

The current role of radiotherapy in vertebral hemangiomas without neurological signs. A case report and a review of literature.

Styliani Stylianidou¹, Ioannis Tzitzikas¹,
Anastasia Chatziannaki², Kyriaki Pistevou-Gompaki¹

¹Department of Radiotherapy Oncology, Aristotle University of Thessaloniki, AHEPA University Hospital

²Department of Medical Physics, Aristotle University of Thessaloniki, AHEPA University Hospital

ABSTRACT: Vertebral hemangiomas (VH) are benign vascular lesions occurring in spine. They are slowly growing tumors, sometimes causing local pain in the spine and/or neurologic disorders. Though vertebral hemangiomas are frequently seen, they are rarely symptomatic. Pain is the commonest symptom. Radiotherapy has been shown effective in many studies in terms of pain relief and at times in cord compression, too. We report a case with vertebral hemangioma without neurological signs, which has been treated in the Radiation Oncology Department of AHEPA University Hospital.

Key Words: Vertebral Hemangioma, Radiotherapy, Symptomatic vertebral hemangioma.

INTRODUCTION

Hemangiomas are benign slow growing vascular tumors that may occur anywhere in the body including bone, VH, was first described by Virchow in 1867 and characteristic radiological appearances were first noted by Perman in 1926¹. VH is the most commonly encountered tumor of the vertebral column². This benign vascular lesion has an estimated incidence of 10-12% in the population, based on large autopsy series (in about 11% at general autopsy) and a large review of plain spine films^{3,4,5,6}. The true incidence of vertebral hemangioma is unknown as the majority of them are asymptomatic and remain undiagnosed throughout the life. They may be detected as incidental roentgenographic findings or when they produce local pain and/or swelling and/or symptoms or signs of spinal cord compression. Only 0,9-1,2% of all vertebral hemangiomas are symptomatic^{7,8}. Women are affected more often than men and young adults are more commonly symptomatic than the elderly⁹. Involvement of more than five vertebral bodies is extremely rare². Hemangiomas may occur in the posterior elements,

the vertebral body, or even in a circumferential pattern involving all three columns. Significant paraspinous tumor masses are occasionally seen⁹. Treatment of vertebral hemangioma is usually done to relieve symptoms. Treatment methods include radiotherapy, surgery, embolization, intralesional injection of ethanol, and vertebroplasty with methyl methacrylate. In this report the case of a patient who received radiotherapy is analysed.

CASE REPORT

A 50-year old man with hemangioma in the 8th Thoracic vertebra was referred to our Department for irradiation, in June 2011. MRI showed a paravertebral mass (Figure 1), the differential diagnosis of which could not exclude neoplastic or tubercular nature of the lesion. Open biopsy confirmed that this mass was neoplastic. Routine blood examination, abdominal ultrasonography, chest and whole spine X-ray, were conducted in the patient and did not reveal any other disorder. The clinical evaluated features were back pain, radiculopathy (±), myelopathy (±). There were

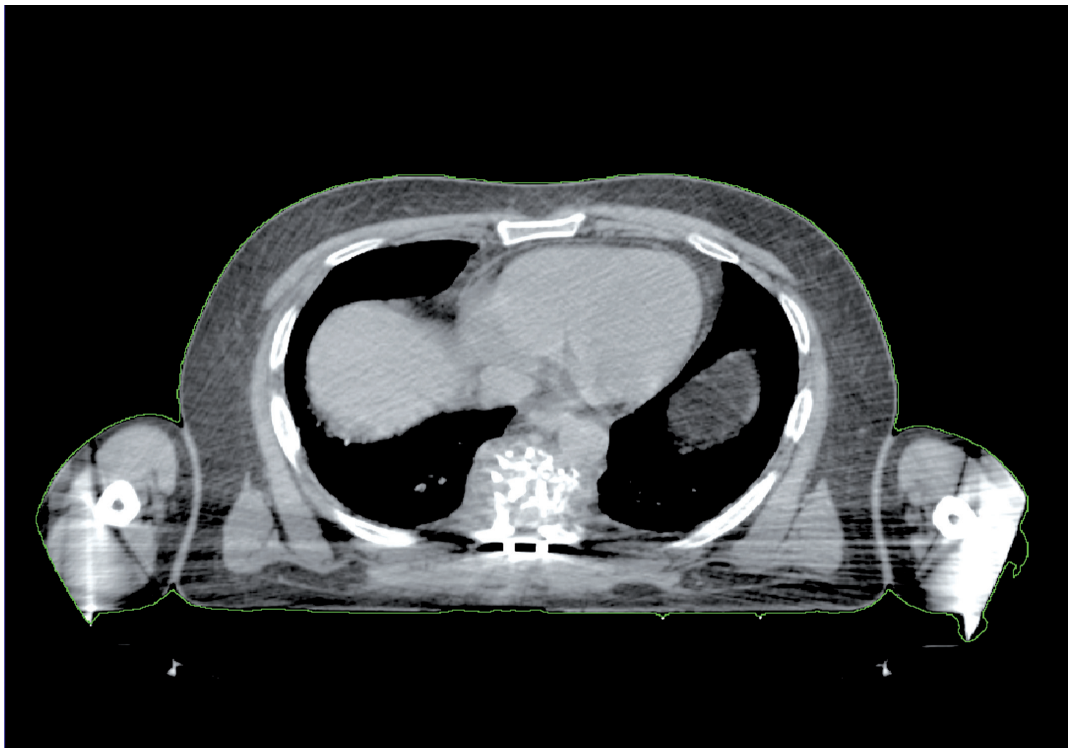


Figure 1. Paravertebral mass in Th8 (MRI before radiotherapy).

no neurological signs, sensory deficits and the patient was with normal bladder/bowel function and normal reflexes. Initially the patient was treated with embolization, then with surgery and perioperative alcohol injection. As the treatments failed to reduce the clinical symptoms he was referred to our department for radiotherapy. He received 3D-conformal radiation therapy to the involved vertebra (Thoracic 8) with one vertebra above (Thoracic 7) and one below (Thoracic 9) (Figures 2, 3, 4). The dose given to the planning target volume (PTV) was 40 Gy in 20 fractions (2Gy/Fr), over 4 weeks. Radiation was delivered by three fields. Oral Dexamethasone at a dose of 12mg daily in divided doses was started along with radiotherapy to minimize radiation induced edema and gradually tapered off at the end of radiation. Analgesics were given as required; physiotherapy was started as soon as patient's condition permitted and continued even after completion of radiation. Muscle power was assessed at the beginning of radiation, 4 weeks after completion and thereafter at three months interval during follow-up. At the end of therapy the patient had decreased pain and overall better physical status.

The MRI 3 months after the end of irradiation therapy, showed reduction of the paravertebral mass at the level of the 8th thoracic vertebra (Figure 5). The patient did not develop backache and myelopathy. Analgesics were no more required two months after the completion of radiotherapy.

DISCUSSION

Hemangiomas are benign slow growing vascular tumors composed of newly formed capillary, cavernous or venous blood vessels. Among skeletal locations, vertebrae are the second commonest site and thoracic spine is affected most frequently¹⁰. At the present case, the vertebral hemangioma was of thoracic origin.

Vertebral hemangiomas are benign vascular lesions¹¹. They can be of cavernous, capillary or mixed type^{2,9}. In the cavernous form, dilated blood vessels get clustered without the intervention of bone stroma. In the capillary form, the walled blood vessels are separated by normal bone tissue. Arteriovenous shunting is not typically present⁹.

Several options are available for the management of symptomatic vertebral hemangiomas and multiple

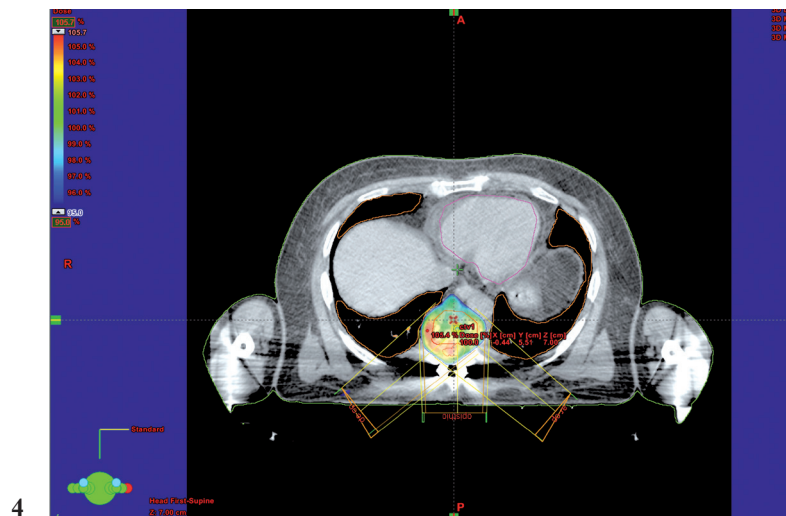
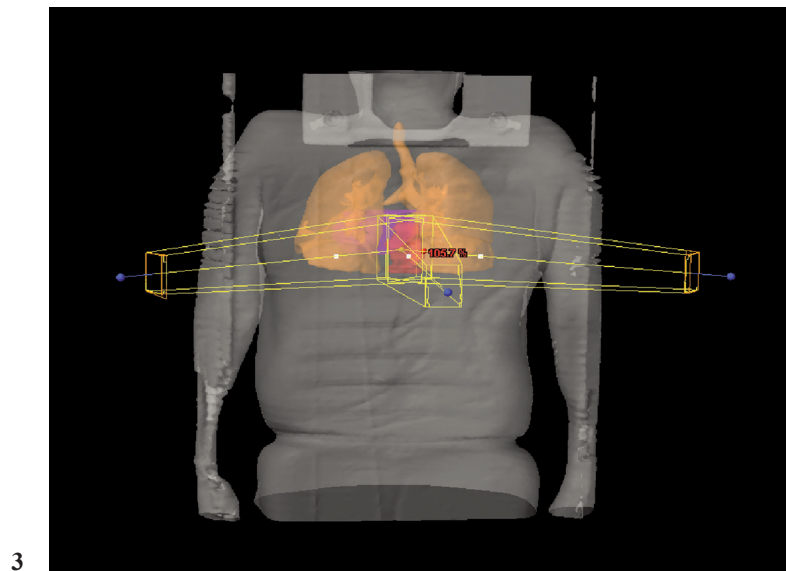
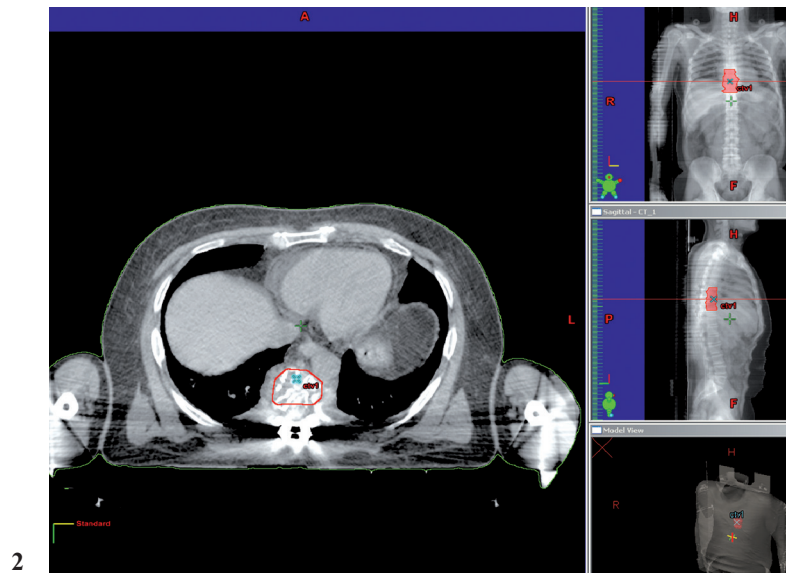


Figure 2, 3, 4. CTV-clinical target volume (red) Treatment planning-fields. For 2D, 3D conformal radiotherapy.



Figure 5. Reduction of paravertebral mass in Th8 (MRI after 3 months at the end of radiotherapy) follow-up.

modalities may have to be used for a single patient. Among the treatment modalities, the non-surgical ones (such as endovascular embolization, injection of alcohol or methyl methacrylate into the vertebral body and radiation therapy) are preferred due to the highly vascular nature of the tumor, because of the threat of mortality due to exsanguinations, the difficulty in approaching and the complete excision of the tumor with its associated morbidity during surgery. 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 correlated with embolization or injection of absolute alcohol.

Endovascular embolization with particulate agents such as polyvinyl alcohol foam is reported to produce dramatic but usually transient remissions of the lesion^{12,13,14}. Recently, percutaneous injection of methyl methacrylate into the vertebral body has generated considerable interest²¹. Methyl methacrylate is an ideal agent to stabilize the vertebral bodies which are at risk of collapse. Leakage of the agent into the drain-

ing veins or posteriorly into the spinal canal may be hazardous.

Even in a paraparetic patients, due to extension of the hemangioma into the spinal canal, methacrylate may fill the intra spinal compartment and may exacerbate the already existing cord compression, requiring immediate laminectomy. In addition, when laminae and pedicles are also involved by the hemangioma (which is a frequent feature in cord compression), the surgeon is in front of considerable intra operative bleeding during laminectomy. The injection of methyl methacrylate into the vertebral body and N-butyl cyanocrylate into the laminae and pedicles are recommended, in order to overcome this complication. Methyl methacrylate strengthens the vertebral body to prevent pathological fracture and cyanocrylate reduces the intra operative bleeding during subsequent laminectomy²².

Vertebral hemangiomas are radiosensitive lesions that respond to administration of 30 to 40 Gy¹⁵. Radiation therapy has been used most often to treat lesions associated with pain. Different reports suggest that

radiotherapy alone or in combination can give good symptomatic relief of pain^{16,17}. The radiation therapy is also used in some patients, after decompression to avoid further deterioration. In cases of acute spinal compression, radiation offers satisfying results of relief^{18,19}. Young et al reported that five out of seven paraplegic patients recovered sufficiently to walk again, after external radiotherapy alone. Recovery was complete in three of them. They also concluded that radiation can be used as a primary treatment in patients with severe cord compression. Operative decompression can be employed in cases of failure of radiation therapy¹⁷.

The exact mechanism of action of radiotherapy on vertebral hemangiomas is not clearly known. On the other hand pain relief is seen in almost all patients treated with radiation. It may be supposed that response to radiotherapy is similar to that seen in pain relief due to radiation in the management of vertebral metastasis. Radiotherapy can result in loss of segments of capillaries causing deficit of micro vascular network, with subsequent ischaemic changes. Anti-inflammatory effect of radiation has also been attributed for the relief of pain observed with radiotherapy²⁰. In our case, the patient presented therapeutic response (pain relief and regression of hemangioma) after receiving a dose of 40Gy (2GyX20fraction in 4 wks). The radiation dose received in the target volume and fractionation schedule was similar to the schemes used by several investigators that suggest a total dose of 30 to 40 Gy (1,8 to 2Gy/fraction)^{16,17,18,24}. Rades et al (2003) pooled and studied (LQ model-statistical analysis) the data to understand the impact of total dose on complete pain relief by using equivalent dose to 2Gy fractions²⁵. It was concluded that 40Gy with 2Gy/fraction gives sufficient pain relief.

Malignant transformation of vertebral hemangiomas is virtually unknown²⁶.

Malignant component was reported in a patient in whom repeated irradiation was given for recurrent hemangioma. The lesion had an aggressive behavior with repeated recurrences, which is not characteristic of benign hemangiomas. It was concluded that malignancy is unlikely to be due to irradiation²⁷. Up to date there is not much evidence of malignant transformation of the lesions, because of radiation therapy.

CONCLUSION

The aim of radiotherapy in hemangiomas is to eliminate the abnormal veins and capillaries and to reduce the size of the lesion. A known long term effect of radiotherapy is impairment of circulation by causing vascular endothelial damage. Radiotherapy is an effective and acceptable mode of treatment for symptomatic hemangiomas of vertebra, where pain is the main symptom. Other options exist, like intralesional injection of ethanol, vertebroplasty with methacrylate, surgical decompression etc. These options are invasive techniques involving risks, where as radiotherapy is non-invasive and safe.

It is considered that 40Gy delivered by conventional fractionation (2Gy/fraction) is the best dose at present. This is the accepted standard dose to achieve compensatory pain relief and at the same time is close to the tolerance level(TD5/5) of the spinal cord. However, in the present era of Intensity Modulated Radiation Therapy(IMRT), higher doses of radiation may be delivered to the involved parts of the vertebrae and may yield improved results without any substantially increased risk of spinal cord damage, which would be evaluated by further clinical studies.

Η δραστηριότητα της ακτινοθεραπείας στα σπονδυλικά αιμαγγειώματα χωρίς νευρολογικά σημεία. Μια ειδική περίπτωση και ανασκόπηση στη βιβλιογραφία.

Στυλιανή Στυλιανίδου¹, Ιωάννης Τζιτζίκας¹,
Αναστασία Χατζηγιαννάκη², Κυριακή Πιστεύου-Γομπάκη¹

¹Τμήμα Ακτινοθεραπευτικής Ογκολογίας, Αριστοτέλειο Πανεπιστήμιο Θεσσαλονίκης, Πανεπιστημιακό Νοσοκομείο ΑΧΕΠΑ

²Τμήμα Ιατρικής Φυσικής, Αριστοτέλειο Πανεπιστήμιο Θεσσαλονίκης, Πανεπιστημιακό Νοσοκομείο ΑΧΕΠΑ

ΠΕΡΙΛΗΨΗ: Τα σπονδυλικά αιμαγγειώματα είναι καλοήθεις αγγειακές βλάβες που εμφανίζονται στη σπονδυλική στήλη. Είναι αργά αναπτυσσόμενοι όγκοι που μερικές φορές προκαλούν πόνο τοπικά στη σπονδυλική στήλη και/ή νευρολογικές διαταραχές. Αν και τα σπονδυλικά αιμαγγειώματα εμφανίζονται συχνά, σπάνια είναι συμπτωματικά. Ο πόνος είναι το συνηθέστερο σύμπτωμα. Η ακτινοθεραπεία έχει δείξει δράση σε πολλές μελέτες, σε περιπτώσεις ανακούφισης πόνου και επίσης σε πίεση νωτιαίου μυελού. Αναφέρουμε μία περίπτωση με σπονδυλικό αιμαγγείωμα χωρίς νευρολογικά σημεία που έχει ακτινοβοληθεί στο Τμήμα Ακτινοθεραπευτικής Ογκολογίας στο Νοσοκομείο ΑΧΕΠΑ, Αριστοτελείου Πανεπιστημίου Θεσσαλονίκης.

Λέξεις Κλειδιά: Σπονδυλικό αιμαγγείωμα, Ακτινοθεραπεία, Συμπτωματικά σπονδυλικά αιμαγγειώματα.

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