Synovectomy of Rheumatoid Joints

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Contents

5.1 Introduction

Rheumatoid arthritis (RA) like similar other inflammatory joint diseases is an autoimmune disease targeting also the synovial lining of all joints. Synovitis and pannus formation may actively destruct articular cartilage and subchondral bone if untreated (Fig. 5.1). During the last three decades, the development of new medical treatments especially the so-called biologicals alone or in combination with standard disease-modifying antirheumatic drugs made enormous progress in controlling the inflammatory and destructive process. Despite this there are still patients with chronic synovitis of their joints and progression of destruction.

Surgical removal of all macroscopic detectable inflamed synovial tissue – synovectomy – is an established method of treatment for longer-lasting synovitis for rheumatoid patients complaining of joint swelling, tenderness, and pain despite

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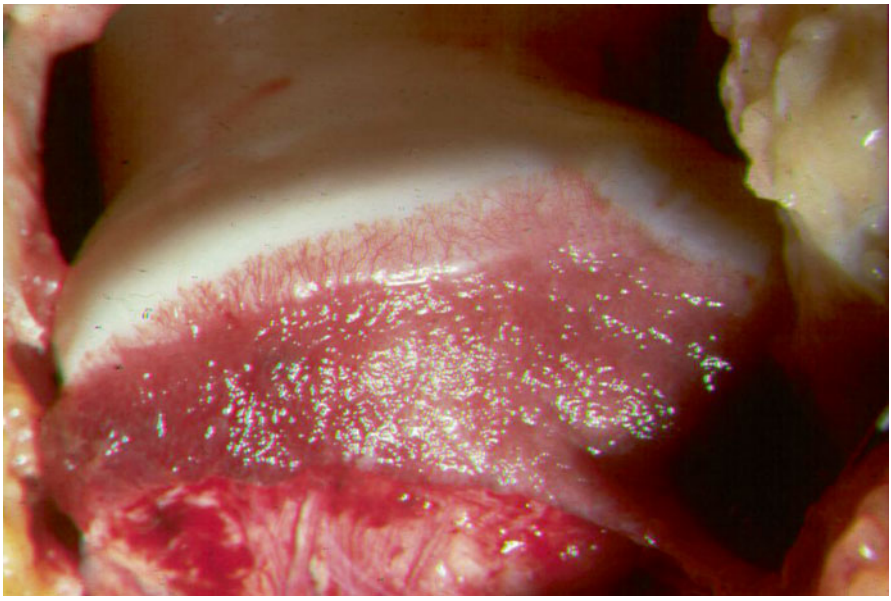

Fig. 5.1 Synovitis and pannus growing over the articular cartilage at the lateral femur condyle in a patient with rheumatoid arthritis of the knee

Table 5.1 Larsen's grading system for RA

Grade	Definition
0	Normal
1	Soft tissue swelling, slight joint space narrowing (<25 % of the original joint space), periarticular osteoporosis
2	Definite early abnormality, one or several small erosions
3	Medium destructive abnormality, marked erosions
4	Severe destructive abnormality, large erosions
5	Gross deformity, the bony outlines of the joint have disappeared

regular medical therapy for 6 months. The exact timing for surgical intervention should be the result of an interdisciplinary discussion between internal and orthopedic rheumatologist.

Synovitis in osteoarthritis in contrast to rheumatic diseases is a cytokine-dependent reaction to detritus originating from cartilage breakdown. The rationale to remove synovitis by surgical means does not work in osteoarthritis because the underlying disease is the problem of cartilage breakdown which is not addressed by synovectomy. Synovectomy in osteoarthritic conditions has shown little short-lasting benefit and overall disappointing clinical outcomes and therefore is not recommended in recent guidelines.

Early synovectomy is performed in radiological Larsen stages 0-II, late synovectomy in Larsen stages III-IV (Table 5.1). It is thought that an early synovectomy

may prevent further joint destruction but clinical trials of high quality to prove this are lacking. Late synovectomies have the goal to decrease pain and improve function.

At present there are no comparative clinical data for a staged algorithm if synovectomy or radiosynoviorthesis should be performed first or which intervention is superior to the other. RSO may be preferred as it is less invasive needing no systemic anesthesia. RSO can be repeated and has the possibility of open surgery if being not successful. On the other hand there are hints that synovectomy closely followed by RSO may lead to better outcomes in knee synovectomy. Further controlled trials are needed.

As a result of the tremendous progress in medical treatment, the need for surgical interventions in arthritic joints declined over the last three decades in many countries. Especially the numbers of synovectomy dropped steadily also in Germany from a reported 5.6 % of rheumatoid patients in 1993 to 3.5 % in 2000 to 0.3 % in 2008 [1].

5.2 Synovectomy of the Knee

As synovectomies of the knee are the most common interventions, there are more data about results of treatment available than in other joints.

Synovectomy of the knee may be performed as an arthroscopic or open surgery. Arthroscopic synovectomy is mostly performed in early Larsen stages and demonstrated its effectivity in a multicenter trial of 93 knee joints in 81 patients with early forms of rheumatoid arthritis at a follow-up time of 33 months [2]. The Lysholm score (an established knee score relating to pain, swelling, instability, and functional outcome: 0–100 points) increased from 43.2 points preoperatively to 78.1 points. The Insall knee and functional score (an established knee score especially for use in knee joint replacement relating to pain and range of motion, 100 points, and additionally to knee function, 100 points) showed a highly significant increase of 25.7 and 25.2 points to 71.2 and 80.2 points, respectively. Among the individual variables investigated, pain, swelling, and walking distance in particular were improved. Larsen stages worsened slightly from 1.57 preoperatively to 1.95 at follow-up.

Even in advanced Larsen stages, open synovectomy of the knee demonstrated over a period of more than 10 years (10.1; range 6.4–12.7) a long-lasting improvement of function [3]. Despite reasonable functional results radiographic progression of disease was observed (Larsen stage 2.2–3.7). The need for joint replacement in nearly three-quarters of the patients could be delayed for more than 10 years.

A recent meta-analysis [4] analyzed all published synovectomy trials to find out whether open or arthroscopic surgery leads to better results. Arthroscopic and open synovectomy provided similar pain relief (Fig. 5.2a) at last follow-up for knees ($p = 0.16$).

Arthroscopic synovectomy was more likely than open synovectomy to lead to recurrence of synovitis at knees ($p < 0.001$) and to lead to radiographic progression (Fig. 5.2b) for knees ($p = 0.001$). Open synovectomies were more likely to require

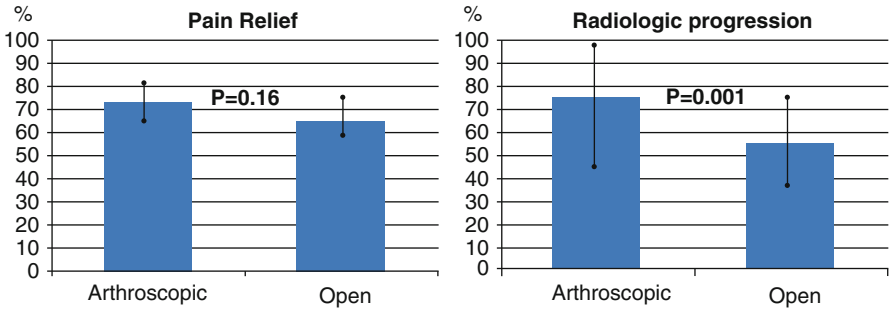

Fig. 5.2 Mean results after synovectomy of the knee. (**a**) Percentage of patients with pain relief. (**b**) Percentage of patients with radiologic progression [4]

joint replacement or arthrodesis ($p=0.01$) at last follow-up, but this may be influenced by an indication bias as the number of patients with advanced rheumatoid arthritis at time of intervention was nearly double as high in open synovectomy.

In the multicenter trial with a mean follow-up of 33 months [2], patients receiving additional radiation synovectomy showed a highly significantly better result than those receiving synovectomy alone. In contrast to this finding, this positive effect does not seem to last over time as in a 14-year follow-up trial, it was found that after 5 years there was a steadily increase in worsening of joint destruction leading to joint replacement. Nearly half of the knees were converted to joint replacement after 10 years and 60.4 % after 14 years. This observation challenges the long-term benefit of the combined procedure.

5.3 Synovectomy of the Hip

There have been disappointing results in cases of synovectomy of the hip joint in adults especially in late-stage cases. Therefore, it is not recommended as a standard procedure at time although clinical trials are lacking. It seems to be more promising to perform total joint replacement in advanced stages of rheumatoid hip involvement instead.

There are data in patients with juvenile arthritis showing that even in late stages of the disease (Larsen III and higher) open synovectomy combined with soft tissue procedures leads to an improvement in function [6]. Merle d'Aubigné hip score (an established hip score relating to pain, range of motion, and walking ability: 0–18 points) significantly improved from 9.5 ± 2.5 points at baseline to 16.3 ± 1.0 points at the time of follow-up ($p<0.001$). The individual scores for pain, mobility, and walking ability were significantly increased as well (all $p<0.001$). Eighty-five percent of the 56 hips were observed to have a very great or great improvement in function. Osteonecrosis of the femoral head was not observed. Five hips required total hip arthroplasty during the follow-up period. Thus, the survival rate for the hips was 94 % at a mean of 4 years following the synovectomy.

5.4 Synovectomy of the Ankle Joint

Open synovectomies in the ankle joint may still be the standard of care as in more than 90 % of the patients additional surgical procedures at tendons have to be performed. Arthroscopic synovectomies may be performed in isolated ankle joint involvement.

An observation trial [7] showed a significant, but clinically moderate, gain in the Kofoed ankle score (a score established for evaluation in ankle arthroplasty: 50 points for pain, 20 for range of motion, and 30 for ankle function) from 42.4 to 55.9 points ($p=0.042$), which was mainly caused by pain reduction and gain of mobility, whereas a decline of function was detected. Pain (VAS) decreased from 7.6 to 3.3 ($p<0.001$) and 81.5 % of the patients assessed the results of the synovectomy as good or very good. But as in other joints, progression of the Larsen grade was found in 62 % of the ankle joints.

5.5 Synovectomy of the Shoulder

In the natural course of rheumatoid arthritis, the shoulder joint is affected in most of the patients. Synovitis not only leads to pain and lack of function of the glenohumeral joint but also destroys tendon structures (rotator cuff, long head of the biceps tendon) and causes subacromial bursitis.

There is only little evidence of outcome after open surgical interventions. But case series clearly showed pain relief in 80–100 % for at least 5–8 years despite some worsening in radiological Larsen score over time.

Arthroscopic synovectomy may be suitable in uncomplicated cases, but if any major tears of the rotator cuff have to be treated, a mini open access allows better visibility. Refixation of the rotator cuff to bone with suture anchors may be compromised by poor bone stock. Suture technique has to be adjusted [8].

One case series [9] in patients with synovitis of the glenohumeral joint and no affection to the rotator cuff showed an improvement in pain at a mean follow-up of 5.5 years in 13 of 16 patients ($P<0.001$). The results regarding improvements in range of motion were less predictable. Seven of eight shoulders followed-up radiographically for more than 1 year showed radiographic progression of disease.

5.6 Synovectomy of the Elbow

About half of the rheumatoid patients have an involvement of the elbow joint after 15 years of disease duration. Synovitis of the elbow early decreases the range of motion regarding supination/pronation and an extension lag occurs. In later stages also flexion beyond 90° will be lost.

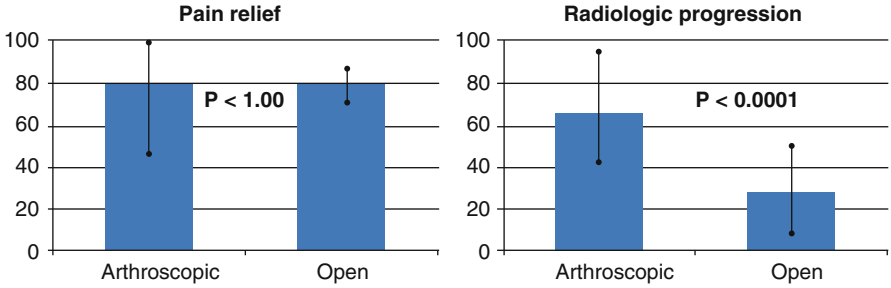

Fig. 5.3 Mean results after synovectomy of the elbow. (**a**) Percentage of patients with pain relief. (**b**) Percentage of patients with radiologic progression [4]

Open surgery is well established and allows a very extensive completeness of synovectomy. Elbow arthroscopy is known as a technically challenging procedure and bears the potential risk of nerve injuries.

A recent meta-analysis [4] analyzed all published synovectomy trials to find out whether open or arthroscopic surgery leads to better results. Arthroscopic and open synovectomy provided similar pain relief (Fig. 5.3a) at last follow-up for elbows (79.4 ± 31.1 % vs. 80.0 ± 9.7 %; $p = 1.00$).

Arthroscopic synovectomy was more likely than open synovectomy to lead to recurrence of synovitis for elbows (21.9 ± 7.9 % vs. 9.3 ± 8.9 %; $p = 0.03$) and to lead to radiographic progression (Fig. 5.3b) for elbows (65.6 ± 29.9 % vs. 27.7 ± 22.7 %; $p < 0.001$). Both interventions were equally likely to require subsequent arthroplasty in elbows ($p = 0.91$).

Similar results were observed in a case series of open and arthroscopic interventions in Japan [10] and South Korea [11].

5.7 Synovectomy of the Wrist

Wrist involvement is very common in rheumatoid arthritis: about 40 % during the first 2 years up to 90 % in the long term [12]. During the natural course of the disease in most patients, there is not only an isolated involvement of the wrist, but also the tendons are affected by tenosynovitis.

Thus, the surgical intervention mostly cares for both: synovitis and tenosynovitis. Results of case series up to 10 years after intervention showed an increased range of motion, improvement of pain and function at follow-up, but also a marked worsening of the radiological Larsen stage at the wrist.

Arthroscopic synovectomy is a well-accepted method in early stage rheumatoid arthritis (RA), but its use is controversial in advanced RA of the wrist [13]. The results of a small case series showed pain relief, improvement in function, but no improvement in range of motion or grip strength.

Overall early synovectomies at the rheumatoid wrist may delay further complex surgery as wrist arthrodesis or wrist arthroplasty.

5.8 Synovectomy of Finger Joints

Finger joints are typically involved at any stages in the course of rheumatoid arthritis, especially all metacarpophalangeal (MCP) and the proximal interphalangeal (PIP) joints. Chronic synovitis at these joints not only leads to destruction of cartilage and bone but also to a distension of the capsule and a dealignment of tendons causing typical deformities like 90/90 deformity of the thumb MCP joint or boutonniere deformity of the PIP joints (Fig. 5.4).

If synovitis is accompanied by one of these deformities, open synovectomy is the standard of care to address the pathology of the synovium and the deformity of the tendons and capsule. There is only limited evidence about the outcome regarding pain, function, or radiological progress of the rheumatoid disease.

As arthroscopic instruments for small joints improved and surgical experience grows, also the small joint of the fingers were addressed by arthroscope for synovectomy [14, 15]. Because the PIP joint space was not wide enough to insert the arthroscope into the palmar cavity, the palmar part of the articular surfaces and the volar synovium could not be inspected.

Short-term (12-month) results and patient satisfaction have been quoted excellent.

5.9 Surgical Complications After Synovectomy

Little data from prospective trials are available about surgical complications of synovectomies in different joints. In one prospective study in 201 patients [16], complications after arthroscopic synovectomy of the knee included septic arthritis (0.5 %), superficial wound healing problems (2 %), and intraarticular hematoma (3.5 %). Complete recovery was achieved after complications were treated, and the result of the synovectomy was not compromised.

Fig. 5.4 Synovitis of PIP joint with synovial protrusion through the joint capsule and development of boutonniere deformity

References

1. Carl HD, Rech J. Large-joint synovectomy in the era of biological therapies. Z Rheumatol. 2011;70(1):9–13.
2. Klug S, Wittmann G, Weseloh G. Arthroscopic synovectomy of the knee joint in early cases of rheumatoid arthritis: follow-up results of a multicenter study. Arthroscopy. 2000;16(3):262–7.
3. Jüsten HP, Pommer S, Leeb I, Pilhofer C, Kisslinger E, Wessinghage D. Long-term results of open knee synovectomy in later cases of rheumatoid arthritis. Z Rheumatol. 1999;58(4):201–6.
4. Chalmers PN, Sherman SL, Raphael BS, Su EP. Rheumatoid synovectomy: does the surgical approach matter? Clin Orthop Relat Res. 2011;469(7):2062–71.
5. Goetz M, Klug S, Gelse K, Swoboda B, Carl HD. Combined arthroscopic and radiation synovectomy of the knee joint in rheumatoid arthritis: 14-year follow-up. Arthroscopy. 2011;27(1):52–9.
6. Carl HD, Schraml A, Swoboda B, Hohenberger G. Synovectomy of the hip in patients with juvenile rheumatoid arthritis. J Bone Joint Surg Am. 2007;89(9):1986–92.
7. Anders S, Schaumburger J, Kerl S, Schill S, Grifka J. Long-term results of synovectomy in the rheumatoid ankle joint. Z Rheumatol. 2007;66(7):595–602.
8. Kiekenbeck A, Preis M, Salzmann G. Rheumatoid shoulder: does minimally invasive therapy make sense? Z Rheumatol. 2008;67(6):462–70.
9. Smith AM, Sperling JW, O'Driscoll SW, Cofield RH. Arthroscopic shoulder synovectomy in patients with rheumatoid arthritis. Arthroscopy. 2006;22(1):50–6.
10. Tanaka N, Sakahashi H, Hirose K, Ishima T, Ishii S. Arthroscopic and open synovectomy of the elbow in rheumatoid arthritis. J Bone Joint Surg Am. 2006;88(3):521–5.
11. Kang HJ, Park MJ, Ahn JH, Lee SH. Arthroscopic synovectomy for the rheumatoid elbow. Arthroscopy. 2010;26(9):1195–202.
12. Dinges H, Fürst M, Rüther H, Schill S. Operative differential therapy of rheumatic wrists. Z Rheumatol. 2007;66(5):388–94.
13. Kim SJ, Jung KA. Arthroscopic synovectomy in rheumatoid arthritis of wrist. Clin Med Res. 2007;5(4):244–50.
14. Wei N, Delauter SK, Erlichman MS, Rozmaryn LM, Beard SJ, Henry DL. Arthroscopic synovectomy of the metacarpophalangeal joint in refractory rheumatoid arthritis: a technique. Arthroscopy. 1999;15(3):265–8.
15. Sekiya I, Kobayashi M, Taneda Y, Matsui N. Arthroscopy of the proximal interphalangeal and metacarpophalangeal joints in rheumatoid arthritis. Arthroscopy. 2002;18(3):292–7.
16. Kuzmanova SI, Atanassov AN, Andreev SA, Solakov PT. Minor and major complications of arthroscopic synovectomy of the knee joint performed by rheumatologist. Folia Med (Plovdiv). 2003;45(3):55–9.