(Anterior) Shoulder Instability: Rehab considerations for return to *performance*

Jake R. Foley, PT, DPT, SCS, CSCS
IAM- Highland Park
Current Concepts in Sports Medicine
May the 4th be with you, 2018
Disclosures

• None, Zero, Zip, Zilch, Nada, Nothing
Anterior Instability
Results of Arthroscopic Bankart Repair for Anterior-Inferior Shoulder Instability at 13-Year Follow-up

Mohamed Aboalata,*† MD, Johannes E. Plath,†‡ MD, Gernot Seppel,† MD, Julia Juretzko,† MD, Stephan Vogt,†§ MD, and Andreas B. Imhoff,†‖ MD

• AJSM 2016
• 180 shoulders
  – Arthroscopic
  – Mean 13 yr f/u
  – Mean age: 30.6 yrs
    • 18-59 yrs
• Overall re-dislocation rate:
  – 18.18%

• Followed up with 119 patients re: sport participation:
  – 49.5% returned to same type/level of sport without reduction
  – 30.25% reported reduction in their sport activity
  – 20.25% could not return to same type of sport

<table>
<thead>
<tr>
<th>TABLE 2</th>
<th>Level of Sport Initially, Preoperatively, and Postoperatively[^a]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Participation in Sport</td>
</tr>
<tr>
<td>Days/wk</td>
<td>3.12 ± 1.67</td>
</tr>
<tr>
<td>Hours/d</td>
<td>2.42 ± 1.52</td>
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<tr>
<td>% activity</td>
<td>100</td>
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</table>
Return to sport following arthroscopic Bankart repair: a systematic review

Muzammil Memon, MD, Jeffrey Kay, MD, Edwin R. Cadet, MD, Shayan Shahsavar, BSc, Nicole Simunovic, MSc, Olufemi R. Ayeni, MD, PhD, FRCSC

• JSES 2018
  – 34 studies
  – 1020 of 1866 subjects included pre-op level of sports participation
    • 560 recreational
    • 415 competitive
    • 45 professional

Conclusion
Arthroscopic Bankart repair yields a high rate of return to sport, in addition to significant improvement in pain and functional outcomes in the majority of patients. However, approximately one-third of athletes do not return to their preinjury level of sports.
# Shoulder Sport-Specific Impairments After Arthroscopic Bankart Repair

A Prospective Longitudinal Assessment

<table>
<thead>
<tr>
<th>Preinjury (P-1)</th>
<th>Presurgery (P0)</th>
<th>6 Months (P1)</th>
<th>16 Months (P2)</th>
<th>32 Months (P3)</th>
<th>P Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Noncollision/nonoverhead (G1)</td>
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<tr>
<td>Surgery-sport interval = 6.4 ± 1.0 months</td>
<td>8.0 ± 0.9</td>
<td>70.4 ± 8.6</td>
<td>86.4 ± 9.8</td>
<td>94.4 ± 7.3</td>
<td>P-1-3 = .021&lt;sup&gt;c&lt;/sup&gt;</td>
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<td>P-1-1 = .005&lt;sup&gt;c&lt;/sup&gt;</td>
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<td>P-1-2 = .011&lt;sup&gt;c&lt;/sup&gt;</td>
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<td>P-2-3 = .027&lt;sup&gt;c&lt;/sup&gt;</td>
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<td>P-1-1 = .005&lt;sup&gt;c&lt;/sup&gt;</td>
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<td>P-1-2 = .007&lt;sup&gt;c&lt;/sup&gt;</td>
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<td>P-2-3 = .986</td>
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<tr>
<td>Overhead (G2)</td>
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<tr>
<td>Surgery-sport interval = 6.7 ± 1.1 months</td>
<td>7.8 ± 0.8</td>
<td>67.2 ± 9.5</td>
<td>89.2 ± 9.7</td>
<td>95.2 ± 8.7</td>
<td>P-1-3 = .014&lt;sup&gt;c&lt;/sup&gt;</td>
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<tr>
<td></td>
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<td>P-1-1 = .001&lt;sup&gt;c&lt;/sup&gt;</td>
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<td>P-1-2 = .002&lt;sup&gt;c&lt;/sup&gt;</td>
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<td>P-2-3 = .001&lt;sup&gt;c&lt;/sup&gt;</td>
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<td>P-1-3 = .248</td>
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<td>P-1-1 = .001&lt;sup&gt;c&lt;/sup&gt;</td>
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<td>P-1-2 = .002&lt;sup&gt;c&lt;/sup&gt;</td>
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<td>P-2-3 = .579</td>
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<tr>
<td>Overhead (G3)</td>
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<tr>
<td>Surgery-sport interval = 6.9 ± 1.5 months</td>
<td>7.5 ± 1.4</td>
<td>5.8 ± 1.2</td>
<td>7.9 ± 1.2</td>
<td>8.1 ± 1.2</td>
<td>P-1-3 &lt; .001&lt;sup&gt;c&lt;/sup&gt;</td>
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<tr>
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<td>P-1-1 &lt; .001&lt;sup&gt;c&lt;/sup&gt;</td>
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<td>P-1-2 &lt; .001&lt;sup&gt;c&lt;/sup&gt;</td>
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<td>P-2-3 &lt; .001&lt;sup&gt;c&lt;/sup&gt;</td>
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<td></td>
<td>P-1-3 &lt; .043&lt;sup&gt;c&lt;/sup&gt;</td>
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<td>P-1-1 &lt; .001&lt;sup&gt;c&lt;/sup&gt;</td>
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<td>P-1-2 &lt; .001&lt;sup&gt;c&lt;/sup&gt;</td>
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<td>P-2-3 = .879</td>
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<tr>
<td>Noncontact-exercise (G4)</td>
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<tr>
<td>Surgery-sport interval = 6.8 ± 1.5 months</td>
<td>5.5 ± 1.0</td>
<td>6.0 ± 1.0</td>
<td>7.7 ± 1.6</td>
<td>8.0 ± 1.2</td>
<td>P-1-3 &lt; .001&lt;sup&gt;c&lt;/sup&gt;</td>
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<td>P-1-2 &lt; .001&lt;sup&gt;c&lt;/sup&gt;</td>
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<td>P-2-3 &lt; .001&lt;sup&gt;c&lt;/sup&gt;</td>
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<td>P-1-3 &lt; .043&lt;sup&gt;c&lt;/sup&gt;</td>
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<td>P-1-1 &lt; .001&lt;sup&gt;c&lt;/sup&gt;</td>
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<td>P-1-2 &lt; .001&lt;sup&gt;c&lt;/sup&gt;</td>
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<td>P-2-3 = .891</td>
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</tbody>
</table>

Stein et al, AJSM 2011
• **Arthroscopy 2018**

• 58 studies (3850 patients)
  
  – At least 1 explicitly-stated criterion for return to play (RTP) identified

---

<table>
<thead>
<tr>
<th>Table 3. Combinations of Return to Play Criteria in the Literature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Combinations of Explicit Return to Play Criteria Presented in the Included Studies</td>
</tr>
<tr>
<td>Time alone</td>
</tr>
<tr>
<td>Strength alone</td>
</tr>
<tr>
<td>Time, ROM, strength</td>
</tr>
<tr>
<td>Time, ROM, strength, pain</td>
</tr>
<tr>
<td>Time, ROM, strength, proprioception</td>
</tr>
<tr>
<td>ROM, strength, stability, pain</td>
</tr>
<tr>
<td>ROM, strength, pain</td>
</tr>
<tr>
<td>Time, ROM, stability</td>
</tr>
<tr>
<td>Time, strength, pain</td>
</tr>
<tr>
<td>Time, strength</td>
</tr>
<tr>
<td>Time, radiographic</td>
</tr>
<tr>
<td>Strength, ROM</td>
</tr>
<tr>
<td>Radiographic alone</td>
</tr>
</tbody>
</table>
The American Society of Shoulder and Elbow Therapists’ Consensus Rehabilitation Guideline for Arthroscopic Anterior Capsulolabral Repair of the Shoulder

JOSPT 2010
Deficits after Instability Episodes

- ROM
- Sensorimotor
- Upper Quarter Power
- Cuff and Scap Strength
- Scapular Control
Interventions

ROM
- Early
  - pain control
  - mitigate loss
- Middle
  - stretch
  - “normalize”
- Late
  - master positions

Sensorimotor
- Early
  - Protected positions
- Middle
  - Progress toward unstable positions
- Late
  - Sport specific requirements

“Muscle-Centric”
- Early
  - mitigate AMI
  - activation
- Middle
  - endurance
  - hypertrophy
- Late
  - strength
  - power
The American Society of Shoulder and Elbow Therapists’ Consensus Rehabilitation Guideline for Arthroscopic Anterior Capsulolabral Repair of the Shoulder

TABLE 1

Guiding Principles for the Rehabilitation Specialist

1. A thorough understanding of the surgical procedure
2. A thorough understanding of the anatomic structures that must be protected, how they are stressed, and the rate at which they heal
3. Appropriate selection and skilled application techniques to impart varying levels of stress to the healing tissues
4. Appropriate management of the initial immobilization period and the rate of range-of-motion progression
• Pain control
• GHJ P/A/AROM within restrictions
• Soft tissue mobilization
  • Glenohumeral and scapulothoracic musculature
• Accessory joint mobilization
  • ACJ, SCJ, Scapulothoracic, TSpine
• Accessory joint joint ROM
## ROM

### Middle
- “Stretching”
- Isometrics at end of available range
- **GHJ mobilization**

### Late
- Eccentrics
- Low Load, Long Duration stretching (if necessary)
- **GHJ Mobilization**

### What are the expectations for mobility?
- Non-Operative vs. Open vs. Arthroscopic

### What are the demands of the sport/activity?
- Golfer vs. OH athlete vs. Lineman vs. Goalkeeper
Quick Screens
Central Nervous System Adaptation After Ligamentous Injury: a Summary of Theories, Evidence, and Clinical Interpretation

Alan R. Needle¹ · Adam S. Lepley² · Dustin R. Grooms³,⁴

**Fig. 1** Theorized paradigm of the role of ligamentous injury for inducing neuroplasticity, and its effects on sensorimotor function.
Sensorimotor System

Some variables to consider:

- Surface/Level changes
- Kinesthesia and Joint Position Sense
- ROM
- Degrees of Freedom
- Static vs. Dynamic
- OKC vs. CKC
- Load
Sensorimotor System

Some variables to consider:

Kinesthesia and Joint Position Sense

ROM vs. CKC

Load

Static vs. Dynamic

Degrees of Freedom

Surface/Level changes
Sensorimotor System

Some variables to consider:

- Kinesthesia and Joint Position Sense
- ROM vs. CKC
- Load
  - Static vs. Dynamic
- Degrees of Freedom
- Surface/Level changes
Sensorimotor System

Some variables to consider:

- Kinesthesia and Joint Position Sense
- ROM (OKC vs. CKC)
- Load (Static vs. Dynamic)
- Degrees of Freedom (Surface/Level changes)
Sensorimotor System

Some variables to consider:

- Kinesthesia and Joint Position Sense
- ROM OKC vs. CKC
- Load Static vs. Dynamic
- Degrees of Freedom
- Surface/Level changes
Sensorimotor System

Some variables to consider:

Static vs. Dynamic
Sensorimotor System

Some variables to consider:

- Degrees of Freedom
- Kinesthesia and Joint Position Sense
- ROM OKC vs. CKC
- Load Static vs. Dynamic
- Degrees of Freedom
- Surface/Level changes
Sensorimotor System

Some variables to consider:

- Surface/Level changes
- Kinesthesia and Joint Position Sense
- ROM
- OKC vs. CKC
- Load
- Static vs. Dynamic
- Degrees of Freedom
- Surface/Level changes
Shoulder Musculature Activation During Upper Extremity Weight-Bearing Exercise

Tim L. Uhl, PT, PhD, ATC¹
Thomas J. Carver, MS, ATC²
Carl G. Mattacola, PhD, ATC³
Scott D. Mair, MD⁴
Arthur J. Nitz, PT, PhD, ECS, OCS⁵

JOSPT 2003

**TABLE 2.** Descriptive statistics (mean ± SD) for the weight-bearing force represented as a percentage of the subject’s body weight (BW) and the normalized EMG activity (% maximum voluntary isometric contraction [MVIC]) for each muscle at each exercise position studied. Comparisons are made between each position for each column separately (P<0.05).

<table>
<thead>
<tr>
<th>Position</th>
<th>Force* (% BW)</th>
<th>Supraspinatus† (% MVIC)</th>
<th>Infraspinatus† (% MVIC)</th>
<th>Anterior Deltoid§ (% MVIC)</th>
<th>Posterior Deltoid† (% MVIC)</th>
<th>Pectoralis Major†† (% MVIC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prayer</td>
<td>6 ± 3</td>
<td>2 ± 2</td>
<td>4 ± 3</td>
<td>2 ± 4</td>
<td>4 ± 3</td>
<td>7 ± 4</td>
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<tr>
<td>Quadruped</td>
<td>19 ± 2&lt;sup&gt;C&lt;/sup&gt;</td>
<td>6 ± 10</td>
<td>11 ± 8</td>
<td>6 ± 6</td>
<td>6 ± 4</td>
<td>10 ± 4</td>
</tr>
<tr>
<td>Tripod</td>
<td>32 ± 3&lt;sup&gt;B&lt;/sup&gt;</td>
<td>10 ± 11</td>
<td>37 ± 26&lt;sup&gt;B&lt;/sup&gt;</td>
<td>12 ± 10</td>
<td>27 ± 16&lt;sup&gt;B&lt;/sup&gt;</td>
<td>16 ± 8</td>
</tr>
<tr>
<td>Pointer</td>
<td>34 ± 4&lt;sup&gt;B&lt;/sup&gt;</td>
<td>12 ± 13&lt;sup&gt;C&lt;/sup&gt;</td>
<td>42 ± 33&lt;sup&gt;B&lt;/sup&gt;</td>
<td>18 ± 10</td>
<td>28 ± 16&lt;sup&gt;B&lt;/sup&gt;</td>
<td>22 ± 10</td>
</tr>
<tr>
<td>Push-up</td>
<td>34 ± 3&lt;sup&gt;B&lt;/sup&gt;</td>
<td>14 ± 14&lt;sup&gt;C&lt;/sup&gt;</td>
<td>44 ± 31&lt;sup&gt;B&lt;/sup&gt;</td>
<td>31 ± 16&lt;sup&gt;B&lt;/sup&gt;</td>
<td>18 ± 12</td>
<td>33 ± 20&lt;sup&gt;B&lt;/sup&gt;</td>
</tr>
<tr>
<td>Push-up feet elevated</td>
<td>39 ± 5&lt;sup&gt;B&lt;/sup&gt;</td>
<td>18 ± 16&lt;sup&gt;B&lt;/sup&gt;</td>
<td>52 ± 32&lt;sup&gt;B&lt;/sup&gt;</td>
<td>37 ± 15&lt;sup&gt;E&lt;/sup&gt;</td>
<td>23 ± 14</td>
<td>42 ± 28&lt;sup&gt;E&lt;/sup&gt;</td>
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<tr>
<td>One-arm push-up</td>
<td>60 ± 6&lt;sup&gt;A&lt;/sup&gt;</td>
<td>29 ± 20&lt;sup&gt;A&lt;/sup&gt;</td>
<td>86 ± 56&lt;sup&gt;A&lt;/sup&gt;</td>
<td>46 ± 20&lt;sup&gt;D&lt;/sup&gt;</td>
<td>74 ± 43&lt;sup&gt;A&lt;/sup&gt;</td>
<td>44 ± 45&lt;sup&gt;D&lt;/sup&gt;</td>
</tr>
</tbody>
</table>
AJSM 2008

- 48 patients (38 men, 10 women)
  - Randomized: open vs. arthroscopic (24 each)
  - Mean follow-up: 19.4 months (range 12–36 mo)
  - At one year, no difference between scope and open, but...

### TABLE 3
**Internal and External Rotation Strength Deficits Expressed as a Percentage**

<table>
<thead>
<tr>
<th>Internal Shoulder Rotation</th>
<th>Open Group, % Strength Deficit Mean (SD)</th>
<th>Arthroscopic Group, % Strength Deficit Mean (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>60 deg/s concentric</td>
<td>10.1 (14.5)</td>
<td>7.4 (12.0)</td>
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<tr>
<td>180 deg/s concentric</td>
<td>2.9 (17.9)</td>
<td>-6.9 (15.7)</td>
</tr>
<tr>
<td>60 deg/s eccentric</td>
<td>10.4 (13.9)</td>
<td>6.1 (23.4)</td>
</tr>
<tr>
<td>180 deg/s eccentric</td>
<td>7.3 (15.1)</td>
<td>8.0 (19.5)</td>
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<tr>
<td>External Shoulder Rotation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>60 deg/s concentric</td>
<td>17.0 (27.6)</td>
<td>20.6 (16.4)</td>
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<tr>
<td>180 deg/s concentric</td>
<td>12.3 (24.7)</td>
<td>9.4 (19.4)</td>
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<tr>
<td>60 deg/s eccentric</td>
<td>12.5 (17.9)</td>
<td>10.3 (18.2)</td>
</tr>
<tr>
<td>180 deg/s eccentric</td>
<td>3.1 (21.6)</td>
<td>11.9 (11.8)</td>
</tr>
</tbody>
</table>
AJSM 2007

60 patients with isolated Bankart lesion
  - Randomized: 30 open & arthroscopic

### Table 2: Serial Change of Muscle Strength in Both Groups

<table>
<thead>
<tr>
<th></th>
<th>Preoperative</th>
<th>6 Weeks</th>
<th>3 Months</th>
<th>6 Months</th>
<th>9 Months</th>
<th>12 Months</th>
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<tr>
<td><strong>Forward flexion in scapular plane</strong></td>
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</tr>
<tr>
<td>Open</td>
<td>95.0 ± 7.5</td>
<td>52.8 ± 10.1</td>
<td>76.3 ± 12.5</td>
<td>85.8 ± 11.5</td>
<td>93.4 ± 10.3</td>
<td>97.4 ± 10.9</td>
</tr>
<tr>
<td>Arthroscopic</td>
<td>97.3 ± 7.2</td>
<td>&lt;.001</td>
<td>.003</td>
<td>.074</td>
<td>.382</td>
<td>.503</td>
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<tr>
<td><em>P</em></td>
<td>.243</td>
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<tr>
<td><strong>External rotation</strong></td>
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<tr>
<td>Open</td>
<td>95.5 ± 13.8</td>
<td>64.4 ± 9.2</td>
<td>82.8 ± 11.4</td>
<td>89.5 ± 10.3</td>
<td>93.4 ± 8.0</td>
<td>98.2 ± 7.3</td>
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<tr>
<td>Arthroscopic</td>
<td>95.0 ± 6.0</td>
<td>&lt;.001</td>
<td>.092</td>
<td>.313</td>
<td>.647</td>
<td>.468</td>
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<td><em>P</em></td>
<td>.862</td>
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<td><strong>Internal rotation</strong></td>
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</tr>
<tr>
<td>Open</td>
<td>96.5 ± 8.4</td>
<td>58.1 ± 13.1</td>
<td>81.8 ± 12.5</td>
<td>89.3 ± 13.3</td>
<td>95.9 ± 13.5</td>
<td>99.8 ± 12.9</td>
</tr>
<tr>
<td>Arthroscopic</td>
<td>97.5 ± 7.1</td>
<td>&lt;.001</td>
<td>.163</td>
<td>.396</td>
<td>.871</td>
<td>.659</td>
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<tr>
<td><em>P</em></td>
<td>.615</td>
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<td></td>
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</tbody>
</table>

The values are given as the mean ± SD (percentage of contralateral side).
“Muscle-centric”

- Early

  - Pain-control
    - Arthrogenic Muscle Inhibition
  - Isometrics
    - Incorporate NMES
  - Irradiation
  - “Cross education”
    - Incorporate contralateral limb
  - *BFR
The Effect of Neuromuscular Electrical Stimulation of the Infraspinatus on Shoulder External Rotation Force Production After Rotator Cuff Repair Surgery

• Utilize NMES for posterior cuff
  – Reinold et al, AJSM 2008
  – s/p rotator cuff repair
• Peak ER force increased by 22% after NMES
  – Frequency: 50 pps
  – Asymmetrical waveform
  – Pulse duration: 300 μs
  – 1 sec ramp time

Figure 1. Pad placement along the muscle belly of the infraspinatus.
“Muscle-centric”

- Middle
  - *Endurance ➔ Hypertrophy*
  - “Train with the end in mind”
    - “Posteriorly-dominant shoulder”
    - **CKCUEST**
    - **UE-YBT**

<table>
<thead>
<tr>
<th>Goal</th>
<th>Load</th>
<th>Tempo (Ecc: Iso: Conc)</th>
<th>Volume</th>
<th>Rest</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Endurance</td>
<td>&lt;70% 1RM</td>
<td>1/1/1</td>
<td>1-4 x 10-25+ reps</td>
<td>30 sec</td>
<td>2-3x/week</td>
</tr>
<tr>
<td>Hypertrophy</td>
<td>67-85% 1RM</td>
<td>4/1/1</td>
<td>1-3+ x 6-12 reps (novice – intermediate)</td>
<td>30 - 90 sec</td>
<td>2-3x/week</td>
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</tbody>
</table>
“Muscle-centric”

• Late
  – Integrate kinetic chain
  – **Strength and Power**
    • **Shot Put Throw**
    • Collaboration with S & C Professionals
    – OKC and CKC
  • Med ball
    – 3-D power

<table>
<thead>
<tr>
<th>Goal</th>
<th>Load</th>
<th>Volume</th>
<th>Rest</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strength</td>
<td>70-85% 1RM</td>
<td>1-3+ x 2-6 reps</td>
<td>2-5 min</td>
<td>2x/week</td>
</tr>
<tr>
<td>Power</td>
<td>30-70% 1RM</td>
<td>1-6 x 1-6 reps</td>
<td>2-5 min</td>
<td>2x/week</td>
</tr>
</tbody>
</table>
Ideas

Zach Brace, NASM CPT, CES: YouTube Channel
Return to Sport ≠ Return to Performance

- Poor criteria?
- Insufficient ROM?
- Sensori-motor deficits?
- Weakness?
- Reduced power?
References


Thank You!

• Friends and Family
• Colleagues at IAM Highland Park
• Fairview Sports Physical Therapy Residency
• St. Catherine University DPT Program

jfoley2@fairview.org