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TEST YOURSELF: ANSWER

Bone mass of the calvarium

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Plasmacytoma of the calvarium is very rare, accounting for the 0.7 % of all plasmacytomas [1–5]. The most common locations are the thoracic and lumbar spine (30–40 % of cases). Involvement of the hip, femurs, and ribs is less frequent [6].

Plasmacytoma of the calvarium can be indistinguishable from other lytic lesions, especially metastatic disease. Meningioma, eosinophilic granuloma, and dermoid cysts can have similar appearances, although usually in a different clinical context [10, 11]. Histopathological examination and laboratory tests are necessary to make a definitive diagnosis of plasmacytoma (Fig. 1).

The typical features on imaging are a lytic lesion on X-ray examination (Fig. 1 question) [1, 6]. On computed tomography (CT), plasmacytoma presents as a lytic punched-out lesion with interspersed residual thickened bony trabeculae. Cortical thinning and focal destruction are typical (Fig. 2 question) [2]. On magnetic resonance imaging (MRI), bone plasmacytoma of the calvarium presents as an intramedullary lesion of low to intermediate intensity on T1-weighted images and high intensity on T2-weighted images. Contrast enhancement is usually mild [4–9].

In the presented case, the calvarium plasmacytoma presents a "mini-brain" appearance, due to the presence of low-intensity hypertrophic residual trabeculae interspersed in a relatively homogeneous mass, mimicking the brain sulci.

Major et al. first described the "mini-brain" appearance of plasmacytoma in a series of ten patients with spinal

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Answer: Plasmacytoma of the calvarium with evolution into multiple myeloma (MM).

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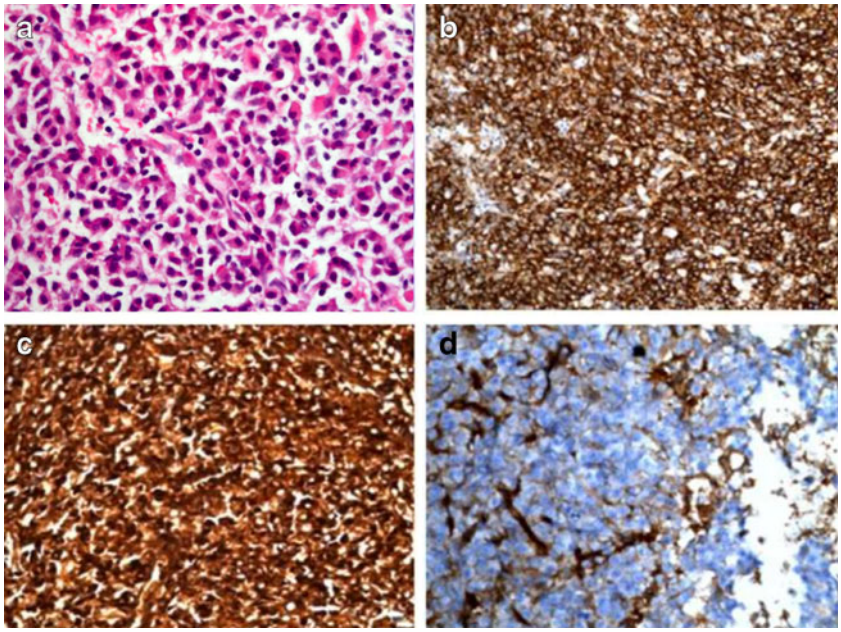

Fig. 1 Surgical biopsy- histological and immunohistochemical specimens. **a** H&E stain (original magnification 40×); plasma cells exhibit abundant cytoplasm, eccentric nuclei with coarse chromatin. **b** Immunostain showing plasma cell marker CD138 (brown, Syndecan-1), original magnification 20× ; Serotec , B-B4 clone, 1/100 dilution. **c** Ig Kappa expression (*brown*) showing a strongly positive monotypic light-chain staining compared to the absence of plasma cell staining for Ig Lambda (**d**); (original magnification 40×, Dako, 1/8,000 dilution). **d** Ig Lambda-negative immunostaining (*brown*); (original magnification 40×, Dako, 1/8,000 dilution)

lesions [2]. Since this appearance had not been observed in other bony lesions, they concluded that the "mini-brain" appearance is virtually pathognomonic for bone plasmacytoma of the spine [3]. They argued that thickened trabeculae might be due to mechanical stress from the lytic process [2].

However, the "mini-brain" on MRI has also been described in plasmacytoma of the appendicular skeleton [3]; it has not previously been described in the calvarium. Nevertheless, a "mini-brain" appearance can be retrospectively observed on MRI images of most bone plasmacytomas of the calvarium reported in the literature (see Table 1).

We think that the finding of the characteristic "mini brain" appearance can help to narrow the differential diagnosis of lytic lesions of the skull.

Table 1 Imaging features of BP of the calvarium reported in the English literature

	Author (year)	Age/sex	Localization	Lesion size (mm)	"Mini-brain" appearance on MRI	Sequences available
1.	Nagatomo (1994)[8]	56/M	Temporoparietal	60 × 40	+	T2w, T1w + Gd
2.	Matsuda (1996)[9]	55/F	Fronto-temporal	70 × 50	+	T1w, T2w, T1w + Gd
3.	Okamoto (1997) [first case][6]	72/F	Occipital	Small lesion measurement not provided	+	T1w, T1w + Gd, T2w
4.	Okamoto (1997)[6] [second case]	64/M	Occipital	60 × 90	+	T1w, T1w + Gd, T2w
5.	Tanaka (1998)[4]	55/M	Frontal	80 × 80	+	T1w, T1w + Gd
6.	Zigouris (2009)[7]	78/F	Temporoparietal	98 × 90	+	T1w, T1w + Gd
7.	Bakar (2010)[5]	49/M	Frontal	90 × 85	Low signal linear images visible	T1w + Gd, MR angiography
8.	Gozzetti (2012) [12]	67/M	Fronto-parietal	Large lesion measurement not provided	Low signal linear images visible	T1w + Gd
9.	Simoni (2012)	48/M	Frontal	60 × 35	+	T1w, T1w + Gd, T2w, FLAIR, T2*w

+ = presence of a "mini-brain" appearance

w = weighted

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