

Clinical Study

Resection of benign vertebral tumors by minimally invasive techniques

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Abstract

BACKGROUND CONTEXT: Benign tumors of the vertebrae are generally an uncommon cause for surgery. Complete removal of these tumors requires in most cases extensive surgical technique that consists of generous surgical exposure followed by laminectomy, facetectomy, and sometimes even an instrumented fusion.

PURPOSE: The aim was to describe our experience in performing resection of benign vertebral tumors, using a minimally invasive surgical (MIS) approach.

STUDY DESIGN: This was a retrospective review of case records.

PATIENT SAMPLE: Patients who underwent MIS, resection of benign vertebral tumors.

OUTCOME MEASURES: Complete neurologic examination and pain evaluation, as measured by the visual analog scale (VAS). Secondary outcomes included postoperative spinal instability assessment and surgical margins examinations.

METHODS: Patients were evaluated preoperatively and postoperatively at 1, 3, and 6 months intervals clinically and radiographically using plain radiographs and postoperative computed tomography (CT) scans. Final pathologic report, operative time, blood loss, complications, and hospital length of stay were also recorded.

RESULTS: Between 2009 and 2013, 14 patients underwent MIS, resection of benign vertebral tumors at our institution. Mean follow-up time was 4 years. There were eight men and six women with a mean age of 27 years (range 16–68 years). For tumors located in the posterior elements, a direct posterior approach was used. Tumors located at the pedicle of the vertebra were excised using a transpedicular approach, and tumors protruding into the foramen were excised using the transforaminal approach. The transcanal approach was used when decompression of the thecal sac or nerve root was required, and the retroperitoneal transpsoas approach was used for tumors located in the vertebral body. Complete removal of these tumors was achieved in all cases, and was verified by a follow-up CT scan. Pathology revealed osteoid osteoma in five patients, osteoblastoma in three patients. Eosinophilic granuloma, fibrous dysplasia, and fibroid adenoma were found in one case each. Average VAS pain score improved from 7.7 (7–9) to 2.8 (0–7) after surgery.

CONCLUSIONS: Minimally invasive techniques are a valuable choice for the treatment of benign osseous tumors of the spine. A larger, long-term study is in progress. In the meantime, we suggest surgeons experienced with both open and MIS surgery should consider these techniques. © 2015 Elsevier Inc. All rights reserved.

Keywords: Minimally invasive; Osteoid osteoma; Osteoblastoma; Eosinophilic granuloma; Fibrous dysplasia; Marginal excision

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Each author certifies that his or her institution has approved the protocol for this investigation, and that all investigations were conducted in conformity with ethical principles of research.

The disclosure key can be found on the Table of Contents and at www.TheSpineJournalOnline.com.

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Introduction

Benign tumors of the vertebrae are generally an uncommon cause for surgery. Rather, they are diagnosed as incidental findings after imaging studies of the spine [1]. Many of them, if asymptomatic and not suspicious for malignant or aggressive behavior can be followed up periodically to ensure lack of progression. If the tumor is symptomatic and suspected to cause pain, spinal deformity, or compression over the adjacent nerves, surgical intervention is usually indicated [2]. Surgical treatment can range in aggressiveness and magnitude from percutaneous kyphoplasty for the treatment of hemangioma to en bloc spondylectomy in cases of large aggressive tumors. However, in most cases, the surgical removal of these tumors consists of intralesional curettage of the tumor until normal bony borders are reached [3,4].

Successful resection of these tumors can be technically challenging. Locating the affected vertebra, especially in the thoracic region can be tricky without the use of an intraoperative computed tomography (CT) imaging [5]. The lesions are usually covered by normal-appearing bone and cannot be identified from the surface of the vertebra. In addition, their sizes can be very small, being only a few millimeters thick as in osteoid osteoma. Finally, they might be located in areas of the vertebra that are difficult to reach such as inside the pedicle or the vertebral body.

Because of these technical challenges, extensive surgical technique that usually consists of generous surgical exposure followed by laminectomy, facetectomy, and instrumented fusion, has previously been described for the treatment of these tumors [3]. Although this approach enables gross removal of the tumor, it necessitates fairly large soft-tissue dissection, and resection of healthy vertebral osseous structures, which may result in significant morbidity, including intraoperative blood loss, postoperative instability and pain, and prolongation of the postoperative hospital stay.

In this study, we describe our experience with performing intralesional resection of vertebral benign tumors from various locations of the spine, using a minimally invasive tubular retractor system. The surgical techniques and the patient outcomes are presented and discussed.

Materials and methods

Records of patients who underwent minimally invasive resection of vertebral tumor from May 2009 through December 2013 were reviewed.

Patients have been evaluated preoperatively and postoperatively at 1, 3, and 6 months intervals. Outcome measures included a complete neurologic examination and pain, as measured by the visual analog scale. Secondary outcomes included postoperative spinal instability and surgical margins. These were assessed clinically and radiographically using plain radiographs, and postoperative CT scans to verify complete removal of the tumor. Final pathologic report,

EVIDENCE & METHODS

Context

Excision of benign tumors of the spine, such as osteoid osteoma, can require extensive surgical exposure and substantial perioperative morbidity. The authors present their experience treating benign tumors of the spine using minimally invasive (MIS) techniques.

Contribution

The authors included 14 patients in this retrospective review. The authors report complete excision of the tumor in all cases as confirmed by postoperative CT imaging. Surgical characteristics and complication profile were comparable to other reports of MIS spine surgery.

Implications

This study is an uncontrolled retrospective review of a small number of patients and thus unable to address the high potential for selection and indication bias to confound results. While this technique may be promising, further research along the lines proposed by the authors must be completed before its acceptability as a regular approach to surgery for benign tumors of the spine can be widely endorsed.

—The Editors

operative time, blood loss, complications, and hospital length of stay were also recorded.

Surgical techniques

Different modifications of the minimally invasive technique were applied according to tumor anatomical characteristics; these are elaborated in case descriptions.

Case 1: a transforaminal approach for the excision of an osteoid osteoma located at the right L5–S1 foramen.

The subject was positioned prone on a Jackson table. The level of L5–S1 disc was identified by fluoroscopic guidance, and a guide pin was inserted and positioned at the lateral edge of the L5 pars. A 2-cm long skin and fascia transverse incision was made, and sequential tubular dilators (METRx; Medtronic Sofamor Danek, Memphis, TN, USA) were inserted. Subsequently, an 18-mm working channel was positioned between the L5 transverse processes (TPs), the sacral ala, and the lateral edge of the L5–S1 facet joint. A surgical microscope was then introduced into the operating field. After exposure of the bony elements, the principal anatomic landmarks: the lateral edge of the pars medially, the facet joints at the inferior and superior aspects of the pars, the base of the TPs of the cephalic and caudal vertebrae were identified. A curved micro curette and Kerrison rongeur were used to define the

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