Development of T-Scores for the diagnosis of osteoarthrosis of the patellofemoral joint using quantitative MR volumetry of cartilage

S. Weckbach[1], A. Horng[1], G. Pforte[1], R. José[1], F. Eckstein[2], M. Hudelmeier[3], M. F. Reiser[1], and C. Glaser[1]

[1]Department of Clinical Radiology, University Hospital Munich- Grosshadern, Munich, Germany, [2]Insitute of Anatomy, Paracelcus Medical University, Salzburg, Austria, [3]Paracelcus Medical University, Insitute of Anatomy, Salzburg, Austria

Purpose: In the diagnostic process of osteoarthrosis (OA) there is no tool for quantitative grading of disease as there is, for example, in osteoporosis. However, especially considering therapeutic decision making a tool with cut off-values for the diagnosis of OA and its different stages of severity would be of high interest [1,2] especially with respect to a simple pratical day-to-day approach. Therefore the purpose of this study was to evaluate T-scores based on quantitative cartilage volumetric parameters for the diagnosis of patellofemoral osteoarthritis.

Material and Methods: 69 patients (39 female) with clinically proven patellofemoral OA classified according to the Kellgren-Lawrence-Score were compared to 185 healthy subjects (76 female, all < 35years). A sagittal 3D FLASH WE sequence (0.3^2 x 2 mm^3) was acquired at 1.5 T. After semiautomatic segmentation, volume, mean thickness and volume normalized to cartilage bone interface (vol/CBI) were calculated. T-Scores, ROC-curves, AUC and sensitivity /specificity for selected cutoff values were calculated.

Results and Discussion: Using vol/CBI the highest sensitivity (1.000) and specificity (0.978) for the diagnosis "OA" was reached at a T-value of -1.935. Using a T-value of -2.4862 (comparable to -2.5 for osteoporosis), sensitivity was 0.942 and specificity 0.995. Using the lowest observed T-value of -2.987, sensitivity is 0.884 and specificity 1.000. The AUC from vol/CBI is 0.999, from volume and mean thickness 0.980 and 0.891 with $p < 0.001$. An AUC value of 1.000 is reached for the female subgroup for vol/CBI.

T-value	Sensitivity	Specificity
T - 1.0 (-1.039)	1.000	0.838
T - 2.0 (-1.935)	1.000	0.978
T - 2.5 (-2.486)	0.942	0.995
T - 3.0 (-2.987)	0.884	1.000

Table 1. T-values with corresponding sensitivity and speficity for vol/CBI.

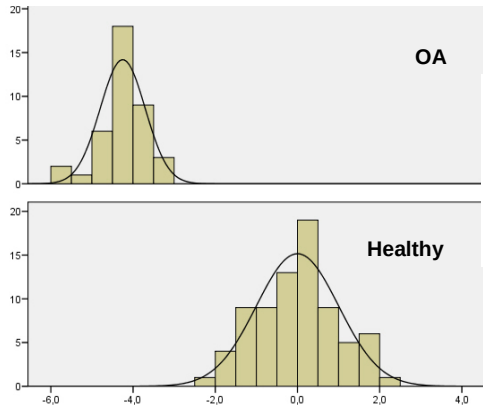

Fig. 1)

Figure 1. Frequency distribution of T-values (vol/CBI) for the female subgroup

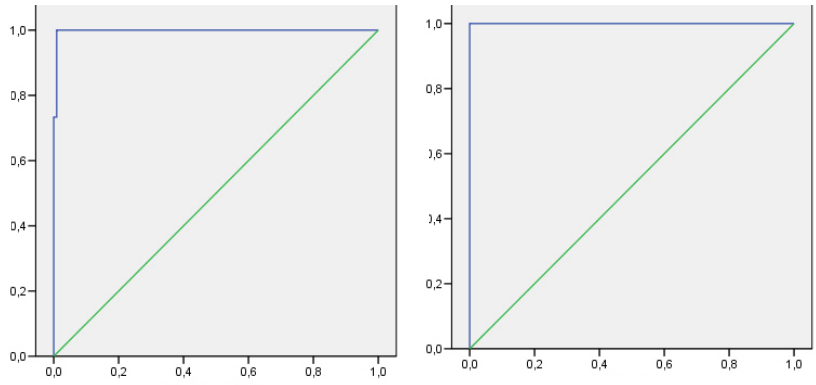

Fig. 2 a) b)

Figure 2. ROC-curves (blue) for T-Scores calculated from vol/CBI for a) the male subgroup, b) the female subgroup

Conclusion: In this study a cutoff T-value of -1.9 yields highest sensitivity whereas a T-value of -2.5 would moderately increase specificity at the cost of some sensitivity. AUC values indicate that vol/CBI has the best discriminatory power for patellofemoral OA among the available parameters. Sensitivities and specificities obtained for selected cutoff values suggest that T-scores based on quantitative cartilage volumetric parameters may be a suitable adjunct for the diagnostic workup of OA in population based studies / approaches.

References:

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