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Refixation techniques and approaches for distal biceps tendon ruptures: a systematic review of clinical studies

Izaäk F. Kodde, MD[a,b,*,1], Remco C. Baerveldt, MD[c,1], Paul G.H. Mulder, PhD[d], Denise Eygendaal, MD, PhD[b], Michel P.J. van den Bekerom, MD[e]

[a]*Department of Orthopedic Surgery, Academic Medical Center, Amsterdam, The Netherlands*
[b]*Department of Orthopedic Surgery, Upper Limb Unit, Amphia Hospital, Breda, The Netherlands*
[c]*Department of Radiology, Medical Center Alkmaar, Alkmaar, The Netherlands*
[d]*Amphia Academy, Amphia Hospital, Breda, The Netherlands*
[e]*Department of Orthopedic Surgery, Onze Lieve Vrouwe Gasthuis, Amsterdam, The Netherlands*

Background: Surgical fixation is the preferred method of treatment for the ruptured distal biceps tendon in active patients. To date, no fixation technique has been proven superior in a clinical setting. The purpose of the study was to systematically review the available literature on approach and fixation methods for distal biceps tendon repair in a clinical setting and to determine the optimal fixation methods of the distal biceps tendon on the radial tuberosity. Our hypothesis was that the outcomes would not be significantly different among the various fixation techniques and approaches.

Methods: A systematic review of the available literature on anatomic reconstruction methods for distal biceps tendon ruptures was performed. The outcome measures evaluated were postoperative range of motion, elbow flexion and supination strength, and complication rates and types.

Results: Forty articles were included, representing 1074 patients divided into 4 fixation groups: suture anchors, bone tunnels, interference screws, and cortical buttons. There was no significant difference in range of motion and strength between the different approaches and fixation techniques. Complications were significantly less common after the double-incision approach with bone tunnel fixation ($P < .0005$).

Conclusions: There were significantly fewer complications after the double-incision approach with bone tunnel fixation. The double-incision approach had significantly fewer complications than the single-incision anterior approach, and the bone tunnel fixation had significantly fewer complications than the other 3 fixation techniques. However, as the double-incision approach was used with bone tunnel fixation in 84% of cases, there was a strong interrelationship between these variables.

Level of evidence: Level IV, Systematic Review.

Keywords: Distal biceps tendon; elbow; fixation technique; repair; rupture; surgical approach

Institutional Review Board approval was not necessary as this report is a systematic review of the literature.

*Reprint requests: Izaäk F. Kodde, MD, Academic Medical Center, Department of Orthopedics, Postbox 22660, NL-1100 DD Amsterdam, The Netherlands.

E-mail address: if.kodde@hotmail.com (I.F. Kodde).

[1] Authors contributed equally to this manuscript.

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The reported incidence of distal biceps ruptures is approximately 1.2 to 5.4 per 100,000 persons per year.[37,55] Acute rupture of the distal biceps tendon is typically seen in middle-aged men (40-60 years old) and is generally the result of an unexpected extension of the actively flexed elbow.[60] A second group is older patients with chronic, degenerative, partial rupture, without a clear history of a traumatic moment.[3] In the elderly, especially with a sedentary lifestyle, nonsurgical treatment can be considered. Nonanatomic attachment, by tenodesis on the brachialis muscle tendon, fails to restore the supination function and leaves considerable residual loss of flexion force.[9,49] Therefore, in most patients, anatomic repair has become the standard of care to obtain optimal strength and function of the elbow.[5,21] However, in the chronic setting, retraction and scarring may limit the ability to achieve enough surgical length, and reconstruction on the radial tuberosity carries a greater neurovascular risk. Hence, most authors advise an anatomic reconstruction in the acute setting.[12,36]

Several surgical procedures for anatomic repair of the distal biceps tendon on the radial tuberosity have evolved during the last decade.[47] Despite numerous publications on fixation methods (suture anchors, bone tunnels, interference screws, or cortical buttons) for the ruptured distal biceps tendon on the radial tuberosity, controversy remains about the best fixation technique.[4,11,19,22,27,33]

Common complications after biceps fixation are loss of motion or strength, heterotopic ossification, elbow pain, rerupture, and transient neurapraxias.[47] The single-incision approach is related to more neurapraxias (especially of the lateral antebrachial cutaneous nerve [LABCN]), whereas the double-incision approach is more commonly complicated by loss of motion.[15] In 2008, Chavan et al[15] performed a systematic review of fixation methods and recommended the use of the cortical button (highest load tolerance and stiffness) on the basis of biomechanical analysis. Yet, until today, there is no *clinical* evidence supporting one fixation technique over another.[47] The purpose of this study was therefore to systematically review and to summarize the available literature on the approach and fixation methods for distal biceps tendon repair in a clinical setting and to determine the optimal fixation method of the distal biceps tendon on the radial tuberosity. Our hypothesis was that the outcomes would not be significantly different among the various fixation techniques and approaches.

Materials and methods

Identification of studies

A research protocol was developed as described by Wright et al[68] and used throughout the study process. This protocol was not registered. A literature search was performed through the PubMed/MEDLINE, Cochrane clinical trial register, and Embase databases on October 4, 2013, with the help of a clinical librarian. The following subject headings and text words and their synonyms were used: ''distal biceps tendon'' and ''rupture'' linked with ''repair'' and ''fixation.'' Because the methods of anatomic reconstruction techniques have evolved fast during the last decade with the introduction of new fixation implants, the publication date was limited to the last 10 years. Language was limited to Dutch, English, and German. All titles and abstracts were reviewed to identify potentially relevant articles. The full manuscript was retrieved for all potentially relevant articles and when the title, keywords, or abstract revealed insufficient information to determine appropriateness for inclusion. The bibliographies of the retrieved studies were manually checked for potential relevant articles that were missed in the initial search. Second-stage screening of the full-text articles was performed unblinded by 2 of the authors (I.F.K. and R.C.B.). Duplicates were deleted. On January 30, 2015, we updated the search to provide a complete up-to-date interpretation of available data as several new articles were published during the time of initial statistical analysis and preparation of the manuscript.

Inclusion and exclusion criteria

The full text of the original prospective or retrospective studies (level of evidence, I–IV) had to be available. Articles had to describe the results of at least 5 living human subjects, and these articles had to report results with a minimum follow-up of 1 year.

Studies had to describe a distal biceps tendon rupture, and all available surgical techniques and approaches for an anatomic reconstruction of the distal biceps tendon were included. Conservative treatment and nonanatomic reconstruction of the distal biceps tendon were exclusion criteria. Biomechanical and cadaveric studies were also excluded. Articles reporting the results of acute (within 6 weeks of injury) as well as delayed (after 6 weeks of injury) anatomic reinsertion of the tendon were included.

Studies had to describe at least 1 of the following functional outcome measures: (1) range of motion (ROM), flexion-extension, pronation-supination; (2) strength of the elbow after and before surgical treatment or strength of the elbow after surgical treatment compared with the contralateral side (unaffected elbow); and (3) complication type and rates.

Data extraction

Included studies were divided into 4 groups based on the fixation method used: suture anchors, bone tunnels, interference screws, and cortical buttons, which were classified A, B, C, and D, respectively (Fig. 1). Group A included all suture anchor derivatives: Titan Corkscrew (Arthrex