The longstanding debate: does size matter?

Adrian Jansen van Rensburg*

Division of Orthopaedic Surgery, Tygerberg Hospital, Stellenbosch University, Cape Town, South Africa

**Corresponding author: adrianjvr@outlook.com*

Osteochondromas are the most common benign bone lesions; however, their complications are feared by many.[1] Osteochondromas represent 9% of all bone lesions and constitute 20–50% of all benign bone lesions.[1,2] The aetiology and pathophysiology of osteochondromas is still poorly understood and remains unclear.[2] It is speculated that the mechanism results from a defect in the ring of Ranvier covering the epiphyseal growth plate.[1,2] The defect is due to so-called *cut-back remodelling*, where a fragment of the epiphyseal plate herniates laterally through the defect, deviating laterally from the normal descent to the metaphysis.[1,2] Complications of osteochondroma include osseous deformity, fracture, neurovascular compromise, bursa formation, and especially malignant transformation.[1]

One term in the literature steals the spotlight – *malignant transformation*. Malignant transformation primarily manifests as chondrosarcoma emerging within the cartilage cap of osteochondroma lesions.[1-3]

The cartilage cap of osteochondroma acts as the origin for neoplastic transformation from osteochondroma into secondary chondrosarcoma.[1-3] Malignant transformation is determined by the measurement of the cartilage cap with the use of magnetic resonance imaging (MRI); this acts as a pivotal criterion in the assessment of malignant transformation.[4] Previous studies have debated the true cut-off or threshold value for determining the malignant potential of osteochondroma.[1-5] Ramavathu & Atwal try to put a lid on this debate by providing evidence of a threshold of 2 cm to be highly sensitive and specific.[2] However, the threshold value continues to spark debate among most researchers, and the quest to prove or refute this threshold value still fuels researchers' curiosity. The real problem is that most studies investigate the threshold value, but do not provide a clear method or criteria for measuring cartilage cap thickness.[1-6] Hence, disputing the measurements without first specifying which measuring instrument is to be used, and the method of its application, would be futile.

Although MRI investigation is widely used to assess the cartilage cap, the lack of standardised, consistent and reproducible criteria makes interpretation of MRI findings challenging.[5,6] Numerous studies have highlighted these challenges in assessing malignant transformation in osteochondroma.[1-6] Existing literature mainly emphasises threshold values for detecting malignant transformation in osteochondroma, but seldom clarifies the methodology by which these measurements should be performed.[1-6]

Deckers et al. suggest that future research efforts should prioritise the development of a reliable methodology for discerning malignant transformation from benign osteochondroma based on both radiological and clinical findings.[5] Previous studies have reported diagnostic difficulties in distinguishing benign osteochondroma from malignant transformation of osteochondroma.[1,4,5] These challenges consist of a multitude of factors, arising primarily from the lack of standardised consistent criteria for diagnosis of malignant transformation. Additionally, the presence of imaging artefacts that can obscure accurate diagnosis, and the complexity of measuring the cartilage cap with surrounding soft tissue, can influence the measurement of the cartilage cap thickness, which can significantly influence diagnostic accuracy.[1,4,5] This could lead to an inaccurate interpretation of malignant findings by overestimating malignant transformation based on cartilage cap thickness measurements.

Bernard et al. proposed the optimal technique for measuring the cartilage cap thickness of osteochondroma in the assessment of malignant transformation.[6] In short, this technique involves identifying the tidemark, excluding any cartilage crevasses, followed by measuring the thickest portion of the cartilage cap perpendicular to the tidemark.[6] However, there are several potential problems with this method for measuring the cartilage cap size.[6] These include 1) variability in identifying the tidemark (crucial reference point); 2) measuring the thickest portion of the cartilage perpendicular to the previously identified tidemark; and 3) difficulty in differentiating the cartilage cap from surrounding structures, such as an overlying bursa.[6] These potential problems could result in inaccurate measurement and subsequent overestimation of cartilage cap size.[6]

Attention should be directed towards producing standardised, consistent and reproducible criteria to accurately measure the cartilage cap thickness. Once researchers have agreed on such criteria to accurately measure the cartilage cap, each side can thereafter present their arguments as they see fit. Furthermore, a criterion to accurately measure the cartilage cap can aid in the research to accurately determine the likelihood of malignant transformation of an osteochondroma. Future research is encouraged to develop a standardised criterion for measuring the cartilage cap, and thus limiting clinical and diagnostic uncertainty.

References

1. Murphey MD, Choi JJ, Kransdorf MJ, et al. Imaging of osteochondroma: variants and complications with radiologic-pathologic correlation. RadioGraphics. 2000;20(5):1407-34.
2. Ramavathu KVM, Atwal SS. Imaging of osteochondromas suspected of malignant transformation. Int J Anat Radiol Surg. 2015;4(2):11-13.
3. Vlok SCS, Wagener GWW, Zaharie D. Secondary chondrosarcoma: Malignant transformation of pre-existing hereditary and non-hereditary cartilaginous lesions. S Afr J Radiol. 2014;18(2):1e-5e.
4. Tepelenis K, Papathanakos G, Kitsoulis A, et al. Osteochondromas: An updated review of epidemiology, pathogenesis, clinical presentation, radiological features and treatment options. In Vivo (Brooklyn). 2021;35(2):681-91.
5. Deckers C, Steyvers MJ, Hannink G, et al. Can MRI differentiate between atypical cartilaginous tumors and high-grade chondrosarcoma? A systematic review. Acta Orthop 2020;91(4):471-78.
6. Bernard SA, Murphey MD, Flemming DJ, Kransdorf MJ. Improved differentiation of benign osteochondromas from secondary chondrosarcomas with standardized measurement of cartilage cap at CT and MR imaging. Radiology. 2010;255(3):857-65.

DOI 10.17159/2309-8309/2026/v25n3a1