Osteochondral Allografts: Indications & Outcomes

International Cartilage Repair Society
13th World Congress
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Oregon Health & Science University
Osteochondral Allografts: Introduction

• First use of hemi-joint transplant reported by Erich Lexer in 1908. 
  Clin Orthop Relat Res. 2008
  “The use of free osteoplasty together with trials on arthrodesis and joint transplantation” Archiv fur kiln Chirurgie 1908

• Allan E Gross developed and reported use of “Small-Fragment OCAs” 1970’s-80’s
  • post-traumatic reconstruction.

• Significant increase in OCA transplants as indications have expanded and therapeutic efficacy reflects improved outcomes
  Torrie AM et al. Curr Rev Musculoskelet Med 8:413-422
  • 2005: 660 cases in the US
  • 2011: 1619 cases in the US

The Allotransplantation of Partial Joints in the Treatment of Osteoarthritis of the Knee

Fresh Small-Fragment Osteochondral Allografts
Long-term Follow-up Study on First 100 Cases
Increased Availability of “Fresh” OCA

- **US tissue banks**
  - JRF Ortho (Centenial, CO)
    - previously Joint Restoration Foundation
  - Musculoskeletal Transplant Foundation (Edison, NJ)
  - Regeneration Technology Inc. (Alachua, FL)
  - University of Miami Tissue Bank (Miami, FL)
  - LifeNet (Virginia Beach, VA)

- JRF Ortho supplies grafts & ships internationally to more than 10 countries:
  - Belgium
  - United Kingdom
  - Ireland
  - Sweden
  - Switzerland
  - Norway
  - Denmark
  - Chile
  - Mexico
  - Brazil
  - Canada
  - Israel
Spectrum of tissue available

- **Knee**
  - Hemi, Partial, and Whole Femoral Condyle
  - Patella & Trochlea (matched)
  - Tibial Plateau (+/- meniscus)
- **Ankle**
  - Distal Tibia & Talus (matched)
- **Hip**
  - Femoral Head
- **Elbow**
  - Distal humerus
  - Proximal Ulna
  - Radial Head
- **Shoulder**
  - Humeral Head
  - Scapula with Glenoid (+/- labrum)
# Payors and “approved” indications for OCAs

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- Femoral condyle
- Trochlea
- Tibial plateau
- Patella
- Distal tibia
- Talus
- Humeral Head
- Distal Humerus
- Proximal Ulna
Indications for OCAs in the knee

Articular cartilage lesions > 2.0 cm²
with associated subchondral bone loss
w/out generalized OA or inflammatory arthropathy
ICRS grades 4a & 4b

Typically for “active patients” not candidates for “arthroplasty”

Requires a “stable and balanced joint”

Diagnosis of lesion etiology
• Osteochondritis dissecans
• Post-traumatic osteochondral fractures
• Focal osteoarthritis (e.g. cystic)
• Osteonecrosis
• Failed cartilage repair (e.g. MFX)
Outcomes for OCA in the knee: Historic Metrics

- **“Clinical Failure”** = Conversion to arthroplasty or graft revision
  Often reported as “Survivorship”

- **Common Reasons for Graft failure**
  - Graft collapse or failure of incorporation
  - Development of osteoarthritis
  - Graft fragmentation

- **Reoperation & failure** rates for OCAs in the knee are relatively low and vary with lesion etiology

  All cited studies performed on femoral condyles

<table>
<thead>
<tr>
<th>Lesion Type</th>
<th>Reoperation (%)</th>
<th>Graft Failure (%)</th>
<th>Survivorship (%) at 5 years</th>
<th>Survivorship (%) at 10 years</th>
<th>Survivorship (%) at 15 years</th>
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<tr>
<td>Osteochondritis dissecans (n = 66) Emmerson AJSM 2007</td>
<td>15</td>
<td>13</td>
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<td>Osteonecrosis (n = 28) Görtz Clin Orthop Relat Res. 2010</td>
<td>18</td>
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<td>89</td>
<td>N/A</td>
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<td>Post-trauma (n = 60) Gross Clin Orthop Relat Res. 2005</td>
<td>20</td>
<td>20</td>
<td>95</td>
<td>85</td>
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<tr>
<td>Failed cartilage surgery (n = 164) MFX = 145; OAT = 8; ACI = 7 Gracitelli Cartilage 2015</td>
<td>42</td>
<td>19</td>
<td>N/A</td>
<td>82</td>
<td>75</td>
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</table>
Outcomes OCAs knee by Etiology Osteochondritis Dissecans

Emmerson *AJSM.* 2007

- 66 Knees with OCD type 3 or 4
  - Age: 28.6 years (15-54)
  - Location: Femoral Condyle
  - Area: 7.5 cm²
  - All previous surgery (average 1.7)
  - Outcomes: Merle d’Aubigné-Postel, Xrays

Patient Reported Outcomes:
At mean follow up of 7.7 yr (2-22)

- Merle d’Aubigné-Postel improved (P < 0.01)
  - 72% (47/65) Excellent or good
  - 11% (7/65) Fair
  - 2% (1/65) Poor

Results:
- Reoperation: 15% (10/64)
- Failure: 13% (9/64)
- Survivorship:
  - 91% at 5 years,
  - 76% at 10 & 15 years

Radiographs:
At a mean follow up of 3.3 years
- 72% (21/29) demonstrated healing
- 79% (23/29) were intact
- 17% (5/29) had subchondral cysts
- 21% (6/29) had sclerosis
Outcomes OCAs knee by Etiology: Osteonecrosis

Görtz *Clin Orthop Relat Res.* 2010

- **28** Knees with osteonecrosis
- **Age:** 24.3 years (16-44)
- **Location:** Femoral Condyle
- **Area:** 10.8 cm² (5-19)
- All previous surgery (average 1.7)

**Outcomes:** Merle d’Aubigné-Postel, IKDC, KS-F

**Results:**
- Reoperation: **18%** (5/28);
- Failure: **18%** (5/28)
- Survivorship: **89%** at 5 years,

**Outcomes:**
- Merle d’Aubigné-Postel improved *(P < 0.001)*
  - 76% (19/25) excellent or good
- Mean IKDC pain improvement: **-5.1** *(P < 0.001)*
- Mean IKDC function improvement: **4.8** *(P = 0.002)*
- Mean KS-F improvement: **25.7** *(P = 0.005)*
Outcomes OCAs knee by Etiology
Failed prior Cartilage Repair & Post Fracture

Gracitelli *Cartilage* 2015

- 164 Knees with failed cartilage surgery
  - MFX (n = 145) OAT (n = 8), ACI (n = 7)
- Location: Femoral condyle
- Age: 32.6 ± 10.6
- BMI: 26.1 ± 4.7

Results:
- Reoperation: 42% (68/164)
- Failure: 19% (31/164)
- Survivorship:
  - 82% at 10 years
  - 75% at 15 years

Gross *Clin Orthop Relat Res* 2005

- 125 Knees with post-traumatic fractures
- Location:
  - Femoral condyle (n = 60)
  - Tibial plateau (n = 65)

Results:
Condylar OCAs:
- Reoperation: 20%
- Graft Failure: 20%
- Survivorship:
  - 95% at 5 years
  - 85% at 10 years

Tibial plateau OCAs:
- Reoperation: N/A
- Graft Failure: 32%
- Survivorship:
  - 95% at 5 years
  - 80% at 10 years
  - 65% at 15 years
OCA Outcomes after Failed Microfracture

Gracitelli AJSM 2015

Methods:
92 pts, cohort study, Level of evidence: 3

Group 1: 46 knees, OCA as primary treatment
Group 2: 46 knees, OCA after failed microfracture
Groups matched: Age, diagnosis, graft size.
Location: essential all Femoral condyles (91.3% group 1, 95.7% group 2)
Outcomes: Merle d’Aubigné-Postel, IKDC, KOOS, & KS-F

<table>
<thead>
<tr>
<th></th>
<th>Group 1</th>
<th>Group 2</th>
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<tbody>
<tr>
<td>Rate of reoperation</td>
<td>24%</td>
<td>44%</td>
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<tr>
<td>OCA failure</td>
<td>11%</td>
<td>15%</td>
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<tr>
<td>Patients “satisfied” or “extremely satisfied”</td>
<td>87%</td>
<td>97%</td>
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<tr>
<td>Survivorship at 10 years</td>
<td>87%</td>
<td>86%</td>
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Patient Reported Outcomes:

Follow-up
Group 1: 7.8 ± 5.1 years
Group 2: 11.3 ± 6.6 years
ALL PRO Mean improvements were significant (P < 0.05)

Group 1
• KOOS QoL: 45
• IKDC: 45.6
• KS-F: 23.8

Group 2
• KOOS QoL: 47
• IKDC: 38.3
• KS-F: 24.8

Concluded: OCAs indicated for BOTH primary Rx & following failed Microfracture in the femoral condyles
OCA Outcomes & Graft In-situ Structural Integrity

Williams et al. *JBJS* 2007

19 pts treatment of *condylar lesions*:
- MFC (74%), LFC (26%)
- **Area:** 6.02 cm²
- 89% (17) had *previous surgeries* (avg. 2)
- 47% (8) underwent *concomitant* procedures

• Outcomes: MRI and **validated PRO**
  - Mean **48 month** follow up
  - 4 (21%) Grafts “failed”
    - 2 revision OCA, 1 revision OAT, 1 TKA

MRI Results:
- Mean **25 month follow up**
  - 100% with normal cartilage thickness
- Signal **Isotense** in **44% (8/18)**
- “Integration”
  - Complete 17%
  - Partial 61%
  - Poor 22%
- Graft incorporation was **correlated with Age**

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<th>Act. Daily Living</th>
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<tr>
<td>Baseline</td>
<td>51 ± 23</td>
<td>56 ± 24</td>
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<tr>
<td>Final Follow-up</td>
<td>66 ± 24, <em>(P &lt; .005)</em></td>
<td>70 ± 22, <em>(P &lt; .05)</em></td>
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• **PRO’s** correlated to degree of incorporation
  - Complete or partial incorporation positively correlated with SF-36 PROs *(r = 0.487, P < .05)*

Concluded MRI characteristics can be used to predict outcomes
Brown Cartilage 2011

34 pts underwent OCA in the femoral condyles.
- 68% (23/34) single press-fit; Area: 3.9 cm²
- 32% (11/34) multiple adjacent; Area: 10.2 cm²
- BMI: 26.9
- 26% (9/34) underwent concomitant procedures
- Average of 0.7 previous procedures

Outcomes:
- Osseous integration assessed with CT @ 6 months
- PROs: KOOS, IKDC
  - Improvement in KOOS pain, sports, QoL & IKDC (p<0.05) @ 2y v. Baseline
  - Improvements for Multiple graft cohort not as great as single /smaller lesion grafts

CT Results:
- “93% had “successful” graft incorporation Defined as >50% “bone bridging”
- 77% (20/26) grafts in direct weight-bearing regions had >75% incorporation
- 57% (8/14) grafts in indirect weight-bearing regions had <50% incorporation

- Adjacent grafts showed least “integration” or bone bridging between dowel grafts
OCA Outcomes & Graft In-situ Structural Integrity

Brown JBJS 2014

- 9 pts underwent OCA in the femoral condyles
  - Age: 43.2 (17-66)
  - Lesion Area: 3.4 cm² (1.8-4.9)
  - BMI: 25 (20-34)
- Outcomes:
  - Assess cartilage viability/health
    - T2 mapping & dGEMRIC:
    - PROs: KOOS, IKDC
      - All significant improvement @ 2 years (p<0.05)

- No difference in T2 value between deep zone allograft and control cartilage @ 1 & 2 years
- Significant difference in T2 value between superficial allograft and control cartilage (P < .0.05) @ 1 & 2 years

- Host:donor interface signal reflected fibrocartilage fill
OCA Outcomes & Graft In-situ Structural Integrity

Meric Cartilage 2015

Osteochondral allograft MRI Scoring System (OCAMRISS)

- 15 pts underwent OCA in the knee.
- Post-op MRIs scored with novel “OCAMRISS”

Results:

High inter-observer agreement between 4 radiologists. 96% comparisons have ICC > 0.8; superior agreement

- Found correlation between OCAMRISS scores and clinical reported outcomes

Conclusion: OCAMRISS is a reliable grading system for in vivo assessment after OCA
OCAs in the Patella

Gracitelli AJSM 2015
27 pts, Case series
Age: 33.7 yrs (range 14-64)
Min. follow up: 2 yrs
Area: 10.1 cm² (range 4.0-18.0)
Prev. Proc: 3.2 (range 1-10)
Outcomes: IKDC, KS-F, Merle d’Aubigné-Postel

Results:
Largest reported series of patellar OCAs
• 60.7% (17/27) had further surgery
• 29% (8/27) considered OCA failure
• 89% of patients are “extremely satisfied or satisfied”
• Patellar OCA survivorship:
  5 years: 78.1%
  10 years: 78.1%
  15 years: 55.8%

Patient reported Outcomes:
At last follow up (Av. 9.7 years),
• 71% (20/26) had grafts in situ
• IKDC & KS-F Mean scores improved significantly (P < 0.05)
  IKDC: +30
  KS-F: +15.9
• Merle d’Aubigné-Postel improved significantly (P < 0.05)
  77% Excellent or good

Outcomes reported are similar to previously published
OCAs for Bi-polar or Reciprocal Lesions

Meric AJSM 2015

48 knees, case series
Age: 40 yrs (range 15-66)
Mean follow up: 8.4 yrs (range 1.7- 27.1)
Location: tibiofemoral (71%), patellofemoral (29%)
Lesion: 19.2 cm² (range 4.2-41)
Prev. Proc: 88%
Concom. Proc: 48%
Outcomes: KS-F, IKDC, Merle d’Aubginé-Postel

Results in all patients:
- 30 (63%) of knees required reoperation
- 22 (46%) bipolar OCAs failed after average of 42 months
  Survivorship
  5 years: 64.1% with decline to 39.1% @ 10 yrs

Results in Non-“failures”:
- 88% of patients were “satisfied or extremely satisfied”
- 92% would undergo OCA transplantation again
- 88% (22/26) of surviving grafts = good/excellent (P<0.05)

PROs Mean improvement
- IKDC pain : -2.8 (P < 0.05); IKDC function: 2.6 (P < 0.05)
- KS-F: 13.6 (P = 0.07)

Bipolar OCA not indicated for older patients with advanced degeneration, but may be indicated for patients not suited for arthroplasty/arthrodesis
OCAs in the pediatric population

Murphy *AJSM* 2014

43 knees, case series  
Age: 16.4 y (range 11-17.9)  
Mean follow up: 8.4 y (range 1.7-27.1)  
Location: MFC (41.9%), LFC (35%)  
Lesion: 8.4 cm² (2.2-20.8)  
Prev. Proc: 79% (range 1.2-2.6)  
Concom. Proc: 10%

Outcomes: KS-F, IKDC, Merle d'Aubginé-Postel

Results:

- Average of 2.7 years: 5 (12%) OCAs failed & 16 (37%) underwent reoperation
- (4/5) of failed knees were salvaged with OCA replacement transplantation
- At 10 years: 90% graft survivorship

At last follow up:

- 88% were rated excellent/good (Merle d'Aubginé-Postel)
- Mean IKDC improvement: 33 (P < 0.05)
- Mean KS-F improvement: 20 (P < 0.05)
- 89% of patients “satisfied or extremely satisfied”

Concluded: low failure rate, high patient satisfaction, long-term graft survivorship and significant improvement in PRO's, OCA is indicated for pediatric populations
OCAs Outcomes in the Knee: “Meta-analysis”

**Chahal Arthroscopy 2013**

- **644 pts, Systematic review of 19 studies**
- **Age:** 37y (range 20-62)
- **Mean follow-up:** 58 months (range 19 - 120)
- **Location:** MFC (56%), LFC (22%), tibial plateau (12%), patella (7%), trochlea (3%)
- **Prev. Proc:** 1.7 (range 1.2-2.6)
- **Concom. Proc:** 46%
- **Area:** 6.3 cm² (range 4.2-10.8)
- **Patient satisfaction:** 86%
- **Failure rate:** 18%
- **Complication rate:** 2.4% @ 6 years

**Concluded patients “Fair Better” with; OCD, traumatic, & “idiopathic” etiologies**
As do younger pts, unipolar lesions, shorter symptoms

**Assenmacher Arthroscopy 2016**

- **291 pts, Systematic review of 5 studies**
- **Age:** 34.8 (range 15-69)
- **Mean follow up:** 12.3 years (range 10-17.1)
- **Location:** MFC (39%), LFC (27%), tibial plateau (29%), patella (4%)
- **Prev. Proc:** 41%
- **Concom. Proc:** TTO (25%), HTO (15%), MAT(18%)
- **KS-F mean improve:** 23.1 (range 10.1-36 ; P < 0.01)
- **Lysholm mean improve:** 53 (range 27.4-78.6; P < 0.01)
- **Failure rate:** 25% ; **Reoperation rate:** 36% @ 12.3 years

**Concluded Patello-femoral OCAs fail at higher rate (50%).**
Patients younger than 35, receiving grafts in the femoral condyle, or smaller lesions had best outcomes.
OCAs: Return to Sport/Work

Shaha AJSM 2013

38 active duty military patients, case series

Age: 29.8 ± 5.3 yrs BMI: 27.6 ± 2.7
Lesion: 4.87 cm² ± 1.7
Location: MFC (65%), LFC (34%),
Follow up: 4 yrs (1-9)
Return to duty:
completion of a physical fitness test, routine
physical training, deployment, & recreation

Results:

• 11 (30%) returned to full duty at 12.1 ± 6.9 months
• 11 (30%) returned to limited activity with permanent modifications
• 16 (42%) were unable to return to duty
• 2 (5 %) returned to preinjury level of activity (Full activity)
OCAs Outcomes: Return to Sport/Work

Campbell Arthroscopy 2016
1117 pts, review of 20 studies,
Age: 28 yr (15.9-38)
Lesion size: 3.7 cm² (1.55-7.25)
Concom Proc: 29%
Cartilage Procedures performed:
- MFX (n = 529)
- ACI (n = 259)
- OAT (n = 139)
- OCA (n = 43)
- Controll (n = 147)

Krych AJSM 2012
43 pts, case series;
Age: 33 (18-49), BMI: 27.9 (21-38),
Lesion: 7.25 cm² (2.5-13.94)
Prev. Proc: 58% Concom. Proc: None
Location: MFC (40%), LFC (40%), Trochlea (2%), Multiple (18%), Follow up: 2.5 years (1-11)
Level: 74% recreate, 23% collegiate, 2% pro

Results:
34 (79%) returned to full activity
38 (88%) returned to full or partial activity

Risk factors for return to preinjury level:
- Age > 25 yrs
- Duration of symptoms > 12 months

Krych 2012 AJSM

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<th>MFX</th>
<th>ACI</th>
<th>OAT</th>
<th>OCA</th>
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<tr>
<td>Rate of RTS</td>
<td>75%</td>
<td>84%</td>
<td>89%</td>
<td>88%</td>
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<tr>
<td>Avg. Time to RTS</td>
<td>8.6 months</td>
<td>16 months</td>
<td>7.1 months</td>
<td>9.6 months</td>
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OCA demonstrates comparable rate of return to sport as current cartilage repair treatments
OCAs in the ankle

Indications:

- **Cystic or uncontained articular cartilage lesions** > 2.0 cm$^2$ or with diameter > 3 cm
- **End-stage ankle arthritis** in patients who refuse ankle arthrodesis or are unsuitable for total ankle arthroplasty.

Locations: talus, distal tibia
OCAs in the Talus

El-Rashidy *JBJS* 2011

38 pts underwent **OCA in the talus**

**Outcomes:** MRI, AOFAS, Visual Analog Score (VAS)

**Results:**

At average **38 months follow-up**

Graft failure occurred in **4 patients (10.5%)**

Patient satisfaction:

- Excellent, very good, or good by **74% (28/38)**
- Fair or poor by **26% (10/38)**

MRI showed acceptable

- graft subsidence, stability, and congruence

Statistically significant PROs ($P < 0.001$)

- VAS Mean Improvement: 4.9
- AOFAS Mean Improvement: 26.5

Haene *JBJS* 2012

17 ankles underwent **OCA in the talus**

**Outcomes:** CT, AOFAS, SF-36, AAOS Foot and Ankle Module, Ankle Osteoarthritis score (AOS)

**Results:**

At average **4.1 years follow-up**

**Graft failure** occurred in **5 ankles (29%)**

- 2 underwent reoperation
  - 5 ankles **(29%)** had osteolysis
  - 8 ankles **(47%)** had subchondral cysts
  - 7 ankles **(39%)** had degenerative changes

10 **(59%)** pts had good or excellent results

- AOS Disability, AAOS Foot and Ankle Core Mean Score improved significantly ($P < 0.05$)
Bipolar OCAs ankle: Tibio-talar joint

Bugbee JBJS 2013

- **88 ankles** underwent **bipolar OCA** in the **tibiotalar** joint
- **Outcomes:** Olerud-Molander Ankle Score, pain, function, and patient satisfaction, Xrays

**Results:**
At average **5.3 years** follow-up

- **36 (42%) patients** underwent **reoperation**
  - **25 (29%)** had **reoperation** due to **graft related concerns** and considered “clinical failures”
  - **11 (13%)** had **reoperation** not strictly related to **graft related concerns**

**Survivorship** was **75%** at 5 years; **44%** at 10 years

Patients reported **satisfaction** (**92%**), **less pain** (**85%**), and **improved function** (**83%**).

**Olerud-Molander** Ankle score Improvement: **33.4 (P < .001)**

**Radiograph Results:** at mean **3.5 years**

- **46%** were classified as **radiograph failures**
- **38%** of grafts had **collapsed**

Bipolar OCA transplantation can be a suitable alternative for patients with end-stage tibiotalar arthritis who are unsuited for ankle arthrodesis.
Applications for OCAs in the **shoulder**

Osteochondral **lesions** with significant **bone loss** or Glenohumeral Osteoarthritis in young patients not suitable for hemi/TSA

**Diagnosis:**
- Typically chronic or acute **instability** arising from “engaging” Hill-Sachs lesions or “Bony” Bankart lesions
- End-stage **glenohumeral osteoarthritis**

**Graft source:**
- **Humerus:** Femoral or Humeral Head
  - Gianni Joints 2011, Saltzman Arthroscopy 2015
- **Glenoid:** Donor Distal Tibia or Glenoid
  - Sekiya Arthroscopy 2011, DeHaan AJSM 2014
Bipolar OCA in the Shoulder

Giannini Joints 2013

3 pts, case series
Age: 44 yrs ± 3.6, Follow up: 34 months
Indication: “End-stage” gleno-humeral osteoarthritis
Outcomes: Constant Score, Radiographs (CT & X-ray)

Results:

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<th>Pre-op</th>
<th>12 months</th>
<th>24 months</th>
<th>36 months</th>
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<tr>
<td>Constant Score</td>
<td>38.3 ± 2.9</td>
<td>78.7 ± 16.2</td>
<td>72.3 ± 15.3</td>
<td>59.3 ± 22</td>
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</tbody>
</table>

Final follow up, all “had full and painless ROM”
2 Satisfied, 1 not

6-months post-op:
All allografts showed osseous integration (CT) and considered healed (x-ray).

Xrays at final follow up indicated
Some arthritis progression
Partial reabsorption at implanted surfaces.
OCAs in the Humeral Head

Saltzman Arthroscopy 2015

35 pts, systematic review of 12 reports

Age: 35.4 yrs ± 18.1,
Follow up: 57 ± 34.14 months
Lesion etiology: 33 (94%) Hill-Sachs
Area: ~40% of articular surface
Grafts: Femoral (66%), humeral (29%), plugs (6%)
Outcomes: Improvement in GH motion, ASES

Mean ASES improvement: 14.7 ± 8 (P = 0.02)

<table>
<thead>
<tr>
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<th>For. flexion (P &lt; 0.001)</th>
<th>Ext. Rotation (P &lt; 0.001)</th>
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<tbody>
<tr>
<td>6 months post-op</td>
<td>68.0 ± 18.1°</td>
<td>N/A</td>
</tr>
<tr>
<td>12 months post-op</td>
<td>83.4 ± 18.3°</td>
<td>38.7 ± 18.2°</td>
</tr>
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</table>

Results:
Mean follow up of 57 months:
• ~20 – 30% complications
• 27% reoperation
• 32% reported residual pain

100% return to work at 4.3 ± 0.8 months

90% ± 8.71 of patients “satisfied” with outcome

Approximately 5% of patient reported recurrent post-operative instability

Small cohort sizes & case reports
OCA in the Humeral Head

Black *OJSM* 2016

Primary treatment of the humeral post-traumatic reverse “engaging” Hill-Sachs lesion as an alternative to “Remplisage”.

Results:

- Recovery of stability & improved clinical reported outcomes
- **Unrestricted return to work** (Coast Guard Yoman) *(20 weeks)*

<table>
<thead>
<tr>
<th>Time</th>
<th>Total</th>
<th>Pain</th>
<th>Instability</th>
<th>Physical</th>
<th>Mental</th>
<th>Oxford Shoulder Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-op</td>
<td>73</td>
<td>2</td>
<td>9</td>
<td>37.2</td>
<td>48.4</td>
<td>28</td>
</tr>
<tr>
<td>6 months</td>
<td>88</td>
<td>2</td>
<td>2</td>
<td>48.5</td>
<td>60.4</td>
<td>46</td>
</tr>
<tr>
<td>10 months</td>
<td>83</td>
<td>3</td>
<td>1</td>
<td>50.3</td>
<td>55.0</td>
<td>45</td>
</tr>
<tr>
<td>32 months</td>
<td>92</td>
<td>1</td>
<td>1</td>
<td>55.3</td>
<td>50.5</td>
<td>47</td>
</tr>
</tbody>
</table>
Summary for OCA

• Indications
  • Expanding spectrum of inherited, acquired and degenerative pathologies amenable to OCA Rx

• Outcomes
  • Increasingly measured with validated patient oriented & “return to function” metrics
  • Reflect a high degree of patient satisfaction associated with improved pain and function
    • Better in younger, smaller lesions, earlier disease

• Future
  • Expand the volume and quality of clinical metrics to better understand patient & disease related factors influencing outcomes
    • ICRS Data base. September 2016
    • MOCA (Metrics of OsteChondral Allograft) Study Group, established 2015
Thank you

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