Percutaneous Sclerotherapy of Symptomatic Vertebral Hemangiomas: Case Report and Review of the Literature

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ABSTRACT

The management of vertebral hemangiomas remains controversial. This report describes the successful management of a spinal cord compression caused by an intra- and extra-osseous vertebral hemangioma, with a percutaneous injection of absolute alcohol. A 71-year-old woman presented with lower-extremity weakness and sensory disturbance. Magnetic Resonance Imaging and Computed Tomography confirmed the presence of vertebral hemangioma involving the Th 11 vertebral body. CT-guided percutaneous transpedicular injection of absolute alcohol into the affected vertebral body resulted in symptomatic and imaging improvement. CT-guided percutaneous transpedicular injection of absolute alcohol into symptomatic vertebral hemangiomas is a simple, safe and effective technique for relieving compression and devascularising the hemangioma.

Key words: vertebral hemangioma, ethanol, CT guide

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Introduction

Many vertebral hemangiomas are asymptomatic, and they rarely need treatment. However, if a hemangioma compresses the spinal cord or nerve root and causes symptoms, treatment becomes necessary. Such symptomatic hemangiomas have generally been treated by surgery, but intraoperative hemorrhage has been a problem in surgical treatment. Radiotherapy has been a second choice, and it has been reported to be effective for the control of some symptoms including pain, but it cannot be expected to produce quick effects on spinal cord compression symptoms. In the case reported here, we observed a reduction in the tumor size and alleviation of clinical symptoms by percutaneous transpedicular ethanol injection into a symptomatic thoracic vertebral hemangioma.

Case

A 71-year-old female began to suffer low back pain and radiated pain of both lower extremities 1 year before, followed by the appearance of numbness below the ankles, dysbasia, and dysuria, and she (Received: January 27, 2005, Accepted: March 1, 2005)
visited us due to exacerbation of these symptoms. Thoracic vertebral MRI and CT performed 6 years before had suggested vertebral hemangioma (Fig. 1), but the patient had been observed because the lesion had been asymptomatic. Neurological findings: The bilateral lower limb muscle strength (anterior tibial muscle, extensor hallucis longus muscle, gastrocnemius muscle) was 4/5 MMT. The gait was spastic. Patellar tendon reflex and Achilles tendon reflex were bilaterally and markedly enhanced, and Babinski reflex was bilaterally positive. The vibration, tactile, and pain sensibilities were reduced in areas distal to the ankles, and bladder and rectal disturbances were noted.

Electrophysiologic examinations: Recording of SEP was poor in both lower extremities.

Images: Plain radiography showed longitudinal arrangement of trabeculae in the T11 vertebral body. CT showed sparse polka dots in the vertebral body, and the mass involved the vertebral arch (Fig. 2a). On MRI, the entire T11 vertebral body showed high signal intensity in both T1- and T2-weighted imaging, the lesion was heterogeneously contrasted and extended from the vertebral body to the vertebral arch on contrast-enhanced MRI. The spinal cord was compressed from both anteriorly and posteriorly by an epidural tumor that projected into the vertebral canal (Fig. 2b,c).

Since all thoracic and lumbar vertebrae below T12 showed compression fracture due to osteoporosis, surgical fixation was considered difficult. Therefore, surgical resection of the tumor was abandoned, and ethanol injection therapy was attempted with careful informed consent.

**Surgery and postoperative course**

In the CT Room, the patient was given general anesthesia (induced with 100 mg propofol and 6 mg vecuronium bromide, i.v.; endotracheal intubation) and laid in the prone position. Under CT guidance, a bone biopsy needle (Osteocyte bone biopsy needle 13 G, 15 cm long, MEDICOS HIRATA) was advanced to the center of the T11 vertebral body percutaneously and transpedicularly. After confirming the venous flow of the vertebral body using a contrast medium
Fig. 2
a. Transverse CT scan demonstrate sparse bone trabecular structures and dotted shadows in the vertebral body.
b. T1-weighted gadolinium enhanced MR image shows inhomogenous enhancement of the vertebral body with strongly enhancing posteriorly protruding hemangioma compressing the spinal cord.

Fig. 3
T1-weighted gadolinium enhanced MR image obtained one month later after ethanol therapy reveals restoration of the spinal arachnoid space and relief of cord compression (compare with Fig. 2).

by both fluoroscopy and CT, absolute ethanol (marketed by Nippon Shinyaku, manufactured by Shioe Co., Osaka City) was injected at 4 ml from the right and 9 ml from the left. Injection of absolute ethanol from the right caused marked bradycardia due to vagovagal reflex. Although the bradycardia disappeared after intravenous injection of atropine sulfate, the treatment was temporarily suspended. MRI immediately after surgery showed thrombus formation in the anterior part of the vertebral body but not in the tumor on the anterior aspect of the vertebral canal. She had no neurological recovery with spastic gait and bladder dysfunction. Therefore, about 1 month later, 9 ml of absolute ethanol was injected percutaneously and transpedicularly from the right by the same technique under anesthesia of sufficient depth (induced by i.v. injection of 100 mg propofol, 0.2 mg fentanyl citrate, and 6 mg vecuronium bromide; endotracheal intubation; maintained with 4% sevoflurane). MRI after surgery showed thrombus formation and shrinking of the entire tumor, delineation of the subarachnoid space, and alleviation of spinal cord compression (Fig. 3). Concerning clinical symptoms, discomfort persisted in distal parts of the bilateral lower extremities, but bladder and rectal disturbances and spastic paralysis disappeared, and the patient, becoming able to walk without assistance, was discharged. The patient has been treated as an outpatient for 1 year after discharge without a new episode of fracture, being prescribed etidronate disodium for the prevention of compression fractures.
Discussion

Vertebral hemangioma is a benign tumor observed in about 10% of those examined by autopsy. It is also detected clinically without symptoms [12,15,17]. Asymptomatic hemangiomas remaining in the vertebral body are not considered to progress or to need treatment, but treatment becomes necessary if they develop posteriorly beyond the vertebral cortex and cause myelopathy or radiculopathy (which are generally considered to occur in 1% or less of cases)[5]. They have been treated by methods including direct resection and fixation [4,6,9,14,16,23,28], embolization [10,25,26,30], irradiation [11], and ethanol sclerotherapy [1,5,7,12,18,19,21,22,24]. Decompression by surgical resection has been reported to produce quick effects but to occasionally cause massive intraoperative hemorrhage because of the nature of the lesion, resulting in insufficient resection and palliative procedures such as laminectomy [3,5,8,11,12,16,19]. Concerning embolization, many hemangiomas are located in the thoracic vertebrae, and the radiculomedullary artery and the vessel supplying the tumor often originate from the same vessel, making selective embolization using a liquid embolizing agent difficult [5]. Also, the effect of embolization is temporary[30], and it is presently performed preoperatively for reducing hemorrhage [4,6,9,14,16,23,28]. Radiotherapy is a second choice, and it is reported to be effective to an extent for controlling symptoms such as pain [2,20,27,29], but the therapy involves the risk of radiation injury while the tumor is intrinsically benign, and it is not expected to produce quick effects on cord compression symptoms [5]. The absolute ethanol injection therapy for vertebral hemangiomas performed in this study has been performed since 1994 [12], and it has been reported to be effective [1,5,7,12,13,21,22,24]. As for the long-term prognosis, symptomatic improvements were observed without complications in 9 of the 11 patients followed-up for a mean period of 40 months (maximum 76 months) reported by Doppman et al. [5] However, absolute ethanol injection therapy has not been covered by medical insurance in Japan and, thus, has not been performed widely. Advantages of this therapy are: The simplicity of the procedure, less invasive than surgical treatment, no need for postoperative rest, effective also for lesions compressing the spinal cord, rapid effects, and therapy can be repeated [7]. In cases that showed compression of the spinal cord such as the case presented here, the tumor size was reduced, and spinal cord compression was relieved after surgery. Since ethanol dehydrates and fixes cells, ethanol injection is considered to alleviate spinal cord compression symptoms within a few days by causing thrombus formation, destroying the tunica intima, and reducing the tumor size. Injection of ethanol causes intralesional thrombosis and destruction of the endothelium that composes hemangioma. Devascularization is followed by shrinkage of the lesion, which thereby decompresses the cord and nerve root [5]. Although absolute ethanol has neurotoxicity, it is reported usually not to cause nerve damages because of the presence of the periosteum as a barrier between the dura mater and hemangioma [5]. However, injection of a large volume of ethanol into the vertebral body may cause pathologic fracture, which has been reported in 2 of the 13 patients of Goyal et al. and 2 of the 11 patients of Doppman et al. Pathological fracture was managed by surgical resection and fixation of the vertebral body in all these patients [5]. In Doppman’s patients who suffered fracture, ethanol was injected at a total volume of 42 ml and 50 ml, and the authors recommended that the volume of ethanol injection should be 15 ml or less [5]. In our patient, ethanol was injected at 10 ml or less, and etidronate disodium was periodically administered postoperatively for the prevention of compression fractures. Cases that showed exacerbation of neurological symptoms have been reported in the literature [23]. These cases had been asymptomatic, and we estimate that there was some room in the vertebral canal, that ethanol entered the epidural venous plexus located in this region to thrombose it, and that this thrombosed venous plexus compressed the spinal cord. On the basis of our experience in percutaneous vertebroplasty for the treatment of compression fracture, we are making efforts to prevent complications by evaluating the
venous flow in the vertebral body and vertebral canal by performing dynamic CT and thin slice CT immediately after injection of a contrast medium in addition to ordinary test contrast fluoroscopy before injection. We also performed this treatment under general anesthesia, because intravertebral injection of ethanol has been reported to cause intense pain. At the first treatment, the depth of anesthesia was insufficient, and ethanol was injected relatively rapidly. This caused vascular pain, which induced vagovagal reflex, and caused marked bradycardia, making sufficient treatment impossible. At the second treatment, injection was performed slowly under anesthesia of sufficient depth. Experience in intravascular surgery of the head, neck, and face regions indicates that ethanol causes no necrosis of the puncture site or generalized symptoms unless there is extravasation. Thus, ethanol does not act as a systemic toxin unless it flows into the systemic circulation in a large bolus, and it is detoxicated by dilution when it enters the systemic circulation via collaterals and veins. However, precautions such as slowly injecting it to avoid its rapid efflux into the venous system and sufficiently anesthetizing the patient are needed in this treatment. Since the maximum tolerated dose of ethanol is considered to be 1 ml/kg [31], an ordinary dose of its intravertebral injection is expected to cause no problem. However, as death has been reported after injection at 0.52 ml/kg due to cardiotoxicity [3], a recommendable injection volume per treatment is considered to be 15 ml or less [3,5].

Conclusion

We reported a case of symptomatic thoracic vertebral hemangioma in which spinal cord compression symptoms were alleviated by percutaneous transpedicular ethanol injection therapy. Percutaneous transpedicular ethanol injection under CT guidance is a mildly invasive, safe, and effective therapy.

References

12. Heiss JD, Doppman JL, Oldfield EH: Brief report: relief of spinal cord compression from vertebral hemangioma by intralesional injection
Reviewer's comment: Shunji Asamoto, M.D.
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International University of Health and Welfare
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I think this paper is very excellent, because the authors not only addressed technical procedures of the operation in detail but also called attentions of the operators about the risks in anesthesia. In addition, they compared the injection volume of alcohol with ones described in other papers, which would be a great help to us, the clinicians.

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This article reports a very relevant experience with a percutaneous technique to achieve sclerosis of symptomatic vertebral hemangioma and decompression of the spinal cord and nerve roots. The study design is case report and review of the literature. The results of their review reveal that the incidence of vertebral hemangioma causing compressive neurological symptoms is rare despite the overall prevalence of vertebral hemangioma. In these cases the clinical presentation is usually the subacute or delayed onset of progressive neurological symptoms and may mimic those symptoms caused by a malignancy. If a patient presents with acute myelopathy, many neurosurgeon may consider decompressive surgery. Angiographic embolization of feeding vessels has been reported effective in minimizing operative blood loss, and surgical decompression and stabilization is frequently indicated. Postsurgical radiotherapy has also been demonstrated to serve as a limited adjunct to surgery by reducing tumor recurrence in the event of less than complete tumor resection. The absolute ethanol injection therapy for vertebral hemangioma has been performed since 1994. Under CT guidance the affected vertebral body is punctured by a biopsy needle percutaneously and transpedicularly, and sclerosant is injected directly into the tumor to induce shrinkage of the whole tumor mass and release of the compressed spinal cord. Neither decompressive surgery, radiation therapy nor stabilization was required with this technique. However, a great care must be taken to avoid ethanol injection to epidural venous plexus to induce cord compression by thrombosed venous plexus. A sufficient experience with in percutaneous vertebroplasty for more common disease, compression fracture, is required before performing this technique for symptomatic vertebral hemangioma.