

ASBMR 2015

[1009] A novel method for the assessment of joint space width and subchondral bone texture

Richard Ljuhar, Braincon Technologies, Vienna, Austria University of Technology, Vienna, Austria, AUSTRIA

October 9, 02:00 PM - 02:15 PM
Room 6B/Washington State Convention Center

Session: Concurrent Orals: Osteoarthritis and Other Joint Disorders

Abstract

A novel method for the assessment of joint space width and subchondral bone texture

Author(s)

Richard Ljuhar, Astrid Fahrleitner-Pammer, Helena Canhao, Hans Peter Dimai

OBJECTIVE: Assessment of osteoarthritis (OA) of the knee usually involves AP and lateral radiographs to evaluate medial and lateral joint spaces, but perspective errors and low reproducibility are limiting factors. In addition to joint space width, subchondral bone area may provide important information on the status of OA. However, no adequate standard has been developed so far to quantify subchondral changes. The method described here combines assessment of joint space width (JSW) and fractal analyses of the adjacent subchondral bone area to discriminate between patients with and without OA.

METHODS: The study included 274 standardized knee radiographs from 110 patients with OA, and 164 controls. Knee joint space analysis was performed at the medial and lateral compartment, applying a gradient based algorithm for automated detection of critical landmarks and joint space contour. Furthermore, subchondral bone texture was assessed by using fractal analysis at predefined regions of the proximal tibia. A matrix of 3x8 ROIs was used to gain sufficient textural information (FIG.). Self-similarity of the texture, reflecting 2D projection of the 3D trabecular structure, has been used to calculate the Bone Structure Value (BSV) which provides indirect information on bone quality.

RESULTS: Comparing mean BSVs of the control group and the OA group, a deviation of 7.04% in mean values was determined. The odds ratio showed that the control group had a 6.5 times higher probability to be measured with a BSV above 0.33 than the OA group. A combination of both, JSW & BSV showed a further increase in discriminative power between the control group and OA patients. The most powerful combination of JSW and BSV enabled a discrimination between control/OA in 97.83% of cases. Differences in BSV were found between left/right knee and male/female. Furthermore, a rising BMI was identified to be linked to lower BSV values.

CONCLUSIONS: The novel method described here is sufficient to discriminate between subjects with and without OA. Furthermore, fractal analysis alone may provide information on bone quality aspects. Future work should therefore also focus on the potential role of fractal analysis (in a possible combination with JSW assessments) to serve as a fracture risk assessment tool.