

ARTHROSCOPIC SYNOVECTOMY IN RHEUMATOID AND PSORIATIC KNEE JOINT SYNOVITIS: LONG-TERM OUTCOME

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SUMMARY

A long-term prospective study was performed to evaluate the safety and long-term outcome of surgical arthroscopy (AS) for persistent rheumatoid (RA) and psoriatic (PsA) knee joint synovitis (KJS). Local signs of joint inflammation (tenderness, swelling, 'ballottement') and range of motion (ROM) were scored and the sum, taken as a global outcome measure, was recorded in 17 RA and 18 PsA knees, both before and at follow-up periods of 2, 6, 12, 24 and 36 months after surgical AS (knee joint synovectomy; meniscal curettage, cartilage shaving or chondrectomy, according to the degree of cartilage damage). A survival analysis (Kaplan-Meier) of the long-term outcome of surgical AS treatment and of the predictive value of clinical parameters of knee joint involvement was also performed. No intra- or post-operative morbidity, pain worsening or loss of joint motion was observed and all patients were discharged within 48 h. Comparison of the parameters of knee joint evaluation showed a significant reduction of the signs of joint inflammation and a significant increase in the ROM in all follow-up periods. At 36 months, the survival curves showed a 61.2% cumulative probability of clinical remission and 72.8% of definite improvement. No significant differences in the prognostic importance of RA, compared to PsA diagnosis, were observed, although higher percentages of PsA compared to RA knees (86.3% and 45.7%, respectively) reached the end point of clinical remission at 36 months. KJS duration, radiographic severity and cartilage damage were not predictors of poor long-term outcome of AS synovectomy. Surgical AS treatment for PsA knees with more advanced cartilage damage gave a better long-term outcome. A total of 50.7% of operated knees reached the end point of a KJS relapse at 36 months, the majority (82%) within the initial 18 months of follow-up. Our study indicates that AS synovectomy is a safe procedure requiring short hospitalization which, in combination with second-line medical treatment, can reduce local inflammation in RA and PsA KJS, and preserve knee joint ROM for up to 3 yr.

KEY WORDS: Arthroscopic synovectomy, Knee joint synovitis, Rheumatoid arthritis, Psoriatic arthritis, Long-term follow-up.

THE prevention of rapid progression of joint damage and functional disability in rheumatoid (RA) [1-3] and psoriatic (PsA) arthritis [4] requires appropriate medical treatment together with combinations of surgical, physical and occupational intervention [5-7]. The advent of arthroscopy has prompted reconsideration of the value of arthroscopic synovectomy (AS) in the management of persistent RA and PsA knee joint synovitis (KJS), and comparable clinical results have already been reported for AS and open knee joint synovectomy [8-10].

However, steady advances in the AS technique over the last 10 yr [11], and the scarcity of long-term prospective follow-ups regarding the response to AS synovectomy, still make it difficult to define the proper role of AS synovectomy in the treatment of RA and PsA KJS [12, 13].

To evaluate the reliability of current surgical AS procedures for RA and PsA KJS, a 36 month prospective study of local KJS response, the survival analysis of a clinical outcome measure and analysis of

the prognostic importance of outcome predictors were performed.

MATERIALS AND METHODS

Thirty-two patients were treated in our department of rheumatology; 15 had RA (17 knees), as defined according to ACR-modified criteria [14], 17 had PsA (18 knees) according to the criteria of Moll and Wright [15], and 12 (13 knees) had polyarticular and five monoarticular involvement. Patients' characteristics, radiological and AS findings on knee joint involvement at the moment of entry into the study are reported in Table I. All patients had persistent KJS and had been treated with NSAIDs and second-line drugs for at least 6 months, except three patients with monoarticular involvement, who had only received NSAIDs (cases MS, ZA and MF; Table I). Intra-articular steroid injections were carried out in five knees, at 1 (two knees), 3 (two knees) and 8 (one knee) months of follow-up. The Larsen score was used for radiographic evaluation of the knee joint [16]. During the follow-up period, patients were asked to inform our department of any sign of KJS relapse outside the normal follow-up checks.

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Clinical assessment

Assessment of KJS inflammation and range of motion (ROM) was carried out on 35 knees within 1 week of AS synovectomy, and 2, 6, 12, 24 and 36 months after synovectomy in 21, 35, 35, 28 and 19 knees, respectively, and in the case of KJS relapse (R-KJS) (a 50% increase in the post-synovectomy value of the global index). Only objective criteria to evaluate responses to surgical AS treatment were considered. Joint tenderness was measured by firm pressure over the knee joint margin (graded 0-3); joint swelling was recorded as detectable synovial thickening, with or without loss of bony contours or cystic synovial proliferation (graded 0-3); 'bulge sign' and/or ballottement of the patella by lateral and medial palpation of the patella or by compression of the suprapatellar pouch, respectively (graded 0-2) [17]; range of knee joint flexion (150-90°) (grade 0-3) and extension (90-0°) (grade 0-3) was recorded. The sum of these grades was taken as a global outcome measure (global index: GI) of joint inflammation (0-14).

Objective evaluations were made by the same two observers throughout.

Arthroscopy

All operations were performed under spinal anaesthesia, with a thigh tourniquet and constant joint irrigation with saline (average 151/h), within an average time of 55 min. Three to four portals were routinely used, including the posterior compartment. The number of points of access required depended on the gross synovial architecture. Before synovectomy, signs of early synovial propagation, such as the presence of pannus growth on meniscal surfaces, non-weight-bearing areas of the femoral condyles and distal margins of the patella were carefully inspected and articular cartilage changes were graded according to Outerbridge [18]. Articular cartilage changes were treated according to the extent of macroscopic findings. Areas of Outerbridge degrees I and II were not treated. Pannus-induced articular cartilage lesions (Outerbridge degrees III-IV) were treated by shaving

TABLE I
Patient characteristics and knee joint involvement parameters. Data obtained before AS synovectomy and during clinical follow-up

Patient	Sex	Age (yr)	Diagnosis	AFC	Knee	KJSD (yr)	Larsen degree	Articular degree†	Cartilage damage location		Therapy*	Time of relapse (months)
									P	FT		
1.	MA	F	60	RA	II	R	2	I	II	+	HCQ	
2.					I	L	2	I	II	+	HCQ	2
3.	DE	M	47	PsA	II	L	17	II	III	+	Gold	8
4.					II	R	22	II	II	+	Gold	
5.	ZG	F	49	RA	II	L	16	I	III	+	AZA	15
6.	SA	M	42	PsA	I	L	1.5	II	III	+	HCQ	20
7.	MS	F	63	RA	II	R	10	II	IV	+	No	
8.	OE	F	50	RA	I	R	4	II	III	+	HCQ	15
9.	BF	M	69	RA	I	L	3	I	III	+	HCQ	15
10.	JM	F	63	PsA	I	L	2	II	III	+	Gold	13
11.	ZR	M	47	PsA	I	L	3	I	III	+	No	
12.	DG	F	39	RA	II	R	4	I	IV	+	Gold	
13.	GS	F	31	RA	II	L	8	I	II	+	HCQ	4
14.	MC	F	24	PsA	I	R	2	I	II		HCQ	
15.	MR	M	36	PsA	I	L	6	I	II	+	HCQ	14
16.	BM	F	50	RA	I	L	10	I	II	+	HCQ	
17.	TD	M	45	PsA	I	R	1.5	I	IV	+	HCQ	12
18.	RM	F	39	PsA	II	L	2.5	I	II	+	HCQ + gold	6
19.	GT	F	20	PsA	I	L	6	I	II	+	HCQ	2
20.	LF	M	42	PsA	I	L	6	I	IV	+	Gold	7
21.	ZGu	M	44	PsA	I	R	22	I	I	+	Gold	
22.	PI	M	29	PsA	I	R	1.08	I	0		HCQ	
23.	BL	F	47	RA	I	L	4	I	I	+	HCQ	
24.	BC	F	29	PsA	II	L	4	II	II	+	Gold	
25.	FP	F	75	PsA	II	L	6	II	IV	+	HCQ	
26.	FG	M	51	RA	I	R	7	I	I	+	HCQ	6
27.					I	L	7	I	II	+	HCQ	4
28.	BG	M	62	RA	II	R	3	I	II	+	HCQ	36
29.	ML	F	43	RA	II	L	28	I	I	+	HCQ	
30.	SC	F	62	RA	II	R	23	III	II	+	HCQ	
31.	TN	F	57	RA	II	R	1	II	I	+	D-Penicillamine	
32.	GSe	M	56	PsA	I	R	10	I	III	+	HCQ	
33.	MG	M	44	PsA	I	R	6	I	III	+	HCQ	3
34.	MF	M	52	PsA	I	L	3	I	III	+	No	
35.	DF	M	59	RA	II	R	1	I	III	+	HCQ	

AFC: ACR functional class; KJSD: knee joint synovitis duration; RA: rheumatoid arthritis; PsA: psoriatic arthritis; P: patellar; FT: femorotibial weight-bearing compartments.

*Since 6 months before AS.

†Outerbridge degree.

and chondrectomy of flap, fibrillation or eroded areas. A 4.5 mm 30 Dyonics videoarthroscope was used. The systematic operative procedure was as follows.

Step 1. Scope and resector in the antero-lateral and -medial points of access, respectively. Inflow into supero-lateral portal. Synovium resection from suprapatellar pouch, medial gutter, medial femoral condylar surface, retropatellar area, posterior aspect of fat pad, ligamentum mucosum and plica, and from intracondylar notch and superior and inferior meniscal surfaces (curved 4.5-; full radius 5.5- synovial resector).

Step 2. Superficial débridement of pannus growth and area of cartilage damage (Outerbridge degrees III and IV), by removing cartilaginous fringe and wiping and blending the borders of cartilage lesions (full radius 5.5 cutter; abrader) at the outer articular surfaces of medial femoral condyles and patellar, trochlear or tibial surfaces.

Step 3. The scope and synovial resector are interchanged (scope: antero-medial; resector: antero-lateral). Synovium resection and cartilage débridement from lateral gutter and lateral compartment.

Step 4. Synovium resection from antero- and postero-medial surface of posterior cruciate ligament, through intracondylar notch, in the virtually stretched knee. Postero-medial access was rarely indicated in addition to the usual standard access, in cases of synovium or osteophyte block of the fossa.

Active knee movement was started during the first post-operative day; an isometric exercise programme, and loading and/or walking with crutches, were planned after the second day.

Statistics

The Wilcoxon signed rank test was used to evaluate the significance of pre- and post-AS treatment evaluations. The BMDP statistical package for univariate survival analysis, according to Kaplan-Meier, was used. The date of AS synovectomy was considered as the entry point and the date of definite improvement of KJS (clinical index $\leq 80\%$ of baseline value), clinical remission (clinical index ≤ 1) or clinical relapse (clinical index $\geq 50\%$ of the post-AS synovectomy value) as the end points. The prognostic importance for the long-term outcome of AS surgical treatment of distinct clinical (and laboratory) parameters was also evaluated: KJS diagnosis (RA and PsA); duration of synovitis (≤ 3 and > 5 yr); radiographic severity (Larsen degrees $\leq I$ and $> I$) and cartilage damage (Outerbridge degrees $\leq II$ and $> II$).

RESULTS

Clinical

The means of each outcome measure of knee joint involvement at the entry point and at various moments during AS post-synovectomy follow-up are reported in Fig. 1. For reasons not related to AS surgical treatment, 14, 6 and 15 patients did not attend at 2, 24 and 36 months of follow-up. A significant reduction in all considered clinical parameters of knee joint involvement was found at the second month, and at 6, 12, 24 and 36 months after the entry point (Fig. 1). Seventeen patients had a clinical relapse of KJS during the subsequent follow-up (six patients ≤ 6 , two < 12 , eight < 24 and one at 36 months follow-up; average 9.5

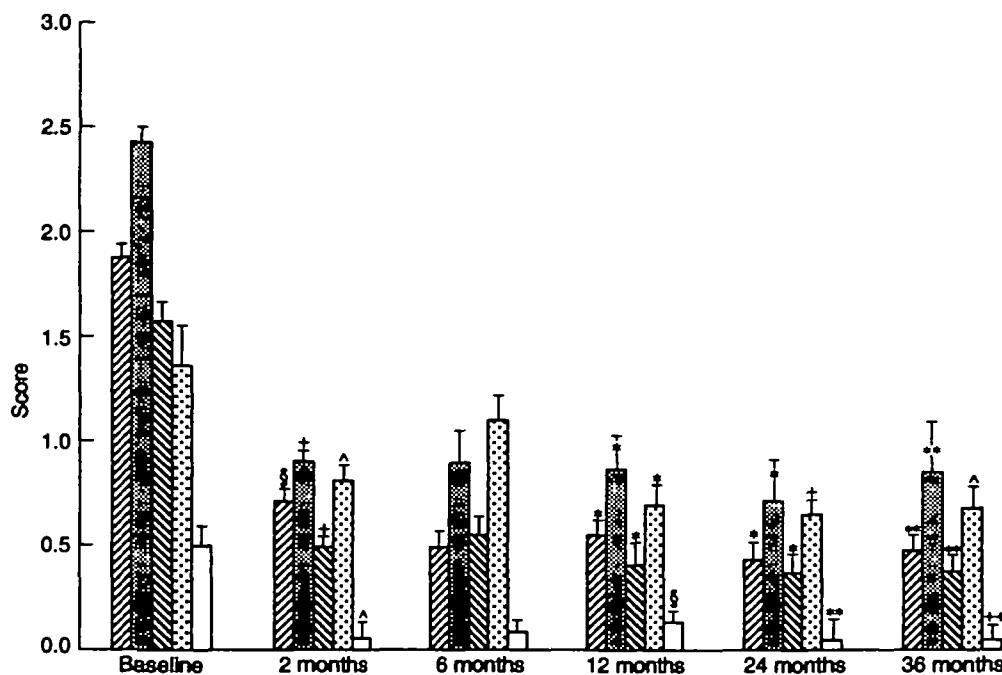


FIG. 1.—Clinical assessment during follow-up after AS synovectomy. Hatched bars: tenderness; stippled bars: swelling; double hatched bars: ballottement; dotted bars: flexion; white bars: extension. Data represent means \pm S.E.M. * $P = 0.00001$; + $P = 0.0001$; § $P = 0.001$; ^ $P = 0.05$; ++ $P = 0.02$.

months). Four cases with relapse (23.5%) and six without relapse (33.3%) suspended basic therapy for periods of 1–3 months, due to undesired side-effects. The percentages of patients remaining in second-line therapy at 2, 6, 12, 24 and 36 months were 90.6, 92.3, 68.6, 70.3 and 64.7%, respectively. During the 36 month clinical follow-up, a knee joint prosthesis was implanted in one patient with RA (Table I; DG).

Arthroscopy

Outerbridge degrees and locations of articular cartilage changes are reported in Table I. One knee was 0 degrees (2.8%), 13 I–II degrees (37.1%) and 16 III–IV degrees (45.6%). In 85% and 42% of the knees, the sites of articular cartilage changes were, respectively, the patella and either lateral or medial weight-bearing compartments (Table I).

Survival analysis

The survival curves of the outcome of AS synovectomy are reported in Fig. 2. At 36 months, the cumulative probability of reaching the end point of definite improvement was 72.8% (Fig. 2a) and that of reaching the end point of clinical remission was 61.2% (Fig. 2b). No significant differences in the prognostic importance of RA compared to PsA diagnosis were observed (Fig. 3a) in spite of higher percentages of PsA, compared to RA knees, reaching the end point of KJS remission at 36 months (86.3% and 45.7%, respectively). The duration of synovitis, radiographic severity and cartilage damage did not turn out to be predictors of poor prognostic value in the long-term surgical AS response (Fig. 3b–d). At 36 months, the probability of reaching the end point of definite improvement or clinical remission was significantly higher ($P = 0.04$ and $P = 0.03$, respectively) for knees

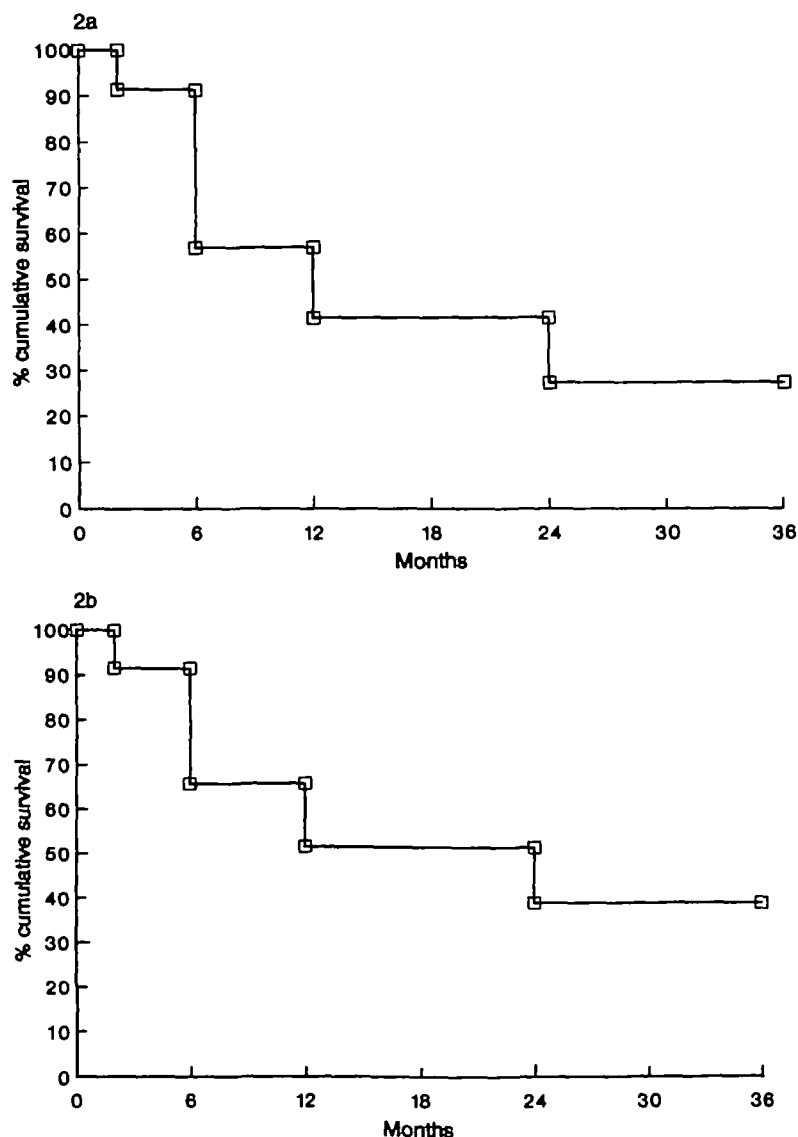


FIG. 2.—Outcome at 36 months follow-up after AS synovectomy in 35 rheumatoid and psoriatic knees. Curves represent the probability of not reaching the end point of (a) definite improvement (80% reduction of global index) and (b) clinical remission (global index ≤ 1).

with Outerbridge degree > II (Fig. 3d). Among knees with more advanced cartilage damage ($n = 16$), those reaching the end point of clinical remission were eight with PsA (50%) and four with RA (25%). The cumulative probability of a clinical relapse of KJS was 50.7% at 36 months, the median survival of clinical relapse was at 24 months (Fig. 4). None of the clinical (and laboratory) parameters of knee joint involvement considered turned out to be predictive of KJS relapse.

DISCUSSION

Our surgical procedure, performed with the recently developed AS technique, has shown itself to be safe, with no intra- or post-operative morbidity, pain worsening or loss of joint motion, and only brief hospitalization is required.

The significant improvement in local assessment of knee joint inflammation and ROM scores 2 months after operation, still lasting after 36 months (Fig. 1), compares favourably with previous reports on AS synovectomy treatment [8, 19]. The early appearance

and long-term persistence of the ROM response is not apparent from more recent reports [20, 21]. Differences in patients' clinical characteristics and in surgical procedures may account for discrepant findings. Interestingly, in the few studies previously reporting significant ROM improvement, standardized second-line medical treatment was maintained throughout [22-24]. This supports the 'biomechanical indication' of AS synovectomy to remove intra-articular obstacles and favour the local action of drugs [25].

Survival analysis showed a 61.2% cumulative probability of local remission and 72.8% of definite improvement of KJS at 36 months (Fig. 2). The overall success rate at 36 months was similar to the only recently available long-term prospective study on AS synovectomy [21], although different statistical methods were used for outcome evaluation. The advantage of survival analysis compared to the Markov process modelling used by Harris and Basinski is that it needs neither assumptions about transition probabilities nor fixed time intervals. However, the lack

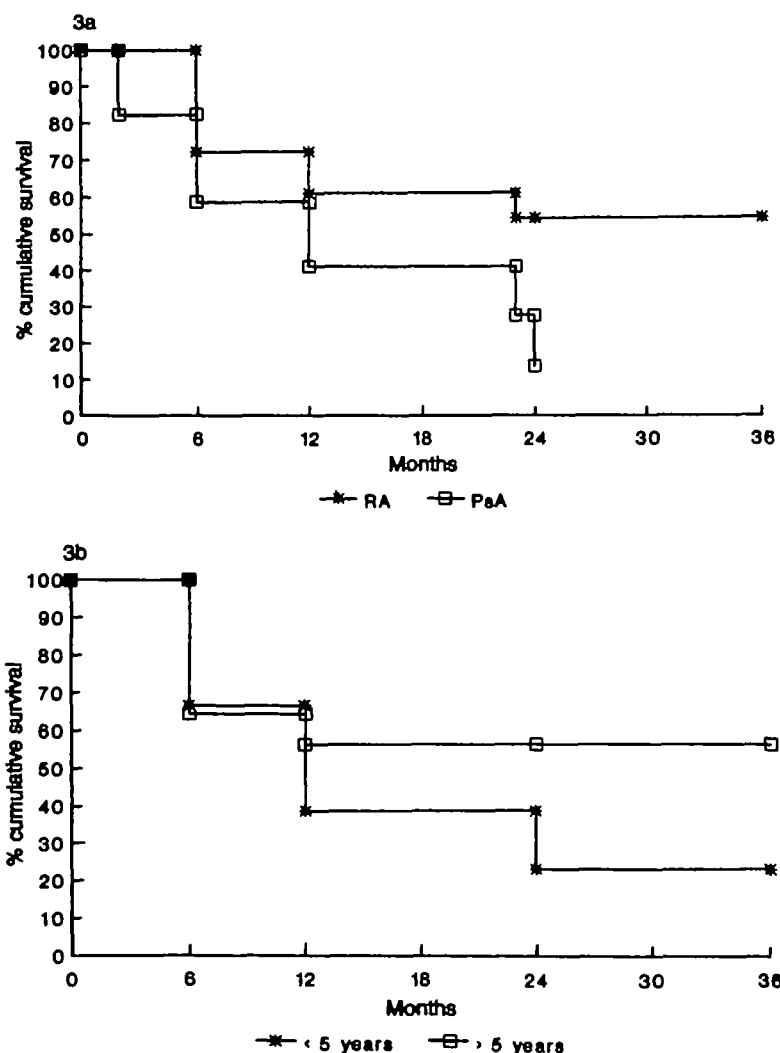


FIG. 3.—Survival curves in 35 rheumatoid and psoriatic knees after AS synovectomy (36 months follow-up) according to clinical remission. (a) Comparison between knees affected by rheumatoid and psoriatic arthritis; (b) comparison between knees with synovitis duration ≤ 5 or > 5 yr.

of controls (for ethical reasons) means that definitive conclusions on the efficacy of our surgical AS procedure are inappropriate.

Survival analysis enabled us to carry out statistical evaluation of the prognostic importance of some clinical parameters of knee joint involvement. As regards diagnosis, the long-term outcome of RA compared to PsA KJS was not significantly different (Fig. 3a). However, the small sample size may have reduced the statistical power of the test, since higher percentages of PsA knees reached the end point of KJS remission at 36 months, compared to that of RA knees (86.3% and 45.7%, respectively). These preliminary data need to be confirmed in a larger number of patients, especially since no prospective studies on surgery have so far been reported in PsA patients [7] and poor functional recovery was found after surgical treatment [26, 27].

The duration of synovitis, radiographic severity and cartilage damage showed no unfavourable prognostic

value, according to some preliminary observations [23, 24], in spite of the poor outcome predictions already reported for open synovectomy [8, 28]. In fact, in comparison to AS, open synovectomy has been shown to cause significantly higher osteoarthritic changes [9, 10]. Thus, improved AS instruments now allow extensive resection of pannus while preserving intra-articular structures, and good results have already been reported in patients with advanced articular damage [23, 24]. More intriguing is the significantly higher probability of reaching the end point of local KJS remission for knees with a higher degree of cartilage damage (Outerbridge III–IV) compared to those with fewer cartilage changes (I–II) (Fig. 3d). Since the two groups had no significant differences in clinical characteristics and medical treatment (Table I), the differential approach of the AS surgical procedure, targeting articular cartilage lesions, may be important. In fact, 45.6% of our treated knees had Outerbridge degrees III–IV—twice the percentage

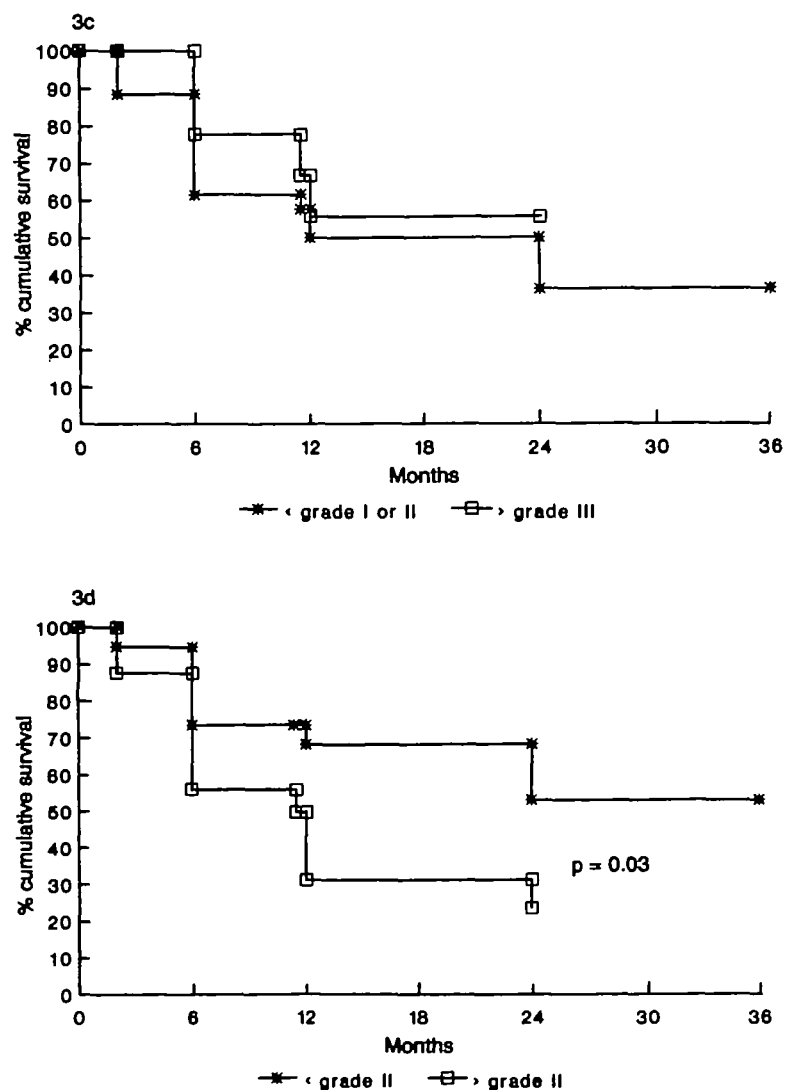


FIG. 3.—Survival curves in 35 rheumatoid and psoriatic knees after AS synovectomy (36 months follow-up) according to clinical remission. (c) Comparison between knees with Larsen grade I or II and III; (d) comparison between knees with chondritis grade \leq II or $>$ II.

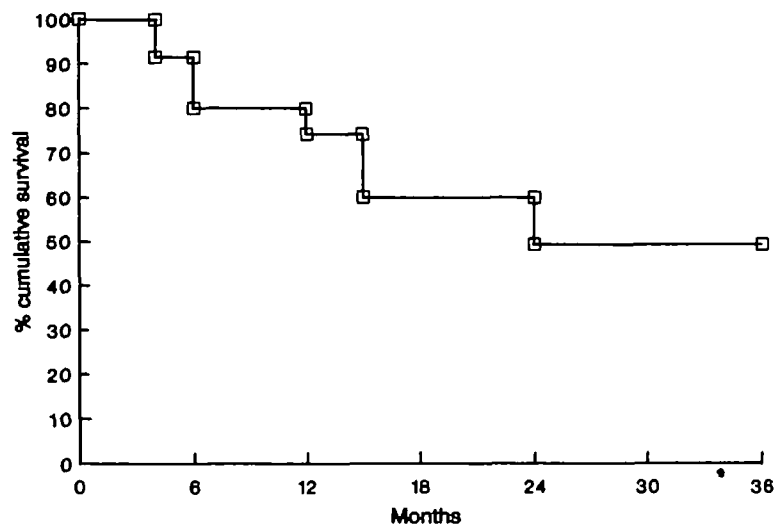


FIG. 4.—Outcome at 36 months follow-up after AS synovectomy in 35 rheumatoid and psoriatic knees. Curves represent the probability of not reaching the end point of KJS relapse (global index 50% higher than the post-synovectomy value).

reported in more recent AS synovectomy studies [21, 24]. The sites of articular cartilage changes (Table I) were consistent with the preferential pathway of synovial propagation from the vertical edge of the patella through the perimeniscal areas of ipsilateral weight-bearing compartments [28, 30]. Whether selective removal of the more aggressive front of pannus in these crucial areas [31, 32] by meniscal curettage and cartilage shaving or chondrectomy is effective in controlling further progression of the KJS process still needs to be confirmed by more extensive and controlled studies.

Survival curves showed a 50% cumulative probability of clinical relapse after 36 months, the median was at 24 months of follow-up (Fig. 4). Interestingly, none of the clinical parameters considered turned out to be predictive for KJS relapse. Up to now, the clinical definition of KJS relapse after AS synovectomy, as well as histological confirmation of reported cases, are lacking [8, 9]. The significant increase in the amount of joint effusion, but not of synovial thickness in relapsed knees, previously reported [33], indicates that a flare of joint inflammation may become clinically evident without detectable synovial regeneration.

Recently, radiation synovectomy has been suggested as an effective alternative to surgical synovectomy [34, 35]. However, the need for strict hospital immobilization, the high failure rate of repeated therapy [34] and the lack of benefits in combination with AS synovectomy [36] indicate the surgical AS approach for refractory KJS, particularly in cases of early ROM reduction and/or severe cartilage lesions. Our study shows that AS synovectomy is a safe procedure requiring short hospitalization which, in combination with second-line medical treatment, can reduce local inflammation in RA and PsA KJS, preserve knee joint ROM for up to 3 yr and delay the need for definitive replacement surgery [21, 23, 24].

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