

Management of Symptomatic Vertebral Hemangiomas : Review of 13 Patients

L. Murugan, R.S. Samson, M.J. Chandy

*Department of Neurological Sciences
Christian Medical College and Hospital
Vellore - 632 004, India.*

Summary

Thirteen consecutive cases with symptomatic vertebral hemangiomas, managed during a five year period from January 1995 at the Christian Medical College and Hospital, Vellore, were analysed. Twelve patients had lesions in the thoracic and 1 in the sacral region. Eight patients had multiple level involvement. Seven patients had laminectomy and soft tissue component excision, of which one had intraoperative injection of absolute alcohol and one had postoperative radiotherapy. One patient had vertebrectomy and stabilization with preoperative embolization. One patient underwent only endovascular embolization. However, the focus of this communication is on 4 patients who underwent a CT guided percutaneous transpedicular injection of absolute alcohol into the affected vertebral body. In the surgical group, 6 patients had cavernous type and 2 patients had mixed type of hemangiomas. Ten patients improved on the Ranawat grade by the time of discharge. On the MRC grade, 11 patients had improved, one was grade 5 pre and postoperative, while one did not improve. Several options are available for the management of symptomatic vertebral hemangiomas and multiple modalities may have to be used for a single patient. CT guided percutaneous transpedicular injection of absolute alcohol shows promising results. However, long term follow up is mandatory.

Key words : Vertebral hemangioma, Alcohol ablation, Management.

Neurol India, 2002; 50 : 301-305

Introduction

Vertebral hemangioma is the most commonly encountered tumor of the vertebral column.¹ This

benign vascular lesion has an estimated incidence of 10-12% in the population, based on large autopsy series and a large review of plain spine films.²⁻⁵ Only 0.9-1.2% of all vertebral hemangiomas are symptomatic.^{6,7} Women are affected more often than men and young adults more commonly symptomatic than the elderly.⁸ The hemangiomas may involve any

Correspondence to : Dr. M.J. Chandy, Professor, Indo-American Hospital, Brain and Spine Centre, Akkarappadam, P.O. Box -Vaikom - 686 143, India.

portion of the spinal column, including the sacrum, but occur most often in the thoracic spine followed by the lumbar spine.¹ In slightly less than two-thirds of cases, a single vertebral body is involved. Two to five lesions are encountered in approximately one-third of the cases. Involvement of more than five vertebral bodies is extremely rare.¹ Hemangiomas may occur in the posterior elements, the vertebral body, or even in a circumferential pattern involving all three columns. Significant paraspinal tumor masses are occasionally seen.⁸ The management options include surgical decompression, endovascular embolization, radiotherapy, and injection of absolute alcohol or methyl methacrylate into the vertebral body or any combination of these. This report analyses the authors experience with various modalities in the management of vertebral hemangiomas in the last five years.

Material and Methods

Patient population : A study of 13 consecutive cases with symptomatic vertebral hemangiomas, managed during a five-year period from January 1995 at the Christian Medical College and Hospital, Vellore, was undertaken.

Clinical assessment and diagnostic imaging : The clinical features evaluated included back pain, radiculopathy, myelopathy, sensory deficits, bladder/bowel involvement and reflexes. All patients were evaluated pre and postoperatively using MRC grading for motor power and the clinical scoring system developed by Ranawat et al, namely, normal - grade I, radiculopathy or mild myelopathy - grade II, moderate myelopathy - grade IIIA, severe myelopathy grade IIIB. All patients had X-rays, along with CT scans or MRI scans of the relevant vertebral levels.

Management : The treatment modalities were surgery with preoperative embolization, peroperative alcohol injection or postoperative radiotherapy. Patients who underwent surgery had either a vertebrectomy via an anterior approach or a laminectomy with varying degrees of soft tissue component excision. It may be noted that endovascular embolization, intraoperative alcohol injection and postoperative radiotherapy were used as adjunctive treatment modalities when indicated. Alcohol injection into the vertebral body was also done as a CT guided percutaneous transpedicular procedure.

Follow-up : All patients were assessed in the ward postoperatively and long term follow up was obtained by clinical and functional evaluation in the hospital or

by correspondence with the patient using a standard format.

Results

The age of patients ranged from 15 to 61 years, with a mean of 35.5 years. There were 8 females and 5 males. The duration of symptoms and/or signs ranged from 1 month to 14 years, with a mean of 2.4 years. Sixty nine percent of patients had backache with varying degrees of sensory involvement. All but one of the 13 patients presented with features of myelopathy, one of them during pregnancy. One patient who had a sacral hemangioma presented with cauda equina syndrome. This was the only patient who had bladder symptoms.

Plain x-ray findings included vertical trabeculations, honeycomb appearance, and/or expansion of the vertebral body. CT scan revealed a characteristic polka dot appearance of the vertebral body. MRI showed increased signal intensity on both T1WI and T2WI, alternating with hypointense areas, giving a salt and pepper appearance. The hyperintense areas represent fat and degenerated marrow, while the hypointense areas represent flow voids. The extraosseous components of the hemangiomas were found to enhance brilliantly with gadolinium.

All but one of the 13 patients had lesions in the thoracic level. One patient had sacral hemangioma. Eight patients had multiple level involvement (2 levels-3, 3 levels-3, 4 levels-1, 7 levels-1), while 5 had a single level involvement.

Management : Eight patients underwent surgical procedures. Seven patients had laminectomy with varying degrees of soft tissue component excision. One of these had intraoperative injection of absolute (100%) alcohol into the vertebral body to control the bleeding and one patient underwent radiation therapy following the laminectomy. One patient underwent preoperative endovascular embolization with gelfoam followed by thoracotomy and radical excision of the vertebral body, which was then replaced with titanium cage and bone graft followed by posterior fusion, using a Hartshill rectangle. Six patients in the surgical group improved by at least 1 Ranawat grade, while 2 patients did not show any improvement.

Histopathological reports for the surgical group showed 6 patients with cavernous type and 2 patients with mixed type of hemangiomas. One of these was mostly cavernous while another was mostly of

capillary type. None of the patients in our surgical group had a pure capillary type hemangiomas.

One patient underwent transfemoral endovascular embolization with polyvinyl alcohol particles and glue. She improved in the immediate postembolization period to grade 5 power in both the lower limbs with only minimal residual pain and exaggerated reflexes.

Four patients underwent CT guided percutaneous transpedicular injection of absolute alcohol. The procedure involved identification of pedicle of the pathological vertebra by CT scan. A bone needle was then percutaneously inserted into the pathological vertebral body through the pedicle under continuous CT guidance. Contrast material was then injected into the vertebral body and the rate of washout was noted. Following this, the vertebral body was injected with absolute (100%) alcohol. Contrast was again injected to note the degree of washout. Further injections of absolute alcohol into the vertebral body were carried out till there was no washout of contrast. Three patients improved by 1 Ranawat grade within the first 48 hours while the fourth who had presented with total cord damage for a period of 3 months did not show any improvement in motor power or sensory symptoms, but her back pain reduced significantly.

Eleven patients improved in their MRC grading of motor power by at least one grade, one patient with normal power remained status quo, while one with grade 0 did not show any improvement by the time of discharge. None of the patients recruited any fresh deficits after the procedures. There was no mortality in our series. Long term follow-up was available for 7 patients. Five patients had become grade I on the Ranawat grade while two patients had improved by one grade.

Discussion

Vertebral hemangiomas are mostly asymptomatic. The symptomatic ones may have only pain (54%) or may be associated with variable neurologic symptomatology (45%).⁹ In this series, 69% of patients presented with pain while 100% of patients presented with neurologic deficits. This probably implies that these patients presented at a fairly advanced stage of the disease. The age and sex distribution in this series is comparable to those described in literature.⁸ One patient in this series presented during her pregnancy. Presentation during pregnancy may result from a hormonal stimulus for

tumor growth. The radiological features were similar to other reports.^{9,10} All but one of the lesions were in the thoracic region. One patient had a sacral hemangioma. There were no lesions in the lumbar and cervical regions, unlike in other reports.¹¹ Sixty one percent of patients had lesions at multiple levels, which is higher than reported earlier.

Vertebral hemangioma is a benign vascular lesion of bone, usually of dysembryogenetic origin or a hamartomatous lesion.¹¹ It can be cavernous, capillary or a mixed type.^{1,8} In the cavernous form, dilated blood vessels get clustered without intervening bone stroma. In the capillary form, thin walled blood vessels are separated by normal bone. Arteriovenous shunting is not typically present.⁸ Pastushyn et al¹¹ reported that 28% of their patients had cavernous type, 50% had capillary type while 22% had mixed type of vertebral hemangiomas. In this series, however, it was noted that 75% of patients had cavernous type, 25% had the mixed type and none had the purely capillary type of vertebral hemangioma.

Several options are available for the management of symptomatic vertebral hemangiomas and multiple modalities may have to be used for a single patient. The treatment modalities include surgical decompression, endovascular embolization, radiotherapy, and injection of absolute alcohol or methyl methacrylate into the vertebral body or any combination of these. The non-surgical modalities are used due to the highly vascular nature of the tumor with the threat of mortality due to exsanguination during surgery and the difficulty in approaching and totally excising the tumor with its associated morbidity.

The goals of surgery include bony decompression by laminectomy or vertebrectomy and excision of soft tissue components of the tumor compressing the neural elements. Surgery can be combined with embolization or injection of absolute alcohol. In this series, 8 patients underwent surgical procedures. Seven of these had laminectomy with varying degrees of soft tissue component excision. Pastushyn et al¹¹ reported 6% mortality in their surgical group. All of these were due to exsanguination during attempts to remove large soft tissue tumor in the ventral part of the vertebral body. There was no mortality in this series.

Endovascular embolization with particulate agents such as polyvinyl alcohol foam is reported to produce dramatic but usually transient remissions.¹²⁻¹⁴ One

patient in this series underwent endovascular embolization with polyvinyl alcohol particles and glue. She showed dramatic immediate improvement in neurological status. Long term follow-up is needed to assess the efficacy of this procedure.

Vertebral hemangiomas are radiosensitive lesions that respond to administration of 3000 to 4000 cGy.⁹ Radiation therapy has been used most often to treat lesions associated with pain. Yang et al¹⁵ and Faria et al¹⁶ reported complete reversal of paraplegia of several weeks duration following radiation therapy alone. Radiation therapy as the sole management modality for patients with progressive neurological deficits has, however, been controversial. Others believe that radiotherapy is as effective as embolization of the feeding vessels without the hazards of an invasive technique.⁹ Radiation therapy has also been used for residual tumor following surgery. The beneficial results of radiation therapy have, however, to be weighed against the potential risk of radionecrosis of the spinal cord and vertebral bodies, leading to a higher incidence of fractures resulting in neurologic deficits in a benign pathology. One patient in this series received postoperative radiotherapy for residual lesion.

There has been considerable interest recently in the treatment of vertebral hemangiomas by means of percutaneous injection of methyl methacrylate.¹⁷ This technique is ideal for stabilizing vertebral bodies at risk of collapse or for alleviating severe local pain. However, when a patient is paraparetic owing to extension of the hemangioma into the spinal canal, methyl methacrylate may fill the intraspinal component and exacerbate cord compression.¹⁵ None of the patients in this series underwent this procedure.

In 1994, Heiss et al¹⁸ published the first report of vertebral hemangiomas treated by percutaneous CT guided injection of absolute alcohol. Injection of absolute alcohol causes intralesional thrombosis and destruction of the endothelium that composes the hemangioma. Devascularisation is followed by shrinkage of the lesion, which decompresses the cord and nerve roots.¹⁹ Goyal et al,²⁰ Munk et al²¹ and Doppmann et al^{19,22} have also reported good results with this procedure. In this series, 4 patients underwent CT guided percutaneous transpedicular injection of absolute alcohol. Three of these patients improved within the first 48 hours, while the fourth who had presented with total cord damage for a period

of 3 months did not show improvement in motor power or sensory symptoms but her back pain reduced significantly.

Doppman et al¹⁹ reported no immediate complications due to this procedure. Two patients, who received the largest volumes of ethanol (42 and 50 ml), developed pathologic fractures of the involved vertebrae, 4 and 16 weeks after treatment. They suggested that a moderate dose of ethanol (<15 ml) obliterates the hemangioma without affecting stability. Goyal et al²⁰ reported that all patients in their series developed transient deterioration of neurologic status after alcohol ablation. One patient developed a paravertebral abscess. One patient developed recurrent hemangioma within a month. Another patient became symptomatic after initial good response, secondary to the collapse of the involved vertebral body. Niemeyer et al²³ reported a case of Brown-Sequard syndrome following injection of alcohol for vertebral hemangioma. In this series, none of the patients developed any fresh deficits nor was there any instance of recurrence or vertebral collapse following this procedure. Long term follow-up is needed to evaluate the occurrence of delayed complications due to this procedure.

Losner et al²⁴ reported intratumoral injection of ethanol during surgery for tumor devascularisation. One patient in this series had intraoperative injection of absolute alcohol into the vertebral body to control the bleeding. This was found to be highly effective in achieving hemostasis.

Conclusion

Early diagnosis and treatment of symptomatic vertebral hemangiomas is essential to prevent permanent and irreversible neurologic deficit. Various management options, such as surgical decompression, endovascular embolization, radiotherapy, and injection of absolute alcohol or methyl methacrylate, or any combination of these, have to be tailored to the specific patient. CT guided percutaneous transpedicular injection of absolute alcohol into symptomatic vertebral hemangiomas is a newer, simple, safe and effective technique for rapidly relieving compression and devascularising the hemangioma. Further follow-up of patients is needed to assess the long term efficacy of this procedure and the occurrence of delayed complications, including vertebral collapse and recurrence.

References

1. Hemmy DC : Vertebral hemangiomas. In : Neurosurgery. Wilkins RH, Rengachary SS (eds). McGraw-Hill, New York. 1996; 1827-1829.
2. Dagi TF, Schmidek HH : Vascular tumors of the spine. In : Tumors of the spine : Diagnosis and clinical management. Sundaresan N, Schmidek HH, Schiller AL et al (eds). WB Saunders, Philadelphia. 1990; 181-191.
3. Lang EF Jr, Peserico L : Neurologic and surgical aspects of vertebral hemangiomas. *Surg Clin North Am* 1960; **40** : 817-823.
4. Reizine D, Laredo JD, Riche MC et al : Vertebral hemangiomas, In : Radiology of the spine. Tumors. Jeanmart L (Ed). Berlin: Springer-Verlag. 1986; 73-80.
5. Blankstein A, Spiegelmann R, Shacked I et al : Hemangioma of the thoracic spine involving multiple adjacent levels: case report. *Paraplegia* 1988; **26** : 186-191.
6. Nguyen JP, Djindjian M, Gaston A : Vertebral hemangiomas presenting with neurologic symptoms. *Surg Neurol* 1987; **27** : 391-397.
7. Healy M, Herz DA, Pearl L : Spinal hemangiomas. *Neurosurgery* 1983; **13** : 689-691.
8. Camins MB, Oppenheim JS, Perrin RG : Tumors of the vertebral axis : Benign, primary malignant and metastatic tumors. In : Neurological surgery. Youmans JR (ed). WB Saunders company 1996; 3135-3167.
9. Fox MW, Onofrio BM : The natural history and management of symptomatic and asymptomatic vertebral hemangiomas. *J Neurosurg* 1993; **71** : 36-45.
10. Cross JJ, Antoun NM, Laing RJ et al : Imaging of compressive vertebral hemangiomas. *Eur Radiol* 2000; **10** : 997-1002.
11. Pastushyn AI, Slin'ko EI, Mirzoyeva GM : Vertebral hemangiomas : Diagnosis, management, natural history and clinicopathological correlates in 86 patients. *Surg Neurol* 1998; **50** : 535-547.
12. Gross CE, Hodge CH, Jr Binet EF et al : Relief of spinal block during embolization of a vertebral body hemangioma: case report. *J Neurosurg* 1976; **45** : 327-330.
13. Smith TP, Koci T, Mehringer CM et al : Transarterial embolization of vertebral hemangioma. *J Vasc Interv Radiol* 1993; **4** : 681-685.
14. Raco A, Ciappetta P, Artico M et al : Vertebral hemangiomas with cord compression : the role of embolization in five cases. *Surg Neurol* 1990; **34** : 164-168.
15. Yang ZY, Zhang LJ, Chen ZX et al : Hemangioma of the vertebral column. A report of twenty-three patients with special reference to functional recovery after radiation therapy. *Acta Radiol Oncol* 1985; **24** : 129-132.
16. Faria SL, Schlupp WR, Chiminazzo H Jr : Radiotherapy in the treatment of vertebral hemangiomas. *Int J Radiat Oncol Biol Phys* 1985; **11** : 387-390.
17. Ide C, Gangi A, Rimmelin A et al : Vertebral hemangiomas with spinal compression : The place of preoperative percutaneous vertebroplasty with methyl methacrylate. *Neuroradiology* 1996; **38** : 585-589.
18. Heiss JD, Doppman JL, Oldfield EH : Treatment of vertebral hemangioma by intralesional injection of absolute ethanol. *N Engl J Med* 1994; **331** : 508-511.
19. Doppman JL, Oldfield EH, Heiss JD : Symptomatic vertebral hemangiomas : Treatment by means of direct intralesional injection of ethanol. *Eur Radiol* 2000; **10** : 997-1002.
20. Goyal M, Mishra NK, Sharma A et al : Alcohol ablation of symptomatic vertebral hemangioma. *AJNR* 1999; **20** : 1091-1096.
21. Munk PL, Marotta TR : Intralesional injection of absolute alcohol into vertebral hemangiomas : A new treatment option? *AJNR* 1999; **20** : 959-960.
22. Doppman JL, Oldfield EH, Heiss JD : Symptomatic vertebral hemangiomas : Treatment by means of direct intralesional injection of ethanol. *Radiology* 2000; **214** : 341-348.
23. Niemeyer T, McClellan J, Webb J et al : Brown-Sequard syndrome after management of vertebral hemangioma with intralesional alcohol. A case report. *Spine* 1999; **24** : 1845-1847.
24. Losner RR, Heiss JD, Oldfield EH : Tumor devascularization by intratumoral ethanol injection during surgery. Technical note. *Neurosurgery* 1998; **88** : 923-924.

Accepted for publication : 3rd May, 2001.