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# Clinical Communications: Adults

## DIAGNOSING AND MANAGING SPINAL INJURY IN PATIENTS WITH ANKYLOSING SPONDYLITIS

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□ **Abstract—Background: Individuals with ankylosing spondylitis are at an increased risk of vertebral fractures. These are often unstable, leading to primary and secondary neurological injury and conferring high levels of morbidity and mortality. Fractures in these patients can occur after minimal trauma and are easily missed, with potentially disastrous consequences. Objectives: To educate health professionals who may be involved in the initial assessment and management of ankylosing spondylitis patients with possible spinal injuries, despite not being spinal specialists. Case Reports: We present three cases from our own hospital, which illustrate the pitfalls associated with traumatic spinal injury in ankylosing spondylitis. Case 1 shows why delayed presentation of spinal injury is common, as well as demonstrating the need for multiple imaging modalities in some patients. Case 2 is an example of primary neurological injury in this patient group, and case 3 highlights the risk of secondary neurological injury, as well as the effect of multiple comorbidities on patient outcomes. Conclusions: It is important that staff in the Emergency Department have an understanding of the extreme caution that is needed in the management of possible spinal injuries in patients with or suspected of having ankylosing spondylitis.** © **2013 Elsevier Inc.**

□ **Keywords—ankylosing spondylitis; spinal injuries; spinal fractures; medical imaging; complications**

## INTRODUCTION

Ankylosing spondylitis (AS) has a prevalence of 0.1–1.4% (1). It is a chronic inflammatory arthropathy, mainly affecting the axial skeleton. Patients develop enthesitis and synovitis, and over time this leads to the ossification of spinal ligaments and intervertebral discs, resulting in bony ankylosis of the spine. The high number of articulations within a normal spine results in flexibility to permit absorption of forces with minimal damage. Ankylosis effectively transforms the spine into a single long bone with little capacity for transient deformity. Associated vertebral osteoporosis is common, and this, combined with the altered mechanical properties of the spine, means that vertebral fracture is much more common in AS patients than in the general population (1–4). Here we discuss three case reports that illustrate the challenges associated with assessing and managing spinal injury in patients with AS.

## CASE REPORTS

Patient 1 is a 62-year-old man with an existing diagnosis of AS. He presented with a 2-week history of thoracolumbar back pain after tripping. Examination revealed tenderness at the thoracolumbar junction, with no

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neurological deficit. Initial X-ray studies suggested an abnormal appearance of L1–3 vertebrae, but it was not possible to determine whether this was an acute injury or the result of old trauma. Further plain radiographs were taken which showed multiple vertebral wedge compressions of L2 and L3, as well as anterolisthesis of T11 on T12 (Figure 1A). A computed tomography (CT) scan of the spine was performed which demonstrated a displaced and unstable fracture–dislocation of T11/T12 (Figure 1B). The patient underwent posterior instrumented fusion and made a good early recovery. However, a non-union of the fracture means this patient will require further surgery.

Patient 2 is a 70-year-old man. He had no known history of ankylosing spondylitis on admission. He fell on an escalator after a myocardial infarction and had immediate quadriparesis. A CT scan showed oblique fractures of T6–T8 (Figure 2A). There was also a subtle posterior disc osteophyte at the C3/4 disc level that appeared mobile (Figure 2B). CT demonstrated typical features of AS with mature osseous fusion along the anterior and posterior longitudinal ligaments in addition to posterior element fusion. Magnetic resonance imaging (MRI) was also performed. Cord signal remained normal through the thoracic fracture levels, where canal dimensions were preserved (Figure 2C). However, MRI demonstrated spinal cord edema at C3/4 with ongoing thecal compression locally (Figure 2D), indicating that this was the level responsible for the acute neurology. The thoracic fractures were stabilized operatively but the patient had persisting myelopathy relating to C3/4 stenosis. The patient was not keen for further cervical spinal decompression, and was therefore managed conservatively. After extensive rehabilitation, he has regained some power in his limbs and can perform many basic personal activities independently.

Patient 3 is an 80-year-old man who had known AS. He sustained a C4/5 fracture-dislocation after a fall at home. There was no primary neurological injury and he was initially managed in traction. Unfortunately, he went on to develop a lower respiratory tract infection leading to acute confusion. During this episode of delirium he removed his own traction weights, leading to fracture subluxation and tetraplegia (Figure 3A). He is now being managed by immobilization in a halo jacket. During his admission, a CT scan of the whole spine (MRI contraindicated due to cardiac pacemaker) demonstrated an additional T10/11 fracture-dislocation (Figure 3B).


**Figure 1. Sixty-two-year-old male patient presenting 2 weeks after minor trauma (tripping). Cross-table lateral radiograph (A) demonstrates a fracture-dislocation injury through the T11/12 disc space with anterior translation of T11 with respect to T12. Sagittal reformatted CT scan (B) confirms the fracture–dislocation at this level. Extensive bony ankylosis is noted, typical of long-standing ankylosing spondylitis.**

## DISCUSSION

Despite the high incidence of vertebral fractures in patients with ankylosing spondylitis, delayed time to

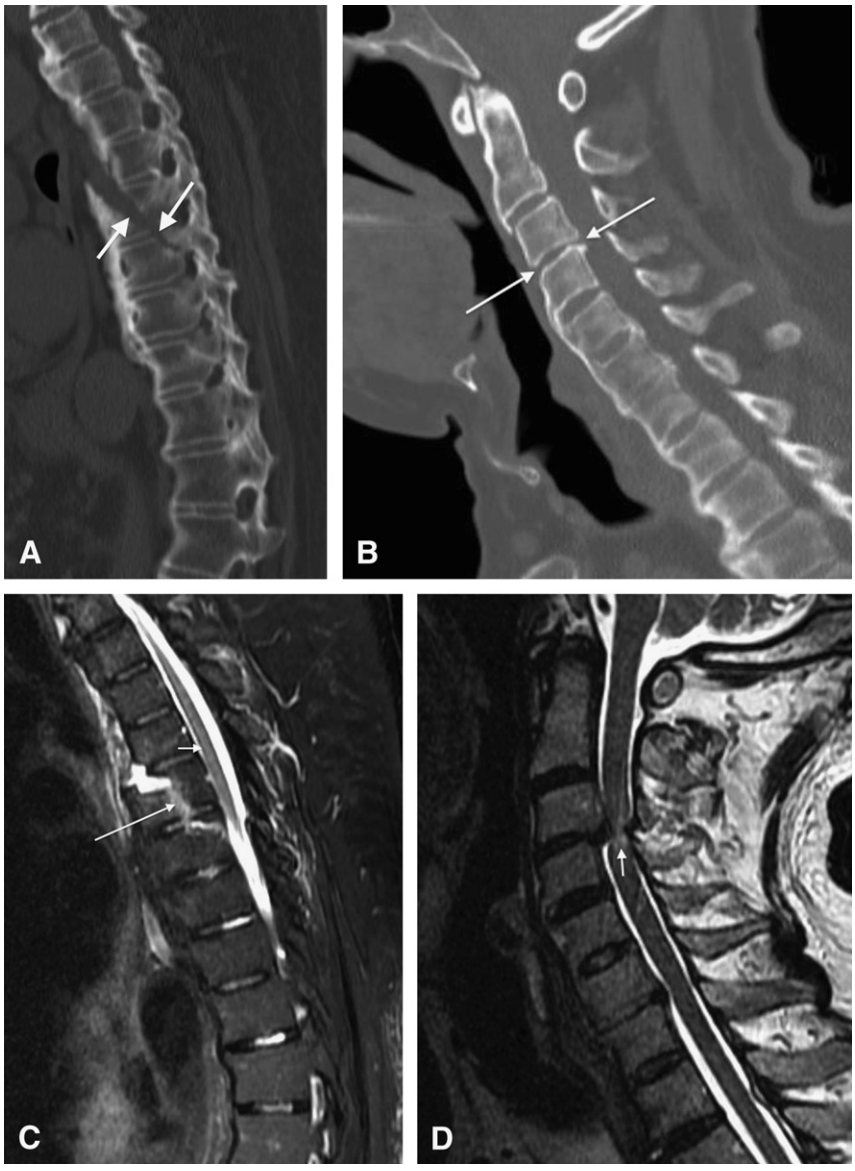


**Figure 2. Seventy-year-old male patient presented with quadriplegia after a fall. Initial computed tomography scan demonstrates an oblique thoracic fracture (arrow) extending through the discs at T6–T8 (A). There is extensive bony ankylosis in keeping with undiagnosed but established ankylosing spondylitis. In the cervical spine, there is fusion through the upper levels and the mid/lower levels but the C3/4 disc appears mobile and there is posterior disc osteophyte locally (arrow) (B). Magnetic resonance image (MRI) of the thoracic area (C) demonstrates the fracture (long white arrow); the cord appears normal in signal locally (short white arrow) and there is no evidence of epidural hematoma or direct compression. Cervical MRI (D) demonstrates disc-based canal stenosis with thecal impression and cord edema (white arrow).**

diagnosis is common (2,5). In some cases, such as in case 1, this is due to the late presentation of the patient. In others it is due to the failure of clinicians to detect a spinal injury (1).

One reason for late presentation to a doctor is that many AS patients suffer from chronic back pain and may not notice the onset of new pain after trauma (1,2). Doctors may also find it difficult to differentiate new symptoms from old when taking a clinical history. Inexperience in dealing with AS may result in the conclusion that a history of minor trauma is incompatible with serious injury, leading to inadequate investigation (6). As demonstrated by patients 1 and 3, vertebral fractures in this patient group often occur after seemingly innocuous mechanisms of injury (2,7,8). In a meta-analysis of vertebral fractures in 345 patients with AS, 65.8% followed low-energy trauma. The majority were caused by a fall from a sitting or standing position (1). It is therefore vital that any history of trauma in such patients be taken seriously and that doctors maintain a very high level of suspicion when assessing them for spinal injuries.

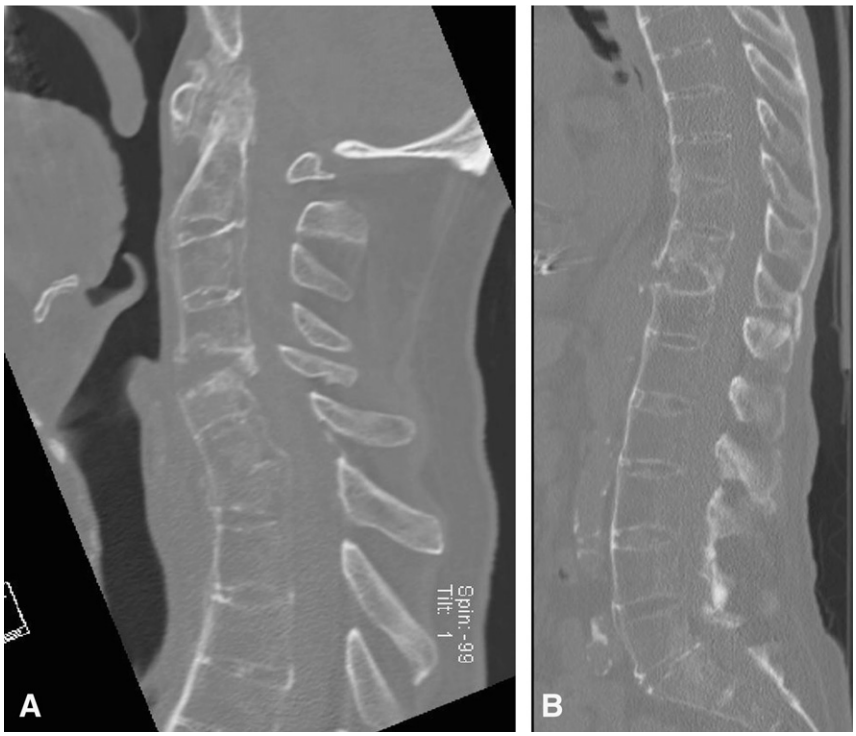


**Figure 3. Eighty-year-old man who fell at home. After removal of traction, computed tomography (CT) scan (A) demonstrates a fracture dislocation injury with significant displacement through the C4/5 disc level. Subsequent CT whole spine [(B) magnetic resonance image contra-indicated due to pacemaker] revealed a second non-contiguous injury level with a further fracture dislocation at T11/12.**

Assessment may be made even more challenging by the fact that imaging is not always reliable (5,6). Plain radiographs of an ankylosed spine are difficult to interpret due to pre-existing osseous abnormalities (1–3). Non-contiguous fractures such as the T10/11 fracture sustained by patient 3 are more common in AS than in the general population, and these are easily missed, particularly when paired with a history or examination that seems inconsistent with multi-level injury (3). Additionally, cervical kyphosis and abnormal shoulder position often give rise to inadequate views of the lower cervical spine (2,4). This is the commonest location for vertebral fractures in those with AS, accounting for around 75% of fractures (2,3). To detect occult fractures it is vital that CT or MRI be performed on patients with possible spinal injuries, even if plain radiographs appear normal. Secondary injuries below the level of neurology are common and should be screened for with whole spine imaging. Case 1 demonstrates the fact that multiple investigations may be required to make a firm diagnosis.

Mortality and morbidity are high after spinal injury in those with AS, with death rates being as high as 35% in cervical fractures (1,2,4,9). Neurological injury is a particular concern. Vertebral fractures in patients with AS are often unstable due to the altered biomechanics of the ankylosed spine and the changes that occur in surrounding soft tissues (1,10). As a result, primary neurological deficits are common. Westerveld et al. reported neurological abnormalities at time of admission in 67.3% of patients in their meta-analysis of AS patients with spinal injuries (1). Patient 2 is an example of such a patient.

There is also a high risk of secondary neurological injury, which is often due to delayed presentation or diagnosis (2,3). Secondary injury can also result from failure to recognize that a patient has AS. Traditional teaching dictates that those with possible spinal injuries are managed in a hard collar until the cervical spine has been fully assessed (11). This is not appropriate for a large number of patients who have a fixed kyphosis of the cervical spine such as in AS. There are reports of such patients sustaining neurological injury or exacerbation of existing deficits as a result of hyperextension in a rigid collar (10,12). Doctors should be vigilant for signs of AS, even when there is no known diagnosis.

Neurological injury is not the only morbidity associated with spinal trauma in AS. AS is a multi-system disease with a wide range of extra-articular manifestations. Patients are often elderly with additional unrelated co-morbidities (2). These factors mean that spinal injuries, which inevitably lead to periods of immobility, long

hospital stays, and often surgery, are likely to precipitate multi-system complications. This may be one reason for the high rate of mortality and morbidity in such patients. Case 3 is a good example of this.

## CONCLUSIONS

Spinal fractures are common in patients with AS and can occur with minimal trauma. They frequently occur in the lower cervical region and are often unstable. As a result, neurological injury is a major risk. Delayed diagnosis can occur due to late patient presentation or failure of doctors to recognize the condition and potential spinal injury. It is important that doctors maintain a high level of suspicion for spinal injury in patients with known AS. Recognition can be challenging, as fractures can occur after little or no trauma, and imaging may be difficult to interpret, as the fracture may frequently be through the intervertebral disc with little or no conventional bony displacement. Incorrect management of these patients puts them at high risk of secondary neurological deficit. Minor trauma or new pain symptoms warrant investigation with CT or MRI, even if plain radiographs appear normal. A rigid collar is not always the most appropriate form of immobilization in patients with AS, and care should be taken to avoid hyperextension in a rigid, kyphotic cervical spine. Non-contiguous injuries are common, and in established fracture the whole spine should be screened with MRI or CT.

The consequences of spinal injury in ankylosing spondylitis can be devastating. It is important that health professionals are alert to the possibility of such injuries, and are aware of the pitfalls that can be associated with their diagnosis and management.

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