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Review article

Cervical spine surgery in ankylosing spondylitis: Review and current concept



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ABSTRACT

Ankylosing spondylitis of the cervical spine is associated with stiff kyphosis and increased risk of transversal unstable fracture. A spine surgeon may be involved mainly in the management of trauma cases, but in some situations, corrective surgery of a kyphotic cervical deformity is needed. Both types of cases carry specific aspects and rely on principles that differ from those associated with more common cervical surgery. This paper is a review of the literature regarding cervical surgery in cases of ankylosing spondylitis. It addresses practical technical questions.

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1. Introduction

Ankylosing spondylitis (AS) is an inflammatory rheumatism that may induce structural damage in the cervical spine. Microscopic changes include bone fragility [1] arising from decreased bone density, which has been shown to be related to persistent systemic inflammation and hypervascularisation of the bone. In the severest forms, macroscopic changes result in spontaneous intervertebral fusion and kyphosis [2] of the entire spine (the so-called “bamboo spine”). The ossification concerns the disc space anteriorly and the facet joints posteriorly. While the normal cervical spine provides mobility and allows upright posture of the head, the AS spine is excessively stiff and the flexed posture of the neck is mostly debilitating. In addition to other possible AS locations (hips, sacroiliac joint, and lumbar spine), the cervical effects lead to a significant impairment of quality of life and an increased risk of cervical spine fracture.

Cervical spine surgery is associated with AS in two main situations: management of trauma [3–8] and correction of sagittal “chin-to-chest” deformity [2,9–16]. Both remain strategically and technically challenging.

As with cervical spine fractures in the general population, traumatic fracture/dislocation in the patient with AS usually occurs in the lower cervical spine (C5 to T1). However, AS-related fractures are frequently more severe, with specific features compared to

cervical fractures in the healthy population [1]. AS fractures are, for example, highly unstable because the anterior and the posterior elements are involved in a transverse or short oblique pattern that does not follow the classical three-column criteria for stability as seen in normal spines [17]. Moreover, the broken “bamboo spine” behaves somewhat like a long bone with diaphyseal fracture: the long lever arms are extremely unstable with an associated higher risk of neurological deterioration [18–20]. In addition, the kyphotic deformation does not provide the most appropriate sagittal balance for primary stability, and the hemorrhagic trend produces a supplementary risk of neurological complication through an increased possibility of compressive epidural hematoma [6]. In spite of all of these considerations, there is a good propensity of the AS bone to fuse.

For these reasons, the surgical treatment of AS spinal fractures is totally different from that for a usual cervical spine fracture. Cases are rare, which means that guidelines and references are sparse. Based on the literature and our experience, we discuss here some relevant issues in the management of AS fractures. Is there room for orthopaedic treatment? What should the fixation be posterior, anterior, or circumferential? What would be the optimal reduction, the former kyphosis or the “more ideal” lordosis? And finally, what is the healing potential of the anterior gap at the site of the fracture?

Outside of the traumatic context, the procedure of posterior cervical subtraction has been described several times [10–12,15], and a few series have reported the surgical treatment of kyphotic deformation [2,9,13,15,16]. However, the surgical strategy regarding which level of osteotomy to choose (i.e. cervical or lumbar) has barely been discussed.

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2. Management of trauma cases

The occurrence of traumatic cervical spine injury in the case of AS is significantly greater than the incidence in the normal population because of the global imbalance among the spine, hip, and knees and because of bone fragility [21]. These patients should be advised to use aids for ambulation and to avoid chiropractic manipulations. Fractures may occur even from low-energy trauma. Hyperextension is classically considered to be the most frequent mechanism of injury; however, the circumstances are not always clear. Sometimes, the patient does not describe any trauma at all and the lesion appears to have occurred spontaneously. In addition, the diagnosis might sometimes be delayed [22]. In AS patients, a recent increase in neck pain or an acute change in neurological status, even if no trauma has occurred, is an indication for a full imaging study of the vertebral column. For example, we encountered one case in which confusion syndrome was the only symptom, similar to what has been described with fractures of the odontoid.

Proper initial treatment of the patient with AS and acute cervical trauma is crucial to avoid iatrogenic complications. Because the fractured ankylosed spine resembles a long-bone fracture, in the absence of bone and ligament stability, the only means of spinal stabilisation left for these patients is the cervical musculature. In addition, the cervical musculature might be atrophied, as is common with a history of ankylosis. Ambulance and emergency staff should be educated that the routinely recommended neutral position can be disastrous in these patients, who should remain in their usual degree of flexion. Related mistakes could be avoided if the diagnosis of AS is suspected in any case in which patients voluntarily hold the head in flexion.

Imaging of the cervical spine may be difficult in the context of AS because of the bone remodelling, kyphosis, and intervertebral fusion [23]. Visualisation may be especially difficult at the cervicothoracic area, leading to a risk of failed diagnosis and neurological complications. Some authors have advocated MRI for detecting traumatic lesions, specifically at the cervicothoracic junction, which is radiologically poorly documented [24]. At the very least, a CT scan is necessary. The CT scan can show the fracture line, which usually is transverse or shortly oblique and complete from the anterior to the posterior side, similar to the classical Chance fracture at the thoracolumbar spine.

2.1. Traction and halo braces

Once a cervical fracture is confirmed, patients with AS can be managed with axial traction. However, the traction direction must be placed in a superior and anterior direction so that the patient is realigned to the pre-existing kyphosis, and minimal weight should be used (Fig. 1). Placing the neck in an extended position may induce neurological complications. Even with properly positioned axial traction, the possibility of further neurological

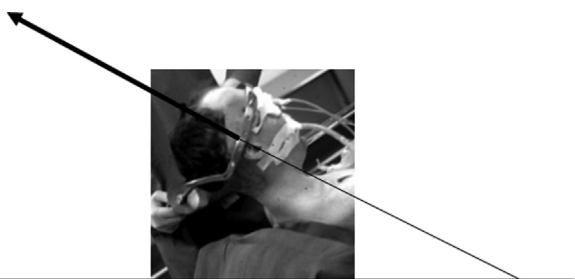


Fig. 1. Axial traction: in the case of ankylosing spondylitis, the direction of the traction has to be considered in the context of the cervical kyphosis.

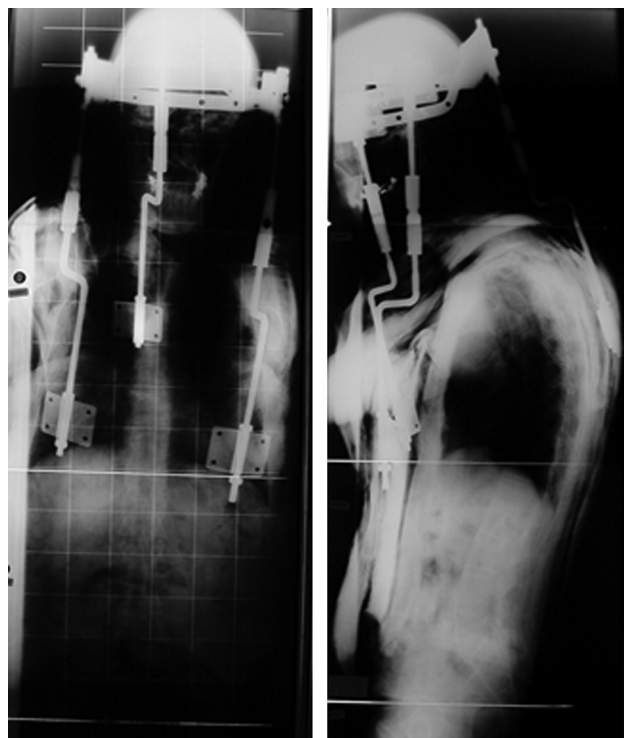


Fig. 2. AP and lateral radiographs of a patient non-operatively treated using a halo vest. Note that the anterior turnbuckles have to rely on the chest because of the kyphosis.

deterioration exists, as this means of immobilisation still allows for rotational movement. Monitoring of the traction must be quite precise: repeated clinical evaluations must focus on the detection of potential neurological worsening including consciousness alterations. Axial traction is an emergency stabilisation procedure that can be used as a transitory stabilisation before surgery. It can be converted to a halo brace if non-operative treatment is ultimately the management choice.

Controversy exists as to whether patients with a fracture/dislocation should be treated with external immobilisation alone or with surgical fusion followed by external immobilisation. The halo brace alone has been advocated as a “classical” mode of treatment, but it is not without complications [25]. While the majority of patients placed in a halo brace achieve spinal fusion without difficulty, failures of union or increased neurological deficit have been encountered.

Some details regarding the installation of the halo brace require emphasis: because of the cervical kyphosis, a standard halo vest is usually inappropriate, and the device must be custom fitted. The connectors between the halo and the vest must be positioned so as to resist the tendency for anterior flexion. Therefore, the lateral connectors should not be placed at the projection of the shoulders because this placement may induce a side effect tendency for hyperextension, excessive traction on the pins, and risk of pulling out from the skull. Other significant side effects include dramatic translation and overdistraction at the site of the fracture. The anterior turnbuckles have to be placed on the anterior valve of the vest because of the kyphosis. An additional posterior turnbuckle can be used posteriorly. In cases of extreme kyphosis or if a progressive correction is planned using the halo vest, another anterior turnbuckle can be used anteriorly (Fig. 2). Our experience is that in the first few days, the specific tools have to be easily available in case of an urgent need to remove the halo vest (e.g., neurological medullar decompensation with neurogenic cardiovascular or respiratory acute complication).

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