A Quick and Simple Four-Strand Barbed Suture Repair Technique for Flexor Tendons: A Comparison to a Traditional Four-Strand Monofilament Repair

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Background: The utilization of barbed suture devices in plastic surgery has become more prominent in recent times[1]. This technology has shown promise in flexor tendon repairs due to an even load distribution whilst eliminating the requirement for a knot[2-4]. A disadvantage of previously reported flexor repairs using barbed devices is the presence of barbs on the tendon surface which would, if used *in vivo*, likely have a deleterious attritional effect on the delicate pulley system[4]. We hypothesized that a novel, quick and simple barbed repair technique without any exposed barbs on the tendon surface, would have a comparable strength to a traditional monofilament method of repair as well as having a smaller cross-sectional area at the repair site.
Methods: Forty fresh porcine flexor tendons were randomized to a four-strand barbed repair or to four-strand cross-locked cruciate (Adelaide) monofilament repair (Figure 1 and 2). The cross-sectional area was measured with a digital caliper before and after each repair. Biomechanical testing with a tensiometer was carried out and the ultimate strength of repair (N), the 2mm gap formation force (N), and method of failure were recorded (pull-out or rupture).
Results: There was no significant difference in the ultimate strength of the barbed repairs (54.51N ±17.9) compared to the cross-locked cruciate repairs (53.17N ± 16.35). A significant difference ($p>0.0001$) was observed between both groups in terms of the 2mm gap formation force. This was 44.71N ± 17.86 for the barbed group compared to 20.25N ± 4.99 for the cross-locked cruciate group. The post-repair percentage change in cross-sectional area at the repair site for the cross-locked cruciate group and barbed group was 12.0% ± 2.3 and 4.6% ± 2.8 respectively ($p>0.0003$).
Conclusions: We have demonstrated that our four-strand knotless, barbed method of flexor tendon repair attained a comparable strength to that of a traditional cross-locked cruciate repair yet had a significantly reduced cross-sectional area at the repair site. The 2mm gap formation force was also significantly less in the barbed group than the cross-locked cruciate group. Furthermore, our novel technique had no exposed barbs on the tendon surface, thereby reducing the potential attritional injury to the pulley system. Barbed repairs show promise for flexor tendon repairs and our simple and quick method warrants further study in an animal model.

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