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

visual computing techniques for automated detection of Osteoporosis (OP) and Osteoarthritis (OA)

background

→ changes in the joint space (narrowing) are currently visually measured
→ shortcommings in measuring progression of disease and efficacy of therapy
→ no standardized follow up methods
→ lack of comparable disease scoring

objectives

→ developing a novel method for the early prediction, assessment and traceability of osteoarthritis (OA) and osteoporosis (OP)
→ including automated joint space measurement and Kellgren & Lawrence scoring
→ using high-resolution radiographs
→ assessing subchondral bone by bone micro architecture (BMA)

methods

→ 274 standardized knee radiographs of which 109 female patients were selected
→ assessment by 3 independent physicians
→ sw-based analysis of BMA, JSW/A
→ evaluation of the discriminatory power of BMA, with or without additional clinical paramters

results

→ current methods often subjective and user-dependent
→ texture analysis and automated JSW/A provide an alternative
→ significant difference in BSV values between case/controls
→ deviation in mean values between case and controls of 7.04%
→ odds Ratio for BSV of 6.39
→ combination of BSV and JSA -> discrimination improvement

conclusion

→ presented method provides an objective and reproducible analysis for disease prediction, assessment and monitoring
→ BMA and automated JSW/A provide a significant discrimination between case and controls
→ application of BMA as a possible early disease predictor
→ future work should focus on the potential role of BMA to serve as a fracture risk assessment tool
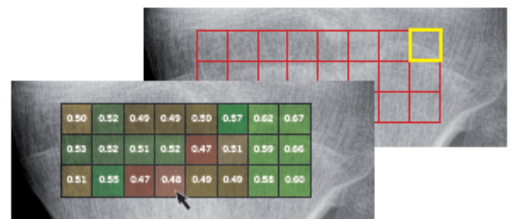
workflow

image segmentation and analysis combining an assessment of joint space width/area (JSW/A) and texture analysis of the adjacent subchondral bone micro architecture (BMA)
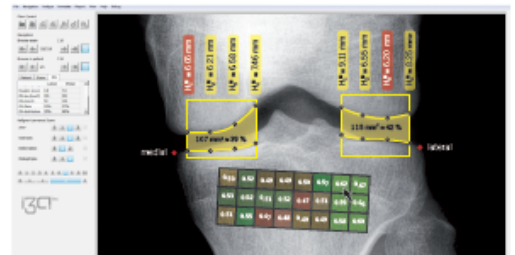

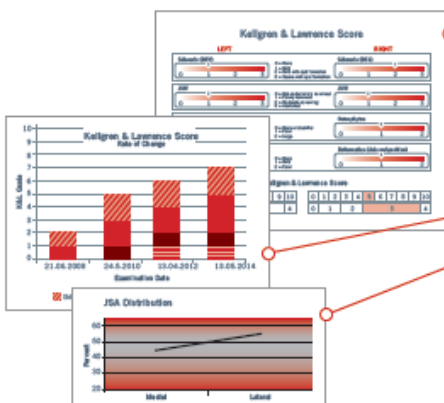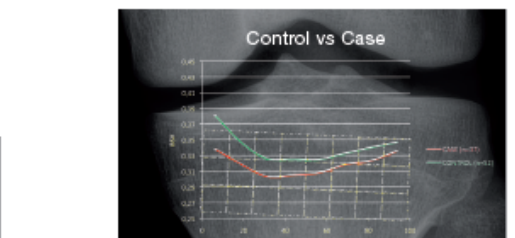bone contour detection
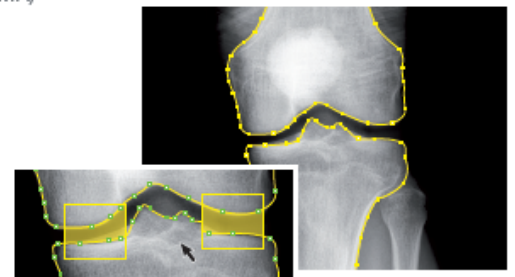
automatic JSW assessment

ROI placement and BMA calculation

JSW and BMA results

Print Single Report

Control vs Case

Patient data is stored in PACS/patient DB

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