

Summary of an evidence-based guideline on soft tissue shoulder injuries and related disorders—Part 2: Management

Gillian Robb MPH (Hons), Dip Physiotherapy, Dip Ergonomics;¹ **Bruce Arroll** MBChB, PhD, FRNZCGP;² **Duncan Reid** MHS (Hons), PGD (Manip Physiotherapy), MNZCP;³ **Felicity Goodyear-Smith** MBChB, MGP, FRNZCGP²

¹Section of Epidemiology & Biostatistics, School of Population Health, Faculty of Medical and Health Science, The University of Auckland, Auckland, New Zealand

²Department of General Practice and Primary Health Care, School of Population Health, Faculty of Medical and Health Science, The University of Auckland, Auckland, New Zealand

³School of Rehabilitation and Occupation Studies, AUT University, Auckland

ABSTRACT

AIM: To provide a succinct summary of the management of soft tissue injuries to the shoulder for primary health care practitioners based on the New Zealand guideline.

METHODS: A multidisciplinary team developed the guideline by critically appraising and grading retrieved literature using the Graphic Appraisal Tool for Epidemiology (GATE); and the Scottish Intercollegiate Guideline Network. Recommendations were derived from resulting evidence tables.

RESULTS: For the management of soft tissue shoulder disorders there is little evidence to support or refute the efficacy of common interventions for shoulder disorders in general and rotator cuff disorders in particular. For rotator cuff tendinosis and partial tears, use NSAIDs and subacromial corticosteroid injections with caution and provide a trial of supervised exercise. For frozen shoulders, intra-articular corticosteroid injection should be considered and refer for supervised exercise after acute pain has settled. For shoulder instability, good evidence supports the referral of physically active young adults for orthopaedic intervention following a first traumatic shoulder dislocation.

CONCLUSION: While there is a dearth of good evidence, this guideline does provide a framework for the management of common soft tissue injuries of the shoulder.

KEYWORDS: Shoulder, soft tissue injuries, primary health care

Introduction

Diagnosis and management of shoulder injuries is one of the most challenging areas of musculoskeletal medicine. Prevalence figures for shoulder disorders vary widely for point prevalence (7–26%), one month prevalence (19–31%), one year prevalence (5–47%) and lifetime prevalence (7–66%).¹ Shoulder disorders are therefore relatively common, but only 50% of new episodes of shoulder complaints presented in primary care are completely recovered within six months, increasing to only 60% at one year.²

It is likely that suboptimal management contributes to unfavourable outcomes for patients. This paper is the second of a two-part series which

summarises the evidence for assessment and management of soft tissue shoulder injuries based on the evidence-based guideline *The diagnosis and management of soft tissue shoulder injuries and related disorders* developed in New Zealand (NZ), led by EPIQ, University of Auckland under the auspices of the New Zealand Guidelines Group (NZGG).³ This guideline was commissioned by ACC in 2003 to reduce identified variation in both diagnosis and management and to improve outcomes for claimants.

This guideline was endorsed by the Royal New Zealand College of General Practitioners, the NZ Orthopaedic Association, the NZ Society of Physiotherapists Inc., the NZ Association of Mus-

J PRIMARY HEALTH CARE 2009;1(1):42–49.

CORRESPONDENCE TO: Gillian Robb

Section of Epidemiology & Biostatistics, School of Population Health, University of Auckland Private Bag 92019, Auckland, New Zealand
g.robb@auckland.ac.nz

culoskeletal Medicine, Sports Medicine NZ, and the Royal Australasian and New Zealand College of Radiologists. The full document is available on the NZGG website (<http://www.nzgg.org.nz>).

The aim of this paper is to provide a succinct summary of the management of soft tissue injuries to the shoulder in a form that is readily accessible to primary health care practitioners.

Methods

Methods have been described in Part 1. Part 2 of this summary addresses the management of adults with the following shoulder injuries. Adolescents were included for shoulder instabilities given that dislocation and recurrent dislocation are more common in this age group.

1. **Rotator cuff and related disorders** (including impingement, subacromial bursitis, tendinosis, painful arc syndrome, partial, full thickness and massive tears of the rotator cuff, long head of biceps rupture and calcific tendonitis)
2. **Frozen shoulder** (also known as adhesive capsulitis)
3. **Glenohumeral instabilities** (acute and recurrent dislocation, labral injuries and other instabilities)
4. **Acromioclavicular (AC) joint injuries** (including stress osteolysis, osteoarthritis and dislocation)
5. **Sternoclavicular (SC) joint injuries** (including sprains, dislocation and arthritis and related conditions).

This guideline specifically excludes fractures, inflammatory conditions, degenerative conditions, endocrinological and neurological conditions, hemiplegic shoulder and chronic shoulder pain including occupational overuse disorders.

For each of the included conditions evidence for management was sought based on searches relating to interventions commonly used in practice. For each condition a comprehensive literature search was undertaken in the major electronic databases (Medline, CINAHL, EMBASE, AMED, SPORTdiscus and Current Contents). Searching also included the Cochrane Database of Systematic Reviews, Cochrane Controlled Trials Register,

WHAT GAP THIS FILLS

What we already know: In general, the evidence for the management of acute soft tissue shoulder injuries is weak and limited.

What this study adds: For rotator cuff tendinosis and partial tears, use NSAIDs and subacromial corticosteroid injections with caution and provide a trial of supervised exercise. For frozen shoulders, intra-articular corticosteroid injection should be considered and refer for supervised exercise after acute pain has settled. For shoulder instability, good evidence supports the referral of physically active young adults for orthopaedic intervention following a first traumatic shoulder dislocation.

the Database of Reviews of Effectiveness (DARE) and relevant Internet sites including PEDro, NHS clinical trials, Health Technology Assessments for NHS, Bandolier and National Guideline Clearing House. Reference lists of included studies were checked for additional studies.

Only published randomised controlled trials, meta-analyses and systematic reviews in the English language were considered for inclusion. Quality was assessed using the Generic Appraisal Tool for Epidemiology (GATE) available at: <http://www.epiq.co.nz> (modified since this guideline developed).

Evidence from the relevant studies was summarised into evidence tables. Recommendations were developed using the SIGN 'Considered Judgment' process. (SIGN Guideline development process: <http://www.sign.ac.uk/guidelines/full-text/50/compjudgement.html>)

Grading is based on the strength of the evidence and does not indicate the relative importance of the recommendations.

Results

Results are presented for each condition according to the grade of recommendation as follows:

- **A Recommendation:**
Supported by good evidence
- **B Recommendation:**
Supported by fair evidence
- **Good practice point:**
Consensus of the guideline team.

In general, due to lack of agreement in defining shoulder disorders, poor quality of studies, and heterogeneity of studies with respect to participants, interventions, and outcomes, there is little evidence to support or refute the efficacy of common interventions for shoulder disorders in general^{4,5} and rotator cuff disorders in particular.⁶

1. Rotator cuff and related disorders

Rotator cuff disorders are the most common sources of shoulder problems. They range from mild strain causing impingement-type symptoms to massive tears and total absence of the cuff with severe loss of function.⁷

Tendinosis causing impingement-type symptoms (painful arc) is due to collagen fatigue resulting from repetitive overhead activities.⁸ In contrast, rotator cuff tears typically result from trauma and are more common in people over the age of 35 years.

Partial thickness tears can occur on the bursal or articular side of the rotator cuff and do not extend through the full thickness of the tendon. These are more common than full thickness tears which extend through the full thickness of the tendon and are often more symptomatic.⁹ Full thickness tears increase with advancing age, frequently occurring as a result of minimal trauma. These tears are often asymptomatic and compatible with normal painless functional activity.¹⁰

Massive tears have been defined as tears >5cm or tears involving two or more tendons (more often supraspinatus and infraspinatus, but also supraspinatus with subscapularis).¹¹

Weakness is the primary sign of loss of integrity of the rotator cuff, but should be distinguished from weakness due to pain inhibition.¹⁰

B recommendations

- Prescribe NSAIDs with caution. They provide short-term symptomatic pain relief but can have serious consequences.¹²
- Use subacromial corticosteroid injection with caution. It provides short-term

symptomatic relief for people with tendinosis and partial thickness tears.^{13,14}

- There is insufficient evidence to determine the benefits or harms of subacromial steroid injection for full thickness rotator cuff tears.⁶
- Provide a trial of supervised exercise by a recognised treatment provider for people with rotator cuff disorders.⁴
- Avoid the use of therapeutic ultrasound (no additional benefit over and above exercise alone).⁴
- For calcific tendonitis, there is limited evidence for the use of ultrasound for pain relief,¹⁵ and weak evidence for the use of Extracorporeal Shock Wave Therapy (ESWT).¹⁶⁻¹⁹

Good practice points for rotator cuff and related disorders

- Simple analgesics provide pain relief with potential for less serious side effects.
- Subacromial corticosteroid injections may be appropriate for full thickness tears as part of long-term management where surgery is not considered as a treatment option.
- If there is no significant improvement in patients with a full thickness tear of the rotator cuff after four to six weeks of non-operative management, refer to an orthopaedic specialist.
- Early surgical management for a rotator cuff tear has the most to offer people with otherwise healthy tissue and who are physiologically young and active.

There are a number of disorders closely related to rotator cuff tears which should be considered as part of the differential diagnosis.

- **Biceps tendinosis** is part of the spectrum of pathological processes of rotator cuff disorders and should be managed in the same way as rotator cuff tendinosis. Rupture of the biceps tendon is more common with increasing age.²⁰ Management is symptomatic with almost no indication for operative repair. Where instability (subluxation or dislocation of the biceps tendon) is suspected, refer to an orthopaedic surgeon.
- **Calcific tendonitis** usually occurs spontaneously and is self-limiting.¹⁶ People with

severe pain and dysfunction may require urgent referral to an orthopaedic specialist.

- **Isolated muscle tears**, while rare, occur most commonly in the subscapularis²¹ and pectoralis major.²² Both require urgent referral for orthopaedic evaluation.

2. Frozen shoulder

The true frozen shoulder is characterised by an unknown aetiology, spontaneous and gradual onset of pain and global restriction of movement.^{23,24} The clinical presentation is described as involving three phases. An initial painful phase lasting two to three months in which pain is severe and movement severely restricted is followed by a second phase also lasting two to three months where pain diminishes and the predominant feature is stiffness. Resolution typically occurs over the next six to 12 months in which there is a gradual gain in range of movement with less discomfort. In contrast with rotator cuff impingement or tear, a key diagnostic feature of frozen shoulder is stiffness (limitation of both passive and active range), lack of discomfort with resisted movement and no weakness. There is frequently substantial functional limitation with respect to activities of daily living.²⁵

B recommendations

- In the painful phase actively consider intra-articular corticosteroid injection performed by an experienced clinician.^{14,26}
- After the acute pain has settled offer supervised exercise by a recognised treatment provider to improve range of movement.²⁶ Mobilisation does not offer any additional benefit.¹⁴
- Laser therapy and acupuncture may be beneficial in the treatment of frozen shoulder.^{4,27}
- Hydrodilatation has not been found to be effective.⁵

Good practice points for frozen shoulder

- Avoid vigorous stretching in the early phase as this will exacerbate pain.
- It is important that people with a frozen shoulder understand the time it takes for this condition to resolve.

3. Glenohumeral instabilities

Instabilities are symptomatic manifestation of pathological movement of one joint surface in relation to another and should be contrasted with laxity which is the non-pathological linear displacement of one articular surface in relation to the other.²⁸ Instabilities include acute glenohumeral dislocations (anterior, posterior and inferior), multidirectional instability (global laxity of the shoulder) and tears of the glenoid labrum.

Anterior dislocations are the most common acute traumatic dislocation. In younger people these are often associated with detachment of the labrum from the rim (Bankart lesions) with a 90% chance of recurrence in people under 20 years.²⁹ Dislocations are also common in the sixth decade of life³⁰ but are more likely to be associated with capsular tear and concomitant rotator cuff tears.³¹

Labral injuries (including detachment of the superior labrum either anteriorly, superiorly or both) are common in overhead athletes as progressive failure of the labrum or may occur as a traumatic event in association with anterior dislocation.³² These are often associated with vague symptoms of impingement associated with activity, clicking, locking and in some a 'dead arm' which is the sudden sharp paralysing pain or sense of subluxation associated with weakness, tingling and numbness.³³

A recommendations

- Young adults engaged in demanding physical activities with a first traumatic shoulder dislocation should be referred for orthopaedic evaluation.³⁴

Good practice points for glenohumeral instabilities

- Investigations for acute dislocations:
 - Pre-reduction x-ray is recommended for people >40 years of age.
 - Post-reduction x-ray is recommended for all people with a first time dislocation to confirm the reduction and assess for bony injury.

- X-ray is required for all people with a failed attempt at reduction.
- X-ray is recommended for those with recurrent dislocation where surgical stabilisation may be a management option.
- Acute management of dislocations:
 - Only clinicians with expertise should reduce anterior or posterior dislocations.
 - Relaxation is critical for successful reduction. Ensure adequate analgesia is given as required before attempting reduction.
 - Attempt slow steady traction for at least 30 seconds, avoiding excessive force while attempting to reduce a dislocated shoulder.
 - Urgent referral to an orthopaedic specialist is required when reduction is unsuccessful after two attempts.
- Post-reduction management of dislocations:
 - In people with a primary dislocation for whom non-operative management is appropriate apply a sling, provide analgesia and refer for a supervised exercise programme.
 - Following dislocation, people should not return to sport for at least six weeks, or when they have achieved near normal muscle strength.
- Recurrent dislocation:
 - People with recurrent dislocation (>2) should be referred to an orthopaedic specialist to evaluate the need for surgical stabilisation.
- Multidirectional instability:
 - A comprehensive rehabilitation programme focusing on strengthening the scapular stabilisers and rotator cuff muscle may improve function.
 - Where treatment fails to improve function by six months, surgical intervention may be considered.
- Labral tears:
 - Labral injuries should be referred to an orthopaedic surgeon for evaluation.

4. Acromioclavicular joint injuries

Acromioclavicular (AC) joint injuries are common in men between the second and fourth decade of life, frequently occurring during sport from a fall on the point of the shoulder.³⁵ AC joint injuries are classified as Grade I (intact joint), Grade II (up to 50% vertical subluxation of the clavicle with rupture of the AC ligament) and Grade III (more than 50% vertical subluxation of the clavicle and complete rupture of both the AC and coracoclavicular ligaments).^{35,36}

Good practice points for acromioclavicular joint injuries

- People with Grade I and II sprains can be provided with a sling and analgesics for five to seven days until comfortable.
- There is a lack of evidence to support any particular method of taping.
- Advise gradual return to activity as symptoms settle, avoiding heavy lifting and contact sports for eight to 12 weeks.
- People with Grade III AC joint sprains can be managed non-operatively, but if this is not successful after three months, consider referral to a specialist for further evaluation.
- More serious AC joint dislocations require referral for orthopaedic evaluation.

5. Sternoclavicular joint injuries

The most common sternoclavicular (SC) disorders are strains sustained from motor vehicle and sporting injuries.^{37,38} In mild strains, the ligaments are intact and the joint stable. In moderate strains, the ligaments may be partially disrupted and the joint is subluxed. Severe strains (dislocations) are rare, the most common being anterior dislocations. Posterior dislocations, however, while uncommon, may compromise major vessels, the trachea and oesophagus which are in close proximity.^{39,40}

Local tenderness and swelling characterise milder strains, whereas a palpable gap may be present in more serious injuries. CT may be the best radiological technique for SC joints.

Good practice points for sternoclavicular joint injuries

- Although rare, clinicians should watch for pulmonary or vascular compromise due to a posterior dislocation of the SC joint usually resulting from severe compression trauma. Immediate referral to an appropriate specialist is required.
- Most injuries of the SC joint are mild and can be managed with a sling, analgesics and return to activity as tolerated.

Discussion

In general, the evidence for the management of acute soft tissue shoulder injuries is weak and limited. Little has been added in the years since publication of the guideline.

A brief search for guidelines, systematic reviews or meta-analyses published since the development of the NZ guideline³ revealed an additional three Cochrane reviews⁴¹⁻⁴³ and a number of reviews published in other journals.^{44,45,46-53}

The first of the three Cochrane reviews found little evidence to support or refute the use of acupuncture for shoulder pain in general, but suggested there may be short-term benefit with respect to pain and function.⁴¹

The second Cochrane review was suggestive that oral steroids confer a worthwhile short-term (six weeks) benefit for pain, range of movement and function in people with adhesive capsulitis.⁴² The stage at which this was most effective was not specified, but the median duration of symptoms of participants in the included studies was six months. While adverse effects reported were minor, the potential risk of oral steroids should be considered when making treatment decisions.⁴²

The third Cochrane review reported a lack of evidence to inform choices for conservative management following closed reduction of traumatic anterior dislocation of the shoulder.⁴³ This review was based on one small, preliminary, poor quality study which was also included in

the shoulder guideline.⁵⁴ While the review reported no significant differences between groups for any outcome, the study did claim that fixation in external rotation was effective in reducing redislocation at 15-months' follow-up ($p=0.008$). Given that this was a small, poor quality study, the conclusions of the review are relevant.

Of the additional reviews located, seven related to disorders of the rotator cuff,^{44, 45,46-49,53} one related to adhesive capsulitis,⁵⁰ one focused on instability,⁵¹ and one reviewed the management of Grade III acromioclavicular injuries.⁵² For disorders of the rotator cuff, the findings of these reviews are consistent with the guideline and no new evidence was reported for treatment options. One review, however, investigated factors influencing the decisions to surgically repair symptomatic full thickness rotator cuff tears, including demographic variables (age and gender), duration of symptoms, non-operative treatment, timing of surgery, physical examination findings,

In general, the evidence for the management of acute soft tissue shoulder injuries is weak and limited

size of the tear and pending workers compensation claims. While there was no randomised trial evidence for any one factor, they suggested that older chronological age should not be considered a barrier to operative repair as studies have reported good outcomes for older patients and that pending workers' compensation claims did not appear to influence treatment results.⁵³

A systematic review of randomised trials using multiple corticosteroid injections for adhesive capsulitis evaluated nine trials, of which four were considered to be of high methodological quality. This review found a benefit for up to three corticosteroid injections and limited evidence that six injections were beneficial. There was no evidence that more than six injections were of benefit. It should be noted that while five different corticosteroids were used, all were given

intra-articularly. Also, only two of these studies were based in general practice.⁵⁰

A review of the effectiveness of rehabilitation for non-operative management of shoulder instability found only weak evidence to support immobilisation for three to four weeks followed by a structured rehabilitation programme for people with a primary dislocation.⁵¹ Instability in this review was defined as symptomatic hypermobility (single plane or multidirectional) resulting from traumatic and atraumatic subluxation or dislocation.

For Grade III acromioclavicular injuries, non-operative treatment is the preferred option based on three randomised trials included in a review which concluded that while surgical results were 'no better' they were associated with more complications, increased convalescence and time away from work.⁵²

Conclusion

As with diagnosis of shoulder injuries, the evidence for management of soft tissue shoulder injuries is limited and largely determined by the collective experience and expertise of practitioners in the field.

References

- Luime JJ, Koes BW, Hendrikson LJM, Burdorf A, Verhagen AP, Miedema HS, et al. Prevalence and incidence of shoulder pain in the general population: A systematic review. *Scand J Rheumatol* 2004;33:73–81.
- Kuijpers T, Van der Windt DA, Van der Heijden GJ, Bouter LM. Systematic review of prognostic cohort studies on shoulder disorders. *Pain* 2004;109:420–431.
- Accident Compensation Corporation, New Zealand Guidelines Group. The diagnosis and management of soft tissue shoulder injuries and related disorders. Wellington: ACC; 2004.
- Green A. Physiotherapy interventions for shoulder pain. *Cochrane Database Syst Rev* 2003(3).
- Green S, Buchbinder R, Glazier R, Forbes A. Interventions for shoulder pain (Cochrane Review). *Cochrane Database Syst Rev* 2003(2).
- Ejnisman B, Carrera EF, Fallopa F, Peccin MS, Cohen M. Interventions for tears of the rotator cuff in adults. *Cochrane Library* 2004(Issue 1).
- Sher JS. Anatomy, biomechanics and pathophysiology of rotator cuff disease. Philadelphia: Lippincott Williams & Wilkins; 1999.
- Khan KM, Cook JL, Taunton JE, Bonar F. Overuse tendinosis: not tendinitis. Part 1: A new paradigm for a difficult clinical problem. *Physician Sports Med* 2000;28(5):31–46.
- Fukuda H. The management of partial-thickness tears of the rotator cuff. *J Bone Joint Surg—Series B* 2003;85(1):3–11.
- Matsen FA, Arntz CT, Lippitt S. *Rotator Cuff*. 2nd ed. WB Saunders Co.; 1998.
- Gerber C. *Massive rotator cuff tears*. Philadelphia: Lippincott Williams and Wilkins; 1999.
- Van der Windt DA, Koes BW, de Jong BA, Bouter LM. Shoulder disorders in general practice: incidence, patient characteristics and management. *Ann Rheum Dis* 1995;54:959–964.
- Arroll B, Goodyear-Smith F. Corticosteroid injections for painful shoulder: a meta-analysis. *Br J Gen Pract* 2005; 55:224–228.
- Buchbinder R, Green S, Youd JM. Corticosteroid injections for shoulder pain. *Cochrane Database Syst Rev* 2003(1):CD004016.
- Ebenbichler GR, Erdogmus CB, Resch KL, Funovics MA, Kainberger F, Barisani G, et al. Ultrasound therapy for calcific tendinitis of the shoulder. [comment]. *N Engl J Med* 1999;340(20):1533–8.
- Gerdesmeyer L, Wagenpfeil S, Haake M, Maier M, Loew M, Wortler K, et al. Extracorporeal shock wave therapy for the treatment of chronic calcifying tendonitis of the rotator cuff: A randomised controlled trial. *JAMA* 2003;290(19):2573–2580.
- Pan P, Chou CL, Chiou HJ, Ma HL, Lee HC, Chan RC. Extracorporeal shock wave therapy for chronic calcific tendinitis of the shoulders: a functional and sonographic study. *Arch Phys Med Rehabil* 2003;84:988–993.
- Cosentino R, De Stefano R, Selvi E, Frati E, manca S, Frediani B, et al. Extracorporeal shock wave therapy for chronic calcific tendinitis of the shoulder: single blind study. *Ann Rheum Dis* 2003;62(3):248–250.
- Loew M, Daecke W, Kusnierczak D, Rahmzadeh M, Ewerbeck V. Shock-wave therapy is effective for chronic calcifying tendinitis of the shoulder. *J Bone Joint Surg—Br* 1999;81(5):863–7.
- Yamaguchi K, Bindra R. *Disorders of the biceps tendon*. Philadelphia: Lippincott Williams and Wilkins; 1999.
- Warner JJ, Answorth AA. Diagnosis and management of subscapularis tendon tears. *Tech Orthop* 1994;9:116–125.
- Dodds SD, Wolfe SW. Injuries to the pectoralis major. *Sports Medicine* 2002;32(14):945–52.
- Harryman DT, Lazarus JM, Rozencaiw R. *The stiff shoulder*. Second Edition ed: WB Saunders Co.; 1998.
- Rizk TE, Christopher RP, Pinals RS, et al. Adhesive capsulitis (frozen shoulder): A new approach to its management. *Arch Phys Med Rehabil* 1983;64(1):29–33.
- Neviasser RJ. Radiologic assessment of the shoulder. *Plain and arthrographic*. *Orthop Clin of North Am* 1987;18(3):343–349.
- Carette S, Moffet H, Tardif J, Bessette L, Morin F, Fremont P, et al. Intraarticular corticosteroids, supervised physiotherapy, or a combination of the two in the treatment of adhesive capsulitis of the shoulder: A placebo-controlled trial. 01 MAR 2003 *Arthritis Rheum* 2003;48(3):829–838.
- Sun KO, Chan KC, Lo SL, Fong DY. Acupuncture for frozen shoulder. *Hong Kong Med J* 2001;7(4):381–91.
- Cole BJ, Warner JJ. *Anatomy, Biomechanics, and pathophysiology of glenohumeral instability*. Philadelphia: Lippincott Williams & Wilkins; 1999.
- Matsen FA, Thomas SC, Rockwood CA, Wirth CJ. *Glenohumeral instability*. WB Saunders Co.; 1998.
- Hayes K, Callanan M, Walton J, Paxinos A, Murrell GAC. *Shoulder instability: Management and rehabilitation*. *J Orthop Sports Phys Ther* 2002;32(10):497–509.
- Liu SH, Mark H. Anterior shoulder instability: Current Review. *Clinical Orthopaedics & Related Research* 1996;323:327–337.
- Parentis MA, Mohr KJ, ElAttrache NS. Disorders of the superior labrum: review and treatment guidelines. *Clin Orthop Relat Res* 2002(400):77–87.
- Rowe CR. Recurrent transient anterior subluxation of the shoulder. *Clin Orthop Relat Res* 1987;223:11–19.

34. Handoll HHG, Almaiyah MA, Rangan A. Surgical versus non-surgical treatment for acute anterior shoulder dislocation. *Cochrane Database Syst Rev* 2004(Issue 1).
35. Rockwood CA, Williams GR, Young DC. Disorders of the acromioclavicular joint. WB Saunders Co.; 1998.
36. Bossart PJ, Jouce SM, Manaster BJ, Packer SM. Lack of efficacy of 'weighted' radiographs in diagnosing acute acromioclavicular separation. *Ann Emerg Med* 1988;17(1):20–24.
37. Wirth MA, Rockwood CA. Disorders of the sternoclavicular joint: Pathophysiology, diagnosis and management. Philadelphia: Lippincott Williams and Wilkins; 1999.
38. Yeh GL, Williams GR, Jr. Conservative management of sternoclavicular injuries. *Orthop Clin North Am* 2000;31(2):189–203.
39. Rockwood CA, Wirth MA. Disorders of the sternoclavicular joint. 2nd ed. WB Saunders Co.; 1999.
40. Szalay EA, Rockwood CA, Jr. Injuries of the shoulder and arm. *Emerg Med Clinics North Am* 1984;2(2):279–94.
41. Green S, Buchbinder R, Hetrick S. Acupuncture for shoulder pain. *Cochrane Database of Syst Rev* 2005; Issue 2.
42. Buchbinder R, Green S, Youd JM, Johnstone RV. Oral steroids for adhesive capsulitis *Cochrane Database Syst Rev* 2006; Issue 4.
43. Handoll HHG, Hanchard NCA, Goodchild L, Feary J. Conservative management following closed reduction of traumatic dislocation of the shoulder *Cochrane Database Syst Rev* 2006; Issue 1.
44. Michener LA, Walsworth MK, Burnet EN. Effectiveness of rehabilitation for patients with subacromial impingement syndrome. A systematic review. *J Hand Ther* 2004;17:152–164.
45. Faber KJ, Kuiper JJ, Burdorf A, Miedema HS, Verhaar J. Treatment of impingement syndrome: a systematic review on the effects on functional limitations and return to work. *J Occup Rehab* 2006;16:7–25.
46. Grant HJ, Arthur A, Pichora DR. Evaluation of interventions for rotator cuff pathology. A systematic review. *J Hand Ther* 2004;17:274–299.
47. Koester MC, Dunn WR, Kuhn JE, Spindler KP. The efficacy of subacromial corticosteroid injection in the treatment of rotator cuff disease. A systematic review. *J Am Acad Orthop Surg* 2007;15:3–11.
48. Ainsworth R, Lewis JS. Exercise therapy of the conservative management of full thickness tears of the rotator cuff. A systematic review. *Br J Sports Med* 2007;41:200–210.
49. Harniman E, Carette S, Kennedy C, Beaton DE. Extracorporeal shock wave therapy for calcific and noncalcific tendinitis of the rotator cuff. A systematic review. *J Hand Ther* 2004;17:132–151.
50. Shah N, Lewis M. Shoulder adhesive capsulitis: systematic review of randomised trials using multiple corticosteroid injections. *British Journal of General Practice* 2007(August):662–667.
51. Gibson K, Growse A, Korda L, Wray E, MacDermid JC. The effectiveness of rehabilitation for nonoperative management of shoulder instability. *J Hand Ther* 2004;17:229–242.
52. Spencer EE. Treatment of Grade III acromioclavicular joint injuries. *Clinical Orthopaedics & Related Research* 2006;455:38–44.
53. Oh LS, Wolf BR, Hall MP, Levy BA, Marx RG. Indications for rotator cuff repair. *Clin Orthop Relat Res* 2006;455:52–63.
54. Itoi E, Hatakeyama Y, Kido T. A new method of immobilization after traumatic anterior dislocation of the shoulder: a preliminary study. *J Shoulder Elbow Surg* 2003;12(5):413–415.

ACKNOWLEDGEMENTS

Funded by the Accident Compensation Corporation New Zealand

COMPETING INTERESTS

None declared.