Imaging findings (Core)

Recording anatomical site of the tumour is important as certain bone tumours have a preference for specific bones and do not occur in others, and there is a strong association between site and outcome. The latter is especially true for cartilaginous tumours, and as a consequence in the World Health Organization (WHO) Classification of Tumours, Soft Tissue and Bone Tumours, 5th edition, 2020,[1] a diagnosis of atypical cartilaginous tumours/chondrosarcoma grade 1, depends on whether the tumour is located in the appendicular or the axial skeleton, respectively. In the long and short tubular bones these tumours behave in a locally aggressive manner and do not metastasize, can be treated locally, and should not be classified as having full malignant potential. Therefore, the term 'atypical cartilaginous tumour' is used for these cartilaginous tumours in the appendicular skeleton (long and short tubular bones). In contrast, the term chondrosarcoma grade 1 is used for histologically similar tumours of the axial skeleton, including the pelvis, scapula and skull base (flat bones) – reflecting the poorer clinical outcome and the necessity of more aggressive treatment of these tumours at these sites. Note that in this dataset, the scapula and skull base are considered to be part of the axial skeleton. It should also be noted that the definition of axial versus appendicular is not universally accepted; while the 2020 WHO Classification[1] categorises the scapula and skull base as part of the axial skeleton, the Union for International Cancer Control (UICC)[2]/American Joint Committee on Cancer (AJCC)[3] TNM 8th editions include these with appendicular skeleton.

The size of the largest tumour nodule should be documented from imaging, preferably in three dimensions as this is important to evaluate the tumour volume. In cases where the radiological tumour dimensions cannot be assessed, such as for multifocal or discontinuous tumour, it is important to note this and record the relative volume of tumour if possible. If biopsies are taken from multiple tumour nodules at different sites, these should be documented separately.

It is important to know the exact tumour site within the bone; for intramedullary tumours and those arising primary at the surface of bone, the histological differential diagnosis will differ. Also, some tumours almost exclusively occur in the epiphysis of the bone (e.g., clear cell chondrosarcoma, giant cell tumour of bone), while others prefer the metaphysis (osteosarcoma) or diaphysis (Ewing sarcoma, adamantinoma). Moreover, primary soft tissue sarcomas may be in close proximity and even invade the bone, while primary bone sarcomas may have an extensive soft tissue component; in these cases, radiological information is required to decide whether the tumour originates primarily from bone or soft tissue.

It is important for the pathologist to be aware of the radiological differential diagnosis, and to be aware of previous radiological findings, if applicable. Correlation between the histology and imaging findings is critical in the diagnosis of bone tumours. For instance, aggressive features identified radiographically (permeative/moth-eaten growth, cortical destruction, soft tissue extension, periosteal reaction) should be mentioned here, as well as multifocality, evidence of matrix deposition, presence of fluid-fluid levels etc. Ideally every case should be discussed in a multidisciplinary team or the pathologist should have access to the imaging findings, when evaluating a biopsy. For cartilaginous tumours for instance, the distinction between benign and low grade malignancy may depend solely on whether or not there is cortical destruction, which may be impossible to evaluate on biopsy or fragmented curettage specimens alone. Therefore, these diagnoses cannot be made without radiological correlation. The presence of fracture should always be documented as it may alter the morphological features and, in some instances, simulate aggressive features, such as host bone entrapment. As the histological alterations caused by the fracture change over time, it is important to know the time frame between fracture and biopsy. Finally, certain bone tumours (cartilaginous tumours, vascular tumours) tend to occur multifocally, and this information is also helpful for the pathologist. The histological diagnosis should always be

correlated with the radiological diagnosis and one should always be cautious when there is a discrepancy between radiological and histological findings. Multidisciplinary discussion is essential and a repeat biopsy should be considered if differences of opinion are not resolved.

References

1 WHO Classification of Tumours Editorial Board (2020). *Soft Tissue and Bone Tumours. WHO Classification of Tumours, 5th Edition, Volume 3*. IARC Publications, Lyon.

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