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A novel barbed suture tie-over dressing for skin grafts: A comparison with traditional techniques



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KEYWORDS

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Summary *Introduction:* Barbed suture devices have a widespread application in plastic surgery. The unidirectional nature of the barbs facilitates a strong grip on tissues and reduces the need to constantly tension the suture manually. We hypothesized that a barbed suture tie-over suture to secure skin grafts would be quicker to perform than traditional tie-overs and would also exert a greater downward pressure on the skin graft.

Methods: Thirty uniform areas of skin were excised from a cadaver. A pressure transducer was placed on the wound bed and covered with the excised skin along with a mineral oil-soaked wool dressing to act as a bolster. Three different sutures were used to secure the graft in place and the pressure was recorded. The tie-over techniques used were the classic silk tie-over, a running Vicryl Rapide™ tie-over and a running barbed tie-over.

Results: The barbed tie-over exerted the most downward pressure (82.8 ± 7.3 mmHg) compared to the silk (46 ± 4.85 mmHg) and the Vicryl Rapide™ (18.6 ± 2.4 mmHg). Furthermore, the barbed tie-over was the quickest to perform ($1:45 \pm 22$ s) when compared to the Vicryl Rapide™ ($02:57 \pm 27$ s) and the silk tie-overs ($04:26 \pm 39$ s).

Conclusion: Barbed sutures are a viable option for securing skin grafts. They are quick to perform and provide significantly improved downward pressure on the skin graft. We feel that this technique would be especially suited to the sole operator as it can be carried out without the need of an assistant.

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Introduction

It has been well documented that even pressure must be applied over a skin graft for successful graft take.¹ This was first documented by Blair and Brown² in 1929 and since then, a variety of methods have been used to secure skin grafts yet no consensus exists as to which is the optimum method. The tie-over dressing is a well renowned and commonly used technique yet its necessity is often open to debate and it has yielded a plethora of modifications throughout the years. In our experience, the classic tie-over is both time-consuming and laborious and can also be difficult to perform if operating without an assistant.

There has been a renewed interest in barbed suture devices in recent years and their versatility is reflected in their reported application in wound closure, body contouring, facial rejuvenation³ and flexor tendon repair.⁴ The most common barbed devices commercially available are Stratafix™ (Ethicon Inc., Somerville, New Jersey, USA), Quill™ (Angiotech, Vancouver, BC, Canada) and V-Loc™ (Covidien, Mansfield, Massachusetts, USA). Both the Stratafix™ and Quill™ devices are bidirectional sutures with a needle on either end. At the centre of the device is the transition point where the barbs change direction. The V-Loc™ is a unidirectional device with a welded loop at one end. Barbed sutures are rated as equal to one United States Pharmacopoeia (USP) suture size larger than their standard equivalent.⁵ This is because there is a loss of the effective diameter during the process of creating the barbs. They are engineered to evenly distribute tension along the length of the suture and they provide immediate tissue hold on placement, thereby eliminating the need for assisting "third hand". One of the main reported advantages of barbed sutures is the reduced operating time on account of no knot requirement.⁶

The purpose of this study was to examine the use of a barbed suture device as part of a tie-over dressing for skin grafts. We hypothesized that the barbed tie-over dressing would be quicker to perform than the conventional tie-over and would also generate increased downward pressure on

the graft as tension is maintained consistently due to the unidirectional nature of the barbs.

Materials and methods

A circular area (diameter = 4 cm) of skin was excised on the anterolateral aspect of a formalin-preserved cadaver (Figure 1). The skin excised was utilized as a full thickness graft in this study. A piece of mineral oil-soaked cotton wool wrapped in fine gauze was used as the bolster and the same bolster was used for each tie-over dressing in our study.

An intra-compartmental monitor (Stryker, MI, USA) was used to measure the pressure under the skin grafts. The needle at the end of the monitor was removed and replaced by fine tubing attached to a small fluid filled finger from a surgical glove (Figure 2). This created a closed system that measured pressure at the graft–wound interface.

Three types of tie-over dressings were assessed in this study. The running tie-over⁷ using a Vicryl Rapide™ suture, the classic tie-over with a silk suture and a novel running barbed method. A 4-0 Vicryl Rapide™ and 4-0 Mersilk™ (Ethicon Inc., Somerville, New Jersey, USA) were used for the running tie-over and the classic tie-over respectively. Each technique was performed a total of 10 times. For the running barbed method, a 3-0 Stratafix PDO suture was utilized as this is equivalent to a 4-0 non-barbed suture. For all of the tie-overs, six strands of suture material were used to bolster the graft to ensure uniformity in each of the groups. The bites were placed equidistant from one another at the 12, 2, 4, 6, 8, and 10 o' clock positions of the graft. For the silk tie-over, interrupted silk sutures were placed at six points around the circumference of the graft and one tail was left long in order to tie-over the dressing. The Vicryl Rapide™ tie-over was performed by firstly securing the suture by tying a knot at the 12 o' clock position and then running the suture back and forth across the graft at each of the six points. The running barbed technique was



Figure 1 A defect with a diameter of 4 cm was excised from the anterolateral aspect of a cadaveric lower limb. The excised skin was utilized as a full thickness graft.



Figure 2 An intra-compartmental pressure monitor was modified to create a closed system which could measure pressure. The finger off a surgical glove was filled with saline and attached to tubing. This reservoir was placed under the graft.

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