A traumatic, high-energy and unstable fracture of the C5 vertebra managed with kyphoplasty: a previously unreported case

Nasir A. Quraishi · Sherief Elsayed

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Abstract

Unstable cervical fractures commonly require fusion surgery. We present a case of an unstable cervical fracture (AO classification A2.2) affecting the fifth cervical vertebra which was managed by kyphoplasty to achieve a pain-free, functional and stable outcome. The decision to undertake a kyphoplasty procedure was made in the hope of preserving motion and limiting the degree of future adjacent segment disease. We believe this to be the first case of the use of kyphoplasty to be published in the literature in relation to a traumatic cervical fracture. Additionally, at one-year follow-up the patient reports no pain, a near full range of motion in the cervical spine and no neurological deficit.

Keywords Kyphoplasty · Fracture · Cervical spine · Minimally invasive · Stability

Case presentation

A 22-year-old man was admitted complaining of neck pain having been involved in a road traffic accident while riding his motorcycle. Initial radiographs and computed tomography scanning revealed an unstable cervical spine fracture (AO classification A2.2). There was no neurological deficit, and he was managed with cervical immobilisation pending definitive surgical management.

After counselling the patient, a decision was made to perform kyphoplasty of the affected vertebra to preserve motion and limit the degree of adjacent segment disease. The alternative method of managing such a fracture would have been to perform an anterior corpectomy and fusion either by an iliac crest graft or a cage with local bone and plating from C4 to C6. There is, of course, the likely problem of early degeneration of the adjacent levels related to a fusion procedure. We believe this to be the first case of the use of kyphoplasty to be published in the literature in relation to a traumatic cervical fracture. One year postoperatively, the patient complains of no neck pain and a near normal range of cervical motion.

Historical review of the condition, epidemiology, diagnosis, pathology, differential diagnosis

The annual incidence of spinal cord injury is 5–40 per million, 49–55% of which results from cervical spine injury [1, 2]. Most cervical spine fractures occur

N. A. Quraishi (✉) · S. Elsayed
Centre for Spinal Studies and Surgery,
Queens Medical Centre, Nottingham, UK
e-mail: nasir.quraishi@nuh.nhs.uk

Fig. 1 Preoperative (a) sagittal CT showing the flexion compression fracture of C5 (A2.2), (b) sagittal T2-weighted MRI with slight kyphosis at the C5 level

predominantly at two levels. One-third of injuries occur at the level of C2, and one-half of injuries occur at the level of C6 or C7. Fractures affecting the lower cervical spine most commonly affect the C6, C7 and C5 vertebra with them accounting for 20.2%, 19.1% and 15% of cervical spine fractures, respectively [3]. Most fatal cervical spine injuries occur in upper cervical levels, either at the cranio-cervical junction C1 or C2.

Traditionally, unstable cervical spine fractures are dealt with a fusion procedure—anterior, posterior or a combination of both. This invariably leads to a fused segment which reduces the range of motion at that particular level.

Kyphoplasty has been successfully used most commonly for osteoporotic wedge compression fractures of the thoracic and lumbar spines. The use of both vertebroplasty and kyphoplasty has featured in the cervical spine, however in the treatment of fracture through aneurysmal bone cysts [4], haemangiomas [5], metastatic disease [6, 7], multiple myeloma [8], eosinophilic granuloma [9], polyostotic fibrous dysplasia [10], and odontoid fractures [11].

Rationale for treatment and evidence-based literature

Unstable cervical spine fractures are commonly treated with fusion allowing for early mobilisation. This type of surgery, especially in the form of corpectomy, carries risks of morbidity and long-term stiffness. In managing fractures of the subaxial cervical spine, both anterior and posterior instrumentation have been advocated. An anterior approach allows for a corpectomy and fusion [12, 13], while the posterior approach enables a safer reduction of facet joints and reconstruction of posterior column stability [14]. There

is of course, a requirement for intact posterior bony structures for fixation with this approach.

Our rationale for treatment therefore was to attempt to restore stability and at the same time, preserve motion and limit the degree of future adjacent segment disease. In addition, it was felt that there would be a far lesser risk of complication with this technique. Had our technique failed, or should it fail in the next decade or longer, then the option of surgical instrumentation and fusion is still available.

Procedure

A ‘mini’ anterior approach was carried out from the right side to reveal the anterior wall of the C5 vertebra. A Kyphon (Sunnyvale, CA, USA) trocar was then inserted into the collapsed vertebra. A balloon was then inserted to restore vertebral height and create a cavity for the injection of cement. Cement (polymethyl methacrylate) was then inserted via the trocar to achieve complete filling of the cavity under image intensifier control. There were no perioperative complications (Fig. 1).

Outcome, follow-up

Postoperatively, a CT scan revealed excellent filling (Fig. 2) and elevation of the superior endplate as suggested by the increment of middle vertebral height in particular (Fig. 3). At 12-month follow-up, our patient reported no pain, no neurological symptoms and only a minimal restriction of cervical motion. A MRI scan was performed at the one-year postoperative follow-up (Fig. 4), which

Fig. 2 Sagittal CT showing (a) preoperative C5 fracture with kyphotic angle 13.7° and (b) postoperative reduction of kyphotic angle to 10.2° and (c) good cement filling seen on postoperative coronal CT

Fig. 3 Sagittal CT showing (a) preoperative C5 fracture and measurements (in mm) of vertebral body height (anterior vertebral height (AVH) 10.4, middle vertebral height (MVH) 5.1, posterior vertebral height (PVH) 16.2 and (b) postoperative CT with improvements in vertebral body height (AVH 12.8, MVH 9.3, PVH 16.6)

showed that the improvement in kyphosis was maintained and there was no worsening of this patient's pre-existing stenosis. Furthermore, there also appeared to be some preservation of the superior disc space with some nucleus visible. There was no neurological deterioration at any point in his care.

Fig. 4 Sagittal T2-weighted MRI showing (a) preoperative C5 kyphosis of 13.7° and (b) at one-year stage, this was maintained at 9.7°

Conflict of interest None.

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