Available online at www.sciencedirect.com
ScienceDirect
Journal of Clinical Neuroscience 15 (2008) 1210–1215
Journal of Clinical Neuroscience
www.elsevier.com/locate/jocn

Clinical Study

Preliminary experience of titanium mesh cages for pathological fracture of middle and lower cervical vertebrae

Hao-Che Chuang, Sung-Tai Wei, Han-Chung Lee, Chun-Chung Chen, Wen-Yuen Lee, Der-Yang Cho *

Department of Neurosurgery, China Medical University Hospital, 2 Yu-Der Road, Taichung, 40447 Taiwan

Received 12 June 2007; accepted 28 November 2007

Abstract

The advantages and disadvantages of titanium mesh cages (TMCs) assisted by anterior cervical plates (ACPs) for interbody fusion following cervical corpectomy were investigated. Between January 2002 and September 2006, 17 patients with cervical radiculomyelopathy caused by metastasis-induced pathologic fractures were selected for anterior corpectomy. TMCs were inserted into the post-corpectomy defect and stabilized by placement of ACPs filled with Triosite. Post-operative plain X-ray films indicated maintenance of spinal stability. No ceramic, donor site or surgery-related complications were observed. True trabeculation was observed in axial and reconstructive CT scans in all surviving patients one year after surgery. Neurological recovery, pain control, and good quality of life were achieved. Short hospital stays, minimal blood loss, short operation times and brief periods of bed confinement were also observed. We conclude that a TMC assisted by an ACP is safe and effective for interbody fusion following cervical corpectomy for pathological fractures resulting from cervical vertebral metastases.

Keywords: Anterior cervical plates; Cervical metastases; Cervical reconstruction; Corpectomy; Interbody fusion; Japanese Orthopedic Association Scale (JOAS) score; Titanium mesh cage

1. Introduction

Skeletal metastasis is a frequent problem for cancer patients, with the spine being the most common site. Neoplasms of the cervical spine occur less frequently than neoplasms of the thoracic–lumbar spine.[1–3] External radiation therapy and steroid administration are used in traditional management of cervical spinal metastases. Surgery is indicated only if the response to these modalities is poor.[4] The common indications for surgical intervention in patients with cervical spinal vertebral neoplasms include unremitting pain, vertebral destruction with anatomical instability, and subsequent neurological impairment.[5,6] Although it may not prolong survival, surgery has the potential to relieve neurological symptoms and improve quality of life.[6,7]

Since its introduction in 1958, anterior cervical fusion has been the preferred surgical treatment for cervical vertebral disorders. Much evidence attests to the clinical and radiological stability of the spine as the result of anterior cervical interbody fusion. In recent decades, many materials, including autografts and allografts, such as tricortical iliac bone grafts, fibular struts, surgibone, and hydroxyapatite grafts, have been used to perform anterior cervical interbody fusion.[8–10] Although considered the ideal fusion material, autologous iliac bone grafts are associated with donor site complications in almost 15% of patients. The extent of donor site grafts correlates directly with the frequency of harvest-related complications including numbness or pain due to femoral cutaneous injury, subcutaneous hematoma, chronic wound discomfort, and wound infection. Allograft materials used for fusion, such as

* Corresponding author. Tel.: +886 4 2205 2121x4434; fax: +886 4 2205 2121x4435.
E-mail address: d5057@www.cmuh.org.tw (D.-Y. Cho).

0967-5868/$ - see front matter © 2008 Elsevier Ltd. All rights reserved.
doi:10.1016/j.jocn.2007.11.011

surgibone, cow-bone, and hydroxyapatite, have a comparable fusion rate to that of autologous iliac bone grafts but are associated with a high morbidity rate.[8,10,11]

In the present study, we used titanium mesh cages (TMCs) for interbody fusion following corpectomy to treat pathological fractures resulting from cervical vertebral metastases. We determined the extent of neurological recovery, the degree of clinical and radiological spinal stability, and complications resulting from this approach.

2. Materials and methods

2.1. Patients

Between January 2002 and January 2006, 40 patients were diagnosed with cervical metastases and managed in the Neurosurgical Department of the China Medical University Hospital (Taichung, Taiwan). An otherwise good health status, including a high Karnofsky's performance status (KPS > 70), and good control of the primary neoplasm constituted the criteria for surgical intervention. Exclusion criteria included inadequate control of the primary neoplasm such that the patient's prognosis was poor, complications such as coagulapathy or infection, and the presence of other life-threatening disorders. Twenty-Three patients who met the criteria for surgery chose to receive medication, radiotherapy, or hospice management. All decisions of patients and/or their families were upheld. All protocols for this study were approved by the ethical and administrative review board of the China Medical University Hospital, and informed oral and written consent was obtained from all participating patients. Seventeen patients were selected to receive anterior approach decompression and interbody fusion to treat cervical radiculomyelopathy (CRM) caused by vertebral neoplasm-related pathologic fractures.

2.2. Surgical and post-surgical procedures

Seventeen patients (10 males and 7 females) received TMCs for interbody fusion and anterior carvical plates (ACPs) for supplementary fixation following corpectomy (Fig. 1). Right anterior cervical microcorpectomy and removal of the posterior longitudinal ligament were performed to free the spinal cord. All TMCs were filled with Triosite (calcium phosphate ceramic; Zimmer Schweiz, Münsingen, Germany), and none contained any autologous iliac or vertebral bone. TMCs were Moss Miami (DePuy Spine, Raynham, MA, USA) and Dimso SA (Stryker ZI, Marticot, France) models. The upper and lower end caps of the TMCs were both locked in place to avoid settling or subsidence of adjacent vertebral endplates. The TMCs were then inserted into the post-corpectomy defect and stabilized by placement of ACPs (Alpha plate, Dimso SA, Stryker) and screws to fasten the upper and lower vertebrae (Fig. 1B). For post-operative orthosis, all patients were required to wear a neck collar. External radiotherapy was administered to all patients after surgical wounds were fully healed.

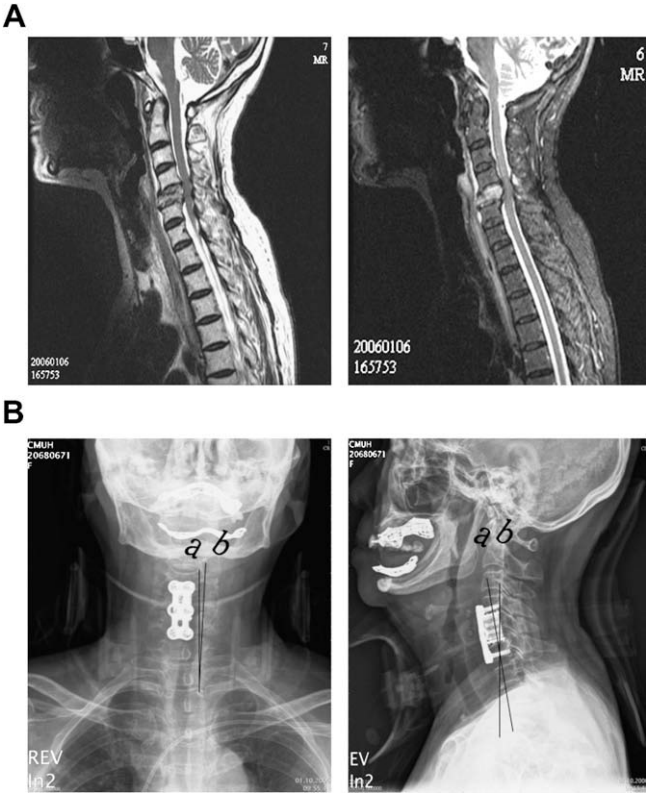

Fig. 1. A 70-year-old woman diagnosed with colorectal adenocarcinoma with multiple metastases before (A) and after (B) insertion of titanium mesh cages (TMCs) for interbody fusion and anterior cervical plates (ACPs) for supplementary fixation. (A) T2-weighted sagittal MRI with (right) and without (left) contrast of the cervical spine revealing decreased height of the C5 vertebra with enhancement and preservation of the adjacent disc space, indicating metastasis with a pathologic fracture compressing the spinal cord at the level of C5. (B) Postoperative X-rays show coronal and sagittal angles (a,b, on anteroposterior (left) and lateral (right) X-rays) reflecting the immediate stability of the cervical spine after surgery. A kyphotic change in the sagittal alignment increases load on the anterior cervical vertebrae, accelerating degenerative changes in the adjacent segments. For all patients who underwent surgery, radiological studies performed immediately after surgery revealed coronal and sagittal angles of <10 degrees, indicating no significant instability.

2.3. Signs, outcomes, complications and other assessments

Presenting signs, neurological outcomes, and complications were recorded before and after surgery. The Japanese Orthopedic Association Scale (JOAS), Nurick scale and Mankoski pain scale were applied to assess clinical neurological symptoms including pain or the prognosis for CRM. Surgery-related and donor site-related complications were recorded. Radiographic assessment with plain film was performed immediately after surgery and at 1, 3, 6, and 12 months post-operatively for surviving patients. Coronal angles, sagittal angles, sagittal displacement ratios, and settling ratios were determined to evaluate post-operative radiographic stability. Axial CT, assisted by reconstructed CT, was used to evaluate true fusion.[12]