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Easily Missed?

Acute rotator cuff tears

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This is one of a series of occasional articles highlighting conditions that may be more common than many doctors realise or may be missed at first presentation. The series advisers are Anthony Harnden, professor of primary care, Department of Primary Care Health Sciences, University of Oxford, and Dr Kevin Barraclough, School of Social and Community Medicine, University of Bristol. To suggest a topic for this series, please email us at practice@bmj.com.

Box start

What you need to know

- Shoulder pain with an inability to abduct above 90° after trauma is a red flag for referral for a same day, plain x ray assessment
- Refer the following patients urgently to a specialist clinic for consideration of ultrasound or magnetic resonance imaging:
 - Patients unable to abduct the arm above 90° more than two weeks after a shoulder injury

- Any patient aged >40 years after dislocation of the glenohumeral joint

- Offer patients with a confirmed acute rotator cuff tear urgent referral to a specialist surgeon to discuss potential surgical repair

Box end

A 45 year old woman falls on ice and injures her shoulder. Assessment at her local hospital reveals bruising only and no bony injury on plain radiographs. Despite ongoing reassurance and participation in a physiotherapy programme for three months, she continues to complain of pain, weakness, and inability to raise her arm. Eventually she is referred to a specialist shoulder clinic, where an ultrasound scan confirms she has suffered an acute full thickness tear of her supraspinatus tendon.

The above patient example highlights a commonly seen problem in the NHS. This article is directed to all clinicians but especially emergency department clinicians, trauma clinic clinicians and general practitioners that see such patients. This article is aimed at raising awareness and the correct management of this commonly missed diagnosis.

What is an acute rotator cuff tear?

The rotator cuff comprises four important muscles (supraspinatus, infraspinatus, teres minor, and subscapularis) which attach close to the humeral head via tendons and are critically involved in stability and function of the shoulder. A rotator cuff tear is when one or more of these tendons tears or detaches from the humerus (fig 1). These tears can vary in size and be acute or chronic. Chronic tears are due to tendon degeneration and attrition, and these patients are not always referred to hospital unless they are having substantial problems. However, acute tears are different and are a result of either a significant direct or indirect injury to the shoulder and the patient requires urgent referral for a surgical opinion.

Fig 1 Diagram of a full thickness tear of the supraspinatus and subscapularis tendons. Extension of the tear and further retraction of the torn ends occurs over time

How common is it?

The estimated incidence of acute full thickness cuff tear is reported at 2.5 per 10 000 patients aged 40-75 years.¹ In studies of patients with “red flag” features (see below) for an acute cuff tear after an injury, with normal radiographs and no pre-existing shoulder problems:

- Of 104 patients aged 19-75 years, 60 had some degree of cuff tear on ultrasound assessment within six weeks of injury, including 33 with a full thickness tear.²
- Of 259 patients aged 18-75 years, 60 had full thickness acute rotator cuff tears, including 15% with involvement of subscapularis.¹

Acute cuff tear after shoulder dislocation is particularly common in older patients. Two studies have identified high rates of acute cuff tears in these patients: 47 (54%) of 87 patients aged 40-87 years,³ and 33 (49%) of 67 patients aged 60-89 years.⁴

Why is it missed?

The importance of early diagnosis and treatment of acute traumatic rotator cuff tears is easily overlooked at presentation because many clinicians focus on excluding dislocations and bony injuries and not tendon ruptures. A clinician's index of suspicion is often further lowered if apparently adequate emergency treatment has taken place elsewhere. The injury is commonly missed after a dislocated shoulder has been reduced in an emergency department and post-reduction radiographs seem normal. Two related studies have shown that pain limits the assessment for specific clinical features of a rotator cuff tear, and clinical examination alone will underdiagnose full thickness rotator cuff tears unless they are very large, and so ultrasound or magnetic resonance imaging (MRI) are needed to fully assess.^{2,12} In a prospective series of 104 patients with soft tissue injuries assessed with ultrasound imaging, a third had a full thickness cuff tear.² This patient group will typically receive no formal follow-up in most regions of the UK, and so those who fail to improve inevitably present much later to general practice when successful treatment options are limited. A recent service evaluation of 30 patients from a large NHS hospital found that the subsequent mean delay from routine referral to treatment was an additional 115 days.¹³

Why does this matter?

Patients with symptomatic rotator cuff tears typically have pain and weakness that can have profound, cascading effects on sleep, work, leisure, and psychosocial functioning, including depression and anxiety.⁵ Patients with longstanding rotator cuff tears recruited to a UK based randomised controlled trial had a mean Oxford Shoulder Score of approximately 26 (0 is equivalent to severe pain and poor function, and 48 is equivalent to normal shoulder function) and a mean EuroQol-5D scale of approximately 0.5 (0 is equivalent to death, 1 is equivalent to perfect health).¹⁴ Early diagnosis of acute tears is essential to facilitate prompt surgical treatment and the improved outcome scores and satisfaction seen after early surgical repair.³ In a study of younger patients aged 26-49 years with acute cuff tears, 95% of patients returned to their usual occupation after rotator cuff repair.⁶ Surgical repair of acute rotator cuff tears results in a significant improvement in pain and function. A 2013 systematic review of 15 studies that included a total of 371 patients undergoing surgery after injury

demonstrated improved outcome scores with an earlier time to surgery.⁷ While the included studies were predominantly small case series and high level evidence in this area is limited, surgical repair is difficult if it is delayed and often impossible if acute tears are ignored for many months or years. Patients are then left unable to raise their arm above shoulder height and are at risk of developing joint arthritis problems at a younger age.

How is it diagnosed?

Clinical

The following key clinical features constitute “red flags” for a possible acute rotator cuff tear⁸:

- Recent trauma
- Pain from the shoulder and/or lateral aspect of the arm
- Inability to raise arm in abduction above shoulder level, especially if not limited by pain.

The presence of these features together mandates urgent assessment and plain radiography to exclude a fracture. If the problems still persist two weeks after injury, the patient should be referred urgently to an appropriate fracture clinic or shoulder clinic with ready access to soft tissue imaging.

While a thorough clinical assessment and documentation of power in the individual rotator cuff muscles is desirable, there are many clinical tests for shoulder problems described in the literature and the clinical utility of each in isolation is limited.⁹ As a minimum, the function of the axillary nerve should be checked by testing sensation over the “regimental badge patch,” and the patient should be checked for any additional associated injuries, particularly of the cervical spine and the affected limb.

Investigations

Plain radiographs of the glenohumeral joint in two planes should be performed on the day of presentation for patients with “red flag” features. The radiographs should identify significant fractures, avulsions, or dislocations which may require immediate treatment.

Those patients with persistent symptoms at two weeks post-injury may be offered an ultrasound scan or MRI to assess for a torn rotator cuff through a specialist shoulder clinic. Because of the high incidence of rotator cuff tear after glenohumeral dislocation in patients aged over 40 years, this group should routinely undergo either urgent ultrasound scanning or MRI to comply with best practice national guidelines produced by the British Elbow and Shoulder Society and British Orthopaedic Association.⁸ The imaging modality chosen may depend on local availability: MRI and ultrasound are both reliable tests for assessing full

thickness tears, with sensitivities of 98% and 91% respectively and specificities of 79% and 85%.¹⁰

Differential diagnosis

Alternative explanations for a presentation of pain and limited function following shoulder injury include:

- Occult or missed fracture
- Persistent or recurrent glenohumeral subluxation/dislocation
- Acromioclavicular joint injury
- Referred pain from cervical spine injury/radiculopathy
- Brachial plexus injury

How is it managed?

Shared treatment decisions should be made between patient and the treating shoulder surgeon. Early surgical repair will probably be recommended to patients with full thickness acute tears causing significant pain or disability. In patients with lesser symptoms, only a partial thickness tear or individuals not suited to surgical intervention, a course of conservative management may be recommended, including the use of adequate analgesia, activity modification, structured exercise and/or a course of physiotherapy.¹¹

Box start

Education into practice

- Are you aware of the relevant guidelines for patients presenting with shoulder injury (such as national best practice guidelines for patients with subacromial shoulder pain¹¹ and traumatic anterior shoulder dislocation⁸)?
- Are you aware of referral pathways to access orthopaedic services for patients presenting with shoulder injury in your local area? When might you consider referral?
- How might you agree on a management plan with your patient that includes the importance of two weeks as threshold for re-evaluation and onward referral?

Box end

Box start

How patients were involved in the creation of this article

One of our recent patients with an acute traumatic rotator cuff tear has reviewed the article for concept, relevance, content, and style.

Box end

Contributors: RC performed the literature search and planned, drafted, and revised the manuscript. TH revised the draft manuscript. JLR devised the article concept, planned and revised the draft manuscript, and is guarantor. All authors agreed the final manuscript.

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- <jrn>1 Aagaard KE, Abu-Zidan F, Lunsjo K. High incidence of acute full-thickness rotator cuff tears. *Acta Orthop* 2015;86:558-62. [PubMed](#)
[doi:10.3109/17453674.2015.1022433](https://doi.org/10.3109/17453674.2015.1022433)</jrn>
- <jrn>2 Sørensen AKB, Bak K, Krarup AL, et al. Acute rotator cuff tear: do we miss the early diagnosis? A prospective study showing a high incidence of rotator cuff tears after shoulder trauma. *J Shoulder Elbow Surg* 2007;16:174-80. [PubMed](#)
[doi:10.1016/j.jse.2006.06.010](https://doi.org/10.1016/j.jse.2006.06.010)</jrn>
- <jrn>3 Simank H-G, Dauer G, Schneider S, Loew M. Incidence of rotator cuff tears in shoulder dislocations and results of therapy in older patients. *Arch Orthop Trauma Surg* 2006;126:235-40. [PubMed](#) [doi:10.1007/s00402-005-0034-0](https://doi.org/10.1007/s00402-005-0034-0)</jrn>
- <jrn>4 Shin S-J, Yun Y-H, Kim DJ, Yoo JD. Treatment of traumatic anterior shoulder dislocation in patients older than 60 years. *Am J Sports Med* 2012;40:822-7. [PubMed](#)
[doi:10.1177/0363546511434522](https://doi.org/10.1177/0363546511434522)</jrn>
- <jrn>5 Minns Lowe CJ, Moser J, Barker K. Living with a symptomatic rotator cuff tear ‘bad days, bad nights’: a qualitative study. *BMC Musculoskelet Disord* 2014;15:228. [PubMed](#)
[doi:10.1186/1471-2474-15-228](https://doi.org/10.1186/1471-2474-15-228)</jrn>
- <jrn>6 Lin Y-P, Huang T-F, Hung S-C, Ma H-L, Liu C-L. Rotator cuff tears in patients younger than 50 years of age. *Acta Orthop Belg* 2012;78:592-6. [PubMed](#)</jrn>
- <jrn>7 Mukovozov I, Byun S, Farrokhyar F, Wong I. Time to surgery in acute rotator cufftear: A systematic review. *Bone Joint Res* 2013;2:122-8. [PubMed](#) [doi:10.1302/2046-3758.27.2000164](https://doi.org/10.1302/2046-3758.27.2000164)</jrn>
- <jrn>8 Brownson P, Donaldson O, Fox M, et al. BESS/BOA Patient Care Pathways: Traumatic anterior shoulder instability. *Shoulder Elbow* 2015;7:214-26. [PubMed](#)
[doi:10.1177/1758573215585656](https://doi.org/10.1177/1758573215585656)</jrn>
- <jrn>9 Gismervik SØ, Drogset JO, Granviken F, Rø M, Leivseth G. Physical examination tests of the shoulder: a systematic review and meta-analysis of diagnostic test performance. *BMC Musculoskelet Disord* 2017;18:41. [PubMed](#) [doi:10.1186/s12891-017-1400-0](https://doi.org/10.1186/s12891-017-1400-0)</jrn>
- <jrn>10 Lenza M, Buchbinder R, Takwoingi Y, Johnston RV, Hanchard NC, Faloppa F. Magnetic resonance imaging, magnetic resonance arthrography and ultrasonography for assessing rotator cuff tears in people with shoulder pain for whom surgery is being considered. *Cochrane Database Syst Rev* 2013;(9):CD009020. [PubMed](#)</jrn>
- <jrn>11 Kulkarni R, Gibson J, Brownson P, et al. Subacromial shoulder pain. *Shoulder Elbow* 2015;7:135-43. [PubMed](#) [doi:10.1177/1758573215576456](https://doi.org/10.1177/1758573215576456)</jrn>
- <jrn>12 Bak K, Sørensen AKB, Jørgensen U, et al. The value of clinical tests in acute full-thickness tears of the supraspinatus tendon: does a subacromial lidocaine injection help in the clinical diagnosis? A prospective study. *Arthroscopy* 2010;26:734-42. [PubMed](#)
[doi:10.1016/j.arthro.2009.11.005](https://doi.org/10.1016/j.arthro.2009.11.005)</jrn>

13. Bateman M, Davies-Jones G, Tambe A, Clark DI. Implementation of a Shoulder Soft Tissue Injury Triage Service in a UK NHS Teaching Hospital Improves Time to Surgery for Acute Rotator Cuff Tears. *BMJ Qual Improv Reports*. 2016 Jun 6;5(1):u211254.w4531.
14. Carr AJ, Cooper CD, Campbell MK, Rees JL, Moser J, Beard DJ, et al. Clinical effectiveness and cost-effectiveness of open and arthroscopic rotator cuff repair [the

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UK Rotator Cuff Surgery (UKUFF) randomised trial]. Health Technol Assess (Rockv). 2015 Oct;19(80):1–218.