The role of arthroscopic synovectomy in patients with undifferentiated chronic monoarthritis of the wrist

We investigated the clinical response to arthroscopic synovectomy in patients with undifferentiated chronic monoarthritis (UCMA) of the wrist. Arthroscopic synovectomy was performed on 20 wrists in 20 patients with UCMA of the wrist who had not responded to non-steroidal anti-inflammatory drugs. The mean duration of symptoms at the time of surgery was 4.3 months (3 to 7) and the mean follow-up was 51.8 months (24 to 94).

Inflamed synovium was completely removed from the radiocarpal, midcarpal and distal radioulnar joints using more portals than normal. After surgery, nine patients had early remission of synovitis and 11 with uncontrolled synovitis received anti-rheumatic medication. Overall, there was significant improvement in terms of pain relief, range of movement and Mayo score. Radiological deterioration was seen in five patients who were diagnosed as having rheumatoid arthritis during the follow-up period. Lymphoid follicles and severe lymphocyte infiltration were seen more often in synovial biopsies from patients with uncontrolled synovitis.

These results suggest that arthroscopic synovectomy provides pain relief and functional improvement, and allows rapid resolution of synovitis in about half of patients with UCMA of the wrist.

Undifferentiated arthritis is usually diagnosed by exclusion based on failure to fulfill the classification criteria for definitive rheumatological conditions, such as rheumatoid arthritis (RA), psoriatic arthritis and ankylosing spondylitis.1,2 There is no agreement about the management of patients with undifferentiated arthritis, and no consensus regarding factors that predict the natural history of the condition.2-6 Analysis of the clinical outcomes of patients with early undifferentiated arthritis has suggested that the best predictor of poor prognosis is persistent synovitis for more than 12 weeks.2-7

A watch-and-wait policy has commonly been used to avoid unnecessary toxicity from the use of disease-modifying antirheumatic drugs (DMARDs),1,2,6 but a disadvantage of this strategy is that it misses an opportunity to improve the outcome once the arthritis advances. When a patient with persistent painful swelling of the wrist does not respond to conservative treatment, including non-steroidal anti-inflammatory drugs (NSAIDs), and shows early arthritic changes on radiographs, more effective efforts to prevent the progression of the arthritis should be attempted.

Several authors have reported that arthroscopic synovectomy of the wrists in patients with rheumatoid disease results in effective pain relief, functional improvement, and delays the progression of arthritis when anti-rheumatic medications have failed to control the inflammation.8-10 However, no study on the efficacy of arthroscopic synovectomy in patients with undifferentiated chronic monoarthritis (UCMA) of the wrist has been reported. The primary aim of this study was to test the hypothesis that arthroscopic synovectomy of the wrist would provide effective control of synovitis and a satisfactory clinical outcome in patients who had resistant chronic synovitis of the wrist. We also investigated factors that might predict the clinical course of the disease after arthroscopic synovectomy.

Patients and Methods

Between January 2001 and February 2008 we performed arthroscopic synovectomy in 78 patients for the treatment of various chronic inflammatory conditions of the wrist, from whom we selected 20 patients (20 wrists) who had pain, swelling and dysfunction of the wrist due to UCMA. There were 11 men and nine women with a mean age of 38 years (18 to 56). The mean duration of arthritic symptoms at the time of surgery was 4.3 months (3 to 7) and the mean follow-up after surgery was...
51.8 months (24 to 94). We excluded patients with a history of trauma, infection or combined extensor tenosynovitis, and any with positive diagnostic criteria for known diseases such as RA, crystalline disease, spondyloarthropathy and ankylosing spondylitis. The indications for surgery included monoarticular synovitis of the wrist that had not responded to conservative treatment, including NSAIDs for at least three months, and showed evidence of early arthritis on plain radiographs, such as narrowing of the joint space, bony erosion or marginal osteoporosis. No patient had received DMARDs or prednisolone prior to surgery.

All operations were performed by a single surgeon (MJP). After surgery, patients were reviewed at one week, one month and three months. Those with complete relief of pain and no evidence of relapse were observed without further treatment. Those with persistent symptoms at one month were referred to a rheumatologist for antirheumatic medications, which included methotrexate, prednisolone, sulfasalazine and hydroxychloroquine.

**Surgical technique.** Under general anaesthesia or brachial plexus block, arthroscopic synovectomy was performed with the patient supine with the shoulder abducted at 90° and the elbow flexed to 90° on a hand table, with 5.5 kg to 7.0 kg traction applied via finger traps to the second and third fingers. A tourniquet was applied to the upper arm and inflated to 250 mmHg. A 2.5 mm diameter 30° angled arthroscope and a motorised shaver system with a 2.0 mm or 2.9 mm diameter serrated resector was mainly used for the synovectomy.

The whole area of the joint was accessed by dividing it into three joint spaces: radiocarpal, midcarpal and distal radioulnar joints. Portals 3/4 and 4/5 were used as standard entry portals for the radiocarpal joint. All visibly inflamed synovium was resected down to the joint capsule. Additional 6U and/or 1/2 portals were established to remove as much synovial tissue as possible from all areas of the joint. The exact positions for these portals were identified by first introducing a needle and using a small, blunt straight mosquito to spread the subcutaneous tissues to the capsule under direct vision. These portals were used as the working portals when the synovium of the ulnar and radial corner was excised, and as the viewing portals for the dorsal side, where the synovium was most hypertrophied. Synovium from the dorsal capsule was excised with the arthroscope in the 6U and/or 1/2 portals using a shaver in the 3/4 and 4/5 portals (Fig. 1).

We observed that the triangular fibrocartilage (TFC) had a central defect in all patients secondary to their synovitis. The distal radioulnar joint (DRUJ) was usually approached through this defect in the TFC from the radiocarpal joint. The 4/5 and 6U portals were particularly useful for reaching and excising the synovium from the DRUJ. Separate portals for the DRUJ were occasionally established just under the TFC for the shaver, while viewing the joint through the defect in the TFC (Fig. 2). Specific attention was paid when the shaver approached the thin volar DRUJ capsule because of the proximity of the ulnar vessels and nerve.

Radial and ulnar portals were routinely used as standard for the midcarpal joint. We also always established an accessory portal to approach the scaphotrapezio-trapezoidal (STT) joint about 1 cm radial and distal to the radial midcarpal portal, which was identified by introducing a needle under arthroscopic guidance from the radial midcarpal portal. The hypertrophied synovium was removed from the STT area using the shaver from the STT portal. Insertion of the arthroscope through this portal allowed us to remove the synovium lining the dorsal midcarpal capsule with the shaver in the radial and ulnar midcarpal portals (Fig. 3).
Post-operatively, a short arm splint with a compression dressing was applied, and active-assisted exercises were started three to five days post-operatively. Formal physiotherapy was not used and patients were allowed to use their hand as comfort permitted.

**Evaluations.** Pain was measured using a visual analogue scale (10 points for intolerable pain) pre-operatively and at the final follow-up. Satisfaction was also assessed in this way with 10 points for maximum satisfaction. The flexion–extension arc of the wrist was measured with a goniometer pre-operatively and at the final follow-up. Functional outcomes were assessed using the modified Mayo wrist score. Standard posteroanterior radiographs were taken pre-operatively and at the final follow-up, and radiological changes were analysed according to a modified Larsen’s grading system. Patients were evaluated by an author (HJK) who did not participate in the surgery and who was blinded to the patients’ details.

In order to identify factors that predicted the course of the disease, various investigations were undertaken including the erythrocyte sedimentation rate (ESR), C-reactive protein (CRP), and serological markers such as the rheumatoid
factor and HLA-B27. Synovial specimens obtained at arthroscopy were examined bacteriologically and also histologically by a pathologist (YLC) who was blinded to the patients’ details, who assessed the severity of lymphocyte infiltration and the existence of lymphoid follicles.

**Statistical analysis.** Continuous and categorical variables were compared between patients in the remission group and those in the uncontrolled group using a Wilcoxon two-sample test or Fisher’s exact test, respectively. Differences in continuous variables between the pre-operative state and the final follow-up within each group were assessed by Wilcoxon’s signed ranks test or paired $t$-test. A Cochran–Armitage test was used to analyse a trend across levels of the ordered categorical variable, and $p < 0.05$ was considered statistically significant.

**Results**

**Clinical course.** Post-operatively, nine patients had resolution of their synovitis with substantial relief of pain and swelling within a mean of three weeks (2 to 5), and had no evidence of recurrence at final follow up without further management. They were classified as the remission group. The remaining 11 patients with persistent symptoms started to take DMARDs. They were classified as the uncontrolled group and four of them eventually showed remission of the synovitis after taking DMARDs for a mean of 29.3 months (11 to 53). The other six patients continued to take DMARDs with their symptoms controlled at the final follow-up. The one remaining patient had progressive synovitis despite medication.

At the end of the study the diagnosis remained UCMA in 13 patients (65%). Specific diagnoses had been identified by a rheumatologist for seven patients, six of RA and one of spondyloarthropathy.

**Clinical and radiological outcomes.** The results for the VAS for pain, the modified Mayo wrist score, and the flexion–extension arc are summarised in Table I. No major differences were found between the remission group and the uncontrolled group in terms of pre-operative clinical features. At the final follow-up, all clinical parameters in both groups were significantly improved. Statistically significant differences were seen at final follow-up when the mean modified Mayo wrist score and the VAS for satisfaction were compared between the two groups.

On the basis of Larsen’s radiological grading system, 19 wrists were grade 1 and one wrist was grade 2 pre-operatively. At final follow-up no radiological change was observed in 14 wrists, but progression was observed in five. The patients with progression were those who did not achieve remission until the latest follow-up and had been diagnosed as having RA during the follow-up period. The mean VAS scores for pain and satisfaction, flexion–extension arc and the modified Mayo wrist score at final follow-up were significantly worse in the patients with radiological evidence of progression than in those without (Wilcoxon’s two-sample test, $p = 0.019, 0.005, 0.001$, and 0.004, respectively).
Labvaratory and pathological findings. Elevated ESR and CRP values did not discriminate between the remission and the uncontrolled group. Rheumatoid factor was positive in one patient in the remission group and five in the uncontrolled group, but there was no significant difference in clinical outcomes between patients with or without a positive rheumatoid factor. The HLA-B27 antigen was positive in one patient who was subsequently diagnosed with spondyloarthritis. All bacteriological studies were negative for organisms and tuberculosis.

The degree of lymphocyte infiltration was graded histologically as mild, moderate or severe. In the uncontrolled group it was mild in one wrist, moderate in two and severe in eight; in the remission group it was mild in seven and moderate in two and was significantly more severe in the uncontrolled group than in the remission group (Cochran-Armitage trend test, p < 0.001). Lymphoid follicles were observed in seven of 11 patients with uncontrolled synovitis but in no patients in the remission group (Fisher’s exact test, p = 0.005) (Fig. 4).

Discussion
We performed arthroscopic synovectomy as an initial attempt to control synovitis of the wrist when conservative management including NSAIDs failed and arthritic changes were observed on radiographs, suggesting a risk of progression. The efficacy of arthroscopic when compared with open synovectomy has been demonstrated, having the advantages of less invasiveness, a low rate of morbidity and rapid functional recovery in rheumatoid wrists refractory to antirheumatic medication. However, its role in the management of UCMA of the wrist has not yet been reported. In our series, nine of 20 wrists (45%) had complete remission after arthroscopic synovectomy without taking DMARDs. The patients with persistent symptoms after surgery started DMARDs therapy, which appeared to be successful in controlling the synovitis until the final follow-up. There was significant improvement in terms of pain, range of movement and function. After synovectomy a diagnosis was identified for seven patients (35%) who continued DMARDs therapy until final follow-up. Only five patients who continued to take DMARDs and had been diagnosed as having RA showed radiological progression, indicating failure of control of the synovitis despite surgical and medical treatment. This study also suggested that histological analysis of the synovium combined with clinical observations can help to determine which patients need treatment with DMARDs in the early stages of the disease. Given the minimal invasiveness and low morbidity of arthroscopic procedures, before starting DMARDs therapy it is justifiable to attempt arthroscopic synovectomy in patients with UCMA of the wrist when the synovitis has persisted for more than three months.

In terms of clinical course, UCMA may resolve spontaneously or evolve into RA or other rheumatoid conditions. A rate of spontaneous remission of between 26% and 76% has been reported. Based on this fact, this study does not support a positive effect of arthroscopic synovectomy on the long-term prognosis of synovitis, in that only half of the patients had remission post-operatively and the remainder required DMARDs for persistent synovitis. However, it should be noted that resolution of the synovitis appeared within several weeks of the operation suggesting that arthroscopic synovectomy is valuable in predicting the clinical features of UCMA, allowing early decisions regarding rheumatological medication to be made with some certainty.

The surgical goal of arthroscopic synovectomy is complete removal of pathological synovium. The wrist joint has a complicated geometry, with three separate joint compartments. Excision of synovium by accessing the whole of the wrist joint arthroscopically is technically demanding. However, the procedure has not been well described previously. The 3/4 and 4/5 or 6R portals for the radiocarpal joint, and the radial and ulnar portals for the midcarpal joint, are usually used as standard. In order to achieve total synovectomy, we always establish additional portals and have noticed that hypertrophied synovium was always most highly developed in the area of the dorsal capsule, which is poorly visualised when the arthroscope is introduced via the standard portals. We recommend using the 6U portal and occasionally the 1/2 portal, which is established at the side of the joint, as a viewing portal for the dorsal aspect of the radiocarpal joint. Synovium lining the dorsal capsule can be easily removed using the resector via the standard portals. For the midcarpal joint, the STT portal is essential not only to remove synovium from the STT joint, but also to visualise the dorsal capsule. Using this portal as a viewing portal and using standard portals as instrument portals, all the synovium lining the dorsal capsule can be removed as far as the distal capsular attachment to the carpal bones.
The distal radioulnar joint is normally separated from the radiocarpal joint by the TFC. Because the working space was limited, we did not attempt to excise the synovium from the DRUJ using independent DRUJ portals for both the arthroscope and the resector. We always approached the DRUJ through the defect in the TFC. Our experience indicates that perforation of the TFC is almost always observed in patients who have a long-standing inflammatory condition, including RA, and is considered an asymptomatic degeneration. All radiocarpal portals can be used as viewing portals to visualise the DRUJ through the defect in the TFC. A resector introduced from the 4/5 and 6U portals can be advanced into the DRUJ space through the TFC. More synovium can be effectively excised by inserting the resector directly into the DRUJ through the portal established just under the TFC. Compared with the synovectomy of the radiocarpal and midcarpal joints, however, synovectomy of the DRUJ is considered incomplete because of the difficulty in accessing the whole joint. It must be remembered that the ulnar nerve and vessels pass in front of the thin anterior capsule. Great attention should be paid so as not to violate the capsule with the resector in order to avoid neurovascular injury.

Many authors have investigated factors that predict the development of persistent inflammatory arthritis in patients who present with UCMA.1,19,20 Although some risk factors for the development of RA have been proposed,21,22,23 there is no consensus regarding which laboratory tests predict the outcome in patients with UCMA. Our results suggest that the histological appearance of the synovium has a prognostic value. Lymphoid follicles and severe lymphocyte infiltration were found predominantly in patients with uncontrolled synovitis after surgery, indicating that these features predict uncontrolled synovitis after synovectomy and these patients would require DMARDs treatment. Synovial biopsy is also critical to rule out infection, particularly tuberculosis, which usually presents as a chronic synovitis similar to UCMA.

The limitations of this study include its retrospective nature, a relatively small number of patients, short-term follow-up and the lack of a control group. However, considering that there have been no long-term studies of arthroscopic synovectomy in patients with UCMA, we believe our study provides helpful information about the efficacy of arthroscopic synovectomy. Another weakness was that the methods of assessment, which were used to find potential prognostic factors, were not standardised. Also, we did not investigate all factors, including antinuclear antibody and anti-CCP antibody.

We have shown that arthroscopic synovectomy provides pain relief and functional improvement, and allows rapid resolution of synovitis in about half of patients with UCMA of the wrist. The histological and bacteriological analysis of synovium combined with clinical observations after arthroscopic synovectomy are helpful in determining the need for antirheumatic drugs for the control of arthritis in its early stages. Arthroscopic synovectomy of the wrist is recommended when the monoarticular synovitis persists for more than three months, before starting DMARD therapy.

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References