

Use of Absorbable Running Barbed Suture and Progressive Tension Technique in Abdominoplasty: A Novel Approach

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Certain general principles regarding abdominoplasty have remained constant throughout the last century, although incision patterns, fascial repair, and fatty contour techniques have varied. What has remained constant has been the use of a layered closure technique for final wound approximation, including in most cases the closure of Scarpa's fascia, popularized by the work of Lockwood.¹ Controversy, however, has continued to present itself over the types of suture material to be used for fascial plication and wound closure, as well as over the necessity for drains following these procedures.

The Quill self-retaining system (Quill SRS; Angiotech Pharmaceuticals, Inc. Vancouver, Canada) is a knotless, bidirectional, barbed, self-anchoring suture that incorporates tiny barbs spaced evenly in a helical array on either side of a nonbarbed midsegment.² Two needles are attached, one at each suture end. In contrast to standard sutures, wound tension is distributed across multiple barbs running the length of the suture line rather than at the knotted end. This suture was designed to allow for faster, more efficient, and more economical tissue approximation and wound closure. It is available in absorbable (polydioxanone; polyglycolide-polycaprolactone copolymer, Monoderm) and nonabsorbable (polypropylene, nylon) formulations. This study evaluated the operative times, closure costs, and safety outcomes associated with bidirectional barbed absorbable sutures compared with standard sutures when used for soft-tissue approximation, including fascial repair, in patients undergoing cosmetic abdominoplasty.

PATIENTS AND METHODS

A group of 24 patients scheduled for abdominoplasty were operated on by the same surgeon in the same facility, with the same anesthesiologist, between June of 2007 and November of 2008. All tissue approximation and wound closure procedures for the first 12 patients were performed using standard nonbarbed sutures with drains and absorbable deep dermal staples. Barbed absorbable sutures were used for the remaining 12 patients without drains or dermal staples. In all cases, a running progressive tension suture was deployed in the paramedian area, securing Scarpa's fascia in a vertical fashion on each side from the costal margin to the lower incision (Figs. 1 and 2). All incisions were closed in three layers (Scarpa's, deep dermal, and subcuticular).

In the standard suture group, fascial plication was performed using size 0 polydioxanone sutures (PDS II; Ethicon, Somerville, N.J.), the progressive tension suture used was a 2-0 polydioxanone (PDS II; Ethicon), then a skin stapler (Inorb Incisive Surgical, Inc., Plymouth, Minn.) was used for deep dermal approximation, and the subcuticular closure was performed with 4-0 poliglecaprone suture (Monocryl; Ethicon). In the bidirectional barbed suture group, fascial plication was performed using sizes 2, 0, or 2-0 polydioxanone sutures, the progressive tension suture used was 0 or 2-0 polydioxanone, and skin closure was performed using polydioxanone and/or Monoderm sutures in various sizes (2-0 and 3-0) and combi-

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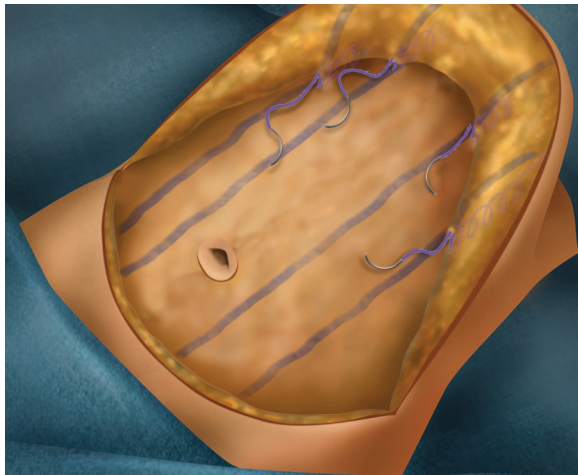


Fig. 1. Suture placement and deployment pattern. Five running parallel rows of barbed suture are placed in a sequential fashion. The midline row is excluded if fat contouring removes Scarpa's in this zone. In this case, only the umbilicus serves to stabilize the flap in the midline.

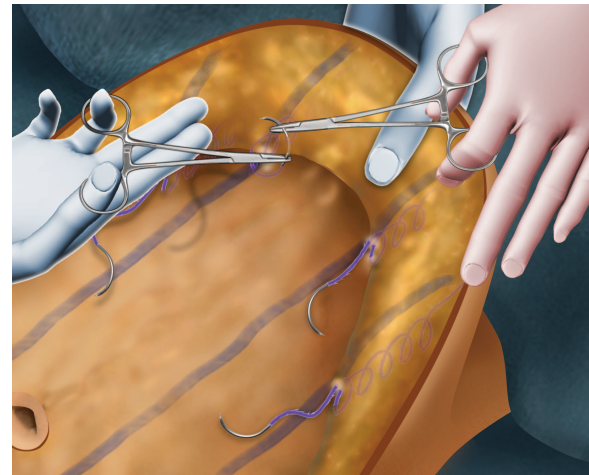


Fig. 2. The deployment requires an assistant as the operating surgeon holds and advances the flap with his or her nondominant hand and places the suture with the other hand. The assistant grasps the needle as it passes from the abdominal fascia into Scarpa's in one bite, so the surgeon can regrab the needle for the next throw.

nations. Performance outcomes that were evaluated included surgical time, material costs (sutures, drains, staples), and complications.

RESULTS

Baseline characteristics were similar between the two suture groups (Table 1). The mean patient age was approximately 44 years, and the mean body mass index was approximately 25 kg/m². All patients were female; most had had previous abdominal operations. Patients in the bidirectional barbed suture group had operative times that were on average 15 minutes shorter than those in the

standard suture group (Table 2). While drains were not utilized for patients in the barbed suture group, between two and three drains were used for each patient in the standard suture group. A similar number of sutures was used for both groups. Case 1 illustrates that excellent cosmetic outcome can be achieved using barbed progressive tension suture with this drainless abdominoplasty technique (Fig. 3).

The only significant complication observed in the bidirectional barbed suture group was an infected hematoma, and this occurred in the only patient in the series who was treated with flap

Table 1. Baseline Characteristics

	Bidirectional Barbed Sutures	Standard Sutures
No. of patients	12	12
Mean age, years (range)	44.4 (20–61)	44.2 (33–57)
Mean body mass index, kg/m ² (range)	24.4 (20.8–29.6)	25.5 (20.5–29.1)
No. of women (%)	12 (100)	12 (100)
Medical history, <i>n</i> (%)		
Hypertension	1 (8.3)	2 (16.6)
Current or past smoker	4 (25.0)	4 (25.0)
Diabetes	1 (8.3)	0 (0.0)
Other	Two hypercholesterolemia (16.6)	One pulmonary embolism (8.3)
	One asthma (8.3)	One asthma (8.3)
	One tracheal malacia (8.3)	One Lyme disease (8.3)
Previous abdominal operations	Eight cesarean deliveries (4 patients)	Seven cesarean deliveries (4 patients)
	Two ectopic pregnancies (2 patients)	Two hysterectomies
	Two hysterectomies	One ovarian cystectomy
	One ovarian cystectomy	One cholecystectomy
	One pelvic cyst	One myomectomy
	One hernia repair	One dilation and curettage
	One appendectomy	One ovarian tumor removal
	One laparotomy, 1 lipoplasty	One lipoplasty
	One laser surgery for endometriosis	

Table 2. Surgical Record

	Bidirectional Barbed Sutures	Standard Sutures
No. of patients	12	12
Mean surgical time, minutes (range)	93 (80–120)*	108 (80–180)*
Direct cost of operating room time, \$ (range)	1674 (1440–2160)	1944 (1440–3240)
Mean no. of sutures used for abdominoplasty closure (range)	10.6 (8–14)	9.0 (8–14)
Drains used		
No. of patients (%)	0 (0.0)	12 (100)
Mean no. of drains (range)	0	2.8 (2–3)
Wound closure costs, \$ (range)	243 (199–330)†	178 (151–184)†
Additional procedures (no. of patients)	Lipoplasty flanks (1); bilateral mastopexy (1); excision gynecomastia (1); revision augmentation mastopexy, implant upsizing, upper blepharoplasty (1); liposuction upper abdomen, post hips, inner thighs (1); bilateral nipple reduction and mastopexy (1)	Lipoplasty inner/outer thighs (1); mastopexy (2); breast augmentation (1); upper blepharoplasty (1); liposuction inner/outerinner/outer thighs (1)

*Six of 12 patients in each group had additional procedures performed, and therefore their data were not included in this calculation.
 †Including sutures, drains, and staples.

liposuction and enoxaparin. In the standard suture group, one small seroma in the subxiphoid region was noted and readily resolved with one puncture aspiration. This represented the only seroma in the entire series of 24 patients treated. We also encountered one patient in the standard suture group who developed fat necrosis in the infraumbilical region. This patient was an ex-smoker. Minor complications were not reported in this series but were comparable to those in similar case studies.

DISCUSSION

This article explores the novel use of a new technological advance in suture material that allows for knot-free and tension-free closure of wounds. This study reaffirms the work of Pollock and Pollock,^{3,4} who have reported that the use of progressive tension suture with pleating of the cutaneous flap to the abdominal fascia eliminates the need for drains in abdominoplasty. While recognizing the advantage of progressive tension suture, Pollock and Pollock were cognizant of the additional time taken to place interrupted sutures. In this series, the running barbed sutures for progressive tension suture were shown to be advantageous in reducing time for placement and are fully knotless. This series further supports the work of Andrades et al., which clearly showed that either progressive tension suture or drains are of equal value in preventing seroma. Furthermore, it corroborates the work of Khan and Khan, who found progressive tension suture advantageous in reducing complication rates as well. Recent work



Fig. 3. Case 1. Cosmetic outcome before (*above*) and 6 months after (*below*) abdominoplasty and wound closure performed with barbed sutures.

of Warner and Gutowski⁵ also confirms the efficacy of this technique.

Drains tend to be a significant source of pain and postoperative “annoyance” for patients. As such, the elimination of drains with progressive tension sutures is of great value. The use of bidirectional barbed sutures is an alternative technique for progressive tension suture and obviates the need for additional knot material.

SUMMARY

This series of patients clearly shows that the use of absorbable bidirectional barbed sutures for repair of fascial defects in abdominoplasty, including fascial plication, progressive tension, and layered skin closure, is a satisfactory alternative to previously reported options. Furthermore, it eliminates the need for redundant permanent suture material and knots. I believe barbed suture technology is truly the proverbial “better mousetrap” that represents a variation of a familiar theme for

all surgeons. I am confident that novel uses for this revolutionary technology will be quickly forthcoming. Here, too, I hope, plastic surgeons will lead the way.

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Future Meetings of the American Society of Plastic Surgeons

The following are the planned sites and dates for future annual meetings of the American Society of Plastic Surgeons:

2010	Toronto, Canada	October 1 to 6
2011	Denver, Colo.	September 23 to 28
2012	Washington, D.C.	November 1 to 7