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Original article

Meniscectomy versus meniscal repair: 10 years radiological and clinical results in vertical lesions in stable knee



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ABSTRACT

Introduction: Surgical management of meniscal lesion consists of either a meniscectomy or meniscal repair. Although repair offers immediate recovery after surgery, it is also associated with higher rates of revision. A meniscectomy, on the other hand is known to be associated with an early onset of osteoarthritis. The present study compared clinical and radiological results at 10 years between meniscectomy and meniscal repair in isolated vertical lesion in an otherwise stable knee. The hypothesis was that repair shows functional and radiological benefit over meniscectomy.

Patients and method: A multi-centric retrospective comparative study of 32 patients (24 male, 8 female). Mean follow-up was 10.6 years (range, 10–13 years). There were 10 meniscal repairs (group R) and 22 meniscectomies (group M), in 17 right and 15 left knees. Mean age at surgery was 33.45 ± 12.3 years (range, 9–47 years). There were 28 medial and 4 lateral meniscal lesions; 26 were in the red-red zone and 6 in red-white zone.

Results: Functional score: KOOS score was significantly higher in group R than M on almost all parameters: 98 ± 4.69 versus 77.38 ± 21.97 for symptoms ($P=0.0043$), 96.89 ± 7.20 versus 78.57 ± 18.9 for pain ($P=0.0052$), 99.89 ± 0.33 versus 80.88 ± 19.6 for daily life activities ($P=0.0002$), 96.11 ± 9.83 versus 54.05 ± 32.85 for sport and leisure ($P=0.0005$), but 91 ± 16.87 versus 68.15 ± 37.7 for quality of life ($P=0.1048$). Radiology score: in group R, 7 patients had no features of osteoarthritis, and 2 had grade 1 osteoarthritis. In group M, 5 patients had grade 1 osteoarthritis, 10 grade 2, 3 grade 3 and 3 grade 4. Mean quantitative score was 0 (mean, 0.22 ± 0.44) in-group R and 2 (mean, 2.19 ± 0.98) in group M ($P<0.0001$).

Discussion: At more than 10 year's follow-up, functional scores were significantly better with meniscal repair than meniscectomy on all parameters of the KOOS scale except quality of life. Functional and radiological scores correlated closely. These results show that meniscal repair for vertical lesions in stable knees protects against osteoarthritis and is therefore strongly recommended.

Level of evidence: IV; retrospective study.

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1. Introduction

Meniscectomy and meniscal repair are two surgical options to treat meniscal lesions. Meniscectomy is known to incur a long-term risk of osteoarthritis [1–10], while meniscal repair has a more difficult immediate postoperative course [11–15], with higher rates of surgical revision and complications [16–20].

In France, the rate of meniscal repair in stable knee increased from 2.5% to 12.05% between 2006 and 2012, at 14,781 operations in 2012 (source: *Agence technique de l'information sur l'hospitalisation* (ATIH) hospitalization information technical agency website). These meniscus-sparing techniques aim to conserve long-term cartilage stock, thereby reducing the rate of osteoarthritis. For this fashion to stabilize and repair to become the first-line attitude, long-term results need to be assessed.

The present study sought to compare clinical and radiological results at 10 years' follow-up between meniscectomy and meniscal repair for isolated vertical lesions in stable knee in regions 1 and 2. The hypothesis was that repair shows functional and radiological benefit over meniscectomy.

2. Patients and methods

2.1. Population

A multicenter retrospective comparative study included patients operated on for vertical meniscal lesion in region 1 or 2 between January 1, 2001 and December 31, 2004. Exclusion criteria comprised associated ligamentous lesion, particularly of the anterior cruciate ligament, history of surgery to the affected knee, region 3 lesion, and concomitant grade > 2 cartilage lesion.

2.2. Surgical technique

Meniscectomy was systematically performed under arthroscopy, by basket forceps and/or shaver, sparing healthy stable meniscal tissue.

Repair was performed under arthroscopy, using suture or hybrid techniques: all-inside for posterior and medial segment lesions, and outside-in for anterior segment lesions, techniques being associated for extensive lesions.

2.3. Clinical and radiological assessment

Lesion type, treatment and chondral status were recorded on an information form based on the surgical report and/or preoperative MRI.

Functional assessment at last follow-up uses the KOOS scale.

Radiologic assessment comprised AP, lateral, schuss and 30° patellofemoral views and bipedal weight-bearing telemetry at last follow-up. Osteoarthritis was classified in 5 grades following Kellgren and Lawrence [21].

2.4. Statistical analysis

Qualitative variables were compared between groups by Chi² or Fisher exact test according to theoretic sample size and number of classes per variable. Quantitative distributions were compared by non-parametric Man–Whitney test for non-matched series, due to the small size of samples.

Non-parametric Kruskal–Wallis tests were used to compare 2 distributions between pairs of variables: 1 qualitative with > 2 classes, and 1 quantitative with non-normal distribution.

Correlations between quantitative variables were assessed by non-parametric Spearman test or simple correlation test, with linear regression to assess relatedness.

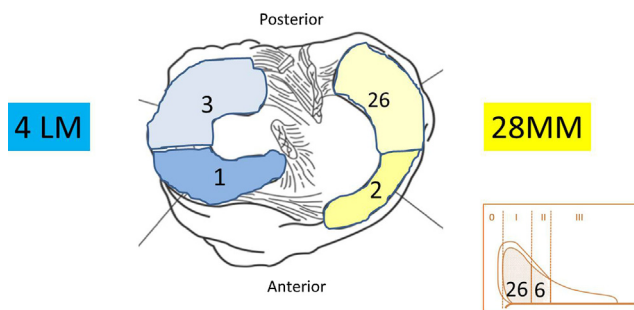


Fig. 1. Location of initial meniscal lesions.

The significance threshold was systematically set at 0.05. Analyses were conducted on Statview 5.0 and SAS 9.1.3 software (SAS Institute, Cary, NC, USA).

3. Results

3.1. Study population

Thirty-two patients were included: 24 male, 8 female. There were 10 meniscal repair procedures (group R) and 22 meniscectomies (group M), in 17 right and 15 left knees. Mean age at surgery was 33.45 ± 12.3 years (range, 9–47 years) for the series as a whole, with a significant difference between group M (38.9 ± 8.1 years; range, 18–47 years) and group R (20.11 ± 10.8 years; range, 9–45). Mean follow-up was 10.6 years (range, 10–13 years). Meniscectomy was performed in one center, and repair in 2 other centers.

There were 28 medial and 4 lateral meniscal lesions. Twenty-six involved region 1 and 6 region 2. Twenty-nine involved the posterior and/or medial segments and 3 the anterior segment (Fig. 1).

There were no baseline chondral lesions in group R; in group M, 7 patients had grade 2 chondropathy of the femoral condyle and/or tibia ipsilateral to the meniscal lesion.

3.2. Clinical results

Mean KOOS score was significantly higher in group R than M: 98 ± 4.69 versus 77.38 ± 21.97 for symptoms ($P=0.0043$), 96.89 ± 7.20 versus 78.57 ± 18.9 for pain ($P=0.0052$), 99.89 ± 0.33 versus 80.88 ± 19.6 for daily life activities ($P=0.0002$), 96.11 ± 9.83 versus 54.05 ± 32.85 for sport and leisure ($P=0.0005$), but 91 ± 16.87 versus 68.15 ± 37.7 for quality of life ($P=0.1048$) (Fig. 2).

3.3. Radiologic results

At last follow-up, radiologic assessment could not be performed for 1 patient in group R and 1 in group M. In group R, 7 patients showed no signs of osteoarthritis and 2 showed grade 2 osteoarthritis. In group M, 5 patients had grade 1, 10 grade 2, 3 grade 3 and 3 grade 4 osteoarthritis. The intergroup difference for the 5 grades of osteoarthritis was significant ($P=0.0001$) (Table 1a).

Median mean quantitative score on schuss radiographs was 0 (mean, 0.22 ± 0.44) in group R and 2 (mean, 2.19 ± 0.98) in group M, constituting a significant difference ($P<0.0001$) (Table 1b).

Table 1a
Radiologic results (osteoarthritis stages per group).

Grade	0	1	2	3	4	P
R	7	2	0	0	0	0.0001*
M	0	5	10	3	3	

* Significant difference between repair and meniscectomy regarding osteoarthritis stages.

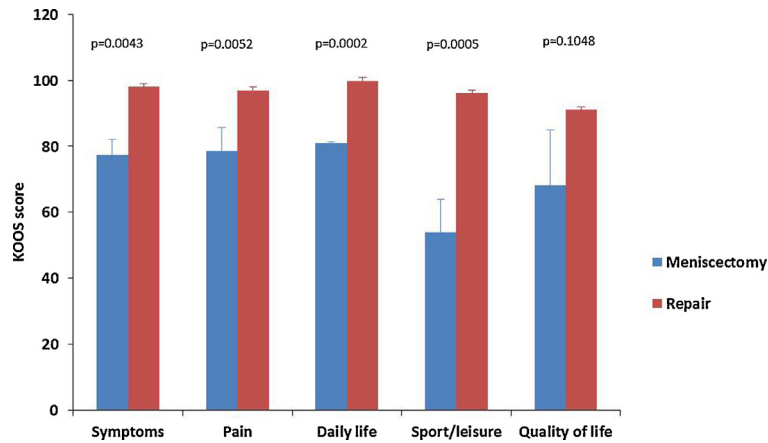


Fig. 2. KOOS scores at last follow-up.

Table 1b

Radiologic results (mean quantitative score).

	Schuss X-rayR	Schuss X-rayM	P
n	9	21	< 0.0001*
Mean ± standard deviation	0.22 ± 0.44	2.19 ± 0.98	
Range	[0–1]	[1–4]	
Median	0	2	

* Significant difference between repair and meniscectomy for the mean osteoarthritis quantitative score.

3.4. Correlation between functional and radiologic scores

There was a significant correlation ($P=0.0016$) between functional and quantitative radiologic results, taking both groups together (Table 2): in the 7 patients with radiology grade 0, median KOOS score was 100; in the 7 with grade 1, it was 95.4; in the 10 with grade 2, 89; in the 3 with grade 3, 53.6; and in the 3 with grade 4, 51.8.

This correlation was linear with KOOS score inversely proportional to radiologic score (Fig. 3).

4. Discussion

At more than 10 years' follow-up, the present series showed significantly better functional scores after meniscal repair than after meniscectomy on all KOOS items, except quality of life. Repair appeared to protect against osteoarthritis, with a median Kellgren-Lawrence grade of 0 at last follow-up, versus 2 for meniscectomy. Functional and radiologic scores were closely correlated, indicating intact cartilage stock, ensuring functional comfort in operated knees.

There are numerous reports of results in meniscectomy [2–8,10,22–24] and meniscal repair [25–29], comparisons between the two [20,30,31] and meta-analyses [32–34]. Interpretation, however, is hindered by numerous biases: meniscal surgery was either isolated or associated to anterior cruciate ligament surgery; patient ages and clinical and radiological assessment scoring

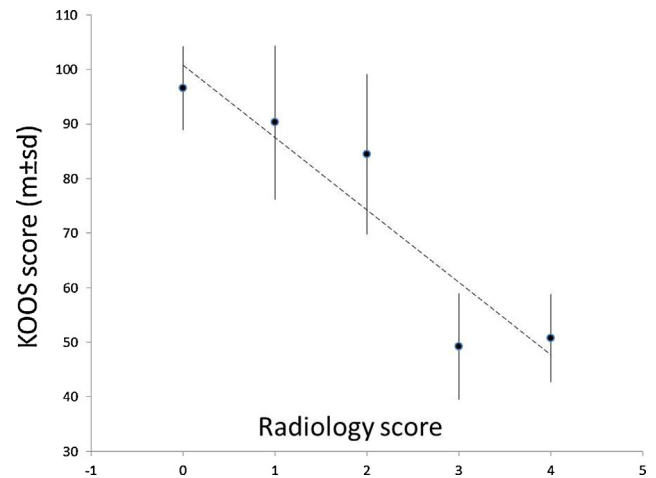


Fig. 3. Linear correlation between KOOS and radiology scores.

systems differed; follow-up was short or variable; and initial meniscal lesion type, repair technique, meniscectomy extent and initial chondral status were not always specified.

Regarding functional results, in a meta-analysis of 7 studies including 367 patients at a minimum 7 years' follow-up, Xu and Zhao [34] reported significantly better Lysholm scores and a smaller reduction in Tegner score with meniscal repair than with meniscectomy. This difference in Lysholm score was likewise found, at more than 10 years' follow-up, in Paxton's meta-analysis [2], but not in other long-term studies, where functional scores differed less between the two techniques [30,31]. Repair, however, gave better results in terms of activity level and sport [30,31].

The present study found a protective effect of repair against osteoarthritis, in agreement with the literature: long-term cartilage degradation rates range from 8% to 43% after repair, versus 21% to 64% after meniscectomy [8,10,20,23,24,28–31,33,35,36]: i.e., a factor of 2.

Table 2

Correlation between functional and quantitative radiological scores, both groups taken together.

Radiological grade	0	1	2	3	4	P
No. patients	7	7	10	3	3	
Koos score						
Mean ± standard deviation	96.6 ± 7.6	90.3 ± 14.1	84.5 ± 14.7	49.2 ± 9.7	50.8 ± 8.0	0.0016*
Range	[79–100]	[59–100]	[52–100]	[38–56]	[42–58]	
Median	100.0	95.4	89.0	53.6	51.8	

* Significant correlation between Koos and radiologic scores.

Table 3
Long-term functional and radiological of meniscectomy and of meniscal repair in the literature.

Authors	Year	FU (years)	Technique	Number of patients	Functional score	Osteoarthritis
Neppel et al. [33](meta-analysis)	2012	7.4	Repair	566 (13 studies)	90	8–25%
Pujol et al. [29]	2015	9.7	Repair	31	94	R 30%
Tengrootenhuysen et al. [28]	2011	5.8	Repair	119	92 if success 80 if failure	14% if success 81% if failure
Rockborn and Messner [30]	2000	13	Repair/meniscectomy	M 30 R 30	M 95 R 95	M27% R 4%
Stein et al. [31]	2010	8.8	Repair/meniscectomy	M 39 R 42	M 91 R 88	M 60% R 20%
Burcks et al. [36]	1997	14.6	Meniscectomy	146	M 94	M 59%
Chatain et al. [8]	2003	11	Meniscectomy	471	Subj IKDC 85 ML 90 LM	21% MM 37% LM
Fauno and Nielsen [35]	1992	12	Meniscectomy	136	83% L > 90	24%
Hulet et al. [24]	2015	24	Meniscectomy	89	Subj IKDC 71 KOOS items 69 to 82	56%

A search of the literature retrieved only 2 studies comparing meniscectomy and meniscal repair in isolated lesions on stable knee. Rockborn and Messner [30] compared clinical and radiologic results in 30 meniscal repairs and 30 meniscectomies at a mean 13 years' follow-up. There was no significant difference in functional score, with a median Lysholm score of 95 in both groups, but Tegner activity score was significantly better after repair. This is comparable to the present findings, with very much better scores on the KOOS sport/leisure item after repair. Radiologically, Rockborn and Messner reported a 27% rate of grade 2 osteoarthritis after meniscectomy, versus 4% after repair, although for reasons of statistical power a significant difference could not be demonstrated [30]. Stein et al. [31] compared 42 repair surgeries and 39 meniscectomies for medial meniscal lesion, at a mean 8.8 years' follow-up. There was no difference in Lysholm functional score, but sport was resumed at preoperative levels in 96% of patients after repair, versus 50% after meniscectomy. Radiologically, 80% of patients with meniscal repair showed no signs of osteoarthritis, compared to 40% of those with meniscectomy. The protective effect of repair was significant in patients aged less than 30 years, but with no difference between groups beyond this age. A benefit of repair in terms of osteoarthritis was likewise found in the present series, although statistical power precluded studying the age effect.

The literature on isolated meniscal lesions testifies to the functional and above all radiological benefit of repair surgery, especially in young adults with high activity levels and in athletes. Table 3 presents clinical and radiological results from the series in the literature.

The present study had several limitations, notably including small sample size. Paxton et al. [20], in a literature review, retrieved 70 studies of meniscal repair, 21 of meniscectomy and only 4 comparing the two. Only one study [37] focused on isolated meniscal lesion, without associated ligament repair, including 10 repairs and 11 meniscectomies: i.e., fairly comparable to the present series.

Other weaknesses of the present study were its retrospective design, age difference between groups, and lack of data on lesion age, morphotype, body mass index or postoperative sports activity. Moreover, functional assessment was restricted to KOOS score. And finally, certain fine analyses, according to medial versus lateral meniscal lesion or lesion depth, were not possible.

5. Conclusion

At more than 10 years' follow-up, the present study of vertical meniscal lesions in stable knee showed that meniscal repair gave better functional results than meniscectomy and exerted a protective effect against progression toward osteoarthritis. The

correlation between functional and radiologic scores encourages a long-term attitude in favor of meniscal repair over meniscectomy in these lesions. Larger-scale studies will be needed to identify factors influencing results.

Disclosure of interest

B. Sonnerly-Cottet is a consultant with Arthrex. The other authors declare that they have no conflicts of interest concerning this article.

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