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All-Endoscopic Distal Biceps Repair: Cadaveric Portal Safety Analysis and Technical Feasibility Using 2 Fixation Techniques

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Summary:
The 2-part cadaveric study evaluated portal placement sites for distal biceps endoscopic repair. Technical feasibility and safety of an all-endoscopic repair using 2 fixation techniques (4 devices) was assessed. The study demonstrates the cadaveric anatomy-at-risk and presents guidelines for safe endoscopy in the cubital fossa and upper forearm region.

Abstract:
Purpose

Distal biceps tendon (DBT) injuries often require surgical intervention. Current treatment strategies use open surgical approaches to debride and repair the tendon. Endoscopic techniques have been suggested, however, the safety and feasibility of performing an endoscopic procedure in the upper forearm has not been evaluated. The purpose of this study was (1) to determine safe portal placement sites for endoscopy in the upper forearm, and (2) to analyze the feasibility and safety of performing an all-endoscopic repair of the ruptured distal biceps tendon using 2 fixation techniques (Button, suture anchors). The hypothesis of this study was that all-endoscopic DBT repair was possible without injury to neurovascular structures.

Methodology:

35 fresh frozen cadavers were used in 2 groups. In the first part of the study, 10 fresh frozen cadavers were used to analyze 5 possible portal sites (Parabiceps portal, two distal anterior portals [DAP 1 and DAP 2], tuberosity portal, and distal posterior portal) for distal biceps endoscopy. Nine neurovascular structures (cephalic vein; lateral cutaneous nerve; leash of vessels; radial nerve; superficial radial nerve; posterior interosseous nerve; radial artery; brachial artery; median nerve) were dissected, and their distances from portal sites were measured. In the second part, 25 fresh frozen cadaveric elbows were used. An endoscopic technique was used to explore the normal distal biceps and cubital fossa. The DBT was sectioned at the radial tuberosity. The tendon was then endoscopically reattached to the tuberosity using (1) button technique, with and without interference screw (15 cadaveric elbows), and (2) dual suture-anchor technique with 2 anchor types (10 cadaveric elbows). At the end of the procedure, each cadaver was dissected and nine neurovascular structures were assessed for injury. In addition, analysis of footprint of repaired DBT was performed, and placement site of fixation devices was evaluated. Compartmental pressures were obtained before and after procedure.

Results:

In the first part (10 cadavers): parabiceps and distal posterior portals were safe. Radial artery was significantly ‘‘at risk’’ of injury from tuberosity portal. Similarly, superficial radial nerve (SRN) was ‘‘at risk’’ from the distal anterior portal 2, and the posterior interosseous nerve (PIN) was ‘‘at risk’’ from distal anterior portal (DAP 1). Overall, RA, SRN , and PIN were found to be significantly " at risk" ($p<0.05$). In the second part (25 cadavers): The normal and sectioned tendons, and the anterior and medial aspects of the tuberosity were clearly visualized via the parabiceps portal. Endoscopic repair was possible using all fixation devices. Neurovascular structures were at low risk for injury.

A small rise in compartment pressures was noted before and after the procedure. Gapping and contact area varied between the different fixation devices.

Conclusion:

Endoscopic reattachment of the sectioned DBT was safe and feasible using all fixation devices. Parabiceps and distal posterior portals were safe, However, other 3 anterior portals were significantly closer to neurovascular structures, and open dissection is recommended if these portals are used. RA, SRN, and PIN were significantly ‘‘at risk’’ as compared to other structures amongst the portals studied.