

# Book report

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A commentary by Drew A. Lansdown, MD,  
is linked to the online version of this article  
at [jbjs.org](http://jbjs.org).

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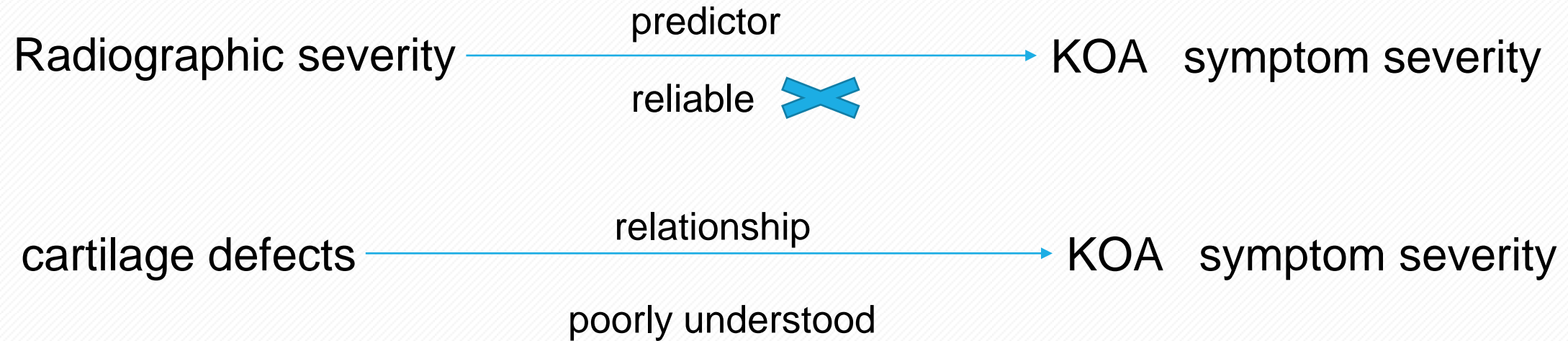
# Full-Thickness Cartilage Defects Are Important Independent Predictive Factors for Progression to Total Knee Arthroplasty in Older Adults with Minimal to Moderate Osteoarthritis

Data from the Osteoarthritis Initiative

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*Investigation performed at The Ohio State University Wexner Medical Center, Columbus, Ohio*

# Introduction



In older adults, knee cartilage defects are common, with a prevalence of >80% among patients with symptomatic OA

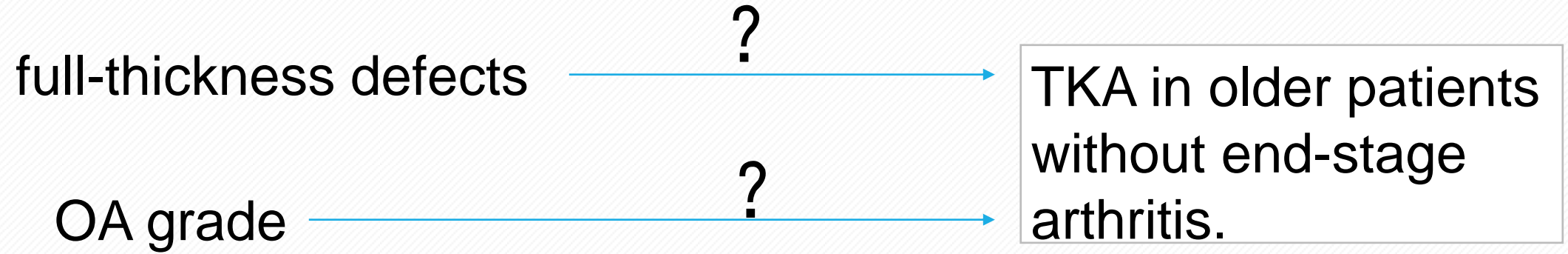
In asymptomatic, middle-aged adults without knee OA, partial-thickness defects are common in both the medial (61%) and lateral (43%) compartments and are associated with increased cartilage loss over time

report

In a longitudinal study of 123 patients with knee MRI, higher baseline cartilage-defect composite scores and rates of cartilage loss over 2 years were predictive of total knee arthroplasty at 4 years.

However, the study included patients with severe OA at baseline and did not specifically assess the effect of full-thickness defects in patients with mild to moderate OA.

purpose



# hypothesis

full-thickness tibiofemoral  
cartilage defects

YES

moderate OA

YES

No full-thickness tibiofemoral  
cartilage defects

NO

minimal to mild OA

NO

T

K

A

# Materials and Methods

1)sample : Kellgren-Lawrence (KL) grade of  $\leq 3$  (n = 1,319 patients) from OAI participants

2)Exclude: kl grade =4

3)Follow: 9 years

Full-thickness central femoral or tibial cartilage defects were present at baseline in 496 (37.6%) of the participants



# results

The results of Kaplan-Meier survival analyses are shown in Figures 1 and 2

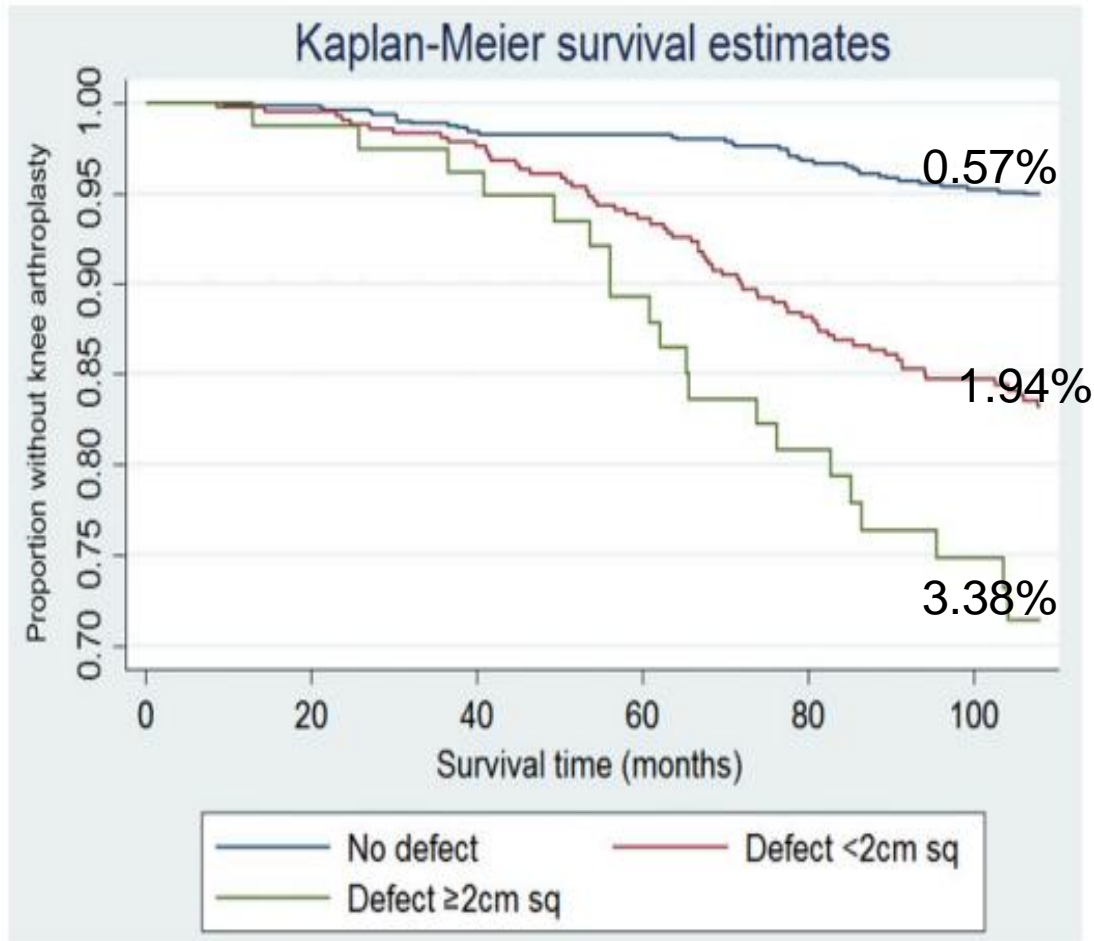


Fig. 1

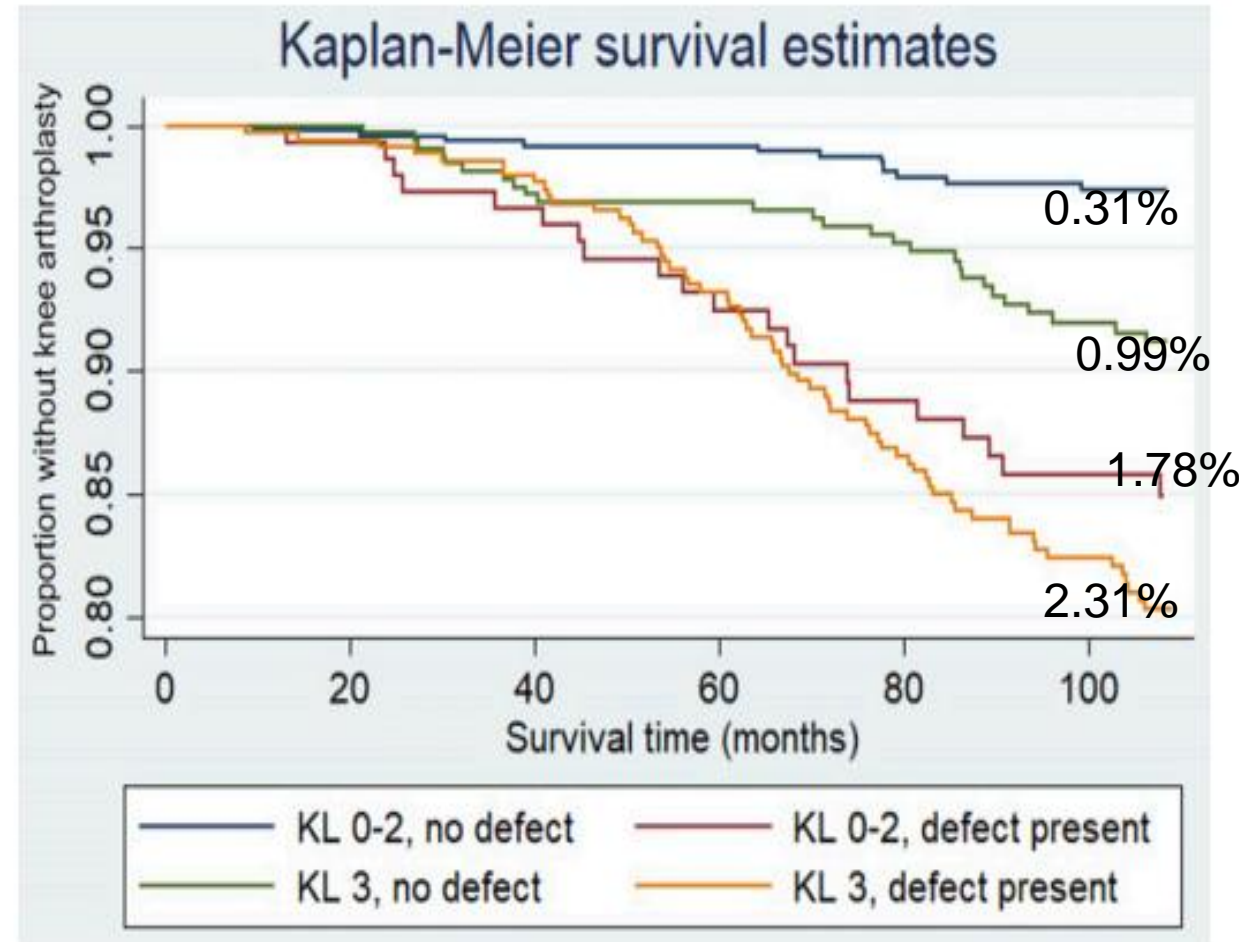


Fig. 2

Table 1: Demographic and symptomatic data for both arthroplasty and no arthroplasty groups

TABLE I Demographic and Symptom Data *			
	Arthroplasty (N = 124)†	No Arthroplasty (N = 1,195)†	P Value
Sex			0.15
Male	32.3%	38.7%	
Female	67.7%	61.2%	
Age (yr)	62.9 ± 7.9	60.8 ± 9.3	0.01
Race			0.79
Caucasian	80.6%	80.0%	
African-American	16.1%	18.1%	
Other race	3.3%	1.9%	
Weight (kg)	90.1 ± 17.1	86.0 ± 17.1	0.02
Prior knee injury	40.7%	39.4%	0.79
Prior knee surgery	35.5%	22.6%	0.002
PASE score	169.5 ± 81.5	162.0 ± 79.9	0.32
CES-D score	6.6 ± 6.8	6.4 ± 7.0	0.81
Health insurance	99.2%	96.6%	0.06
Prescription coverage	94.3%	88.1%	0.03

Table 1: Demographic and symptomatic data for both arthroplasty and no arthroplasty groups

KOOS			
Sport/recreation	55.4 ± 25.7	72.4 ± 26.0	<0.001
Quality of life	55.8 ± 20.4	67.6 ± 22.2	<0.001
Pain	74.6 ± 18.4	82.8 ± 18.2	<0.001
Symptoms	77.4 ± 16.9	85.1 ± 15.5	<0.001
WOMAC			
Pain	4.1 ± 3.7	2.7 ± 3.4	<0.001
Stiffness	2.5 ± 1.8	1.6 ± 1.6	<0.001
Disability	13.7 ± 11.5	8.8 ± 11.2	<0.001

# Table2: Imaging Data for both arthroplasty and no arthroplasty groups

TABLE II Imaging Data*			
	Arthroplasty (N = 124)†	No Arthroplasty (N = 1,195)†	P Value
Medial full-thickness defect	47.6%	19.0%	<0.001
Lateral full-thickness defect	51.6%	24.4%	<0.001
Full-thickness defect, either compartment	68.5%	34.3%	<0.001
Defect <2 cm <sup>2</sup>	52.4%	29.5%	<0.001
Defect ≥2 cm <sup>2</sup>	16.1%	4.9%	<0.001
≥5° valgus	16.9%	15.8%	0.75
≥5° varus	8.8%	9.0%	0.97
>10° varus or valgus	2.4%	2.3%	0.96
KL grade			
0-1	10.4%	20.5%	<0.001
2	16.9%	30.4%	<0.001
3	72.6%	49.1%	<0.001
Medial SSR	0.59 ± 0.12	0.57 ± 0.11	0.01
Lateral SSR	0.67 ± 0.11	0.66 ± 0.09	0.16

Table3: Median Baseline KOOS Symptom Score, with Stratification by Full-Thickness Defect Status and Osteoarthritis Grade

TABLE III Median Baseline KOOS Symptom Score, with Stratification by Full-Thickness Defect Status and Osteoarthritis Grade*				
	No Full-Thickness Defect	Defect Surface Area <2 cm <sup>2</sup>	Defect Surface Area ≥2 cm <sup>2</sup>	P Value†
KL grade 0-1	100 (42.8-100)	89.3 (67.9-100)	85.7 (71.4-96.4)	<0.001
KL grade 2	89.3 (21.4-100)	82.1 (35.7-100)	73.2 (60.7-92.8)	0.003
KL grade 3	89.3 (32.1-100)	82.1 (7.1-100)	75 (21.4-100)	<0.001
P value†	<0.001	0.006	0.07	

\*The values are given as the median score, with the range in parentheses. KL = Kellgren-Lawrence. †Wilcoxon rank-sum.

## Table 4: Unadjusted Risk of Arthroplasty by Demographic Factors and Baseline Symptoms

<b>TABLE IV Unadjusted Risk of Arthroplasty by Demographic Factors and Baseline Symptoms *</b>		
	<b>Unadjusted Hazard Ratio (95% CI)</b>	<b>P Value</b>
Male sex	0.77 (0.53, 1.13)	0.15
Age (per yr increase)	1.02 (1.01, 1.05)	0.009
African-American race	0.89 (0.51, 1.41)	0.66
Weight (per kg increase)	1.01 (1.00, 1.02)	0.01
Prior knee injury	1.02 (0.71, 1.46)	0.90
Prior knee surgery	1.81 (1.25, 2.61)	0.002
PASE score (per point increase)	1.00 (1.00, 1.00)	0.41
CES-D score (per point increase)	1.00 (0.98, 1.03)	0.77
Health insurance	3.97 (0.89, 6.98)	0.08
Prescription coverage	2.14 (1.08, 5.07)	0.03
KOOS sport/recreation (per point increase)	0.98 (0.97, 0.99)	<0.001
KOOS quality of life (per point increase)	0.98 (0.97, 0.99)	<0.001
KOOS pain (per point increase)	0.98 (0.97, 0.99)	<0.001
KOOS symptoms (per point increase)	0.98 (0.97, 0.99)	<0.001
WOMAC pain (per point increase)	1.09 (1.04, 1.13)	<0.001
WOMAC stiffness (per point increase)	1.30 (1.18, 1.43)	<0.001
WOMAC disability (per point increase)	1.03 (1.02, 1.04)	<0.001



# Table 5: Unadjusted Risk of Arthroplasty by Radiographic Factors

TABLE V Unadjusted Risk of Arthroplasty by Radiographic Factors*		
	Unadjusted Hazard Ratio (95% CI)	P Value
No full-thickness defect	1.0 (ref.)	
Medial full-thickness defect	3.50 (2.46, 4.98)	<0.001
Lateral full-thickness defect	3.05 (2.15, 4.35)	<0.001
Full-thickness defect, either compartment	3.85 (2.65, 5.68)	<0.001
Defect surface area <2 cm <sup>2</sup>	3.45 (2.32, 5.13)	<0.001
Defect surface area ≥2 cm <sup>2</sup>	6.21 (3.62, 10.7)	<0.001
≥5° valgus	1.07 (0.65, 1.67)	0.79
≥5° varus	1.10 (0.56, 1.95)	0.77
>10° varus or valgus	1.11 (0.27, 2.94)	0.86
KL grade 0-1	1.0 (ref.)	
KL grade 2	1.14 (0.58, 2.33)	0.72
KL grade 3	2.86 (1.66, 5.36)	<0.001
Medial SSR (per 0.1 increase)	1.20 (1.03, 1.38)	0.02
Lateral SSR (per 0.1 increase)	1.12 (0.93, 1.33)	0.23

## Table6: Independent Risk Factors for Future Total Knee Arthroplasty as well as Adjusted Risk of Arthroplasty

**TABLE VI Adjusted Risk of Arthroplasty\***

Predictor	Adjusted Hazard Ratio (95% CI)	P Value
Male sex	0.45 (0.28, 0.74)	0.001
Age (per yr increase)	1.04 (1.02, 1.07)	0.001
African-American race	0.36 (0.19, 0.69)	0.002
Weight (per kg increase)	1.02 (1.01, 1.04)	0.002
KOOS sport/recreation (per point increase)	0.98 (0.97, 0.99)	<0.001
No full-thickness defect	1.0 (ref.)	
Full-thickness defect <2 cm <sup>2</sup>	2.65 (1.60, 4.37)	<0.001
Full-thickness defect ≥2 cm <sup>2</sup>	5.27 (2.70, 10.3)	<0.001
KL grade 0-1	1.0 (ref.)	
KL grade 2	0.71 (0.31, 1.60)	0.41
KL grade 0-2: full-thickness defect present	1.0 (ref.)	
KL grade 3: full-thickness defect present	0.64 (0.28, 1.49)	0.30
KL grade 0-2: no full-thickness defect	1.0 (ref.)	
KL grade 3: no full-thickness defect	3.15 (1.34, 7.40)	0.009



## conclusion

full-thickness cartilage defects were a major determinant of future knee arthroplasty in older adults with minimal to moderate OA, even after controlling for baseline symptom severity and demographic factors.

In older adults with minimal to moderate OA, radiographic severity was only associated with total knee arthroplasty risk in the absence of a full-thickness defect.

**Thank**

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