CASE REPORT

Missed bilateral radial head fractures in central cord syndrome

Rajinder Singh¹ · Bhajneek Grewal² · Siddeshwar Patil ¹

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Abstract

Introduction In 2012, 22 new major trauma centres were introduced in England. This followed evidence demonstrating that such units saved lives and reduced serious disability. Traumatic central cord syndrome is an example of spinal injury seen in major trauma centres. This condition occurs most frequently as a result of hyperextension to the neck in the presence of spondylosis or degenerative changes. These patients may suffer additional injuries during the initial trauma which may be missed, either due to lack of clinically apparent symptoms or due to the masking of symptoms as a result of neurological compromise.

Case presentation We describe a case of a 56-year-old gentleman who sustained a traumatic central cord syndrome following a fall down a flight of stairs whilst disembarking an aeroplane. Following transfer from the major trauma centre to the regional spinal injuries centre it was discovered that he had bilateral radial head fractures which had been missed on the initial primary and secondary surveys.

Discussion Radial head fractures are a significant injury in the context of traumatic central cord syndrome due to the potential impact on functional recovery and rehabilitation. The tertiary survey has been proposed as a method to detect subclinical injuries in trauma cases. This case highlights the importance of conducting the tertiary survey to avoid missing important subclinical injuries.

Introduction

The introduction of 22 new major trauma centres in England followed evidence that demonstrated such units saved lives and reduced serious disability [1]. Traumatic spinal cord injury is one of the many presentations occurring in major trauma centres. Traumatic central cord syndrome is a common cord-related injury occurring as a result of hyperextension of the cervical spine [2]. Neurological injury occurs as a result of osteophyte-related cord impingement or buckling of the ligamentum flavum [3]. Traumatic central cord syndrome frequently presents with a symmetrical incomplete tetraplegia associated with bladder and bowel dysfunction as well as varying sensory impairments [4]. Consequently, rehabilitation focuses on optimisation of limb function, with particular emphasis on the preservation of

hand function in order to promote ongoing independence. It is therefore important to consider upper limb fractures during the tertiary survey, once the patient has been stabilised from other life-threatening injuries.

Radial head fractures are relatively common injuries, accounting for 4% of all fractures [5]. However, isolated radial head fractures are much rarer, comprising around 2% of fractures occurring around the elbow [6]. Furthermore, only a few case reports of bilateral radial head fractures have been reported [7, 8]. Missed traumatic injuries can significantly contribute to the morbidity of the initial injury. Morbidity can be especially significant in the context of traumatic central cord syndrome [9].

Herein, the authors report a case of missed bilateral radial head fractures in a patient with traumatic central cord syndrome.

Case presentation

A 56-year-old gentleman presented to the emergency department following a fall down eight steps whilst disembarking from an aeroplane. He had no recollection of the event but immediately reported the inability to move all four

✉ Rajinder Singh
Rajinder.singh10@nhs.net

¹ Yorkshire Regional Spinal Injuries Centre, Pinderfields General Hospital, Wakefield, UK

² Leeds Teaching Hospitals NHS Trust, Leeds, UK

Fig. 1 Axial and sagittal MRI highlighting calcified posterior longitudinal ligament with impingement. Axial and sagittal MRI demonstrates a calcified posterior longitudinal ligament from C2 to C6 with impingement of C3, C4 and C6.

limbs. An MRI spine (Fig. 1) demonstrated a calcified posterior longitudinal ligament from C2 to C6 with impingement of C3, C4 and C6. He was diagnosed with central cord syndrome and managed conservatively with an aspen collar.

Six days after his admission he was transferred to the Yorkshire Regional Spinal Injuries Centre (YRSIC) for ongoing rehabilitation. Peripheral neurological assessment at the centre confirmed an incomplete paraplegia (AIS-D) with a neurological level of C3.

A day following his transfer to the YRSIC it was noted that he had pain in his left elbow on flexion. A radiograph (Fig. 2) was requested which confirmed a mildly depressed fracture of the lateral aspect of the left radial head. Four days following this it was noted that the patient had right forearm pain. Subsequent radiograph (Fig. 2) confirmed a minimally displaced, intra-articular fracture through the radial head and neck.

Given that both fractures were Mason type I they were managed conservatively with analgesia followed by elbow mobilisation and physical therapy [10, 11].

The patient was eventually discharged home after a stay of 89 days at the YRSIC. He was seen 8 weeks following discharge where he remained AIS-D with a neurological level of C3. Significantly there was an increase in motor recovery percentage in the upper limbs.

Discussion

The incidence of missed injuries in patients with major trauma is reported to be between 1 and 40% in the literature, with 15–22% of these missed injuries being clinically significant [12]. These can be classified as injuries missed in primary, secondary and tertiary surveys. Tertiary survey has been proposed as a possible method of detecting subclinical injuries [13, 14]. However, whilst it is generally accepted

Fig. 2 Anteroposterior and lateral radiographs of both elbows demonstrate bilateral radial head fracture.

that repeated review and detailed examination of trauma patients is recommended, high quality evidence is lacking for the effect of tertiary surveys on patient outcomes [15, 16].

Patients with spinal cord injury can present with a number of concomitant injuries including thoracic cavity, shoulder girdle, upper extremity, lower extremity, upper-extremity vascular, lower-vertebral spine, pelvis, hips and a visceral injury [17]. However, the detection of fractures may be impeded by loss of sensation and motor function secondary to cervical spinal cord injury. Additionally, palpation alone cannot be relied upon as soft tissue and muscle bulk in these areas may mask injury. Head injury associated with cervical trauma may be missed if signs are subtle. Clinicians should consider cognitive screening to detect dual diagnoses of traumatic brain injury with spinal cord injury [18].

Patients with central cord syndrome typically present with motor and varying degrees of sensory impairments which are more apparent in the upper limbs than lower limbs [19]. This can theoretically increase the likelihood of a concurrent injury being missed, as sensory deficits associated with traumatic central cord syndrome can mask the presence of pain, as in this case. Rehabilitation focuses on maintaining and optimising residual limb function, whilst monitoring for and capitalising on any spontaneous neurological improvement that may occur. Maintenance of upper limb function is integral to a patient's ability to transfer, bed mobility and positioning, pressure relief, wheelchair propulsion, perineal hygiene and elimination, eating, drinking, and dressing.

Most commonly, the radial head is fractured through a traumatic injury such as a fall. The patient typically attempts to stop the fall by stretching the hand out. The subsequent axial load through the forearm results in the radial head compacting against the humeral capitellum, resulting in radial head fracture [20, 21]. Patients present with pain on active rotational movement of the forearm, and this can be confirmed on examination of passive movement [22]. Swelling and crepitus may also be present [23]. Fracture of the radial head can range in severity from minimally displaced to fractures associated with elbow dislocation [24, 25]. Undisplaced or minimally displaced radial head fractures can be managed conservatively with early mobilisation with good outcomes being reported in the literature [25, 26]. In severe cases, surgical correction ranges from open reduction and internal fixation to radial head replacement [25]. As such, this is a significant injury which has the potential to drastically alter function if left untreated. Complications can occur with or without treatment, and include stiffness, osteonecrosis, instability and malunion.

Missing radial head fractures in such patients has the potential to significantly hinder rehabilitation and therefore the achievement of rehabilitation goals, especially if therapy is continued in the presence of subclinical fractures. Problems with hand function have significant implications for patients with central cord syndrome. Optimal hand function

is essential to promote ongoing independence with common cord complications such as bladder and bowel dysfunction. Reduction in hand function has been associated with poorer quality of life in these patients [27].

To our knowledge this is the first case report of bilateral radial head fractures associated with traumatic central cord syndrome which has been missed at a major trauma centre. Whilst a limitation of this report is the solitary case, we can speculate that such missed injuries do occur and add to existing disability. Further research in this area is recommended. Fortunately, in this case the patient's bilateral radial head fractures were detected early during his rehabilitation due to the thorough clinical assessment conducted at the regional spinal injury centre.

One local challenge for these patients is that the YRSIC is situated in a different geographical location to the closest major trauma centre. Had the centres been combined, this injury may have been detected even earlier through prompt involvement of the spinal injuries rehabilitation team in the acute phase.

In summary, this case highlights the importance of thorough clinical assessment and examination in the context of trauma-induced central cord syndrome and provides supportive evidence for tertiary surveys in this patient cohort. In patients with a high-risk injury and compromised symptom awareness, it is important to consider bilateral radiographs to screen for subclinical fractures.

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Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

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