

Skull Scalloping Mimicking an Osteolytic Lesion in a Patient with Plasmacytoma

Leonid L. Yavorkovsky^{1*} and Zhixi Li²

¹Oncology Division, Kaiser Permanente San Jose Medical Center 270 International Circle, San Jose, California, USA

²Radiology Department, Kaiser Permanente Oakland Medical Center, Oakland, California, USA

*Corresponding author: Leonid L Yavorkovsky, Oncology Division, Kaiser Permanente San Jose Medical Center, San Jose, California, USA. E-mail: Leonid.yavorkovsky@kp.org

Received: August 18, 2024; **Accepted:** August 30, 2024; **Published:** September 25, 2024

Abstract

Bone scalloping refers to a particular pattern of localized bone erosion appearing as multi-curved, sharply marginated lucencies on radiographic images. This imaging finding indicates an indolent bone remodeling process, which can be caused by benign or malignant conditions. We describe a case of the bone scalloping caused by a giant arachnoid (pacchionian) granulation. Such granulations may simulate malignant osteolytic lesions on radiographic images and cause diagnostic challenges especially in patients with pre-existing malignancy such as plasmacytoma.

Keywords: Arachnoid granulation; Bone scalloping; Osseous lytic lesion; Myeloma; Plasmacytoma

Case Presentation

A 64-year-old Caucasian male with a history of asthma, obstructive sleep apnea, hypertension and hyperlipidemia presented with acute lower back pain during hiking in April 2015. He denied systemic symptoms, weight loss, fevers, febrile illnesses, or family history of cancers. He was taking hydrochlorothiazide, losartan, and simvastatin.

A spine X-ray was negative, but disabling pain recurred two months later. CT and MRI of the spine showed diffuse marrow edema associated with an L5 vertebral body fracture resulting in 10% loss of height of unclear etiology. The patient underwent L4 to S1 laminectomy and posterior instrumented fusion with L5 biopsy and vertebroplasty. The tumor tissue taken from a large open cavity in L5 showed monomorphic malignant plasma cell neoplasm expressing CD138, kappa light chains and Bcl2. Serum protein electrophoresis (SPEP) and immunoelectrophoresis (IEP) showed IgA/kappa monoclonal protein of 0.4 g/dL and normal light chains. Bone marrow biopsy showed hypocellular marrow with trilineage hematopoiesis and no morphologic, immunohistochemical or flow cytometric support for plasma cell neoplasm. A body CT scan showed no evidence of malignancy within the chest, abdomen and pelvis. The patient received radiation treatment (4,600 cGy) to L5 plasmacytoma in October 2015. The M protein on SPEP resolved post treatment, but IEP continued to show the trace of monoclonal IgA/kappa.

In 2023, a mild increase in serum free light chain was noted. Skeletal survey showed a single questionable 2.5 x 1.5 cm osseous lytic mass in the occipital bone (Figure 1). A CT venogram of the head with contrast showed no suspicious bony lesions but revealed a focal lobulated area of bony scalloping along the inner table of the midline occipital calvarium measuring 12 mm (Figure 2) compatible with an arachnoid granulation. No abnormal enhancement, hydrocephalus, hemorrhage, mass effect or herniation were seen. Dural venous sinuses were patent.



Figure 1: X-ray of the skull. Question lytic osseous mass and 2.5 x 1.5 cm in the occipital bone.

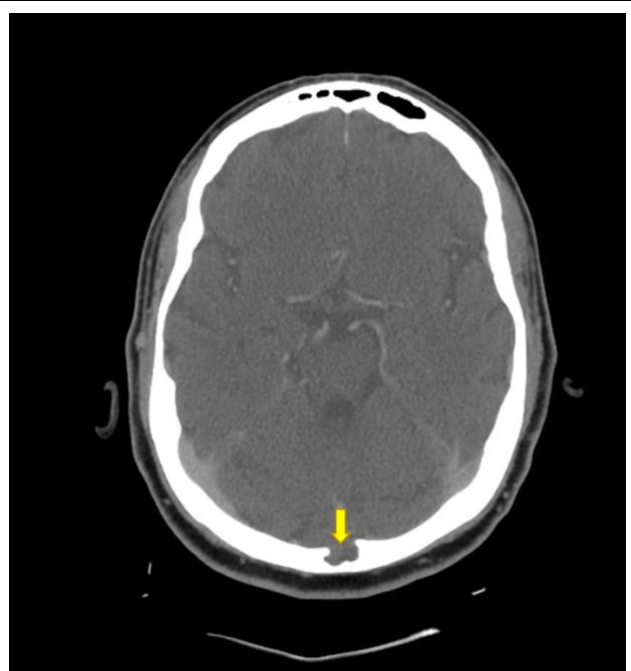


Figure 2: CT venogram head with contrast. Focal lobulated area of bony scalloping along the inner table of the midline occipital calvarium measuring 12 mm (arrow) compatible with an arachnoid granulation.

Discussion

Bone scalloping refers to a particular pattern of localized bone erosion appearing as multi-curved (fluted) bone lucencies on radiographic images. The bone scalloping is an infrequently reported finding that can be seen with both benign and malignant conditions. The distinction between them is not always straightforward but important, particularly in cases of pre-existing malignancy with bone involvement. A CT venogram was compatible with an arachnoid granulation as a cause of the calvarial bone scalloping dismissing concern about possible plasmacytoma or myeloma. Arachnoid granulations also referred to as pacchionian granulations are the normal extensions of the arachnoid membrane into the dural venous sinuses and lateral lacunae of the calvarium.

When enlarged, they may exert pressure on the inner table of the calvarium causing bone impressions or scalloping. The giant arachnoid granulations that extend into the diploic space may simulate malignant osteolytic lesions on skeletal survey radiographs but are better resolved on CT and MRI. Such cases are exceedingly rare [1-5] and, to our knowledge, have not been reported in patients with plasma cell neoplasm. Despite a 10-year disease-free period, the patient continues surveillance because of persistent risk of plasmacytoma relapse.

Conclusion

We present a case of skull scalloping in a patient with history of plasmacytoma. Because the bone scalloping can mimic malignant bone lesions characteristic of multiple myeloma, their distinction is critical.

REFERENCES

1. Branagan R, Wilson CB. Arachnoid granulations simulating osteolytic lesions of the calvarium. *Am J Roentgenol.* 1976; 127: 523-525.
2. Hesselink JR, Rosenberg AE. Case 42-1984: A 29-year-old woman with a lytic lesion of a parietal bone. *N Engl J Med.* 1984; 311: 1036-1043.
3. Tural Emon S, Orakdogan M, Akpınar E, et al. Arachnoid granulations: a rare cause of lytic occipital bone lesion. *Neurol Neurochir Pol.* 2012; 46: 603-606.
4. Lu CX, Du Y, Xu XX, et al. Multiple occipital defects caused by arachnoid granulations: Emphasis on T2 mapping. *World J Radiol.* 2012; 4: 341-344.
5. Park S-H, Park K-S, Hwang J-H. Arachnoid granulations mimicking multiple osteolytic bone lesions in the occipital bone. *Brain Tumor Res Treat.* 2018; 6: 68-72.