Early postoperative magnetic resonance imaging findings after autologous osteochondral plug grafts for osteochondritis dissecans of the humeral capitellum

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COI disclosure

I (and my co-authors) have nothing to disclose.
Autologous osteochondral plug grafts for capitellar OCD

Articular reconstruction for OCD lesion

80-90%  
mean 48%  

Iwasaki et al AJSM 2009  
Maruyama et al AJSM 2014

Articular reconstruction  
Relationships?  
Articular repair  
Clinical result
Aim

1. To investigate early postoperative MRI findings and clinical results after autologous osteochondral plug grafts for capitellar OCD

2. To analyze relationships between articular reconstruction and MRI findings / clinical results
Materials and Methods

2012-2014

Autologous osteochondral plug grafts for capitellar OCD: 20 cases

MRI at post-op 3 mos and 6 mos: 16 cases

Exclude
Absorbable pin: 1 case

15 cases

Age at surgery: 13.5 (13 – 15) year
Sports event: Baseball All cases
ICRS OCD: III 4 cases IV 11 cases
Lesion size (sagittal x coronal): 16 x 14 (10 – 20 x 10 – 20) mm
Surgical procedure

Resected unstable lesion

Grafts harvested from knee
6 – 8 mm
1 – 2 grafts

*3 cases: preserved unstable lateral wall

Reconstruction rate

\[
\frac{\text{Total surface area of the grafts}}{\text{Surface area of articular defect}} \times 100\%
\]

Unreconstructed area

40 (12 – 65) %

1.12 (0.31 – 2.76) cm²

Mean (range)
<table>
<thead>
<tr>
<th>Time</th>
<th>Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 wks</td>
<td>Casting</td>
</tr>
<tr>
<td>3 mos</td>
<td>Start to throw</td>
</tr>
<tr>
<td>6 mos</td>
<td>Allowed vigorous throwing</td>
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</table>

Follow-up period
mean 23 (12 – 41) mos
MRI assessment

- 1.5 T (Toshiba Medical systems EXCELART Vantage™)
- Performed at post-op 3 mos and 6 mos
- Assessment: Graft incorporation
  
  Articular repair

- Observer: 2 orthopaedic surgeons

  MRI were blinded and randomized, and two observers reviewed independently and conferred when they differed.
Graft incorporation

Incorporation (−)
- Low intensity
- Fluid surrounding the graft

Incorporation (+)
- No change
- No fluid

Modified Iwasaki et al. AJSM 2009
## Articular repair (Henderson score)

Henderson et al. JBJS Br 2003

<table>
<thead>
<tr>
<th>Score</th>
<th>Fill of repair site</th>
<th>Signal at the repair site</th>
<th>Bone marrow edema</th>
<th>Joint effusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Complete</td>
<td>Normal</td>
<td>Absent</td>
<td>Absent</td>
</tr>
<tr>
<td>2</td>
<td>&gt; 50%</td>
<td>Nearly normal</td>
<td>Mild</td>
<td>Mild</td>
</tr>
<tr>
<td>3</td>
<td>&lt; 50%</td>
<td>Abnormal</td>
<td>Moderate</td>
<td>Moderate</td>
</tr>
<tr>
<td>4</td>
<td>Full thickness defect</td>
<td>Absent</td>
<td>Severe</td>
<td>Severe</td>
</tr>
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</table>

Total score = summarized 4 item (4: complete repair, 16: no repair)
Clinical assessment

- Elbow pain at final follow-up: No / Mild / Moderate / Severe
  
  Timmerman et al. JBJS Am 2007

- Timmerman and Andrews (T&A) score

  Pre-op, Post-op 6 mos, Final follow-up

  Timmerman and Andrews AJSM 1994

- Return to sports: Complete / Incomplete / No return

  Takahara et al. JBJS Am 2007
Analysis

Articular repair (Henderson score)

- at 6 mos on MRI
- Complete repair (4 point)
- Incomplete repair ($\geq 5$ point)

Relationships

- Unreconstructed area
- Clinical results

Statistical analysis
Paired $t$ test, Mann-Whitney $U$ test, Fisher exact test
$P < 0.05$ significant differences
Results
MRI findings

Graft corporation

Articular repair (Henderson score)

Cases

3 mos 6 mos

Graft corporation

Articular repair (Henderson score)
Clinical results

Elbow pain at final F/U

- No: 13 (87%)
- Mild: 1
- Moderate: 1

T&A score

- Pre-op: 141
- 6 mos: 185
- Final F/U: 184

Paired t test

$P < .05$
Complete return 14 (93%)
Periods: 6 mos (all cases)
A case of revision surgery

Resected unstable fragment involved with lateral wall
Unreconstructed area 1.79 cm²

Graft was disappeared, joint fluid ++
Henderson score 6 point
Relationships between articular repair at 6 mos and unreconstructed area

1.13 cm$^2$ ≤ 1 (25%) 3 (75%)

10 (91%) 1 (9%)

$P < .05$

Mann-Whitney U test

Fisher exact test
Relationships between articular repair at 6 mos and clinical results

- Decreased T&A score
  - None / 11 cases
  - Complete return in all

- Decreased T&A score
  - 2 / 4 cases (50%)
  - Revision surgery 1 case

Diagram:

- Complete repair
- Incomplete repair

T&A score

Pre-op  | 6 mos  | Final F/U  | Pre-op  | 6 mos  | Final F/U

(mean 23 mos)  (mean 23 mos)
Discussion
Relationships between articular repair at 6 mos on MRI and unreconstructed area / clinical results

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<td>(≒ 12 mm diameter of circle area)</td>
<td>&gt;</td>
<td>1 (9%)</td>
</tr>
<tr>
<td>Decreased T&amp;A score</td>
<td>2 / 4 (50%)</td>
<td>None / 11</td>
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Reason of incomplete repair
- Insufficient reconstruction
- Resected unstable lateral wall
# Relationships between articular repair at 6 mos on MRI and unreconstructed area / clinical results

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- Decreased T&A score: 2 / 4 (50%) None / 11

## Reason of incomplete repair

- Insufficient reconstruction
- Resected unstable lateral wall

## To be complete repair

- Unreconstructed area: less than 1.13 cm² (12 mm)
- Unstable lateral wall: preservation and fixation

Bone peg/ absorbable pin
Summary

1. MRI findings after autologous osteochondral plug grafts for capitellar OCD showed
   Graft incorporation: 73% at 3 mos, 87% at 6 mos
   Complete articular repair: 60% at 3 mos, 73% at 6 mos

2. 14 cases 93% completely return to sports at 6 mos
   and 1 case underwent revision surgery.

3. Unreconstructed area 1.13 cm² (≈ 12 mm circle) and more
   was related to poor articular repair and clinical outcomes.