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CASE STUDY

Shoulder instability: A myriad of decisions for optimal emergency department care

Martin Duignan MSc, BSc, H.Dip ((Emergency Nursing), Cert Nurse Medicinal Prescribing Post: Registered Advanced Nurse Practitioner (Emergency)) *

Emergency Department, Our Lady's Hospital, Navan, Co. Meath, Ireland

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1. Initial patient presentation

A 25 year old patient self-presented to the Emergency Department (ED) having sustained a right shoulder injury. Due to his distress at reception, he was streamed directly to the Registered Advanced Nurse Practitioner (RANP) on duty in the ambulatory care area (ACA) within the ED. He was pale and trembling and reported reaching for a newspaper off the back seat of his car and feeling his right shoulder "come out of place". He denied any falls, sporting injuries or recent trauma. On arrival he was supporting the affected arm in an externally rotated abducted position.

2. Relevant history

This patient's previous relevant medical history included three previous dislocations to the same shoulder (first at age 17 years), with surgery following his second dislocation to "stabilise his shoulder". All of his previous dislocations had occurred while playing football or rugby and he was concerned at presentation that this injury would interrupt his football season.

3. Relevant physical examination findings

Systems review ruled out head, neck, abdominal, spinal, chest, or pelvic injuries and other distracting injury. The patient was alert and orientated to person, place and time. Clothing was carefully removed to adequately expose both shoulders, and he was placed on an examination couch in a semirecumbent position. Physical examination revealed a squaring of the right shoulder vs. the contralateral shoulder that represented an abnormally prominent acromium, with an anterior bulge inferior to the clavicle that was suspected to be the displaced humeral head in a sub-coracoid position. Palpation revealed tenderness over the lateral shoulder with an empty subacromial space.

A systematic approach to sensory and motor examination of the shoulder girdle was paramount to ensure that neurological deficits were recognised prior to attempted relocation (see Table 1; Whitaker and Borley, 2010; McFarland et al., 2012; Robinson et al., 2012; Horn and Ufberg 2014; King and Wright 2014; Zdravkovic 2015). Nerve injuries remain underreported (Scully et al., 2013), with between 13.5% and 50% of all patients with an anterior shoulder dislocation reported to demonstrate a neurological deficit associated with the dislocation (Robinson et al., 2012; Visser et al., 1999; Webb, 1999). Most frequently involved is the axillary nerve (Robinson et al., 2012). This patient was experiencing some parasthesia over the regimental patch on initial assessment. Evaluation of the musculocutaneous, suprascapular, radial, ulnar and median nerves was unremarkable.

Both active and passive range of movement (ROM) was reduced in all planes due to pain and the obvious deformity.

4. Case progression and discussion

As the patient's self-reported pain scale was 9/10, analgesia was immediately prescribed: Dexketoprofen trometoprofen 50 mgs IV and patient controlled entonox (nitrous oxide 50% and oxygen 50%) were both administered. Dexketoprofen Trometamol is a non-steroidal anti-inflammatory drug available in Europe and Latin America, which is diluted in 100 ml normal saline and infused intravenously over 10–30 minutes in the acute symptomatic period.

Patient consent was obtained, and the RANP ensured that the patient had received adequate analgesia. A decision was made not to attempt reduction without first requesting pre-reduction images. This was despite the likelihood of a fracture being extremely unlikely due to the atraumatic mechanism of dislocation, and the clinical presentation which was characteristic of an anteroinferior dislocation. There is however little definitive guidance in the literature to guide the decision-making process around the requirement

* Emergency Department, Our Lady's Hospital, Navan, Co. Meath, Ireland. Tel.: +0035346-9078729; fax: +0035346-9074917.
E-mail address: martin.duignan@hse.ie.

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Table 1
Peripheral nerve assessment.

Nerve	Test site of sensory distribution	Method of assessment of motor distribution
Axillary nerve	"Regimental Patch" over the lateral arm	Patient is requested to statically abduct their arm (against examiner's resistance) while the examiner feels for deltoid contraction
Musculocutaneous nerve	On the skin over the radial artery at the wrist (where it terminates as the lateral cutaneous nerve)	Motor function can be assessed by resisted concentric action of biceps
Suprascapular	No sensory distribution	Patient is requested to externally rotate their arm. The examiner resists the external rotation with one hand, while the other hand feels for contraction of infraspinatus
Radial nerve	Over the proximal proximal thumb and thumb web space (autonomous area)	The examiner attempts to push the patient's extended wrist into a flexed position against the patient's resistance
Ulnar nerve	On the skin over the volar pulp little finger (autonomous area)	The patient is asked to first turn hand prone and spread fingers apart to a maximal distance. Then, ask the patient to resist your attempts to squeeze the fingers together.
Median nerve	On the skin over the volar pulp index finger (autonomous area)	Ask the patient to touch the distal tip of the thumb to the distal tip of the little finger and maintain it. The examiner attempts to pull the two fingers apart and ask patient to resist.

for pre-reduction x-rays in patients with glenohumeral dislocation. In their recent paper Dala-Ali et al. (2014) advocate requesting pre-reduction x-rays to confirm the diagnosis and reveal any associated fractures. Conversely the Quebec Shoulder Dislocation Rule (Fig. 1)

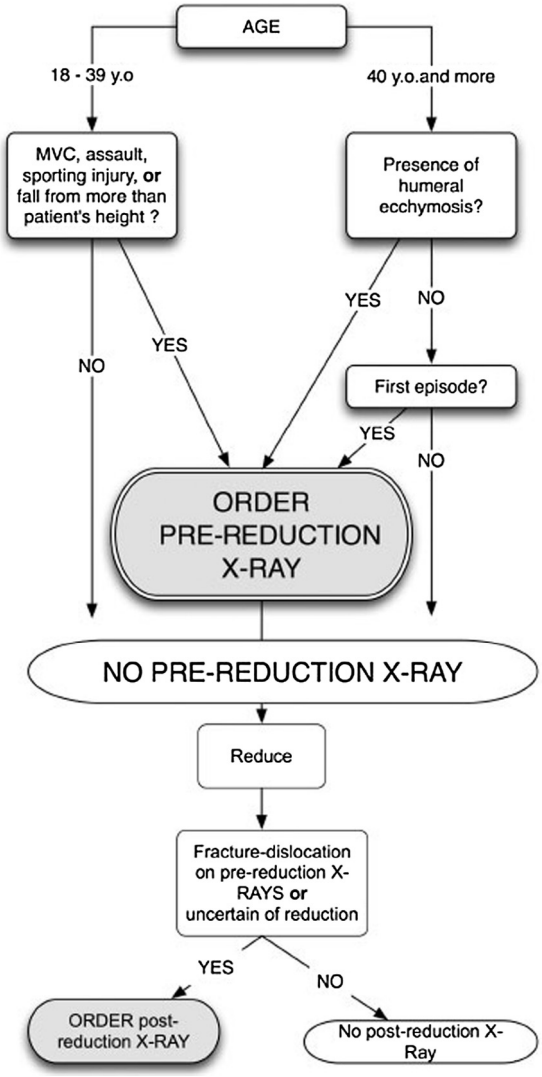

Fig. 1. Quebec Shoulder Dislocation Rule. The Quebec Shoulder Dislocation Rule was previously published in the Canadian Journal of Emergency Medicine, 11 (1): 36–43 and has been republished with the kind permission of the Canadian Association of Emergency Physicians.

assists clinicians in the selective use of radiography for patients with shoulder dislocation (Emond et al., 2009). This rule has not been clinically validated for use in the ED. While the initial study reported that the Quebec rule had a sensitivity of 100% (Emond et al., 2009), subsequent validation attempts (Ong et al., 2011), which included all types of shoulder dislocations, suggested a sensitivity closer to 42%. Caution is indicated when using this rule.

Multiple methods for reduction of shoulder dislocation have been described (Cunningham, 2005), however it has been suggested that the optimal technique should be quick, effective, simple to perform and should require minimal force, analgesia and assistance (Dala-Ali et al., 2014).

The Cunningham Technique (Cunningham, 2003) which is a leverage procedure and uses a combination of positioning and specific massage of the biceps at the mid-humeral level was employed in this patient's care (Fig. 2). It allowed the humeral head to reduce resulting in the return of the characteristic roundness of the shoulder and an immediate decrease in the patient's pain intensity. Although this method has been shown to meet the criteria outlined

Fig. 2. Starting position for Cunningham Technique.

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by Dala-Ali et al. (2014), a case series of 3 patients who underwent reduction of their anterior shoulder dislocation using the Cunningham technique by Walsh et al. (2012) illustrated that significantly more discomfort can occur during the procedure than outlined in the original paper by Cunningham.

5. Post-reduction case progression

Repeat peripheral nerve assessment (as described in Table 1) following reduction revealed resolution of the "tingling" at the regimental patch, with unremarkable examination of the remaining peripheral nerves. Distal pulses remained symmetrical with the contralateral side.

Post reduction x-rays (Figs. 3 and 4) were requested in this case due to the absence of a validated clinical decision rule. A prospective observational study by Kahn and Mehta (2007) examined whether post-reduction radiographs add clinically important information to what is seen on pre-reduction radiographs in patients with anterior shoulder dislocations who are seen in the ED. The authors found that, even though the majority (62.5%) of fractures were seen on pre-reduction radiographs, more than one third (37.5%) were only visible on post-reduction films. None of the missed fractures changed ED management, and no persistent dislocations were found on post-reduction films. In this case repeat imaging revealed a satisfactory post reduction position, with surgical anchors evident from previous Bankart repair. A small Hill–Sachs lesion was evident.

The RANP considered placing this patient in an external rotation brace as described and advocated by Itoi et al. (2003) and Heidari et al. (2014); however there is ongoing debate as to the best approach to immobilisation post glenohumeral dislocation. Randomised controlled trials by Liavaag et al. (2011) and Whelan et al. (2014) have demonstrated no reduction in reoccurrence rates by managing the patient in an external rotation brace vs. the more traditional approach of internal rotation. In support of this view a recent systematic review by Vavken et al. (2014) concludes that current evidence does not support the effectiveness of immobilisation in external rotation compared with internal rotation. The patient was therefore managed in the more conventional internal rotation position using a simple shoulder immobiliser (Polysling™).

Fig. 3. Shoulder post reduction AP view.

Fig. 4. Shoulder post reduction scapular "Y" view.

Another clinical challenge is the lack of consensus in the literature regarding the duration of sling use, with some commentators asserting that there is no benefit in immobilising the shoulder for longer than one week (Paterson et al., 2010) while Scheibel et al. (2009) suggest immobilisation in external rotation for between 3 and 5 weeks, and Whelan et al. (2014) advocating 4 weeks of immobilisation. Elsewhere Murrell (2003) suggests that there are no benefits to immobilising the shoulder in a sling (especially if the injury is to be managed non-operatively) and that it may be preferable not to immobilise the shoulder at all. In this case the patient was advised to wear the sling until reviewed in the orthopaedic trauma clinic.

6. Teaching points

Recurrent glenohumeral instability is common especially in those patients whose initial dislocation occurred at a young age. The repeated capsular stretch and damage to the active and passive stabilisers are associated with persistent anterior instability. The management of acute shoulder instability by RANPs requires both comprehensive anatomical and biomechanical knowledge and adept clinical skills. Adequate assessment of potential concomitant pathology (especially peripheral nerve involvement) is necessary both prior and following GH relocation.

Although rare, the clinician should be cognisant that axillary artery injuries have been reported to occur with anterior, inferior, and intrathoracic dislocations. Especially susceptible are older adults with atherosclerotic axillary arteries. Clinically, a decreased radial pulse may alert the RANP to the possibility of arterial injury (Maweja et al., 2002). Ipsilateral chest wall ecchymosis with associated axillary hematoma and bruit may also be noted on physical examination. Angiography and prompt surgical repair should be considered with any axillary artery or brachial plexus injury (Mwipatayi et al., 2005).

Due to the high incidence of recurrent instability in the young patient cohort with conservative therapy, repair of inferior labral

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defects (i.e. Bankart lesions) is becoming widespread (Micheo and Ramos, 2015). For recurrent instability after a Bankart repair a latarjet procedure (which involves transfer of the coracoid with its attached muscles over the front of the glenoid) may be considered to provide a triple effect of 1. increasing the glenoid surface area, 2. creating a sling with the conjoint tendon which reinforces the inferior subscapularis and anteroinferior capsule, and 3. capsular repair.

A Hill–Sachs lesion is a compression fracture to the posterolateral humeral head, which is usually caused by recurrent glenohumeral dislocations. The incidence of these lesions approaches 100% in those patients with recurrent anterior shoulder instability (Provencher et al., 2012), and they can contribute to ongoing instability.

This condition is increasingly being managed by nurses in advanced practice roles (Smith, 2011; Summers, 2007), hence shoulder instability is an important concept for the RANP to understand to ensure optimal outcomes for patients. Management of this cohort by RANPs can result in optimal patient care in terms of timely assessment and management, and in identifying treatment pathways. There are also organisational benefits as patients may be managed in lower acuity areas, and have shorter stays in the ED due to non-utilisation of anaesthetic drugs.

7. Case outcome

Following successful relocation of the GH joint, this patient was discharged home with a referral to the outpatient orthopaedic trauma clinic within 72 hours. Discharge advice included regular analgesia, icing, and safe positioning options for sleeping, showering and dressing to avoid re-injury. ROM within pain parameters was permitted, with advice to return to the ED in the interim if there were any concerns.

In the months following this ED presentation, this patient experienced a further two glenohumeral dislocations, and was subsequently scheduled by his orthopaedic team for a Latarjet stabilisation procedure of his shoulder. At the time of writing the patient is six months post a latarjet procedure, and has had no re-occurrence of glenohumeral dislocation.

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