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THE OMERACT KNEE INFLAMMATION MRI SCORING SYSTEM: VALIDATION OF QUANTITATIVE METHODOLOGIES AND TRI-COMPARTMENTAL OVERLAYS BY COMPARISON WITH THE MRI OSTEOARTHRITIS KNEE SCORE

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Background: Randomized controlled trials have targeted reducing the size of BML and degree of synovitis for the treatment of OA. We have developed the OMERACT Knee Inflammation MRI Scoring System (KIMRISS) and have recently refined it to maximize reliability and sensitivity to change. Innovations include electronic overlays for assessment of BML in 500 subregions, a web-based interface with direct online scoring, and real-time iterative calibration (RETIC) prior to reading exercises. Synovitis-effusion (S-E) is also scored on all consecutive sagittal slices on a web-based interface.

Objectives: We aimed to test the feasibility, reliability, and responsiveness of KIMRISS versus an established method, MOAKS, in two multi-reader exercises.

Methods: KIMRISS incorporates web-based graphic overlays for each of femur, tibia, and patella (range 0-500). S-E is recorded as the largest diameter perpendicular to the longest axis of this feature (range 0-100). All scores are pro-rated for a standardized number of MRI slices. In a pre-reading exercise for KIMRISS, readers scored sufficient cases in RETIC to attain scoring proficiency, pre-specified as an ICC of ≥ 0.80 and ≥ 0.70 for status and change scores of BML and S-E compared to developer reads. A new web-based scoring platform with overlays designating different subregions for scoring BML was developed for MOAKS. We compared reliability for status and change scores of BML and S-E in 2 international multi-reader exercises of baseline and one-year MRI scans from the Osteoarthritis Initiative: A. 4 expert readers and an OMERACT fellow scored 38 cases selected for MOAKS BML score ≥ 1 . B. 7 expert readers and an OMERACT fellow scored 60 cases selected for MOAKS BML ≥ 3 and Kellgren-Lawrence (K-L) grade < 3 . Reliability was assessed by intra-class correlation coefficient (ICC) and Smallest Detectable Change (SDC), responsiveness by the standardized response mean (SRM), and feasibility using the System Usability Scale (SUS scoring range 0-100).

Results: For exercises A/B, subjects were 55.3%/ 26.7% male, mean($\pm$ SD) age 61.7($\pm$ 9.1)/61.9(8.8) years, and radiographic K-L grade ≤ 2 in 39.4%/100%. Change was small in both exercises ($< 5\%$ of scoring range for KIMRISS and MOAKS BML and S-E) with comparable responsiveness (Table 1). Despite this, ICC for change was consistently good to very good for both BML and S-E and consistently better for KIMRISS (Table 1). Mean SUS scores were 88.2 for KIMRISS and 54.3 for MOAKS.

Table 1. KIMRISS and MOAKS scores in Two International Multi-reader Exercises

Method	MRI feature	Scores mean (SD)			SDC (% of max)	P value	SRM
		Baseline	One-year Follow up	Change			
EXERCISE A							
MOAKS	BML	3.6 (2.9)	3.4 (2.3)	-0.2 (1.9)	1.0 (2.2%)	0.72	-0.11
	Synovitis-effusion	1.3 (0.8)	1.5 (0.8)	0.2 (0.4)	0.4 (13.3%)	0.017	0.5
KIMRISS	BML	15.7 (13.3)	21.2 (22.5)	5.5 (15.3)	5.6 (1.1%)	0.022	0.36
	Synovitis-effusion	21.8 (12.0)	24.3 (11.9)	2.5 (7.4)	2.8 (2.8%)	0.043	0.34
EXERCISE B							
MOAKS	BML	4.2 (2.6)	3.7 (2.4)	-0.5 (2.1)	1.1 (2.4%)	0.083	-0.24
	Synovitis-effusion	1.2 (0.7)	1.3 (0.8)	0.0 (0.5)	0.4 (13.3%)	0.59	0.0
KIMRISS	BML	18.0 (17.5)	15.9 (14.3)	-2.1 (12.3)	5.9 (1.2%)	0.19	-0.17
	Synovitis-effusion	21.8 (9.3)	22.9 (10.8)	1.1 (7.1)	2.2 (2.2%)	0.25	0.15
Intra-class Correlation Coefficients (95%CI)							
Method	MRI feature	Exercise A			Exercise B		
KIMRISS status	BML	0.86 (0.78-0.92)			0.80 (0.70-0.87)		
KIMRISS change	BML	0.88 (0.81-0.93)			0.72 (0.64-0.80)		
MOAKS status	BML	0.71 (0.46-0.85)			0.67 (0.56-0.77)		
MOAKS change	BML	0.76 (0.64-0.85)			0.69 (0.60-0.78)		
KIMRISS status	Synovitis-effusion	0.88 (0.81-0.93)			0.75 (0.52-0.86)		
KIMRISS change	Synovitis-effusion	0.87 (0.79-0.92)			0.87 (0.82-0.91)		
MOAKS status	Synovitis-effusion	0.66 (0.4-0.79)			0.65 (0.52-0.75)		
MOAKS change	Synovitis-effusion	0.52 (0.36-0.67)			0.48 (0.37-0.60)		

Conclusion: The KIMRISS method for scoring BML and Synovitis-Effusion scores highly for feasibility and demonstrates consistently high reliability when compared to MOAKS. Further validation for responsiveness is necessary in cases with greater change in MRI features than in the OAI dataset.

Disclosure of Interests: None declared.

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Osteoarthritis

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TEMPORAL TRENDS AND FACTORS ASSOCIATED WITH VITAMIN D PRESCRIPTION AND INTAKE

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Background: Vitamin D has proven skeletal effects and its administration is recommended in patients with osteoporosis by many national and international guidelines. Nevertheless, the compliance to treatment of patients with osteoporosis is scarce. Understanding the factors associated with low vitamin D intake and prescription might help design future intervention aimed to improve adherence.

Objectives: This study aims to investigate the temporal trends and factors associated with vitamin D prescription and intake.

Methods: Using a web-based fracture risk-assessment tool, we collected demographic, densitometric and clinical data of women at high risk for fractures. To determine the factors associated with low vitamin D intake we ran a multivariable logistic regression analysis. We described the public general interest in the term "vitamin D" using the Google Trends tool.

Results: 12,419 women were included in the study. 6,748 (54.4%) individuals had a prevalent fragility fracture and 8,950 (72.1%) individuals were on < 800 IU of vitamin D per day and 11,434 (92.1%) were taking $< 1,200$ IU of vitamin D per day. The factors associated with vitamin D intake were evaluated with a multivariable logistic regression analysis, which results are presented in Table 1. We found that low BMD levels, the presence of associated comorbidities and glucocorticoid utilization were associated with greater vitamin D intake. Falls were associated only with lower risk of receiving very low dose of vitamin D (< 250 IU day). Smoking status was associated with lower vitamin D intake. Overall, the internet interest in vitamin D was higher during the winter season Figure 1.

Figure 1. Google trends interest in the term "vitamin D" from January 2010 to October 2020

Conclusion: Low vitamin D intake (< 800 IU day) was common in our cohort of women at high risk for fractures. The factors associated with greater vitamin D intake were: having low BMD levels, associated rheumatic diseases and glucocorticoid use. Falls were associated with lower risk of receiving very low dose of vitamin D (< 250 IU day). Smoking status was associated with lower vitamin D intake.