

Challenges in the Diagnosis and Treatment of Spinal Injuries in Ankylosing Spondylitis: A Case Review

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Abstract

In patients with ankylosing spondylitis (AS) even a low impact trauma can lead to a significant injury. A case study of an 86-year-old man illustrates the complexity in diagnosis and treatment following a fall that resulted into a thoracic spine fracture. Initial investigations revealed critical injuries, resulting in surgical intervention. The management of such injuries is complicated by high rates of comorbidities and potential postoperative complications, including respiratory failure and cardiac issues. As such, the priority is on the detection of the injury as it may be flawed by the lack of identifying it sufficiently as much as a timely surgical intervention to improve outcomes and reduce mortality rates associated with these conditions. Overall, early recognition and comprehensive management are crucial for enhancing patient survival and quality of life.

Keywords: Ankylosing Spinal Diseases; AO Spine Classification; Ankylosing Spondylitis (AS)

Introduction

Ankylosing spinal diseases have such a high relevance in spinal trauma that they are marked as extra entity in the AO spine Classification ("M2" in the thoracolumbar classification and "M3" in the cervical classification [1,2]. Their characteristic is the reduced segmental mobility, which lead to stress peaks in adjacent segments making the spine more vulnerable to injury. The detection of the injury requires not only a high degree of suspicion but also a stringent approach to exclude an injury with the help of further investigations. In particular, the hyperostosis complicates a safe diagnosis and may delay treatment resulting into an increased mortality. Concomitant neurological injuries are frequent [3]. The treatment of injuries is rather complex and requires considerate planning. Early and precise diagnostics with computed tomography (CT) and magnetic resonance imaging (MRI) as well as a surgical intervention are crucial for the survival and the quality of life of patients [4]. In general, the treatment options consist of surgical intervention as conservative treatment often leads to high complication rates. In postoperative care, cardiopulmonary complications require special attention [5].

The Case

A 86-year-old resident from a nursery home lost balance and fell on his back. He could be mobilised with help into bed. However, the patient complained of pain in his mid back, which made the nurses present the patient on the following day.

The man had a history of an ischaemic heart disease with a heart attack 5 years ago resulting in stenting. Besides, he suffers from a well controlled hypertension. The patient is on Aspirin.

On arrival, the patient was alert and well orientated. His history was consistent. He presented with a slight gibbus deformity in the thoracic spine. There were no marks. Movements were rigid in all planes. He indicated tenderness on palpation of the spinous processes in the mid third of the thoracic spine. The patient did not display any neurological signs.

X-rays showed the following findings

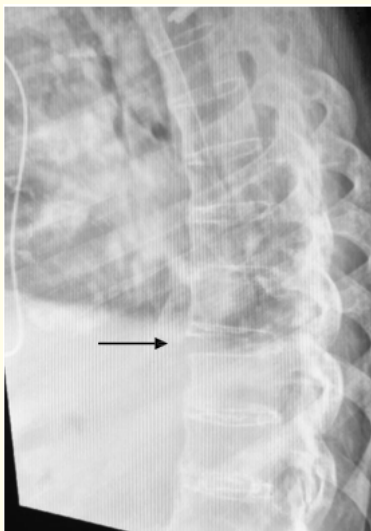


Figure 1: Lateral view of the thoracic spine: Opening intervertebral disc space (arrows).

There was ossification of the anterior longitudinal ligaments. More importantly, the disc space between T8 and T9 showed an anterior diastasis with interruption of the ligament.

CT studies followed and showed the true extent of the injury

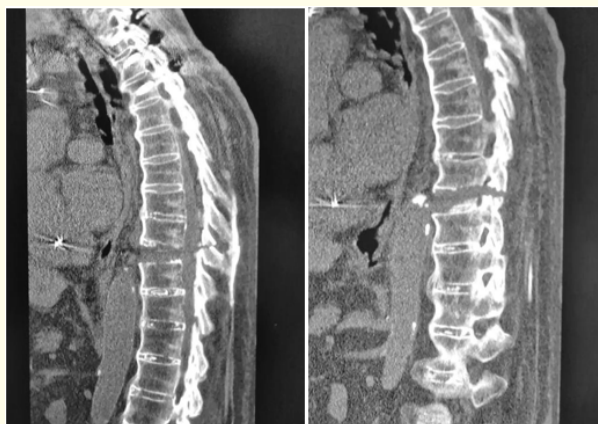


Figure 2: CT thoracic spine: Distraction of T8 and T9 with clear fracture extending through all columns.

There was a distraction type of fracture extending through the intervertebral disc space, the end plate of T8 and through the facet joints. The fracture fulfils the criteria of an instable type B2 (M2) according to the AO classification due to a complete osseoligamentous disruption

The patient was referred to a spinal unit where a stabilisation was conducted. This involved long posterior instrumentation, which is usually recommended for fractures in the upper and middle thoracic spine [6]. There was no documentation of a spinal hematoma. The patient was kept in intensive care unit for 2 days before he could be transferred to the ward from where he was sent to a geriatric rehabilitation.

Discussion

The two main forms of ankylosing spinal diseases are specified as “ankylosing spondylitis” (AS or the synonym: “Bechterew’s disease”) and “diffuse idiopathic skeletal hyperostosis” (DISH or the synonym: Forestier’s disease). Both diseases result into progressive stiffening of the spine.

Ankylosing Spondylitis belongs to the seronegative spondyloarthritides and has a pronounced genetic component. Worldwide, 60 to 90% of patients express a Human Leukocyte Antigen (HLA)-B27 [7]. According to the S3 guideline, the criteria of the Assessment of Spondyloarthritis International Society (“ASAS criteria”), which combine clinical findings with radiological or laboratory findings, are used for diagnosis.

Symptom onset typically falls in the 3rd to 4th decade of life; the worldwide prevalence is estimated at about 0.1-1.4% [8]. The gender ratio m:f prefers the male sex with a ratio of approximately 1.5:1. The leading symptom “back pain” is very unspecific and may be the reason for the latency of 5 to 10 years [9] between the onset of symptoms and the diagnosis.

Common comorbidities are uveitis (approximately 50%), psoriasis (25%) and cardiopulmonary factors: The risk for coronary heart disease is about twice as high as in the general population, and almost 90% of those affected have a pulmonary involvement [10]. Cardiovascular mortality is increased by about 35% [11].

The presence of an ankylosing disease is often not known to patients and is frequently only discovered during an accident-related imaging examination of the spine. AS shows some characteristics that allow for classification based on CT.

AS typically involves the facet joints, which are ankylosed. The picture of a “bamboo spine” results from syndesmophytic formations in the disc spaces. The disc space height can be reduced. Besides, there can be focal sclerosis or erosions known as “shiny corners” or “Romanus lesion” manifesting at the vertebral endplates. Also, the sacroiliac joints can be affected leading either to unilateral or bilateral involvement with erosion of subchondral bone, focal joint space widening, surrounding reactive sclerosis up to ankylosis.

The stiffening of motion segments typically reduces bone density and decreases the spine’s resistance to external forces [12]. It creates long lever arms in the spinal column, making it more susceptible to injury [13]. Patients have a 4 to 5-fold risk of sustaining a spinal fracture [14]. 50 - 90% of injuries result from minor trauma, e.g. falls onto the ground. Simultaneously, there’s a significantly increased risk of falling due to impaired visual axis and neurological dysfunction from spinal canal narrowing. An unstable spinal injury must be suspected in any ankylosed spine until proven otherwise.

Injuries in ankylosing spine affect more often the cervical spine (50 - 80%), particularly the lower segments of C5-C7. The thoracic spine is involved in 15%, the lumbar spine only in 5 - 10%. In about 8 - 55% of cases, multiple segments are injured [14,15].

The ossification of ligamentous structures and, in AS, also of facet joints leads to a high rate of unstable injuries (Type B2, B3, and C according to AO Spine) compared to the predominantly Type A compression injuries in the normal population.

The risk of spinal cord injury on admission is significantly increased to about 19 to 67% with secondary neurological lesions in about 14% of cases, underlining the danger of these injuries [16]. Spinal epidural hematomas are the most common cause of secondary neurological lesions, often extending over many segments.

To make the correct diagnosis remains challenging and can delay the diagnosis at a rate of 17.1% to 65.4% [17-19] which is due to the fact that the initial X-rays may not detect the injury adequately as shown in our case. With the history of trauma, a symptomatic patient requires further imaging in the form of a CT or MRI scan to exclude a relevant injury.

CT scans have a high sensitivity for detecting bony lesions. MRI can be involved to detect obscure lesions of the posterior tension band or epidural hematomas. Epidural hematomas have a high relevance for the therapeutic approach whenever decompression of the spinal canal becomes necessary. The relevance of bone marrow signals, however, needs to be evaluated critically as they are common in ankylosing disease.

Injuries in ankylosing spine almost always require surgical treatment: In the vast majority of cases, the injuries involve a disruption of the anterior and posterior tension band, causing high instability. The classification of injuries follows the AO spine Classification. It differs between compression (Type A), distraction (Type B) and translational injuries (Type C) and includes clinical modifiers, such as “M2” for the presence of ankylosing spondylitis. It reflects the increased risk and altered biomechanics in these patients. The most common type refers to a hyperextension injury with disruption of the anterior tension band, while the posterior aspect of the spine remains intact [20].

Various (retrospective, uncontrolled) studies have demonstrated a significantly increased mortality and a significantly lower rate of neurological improvement with conservative treatment for both AS and DISH, although this may be partly due to selection bias [14,21,22].

The non-union rate in conservative treatment is very high. It is recommended to follow conservative treatment only as a second-line treatment if it is regarded as medically safe [14]. With surgical treatment pseudarthrosis tends towards 0% (Olerud 1996). Due to the long-segment stiffening, significant translational dislocation of the fracture can easily occur, with corresponding damage to the spinal cord with a secondary neurological lesion.

The timing of surgery plays a significant role even in neurologically intact patients: Barkay [23] found in a retrospective study that even in neurologically intact patients, a delay >72h is associated with significantly increased mortality (0% vs. 22.5%) within 6 months.

Since the inflammatory disease increases vascular vulnerability and compromises the coagulation system, significantly increased intraoperative blood loss must be expected: In individual cases, up to 17 litres of blood loss have been reported following spinal surgery of AS patients.

Airway management is significantly complicated by kyphosis, space-occupying ventral osteophytes, and high fracture instability. Techniques such as video laryngoscopy or fiberoptic awake intubation should be considered during surgical preparation [24].

Due to the often extreme kyphosis, especially in the high thoracic region, and the high-grade instability of the injury, patient positioning often presents a great challenge. This can be addressed by using the Mayfield clamp and positioning aids such as pillows and blankets with padding of the kyphotic spine sections.

The high rate of cardiopulmonary comorbidities complicates the immediate postoperative management of patients with ankylosing spine. Overall complication rates of 50 - 90% are described, with the largest proportion being pulmonary complications up to respiratory failure at about 30 - 40% [25,26]. Cardiac decompensation is also common at about 20%. Wound infections are rather rare at about 5 - 10%. These risks result in a 3-month mortality of about 10 - 20%.

Once the immediate perioperative risks are overcome, patients have a good outcome with surgical treatment: Pseudarthrosis occurs almost exclusively with conservative treatment due to the rather excessive new bone formation [27]. Neurological function shows at least an improvement in 20 - 60% of cases [24]. There is surprisingly little data on postoperative quality of life; at least for percutaneous stabilization of thoracolumbar fractures, postoperative quality of life seems to be improved.

Conclusion

Symptomatic patients with a history of trauma and ankylosing spondylitis, even if regarded as minor, require imaging to exclude a relevant injury. Due to the high number of comorbidities and a high mortality rate if the diagnosis is delayed the patients require a stringent pathway to establish the diagnosis as soon as possible in order to achieve a good outcome with a timely adequate treatment, usually with stabilisation. Unfortunately, the diagnosis can be delayed as clear signs of injury may not be present on the initial X-ray, which should then result into further imaging in the form of CT or MRI scans.

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