CASE REPORT

Seizure induced polytrauma; not just posterior dislocation of the shoulder

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SUMMARY

A 61-year-old woman sustained multiple fractures secondary to the tonic clonic muscular contractions of a seizure. Her injuries included: bilateral proximal humerus posterior fracture dislocations, manubrium fracture, unstable sixth thoracic vertebrae crush fracture, bilateral acetabular fractures and a left femoral neck fracture. Seizures are a rare but recognised cause of fracture. Patients with osteoporosis are more susceptible to more serious fractures to long bones, spine and pelvis. The lack of history of high-energy trauma can lead to a delay in diagnosis. Rarely, the combination and magnitude of these injuries can be life-threatening.

BACKGROUND

- It is important to recognise seizure as a potential cause of multiple fractures
- The lack of a typical history of high-energy trauma can lead to a delay in diagnosis of potentially life-threatening injuries^{1 2}
- Patients with osteoporosis are at high risk for multiple fractures

CASE PRESENTATION

A 61-year-old woman was found on the floor of her living room by her son. Seizures were witnessed by the son and, later, by paramedics, who administered antiepileptic medications. Following the cessation of seizure activity, the patient, in significant pain and unable to mobilise, was taken to the emergency department. When more alert, she reported bilateral shoulder and hip pain. On examination, she reported pain on movement, in all four limbs, which were neurovascularly intact. History and examination findings prompted plain radiographic imaging to be performed.

The patient's medical history included excess alcohol consumption but no history of epilepsy. She lived alone in a single storey flat; at the time of presentation, she was a smoker and typically smoked 20 roll up cigarettes/day.

INVESTIGATIONS

A plain film anteroposterior (AP) chest radiograph revealed bilateral proximal humerus posterior fracture dislocations (figure 1) and an AP pelvic radiograph demonstrated bilateral acetabular fractures with a left intracapsular femoral neck fracture (figure 2). The findings of plain film radiographic imaging prompted further investigation. The extent of the patient's injuries were not fully recognised until a CT of the chest, abdomen and pelvis was performed (figures 3–5).

Figure 1 Plain erect anteroposterior chest radiograph: showing bilateral proximal humerus fracture dislocations.

The CT reported the following injuries:

- Bilateral comminuted proximal humerus posterior fracture dislocations (figure 3);
- Minimally displaced fracture of the manubrium (figures 4 and 5);
- Sixth thoracic vertebrae crush fracture involving the anterior and posterior columns with retro-pulsion into the spinal canal (figures 4 and 5);
- Compression fracture of the fifth lumbar vertebrae;
- Bilateral acetabular fractures with central dislocation; right anterior column fracture, left anterior column posterior hemitransverse;
- Intrapelvic haematoma;
- Left intracapsular femoral neck fracture.

Figure 2 Plain anteroposterior pelvis radiograph: showing bilateral central hip fracture dislocations and a left intracapsular fractured neck of femur.

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Figure 3 Chest CT axial slice: bilateral comminuted impacted proximal humerus posterior fracture dislocations.

Subsequent MRI of the spine reported:

- ▶ Two-column injury at T6 with significant loss of height and bony protrusion into the canal;
- ▶ Compression fracture involving the superior end plate of L5.

TREATMENT

Multiple operations were undertaken at two centres, including:

- ▶ Right acetabulum anterior column fracture open reduction and internal fixation (figure 6);
- ▶ Left acetabulum fracture/intracapsular fractured neck of femur complex primary total hip replacement (figure 6);
- ▶ Posterior stabilisation of sixth thoracic vertebrae with fixation of the fourth to eighth thoracic vertebrae (figure 7);
- ▶ Left proximal humerus fracture open reduction and internal fixation (figure 8)
- ▶ Right shoulder hemiarthroplasty (figure 9).

The patient's manubrial fracture and lumbar vertebrae fracture were managed non-operatively.

The patient's inpatient stay was complicated by a lower respiratory tract infection requiring non-invasive positive pressure ventilation and admission to the intensive care unit. Following a 43-day inpatient stay she was discharged home.

Figure 4 Chest CT sagittal slice: sixth thoracic vertebrae crush fracture involving the anterior and posterior columns with retropulsion into the spinal canal, and a fractured manubrium.

Figure 5 Chest CT axial slice: sixth thoracic vertebrae crush fracture with retropulsion into the spinal canal and a fractured manubrium.

OUTCOME AND FOLLOW-UP

The patient has returned to independent living and can climb stairs without assistance.

DISCUSSION

Seizures are a rare but recognised cause of fracture.³ Up to 3% of patients with epilepsy are injured by epileptic seizures.^{3 4} The aetiology of fractures secondary to seizures can be divided into direct or indirect.

- ▶ *Direct* result from the action of powerful tonic clonic muscle contractions overcoming the strength of bone.
- ▶ *Indirect* occur as a result of trauma. This can be further subdivided into:
 - A. Fractures sustained as a result of loss of voluntary motor function while performing activities (eg, driving, cycling or a fall from standing height);
 - B. Fractures sustained from a flailing limb striking a solid object.

Fractures secondary to seizure vary in location. Common fractures secondary to seizure include: proximal humerus, femoral neck, spinal, facial bone, distal radius and ankle fractures.³⁻⁵

Direct fractures, or 'non-traumatic fractures', are terms that have been used to describe fractures caused by seizure, electric

Figure 6 Postoperative plain anteroposterior pelvis radiograph: showing complex primary left total hip replacement with impaction bone autograft and fixation of right acetabulum.

Figure 7 Erect anteroposterior chest radiograph: spinal fixation and bilateral proximal humerus posterior fracture dislocations before surgical management.

convulsive therapy or electric shock resulting from powerful tonic clonic contractions overcoming the strength of bone. This occurs most commonly in the proximal upper and lower limbs, and thorax, where multiple large muscle groups contract en masse. Fractures of facial bones and the distal limb bones, as a result of seizure, are more likely to be caused by indirect trauma rather than muscle contractions overcoming the strength of bone.

Posterior shoulder fracture dislocations and vertebral fractures are a recognised complication of seizure. Shoulder fracture dislocations typically result from the combined contractions of the powerful adductors and internal rotators of the shoulder. If shoulder dislocation occurs, it tends to be posterior, as the

Figure 8 Left shoulder anteroposterior radiograph: showing fixation of left proximal humerus fracture dislocation and the edge of the spinal fixation construct.

Figure 9 Right shoulder anteroposterior radiograph: right shoulder hemiarthroplasty.

internal rotators and adductors overpower the external rotators. Bilateral posterior fracture dislocation of the shoulders is highly suggestive of seizure-related injuries.^{4 6}

Patterns of spinal fractures also differ in patients who suffer indirect trauma when compared to those whose fractures are secondary to direct muscle contracture. Patients who suffer fractures secondary to trauma sustain fractures of the cervical spine and thoracolumbar junction, whereas direct fractures secondary to seizure are more likely to occur in the upper to mid-thoracic region (T3–T8).^{7–9} This distinctive distribution occurs because compressive forces during contraction of the muscles are concentrated along the anterior and middle columns of the mid-thoracic kyphosis curves.^{7–9} This is in contrast to external trauma, where the mid-thoracic vertebrae are relatively protected from mechanical stresses, unlike the cervical spine and thoracolumbar junction.

Proximal lower limb fractures, either extracapsular or intracapsular fractured neck of femur or acetabular fractures, result from the combined contractions of muscles around the hip: the extensors, abductors, flexors, and internal and external rotators. The net combined force results in compression of the femoral head cranio-medially into the acetabulum.⁹ There are approximately 30 cases of acetabular fractures secondary to ‘non-traumatic seizure’ reported in the literature. Similar to proximal humerus fracture dislocations, when femoral neck or acetabular fractures occur bilaterally, the likelihood of the underlying aetiology being seizure increases.

Osteoporosis is recognised as a factor contributing to the increased risk of fracture in epilepsy.^{10–12} Although our patient had not formally been diagnosed with osteoporosis, multiple risk factors were present, including sex, age, excessive alcohol consumption, tobacco and sedentary lifestyle.¹³ While this patient had no history of epilepsy, it should be noted that antiepileptic medications are known to increase the risk of fracture in epileptic patients through the reduction of bone mineral density.^{14–16}

Learning points

- Muscle contractures secondary to seizure can cause multiple fractures akin to high-energy traumatic injuries.
- The absence of a history of high energy trauma may delay appropriate investigations and treatment of patients with multiple fractures secondary to seizure.
- A history of seizure in patients with osteoporosis can result in multiple fractures.

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Competing interests None declared.

Patient consent Obtained.

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