



**Management of Shoulder Instability  
in the Overhead Athlete**

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**SESSION OBJECTIVES**



- Describe EBP Strategies for Management of SI
- Understand importance of Neurological Status with SI
- Describe Clinical Proprioception & Kinesthetic Testing
- Describe manual therapy interventions including sensiomotor training.

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**What is Shoulder Instability?**

**Hypermobility vs Instability?**

**Excessive ROM with ER is not Instability** (Morrison, 1997)

**Unless Poor Humeral Head Control** (Rockman, 2001)

**Additionally Decrease Humeral Posterior Translation** (Harryman, 2001)




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# Shoulder Stability



Shoulder Stability is the ability to maintain the humeral head in the center of the glenoid fossa during movement of the arm.

(Abbound and Soslowsky, 2002; Magarey and Jones, 1992; von Eisenhart-Rothe et al., 2002)

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# How Can I be Sure I'm doing the "Best" for my SI Patient?

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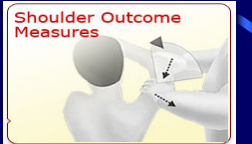
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# Outcome Tools with SI?

- a. WOSI
- b. TSK-11
- c. P-4
- d. Proprioception Testing



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## a. Western Ontario Shoulder Instability Index (WOSI)

Specific Outcome Tool for Shoulder Instability

Psychometric Properties ?

20% ▲ =MCID Estimate  
(Minimum Clinically Important Difference)



Kirkley et al, 2003; Mohtad et al, 2006; Rouleau et al, 2010

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## b. Tampa Scale for Kinesiophobia (TSK-11)

11-item; 4-point Likert scale 1 indicating “strongly disagree” and 4 indicating “strongly agree.”

Scores range 11 to 44

**Higher scores represent increased fear of movement (Fear Avoidance)**

Woby et al 2005; Gómez-Pérez et al 2010

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## Tampa Scale for Kinesiophobia (TSK-11)

Assess avoidance of activities because fear of pain with respect to shoulder instability.

MCID was found to be a reduction of **4 points**



Woby et al 2005; Gómez-Pérez et al 2010

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### c. Pain Measurement: Important to Minimize Pain



- Pain reflexively inhibits muscle recruitment

Omoigui, 2007; Plattner et al 2011

Pain also alters Proprioception

Safran, 2001; Keer, 2011

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### c. Four Item Pain Intensity Measure (P4)

Measure pain intensity. P4 scores: 0-40

4 Data Pts: AM; PM; Evening; W/Activity

MDC: 9 P4 points or 22% of scale range

P4 more adept at assessing change than the single-item NPRS.



Lehmann et al, 2010; Spadoni, 2003

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### d. Proprioception Testing

Evaluation  
of  
Kinesthetic  
Awareness



Hung Y. Shoulder Position Sense And Kinesthetically Guided Reaching Accuracy In Individuals With Anterior Shoulder Instability. *Theses and Dissertations*. 2008. Available at: <http://ir.uiowa.edu/etd/204> [Accessed August 4, 2010].

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# Proprioception

Originates from mechanoreceptors which are peripheral afferent sensory neurons present within muscle, tendons, fascia, joint capsule, ligaments, and skin and contributes to joint stability and postural control.

## Dynamic and Static Constraints

Kikuchi, 1968; Grigg, 1994; Vangsness et al., 1995

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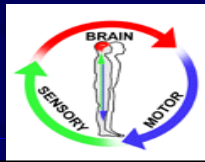
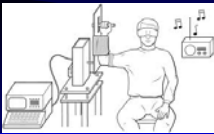
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# Proprioception

Shoulder Instability has detrimental effects proprioception  
SI alters both joint position sense and kinesthesia  
Therefore: More susceptible to trauma and injury  
(Lephart et al., 1994; Zuckerman et al., 2003; Barden et al., 2004 Ferrell et al., 2004; Gazit et al., 2003; Hakim and Grahame, 2004.)



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# Methods

Research has shown shoulder proprioception assessed by measuring active reproduction of passive positioning on Isokinetic Devices



Lephart et al., 1994; Zuckerman et al., 2003; Jeremiah, 2010

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## Proprioception Testing Phase 1

- a. ER/IR measure with goniometry @ 0 & 90° abduction: Establish max and mid ROM
- b. Subject educated on reproducing positions
- c. Subject blindfolded
- d. Subject tested on reproducing starting pos.

**If subject unable to reproduce starting position, they are judged to have a proprioception deficit.**



Hung Y. Shoulder Position Sense And Kinesthetically Guided Reaching Accuracy In Individuals With Anterior Shoulder Instability. *Theses and Dissertations*. 2008. Available at: <http://ir.uiowa.edu/etd/204> [Accessed August 4, 2010].

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## Proprioception Testing Phase 2

- a. The therapist then moves the subjects arm to 10 degrees short of their max ER and keeps the arm there for 1 sec. Then the subjects arm is moved back to neutral.
- b. Next, the subject is instructed to rotate their arm back to this max ER position
- c. This angle is measured with a goniometer and recorded as the difference in degrees between the passively positioned arm and the actively positioned arm.



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## Proprioception Testing Phase 3

- a. After testing Phase 1, if the subject is able to reposition their shld at 90 abd, the therapist moves the subj arm to measured midpoint of ER and keeps the arm there for 1 sec. Then the subjects arm is moved back to neutral.
- b. Next, the subject is instructed to rotate their arm back to the mid point position
- c. This angle is recorded as the difference in degrees between the passively positioned arm and the actively positioned arm.



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## CASE: CK Clinical Presentation



### Examination:

1. Western Ontario Shoulder Instability Index (WOSI): **55**
2. TSK 11: **31**
3. P-4: **29**
4. Proprioception Evaluation:  
Kin Com: **21°** Phase 1: **Deficit**  
Phase 2: **18°** Phase 3: **24°**

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## Shoulder Instability Rehabilitation

### Goals

- Inc proprioceptive awareness
  - Inc dynamic stabilization
  - Elicit preparatory and reactive muscle activation
  - Restoration functional movement patterns
- (Lephart and Henry, 1996)



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## Shoulder Instability

### PROGRAM

- Three Phases**
- Goal Orientated**
- Criteria Based**



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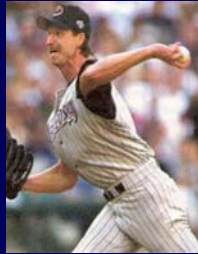
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# Shoulder Instability

- A. Acute
- B. Rehabilitation
- C. Return to Activity



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## Phase 1: Acute Stage (Goals)

1. Improve Scapula Position
2. Improve Cuff Performance
3. Improve Proprioception
4. Decrease Pain and Irritation
5. Patient Education
6. Retard Muscle Atrophy
7. Maintain/Increase Flexibility



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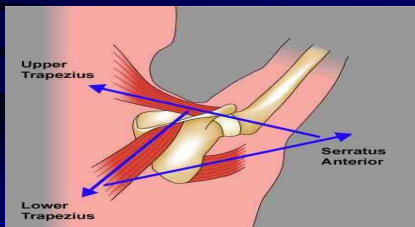
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## 1. Improve Scapula Position

Scapula Retraining needed for Correct Scapula/Humeral Rhythm



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**The unstable shoulder in arm elevation: A three-dimensional and electromyographic study in subjects with glenohumeral instability.**

Matias R, Pascoal AG

Clinical Biomechanics 21 (2006) S52–S58

- There is evidence to suggest that the sensorimotor contributors to joint stability can be restored.

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**The unstable shoulder in arm elevation: A three-dimensional and electromyographic study in subjects with glenohumeral instability.**

Matias R, Pascoal AG

Clinical Biomechanics 21 (2006) S52–S58

- 6 Subjects with GH Instability
- ROM Exercises evaluated with electromagnetic tracking device & SEMG of UT, LT, SA, Deltoid
- Scapular Kinematics Analyzed

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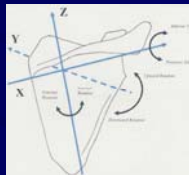
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**Results of Matias and Pascoal**

- Significant differences were found with increase scapular protraction and anterior tilt.
- Activity of the lower trapezius and serratus anterior delayed during first part of elevation.



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## Clinical Implications of Matias and Pascoal

Altered humeral head and glenoid alignment predispose shoulder instability

These kinematics scapular changes are perhaps due to an inadequate scapular muscular activity.

Scapulohumeral rhythm assessment should be done with the rehabilitation of patients with shoulder instability.

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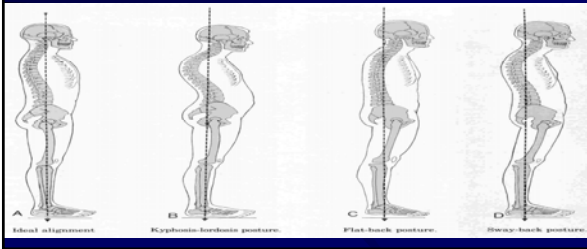
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## 1. Improve Scapula Position

Posture Education & Scapula Position  
Lower Trapezius Early Facilitation



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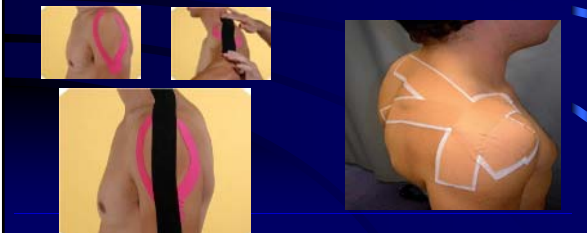
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## Shoulder Taping

Kinesiotape/McConnell Tape

Studies have shown alterations in NM and proprioception with Taping: (Morin et al, 1997; Halseth et al., 2004)



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**The effects of scapular taping on electromyographic muscle activity and proprioception feedback in healthy shoulders.**  
 Lin JJ, Hung CJ, Yang PL J Orthop Res. 2010 Jul 6

12 healthy shoulders 23.7±4.8 years  
 EMG activity of UT, LT, SA, AD: Used task-specific normalization vector instead of MVC analysis  
 Shoulder proprioception measured using kinematic evaluation from 3-d motion capture system of repeated movement: lower angle = accuracy in terms of proprioception.

**Kinesio Tape Method:** Subject posture w/ scapula depress & retracted  
**"T" Method** attach inferior margin of the medial 1/3 of the clavicle to T12 with full stretching of the tape




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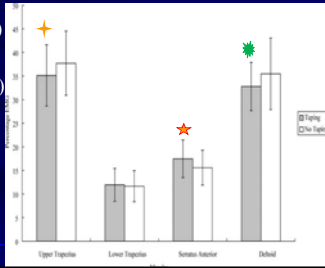
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**The effects of scapular taping on electromyographic muscle activity and proprioception feedback in healthy shoulders.**  
 Lin JJ, Hung CJ, Yang PL J Orthop Res. 2010 Jul 6

The proprioceptive feedback magnitude was significantly better in the taping condition than in the no taping condition (11.9° p<0.005)  
 Two-way repeated measures ANOVA showed significant changes with tape:

- ✦ Decrease UT (2.65% p=0.001)
- ★ Increase SA (1.9% p=0.015)
- ✪ Decrease AD (2.7%, p=0.001)




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**The effects of scapular taping on electromyographic muscle activity and proprioception feedback in healthy shoulders.**  
 Lin JJ, Hung CJ, Yang PL J Orthop Res. 2010 Jul 6

**CONCLUSION:**

Study showed significant changes in EMG activity in the scapular muscles with the application of tape and enhanced proprioceptive feedback. The mechanisms by which scapular taping can be explained as neuromuscular control as well as proprioceptive feedback factors.



**Other taping strategies may facilitate other NM changes.**

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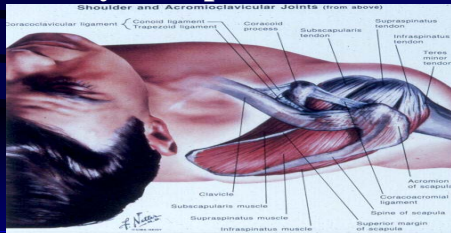
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## 2. Improve Cuff Performance

### Neuromuscular Training Concavity-Compressive Retraining



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Neuromuscular retraining for multidirectional instability of the shoulder -- a case study.  
Darlow B

*NZ J Physiother.* 2006;34(2):60-65.

Rehab Success for Shoulder Instability  
Requires Cuff Recruitment  
Facilitate Glenohumeral Approximation  
Concavity-Compression Retraining  
(Similar to Dynamic Relocation Test)

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## 2. Improve Cuff Performance

- Low compressive forces, such as those from resting muscle tone large resistance to translation (Halder et al., 2001; Makhsous et al., 2004; Schiffen et al., 2002).
- Maximal translational force required to minimally translate humeral head from its centered position with CC low forces (Halder et al., 2001)

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## 2. Improve Cuff Performance

Concavity-Compression

40° GH Abd.

Longitudinal Distraction

Pt Resist This Force with  
subscapularis

Monitor Pec/Lat/Biceps  
Substitution



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## 3. Enhance Shoulder Proprioception

The effect of instability and subsequent anterior  
shoulder repair on proprioceptive ability.

Zuckerman JD, Gallagher MA, Cuomo F, Rokito A

Shoulder Elbow Surg 2003;12:105-9.

- 30 patients w/ anterior instability
- Significant deficit in proprioception  
was found when the unstable side was  
compared with the uninvolved side

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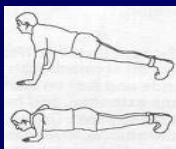
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## 3. Enhance Shoulder Proprioception

• Open & Closed KC  
beneficial Rogol et al., 1998

• Perturbations, closed  
kinetic chain, and  
plyometric exercises are a  
few of the techniques  
described in the literature.



Ginn & Cohen, 2005; Naughton et al. 2004; Swanik et  
al. 2002; Ubinger et al., 1999; Henry et al., 2001

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### 3. Enhance Shoulder Proprioception

#### Coordination Training Exercises

- Closed Chain Exercises: Progress with Single arm press-up



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Naughton J et al. Upper-body wobbleboard training effects on the post-dislocation shoulder. Phys Ther In Sport. 2005; 6:31-37.

30 subjects;

- 15 uninjured control (mean 23, SD 8.09)
- 15 dislocated/subluxed within past 12 months (mean 22, SD 4.8)



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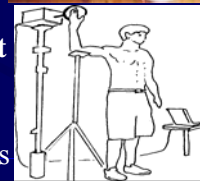
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### Methods

4 wk training period Trunk Lying on Swiss ball (75cm) balancing UE on wobbleboard (42 cm) 10 minutes daily



Movement Discrimination Test 5 locations between 0.95 and 4.77 cm of a 'policeman's stop' action Pre-Post Measures



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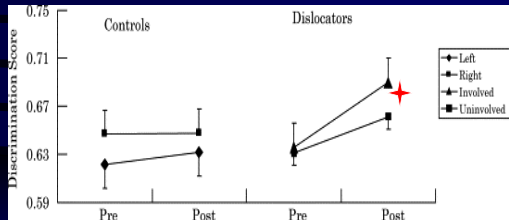
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## Results Proprioception

Separate 2X2 ANOVAs with factors group and side, on control and dislocator



Significant overall movement discrimination improvement with dislocators ( $F_{1,14} = 45.18, p < 0.001$ )

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## Conclusion

This study demonstrated that discrimination ability at the shoulder can be improved with upper-body wobbleboard training for 10 min daily over 1 month

- This study suggest that improved discrimination scores are correlated with improved static and dynamic control of GH joint & CKC exercise improves peripheral and central neural adaptations.
- Because the discrimination improvement was at common dislocation position, it was hypothesized improved NM control & increase functional stability

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## 4. Patient Education

- Avoid letting shld pop out
- Arm Positioning
- Avoid activities that threaten shoulder's stability
- Practicing performing confidence activities



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## Shoulder Instability

### 4. Patient Education

Optimizing the strength and endurance of the muscles that control your scapula.



### POSTURE/SCAPULA POSITIONING

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### 5. Relieve Pain and Inflammation

- a. Modalities
- b. Manual Interventions such as Strain/CounterStrain; Dry Needling
- c. Joint Mob/Manip GH & T-Spine



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### Retard Muscle Atrophy

- a. Standing
- b. Submax
- c. Modified Isometrics
- d. Total Arm Strength



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## 5. Maintain/Increase ROM

- a. External Rotation  
0° 45° and 90° Abd
- b. Active Assistance
- c. No Pain or Apprehension



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## CLOSURE

The End is Here



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## CASE: CK Clinical Presentation



Examination at end of Phase 1

TEST	INITIAL	POST PHASE 1
WOSI	55	22
TSK 11	31	11
P-4	29	3
Proprioception Kin Com Test	21	8

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# Shoulder Instability

## Phase One: Acute Phase (Criteria for Advancement)

Athlete is happy with status at rest

1. No Acute Signs
2. Decrease Symptoms
3. Muscular Function Improved
4. Improved ROM



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# Shoulder Instability

## Phase Two: Rehabilitation Stage (Goals)

1. Normalize ROM
2. Improve Muscular Performance
3. Improve Neuromuscular Control



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# Shoulder Instability

## Improve Muscle Performance

- a. Isolate Muscle
- b. Basic Energy System
- c. Type of Exercise
- d. What Activities?



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# Shoulder Instability

**Initial Strengthening**

- \*Rotary Cuff
- \*Proximal Stability
- \*Dumbbell
- \*Tubing (Submax)




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# Exercise Example

**Strengthening:**

Six Core Exercises

- Flexion
- Scaption
- Rowing
- Horizontal extension/external rotation
- Seated Press-up
- Push-up with overpressure




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# Shoulder Instability

**Advanced Strengthening**

- \*Strength and Power
- \*Plyometrics
- \*Coordination




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# Shoulder Instability

Rehabilitation Phase  
(Criteria for  
Advancement)

1. Full Non-Pnful ROM
2. No Pain or Tenderness
3. Isokinetic Evaluation
4. Satisfactory Clinical Exam



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# Shoulder Instability

C.Phase Three:  
Return to  
Activity (Goal)  
Unrestricted  
Symptom-Free  
Activity



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# Shoulder Instability

Return to Activity  
Treatment

- \*Film Athlete:  
Correct Mechanics
- \*Interval Program
- \*Maintenance  
Exercise Program



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# Shoulder Instability

Return to Activity  
Treatment

\*Film Athlete:  
Correct Mechanics

\*Interval Program

\*Maintenance  
Exercise Program



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# Bracing or Taping To Play?



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# CLOSURE

The End is Here



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