CHARACTERISTIC ASPECTS OF CERVICAL SPINE FRACTURES IN ANKYLOSING SPONDYLITIS – CASE REPORT

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ABSTRACT: Ankylosing spondylitis is a chronic, systemic, inflammatory disease, that affects especially the axial skeleton. In patients with spondylitis, the cervical segment of the spine is the most affected in trauma. The fracture risk appears even after a minor or mild traumatic event and the rigidity of the spine, the kyphosis, the secondary osteoporosis, have a special contribution. The injuries are localized especially on the lower cervical spine, such as segments C5/C6 and C6/C7 and in the cervico-thoracic junction. Traumatic lesions on ankylosing spondylitis spine are commonly succeeded by spine instability and high risk of secondary neurological deficiency, so that surgical intervention is the most indicated. In this article, we reveal some of the special aspects of the spine fractures in ankylosing spondylitis, illustrating a case of a patient with spondylitis, admitted in the department of traumatology „Casa Austria”, University County Hospital Timișoara, with cervical spine trauma, spinal cord injury and tetraplegia, after a medium intensity traumatic event. Patients with ankylosing spondylitis are highly susceptible to cervical fractures, even after a minor or mild trauma. These lesions often lead to secondary neurological deficits, so that CT or/and MR imaging evaluation of the whole spine is strongly recommended regardless of whether mild initial clinical findings are present. In case of a cervical spine fracture detection, the stabilization procedure is needed, and the standard management includes anterior decompression and combined anterior-posterior stabilization. Anterior approach stabilization alone is not indicated because instability of the posterior column may go undetected in the acute phase of the trauma.

Keywords: ankylosing spondylitis, spine fractures, cervical spine trauma.

Rezumat: Spondilita anchilopoetică este o afecțiune sistemică cronicană și o boală inflamatorie, cu o dezvoltare preponderentă la nivelul scheletului axial. Cel mai frecvent implicat traumatic, la pacienții cu spondilită, este segmentul cervical al coloanei vertebrale. Aceștia sunt supuși riscului de fractură, în urma unor traumatisme de intensitate medie sau mică, datorită cifozii, rigidității și osteoporozii existente. Leziunile traumatice sunt localizate cel mai frecvent la nivelul coloanei cervicale distale (C5/C6 și C6/C7) și la nivelul joncțiunii cervico-toracale. Acestea sunt însoțite înprime frecvent de instabilitate a coloanei vertebrale și risc crescut de a dezvolta deficit neurologic, astfel încât, de cele mai multe ori, intervenția chirurgicală este o necesitate. În acest articol, exemplificăm particularitatea fracturilor spinale pe fond de spondilită anchilopoetică, prezintând cazul unui pacient cu spondilită, internat în secția de traumatologie „Casa Austria”, Spitalul Clinic Județean de Urgență Timișoara, cu traumatism vertebral cervical mielic și tetraplegie. Deoarece aceste leziuni duc de cele mai multe ori la deficit neurologic secundar, evaluarea imagistică CT și RM a întregii coloane este recomandată, chiar dacă simptomatologia clinică este minoră. Dacă este prezentă o fractură cervicală, este necesară stabilizarea chirurgicală a coloanei vertebrale, iar procedura standard este de decompresie și apoi, stabilizare combinată anterioară și posterioară. Stabilizarea strict anterioară nu este recomandată, deoarece o instabilitate a pilonului posterior al coloanei, poate fi de multe ori nedetectată în fază acută.

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INTRODUCTION

Ankylosing spondylitis is a chronic, systemic, inflammatory disease, that affects especially the axial skeleton. Usually, sacro-iliitis is the first clinical sign in spondylitis. The positive diagnosis can be pronounced if a grade 2, bilateral, or grade 3-4, ipsilateral, sacroiliitis is present, in association with one of the modified New-York criteria.

Modified New-York criteria are divided in clinical criteria and radiological criteria. Clinical criteria: lower back pain and stiffness for more than 3 months with improvement after exercise; reduced mobility of the lumbar spine in the sagittal and frontal axis; restriction of the chest expansion (age and gender related).

Radiological criteria: sacroiliitis at least grade 2, bilateral, or grade 3-4, ipsilateral.

It is considered that an autoimmune response produces fibrosis and ossification of the spine ligaments and joints, and finally, a fusion of the spinal segments.

One of the ankylosing spondylitis classifications is described by Hehne and Zielke and is based on radiographic findings: the presence of syndesmophytes and the grade of anulus fibrosus and facet joints ossification.

Ankylosing spondylitis type I (spondylarthitis): simple ossification of the vertebral bodies, without syndesmophytes.

Type IIa (anulus type): incomplete anular ossification, especially ventral, with or without lateral syndesmophytes.

Type IIb (anulus type): complete anular ossification, with syndesmophytes, that overlapp the vertebral disc (complete).

Type IIIa (ligament/sub-ligament type): thick and wide syndesmophytes (with cortical and spongiosa structure), but not in all segments of the spine (incomplete).

Type IIIb (bamboo-spine): similar with type IIIa, but multiple vertebral segments are affected (especially on lumbar and thoracic spine).

The development of kyphosis, spinal rigidity and secondary osteoporosis leads to biomechanical changes of the spine. Reduced muscle activity and increased muscle degeneration produce an overall loss of muscle strength.

All the pathological changes in ankylosing spondylitis spine have a special contribution in the characteristic pattern of traumatic spinal injuries and explain the fracture development even after a minor trauma mechanism.

The risk of traumatic injuries increases, especially in the presence of complete rigidity of the spine, such as in ankylosing spondylitis type IIb, IIIa and IIIb, by Hehne and Zielke. In these cases, there is a high rate of neurological complications.

Although vertebral fractures on ankylosing spondylitis spine reveal a low prevalence, even in trauma centers with high case load of spine trauma, these types of injuries draw a special attention because of the specific and uncommon fracture pattern, sometimes grotesque, the high rates of neurological complications and the challenging surgical management.

The disease prevalence, translated in male to female ratio is 2.5:1 and the incidence of traumatic spine injuries is higher in males (1).

In patients with spondylitis, the most affected in trauma is the cervical segment of the spine. Like we said, the rigidity of the spine, the kyphosis, the secondary osteoporosis, that appear in the evolution of the disease, all have a special contribution in fracture risk (2). The injuries are localized especially on the lower cervical spine, such as segments C5/C6 and C6/C7 and in the cervico-thoracic junction (1). Traumatic lesions on ankylosing spondylitis spine are commonly succeeded by spine instability and high risk of secondary neurological deficiency.

Usually, traumatic injuries of the spine with ankylosing spondylitis involve all vertebral stability columns, so that surgical intervention is the most indicated (3).

PURPOSE

To portray the special pattern of spine fractures in ankylosing spondylitis, in this article we present the case of a patient with cervical spine injuries in ankylosing spondylitis, after a medium intensity traumatic event. These lesions affect all anterior and posterior vertebral structures, with secondary spine column instability.

MATERIAL AND METHODS

The patient R. L. M. (male, 56 years old) came in the Department of Traumatology „Casa Austria”, University County Hospital Timisoara, on October 2006 (observation chart number 14186/30.10.2006). The diagnosis was cervical spine trauma with spinal cord involvement and tetraplegia.

The patient suffered a car accident (driver), but the traumatic stress was of medium intensity. R.L.M. was known with ankylosing spondylitis diagnosis.

At the arrival in the emergency department, the patient was conscious, but with tetraplegia, pain in the cervical...
region, acute respiratory impairment. On local examination, edema of the cervical soft tissues, with latero-cervical bilateral hematoma and bony structures luxation were evident.

Concerning impaired clinical status, the patient was investigated immediately to quantify the spinal cord injuries, post-traumatic lesions of the vessels, ligaments and adjacent soft tissues, using magnetic resonance imaging (MRI) of the cervical spine and angio-MRI technique (General Electric – GE machine, 1 Tesla).

MRI images show burst fracture of C6 vertebrae, fracture of the C7 vertebrae, loss of the normal alignment of the cervical vertebral bodies, with anterior displacement of the distal bony structures, because of a complete fracture of the cervical spine on C6/C7 level, anterior listesis of C7 vertebral body on T1.

MRI could also visualize the spinal cord injury along C4 to T1 levels and the compresion of spinal cord at the level of the complete fracture (Fig. 1, Fig. 2, Fig. 3, Fig. 4). The anterior and posterior ligamentary structures were disrupted and a massive hematoma was visible, with anterior and lateral displacement of adjacent structures.

The angio-MRI investigation shows the absence of vascular flow on left vertebral artery (Fig. 5, Fig. 6).
The patient is intubated, with assisted ventilation, hemodynamic equilibration, tracheostomy, but his clinical status reveals a continuous impairment, until unresponsive cardiac arrest.

RESULTS AND DISCUSSIONS

Pathological changes in ankylosing spondylitis (ligament ossification, syndesmophytes, hyper-kyphosis with rigidity) affect the normal biomechanical characteristics of the spinal column. The fused spine is incapable of appropriately dissipating the energy of a traumatic event and in association with osteoporotic bones, increase the susceptibility to vertebral fractures, even after a minor trauma event (1,4).

Some authors made a synthesis of factors that increase the fracture risk in spine with spondylitis (1). These factors include: gender (especially males), age, low body mass index, osteoporosis, disease duration, degree of syndesmophyte formation, joint involvement, increased restriction of vertebral column mobility, grade of kyphosis (4).

The most frequent injury mechanism implicated in spine fractures related with ankylosing spondylitis is flexion with hyperextension. The torsion mechanism is rare, but if present, the traumatic lesions developed are unstable (1).

The incidence of spinal cord injuries after trauma in patients with spondylitis is higher (84% of all spinal cord lesions) than spinal cord injuries in general population (55%) (4).

Because of the special pattern (atypical and complex) of vertebral fractures in the rigid spine, the classical classification of these lesions is hardly applicable.

Cornejfjord et al. consider that cervical spine fractures on ankylosing spondylitis changes are due to hyperextension on a rigid and distorted vertebral column. The fracture line could pass through the calcified intervertebral discus or through the vertebral body, but more frequent are those through discal space. The rate of associated neurological complications, including complete paraplegia, is high. After a minor trauma, the injuries could be localized only at the anterior structures of the spine, but with a permanent risk of secondary extension in the posterior column structures (1).

Frequently, in patients with ankylosing spondylitis, the detection of cervical fractures is delayed, therefor the risk of secondary neurological impairment is higher. Also, the neurological complications often develop over time. The delayed fracture detection could be due to the minor pain (usually, minor trauma event), grotesque changes of the spine in spondylitis (5). So, the recommendation is of a concise and proper radio-imaging evaluation of the spine (1).

The first option imaging procedure is the plain film of the cervical spine, in at least two views. Sometimes, additional views are required – for occipito-cervical and cervico-thoracic junctions (1,6). The execution of radiograms is difficult by reason of spine rigidity and the visualization of the fracture lines is also difficult because of the osteoporosis.

Finfelstein et al. showed some of the causes of missed fractures on conventional radiogram: pathological changes in the normal anatomy of the spine, extra-bone formation, ligament ossification, osteoporosis, minor...
trauma, no displacement, difficult visualization of the cervico-thoracic junction.

The plain film can visualize fractures of the anterior column of the spine (exception – occult fractures), rupture of the anterior longitudinal ligament (consequence of calcification), fractures of the cervical spinous processes. Fractures of the posterior column of the spine, fractures of the facet joints, ruptures of the posterior longitudinal ligament and soft tissues injuries are difficult to see on the plain film.

Before the use of MRI, the diagnosis of spinal fractures on ankylosing spondylitis was difficult, in the absence of neurological damage (6).

MRI has a special contribution in imaging evaluation of the ligaments, intervertebral discs and the spinal cord. MRI could visualize the bone edema – an indirect sign of an occult fracture (1,6); intraspinal bleeding (hematoma) – usually seen in these cases because of the solid fixation of epi- and peridural veins with the fibrotic or ossified tissue (1).

Diagnostic MRI images could be obtained using a flexible multipurpose coil if the use of standard coil is impossible due to a excessive kyphosis or a rigid collar (7).

In comparison to MRI, CT of the spine requires shorter scanning time and is of better quality in evaluation of detailed bony injuries and fragment displacement (6). The new-generation of CT scanners, with multiplanar reconstruction possibility (3D-CT), offer a high quality imaging evaluation of spinal fractures (extent of the lesion and details).

Multislice-CT (MDCT), with slice thickness of 2 mm and multiplanar reconstruction ability, is helpful for the visualization of the fine fracture lines (1,6,8).

Frequently discussed by literature are the multi-level spine fractures, asymptomatic or with minimal clinical appearance. In consequence, often comes the indication of imaging evaluation of all the spine (CT or/and MRI) – because of associated lesions on different spinal levels (for example, the association of cervical segments traumatic injuries with lombar spine injuries) (5).

Concerning treatment procedures, both non-operative and operative management are accepted. Indications of surgical intervention treatment include: instability of the spine, incorrect posture, pain and neurological deficit. The surgical procedure is aimed on spine stabilization and single posterior or a combined anterior-posterior approach are preferred (1).

Due to the traumatic injuries on the spine with ankylosing spondylitis, that have a high prevalence of instability, the recommendation of non-operative treatment strategies is controversial (5).

Some authors are considering that adequate stabilization and realignment of the cervical spine with spondylitis is obtained with surgical fixation, the approach being in correlation with fracture localization: anterior intervention – the injury is localized anteriorly; posterior – in posterior localized lesions and 360 degree fixation – if all vertebral stability pylons are damaged.

The acute traumatic lesions, without spinal deformities, could be managed by anterior or posterior fusion, depending on fracture location.

Patients with spinal post-traumatic deformities and tears/deformities developed over time, are therapeutically managed applying a fracture reduction procedure and realignment of the vertebral bodies, using traction maneuvers. If the reduction is obtained, but the spinal deformity still exists, posterior and, possibly, anterior fusion are indicated. If a pronounced spinal deformity (such as chin on chest) persists, the cervical traction maneuver is prolonged (several days, with low traction weight) and/or an anterior wedge release via osteotomy is indicated and restoring of cranio-cervical alignment with posterior spinal fusion.

The posterior spinal fusion uses lateral masses approach and iliac bone fusion graft, for safety fixation (9). Some authors, recommend the use of a special cement for fusion (5).

In the majority of cases, a high rate of instability is present, on account of injured posterior elements of the spine and tearing of the interspinous ligament, so that posterior stabilization is needed and must encompass a sufficient number of vertebral segments. Implants for posterior instrumentation include hook-based plates, wire loops, and internal fixation devices like flexible internal fixators or plates.

If the surgical management consists of combined anterior and posterior stabilization, the decision of performing the intervention in one session or two, depends on the individual case and surgeon’s standard procedure. Laminectomy could be performed on cases without instability (1).

The decision and the type of surgical management procedure in patients with ankylosing spondylitis depends on fracture localization, if one or more spinal levels are affected, if the injury is acute or chronic, if the instability is present, evidence of displacement, degree of spinal cord damage (6).

However, the anterior-posterior stabilization becomes the procedure of choice in cases of trauma on ankylosing spondylitis spine, with marked column instabilities (5).
The literature based evidence shows that clinical evolution of the patients with ankylosing spondylitis and spine fractures is less positive than in patients with normal spine fractures (10). Regardless the surgical procedure, patients with spondylitis cumulate a higher risk of surgical procedure’s complications (1,9). The following have been reported: high risk of epidural hematoma and bleeding (6,9), implant failure (40%-50% cases) (5), septic problems (30%) (1,5) and death (30%-75%) (4,5).

In conclusion, we can state that patients with ankylosing spondylitis are highly susceptible to cervical fractures, even after a minor or mild trauma. These lesions often lead to secondary neurological deficits, so that CT or/and MRI imaging evaluation of the whole spine is strongly recommended, regardless of whether mild initial clinical findings are present.

In case of a cervical spine fracture detection, the stabilization procedure is needed, and the standard management includes anterior decompression and combined anterior-posterior stabilization. Anterior approach stabilization alone is not indicated because instability of the posterior column may go undetected in the acute phase of the trauma. Further follow-up imaging studies are necessary (1).

Any patient with new complaint neck or back pain, with or without neurologic deficit, should be treated as if he/she has an unstable spine fracture, until proved otherwise (6).

REFERENCES