

Sonographic diagnosis of rotator cuff tears in anterior shoulder dislocation

以超聲波診斷前肩關節脫臼的旋轉套撕裂

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A 61-year-old gentleman fell from a tree about two meters high and suffered from a right shoulder injury. The physical examination showed tenderness with marked decrease in range of movement over the right shoulder. X-ray of the right shoulder showed anterior dislocation. Closed reduction under sedation was performed. After reduction, ultrasound was done and showed a full-thickness supraspinatus tear. He was referred to the orthopaedic department urgently and an arthroscopic rotator cuff repair was done subsequently. (*Hong Kong j.emerg.med.* 2008;15:143-147)

一名 61 歲男士從大約兩米高的樹上墮下而右肩受傷。身體檢查顯示右肩有觸痛及活動幅度顯著下降。右肩 X 光顯示前脫臼。鎮靜下進行閉合式復位。復位後，超聲波顯示岡上肌全層撕裂。他被緊急轉介至骨科部門，其後以關節鏡修補旋轉套。

Keywords: Shoulder joint, supraspinatus, tendon injuries, tendons, ultrasonography

關鍵詞：肩關節、岡上肌、腱受傷、腱、超聲波造影術

Case

A 61-year-old gentleman fell from a tree about two meters high and suffered from a right shoulder injury. He was a heavy manual worker, and he had one episode of right shoulder dislocation 40 years ago in China that was managed non-operatively. He attended a local accident and emergency department (AED). The physical examination showed tenderness with marked decrease in range of movement of the right shoulder. There was no neurological deficit demonstrable over the right upper limb. X-ray of the right shoulder showed anterior dislocation. Closed reduction under

sedation was performed, and the shoulder was reduced successfully. Post-reduction X-ray showed normal alignment. Ultrasound was then performed using a linear probe at 10 MHz frequency (GE Logiq 5). Full-thickness tear of the supraspinatus was identified (Figures 1 & 2). He was subsequently referred to the orthopaedic department for an urgent appointment.

The patient was seen by an orthopaedic surgeon nine days after the injury. The physical examination was compatible with a rotator cuff tear. Magnetic resonance imaging (MRI) and magnetic resonance arthrogram (MRA) of the right shoulder were done at 40 days and 58 days after the injury respectively. MRI right shoulder (Figure 3) showed a full-thickness supraspinatus tear without retraction or significant muscle atrophy. MRA (Figure 4) showed communication between the subacromial-subdeltoid bursa with the glenohumeral joint that was possible only in the presence of full-thickness rotator cuff tear. Arthroscopic rotator cuff repair was done 69 days after the injury. The intra-operative

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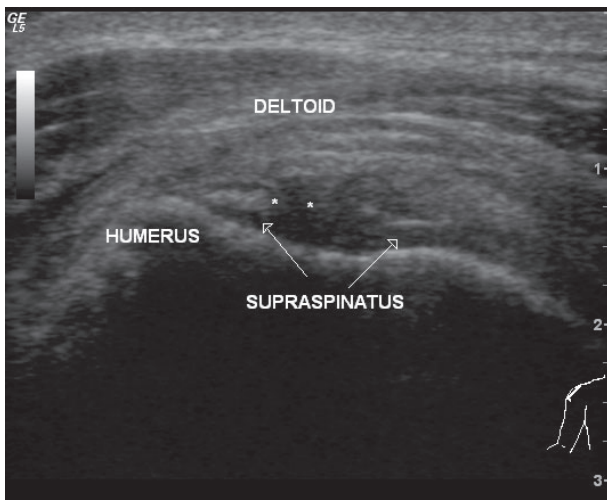


Figure 1. Longitudinal scan of the supraspinatus.

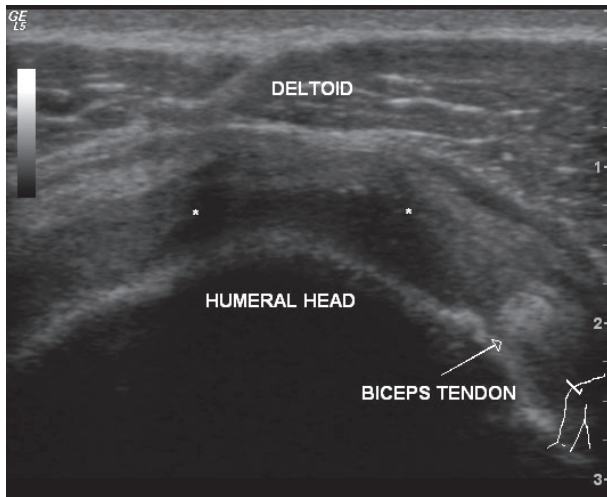


Figure 2. Transverse scan of the supraspinatus.



Figure 3. MRI (T₁W) right shoulder showing supraspinatus tendinopathy.

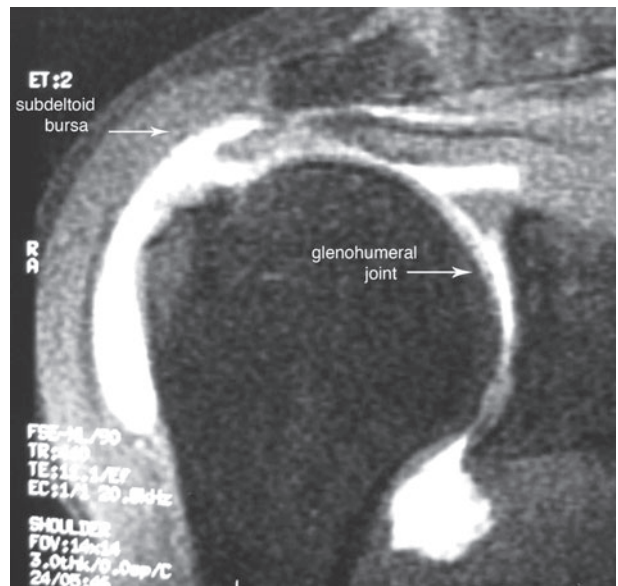


Figure 4. MR arthrogram showing abnormal communication between subdeltoid bursa and glenohumeral joint.

findings showed full-thickness supraspinatus tear with Hill-Sachs lesion, and the anterior labrum was intact. Post-operatively the patient enjoyed good recovery with minimal decrease in cuff power, mild residual shoulder pain and satisfactory range of movement.

Discussion

In younger patients, the main problem after shoulder dislocation is stability because the static restraints (labrum) are more likely to fail, resulting in recurrent dislocation. In older patients, the main problem is not the stability but the inferior functional outcome, which is often caused by the failure of dynamic stabilisers (rotator cuff injuries) leading to shoulder pain and weakness.¹ The inability to abduct after shoulder dislocation points to a rotator cuff rupture or brachial plexus palsy or both.² Neviaser stated that shoulder weakness after primary dislocation in the older age group is much more likely to be attributable to cuff tear than to axillary or other nerve injury.³

The association of a rotator cuff tear and dislocation in the older population is well documented. Ribbans et al⁴ reported a 63% cuff tear in primary traumatic shoulder dislocation in patients older than 50 years,

and Hawkins and Mohtadi⁵ reported a 90% cuff tear in a similar patient population. Pevny reported a 35% rotator cuff tear in primary traumatic shoulder dislocation secondary to athletic trauma at a major ski resort in patients older than 40 years.⁶ He also found an association of rotator cuff tear in all patients with nerve injury. This combination suggested a more violent mechanism resulting in significant soft tissue damage, and he believed that a rotator cuff tear should always be suspected when axillary nerve or brachial plexus palsy was recognised.

The incidence of pre-existing degenerative rotator cuff tears increases with increasing age. The prevalence of partial- or full-thickness tears increases markedly after 50 years of age. In the examination of asymptomatic shoulders by ultrasound, Milgrom et al found a 5-11% prevalence of cuff tear in the fourth and fifth decades of life.⁷ The prevalence reached 50% in the seventh decade and 80% in the ninth and tenth decades of life. All the cuff tears in the earlier decades were partial tears, but after the fifth decade 55% were full-thickness tears. As a result, treatment of cuff tear after shoulder dislocation should be based on clinical findings but not on the results of imaging alone.

Ultrasound is a useful investigation tool for the detection of rotator cuff tear especially in the setting of an AED. High resolution (≥ 7.5 MHz) linear array transducer should be used for shoulder examination

because of their optimal near-field spatial resolution. It is readily available in most AEDs, portable, quick, much more cost-effective when compared with MRI, and easily tolerated by patients. It is not subjected to motion artefacts, and comparison with the contralateral side can be done instantaneously. The real time capability of ultrasound facilitates interventional procedures and allows better interaction with the patient who can point out the symptomatic area that will optimise the diagnostic yield.

Ultrasound offers the opportunity to perform dynamic studies in internal and external rotation with enhanced visualisation of the tendons during motion. It may be helpful in discriminating between partial and full-thickness rotator cuff tears, in detecting subtle partial rotator cuff tears by looking for separation of the margins of a tear, or to overcome anisotropy artifacts.⁸ In the rotator cuff tendons, the fibrocartilaginous attachments and interdigitation of tendon and muscle fibres at the musculotendinous junctions result in non-pathologic inhomogenities.⁹ To avoid misdiagnosis because of anisotropy, the transducer should be moved slowly to and fro over and perpendicular to the rotator cuff and biceps tendon. Compression with the transducer should be varied. Increasing the pressure may facilitate the detection of partial-thickness tears of the rotator cuff. However, pressure should be eased so as not to miss fluid collections in the biceps tendon sheath (Figures 5 & 6) and the subacromial-subdeltoid bursa.

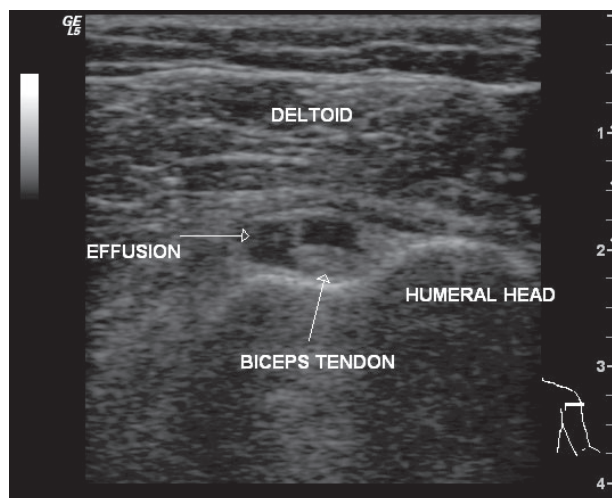


Figure 5. Transverse scan of biceps tendon sheath with fluid collection.

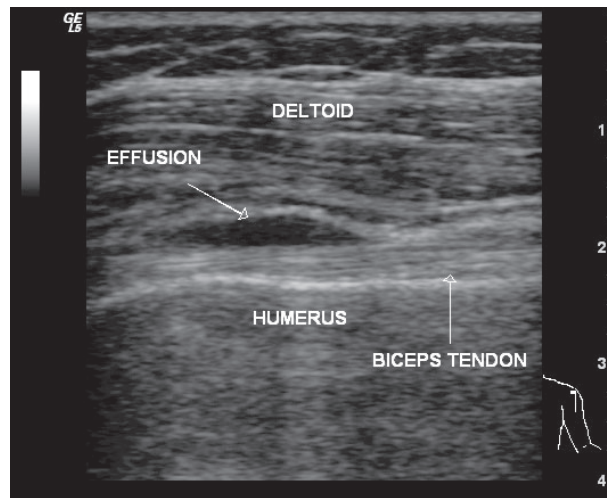


Figure 6. Longitudinal scan of biceps tendon sheath with fluid collection.

Farin and Jaroma performed preoperative ultrasound within three weeks of trauma in 184 patients.¹⁰ The sensitivity in the detection of tears was 89% and the specificity was 93%. Besides, they found that a hypoechoic focus within the defect was found to indicate a fresh tear in most cases. The defect separated the ends of the ruptured tendons and was found at surgery to be a haematoma. This fluid distension seemed to preserve the peritendinous convexity in contrast to what is seen in chronic lesions. Hyperechoic abnormalities of the rotator cuff or nonvisualisation was associated with the chronic phase of rotator cuff tear. Teefey found the presence of a midsubstance tear or fluid in the joint or bursa suggested an acute tear, whereas the presence of a nonvisualised cuff or absence of joint or bursal fluid suggested a chronic tear.¹¹

In a study comparing ultrasound with MRI in painful shoulders, it showed that ultrasound visualised biceps tendon ruptures equally well as the MRI. MRI was better in the detection of full-thickness tear of the supraspinatus tendon and joint inflammation, whereas ultrasound showed the internal architecture of tendon fibres (degeneration and partial-thickness tear) better.^{12,13} MRI provided excellent soft-tissue detail and has multiplanar capability, but interpretation of intra-substance lesions remained problematic.¹⁴ If the rotator cuff defect was filled with bursa or debris instead of fluid, it may lead to false negative MRI results.¹⁵ In another study done by Iannotti et al, it showed no significant difference between MRI and ultrasound with regard to the correct identification of a full-thickness tear or its size, reflecting the improvement in the quality of the ultrasound equipment and the protocol for the evaluation of the shoulder. Errors in ultrasound diagnosis were often attributed to the inability to distinguish between partial and full-thickness tears that were approximately 1 cm in size, which did not significantly affect the planned surgical approach.¹⁶

Conclusion

Ultrasound is useful in the diagnosis of rotator cuff tears, but the accuracy is heavily dependent on the

experience of the operator. In the past, rotator cuff tear is rarely diagnosed in the AED. Emergency medicine is a very suitable specialty for the development of musculoskeletal ultrasound because we encounter a lot of acute and chronic musculoskeletal problems. With the help of ultrasound, we can diagnose a lot of problems that we are unable to diagnose in the past like muscle or tendon tears, and radiolucent foreign bodies. More training should be provided in musculoskeletal ultrasound because on one hand it is highly accurate and cost-effective, but on the other hand it is highly operator dependent for correct interpretation.

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