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Use of locking barbed sutures in foot and ankle surgery. A case series

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ABSTRACT

Background: Barbed sutures represent a novel technique for wound closure. By distributing tension forces across the length of a wound, it results in better wound healing. A recent article from Chowdhry et al. cautioned against the use of barbed sutures in foot and ankle surgery. Our experience with the Quill® (Angiotech, Vancouver, BC) barbed suture, showed a more positive outcome.
Materials and methods: 123 surgical wounds were prospectively followed up after closure with a bidirectional barbed suture. The cohort represented a large range of patient ages and co-morbidities, as well as incision length and locations.
Results: Complication rates were low in this large cohort. The total complication rate was 6.5% (8 wounds). One wound (0.8%) had a major infection that needed further surgery, and 2 wounds (1.6%) showed inflammatory related complications. The remaining 5 wounds (4%) had minor wound complications, which resolved without any further surgical intervention. Patient satisfaction rates were high, with 78% of incisions scoring at maximum on the visual analogue cosmesis score.
Conclusions: Use of the Quill® (Angiotech, Vancouver, BC) suture is a safe and effective alternative for wound closure in foot and ankle surgery.

1. Introduction

Barbed sutures represent a novel technique in skin closure that has been used by plastic surgeons for a number of years. It has been described as a new tool for soft tissue fixation for today's generation of surgeons [1].

Adding barbs to a suture in a helical fashion circumferentially distributes the dynamic tension forces along the length of the suture line. This potentially allows for better wound healing. A decrease in wound suturing time is an added advantage. Increased surgeon satisfaction with the results of wound closure has been reported in the plastic surgery literature [1–5]. Besides plastic surgery, barbed sutures have also been successfully used in urology and gynaecology [6,7].

In orthopaedics barbed sutures have been used in hip and knee arthroplasty [8–10], hand flexor tendon surgery [11] and spine surgery [12]. Very little has been written about its use in the foot and ankle. A biomechanical study for Achilles tendon repair has shown a higher resistance to gapping and a decreased resistance to failure as compared to fiberwire [13]. A recent clinical study has reported poor results for wound closure in foot and ankle surgery using the V-loc 180® (Covidien, Mansfield, MA) suture [7]. Due to unacceptably high rates of wound complications the authors cautioned against the use of barbed sutures. Complications included wound dehiscence and skin irritation due to prominent barbs, which were removed in the clinic [7]. Our experience with the Quill® (Angiotech, Vancouver, BC) barbed suture has proven otherwise. The senior authors (NP and PF) have been successfully using this suture in clinical practice.

The aim of this study is to show that use of the Quill® (Angiotech, Vancouver, BC) suture is a safe and effective alternative for wound closure in foot and ankle surgery.

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Table 1
Co-morbidities of patients.

Co-morbidity	*n*	%
Smokers	7	9
Diabetes	6	8
Rheumatoid	2	2
Breast carcinoma	1	1
Anticoagulant use for strokes, arrhythmias or TED*	3	4
COPD on steroids	1	1
Hypertensive and cardiac	9	12
Renal dysfunction	1	1

* Thrombo-embolic Disease.

2. Materials and methods

One hundred and twenty-three consecutive surgical incisions closed using a Quill® (Angiotech, Vancouver, BC) suture were included in the study and followed up. A precision-based sample size calculator was used to determine the number of wounds needed to achieve statistical significance at a proportion of 0.07. The calculated sample size was 120 wounds. The surgical procedures were all performed by the senior surgeons between September and December 2014.

Exclusion criteria included traumatic wounds, the presence of any infection and incisions over previous scars. This allowed for an assessment of closure with the Quill® (Angiotech, Vancouver, BC) suture across a large spectrum of different foot and ankle procedures and varying patient profiles. Incisions needed to be a minimum length of 3 cm to be included.

Patient demographics recorded included age, sex, presence of co-morbidities and smoking status. The co-morbidities that were recorded were those of which the disease or its treatment would influence wound healing, and are listed in Table 1. The length and anatomical location of the incisions were documented. The anatomical locations were divided into six regions as listed in Table 2.

2.1. Technique of incision closure

Closure was performed with interrupted deep and subcutaneous absorbable Vicryl sutures. This was followed by a predetermined length of Quill® (Angiotech, Vancouver, BC) suture, which was placed subcuticular to oppose the skin (Fig. 1). The correct tension was achieved by pulling the opposite ends of the suture across the wound (Fig. 2). The ends of the suture were cut flush with the skin. Steristrips® (3M, St. Paul, MN) were applied across the incision.

2.2. Follow up

Wounds were followed up for 6 weeks. If complications were noted, follow up was continued until resolution of the problem. A final visual analogue cosmesis score, as described by Quinn et al., was recorded in all cases. This was used to rate the patient's satisfaction with the wound on a scale of 0–100, where 0 represented maximum satisfaction and 100 represented maximum dissatisfaction [14]. Scoring was done at 6 weeks, as Chowdhry et al. had noticed wounds become bulkier or more erythematous at around 4 weeks, despite initially appearing to have healed well [7].

Table 2
Anatomical locations of incisions.

Anatomical location	*n*	%
Dorsum foot	47	38
Medial border foot	27	22
Lateral border foot	13	11
Medial ankle/hindfoot	6	5
Lateral ankle/hindfoot	11	9
Anterior midline ankle	9	7
Posterior ankle	7	6
Calf	3	2

Fig. 1. Skin closure with Quill® suture.

3. Results

A total of 78 patients were included in the study. There were 23 male and 55 female patients. The average age was 53 years (range 17–84 years). Fig. 3 graphically represents the number of patients per age group. A list of co-morbidities is listed in Table 1. Forty-two percent of patients were older than 60 years. Nine percent of patients were smokers and eight percent were diabetics.

Of the 78 patients, 8 were operated on both feet, which gave a total of 86 feet. Of these, 60 feet had 1 incision, 16 feet had 2 incisions, 9 feet had 3 incisions and 1 foot had 4 incisions. This gave a total of 123 incisions for assessment, which was in keeping with the calculated sample size. The lengths of incisions are presented in Fig. 4. The average incision length was 5.9 cm (range 3–15 cm). Table 2 shows the anatomical regions of the incisions. Thirty five percent of wounds were for procedures around the

Fig. 2. Tensioning of suture line by pulling on the opposite ends of the suture.

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