

Flexor Tenorraphy: An Ex-Vivo Study Comparing Three Different Barbed Devices

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INTRODUCTION: Barbed sutures have a growing number of applications in plastic surgery from body contouring to facelifts. Several flexor tendon repair methods have been described using barbed devices yet these have resulted in exposed barbs on the tendon surface that would damage the intricate pulley system in-vivo¹⁻³. We have previously described a barbed technique for flexor tenorraphy without exposed barbs⁴ (Figure 1). The purpose of this study was to test our novel barbed method using three commercially available barbed devices against a traditional polyester repair technique.

MATERIALS AND METHODS: Eighty porcine tendons were randomly assigned to one of the four repair groups (three barbed repairs, one cross-locked cruciate polyester repair group). The tendons were then transected and repaired. Cross-sectional area at the repair site was measured before and after repair. Biomechanical testing was carried out using a tensiometer and data recorded included ultimate strength, 2mm gap formation force and mode of failure. A running 5-0 epitendinous repair was carried out on all tendons using a 5-0 polypropylene suture.

RESULTS: The V-Loc device performed the best out of the barbed devices in relation to ultimate strength and 2mm-gap-formation force (Table 1). In terms of ultimate strength, there was no significant difference between the Ethibond (90.4 ± 11.01 N) and the V-Loc device (88.16 ± 8.3 N). Following repair, the percentage increase in cross-sectional area at the repair site was significantly less in the V-Loc, Quill and Stratafix groups ($3.1 \pm 0.9\%$, $3.8 \pm 1.1\%$ and $2.9 \pm 0.4\%$ respectively) compared to the traditional polyester repair group ($8.2 \pm 3.7\%$).

CONCLUSION: We have demonstrated that the V-Loc barbed device has a comparable tensile strength to a traditional suture for flexor tendon repairs. The V-Loc performed the best out of the barbed sutures due to the larger barbs secondary to the dual angle cut in the barb manufacture. The Stratafix and Quill devices have smaller barbs secondary to a single angle manufactured cut. Furthermore, following repair, all barbed repair groups had a significantly reduced increase in cross-sectional area compared to the polyester repair group. In vivo, this would improve tendon gliding in zone II and lead to less gapping and rupture. Barbed sutures may represent the future of flexor tendon repairs but further study is definitely warranted.

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FIGURE LEGEND:

Figure 1. The barbed repair technique. The arrows represent the direction of the suture passage.

Table 1. Data from the biomechanical testing of all four groups. CSA = Cross-sectional area

Repair method	Ultimate Strength(N)	2mm Gap Force (N)	CSA (mm)	% Change in CSA (mm)
Ethibond	90.4 ± 11.01	70.3 ± 13.3	83.1 ± 9.2	8.2 ± 3.7
Stratafix	64.79 ± 10.7	49.1 ± 8.7	88.3 ± 10.3	2.9 ± 0.4
Quill	65.8 ± 8.6	52.4 ± 10.2	89.1 ± 14.2	3.8 ± 1.1
V-Loc	88.16 ± 8.3	61.25 ± 3.3	83.9 ± 12.1	3.1 ± 0.9