Treatment of Chronic Knee Synovitis with Arthroscopic Synovectomy: Longterm Results

FRANÇOISE ROCH-BRAS, JEAN-PIERRE DAURÈS, MARIE-CHRISTINE LEGOUFFE, JACQUES SANY, and BERNARD COMBE

ABSTRACT. ***Objective.*** We examined the longterm results of arthroscopic synovectomy in chronic knee synovitis of rheumatoid arthritis (RA).

Methods. Forty-one knees of 38 patients (30 women, 8 men), mean age of 42.7 ± 15.3 years, were evaluated clinically and radiographically at a mean 8.9 years (range 5.0–12.3) after arthroscopic synovectomy. Arthroscopic synovectomies were always performed with a shaver by the same physician after failure of at least one radioactive or chemical synovectomy. Radiographs were blindly read by 2 examiners.

Results. At the final evaluation, the clinical results (pain, range of motion, recurrent effusion) were good in 29 cases (70.7%) and poor in 12 cases (knee arthroplasty was required in 11 cases). Radiographs highlighted significant progression of joint damage (more than one Larsen score grade) in 16 knees (39.0%). No radiographically detectable change was observed in 12 cases (29.3%), and 11 knees (26.8%) had a change of only one Larsen score grade. There was a close correlation between the Larsen score at final examination and both Larsen score and arthroscopic score for cartilage damage at baseline. Only 4 knees (22%) with grade 0 or 1 on preoperative radiographs had significant progression of joint damage, compared to 12 knees (57%) with Larsen scores of 2 or 3 at baseline.

Conclusion. These data suggest that arthroscopic synovectomy is a useful alternative treatment for chronic knee synovitis in RA after failure of radiation or chemosynovectomy, and that less severely damaged joints deteriorate less rapidly after synovectomy. (J Rheumatol 2002;29:1171–5)

Key Indexing Terms:
KNEE JOINT
CHRONIC SYNOVITIS
ARTHROSCOPIC SYNOVECTOMY
RHEUMATOID ARTHRITIS

There has been a decline in interest for synovectomy of the knee in patients with inflammatory rheumatoid disease because of the development of new basic treatments and progress in their management. Chronic synovitis can persist, despite efficient systemic disease management, and local treatments are thus indicated. Intraarticular corticosteroid injections sometimes fail to provide sustained relief for local inflammatory disease. The efficacy of chemical and isotopic synovectomy has been demonstrated in the treatment of chronic synovitis[1,2]. Surgical or arthroscopic synovectomy can be prescribed when synovitis is refractory to standard therapies. Arthroscopic synovectomy is a relatively noninvasive procedure that enables subtotal removal of damaged synovial tissue[3-8]. Postoperative joint stiffness, a very common manifestation after open synovectomy[9-12], is rarely noted after arthroscopic synovectomy. Good short term clinical results have been reported, especially in knees operated at an early synovitis stage, without postoperative radiographic progression of lesions[13-17].

We assessed the longterm results of arthroscopic synovectomy of the knee in patients presenting with rheumatoid arthritis (RA).

MATERIALS AND METHODS

Patients. Arthroscopic synovectomy of the knee was performed in 48 patients with RA, according to the American College of Rheumatology criteria[18], between 1985 and 1992. Ten patients were lost to followup. Forty-one knees of the 38 remaining patients (30 women, 8 men) were evaluated clinically and radiographically at a mean 8.9 years (range 5.0–12.3) after arthroscopic synovectomy. The mean age at surgery was 42.7 ± 15.3 years. All patients had been unsuccessfully treated with chemical (osmic acid, 4 knees) or radiation (yttrium, 37 knees) synovectomy 6 months or more before arthroscopic synovectomy.

Arthroscopic procedure. As described[14], all arthroscopies were performed by the same physician (BC) using a 4 mm 30˚ arthroscope, a video system, and a thigh tourniquet control. All patients were under local or general anesthesia. The procedure required 3–4 anterior portals, and sometimes a posteromedial portal. A suction chondrotome with rotating blades was used to remove the largest amount of synovial membrane as efficiently as possible during the 90 min tourniquet time limit. The procedure led to subtotal removal of synovium from the entire suprapatellar pouch, as well as from the intercondylar notch, around the fringes of the meniscus, and in

From the Fédération de Rhumatologie, CHU Lapeyronie, Montpellier, France.

F. Roch-Bras, MD; M.C. Legouffe, MD; J. Sany, MD; B. Combe, MD, PhD, Fédération de Rhumatologie, CHU de Montpellier; J-P. Daurès, MD, PhD, Institut Universitaire de Recherche Clinique, Montpellier, France.

Address reprint requests to Prof. B. Combe, Fédération de Rhumatologie, Hôpital Lapeyronie, 34295 Montpellier Cedex 5, France.

Submitted March 23, 2001; revision accepted December 4, 2001.

the posterior compartments. The joint was continuously washed with 9–15 l of saline solution. No vacuum drain was applied. Postoperatively, the knee was moved very soon after the procedure (3–5 h), and the patients walked the next day. No other rehabilitation was required. Gait-assisting devices were never required.

Clinical assessment. Patients were evaluated postoperatively at 6 months and then every 2 years, with a mean followup of 8.9 years (range 5.0–12.3). The clinical assessment involved measurement of 3 variables. The degree of pain (at rest) and the degree of joint swelling were each scored on a scale of 0–3. Range of motion (ROM) in flexion-extension was measured with a goniometer. The extent of articular damage determined during arthroscopy was graded from 0 to 4, according to the classification of Outerbridge[19]. Initial and final clinical assessments were performed by the same investigator (BC) for all patients.

Radiographic assessment. Each patient had anteroposterior weight-bearing radiographs of the knee before synovectomy (but 2 films were lost). At final evaluation, 28 of 29 knees not treated with total arthroplasty or arthrodesis (see Results) had anteroposterior weight-bearing radiographs. Initial and final radiographic changes were blindly graded by 2 investigators (FRB, MCL), according to the Larsen classification[20].

Statistical analysis. The Kruskal-Wallis test and Fisher exact test were used to calculate between-group differences. Spearman's rank test was used to verify the correlations. A stepwise logistic regression was performed to identify baseline variables predictive of radiological destruction after arthroscopic synovectomy. The baseline variables tested were age, sex, disease duration, diagnosis, number of tender joints, erythrocyte sedimentation rate (ESR), C-reactive protein (CRP), rheumatoid factor, Larsen score on operated knees, and number of joints with severe damage.

Table 1. Pain assessment preoperatively (groups A and B) and during postoperative followup (group A). Data are number of patients (%).

Pain Score	Group B, n = 12 Baseline*	Group A, n = 29 Baseline* n = 29	After 6 mo, n = 20	Final Evaluation†, n = 29
0	0	1 (3)	15 (75)	23 (79)
1	1 (8)	3 (10)	5 (25)	4 (14)
2	8 (67)	25 (86)	0	1 (3)
3	3 (25)	0	0	1 (3)

* Before arthroscopic synovectomy. † Mean 8.9 years (5.0–12.3).

Table 2. Joint swelling assessment preoperatively (groups A and B) and during postoperative followup (group A). Data are number of patients (%).

Synovitis Score	Group B, n = 12 Baseline*	Group A, n = 29 Baseline*, n = 29	After 6 mo, n = 20	Final Evaluation†, n = 29
0	0	0	14 (70)	20 (69)
1	0	2 (7)	6 (30)	8 (28)
2	8 (67)	17 (59)	0	1 (3)
3	4 (33)	10 (34)	0	0

* Before arthroscopic synovectomy, †mean: 8.9 years (5.0–12.3).

RESULTS

No subject required a second arthroscopic synovectomy, but knee arthroplasty was required after arthroscopic synovectomy in 11 cases (26.8%), because of the progression of disease during the mean 8.9 year followup.

All knees that had undergone arthroscopic synovectomy (n = 41) were divided into 2 groups: Group A: knees that required no further operative procedures (n = 29); and Group B: knees that required a supplementary procedure after synovectomy (n = 12) (29.2%), i.e., total knee prosthesis (n = 11) or arthrodesis due to joint infection (n = 1).

Clinical results. Pain. Knee pain score was significantly higher in group B than in group A ($p = 0.04$) before arthroscopic synovectomy. In the final assessment, there was a statistically significant improvement in the pain score relative to baseline ($p < 10^{-5}$) for the 29 knees in group A. This pain reduction was noted within the first postoperative months ($p < 10^{-5}$). The number of "no pain" or "mild pain" cases increased from 4 of the 29 knees preoperatively to 27 knees at the final examination (Table 1).

Joint swelling. Before arthroscopic synovectomy, the extent of joint swelling was not significantly different ($p = 0.63$) between the 2 groups. For the 29 knees in group A, there was a significant reduction in joint swelling within the first postoperative months ($p < 10^{-5}$) and also in the final assessment ($p < 10^{-5}$). Finally, 28 of the 29 knees (96.6%) in group A had joint swelling scored 0 or 1 (Table 2).

Range of motion. Preoperatively, there were no significant differences in ROM in flexion-extension between knees in group B (mean 98.8°, SEM ± 29.4°) and knees in group A (mean 113.4° ± 10.3°) ($p = 0.09$). Within the first 6 postoperative months, the ROM improved significantly ($p = 0.001$) for knees in group A (mean 124.2° ± 12.7°), and this improvement remained steady until the final assessment ($p = 0.002$) (mean 123.2° ± 14.5°). In the final assessment, 74% of group A knees had a better ROM than at baseline (Table 3).

Radiographic assessment results. Preoperatively, Larsen scores were no higher than 3 for any knees, but the scores were significantly higher ($p = 0.02$) for group B knees relative to those of group A (Table 4). In the final radiological assessment, Larsen scores were significantly higher for group A knees relative to baseline ($p = 0.03$) (Table 5).

In a comparison of baseline and final Larsen scores for all knees that had undergone arthroscopic synovectomy and radiological assessment pre- and postoperatively (n = 39), with a Larsen score of 5 attributed to reoperated knees of

Table 3. Range of motion (ROM) of the operated knee at final evaluation compared to baseline (group A). Data are number of knees (n = 27).

ROM at Final Evaluation	ROM at Baseline < 90°	> 90° and < 120°	> 120°	Total	%
Improved	2	14	4	20	74
Stable	0	3	0	3	11
Worst	0	2	2	4	15

Table 4. Larsen score for knees at baseline (groups A and B) and at final evaluation (group A).

	Larsen Score, n (%)					
	0	1	2	3	4	5
Group A*, before synovectomy, n = 38	4 (14)	14 (48)	7 (24)	4 (14)	0	0
Group A, final evaluation, n = 37	2 (7)	5 (18)	11 (39)	6 (21)	4 (14)	0
Group B, before synovectomy, n = 12	0	1 (9)	5 (45)	6 (45)	0	0

* p = 0.02, compared to group B before synovectomy.

Table 5. Final Larsen score relative to the baseline score (before synovectomy) (Groups A and B).

Larsen Score Before Synovectomy, n = 39	Larsen Score at Final Evaluation, no. of Knees					
	0	1	2	3	4	5
0	2	0	2	0	0	0
1	—	5	7	0	1	1
2	—	—	2	3	2	5
3	—	—	—	3	1	5

Table 6. Arthroscopic cartilage lesions in the whole patient population, n (%).

	Stage 0	Stage 1	Stage 2 Superficial	Stage 2 Deep	Stage 3
Group A, n = 27	2 (7)	6 (22)	16 (59)	2 (7)	1 (4)
Group B, n = 10	0	0	3 (30)	3 (30)	4 (40)

Table 7. Final Larsen score according to the extent of cartilage joint degradation during synovectomy.

Cartilage Joint Degradation, n = 36	Final Larsen Score, no. of Knees					
	0	1	2	3	4	5
Stage 0	1	1	0	0	0	0
Stage 1	0	3	3	0	0	0
Stage 2 superficial	1	1	8	4	2	3
Stage 2 deep	0	0	0	1	1	3
Stage 3	0	0	0	1	0	4

group B, we noted that (Table 5) 12 knees (31%) showed no change, 11 (28%) had worsened by one grade, 9 (3%) had worsened by 2 grades, 7 (18%) had worsened by ≥ 3 grades.

This radiographic improvement varied according to the baseline Larsen score (Table 5): (1) 18 knees were scored 0 or 1 preoperatively — at the final assessment, 14 knees (78%) had not worsened or had changed by only one grade; 4 knees (22%) had worsened by 2 grades or more; (2) 21 knees were scored 2 or 3 preoperatively — at the final assessment, 9 knees (43%) had not worsened or had changed by only one grade; 12 knees (57%) had worsened by 2 grades or more.

Radiographic patterns according to baseline arthroscopic data. During arthroscopy, cartilage lesions were ranked according to Outerbridge classification (Table 6). At baseline, group B knees had more serious cartilage lesions than non-reoperated group A knees (p = 0.007). There was a correlation between the arthroscopic data and the baseline radiographic Larsen scores ($p < 10^{-4}$). In the final assessment, the 8 knees that had less severe cartilage damage at baseline (stage 0 or 1) showed very little radiographic progression (Table 7). The 10 knees with arthroscopic cartilage lesions ranked as stage 2 deep, and 3 showed a more negative trend, as all of them had a Larsen score ≥ 3 (Table 7). The 19 knees with cartilage damage ranked as stage 2 superficial progressed differently, i.e., with varied radiographic ranks and Larsen scores ranging from 0 to 5. The distribution was uniform, since 53% had a final Larsen score ≤ 2 and 47% had a score of 3 (Table 7).

Variables predictive of articular destruction after arthroscopic synovectomy. The independent variables (logistic regression) for predicting the final Larsen score were the baseline Larsen score (odds ratio 4.2, $p = 2 \times 10^{-4}$), which was closely correlated with the baseline Outerbridge cartilage classification; and the number of large joints (apart from the operated knee) presenting with severe destruction (Larsen score ≥ 3) (OR 29.2, $p = 1 \times 10^{-8}$).

Complications. One case of joint stiffness was noted; the knee required manipulation under anesthesia and then a normal ROM was obtained. One osteoarticular infection required arthrodesis.

DISCUSSION

Synovectomy has long been used to treat chronic knee synovitis. Open synovectomy is a highly invasive operation and there are many cases of severe damage to knee joints

and a decrease in the ROM, despite extensive physical therapy and hospital care[12,21,22].

Many studies have been undertaken to assess the short and medium term results (up to 4 years followup) of arthroscopic synovectomy[6,13-16,23,24], with 60–96% of good to excellent clinical results reported. There is generally only slight progression of the initial radiographic lesions during the first 2 postoperative years[14,15]. Very few longterm studies have been undertaken.

This study was carried out to assess the longterm results of arthroscopic synovectomy of the knee in patients with RA. Forty-eight patients underwent synovectomy, but they were not all followed up. Patients requiring reoperation after arthroscopic synovectomy were included in the study solely on the basis of their case history, thus explaining why part of this patient population (29%) was certainly overestimated. In the only 2 reported studies with longterm followup, this proportion was 7% after 6.4 years' followup[24] and 17% after 12 years' followup[25], while in these 2 studies knees had almost the same radiographic lesions at baseline.

Pain relief was achieved soon after synovectomy, as noted[7,14,15]. This relief was maintained up to 2 years postoperatively in around 80% of knees. After 4 years' followup, some authors noted a decline in the good initial results to around 60%[6,15]. Others found that 80–90% of knees were still improved[15,17,24]. In our study, pain relief was sustained in 90% of the non-reoperated knees at 8.9 years' followup, which is in accord with the results reported by Tanaka, *et al*[24], i.e., in 49 operated rheumatoid knees, 86% had no or only slight pain after 6.4 years' followup. Conversely, Matsui, *et al*[25] obtained only 46% good results (no pain and normal knee function) in 41 knees after 8 years' followup.

Joint effusion was observed in all knees that underwent synovectomy in our study. At 8.9 years' followup, 97% of knees in group A had no or only mild swelling. Tanaka, *et al*[24] reported that 78% of rheumatoid knees followed for 6.4 years had no or only occasional joint effusion.

These results are in agreement with some studies with shorter followup[16,17], while they seem to be better than those of other studies where recurrent effusion was documented in some 40% of knees at 4 years postsynovectomy[6,15].

The longterm results after open synovectomy do not seem quite as good, with recurrent effusion in 20–42% of operated knees[21,26,27].

After synovectomy, the operated knee can be mobilized immediately after postoperative recovery. The patient can begin walking the same day or the following day, which is facilitated because there is very little or no postoperative pain[5,6,13,14,16,17,24,28]. In the short term, the ROM of the knee is at least as good as the preoperative range[4,7,13-17,23,24,28].

Clear longterm improvement in ROM in flexion-extension was achieved in our study: 80% of group A knees had better flexion-extension results than preoperatively. In the final assessment, the ROM had worsened in 15% of knees. Our longterm results seem to be in accord with those reported by Tanaka, *et al*[24], who found no change in the mean ROM preoperatively and 6.4 years postoperatively.

Joint stiffening is the main problem noted after open surgical synovectomy, which prompted many authors to mobilize (systematically or not) the knee postoperatively under anesthesia[9,10,12,21,22,27]. Extended rehabilitation, preferably at a specialized center, is required after around 2 weeks of immobilization. Thereafter, no or very little joint limitation was noted in a few studies[7,21,22], but a loss in the ROM has been reported in 64% of patients[10,27].

Radiographically, the operated knees had a significantly higher final Larsen score than baseline. Arthroscopic synovectomy therefore did not arrest disease progression in treated knees, as noted by others[24,25]. Further, only a controlled study could assess the effect of this procedure on the progression of joint destruction.

However, there was no radiographic change after 8.9 years' followup in 31% of the 39 operated knees. Only 41% of knees showed significant radiographic progression of damage (at least 2 Larsen score stages).

All studies on surgical synovectomy of the knee have reported radiographic progression of lesions over a relatively long term[1,21,25-27]; they are often degenerative but not inflammatory lesions. This was confirmed in a study comparing the results of arthroscopic synovectomy and open synovectomy of the knee[29].

We tried to determine predictive factors of disease progression after arthroscopic synovectomy. The results showed some differences in the baseline clinical features of reoperated knees (group B) and non-reoperated knees (group A). Reoperated knees had significantly higher baseline pain scores and significantly greater knee flexion deformity. In previous reports, a poor result was correlated with an initially greater knee flexion deformity (> 15°)[24]. Laurin, *et al*[22] also noted this with surgical synovectomy, and Stucki, *et al*[2] for synoviorthesis with yttrium-90.

Concerning radiographically detectable damage, we noted that knees with only minor initial damage progressed the least over the 9 year followup. Logistic regression analysis clearly showed that the final Larsen score depended closely on the baseline Larsen score; this was noted in surgical synovectomy studies[11,21]. In addition, the final clinical results of arthroscopic or surgical synovectomy depend on the baseline Larsen score, as shown in several longterm studies[10,11,22,24,27].

Assessment of initial cartilage lesions during arthroscopy also enables assessment of anatomic (radiographic) progression: all the knees with initial cartilage lesions graded 2 deep or 3 had a final Larsen score ≥ 3. In addition, the initial Larsen and Outerbridge scores were closely correlated. Prosthetic knee replacement was performed for knees with the highest Outerbridge cartilage scores: 40% were stage 3, compared to 4% for non-reoperated knees.

In previous reports, baseline cartilage scores were correlated with the clinical results of synovectomy. Some authors found no correlation after a maximum 4 year followup[17,23], whereas others noted poorer pain and joint swelling and function results when there was more severe initial cartilage damage[13,24,29].

Arthroscopic synovectomy thus seems to be an effective and competitive therapeutic tool for chronic knee synovitis in patients with RA after failure of radiation or chemosynovectomy. The main benefits of this approach include its selectivity for synovial tissue, and its efficacy and high tolerance. The results are excellent when it is performed at an early stage on knees that have not undergone severe rheumatic damage. Many authors still recommend arthroscopic synovectomy after the failure of simpler treatments such as synoviorthesis.

REFERENCES

1. Nissila M, Anttila P, Hämäläinen M, Jalava S. Comparison of chemical, radiation and surgical synovectomy for knee joint synovitis. Scand J Rheumatol 1978;7:225-28.
2. Stucki G, Bozzone P, Treuer E, Wassmer P, Felder M. Efficacy and safety of radiation synovectomy with Yttrium-90: a retrospective long-term analysis of 164 applications in 82 patients. Br J Rheumatol 1993;32:383-6.
3. Aritomi H. Arthroscopic synovectomy of the knee joint with the electric resectoscope. Scand J Haematol 1984;33:249-62.
4. Day B. Arthroscopic synovectomy: a preliminary report [abstract]. J Bone Joint Surg Br 1984;66:304.
5. Highgenboten CL. Arthroscopic synovectomy. Arthroscopy 1985;1:190-3.
6. Wilkes LL. Arthroscopic synovectomy in the rheumatoid knee. J Med Assoc Ga 1985;74:582-3.
7. Cleland LG, Treganza R, Dobson P. Arthroscopic synovectomy: a prospective study. J Rheumatol 1986;13:907-10.
8. Klein W, Jensen KU. Arthroscopic synovectomy of the knee joint: indication, technique, and follow-up results. Arthroscopy 1988;4:63-71.
9. Camp V. Synovectomy of the knee in rheumatoid arthritis. Range of movement and quadriceps lag after surgery. Ann Rheum Dis 1972;31:155-8.
10. Paradies LH. Synovectomy for rheumatoid arthritis of the knee. J Bone Joint Surg Am 1975;57:95-100.
11. Taylor AR, Harbison JS, Pepler C. Synovectomy of the knee in rheumatoid arthritis. Results of surgery. Ann Rheum Dis 1972;31:159-61.
12. Ranawat CS, Ecker ML, Straub LR. Synovectomy and debridement of the knee in rheumatoid arthritis. A study of 60 knees. Arthritis Rheum 1972;15:571-81.
13. Cohen S, Jones R. An evaluation of the efficacy of arthroscopic synovectomy of the knee in rheumatoid arthritis: 12-24 month results. J Rheumatol 1987;14:452-5.
14. Combe B, Krause E, Sany J. Treatment of chronic knee synovitis with arthroscopic synovectomy after failure of intra-articular injection of radionuclide. Arthritis Rheum 1989;32:10-4.
15. Smiley P, Wasilewski SA. Arthroscopic synovectomy. Arthroscopy 1990;6:18-23.
16. Ogilvie-Harris DJ, Weisleder L. Arthroscopic synovectomy of the knee: is it helpful? Arthroscopy 1995;11:91-5.
17. Ogilvie-Harris DJ, Basinski A. Arthroscopic synovectomy of the knee for rheumatoid arthritis. Arthroscopy 1991;7:91-7.
18. Arnett FC, Edworthy SM, Bloch DA, et al. The American Rheumatism Association 1987 revised criteria for the classification of rheumatoid arthritis. Arthritis Rheum 1987;31:315-24.
19. Outerbridge RE. The etiology of chondromalacia patellae. J Bone Joint Surg Br 1961;43:753-7.
20. Larsen A, Dale K, Eek M. Radiographic evaluation of rheumatoid arthritis and related conditions by standard reference films. Acta Radiol Diag 1977;18:481-91.
21. Ishikawa H, Ohno O, Hirohata K. Long-term results of synovectomy in rheumatoid patients. J Bone Joint Surg Am 1986;68:198-205.
22. Laurin CA, Desmarchais J, Daziano L, Gariépy R, Derome A. Long-term results of synovectomy of the knee in rheumatoid patients. J Bone Joint Surg Am 1974;56:521-31.
23. Ayral X, Bonvarlet JP, Simonnet J, Amor B, Dougados M. Intéret de la synovectomie arthroscopique dans le traitement des synovites chroniques du genou. Rev Rhum 1997;64:231-42.
24. Tanaka N, Masuko T, Nishiya T, Iba K, Ishii S. Five to nine year follow-up results of arthroscopic synovectomy of the knee in rheumatoid patients. Jpn J Rheumatol 1998;8:51-8.
25. Matsui N, Taneda Y, Ohta H, Itoh T, Tsuboguchi S. Arthroscopic versus open synovectomy in the rheumatoid knee. Intern Orthop 1989;13:17-20.
26. Brattstrom H, Czurda R, Gschwend N, et al. Longterm results of knee synovectomy in early cases of rheumatoid arthritis. Clin Rheumatol 1985;4:19-22.
27. Graham J, Checketts RG. Synovectomy of the knee-joint in rheumatoid arthritis. A long-term follow-up. J Bone Joint Surg Br 1973;55:786-95.
28. Shibata T, Shiraoka K, Takubo N. Comparison between arthroscopic and open synovectomy for the knee in rheumatoid arthritis. Arch Orthop Trauma Surg 1986;105:257-62.
29. Paus AC, Forre O, Refsum S, Mellbye O. A prospective clinical five year follow-up study after open synovectomy of the knee joint in patients with chronic inflammatory joint disease. Scand J Rheumatol 1992;21:248-53.