Clinical outcome & complications of cortical button distal biceps repair: A systematic review of literature

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Epidemiology

**Incidence**: 1.2/100,000 per year

10% of biceps ruptures: **distal**

**Dominant** elbow: 85%

**Men** in 40’s: 93%

**Athletic** activity: 29%

**Cause**: excessive eccentric tension

**Smokers**: 7.5 times at greater risk

_Safran MR, et al. CORR, 2002_
Diagnosis

Patient history
Clinical examination: hook test
Sensitivity/specificity: 100% >MRI
Imaging: US/MRI

Treatment

Non-surgical:
- low-demand pts
- medically infirm pts
- partial rupture of tendon

Surgical:
- improvement of strength:
  flexion (30%) / supination (40%)
- early rehabilitation

Karen M, et al. AAOS, 2010
Baker BE, et al. JBJS, 1985
Greenberg JA, J Hand Surg., 2009
Surgical options

- Bone tunnels
- Suture anchors
- Intraosseous screws
- **Cortical button**
- Intramedullary button
- Button & interference screw
- Endoscopic techniques
Cortical button repair

Superior load to failure strength

- Greenberg JA, J Hand Surg, 2009,
- Kettler M, et al. JBJS, 2008,

Superior cyclic load to failure

EndoButton (440 N), suture anchor (381 N), bone tunnel (310 N), interference screw (232 N)

Purpose of the study

A literature review was performed to investigate the clinical outcome and complications of the cortical button distal biceps fixation (Level of evidence, IV).
Methodology

Inclusion criteria

- English language,
- 5 or more patients,
- complete demographic data,
- at least 1 year follow up
- ROM and performance score
- report of complications
**Search strategy**

**Search:** Medline and PubMed databases, Embase, Google Scholar, Web of Science,

**Query:** distal biceps alone or with rupture, repair, injury, button, cortical button, endobutton, suspensory fixation or complications

643 articles

542 removed after title and/or abstract review

101 relevant articles

9 articles for final outcome review

92 removed due to:
- Follow-up < 1 year (2)
- Biomechanical/Anatomical studies (19)
- Imaging series (7)
- Less than 5 cases (10)
- No clinical outcome (1)
- Conservative treatment (1)
- Reviews or Editorial (12)
- No treatment described (3)
- No English language (9)
- Surgical technique articles (3)
- No endobutton fixation (25)
## 9 eligible studies (all Level IV)

<table>
<thead>
<tr>
<th>Author</th>
<th>Year</th>
<th>Patients/cases</th>
<th>Men/female</th>
<th>Acute/chronic</th>
<th>Mean age (y)</th>
<th>Follow-up (m)</th>
<th>Approach</th>
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<tbody>
<tr>
<td>4. Peeters et al 20</td>
<td>2009</td>
<td>23</td>
<td>20/3</td>
<td>17/6</td>
<td>52</td>
<td>16</td>
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<td>5. Dillon et al 24</td>
<td>2010</td>
<td>27</td>
<td>26/1</td>
<td>17/9/1@</td>
<td>50.1</td>
<td>30.9</td>
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<tr>
<td>6. Gupta et al 26</td>
<td>2012</td>
<td>8 / 9</td>
<td>8</td>
<td>9/-</td>
<td>27.35</td>
<td>41.5</td>
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<tr>
<td>7. Bosman et al 27</td>
<td>2012</td>
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<td>5</td>
<td>-/5</td>
<td>47.5</td>
<td>20.2</td>
<td>2-incisions</td>
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<td>9. Banerjee et al 22</td>
<td>2013</td>
<td>27</td>
<td>27</td>
<td>27/NR</td>
<td>47.9</td>
<td>36.1</td>
<td>Single anterior</td>
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<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>152 /155</strong></td>
<td><strong>147/5</strong></td>
<td><strong>110/45</strong></td>
<td><strong>44.8</strong></td>
<td><strong>21.5</strong></td>
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</table>
Clinical results

96.7% male flexion strength 91% - 101% supination strength 82% - 99%. Level of activity at pre-injury status in 84/89 patients (6/9 studies)

ROM
Mean flexion 138.1°, Extension ranged -4 to 0° Mean supination 77.54° Mean pronation 85.8°

MEPS >90 in the 7/9 studies
ASES
Complications

**PIN**: 6 cases (3.8%), all resolved

**LABN**: 15 cases (9.7%), 2 persistent

**SRN**: 2 cases (1.3%)

**Heterotopic ossification**: 9.7%

(13/15 asymptomatic)

**Other**: 3 infections, 3 wound irritation of the cortical button, 
2 button disengagement, 2 cases wrong button placement, 3 re-ruptures

The overall **re-operation rate** was 5.8% (9/155 cases).
Discussion

Risk of biases

surgical approach,

rehabilitation protocol,

no universal outcome scoring,

chronic ruptures (29%)

comparison of complications
Surgical approach

Single incision in 147/155 cases

no difference in complications between 2-incision approaches (16%) and single-incision approaches (18%), but more instances of significant loss of forearm rotation with the 2-incision approach.
Rehabilitation protocol

most surgeons prefer a short period of immobilization in a cast and gradual non-restricted ROM thereafter.

mean time to full ROM 8.67 weeks for the supervised therapy (6 pt) and 4.38 weeks for the unrestricted group (9 pt).
Outcome scoring

Measurement of functional outcomes were not homogeneous or no outcome score at all (2 studies)

Future studies:
ASES
MEPS
SF-12, DASH
objective ROM
isokinetic strength evaluation
Chronic ruptures

45 (29%) chronic ruptures (tendon grafting 4 cases)

198 patients with a 46% complication rate in patients operated > 4 weeks compared to 30 % in those operated upon acutely
Nerve injuries

PIN palsy 6%, LABCN 30%, RSN 3%

Prognosis for recovery of posterior interosseous nerve palsy after distal biceps repair

PIN palsy 3.2%, (9/280 patients) (all resolved spontaneously)

- Current review 3.8% (all transient)
Heterotopic ossification

Extensive Heterotopic Ossification After Suspensory Cortical Fixation of Acute Distal Biceps Tendon Ruptures

Armando F. Vidal, M.D., Ryan C. Koonce, M.D.,
Michelle Wolcott, M.D., and Joel B. Gonzales, M.D.

4/8 cases (50%) severe HO, 3 re-operations

Current review: 15/155 (9.7%) only one re-operation

Possible underestimation due to lack of routine x-ray control at final follow up
Conclusions

The clinical studies on suspensory cortical button fixation for distal biceps ruptures were few, based on retrospective study designs, and often unclearly reported

Advantages:

• Early aggressive rehabilitation
• Sufficient for acute and chronic (> 4 weeks) ruptures
• Very good clinical results with low morbidity
• Low percentage of serious complications (PIN palsy)

More well designed prospective comparative studies are needed to prove this superiority