension, a minimally invasive technique in facial rejuvenation. *Plast Reconstr Surg* 2002;109:2521-2532.
4. Keller GS, et al. Elevation of the malar fat pad with a percutaneous technique. *Arch Facial Plast* Surg 2002;4:20-25.
5. Sasaki GH, Cohen AT. Meloplication of the malar fat pads by percutaneous cable-suture technique for midface rejuvenation: outcome study (392 cases, 6 years experience). *Plast Reconstr Surg* 2002;110:635-654.
6. De Cordier BC, Vasconez LO. Rejuvenation of the midface by elevating the malar fat pad: review of technique cases and complications. *Plast Reconstr Surg* 2002;110:1526-1536.
7. Sulamanidze MA, Fournier PF, Paikidze TG, Sulamanidze G. Removal of facial soft tissue ptosis with special threads. *Dermatol Surg* 2000;28:367-371.
8. Sulamanidze MA, Shiffman MA, Paikidze TG, Sulamanidze GM, Gavasheli LG. Facial lifting with APTOS threads. *Int J Cosmetic Surg Aesthetic Dermatol* 2001;4:275-281.
9. Wu WTL. Facial Rejuvenation using APTOS and WAPTOS (the WOFFLES LIFT): A novel approach. 13th International Congress of the International Confederation of Plastic and Reconstructive Surgery (IPRAS), Sydney, Australia. September 10-14, 2003.
10. Wu WTL. The WOFFLES LIFT: a non surgical facelifting technique. Appearance Medicine Society of Australasia (AMSA) 3rd Annual Scientific Meeting, Wellington, New Zealand. March 17-20, 2004.
11. Wu WTL. Non surgical facelifting with the WOFFLES LIFT. American Society of Aesthetic Plastic Surgeons (ASAPS) Annual Meeting, Hot Topics Symposium. Vancouver Convention Centre, Vancouver, Canada. April 16-21, 2004.
12. Wu WTL. Facial rejuvenation with a Suture Suspension technique: The WOFFLES ThreadLift. The Coupure Seminars 4th Edition: Controversies, Art and Technology in Facial Aesthetic Surgery. Gent, Belgium. May 6-7, 2004.
13. Lycka B, Bazan C, Poletti E, Treen B. The emerging technique of the antiptosis subdermal suspension thread. *Dermatol Surg* 2004;30:41-44.
14. Alcamo JH. Surgical suture. U.S. Patent 3,123,077, 1964.
15. Fukuda. Surgical barbed suture. U.S. Patent 4,467,805, 1984.
16. Ruff GL. Insertion device for a barbed tissue connector. U.S. Patent 5,342,376, 1994.
17. Ruff GL. Barbed bodily tissue connector. U.S. Patent 6,241,747B1, 2001.
18. Leung JC, Pritt S. Barbed, bi-directional surgical sutures; in vivo strength and histopathology evaluations. 2003 Society for Biomaterials 29th Annual Meeting Transactions, #101.

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