



Contrast enhancement with uranyl acetate allows quantitative analysis of the articular cartilage by microCT: Application to mandibular condyles in the BTX rat model of disuse

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Résumé en
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Microcomputed tomography (microCT) is well adapted to quantitative analysis of calcified tissues but soft tissues (such as cartilage) are radiolucent and need a contrast enhancement procedure for microCT. We developed a "staining" method allowing microCT imaging of articular cartilage using uranyl acetate (UA). The method was used to see whether adult rats with a botulinum toxin (BTX) injection in masticatory muscles present a change at the condylar cartilage of the mandible in association with a localized trabecular bone loss. Human femoral head samples were used to develop the enhanced contrast method using UA or lanthanides (recently proposed as a substitute for UA). The method was then applied to the condylar cartilage of rat mandibles. Mature male rats (n=11) were randomized into 2 groups: control (CTRL; n=4) and BTX group (n=7). Rats of the BTX group received a single injection of BTX into the right M. Masseter and M. Temporalis. Rats of the CTRL group were similarly injected with saline. Rats were sacrificed 4 weeks after injection. Condyles were harvested, fixed in formalin and immersed in UA. MicroCT was performed for bone and cartilage measurements. After UA impregnation, articular cartilage of human femoral head samples was clearly seen on its full thickness whereas lanthanides produced a much less pronounced contrast, with a faint labeling at the upper layer. In BTX rats, microCT analysis showed a significant bone loss at the right condyles. After UA, the whole thickness of articular cartilage was clearly evidenced. Cartilage thickness measurement showed no difference when comparing the right with the left sides of the BTX group nor between the two sides of the CTRL group. Contrast enhancement with UA is a simple technique allowing quantitative analysis of cartilage by microCT. 290 words.

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