Missed posterior fracture-dislocation of the humeral head following an electrocution injury to the arm

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ABSTRACT

Posterior dislocation of the shoulder is a rare and commonly missed injury. While prompt diagnosis and treatment is important to prevent untoward sequelae, it is often diagnosed and treated too late. The first reported case of a posterior fracture-dislocation of the humeral head following a domestic electrocution accident in Singapore is described in a 52-year-old man. The injury was missed by several doctors before a humeral head replacement was done. The diagnostic pitfalls and management of this injury and ways to avoid a missed or delayed diagnosis are discussed.

Keywords: electrocution accident, fracture-dislocation, missed dislocation, posterior shoulder dislocation

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INTRODUCTION

Posterior shoulder dislocation is an uncommon and frequently missed injury[1-4]. It may be an isolated injury or may be associated with concomitant fractures of the proximal humerus. Mechanisms of injury include a traumatic event with axial loading of the adducted, internally rotated arm or more commonly, from violent muscle contraction following an epileptic seizure or an electrocution injury to the arm[5-8]. Prompt diagnosis and reduction of a posterior shoulder dislocation is important to prevent osteonecrosis of the humeral head. However, in view of its rarity and diagnostic difficulty, it is often diagnosed and treated late. The first reported case of a posterior fracture-dislocation of the humeral head following a domestic electrocution accident in Singapore is described. A delayed diagnosis was made after the injury was missed by several doctors. The fracture-dislocation was treated with a prosthetic replacement of the humeral head.

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CASE REPORT

A 52-year-old man was getting out of his bathroom and without drying himself, attempted to disconnect the electric cord off an electric kettle using his right hand while the cord was still plugged into a switched-on 240 volts wall socket. He sustained an electric shock injury up his right arm. He developed immediate severe right shoulder pain following the incident and was not able to move his arm. He was right-hand dominant and worked as a bus driver.

He consulted a general practitioner on the same day who advised him that he had a "shocked arm" which would recover with time. He did not improve over the next three days and being increasingly worried, decided to seek a second opinion with the polyclinic. He was similarly reassured by the polyclinic doctor and was sent home with a week of medical leave. His shoulder remained painful over

Fig. 1 AP radiograph shows an obvious lesser tuberosity fracture. Closer scrutiny also shows fractures of the greater tuberosity and anatomical head. No obvious dislocation is visible. An obvious lesser tuberosity fracture should alert one to the possibility of a posterior dislocation.

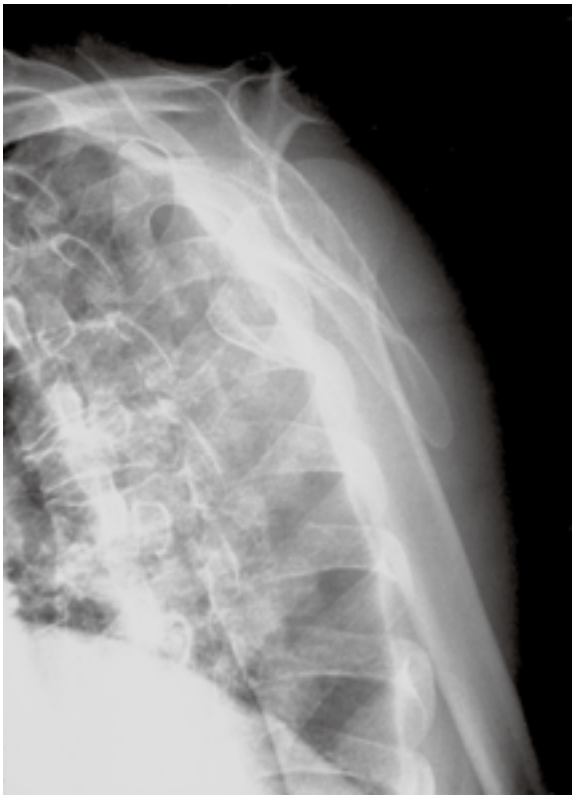

Fig. 2 Lateral scapular radiograph shows the humeral head overlapping with the confluence of the scapula. No obvious dislocation is visible on this projection.

Fig. 4 Post-operative radiograph shows a humeral head replacement. The patient's pain and range of motion improved following the surgery.

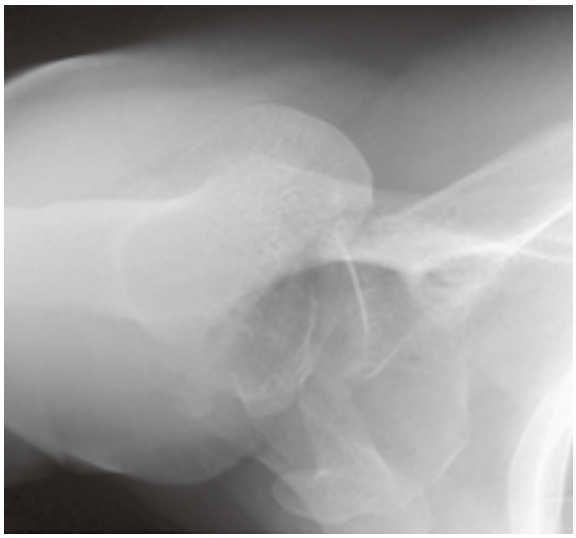

Fig. 3 Axillary radiograph shows a posteriorly-displaced anatomical head behind the glenoid.

the next one week and he was still unable to move his arm much. Unable to tolerate his symptoms, he then decided to visit the Accident and Emergency Department at the Singapore General Hospital.

Anteroposterior and lateral scapular radiographs of his right shoulder were done (Figs. 1 & 2). A diagnosis of a minimally-displaced lesser tuberosity fracture was made by the attending doctor. The patient was then treated with an arm sling and sent home with an outpatient orthopaedic appointment. No obvious shoulder dislocation was seen on these radiographs. He was seen by the orthopaedic medical officer three days later and was reassured that in view of only slight displacement, the fracture did not require surgical intervention and he was told to continue with the arm sling. The patient returned for a scheduled review at the orthopaedic clinic a week later and reported no alleviation in his symptoms. At this juncture, three weeks had passed since he sustained the electric shock. Examination revealed an internal rotation contracture, with zero degree of external rotation. Forward elevation was about 60 degrees and internal rotation was up to the level of the greater trochanter. There were no associated neurovascular injuries.

In view of the history of an electrocution injury, the physical examination of an internal rotation contracture and the presence of an obvious lesser tuberosity fracture on the anteroposterior radiograph, the suspicion of a posterior shoulder dislocation was raised. An axillary radiograph of the right shoulder was performed which revealed a posterior fracture-dislocation of the humeral head (Fig. 3). The patient was admitted to the ward and underwent surgery the next morning. Intra-operatively, a posterior fracture-dislocation of the humeral head was confirmed, with

the anatomical head locked behind the glenoid. The presence of associated lesser and greater tuberosity fractures were noted. The anatomical head was found to be devoid of soft tissue attachment. It was retrieved using a bone lever and with anteriorly-directed pressure behind the shoulder. The completely devascularised head was then replaced with a humeral head prosthesis (Fig. 4).

Post-operatively, the patient was started on pendular exercises. He reported an immediate reduction of right shoulder pain and improvement in shoulder motion following the surgery. Passive elevation was started at two weeks, followed by active range of motion and strengthening exercises at six weeks. At three months post-surgery, his right shoulder was noted to have range of motion of 130 degrees of forward flexion, 50 degrees of external rotation and internal rotation to the 10th thoracic vertebra, compared with 160 degrees of forward flexion, 60 degrees of external rotation and internal rotation to the the 7th thoracic vertebra on the left shoulder. He has since returned to his job as a bus driver.

DISCUSSION

Posterior shoulder dislocation with or without associated fractures is a rare and frequently missed diagnosis[1-4]. It is frequently missed in view of its rarity, as well as the paucity of obvious physical signs and often inadequate radiographs[1,3,9,10]. Suspicion should be raised when a patient reports shoulder pain and inability to move his shoulder following either an epileptic seizure or an electrocution injury to the arm, or following axial loading on an adducted, internally rotated arm[5-8]. The posterior dislocation that occurs following a seizure or an electrocution injury is explained by the activation of the powerful internal rotators of the shoulder as well as by the resting position of arm with a posteriorly-oriented humeral head when the event occurs.

Physical signs may be subtle and must be actively sought for including looking for an internal rotation contracture with the shoulder having zero degree of external rotation. This occurs because the posteriorly-dislocated humeral head gets locked behind the glenoid. Other signs that may be present include a prominent coracoid process, flattening of the anterior aspect of the shoulder, and prominence over the back of the shoulder. A main reason for a missed diagnosis of a posterior shoulder dislocation is the failure to do adequate radiographs, including the axillary radiograph, which often is the only view that shows a posterior shoulder dislocation[1,3,9,10]. It should therefore be mandatory that all patients with shoulder injuries have a complete set of radiographs taken, namely the anteroposterior, lateral scapular and axillary radiographs[10,11]. In our patient, the anteroposterior radiograph showed an obvious lesser tuberosity fracture. This injury is often associated with a posterior dislocation which must always be excluded in such circumstances.

Reduction of dislocation must be carried out as soon as possible to minimise the vascular insult to the humeral head which may lead to osteonecrosis and subsequent collapse of the humeral head. With an acute isolated dislocation without fractures, closed reduction is done with longitudinal and lateral traction on the arm to disimpact the humeral head. In chronic dislocations, it may be necessary to first stretch the posterior capsule by maximally internally rotating the arm. Care should be taken not to externally rotate the arm before reduction is achieved. With the humeral head locked behind the glenoid, forced external rotation may result in a humeral head or shaft fracture. If the chronic dislocation has not resulted in much pain or functional disability, it may be left alone and surgery may not be indicated. When associated with fractures, open reduction may be required.

The treatment of such fracture-dislocations depend on several factors, namely: the severity of associated fractures, presence of impacted humeral head fractures, the vascularity of the humeral head fragment, the delay in diagnosis, and the age of the patient. In our patient, the injury resulted in a fracture-dislocation of the anatomical head. Some authors have advocated routine prosthetic replacement of the humeral head in such cases, particularly if there has been a delay in treatment[10,12]. Others have advocated internal fixation of the fracture, particularly in young patients, and have shown good results in this group of patients even when the dislocated head was devoid of soft tissue attachments[13-15]. Prosthetic replacement is generally ill-advised in young patients in view of their higher activity level and longer expected lifespan with a probable need for revision prosthetic replacement. At the time of surgery, the dislocated humeral head is usually delivered either by a bone lever, an anteriorly directed force applied just behind the glenoid or through a posterior incision. In our patient, the humeral head was delivered with ease using the first two means and was found to be devoid of soft tissue attachment. He was treated with a humeral head replacement in view of a devascularised humeral head, his age, fracture severity and a delay in treatment.

In conclusion, a high index of suspicion is required to diagnose a posterior shoulder dislocation, particularly if the patient gives a history of shoulder

pain and decreased shoulder motion following an epileptic seizure or an electrocution injury. A proper physical examination and a complete set of radiographs, including the axillary view, should follow and the incidence of a missed or delayed diagnosis would then be minimised.

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