Ossicle vs. avulsion fracture: Cinematic rendering of MDCT data as an additional diagnostic key

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Background

The differentiation between variants within the normal range and pathologic findings is a frequent challenge to radiologists in the daily routine. In trauma patients for example, it may be difficult to differentiate an ossicle from an avulsion fracture, even in cross-sectional images [1]. Ossicles are a frequent finding and usually require no further therapy. On the other hand, through their relation to tendons or ligaments, avulsion fractures are frequently considered as "complex fractures" and require conservative and - in some cases - surgical management [2-4]. Thus, the clear differentiation between ossicles and avulsion fractures, even in anatomically difficult regions, is an important aspect of the radiologist's report [5]. We present a case in which cinematic rendering of MDCT data was a helpful key in the differentiation between an ossicle and an avulsion fracture.

Case report

We report a 31-year-old male patient with recent trauma to the right knee. After initial clinical examination and plain radiograms of the knee an avulsion fracture of the intercondylar eminence was suspected, differential diagnosis ossicle (Figure 1).

Subsequently, the patient was referred to computed tomography (CT) examination for further evaluation. A non-contrast conventional multi-detector computed tomography (MDCT) with axial slicing was carried out. Multiplanar reformations (MPR) were acquired in coronal and sagittal orientation. In postprocessing, a 3D-cinematic rendered overview for the whole volume and a separate reconstruction of the tibial head were conducted. Conventional MDCT images confirmed the bone dense formation close to the intercondylar eminence, suspicious of an ossicle. No other bone lesions were detected (Figure 2).

Additionally, 3D cinematic rendered images clearly confirmed that the bone dense structure was an ossicle in the intercondylar eminence (Figure 3).

Discussion

Especially in difficult anatomic regions it might be hard to differentiate between variations within the normal range and pathological findings even in MDCT images [5]. Regarding the presented case, radiological reports are frequently inconclusive in the differentiation between ossicles and avulsion fractures. This might lead to further, cost-intensive imaging and may delay immediate therapy[1,3,5].

Ossicles usually are sharply demarcated and show a sclerosed border. They are a frequent finding in articular and periarticular regions and appear in every age group. Normally, ossicles require no further therapy. Avulsion fractures on the other hand have a relation to the
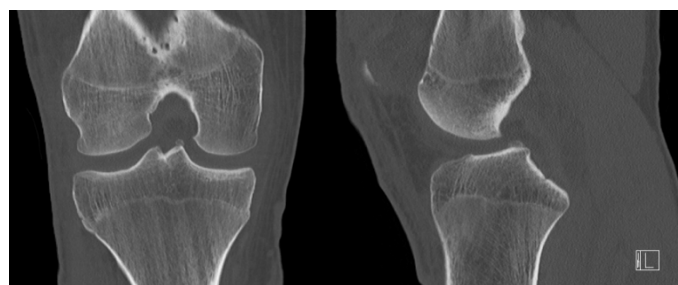

Figure 1. Conventional X-ray in ap (left) and lateral (right) view: Bone dense formation next to the intercondylar eminence, suspicious of an avulsion fracture.

Figure 2. Coronar (left) and sagittal (right) MPR images from MDCT show an ossicle in the intercondylar eminence. There is no avulsion fracture.
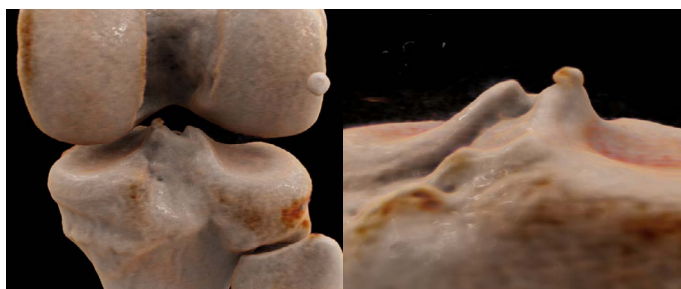
Figure 3. 3D-cinematic rendered images, posterior view of the knee (left) and ventromedial view of the tibial plateau (right) clearly visualize an ossicle in the intercondylar eminence.

origin or onset of a tendon or ligament, thus they might appear intra- or periarticular regions as well. On conventional MDCT images they usually (partially) miss a sclerosed border as a sign of fracture [1,3,4]. However, even in new generation MSCTs with high resolution, the differentiation can be difficult or inconclusive. In our case, 3D-cinematic rendering was very helpful in addition to the MDCT source and MPR images concerning the differentiation of these diagnoses. It was a useful diagnostic addition to the conventional MDCT images by perfectly illustrating the difficult anatomy and its variants.

Conclusion

In conclusion, 3D-cinematic rendered images can be a helpful adjunct in cases with inconclusive findings and/or difficult anatomic circumstances and play a role for better illustration in interdisciplinary conferences [6,7].

Disclosure

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