

Prevention of shoulder injuries

Dr Jane Fitzpatrick
Sports Medicine Professionals
21 Erin Street
Richmond VIC

Dr Jane Fitzpatrick

Private Practice – Consulting Sports Medicine

Medical Director for Biathlon Australia

Team Physician Australian XC Ski Team

Member Research Committee Australasian College of Sports and Exercise Medicine

Current research in PRP in Tendinopathy with support from Biomet Biologics USA

Principal Investigator, Cannabidiol gel trial in OA knee, Zynerba Pharmaceuticals

Principal Investigator, Meloxicam trial post surgery, Recro Pharmaceuticals

University of Western Australia – Department of Surgery, PhD, Pr Minghao Zheng

Hip Arthroscopy Australia Education and Research Trust

Member Clinical Advisory Board, Bioventus, 2014-2018

Member Medical Committee IBU 2014-2018

Recipient 2017 Experienced Researcher Poster Award, Epworth RI

Advisor Orthocell, Western Australia.



Prevention – don't use it!

- Identify what are the commonest injuries
- How do we diagnose them?
- What sports do they occur in?
- How can we prevent them?
- How do we get the prevention in place?



Common shoulder injuries

; McLaughlin, Harrison L.;

; The American Journal of Surgery, 09/1947, Vol.74(3), pp.282-295[Peer Reviewed Journal]

- Common Shoulder injuries are simple problems when treated by a program founded on a knowledge of the normal functional anatomy of the part.
- Fractures of the proximal humerus
- Anterior dislocation of the shoulder
- Dislocation with fracture tuberosity / intrinsic tendon damage
- Internal derangement of the subacromial mechanism i.e the cuff and the bursa
- Watch out for calcific deposits, adhesive capsulitis, cuff tear, arthritis, infection

What sports do they occur in?



Prevention - Definition



 IOC WORLD CONFERENCE
PREVENTION OF INJURY & ILLNESS IN SPORT



- First surveillance – identify the problem
- Second – consider the risk factors
- Can we intervene in a positive way
- Re-assess how we went?
- Build a prevention program

Prevention of shoulder injuries – Are we there yet?

- **ABSOLUTE AND RELATIVE OUTCOMES OF SHOULDER INJURY PREVENTION PROGRAMS IN NON-INJURED OVERHEAD ATHLETES – A SYSTEMATIC LITERATURE REVIEW**
- ; Grygorowicz, M ; Lubiatowski, P ; Witold, D ; Romanowski, L;
- ; BMJ Publishing Group Ltd and British Association of Sport and Exercise Medicine;
- ; British Journal of Sports Medicine April 2014, Vol.48(7), p.603[Peer Reviewed Journal]

Abstract

Background The incidence of shoulder injuries in overhead sports is high. Despite this high rate, insufficient evidence is available on the efficacy of preventive training programs.

Objective To analyze the absolute and relative outcomes of shoulder injury prevention programs in non-injured overhead athletes.

Design Systematic literature review.

Setting Amateur and professional.

Participants Athletes of different throwing sports.

Interventions Analyzed different prevention approaches in injury prevention programs

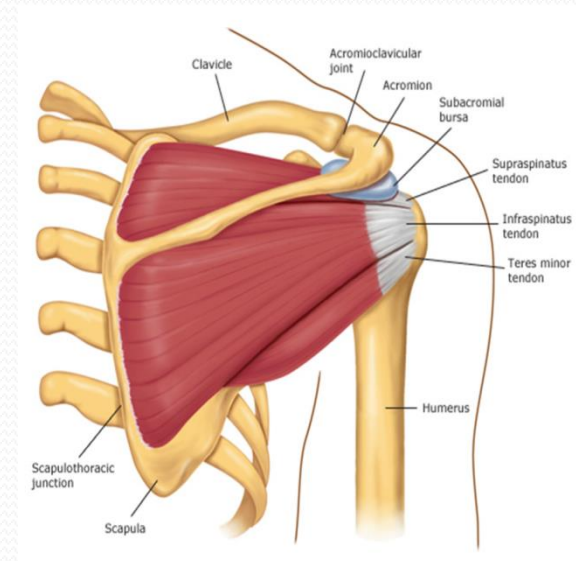
Main outcome measurements Primary: reduction of shoulder injury rate during the analyzed period of time. Secondary: relative outcomes such as improvement in biomechanical factors (e.g. throwing velocity, isokinetic strength)

Results Our searches identified 827 potentially relevant articles. There were no paper reporting absolute outcomes. As the relative outcomes authors most frequently used: shoulder strength, power, throwing velocity, range of motion.

Conclusions Conflicting evidence has been found. Not all of the PEDro criteria could be satisfied, as the experimental crossover design implemented by the majority of studies resulted in subject and therapist blinding not being possible. High-quality studies investigating the shoulder injury prevention are needed to reduce the incidence of injuries in non-injured overhead athletes.

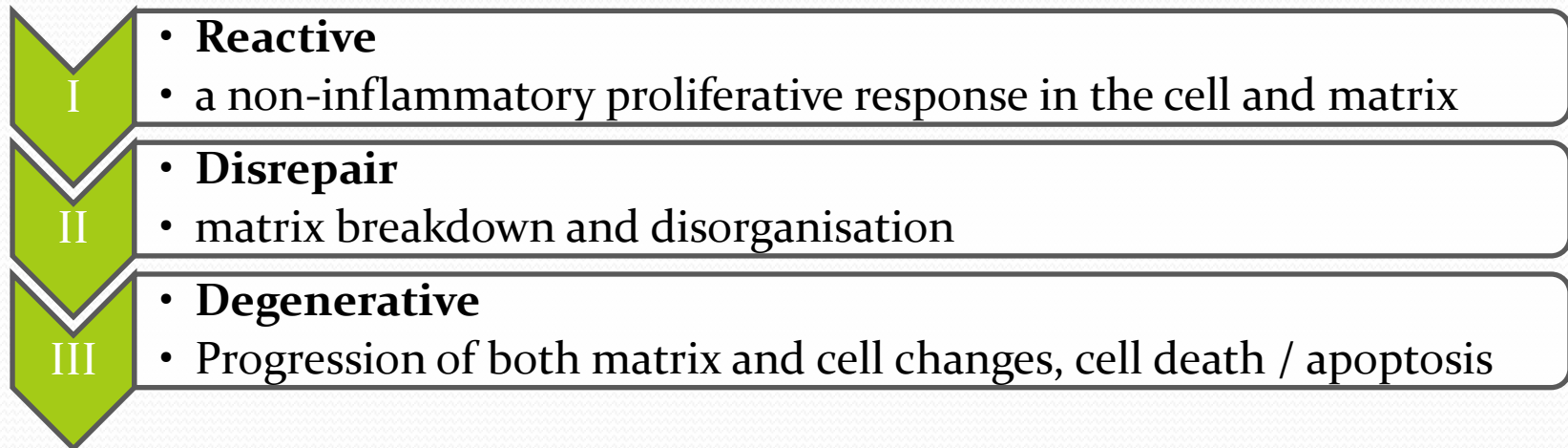
Rotator cuff disease

- Rotator cuff tears, impingement and **tendinopathies**
- Related to scapulothoracic control



Tendinopathy Spectrum

- It is widely accepted that tendinopathies exist in a spectrum of severity



- Chen et al, J Shou. Elb. Surg, 2009
- Wu et al. Arch Orthop Trauma Surg 2011
- Cook et al. *Br J Sports Med* 2016
- Cook & Purdam, *Br J Sports Med* 2017

Slide Courtesy of Pr Ming Hao Zheng, Uni of WA

Normal Reactive I Disrepair II Degenerative III

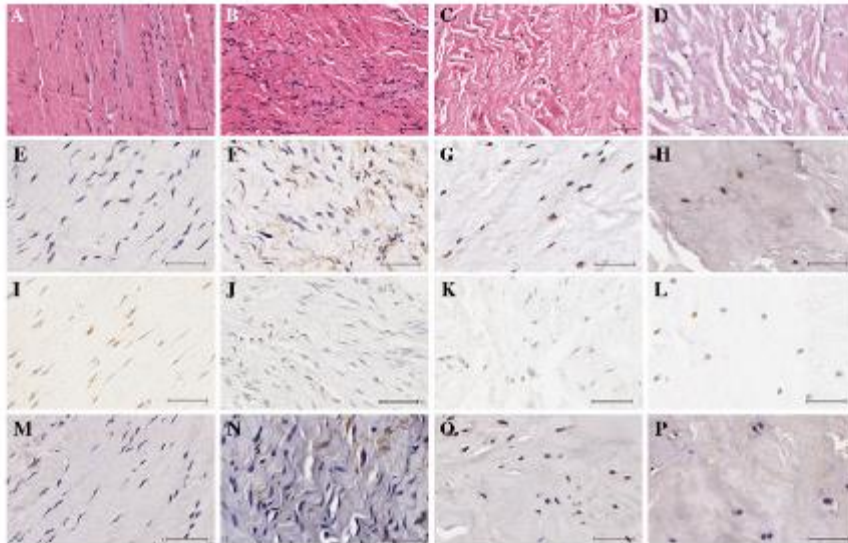


Fig. 1 a-d The ECM (H&E staining) was graded 0-3, where 0 represents nearly normal and 3 represents most abnormal. e-h Autophagic cell death (brown) was identified by immunohistochemistry in the ECM graded 0-3, respectively. i-l Apoptotic cells (brown) were

assessed by TUNEL assay in the ECM graded 0-3, respectively. m-p Myofibroblasts (brown) were stained brown by immunohistochemistry in the ECM graded 0-3, respectively. Bar is 50 μ m in all pictures

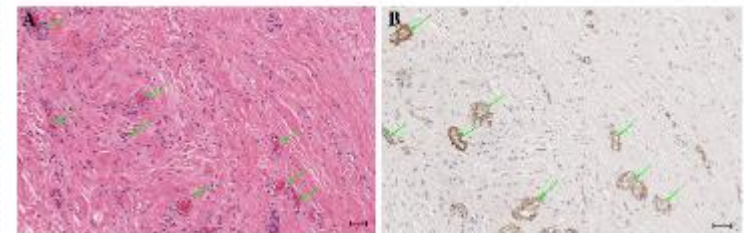
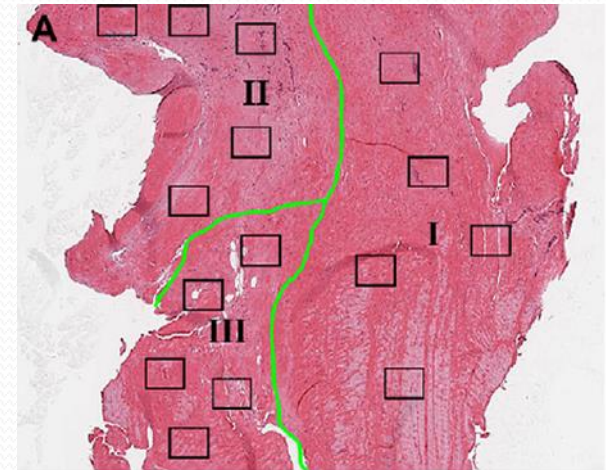


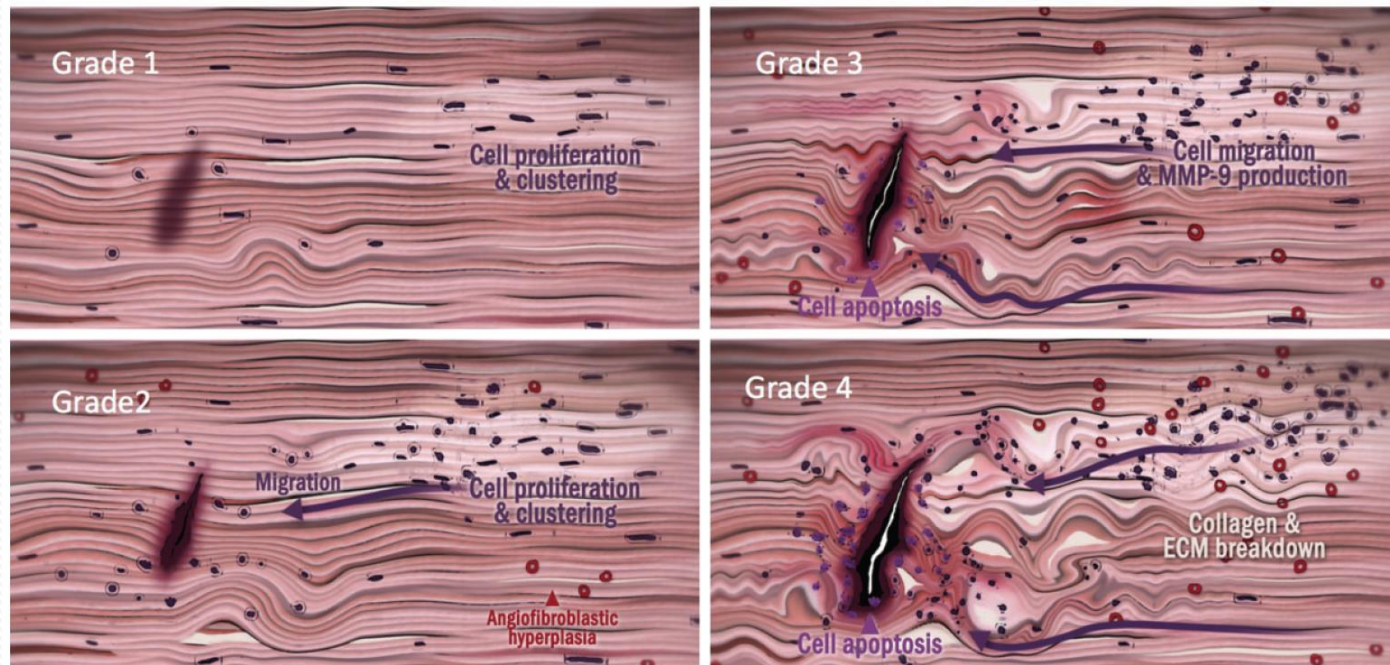
Table 2 Percentage of autophagic cell death, apoptosis, myofibroblasts and the cell density in the ECM graded 0-3, respectively

	Extra cellular matrix grade			
	0	1	2	3
Autophagic cell death (%)	33.9 \pm 3.6 (51 fields)	42.9 \pm 1.8 (209 fields)	51.9 \pm 1.5 (371 fields)	46.0 \pm 1.8 (269 fields)
Apoptotic cell death (%)	21.4 \pm 2.2 (54 fields)	26.0 \pm 1.4 (237 fields)	31.0 \pm 1.2 (363 fields)	34.8 \pm 1.6 (246 fields)
Myofibroblasts (%)	6.7 \pm 1.0 (50 fields)	13.8 \pm 0.9 (229 fields)	16.9 \pm 1.0 (358 fields)	19.8 \pm 1.3 (263 fields)
Cell density (cells/mm ²)	555 \pm 41 (57 fields)	674 \pm 27 (246 fields)	529 \pm 17 (358 fields)	395 \pm 17 (239 fields)

All the data were presented as mean \pm SEM

Tendinopathy Spectrum

- This spectrum of tendinopathy has been confirmed using histopathology

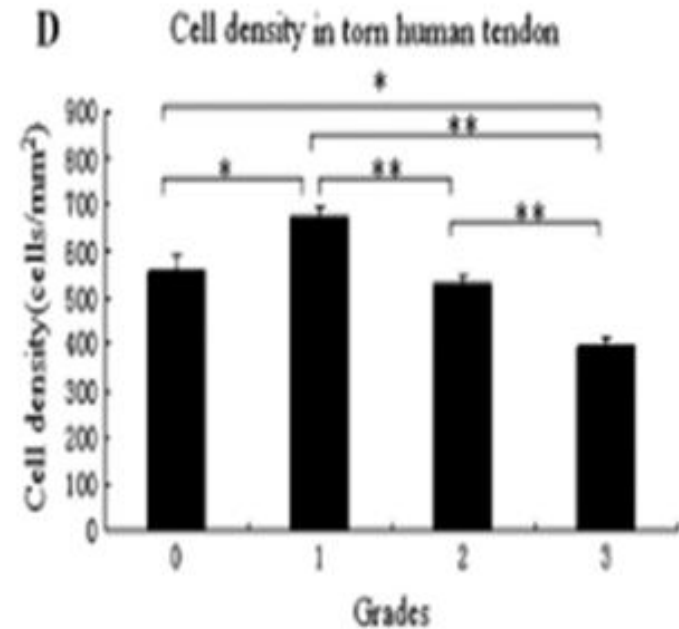


•¹ Bhabra et al, 2017 *Orthop J Sports Med* 4(11)

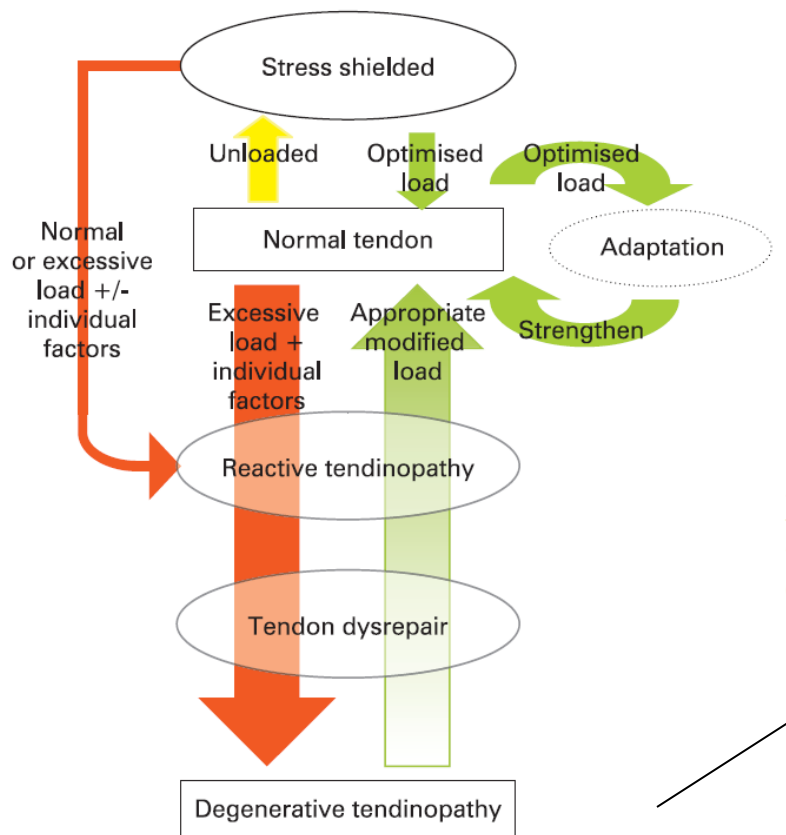
² Scott et al, 2015 *J Orthop Sports Phys Ther* 45(11):833-41

Degenerative changes of tendinopathy – reduction of a functional tendon cell pool

- Apoptosis and autophagic cell death has been implicated in tendinopathies throughout the body
 - Lateral epicondylitis
 - Chen et al, 2010; Kahlenburg et al, 2015
 - Rotator cuff
 - Yuan et al, 2002; Tuoheti et al, 2005; Millar et al, 2009; Wu et al, 2011; Lundgreen et al, 2011; Lundgreen et al, 2013; DeGiorgi et al, 2014
 - Achilles
 - Pearce et al, 2009; Nell et al, 2012; Wang et al, 2015
 - Patellar tendon
 - Andarawis-Puri et al, 2014; Lian et al, 2007



¹ Bhabra et al, 2017 *Orthop J Sports Med* 4(11)



Degenerative tendinopathy, if extensive enough, or if the tendon is placed under high load, can rupture,²² consistent with 97% of tendons that rupture having degenerative change.²³

Figure 1 Pathology continuum; this model embraces the transition from normal through to degenerative tendinopathy and highlights the potential for reversibility early in the continuum. Reversibility of pathology is unlikely in the degenerative stage.

Merete Møller - Handball load and shoulder injury rate

Winner open presentation

SportsKongress 2017

- Load increases of $> 20\%$ per week lead to shoulder injury
- Scapular Dyskinesis or loss strength rotation more likely to get injured
- Only if loads $> 20\%$!!

Shoulder injury prevention program

- christina le @yegphysio Mar 18
- 10min shoulder prevention program lead to 28% decrease in injury risk.
- #iocprev2017 pic.twitter.com/WU1lt6QuVa
- IOC WORLD CONFERENCE and Grethe Myklebust

1. Scapula control



8-16 reps x 3

2. ER strength



8-16 reps x 3

3. IR ROM



20 reps x 3

4. Kinetic chain



30 sec x 3

5. Thoracic mobility



8-16 reps x 3

Adhesive capsulitis

- Often follows wrenching
- Associated with tendonitis and cuff tears
- Often confused with osteoarthritis
- Associated with diabetes
- may be related to glycosylation of the basement membrane = Martin Richardson trial Epworth
- Adhesive capsulitis of the shoulder and diabetes: a meta-analysis of prevalence
- ; Zreik, Nasri Hani ; Malik, Rayaz A ; Charalambous, Charalambos P;
- ; Muscles, ligaments and tendons journal, 2016, Vol.6(1), pp.26-34



Prevention adhesive capsulitis

- Treat early – inflammatory phase
- LCHF diet



Osteoarthritis of the shoulder

- Trauma – recognise and treat shoulder fractures well.
- Judicious use
Prednisolone – AVN
- Load related – gym programs – the gym junkie?



Shoulder instability



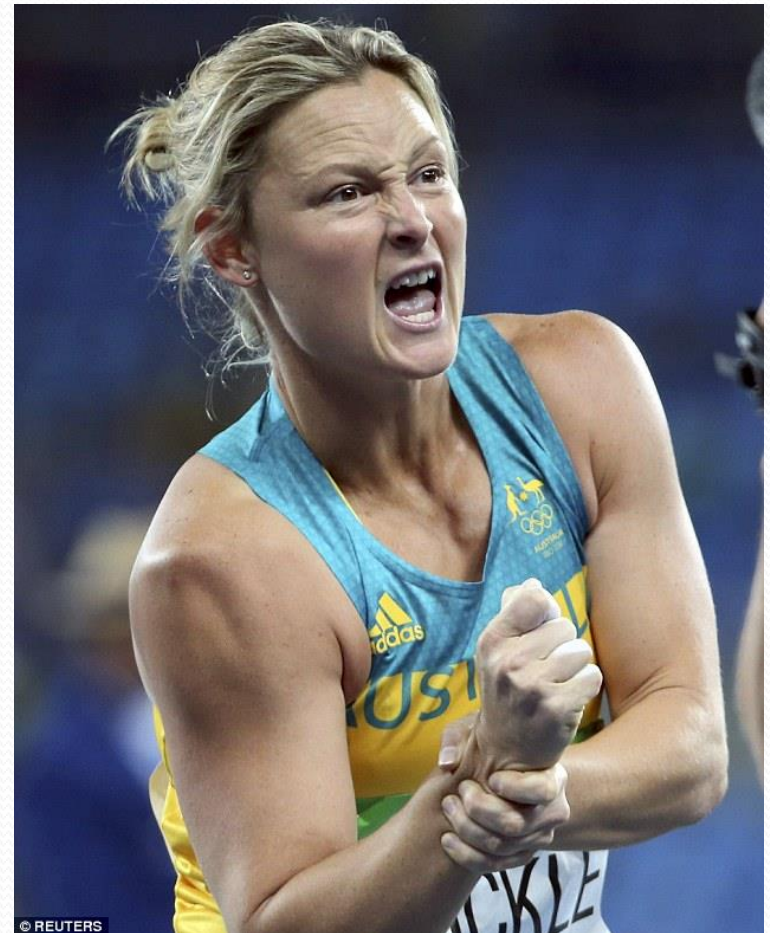
- Traumatic / Non traumatic
- Abduction / ER
- Use the arm within the normal range of motion
- Is there a role for strengthening?

Shoulder Instability Primary prevention

- The role of the scapula in preventing and treating shoulder instability
- ; Kibler, W. ; Sciascia, Aaron;
- ; Knee Surgery, Sports Traumatology, Arthroscopy, 2016, Vol.24(2), pp.390-397[Peer Reviewed Journal];
- Scapula · Scapular dyskinesis · Scapula evaluation · Shoulder injury prevention * Aaron Sciascia
ascia@lexclin.com W. Ben Kibler wkibler@aol.com 1...

Shoulder Instability prevention of recurrence

- Shoulder has the largest ROM of any joint
- Preservation of stability is paramount to function
- 95% are traumatic
- Recurrence inversely proportional to age
- <20 yrs 90% in sporting
- 20-30 = 75 – 50 %
- Arthroscopically Determined Degree of Injury After Shoulder Dislocation Relates to Recurrence Rate
- ; Gutierrez, Vicente ; Monckeberg, Juan ; Pinedo, Miguel ; Radice, Fernando;
- ; Clinical Orthopaedics and Related Research®, 2012, Vol.470(4), pp.961-964



Prevention of shoulder injury

- Don't use it!
- Research will develop
- Know your sport
- Tendinopathy – load continuum
- Scapular dyskinesia
- Diabetes prevention
- Treat Trauma well
- Instability – prevent recurrence

