

Supplementary appendix

Table 1 Definition of severity score for each meniscal segment

Type of meniscal damage based on ACLOAS*	Severity score†
No tear (0)	0
Meniscal extrusion, none	0
Intrameniscal signal only (1)	0.5
Status post meniscal repair (5)	1.5
Meniscal body extrusion <50%	1.5
Meniscal tear (2-4)	2.0
Partial maceration, destruction or resection (6,7)	3.0
Meniscal body extrusion >50%	3.0
Complete maceration, destruction or resection (8)	4.0

*Numbers at the end of each type of meniscal damage are according to ACLOAS grades (with the exception of meniscal body extrusion as this was not included in ACLOAS)

ACLOAS definitions of grade 0-8:

0 = Normal meniscus with absence of tear, maceration and hypointense signal

1 = Intrameniscal hyperintensity not extending to meniscal surface

2 = Horizontal tear

3 = Radial and vertical tear

4 = Bucket-handle tear, displaced tear (including root tears) and complex tears

5 = Meniscal repair

6 = Partial meniscectomy and partial maceration

7 = Progressive partial maceration or re-partial meniscectomy (i.e., loss of morphological substance of the meniscus) as compared to the previous visit

8 = Complete maceration or resection

† On knee level, the severity scores were based on meniscal integrity grades from the three segments each from the medial and lateral meniscus as well as the meniscal body extrusion grade from each meniscus. The sum could therefore theoretically range from 0-30 points (0 if both menisci were normal and not extruded; 30 if both menisci were more or less fully destroyed in all three sub regions (24 points) and any remnant of peripheral body rim of the menisci were both fully extruded (6 points)).

Table 2 The frequency of each item that defines the development of meniscal damage

	Medial meniscus		Lateral meniscus	
	Rehabilitation plus Early ACL Reconstruction (N=11)	Rehabilitation plus Optional Delayed ACL Reconstruction (N=21)	Rehabilitation plus Early ACL Reconstruction (N=22)	Rehabilitation plus Optional Delayed ACL Reconstruction (N=12)
a) an incident meniscal tear on follow up MRI, which was not present at the baseline scan	3	9	4	3
b) a pre-existing meniscal tear which has expanded to involve another meniscal segment	1	0	1	0
c) incident loss of meniscus substance due to destruction, maceration or meniscal resection	7	21	21	9
d) increased medial or lateral meniscal body extrusion grade according to ACLOAS	3	4	1	0
e) new finding of post- meniscal repair	2	1	6	3

ACLOAS= Anterior Cruciate Ligament Osteoarthritis Score

Because different items could occur in different segments for one person, the numbers do not add up to total number of persons.

Table 3 Results (odds ratios) of the logistic regression analysis for *development of meniscal damage* at 5 years compared to baseline for the optional delayed ACL reconstruction arm compared to the early ACL reconstruction arm

		Development of meniscal damage, Odds ratio (95% CI)
Knee level		
	Unadjusted	1.36 (0.66 – 2.86)
	Adjusted	1.86 (0.82 – 4.21)*
Medial meniscus		
	Unadjusted	2.75 (1.20 – 6.63)
	Adjusted	3.10 (1.27 – 8.10)*
Lateral meniscus		
	Unadjusted	0.48 (0.21 – 1.09)
	Adjusted	0.94 (0.32 – 2.78)*

CI=confidence interval

N=60 for early arm due to one missing baseline MRI reading and one lost to follow up

N=55 for optional delayed arm due to four missing five year MRI readings

* Adjusted for age, gender, and baseline meniscal damage

Table 4 Descriptive statistics for the severity score at baseline and after 5 years on knee level and on compartment level

		Rehabilitation plus Early ACL Reconstruction (N=61)	Rehabilitation plus Optional Delayed ACL Reconstruction (N=59)
Knee level*	Baseline	2.0 (0.5, 6.0); 34/60	2.0 (0.5, 6.0); 41/59
	5 years	3.0 (0.5, 9.5); 24/60	3.5 (2.0, 8.0); 23/55
Medial meniscus [†]	Baseline	2.0 (0.5, 6.0); 47/60	2.0 (0.5, 6.0); 46/59
	5 years	2.0 (0.5, 6.0); 43/60	3.5 (2.0, 7.5); 31/55
Lateral meniscus [†]	Baseline	2.0 (0.5, 6.0); 44/60	2.0 (0.5, 4.0); 54/59
	5 years	3.0 (0.5, 9.0); 35/60	3.0 (1.5, 5.0); 43/55

ACL=anterior cruciate ligament

The numbers are presented as median (range) for persons with score>0; N of persons with 0 score/N total

Table 5 Results of the zero inflated Poisson regression analysis, including the logistic model as well as the count model, for *meniscal severity scores* at 5 years compared to baseline for the optional delayed ACL reconstruction arm compared to the early ACL reconstruction arm

Meniscal damage			
severity score			
	Ratio of means	Logit coefficients	
	(95% CI)	(95% CI)	
Knee level			
Unadjusted	1.26 (0.92 – 1.72)	0.13 (-0.65 – 0.91)	
Adjusted	1.46 (1.13 – 1.87)*	-6.48 (-17.10 – 4.10)*	
Medial meniscus			
Unadjusted	1.73 (1.07 – 2.79)	-0.57 (-1.38 – 0.24)	
Adjusted	1.71 (1.18 – 2.47)*	-1.03 (-2.24 – 0.17)*	
Lateral meniscus			
Unadjusted	0.88 (0.62 – 1.24)	0.93 (0.08 – 1.78)	
Adjusted	1.06 (0.80 – 1.40)*	0.39 (-0.71 – 1.50)*	

CI=confidence interval, Ratio of means = concerns the subjects that had a positive probability of a non-zero score,

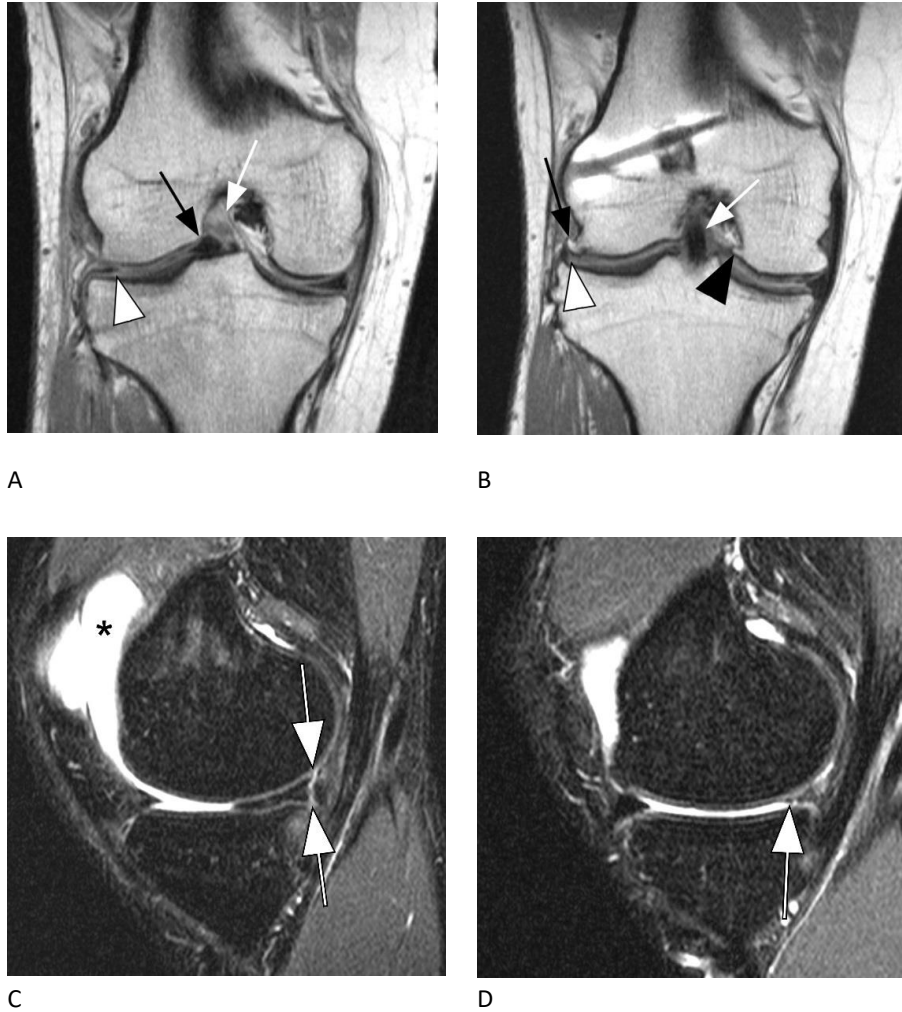
Logit coefficients = predicting excess zeros in the model

N=60 for early arm due to one missing baseline MRI reading and one lost to follow up

N=55 for optional delayed arm due to four missing five year MRI readings

* Adjusted for age, gender, and baseline meniscal damage severity score

Figure 1 Two examples of development of meniscal damage over the course of 5 years



A. Baseline coronal proton density-weighted image shows a traumatic bucket handle tear of the lateral meniscus with dislocation of bucket handle fragment into the femoral notch (black arrow). Not corresponding substance loss at the free edge of the meniscal body (arrowhead). There is a complete rupture of the anterior cruciate ligament (ACL) with only remnants suggesting ligamentous fibres (white arrow). B. 5 years after surgical reconstruction of the ACL, the graft has attained a regular hypointense appearance (white arrow). The bucket handle fragment has been removed and extensive partial meniscectomy was performed with substance loss of the free edge of the lateral meniscal body (white arrowhead). In addition, osteophyte development at the lateral femur (black arrow) and medial femoral notch (black arrowhead) is observed. C. Another patient suffered a longitudinal tear of the posterior aspect of the medial posterior horn (arrows). In addition, there is traumatic hemarthrosis (asterisk). D. Partial meniscectomy was performed and at the 5-year follow-up visit a large substance defect of the free edge of the posterior horn is observed (arrow).

Figure 2 *Difference in severity score between 5-year follow-up and baseline for medial and lateral meniscus in the rehabilitation plus early ACL reconstruction arm and the rehabilitation plus optional delayed ACL reconstruction arm*

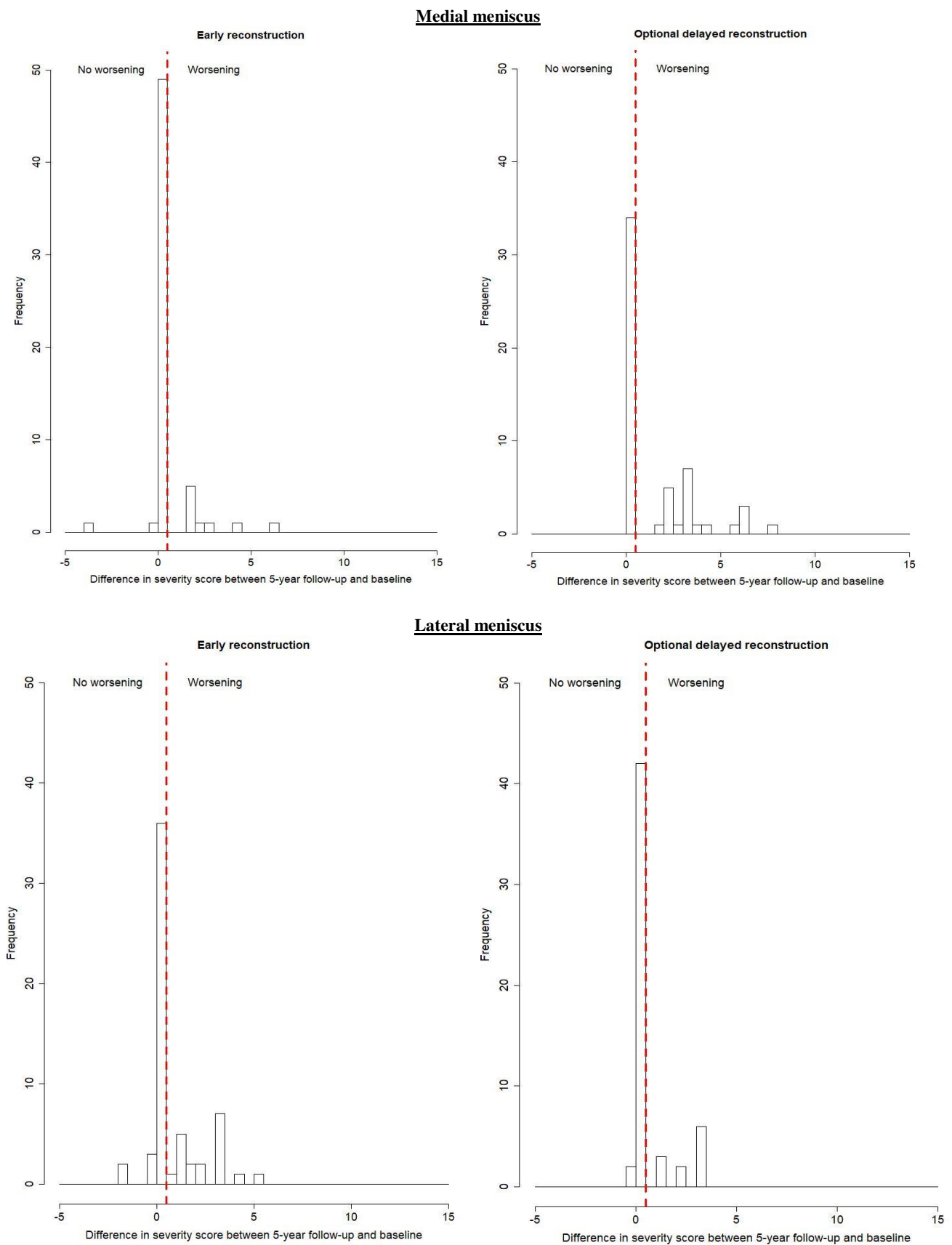


Table 6 Diagnostic accuracy ACLOAS MRI readings versus clinical MRI readings compared to surgical reports* for medial and lateral meniscal tears at baseline in the early reconstruction arm (N=60)

Medial meniscal tears

	ACLOAS		Accuracy	Clinical readings		Accuracy
	Meniscal tear on	No meniscal tear on	Sensitivity/	Meniscal tear on	No meniscal tear on	Sensitivity/
	surgical report	surgical report	Specificity	surgical report	surgical report	Specificity
Meniscal tear on MRI	6	4	0.38/0.91	12	8	0.75/0.82
No meniscal tear on MRI	10	40		4	36	
Total	16	44		16	44	

Lateral meniscal tears

	ACLOAS		Accuracy	Clinical readings		Accuracy
	Meniscal tear on	No meniscal tear on	Sensitivity/	Meniscal tear on	No meniscal tear on	Sensitivity/
	surgical report	surgical report	Specificity	surgical report	surgical report	Specificity
Meniscal tear on MRI	13	2	0.50/0.94	21	11	0.81/0.68
No meniscal tear on MRI	13	32		5	23	
Total	26	34		26	34	

* Surgical reports (gold standard) were biased towards the clinical MRI readings which were available during surgery to help find meniscal tears.