Total Elbow Arthroplasty (TEA)

Grand Round
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Outline

- Indications of TEA
- Types of TEA
- TEA & RA
- TEA & Fractures
- Technical opinions
Indications of TEA

- Post traumatic arthritis
- Comminuted distal humeral #
- Rheumatoid Arthritis
- Distal humeral nonunion
Types of TEA

- **Unconstrained (Resurfacing)**
  - Capitellocondyler, Kudo, Roper-Tuke
  - Instability

- **Semi Constrained**
  - Mayo or Morrey-Coonard, GSB III
  - Loosening and wear
  - More stable
Functional outcome comparison of semiconstrained and unconstrained TEA

Wright et al, J Shoulder Elbow Surg 2000

- 26 elbows either semiconstrained (Mayo-Coonrad) or unconstrained (Ewald) TEA

- To evaluate the restoration of function (ADL)

- Follow-up X-ray to rule out loosening or failure of prosthesis
<table>
<thead>
<tr>
<th></th>
<th>Semiconstrained</th>
<th>Unconstrained</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>14</td>
<td>12</td>
</tr>
<tr>
<td>Average age (years)</td>
<td>62.8 (47-75)</td>
<td>63.1 (54-74)</td>
</tr>
<tr>
<td>Female:Male</td>
<td>8:6</td>
<td>10:2</td>
</tr>
<tr>
<td>Average FU (months)</td>
<td>35.5 (24-73)</td>
<td>73 (27-110)</td>
</tr>
</tbody>
</table>
Wright et al
J Shoulder Elbow Surg 2000

- **Indications:**
  - 22 RA
  - 3 posttraumatic humeral nonunion
  - 1 posttraumatic arthritis

- **2 elbows required revision → excluded:**
  - 1 semiconstrained for aseptic loosening
  - 1 unconstrained for metal synovitis and pain from chronically dislocated prosthesis
No significant differences in functional performance

No elbows demonstrated progressive radiolucencies suggestive of loosening

All patients were satisfied with the procedure except one who had a dislocated unconstrained prosthesis

When it is properly performed, TEA with either type of prostheses yields satisfactory results
The Kudo TEA in patients with RA
Willems et al, J Shoulder Elbow Surg 2004

- Kudo TEA performed in 36 elbows in 35 RA pt
- Out of 36: 4 died, 6 revised, and 2 lost to F/U:
  - 24 elbows with a mean follow-up of 58 months
- 16 scored as excellent by use of the Mayo score
- The mean increase in active motion was 25°
- 2 humeral and 4 ulnar radiological loosening
Willems et al
J Shoulder Elbow Surg 2004

- 2 early dislocations

- 2 pt used an elbow brace after closed reduction, and one pt underwent a resection arthroplasty for instability and deep wound infection

- 4 aseptic loosenings (of which 3 had an intraop # and one had instability) were revised

- Despite initially excellent results, longer follow-up of TEA in rheumatoid pt demonstrated deterioration of the outcome and increased loosening
RA and X-RAY

- Type 1: synovitis, normal-appearing joint
- Type 2: Loss of joint space
RA and X-RAY

- Type 3A: Alteration of subchondral architecture

- Type 3B: Alteration of architecture with deformity
RA and X-RAY

- Type 4: Gross deformity
A Comparison of ORIF and 1° TEA in the Treatment of Intraarticular Distal Humerus # in Women > 65

Frankle et al, JOT 2003
Frankle et al
J OT 2003

- Comparison between a level 1 trauma center with fellowship-trained traumatologists and a tertiary care center with fellowship-trained shoulder and elbow surgeons

- 24 females > 65yr sustained distal humerus # required surgical treatment with f/u at a minimum of 2 years

- All # were OTA classification C2 or C3. No loss of f-u.

- ORIF or TEA was the treatment method

- The Mayo Elbow Performance score and the need for revision surgery were established as the means of patient evaluation
Outcomes of 12 pt with ORIF:
   - 4 excellent, 4 good, 1 fair, and 3 poor (conversion to TEA)

Outcomes of the 12 pt with TEA:
   - 11 excellent and 1 good. No fair or poor outcomes.

No pt treated with TEA required revision surgery

TEA is a viable treatment option for distal intraarticular humerus # in women > 65

Particularly true for women with associated comorbidities, such as RA, osteoporosis, etc.
Effect of humeral condylar resection on strength and functional outcome after semiconstrained TEA

McKee et al, JBJ S(A) 2003
Objective testing to determine the effect of condylar resection after TEA on the muscle strength of the elbow, forearm, wrist, and hand in 32 patients.

To eliminate bias, the contralateral limb served as the control, and all strength values are given as a percentage of the normal side.

The humeral condyles were intact in 16 patients and had been resected in the other 16.

Patient demographics were similar in the two groups.
<table>
<thead>
<tr>
<th></th>
<th>Intact Condyles</th>
<th>Resected Condyles</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Elbow Flexion-Extension</strong></td>
<td>102°</td>
<td>114°</td>
<td>0.2</td>
</tr>
<tr>
<td><strong>Forearm Rotation</strong></td>
<td>131°</td>
<td>154°</td>
<td>0.3</td>
</tr>
<tr>
<td><strong>MEP Score</strong></td>
<td>79</td>
<td>77</td>
<td>0.67</td>
</tr>
<tr>
<td></td>
<td>Intact Condyles</td>
<td>Resected Condyles</td>
<td>P-value</td>
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<tr>
<td>Pronation</td>
<td>103%</td>
<td>89%</td>
<td>0.4</td>
</tr>
<tr>
<td>Supination</td>
<td>68%</td>
<td>89%</td>
<td>0.49</td>
</tr>
<tr>
<td>Wrist Flexion</td>
<td>66%</td>
<td>56%</td>
<td>0.46</td>
</tr>
<tr>
<td>Wrist Extension</td>
<td>75%</td>
<td>65%</td>
<td>0.4</td>
</tr>
<tr>
<td>Grip</td>
<td>83%</td>
<td>72%</td>
<td>0.4</td>
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</table>
Condylar resection has a minimal, clinically irrelevant effect on forearm, wrist, and hand strength and no effect on the Mayo Elbow Performance Score following total elbow arthroplasty.

Thus, these findings support the practice of condylar resection, which simplifies total elbow arthroplasty for many conditions.