International Journal Dental and Medical Sciences Research
Volume 3, Issue 2, Mar-Apr 2021 pp 120-123www.ijdmsrjournal.comISSN: 2582-6018

Injury to A Rigid Spine: A Tale of Three Spines

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Submitted: 20-02-2021 Revised: 05-03-2021 Accepted: 08-03-2021

ABSTRACT: Many spine fractures are missed in daily clinical practice. A rigid spine is particularly susceptible to fracture. Trivial mechanism of injury is often the cause of a spine fracture in a patient with a rigid spine. It is important to be aware that epidural hematoma can occur in isolation without any spine fracture. Identification of spine fractures in a rigid spine is difficult due to atypical presentation, trivial mechanism of injury and x-ray changes due to underlying disease. A high index of suspicion is the key to identify spinal injury among patients with spinal ankylosing disorders.

Keywords: Ankylosing spondylitis; Ossification of posterior longitudinal ligament; Disseminated idiopathic skeletal hyperostosis;rigid spine; extradural hematoma

I. INTRODUCTION

Many spinefracturesare missed in daily clinical practice. A rigid spine is particularly susceptible to fracture.[1]Trivial mechanism of injury is often the cause of a spine fracture in a patient with a rigid spine. Common causes ofincreasespinal rigidityincludeankylosing spondylosis (AS), disseminated idiopathic skeletal hyperostosis (DISH) and ossification of the posterior longitudinal ligament (OPLL). These conditions are grouped and sometimes referred to as spinal ankylosing disorder (SAD).

The cervical vertebraeare the most common sites of fractures in rigid spines.[2]Hyperextension isthepredominant mechanismofthecervical fractures.67% of the AS patients and 40% of the DISH patientswhopresented withspinefractures also sustained neurological deficits duringtheinitialassessment.[3]However, the development ofsecondaryspinal cord injuriesis common due to delay in diagnosing unstable fractures. 7%-23% of spine fractures in SAD patients are associated with epidural hematoma.[2] It is important to be aware that epidural hematoma can occur in isolation without any spine fracture as described below in Case 1. Surgical decompression of the spinal cord is the mainstay of treatmentin patients with neurological deficits due to extradural hematoma.

Immobilization of an unstable spineiscrucialto prevent secondary spinal cord injuries. However, identification of spine fractures in a rigid spine is difficult due to atypical presentation, trivial mechanism of injury and x-ray changes due to underlying disease. A high index of suspicion is the key to identify spinal injury among patients with spinal ankylosing disorders.

We would like to share three cases who presented with different history and symptoms.

Case 1 - Ankylosing spondylitis

This 54-year-old gentleman with a background of ankylosing spondylitis presented with a history of fall at home. Following the trauma, he complained of neck pain but did not seek any medical treatment immediately. He presented to us with bilateral lower limbs weakness and urinary retention following massage therapy. The CT cervical showed no fracture. The sagittal MRI of the cervical spine showed intraspinal extradural hematoma from the level of C5 until T3 with spinal cord oedema (Figure 1b).

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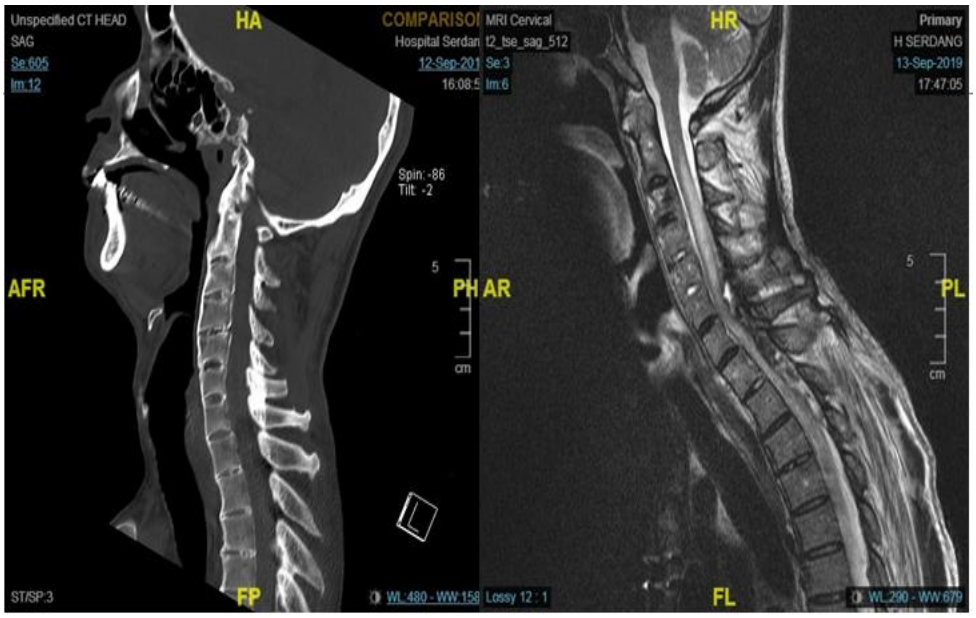

Figure 1a Figure 1b

Case 2 - Disseminated idiopathic skeletal hyperostosis

This 64-year-old gentleman presented with a fall from a chair. He complained of back pain, however, was able to ambulate post-trauma.On examination, there was no neurologic deficit. A plain X-ray was requested initially rather than CT due to a trivial mechanism of injury. The lateral thoracic Xray showed loss of T10, T11 vertebral height and multilevel degenerative spine changes (Figure 2a). The sagittal CT of the thoracolumbar spine showed T10, T11 chance fracture and extensive calcification of anterior longitudinal ligament(Figure 2b). He was treated conservatively with an extension body cast.

Figure 2a Figure 2b

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Case 3 - Ossification of the posterior longitudinal ligament

This 51-year-old gentleman was struck on his chest by a falling school gate. He complained of posterior neck pain and bilateral upper limbs weakness post-trauma. On examination, power over the upper limbs is weaker than lower limbs. The diagnosis of central cord syndrome was made based on clinical findings. The Sagittal CT of the cervical spine showed posterior longitudinal ligament calcification causing cervical spinal canal stenosis (Figure 3a). The sagittal MRI of the cervical spine showed compression at C2/C3 level associated with focal spinal cord oedema (Figure 3b).Posterior instrumentation and fusion of C2-C4 vertebrae with laminectomy of C3 were done.

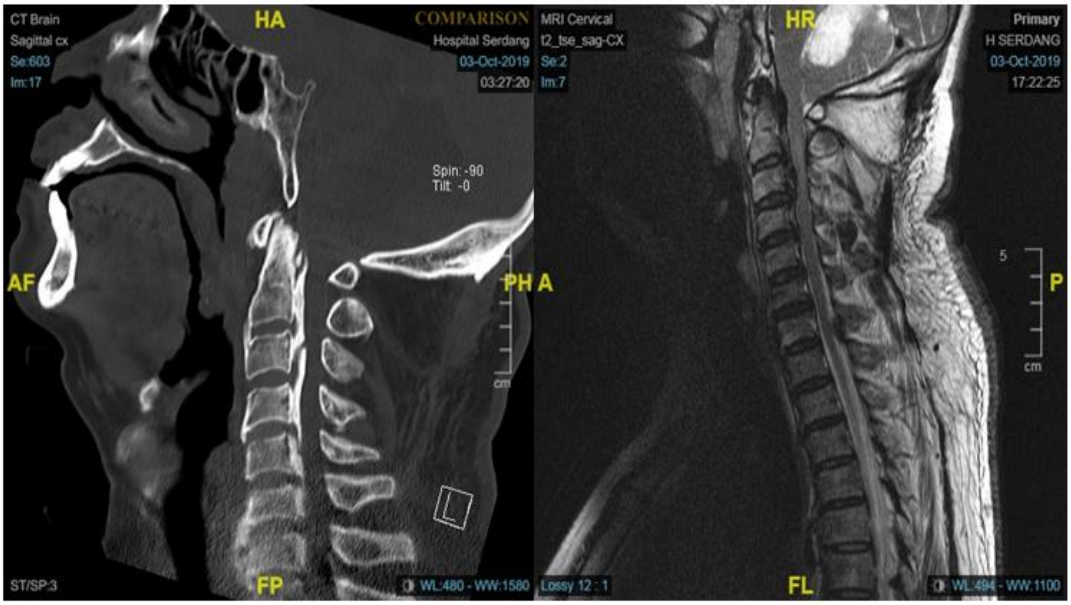

Figure 3a Figure 3b

II. DISCUSSION:

From case 1, we learn that spinal injury can be easily missed even with a CT scan.In the case of negative CT scan findings, an MRI should be performed to look for the presence of soft tissue injuries such as transdiscal injury, spinal cord oedema and extradural hematoma.Ligament injury will only be apparent in a CT scan if the ligament is calcified. Otherwise, MRI is a better modality to assess soft tissue injury. An extradural hematoma occurs after an acute trauma will not be apparent in a CT scan.

However, there isvaluableinformation that we can retrieve from a plain CT image. The features of a rigid spine should be scrutinized during the interpretation of a CT scan.Asthe cases discussed above, CTimagecanshow extensive calcification of anterior longitudinal ligament, syndesmophytes across multiple vertebral levels and loss of intervertebral space. These features of the ankylosing spine should support the indication for more advanced imaging such as an MRI to detect subtle spine injury which is common in a rigid spine.

A plain X-ray still plays an important role in the daily emergency setting. It is unnecessary to expose every trauma patient to excessive radiation from a CT scan. Casualties with low suspicion of spinal fracture should be offered a plain X-ray as the initial assessment. Any positive plain X-ray finding will warrant more advanced imaging evaluation.

Ankylosing Spondylitis

Extensive bridging of syndesmophytes across multiple vertebral levels is the hallmark of ankylosing spondylitis.[4] The fusion of adjacent vertebra body greatly reduces the ability of the spine to resist axial and bending forces. Due to the rigidity, the entire length of the vertebra forms a long leverage arm. The mobile spinal segment at the end of the leverage arm is susceptible to fracture. Coexisting osteoporosis is also common among ankylosing spondylitis patients. Ankylosing spondylitis causes kyphosis deformity which shifts the centre of motion forwards. This alteration in postural control increases the risk of fall.

DISH

In contrast to ankylosing spondylitis, DISH is more commonly seen in elderly and the involvement of sacroiliac joint is unusual.[5] Symptoms are usually caused by the ossification ligaments and entheses. Ossification is seen running across the vertebral body forming a hyperlucent line on the radiograph. The anterior longitudinal ligament (ALL) is more commonly involved as shown in Figure 2. Majority of DISH patients are asymptomatic. However, DISH can cause a marked reduction in spinal mobility and increase vulnerability to fracture.A trivial fall resulted in a chance fracture as showed in case 2.

OPLL

Ossification of the posterior longitudinal ligament (OPLL) causes narrowing of the spinal canal as shown in Figures 3(a) and 3(b). OPLL in the cervical region is more common. Patients often present with myelopathy or myeloradiculopathy signs due to the spinal cord compression. Acute spinal cord injury following minor trauma is common among patients with OPLL. Most of the spinal cord injuries are incomplete if there is no cervical vertebra fracture following trauma.

The selection of imaging assessments is crucial to prevent secondary spinal cord injury. Inadequate immobilization of an unstable spine fracture and failure to identify an expanding extradural hematoma can lead to worsening neurological deficit. Hence, there should be a low threshold for MRI scan as the initial assessment if the patient is known to haveaspinal ankylosing disorder.A trivial fall in a patient with a rigid spine should always be assumed to haveasignificant spinal injury until proven otherwise.

Take home message:

A high index of suspicion is the key to identify spinal injury among patients with spinal ankylosing disorders. MRI is superior to CT scan if any neurological deficit is present.

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