CASE REPORT

Venous congestion from brachiocephalic vein stenosis mimicking sclerotic vertebral lesions

Nazimah Ab Mumin, MRad[1], Raja Rizal Raja Aman, FRCR[2], Wai Yee Chan, FRCR[2]

[1]Radiology Department, Faculty of Medicine, Universiti Teknologi MARA, Sungai Buloh, Selangor, Malaysia, [2]Biomedical Imaging Department, Universiti Malaya Medical Centre, Faculty of Medicine, Kuala Lumpur, Malaysia

SUMMARY

In central venous obstruction, vertebral marrow enhancement (VME) may be seen secondary to collateral venous flow via the vertebral venous plexus.[1] There are only sporadic case reports on pseudolesions due to collateral enhancement mimicking sclerotic osseous metastasis. This abnormal vertebral enhancement may lead to erroneous diagnosis of sclerotic metastases or suspicious bone lesion which affect the management and prognosis. We describe a case of brachiocephalic vein obstruction-related vertebral body pseudolesions as identified in contrast-enhanced computed tomography (CECT) scan.

CASE PRESENTATION

A 69-year-old man with diabetes mellitus and renal failure presented with generalised abdominal pain. He was on peritoneal dialysis via a Tenckhoff peritoneal catheter. He had multiple previous central venous catheter insertions in internal jugular veins. On clinical examination the patient was comfortable with no fever. The abdomen was soft and vital signs were normal.

Laboratory investigation showed raised white cell count of 12 x 10^9/L. The rest of the blood test parameters were unremarkable. Due to the previous clinical history, he was treated as having peritoneal catheter infection and peritonitis. Diagnosis was confirmed by catheter culture (*Corynebacterium striatum* sensitive to Vancomycin). Unresolved pain and persistently raised white cell count prompted the surgical team to perform drainage and lavage. Intraoperative findings showed right subdiaphragmatic abscess which was successfully drained. In view of a persistent right pleural effusion of 1month duration on chest radiograph, a contrast-enhanced computed tomography (CECT) scan of the thorax was performed to assess for possible intrathoracic abscess. The scan was done with intravenous (IV) contrast pump injection through left brachial vein on venous phase.

IMAGE INTERPRETATION

There were areas of abnormal marrow enhancement of the postero-central vertebral bodies of T3 and T4 (black arrows) (Figure 1A and 1B). Collateral vessels were noted surrounding the enhancing vertebral body (white arrows) (Figure 1B). No bone erosions or associated soft tissue lesions were seen. On further scrutiny, there was significant narrowing of the left brachiocephalic vein (white arrow) and proximal superior vena cava (SVC) with associated collateral vessels in the upper mediastinum, paravertebral and paraspinal regions of the upper thorax (arrowheads) (Figure 2).

As the patient had no clinical signs or symptoms to suggest vertebral metastases from an unknown primary malignancy, a provisional diagnosis of vertebral enhancement secondary to vertebral venous congestion was made.

A follow up CECT scan was done two months later with the intravenous contrast injected through right brachial vein in portal venous phase. The previously noted vertebral body marrow enhancement was no longer seen.

This confirmed the diagnosis that the abnormal marrow enhancement was due to vertebral venous plexus collateral system bypassing the left brachiocephalic vein obstruction. As the right brachiocephalic vein was patent, no collateral vessels or abnormal vertebral enhancement were evident in the follow up scan.

The patient recovered well after a course of antibiotic and was discharged and asked to continue peritoneal dialysis at home. The brachiocephalic vein stenosis was not treated as the patient was asymptomatic and dialysis was through peritoneal dialysis.

DISCUSSION

Vertebral marrow enhancement (VME) may be seen secondary to collateral venous flow via the vertebral venous plexus in the setting of superior vena cava or other central venous obstruction.[1] VME from central venous stenosis and obstruction has been previously reported and are commonly secondary to superior vena cava obstruction and malignancy.[1,5]

The case presented here demonstrates that of vertebral body enhancement due to left brachiocephalic vein stenosis. These pseudolesions 'resolved' when the scan was repeated. Instead of central vein obstruction from malignancy, which is more common, this case highlights the complications of multiple central venous catheter insertions causing stenosis of the brachiocephalic vein.[2]

This article was accepted: 4 April 2019
Corresponding Author: Dr. Nazimah Ab Mumin
Email: nazimah.abm@gmail.com

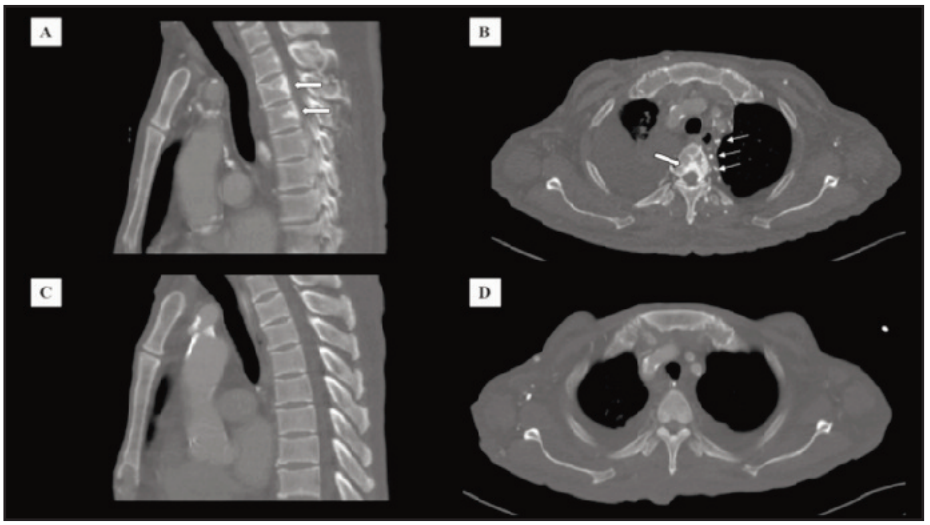

Fig. 1: (A) Sagittal reconstruction image of the contrast-enhanced computed tomography (CECT) scan at the level of thoracic spine and (B) axial image at the level of interest, both in bone window, showing collateral vessels and enhancing vertebral bodies when the CECT scan was done via contrast injection through the left brachial vein. (C) Sagittal reconstructed image of the follow up CECT scan at thoracic level and (D) in axial view, both in bone window, showing no enhancement of the vertebral marrow, when the contrast injection was done through the right brachial vein.

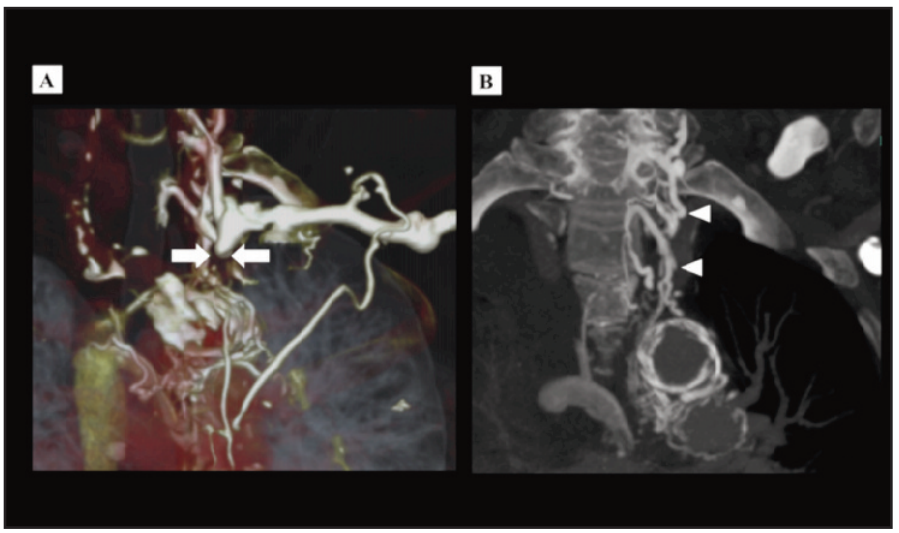

Fig. 2: (A) Coronal reconstructed volume rendering technique image of the left upper thorax (B) Coronal reconstructed maximum intensity projection image of the left upper thorax.

Transient VME is due to retrograde filling of the thoracic and vertebral venous collateral system which opacifies the vertebral venous plexus. When there is obstruction of the central venous system, blood is diverted via collateral pathways, which can be divided into superficial and deep systems.[3]

The vertebral venous plexus is a unique system, which consists of thin-walled and valve-less network of vessels located within and surrounding the spinal column. The internal part of the plexus, called the venous plexus of Batson, is epidural, and drains blood from vertebral bodies via basivertebral veins. The venous plexus of Batson communicates with external paravertebral venous plexus through multiple intervertebral veins. Multiple anastomosis exists between the paravertebral plexus via segmental veins, connecting with the left brachiocephalic, azygos- hemiazygos and inferior vena cava. Because of this unique anatomical design, the vertebral venous plexus is not only a preferential route for malignant spread of vertebral metastatic disease, but an ideal alternative pathway for draining blood to bypass an obstructed central venous system as in our case. Significant vertebral venous congestion is required to raise the intravenous pressure to opacify the intravertebral veins and capillary spaces, leading to enhancement of the vertebral bodies.[2]

Pattern and location of enhancement relates to the site of obstruction. As in our case, marrow enhancement was present at T3/T4 vertebrae which corresponds to the level of collateral vessels. In a study by Kim et al., areas of vertebral body enhancement were variable, with middle one-third and

central parts of vertebral body more frequently involved, as in our case, which may be associated with the anatomical location of basivertebral veins.5 The pattern of enhancement are either polygonal or focal nodular, with the former associated with marrow blush and the latter to stasis of contrast agent within the marrow space.[5]

Kim et al., included 13 SVC obstruction cases, which demonstrated nodular enhancement pattern (n=19), and polygonal enhancement pattern (n=20). Majority of the enhancement were central, and 34 cases showed connection to the paravertebral venous plexus. Kara et al., included nine patients, involving 30 vertebrae, in which all abnormal marrow enhancements were from SVCO,1 caused by multiple catheter insertions (n=7) and secondary to malignancies (n=2).

CONCLUSION

Vertebral venous congestion related to filling of the vertebral venous plexuses may be observed in central venous stenosis. These lesions may be mistaken for malignant vertebral body lesions. The presence of dense vertebral body lesions in a patient with central vein stenosis should lead to careful evaluation of the distribution of the lesions to differentiate venous congestion from sclerotic bone lesions. If in doubt, a non-contrast enhanced CT scan, MRI or bone scan may be useful to exclude osteoblastic lesion.

REFERENCES

1. Kara M, Pradel C, Phan C, Miquel A, Arrive L. CT Features of vertebral venous congestion simulating sclerotic metastases in nine patients with thrombosis of the superior vena cava. AJR Am J Roentgenol 2016; 207(1): 80-6.
2. Thomas N, Oliver TB, Sudarshan T. Vanishing bone metastases—a pitfall in the interpretation of contrast enhanced CT in patients with superior vena cava obstruction. Br J Radiol 2011; 84(1005): e176-8.
3. Pruente R, Strickland C, Koo P. Vanishing bone metastases: a pitfall in contrast-enhanced CT in patients with venous thrombosis. BJR Case Rep 2015; 1(3): 20150149.
4. Berritto D, Abboud S, Kosmas C, Riherd D, Robbin M. Vertebral body enhancement mimicking sclerotic osseous lesions in the setting of bilateral brachiocephalic vein thrombosis. Skeletal Radiol 2015; 44(2): 303-5.
5. Kim YK, Sung YM, Hwang KH, Cho EK, Choi HY. Pseudopathologic vertebral body enhancement in the presence of superior vena cava obstruction on computed tomography. Spine J 2015; 15(6): 1295-301.