



Clinical Study

Intraoperative vertebroplasty during surgical decompression and instrumentation for aggressive vertebral hemangiomas: a retrospective study of 39 patients and review of the literature

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Abstract

BACKGROUND CONTEXT: Aggressive (Enneking stage 3, S3) vertebral hemangiomas (VHs) are rare, which might require surgery. However, the choice of surgery for S3 VHs remains controversial because of the rarity of these lesions.

PURPOSE: We reported our experience of treating S3 VHs, and evaluated the effectiveness and safety of intraoperative vertebroplasty during decompression surgery for S3 VHs.

STUDY DESIGN: This is a retrospective study.

PATIENT SAMPLE: Thirty-nine patients with a definitive pathologic diagnosis of aggressive VHs who underwent primary decompression surgery in our department were included in this study.

OUTCOME MEASURES: Basic data such as surgical procedure, surgical duration, estimated blood loss during surgery, and pathology were collected. The modified Frankel grade was used to evaluate neurologic function. Enneking staging was based on radiological findings.

METHODS: We retrospectively examined aggressive VHs with neurologic deficits. Surgery was indicated if the neurologic deficit was severe or developed quickly or if radiotherapy was ineffective. Decompression surgery was performed. Intraoperative vertebroplasty during posterior decompression has been used since 2009. If contrast-enhanced computed tomography (CT) revealed a residual lesion, we recommended adjuvant radiotherapy with 40–50 Gy to prevent recurrence. Patients' basic and surgical information was collected. The minimum follow-up duration was 18 months. This study was partially funded by Peking University Third Hospital, Grant no. Y71508-01.

RESULTS: Average age of the 39 patients with S3 VHs who underwent primary decompression surgery was 46.2 (range, 10–69) years. All patients had neurologic deficits caused by aggressive VHs. Aggressive VH lesions were located in the cervical, thoracic, and lumbar spine in 2, 32, and 5 patients, respectively. The decompression-alone group had 17 patients, and the decompression plus intraoperative vertebroplasty group had 22. There were no statistically significant intergroup differences in preoperative information ($p > .05$). The average estimated blood losses were 1,764.7 mL (range, 500–4,000 mL) and 1,068.2 mL (range, 300–3,000 mL) in the decompression-alone group and

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decompression plus vertebroplasty group, respectively ($p=.017$). One patient who underwent primary decompression alone without adjuvant radiotherapy experienced recurrence after the first decompression. The average follow-up was 50.2 (range, 18–134) months, and no cases of recurrence were observed at the last follow-up.

CONCLUSIONS: Our results suggest that posterior decompression effectively provides symptom relief in patients with aggressive (S3) VHs with severe spinal cord compression. Intraoperative vertebroplasty is a safe and effective method for minimizing blood loss during surgery, whereas adjuvant radiotherapy or vertebroplasty helps in minimizing recurrence after decompression. © 2017 Elsevier Inc. All rights reserved.

Keywords: Aggressive vertebral hemangioma; Blood loss; Decompression surgery; Enneking stage; Intraoperative vertebroplasty; Surgical management

Introduction

Hemangiomas, which present as benign tumors comprising newly formed blood vessels, are a type of vascular malformation [1]. Vertebral hemangiomas (VHs) are the most common benign tumors involving the spinal column and frequently affect the thoracic spine. The incidence of VHs is 10%–26%; most cases are asymptomatic (Enneking stage 1 [2], S1), with only 0.9%–1.2% symptomatic cases [1,3–6]. Approximately 55% symptomatic VHs present with pain as the only symptom (Enneking stage 2, S2). The other 45% are aggressive, with possible invasion of the spinal canal or paravertebral space, which leads to neurologic deficits (Enneking stage 3, S3) [3,6–13].

Asymptomatic VHs (S1) are generally found incidentally and require only observation, whereas S3 VHs might require surgery. However, the choice of surgery for S3 VHs remains controversial because of the rarity of these lesions. Decompression with laminectomy and debulking is relatively less technically demanding [3–5,11,14]. Japanese surgeons have reported total en bloc spondylectomy to achieve wide oncologic margins [9]. Acosta et al. and Goldstein et al. recommended intralesional vertebrectomy because of the benign nature of these lesions [6,10]. Moreover, Doppman et al. suggested direct intralesional injection of ethanol [15]. VHs are highly vascular lesions and can cause intraoperative excessive hemorrhage during surgery. Preoperative embolization is often mandatory to minimize blood loss [9–11,16].

At our institution, we performed intraoperative vertebroplasty for external embolization and learned that it can effectively minimize blood loss. In the present study, we retrospectively evaluated the effectiveness and safety of vertebroplasty during decompression surgery for S3 VHs.

Materials and methods

General information

This study was approved by our hospital's ethics committee and conducted according to the principles of the Declaration of Helsinki.

We reviewed our spinal tumor database and identified a total of 61 patients with aggressive (S3) VHs who had undergone treatment or consultation with the spinal surgery team at our hospital between 2001 and 2016. Patients treated before 2001 were lost to follow-up because of frequent changes in addresses and telephone numbers. Eventually, we identified 39 patients with a definitive pathologic diagnosis of aggressive VHs who underwent primary decompression surgery in our department.

Hospital charts, operating room reports, anesthesia reports, office charts, pathology reports, and radiographs of the included patients were retrospectively evaluated. Data pertaining to patient age, sex, symptoms, underlying diseases, smoking habits, body mass index, neurologic function, radiological features, Enneking stage, surgical procedure, surgical duration, estimated blood loss during surgery, pathology, time between surgery and discharge, and treatment complications were collected. The modified Frankel grade was used to evaluate neurologic function. Enneking staging was based on radiological findings.

Imaging and biopsy

We routinely performed posteroanterior and lateral spinal radiography, computed tomography (CT), and magnetic resonance imaging (MRI) for all patients. Typical lesions exhibit a honeycomb appearance on CT and a salt-and-pepper appearance on MRI. For patients with atypical images, CT-guided biopsy was indicated and performed by our interventional radiologists.

Treatment protocol

In our practice, radiotherapy is generally the first choice of treatment, particularly for patients with mild or slowly developing neurologic deficits, including those with multiple-level VHs or massive soft tissue invasion. Indications for surgery at our institute include ineffective radiotherapy or severe or rapidly developing neurologic deficits (muscle strength grade of <3 of 5 and rapid deterioration of neurologic function within 2 weeks).

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