Hibernoma: Don’t be caught out by a PET scan!

A. Ongnon Boulemo\textsuperscript{a}, J.-A. Roch\textsuperscript{a,\textdagger}, F. Ricard\textsuperscript{b}, J. Fontaine Hommell\textsuperscript{c}, F. Cotton\textsuperscript{a,d}

\textsuperscript{a} Radiology Department, Centre Hospitalier Lyon-Sud, Pierre-Bénite, HCL, Université Claude-Bernard Lyon-1, Lyon, France
\textsuperscript{b} Nuclear Medicine Department, Centre Hospitalier Lyon-Sud, Pierre-Bénite, HCL, Université Claude-Bernard, Lyon-1, Lyon, France
\textsuperscript{c} Pathological Anatomy Department, Centre Hospitalier Lyon-Sud, Pierre-Bénite, HCL, Université Claude-Bernard Lyon-1, Lyon, France
\textsuperscript{d} CREATIS-LRMN, CNRS UMR 5220, Inserm U630, 69621 Villeurbanne cedex, France

A hibernoma is a rare soft tissue tumour which always evolves in a benign fashion, but its PET scan appearance can be worrying and cause it to be wrongly confused with a sarcoma. It is therefore important to be aware of the characteristics of this lesion in multimodal imaging to avoid being misled in making the diagnosis and provide better patient management.

Observation

A 65-year-old woman was being treated in the endocrinology unit for multiple endocrine neoplasia type 1 (MEN1), revealed clinically through the occurrence of a gastrinoma. As part of the MEN1 she also presented with hyperparathyroidism, an adrenal adenoma, two pituitary micro-adenomas, and many superficial lipomas. A monitoring PET scan (Fig. 1a) was performed, consisting of a 3D acquisition, 1 hour after injection of 361 MBq fludeoxyglucose (18-FDG) for a weight of 77 kg. A coxofemoral para-articular tumour was found, the site of abnormally intense FDG hyperfixation, with an standardised uptake valuemax (SUV) of more than 10!

An additional abdominopelvic contrast-enhanced CT scan (Fig. 1b) showed an area with fatty density measured at \(-10\) HU within the lesion. MRI (Fig. 2) found a suspicious fatty lesion which was well enhanced after Gadolinium injection, and that remained hyperintense on T2-weighted MR images even after fat saturation. The well-defined character and the absence of a mass effect on the adjacent muscle structures made the diagnosis of liposarcoma uncertain. The presence of a T1-weighted signal which was hypointense to the subcutaneous fat and the persistence of a fatty interface between the tumour and the surrounding muscles were consistent with the diagnosis of hibernoma. However, a sarcoma could not be completely
excluded on the basis of the imaging criteria alone, so a CT-guided fine needle biopsy was performed. This confirmed the diagnosis of a hibernoma by showing a proliferation of micro-vacuolated eosinophilic cells containing a non-atypical, small regular, rounded, central nucleus (Fig. 3). These cells were dispersed among mature adipocytes, containing a single cytoplasmic vacuole displacing the barely visible nucleus to the periphery. Striated

Figure 1. The FDG-PET scan shows an area of intense FDG hyperfixation with an SUVmax of more than 10 (a). On the CT scan, the lesion has a fatty appearance but higher density (−10 HU) than that measured in the adjacent subcutaneous fat (−40 HU) (b).

Figure 2. Coronal T2-weighted slice with fat saturation: persistence of hyperintensity of the lesion (a). Axial T1-weighted image with injection of contrast agent after fat saturation: enhancement of the lesion (b). Axial T1-weighted image without injection: the lesion is hypointense relative to the subcutaneous fat. A thin fatty interface persisting between the tumour and the surrounding muscles can be seen (c).
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Unlike lipoma, the T1-weighted signal is hypointense to the subcutaneous fat, composed of mature adipocytes. In addition, with T2-weighting and fat saturation this lesion has bands which enhance after injection of Gadolinium.

The asymptomatic nature of the lesion and the limited mass effect on surrounding structures does not support a diagnosis of sarcoma. In our case, the presence of a thin fatty border separating the tumour from the adjacent gluteal muscles was very atypical for a liposarcoma. Moreover, brown fat has an extremely high metabolic rate, with an SUVmax greater than 10 due to the considerable mitochondrial activity of the tumour [4]. A sarcoma may also present evident hypermetabolism, but the SUVmax is rarely greater than 6 and remains stable between two examinations [5], unlike a hibernoma. This fluctuation in the SUVmax found in hibernomas is thought to be the consequence of the influence of the external temperature.

Conclusion

MRI and a PET scan alone can rarely supply the diagnosis of hibernoma when faced with a fatty tumour. On the other hand, the combination of data from these two examinations (FDG hyperfixation and T1-weighted hypointensity relative to subcutaneous fat) can increase diagnostic certainty... and make a biopsy less systematic.

Disclosure of interest

The authors declare that they have no conflicts of interest concerning this article.

References


Figure 3. Histological appearance of hibernoma: association of rounded, finely vacuolated cells with an eosinophilic cytoplasm and central rounded nucleus and mature adipocytes containing one large vacuole and a nucleus displaced to the periphery (HPS × 200).

Discussion

A hibernoma is a benign tumour that contains, above all, immature fat cells, which are commonly found in large quantities in hibernating animals. The role of these cells is thermogenic, allowing heat production in these animals. These cells are also found physiologically in the newborn, forming brown fat (typically in the mediastinal, nuchal or paravertebral regions). The abundance of this brown fat decreases with age, but a few remnants may still persist in the cervical, axillary, subpleural and gluteal regions [1]. Tumour sites do not correspond solely to the physiological sites and above all affect women between 20 and 40 years of age. A hibernoma is usually asymptomatic, slow growing, sometimes revealed by pain, a palpable swelling or more rarely by weight loss. A genetic origin has been suggested, particularly in the q13 region of chromosome 11. It is interesting to note that this region is situated near the gene for multiple endocrine neoplasias type 1 (MEN1) without a ‘hibernoma/MEN1’ association ever having been confirmed [2,3].

Histologically, a hibernoma is macroscopically well-defined, and coloured pink or reddish-brown. It is composed of immature adipocytes which are clearly oval monomorphic cells with a small nucleus and eosinophilic cytoplasm. It is often associated with fat or muscle cells or myxoid modifications. The ‘pure’ form consisting of immature adipocytes is actually quite uncommon. The two main differential diagnoses are lipoma and liposarcoma. Imaging produces the essential features for diagnosis.