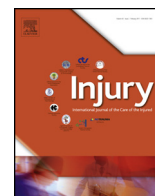




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Surgical options for osteoporotic vertebral compression fractures complicated with spinal deformity and neurologic deficit

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ABSTRACT

Introduction: This paper describes surgical options for Osteoporotic vertebral compression fracture (OVCF) with acute flexible or chronic rigid kyphosis, and pseudarthrosis complicated with pain and neurologic deficit.

Methods: This study has two components. a) A prospective clinical study of surgical treatment of 31 patients (age: 69 ± 11 years) with either acute flexible or progressive pseudarthrotic kyphosis manifested with severe pain or neurological deficit between 2010 and 2014. Eleven patients exhibited neurocompression (Frankel B, C, D). Surgery consisted in indirect reduction, kyphoplasty, and short posterior instrumentation in 28 patients and multilevel instrumentation in three. b) The second component involved a literature search of OVCF complicated with acute or painful chronic deformities and neurologic deficit, managed with open surgical approach.

Results: Indirect reduction, kyphoplasty and short posterior stabilization can restore satisfactory anatomic alignment and neurological deficit. Multilevel instrumentation was used for rigid long kyphosis. Complications were related to a) screw pull out and junctional kyphosis (4 patients) one of the patients also developed anterior migration of cement, b) cement leakage (4 patients). L5 radiculopathy occurred in one patient. The others remained asymptomatic. The literature review concluded that corpectomy with anterior, posterior or combined instrumentations is indicated for burst fractures, or rigid kyphosis with neurocompression. Prompt decompression with anatomical alignment may restore paraplegia. Complications were germane to osteoporotic bone predisposing to hardware loosening or cut out and dislodgement of instrumentation.

Discussion: Neurologic deficit associated with fractures or progressive pseudarthrotic kyphosis effectively may respond to indirect postural reduction, kyphoplasty and posterior percutaneous short segment transpedicle instrumentation. For burst fractures and rigid chronic kyphosis corpectomy reconstructed with cages and anterior, or posterior or combined instrumentations can restore and maintain normal anatomy. The following guidelines for optimal surgical instrumentation have been established: To prevent screw loosening and junctional kyphosis the instrumentation should not end within the kyphotic segment. Screws for anterior instrumentation should penetrate the contralateral cortex. Multiple site of fixation or combined anterior and posterior instrumentations dissipate stresses at any one site. Augmentation of transpedicle screw fixation with cement is a sound technical principle. Cement should be inserted in a doughy state with minimal pressure to prevent cement complications.

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Introduction

Osteoporotic vertebral compression fractures (OVCF) can be asymptomatic and reported as incidental findings in 15% of

patients with radiologically documented fracture. A majority of symptomatic patients with OVCF pain improve within 3 months. Pain in many patients with OVCF often resolves spontaneously. The most appropriate recommended initial treatment should consist of conservative measures including: braces, corsets, analgesics, antiosteoporotic drugs such as Denosumab, bisphosphonates, Teriparatide, Calcium, Vitamin D and physical therapy [1].

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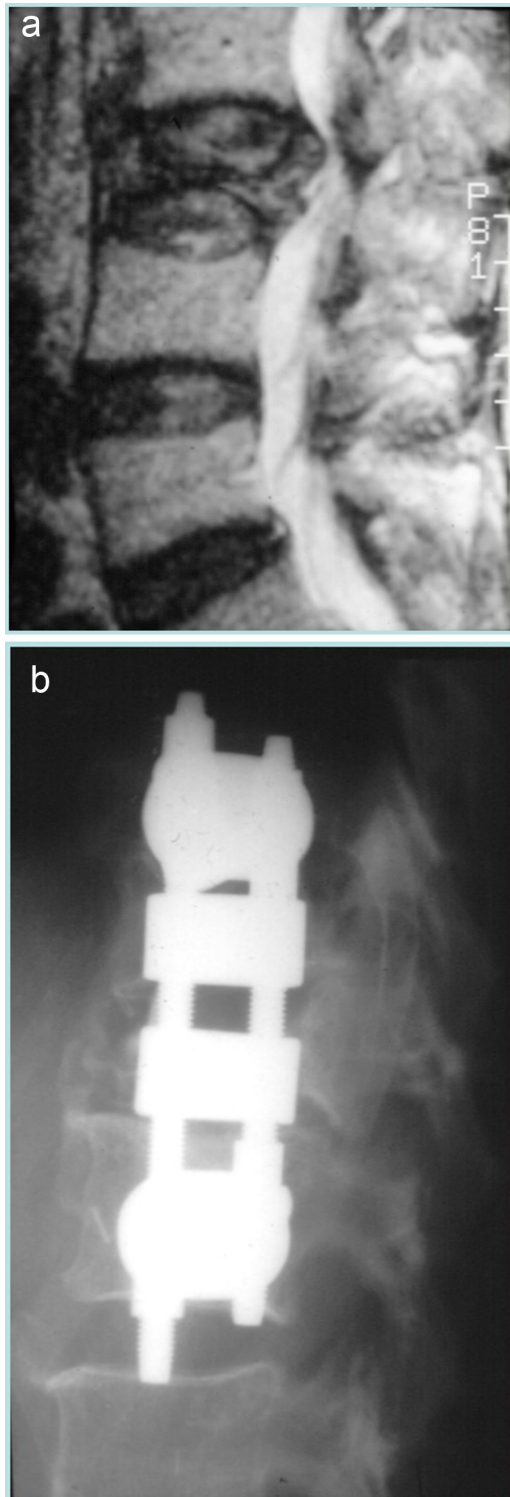


Fig. 1. (a) Spontaneous osteoporotic crush fracture with severe paraparesis. (b) Complete restoration of neurological deficit after anterior decompression, iliac bone graft and Kaneda stabilization (With permission from "Principles of management of osteometabolic disorders affecting the aging spine. *Eur Spine J* 2003; 12 (Suppl. 2): S113–S31", by Hadjipavlou et al.).

However, an estimated 33% [1] of these patients have continued back pain, which can become debilitating and can be complicated with serious neurologic deficit or paraplegia. These patients may be refractory to conservative care and may experience a substantial deterioration in their quality of life and a cascade of psychosocial



Fig. 2. Painful kyphosis due to OVCF collapse. Failed conservative treatment with bracing.

disorders [2]. The average duration of hospitalization ranges from 8 to 30 days [3]. There are reported periods of disability for cases of OVCF requiring bed rest of 26 days for those with lumbar fractures and 13 days for those with thoracic fractures. Periods of disability required for limited activity are 159 days and 74 days respectively. In comparison, patients with hip fracture may require 22 days of bed rest and 102 days of limited activity [4]. Overall mortality appears equivalent to hip fracture. A prospective study of 9575 women, followed over 8 years, demonstrated that patients with OVCF have a 23–34% increased mortality rate when compared to patients without OVCF [5]. This study supports the findings of Cooper et al. [6], which demonstrated a 5-year survival rate in patients with OVCF of 61% which is significantly lower than the expected normal survival rate of 76% and comparable to the 5-year survival rate after hip fracture. In hip fracture, increased mortality occurs within 6 months of the fracture event, in OVCF survival declines steadily after the fracture [6]. Common causes of death in patients with OVCF are pulmonary, including chronic obstructive pulmonary disease (COPD) and pneumonia (hazard ratio 2.1) [5]. Lung function (FVC, FEV1) is significantly decreased in patients with thoracic and lumbar fracture. One OVCF may result in 9% loss of forced vital capacity (FVC) [7–9].

Acute kyphotic deformity as a result of OVCF is not usually associated with neurologic deficit, but may continue to remain a painful debilitating condition requiring major surgical intervention [1].

According to a study by Parfitt and Duncan, published in 1982 [10], spontaneous crush fractures in osteoporotic patients did not result in spinal cord compression requiring decompressive surgery. However, several reports have since appeared in the literature highlighting the fact that spontaneous osteoporotic fracture with serious spinal cord compression and variable degree of neurologic deficit does occur [11–20]. Neurocompression results from either acute crush fracture (Fig. 1) [18,20,21] or delayed collapse of a pseudarthrotic wedge fracture resulting in severe kyphotic deformity (Fig. 2) [15,16,19]. Clinical manifestation of neurocompression, caused by kyphotic vertebral fracture, may present 1

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