Solitary vertebral plasmacytoma causing compression fracture in a patient with multiple vertebral hemangiomas: a diagnosis easily missed!

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Abstract

The imaging mimics, acute osteoporotic compression fractures, metastasis and malignant melanoma or plasmacytoma pathological fractures are the important clinical problems in geriatric age group that need to be differentiated due to their grossly differing prognostic and therapeutic implications. There are few suggestive features on magnetic resonance imaging (MRI) that help differentiate between these entities. Hemangiomas are very common benign spinal tumors that have characteristic features on MRI. In the setting of multiple vertebral hemangiomas causing cord compression in elderly patients, the scenario is even more complex with four different entities with different prognostic profiles. We report such a diagnostic dilemma we encountered in a middle aged female patient with multiple vertebral hemangiomas and compression fracture in D10 vertebra.

Case Report

A 50-year-old female patient presented to orthopedic OPD with 4 months history of progressive back pain with weakness in bilateral lower limbs. Clinical examination revealed grade 3 power in both lower limbs with hyperactive reflexes. Plain radiographs of dorsolumbar spine showed collapse of the D10 vertebra with preserved intervertebral disc space. The vertebra at remaining levels appeared apparently normal except for mild osteopenia. Magnetic resonance imaging (MRI) was performed to rule out cord compression. T1 weighted sequences revealed heterogeneous hypointense signal intensity within the body, left side pedicle and transverse process of D10 vertebra. On T2 weighted sequences these areas were hyperintense. On post Gadolinium Fat Saturation sequences, intense contrast enhancement were seen with a focal enhancing minimal prevertebral soft tissue component (Figure 1). Incidentally at various vertebral levels the patient had multiple well defined T1, T2 hyperintense lesions showing suppression of signal intensity on STIR sequences and avid post contast enhancement (Figure 2). Since these imaging features were thought to be typical of vertebral hemangiomas, these lesions were diagnosed as hemangiomas. In this setting of multiple vertebral hemangiomas, the altered signal intensity lesion in D10 vertebra was considered to be an atypical hemangioma. The differential of acute osteoporotic fracture was also considered. Due to absence of evidence of systemic symptoms or known primary malignancy elsewhere and also being a morphologically solitary lesion, the possibility of metastasis or myeloma was considered only as a remote possibility. For definitive pathological diagnosis, the patient underwent CT guided FNAC. Non contrast enhanced CT images showed a lytic lesion involving the D10 vertebra and its posterior elements with prominent prevertebral soft tissue component (Figure 3). FNAC revealed large hyperchromatic plasma cells suggestive of plasma cell dyscrasia.

Discussion

Hemangioma is the most common benign vertebral lesion. It is a hamartomatous lesion composed of a stroma of thin walled blood vessels, interstitial edema and interspersed fat within the trabecular network of bone. The imaging characteristics described with typical hemangiomas are due to the amount of its fat content. Predominantly fat containing hemangiomas are usually inactive lesions which show high signal intensity on both T1 and T2 weight-

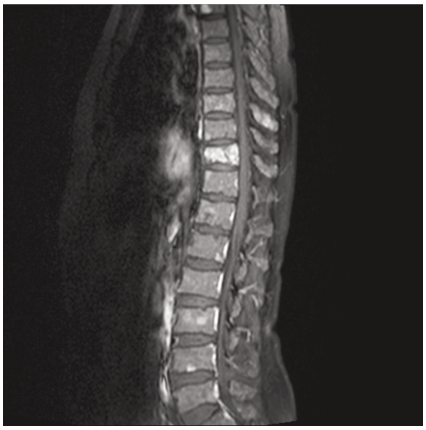

Figure 1. Sagittal magnetic resonance imaging Image showing avid heterogenous contrast enhancement in D10 vertebra with vertebral collapse seen in the same vertebra.

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Figure 2. Sagittal T2 Image showing round well defined hyperintense lesions at multiple vertebral levels suggestive of hemangiomas.

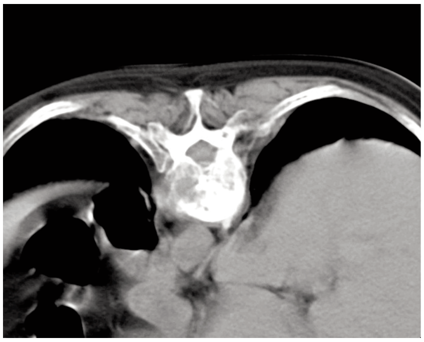

Figure 3. Non contrast enhanced CT image performed for CT guided FNAC showing lytic lesion involving the D10 vertebra and its posterior elements with prominent prevertebral soft tissue component.

ed sequences.[1] Active symptomatic hemangioma, composed predominantly of blood vessels, usually appear hypointense on MR sequences. Few of such lesions have the potential to grow and cause spinal cord compression. Although classically described as being limited to the body, vertebral hemangiomas can involve any portion of the vertebra. In about 30% cases, hemangiomas are multiple.[1]

The primary differentials for vertebral collapse in an elderly patient are osteoporotic compression fracture, metastasis, myeloma and aggressive hemangioma. The other primary benign and malignant tumors of vertebra are very rare. Multiple imaging findings were suggested to differentiate between acute osteoporotic collapse and malignant pathological collapse. Chronic osteoporotic collapse exhibit normal signal intensity in T1w sequences whereas both acute osteoporotic collapse and malignant collapse appear hypointense. Features such as low signal intensity band on T1 and T2 with maintained marrow signal intensity of the vertebral body, retropulsion of the posterior bone fragment and multiple compression fractures indicate osteoporotic collapse. Presence of an epidural mass, involvement of posterior elements, paraspinal soft tissue masses and convex posterior border of the vertebral body are suggestive of malignant collapse.[2] Metastatic and myelomatous lesions more often involve multiple rather than solitary vertebra. In the setting of multiple hemangiomas in other vertebra, the likelihood of the solitary vertebral collapse seen in our patient being due to aggressive hemangioma was high. Considering the age of the patient and the fact that there were no systemic symptoms to suggest an alternate cause, the differential possibility of osteoporotic collapse was also considered. However CT guided FNAC in our case proved the solitary vertebral collapse was due to plasmacytoma. The first case of solitary plasmacytoma of spine was reported by Shaw in 1923[3] .They are very rare precursor lesions for multiple myeloma. Solitary myeloma is a focal malignant proliferation of plasma cells with no evidence of diffuse marrow involvement. Typically plasmacytoma presents as a single collapsed vertebra. On axial images classical *mini-brain* appearance may be seen due to replacement of cancellous bone with preserved cortical outline resulting in hollow vertebral body. Unlike metastatic lesions adjacent Intervertebral disc space are preserved in plasmacytoma.[4] A useful differential Table 1 with imaging features and a diag-

Table 1.

Lesion	X-ray	CT	MRI	PET -CT
Hemangioma	Coarse, thickened vertical trabeculae giving the typical corduroy or accordion appearance	Small punctuate areas of high attenuation in the medullary cavity with thickened trabeculae - the classic polka dot sign	High signal intensity on T1 and T2 with signal intensity reduction in fat suppressed sequences. The extent of high signal intensity and suppression depends upon the amount of fat content in the lesion.	Variable. Photopenic to mild tracer uptake.
Plasmacytoma	Plain films can look normal during early pathologic process but later will demonstrate lytic	Predominantly lytic; typically involves the vertebral body and the posterior elements with compression of the cord; but, on occasion, may present as an expansible multicystic with a soft-tissue mass, fractures and osteosclerosis.	Low signal intensity on T1-weighted images and high signal intensity on T2-weighted images involving the entire vertebral body. Axial T2 images reveals diffuse high signal intensity throughout vertebral body and low-signal-intensity cortical struts resembling mini brain.	False negative results of low uptake has been reported on FDG PET-CT.
Metastasis	Single or multiple areas of bone destruction of variable size with irregular and poorly defined margins typically destroying the pedicles	Useful in evaluating lesions detected by scintigraphy, but not confirmed by plain film. It reveals trabecular and cortical bone lysis, invasion of the paraspinal tissues and the relative speed of growth of the tumor by identifying a sclerotic peritumoral reaction	On T1-WI spinal osteolytic metastases are hypointense signal in relation to the normal bone, whereas on T2-WI they are hyperintense, especially on STIR with massive enhancement on post contrast. On the contrary, osteosclerotic metastasis have low signal on T1- and T2-WI with heterogeneous enhancement on post contrast.	Positron emission tomography with fluorine-18 deoxyglucose (FDG-PET) has potential value for differentiation between osteoporotic and pathological vertebral fractures, since a high FDG uptake is characteristic for malignant and inflammatory processes
ABC	Expansile, trabeculated, lucent lesion that primarily involves the posterior elements. There may be extension into or primary involvement of a vertebral body.	Expansile multiloculated Lesion with fluid-fluid levels.	Multiloculated lytic lesion with fluid- fluid levels. Sometimes shows internal septations and trabeculations.	Despite their cystic nature, aneurysmal bone cysts may show FDG uptake high enough to be confused with a malignancy on the basis of PET alone.
Osteoportic fracture	A vertebral fracture should be diagnosed when there is loss of height of more than 20% of the anterior, middle, or posterior dimension of the vertebral body. Acute fractures present with cortical disruption or impaction of the trabeculae.	Cortical disruption, bone impaction and a retropulsed bony fragment at the superoposterior edge of the vertebral body favour the diagnosis of an acute insuffi ciency fracture	Usually present with a focal band-like area of low signal intensity bordering the fractured endplate on T1-weighted images. On STIR images, the presence of focal, linear or triangular areas of high signal intensity, equal to the signal of CSF, adjacent to the fractured vertebral endplate (fluid sign)	Usually no uptake is seen on PET CT.

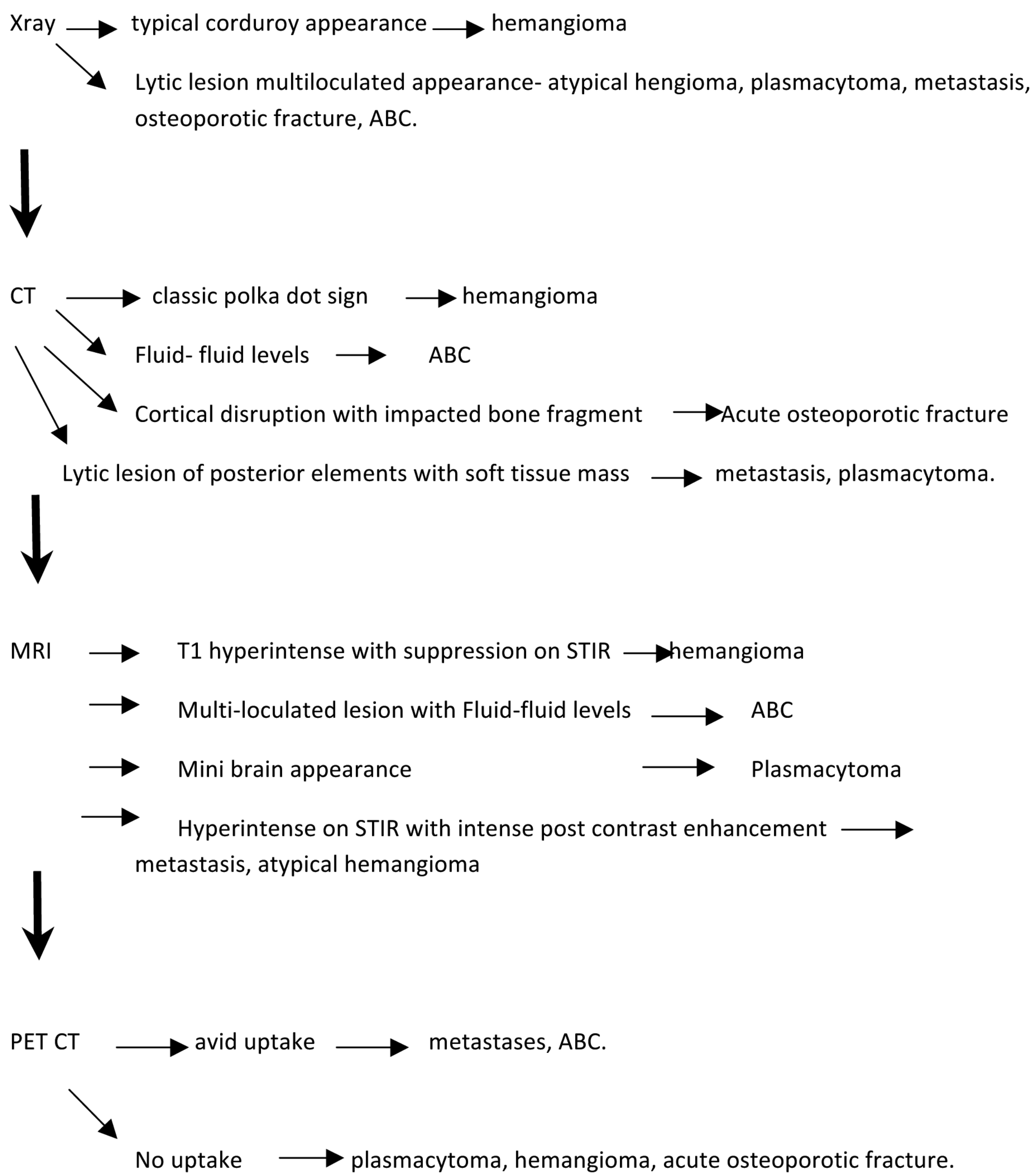

Figure 4.

nostic algorithm of these different entities is given below.[5,6]

Thus our case emphasizes the practical difficulty in correct etiological diagnosis of the solitary vertebral collapse based on imaging alone (Figure 4). Clinical features and associated findings at other vertebra may help narrow down the differentials. Expedite biopsy and tissue diagnosis is necessary in most of these cases to establish the correct diagnosis and early management.

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