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Septic arthritis of the knee in adults: treatment by arthroscopy or arthrotomy

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Abstract Fifty-one patients with septic arthritis of the knee were reviewed retrospectively. Twenty-seven patients had been treated by arthroscopic lavage and debridement, 24 patients by open arthrotomy with subtotal synovectomy. The patients were staged according to the duration of preoperative symptoms and to the intraoperative spread of the inflammatory process. With early onset of therapy (less than 5 days) and without osseous involvement arthroscopic treatment led to an effective resolution of infection with better functional results than open arthrotomy.

Résumé 51 malades présentant une arthrite septique du genou ont été examinés rétrospectivement. 27 avaient été traités par lavage arthroscopique et débridement, et 24 par arthrotomie avec synovectomie subtotale. Les malades ont été étudiés selon la durée des symptômes avant l'intervention et selon la diffusion du processus inflammatoire constaté opératoirement. Lorsqu'il est fait précocément (dans les 5 jours) et sans atteinte osseuse, le traitement arthroscopique mène à une résolution infectieuse efficace avec de meilleurs résultats fonctionnels que le traitement par arthrotomie.

Introduction

Septic arthritis is a serious condition and in adults the knee is the most frequently involved joint [11, 14]. It is essential to start treatment early if a good prognosis is to be achieved [5, 11]. Besides organism-specific antibiotics in sufficient dosage, decompression of the joint abscess is regarded as a hallmark of therapy. The problem of whether an open arthrotomy with subtotal or complete synovectomy [5, 10] or an arthroscopy with lavage and debridement [1, 4, 12, 13] is preferable is still unsolved. The aim of this study was therefore to evaluate the efficacy of the operative procedures with particular emphasis on the stage and duration of the infection.

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Materials and methods

Fifty-one patients (25 male, 26 female), mean age 59.7 (21–94) years with septic arthritis of the knee treated between January 1987 and December 1999 were retrospectively analyzed. A knee joint was defined as septic if culture of the joint fluid was positive, or if purulent material was found in the joint. Patients with osteomyelitis of the femur or tibia, with total knee arthroplasty or with positive cultures for gonococcus, fungus or mycobacterium were excluded from the study.

A joint aspirate for culture was obtained from all patients prior to treatment. Roentgenograms were available from all patients and magnetic resonance imaging scans (MRIs) from 26 patients. All the patients were staged according to Gächter's classification [3] and according to the duration of symptoms prior to treatment (Table 1). The Larson score [6] was determined preoperatively, at 10 days and 1 month postoperatively, and at the final follow-up.

Twenty-four patients were treated by arthrotomy and 27 by arthroscopy. Arthrotomy was performed with a parapatellar incision, joint debridement, synovectomy of the anterior parts of the joint and drainage with 2 suction drains. In arthroscopy standard approaches were used to decompress and irrigate the joint. Lavage was continued until clear fluid was obtained. The knee joint was examined in a systematic fashion by using video-arthroscopic control and fibrinous deposits and necrotic cell debris were removed using a motorized shaver. Finally, two drains were inserted through the portals.

In all cases culture-specific antibiotics were given, in the arthrotomy group for a mean period of 39 days (range 8–137 days) and in the arthroscopy group for a mean period of 19 days (range 2–62 days). Range-of-motion exercises were instituted 2 to 3 days after surgery and crutches were used for 6 weeks with partial weight bearing of the involved extremity.

Successful management was defined as complete resolution of the inflammatory symptoms and elimination of the infection from the knee. If the infection recurred at any time the treatment was considered a failure. Patients were followed-up for a mean duration of 2.2 years and a maximum duration of 12.8 years. Student's *t*-test was used for statistical evaluation of the results.

Table 1 Criteria and staging of disease

Clinical staging (Gächter's classification)	Intraoperative spread of the inflammatory process	Arthroscopy patients (number)	Arthrotomy patients (number)
Stage I	Turbid effusion, hyperemic synovia	9	0
Stage II	Purulent effusion, fibrinous appositions, hypertrophic synovia	13	7
Stage III	Synovial adhesions, necrotic areas of synovia and cartilage	5	9
Stage IV	Cartilage necrosis, bone erosions, osteolysis	0	8
Temporal staging (time categories)	Preoperative duration of inflammatory symptoms		
A	1–5 days	25	18
B	6–10 days	2	3
C	11–15 days	0	2
D	>15 days	0	1

Results

A positive culture was found in 38 cases, most often *Staphylococcus aureus*. In 23 patients the infection was judged to be hematogenic and in 28 patients iatrogenic (18 after knee puncture, 8 after arthroscopy and 2 after osteotomy).

The infection was eradicated in all patients treated by arthroscopy. Two patients underwent a second arthroscopy. In the arthrotomy group 4 patients suffered from recurrence of infection. One was treated by a secondary arthrotomy. In 3 patients the infection persisted and ultimately an arthrodesis was performed.

The average duration of inpatient hospitalization was 32 days (range 5–91 days) in the arthroscopy group and 50 days (range 8–135 days) in the arthrotomy group. During follow-up the functional results showed an increasing improvement of the Larson score after both operative procedures. Summarizing all cases that were cured a better score (Fig. 1) and better range-of-motion (Fig. 2) were found in the arthroscopy group.

The delay in operative treatment had a recognizable effect on the outcome. In both groups the score was better if the treatment was started within 1–5 days as compared to 6–10 days. In patients where the treatment was started within the first 5 days a significantly better score was achieved for patients treated by arthroscopy. With longer delay the score values declined but without significant difference between the 2 groups.

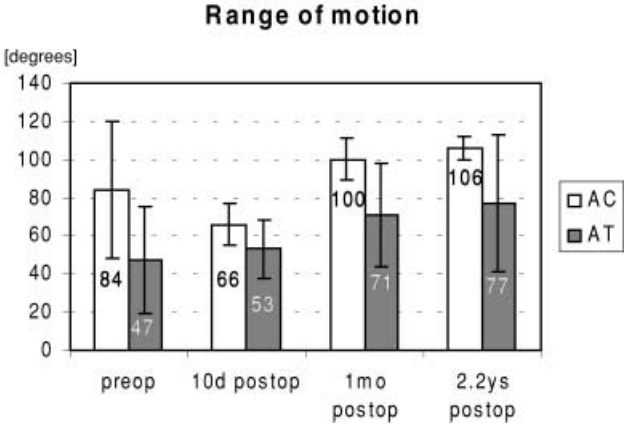

Fig. 2 Pre- and postoperative range-of-motion. The range-of-motion was taken as the difference between flexion and extension of the knee

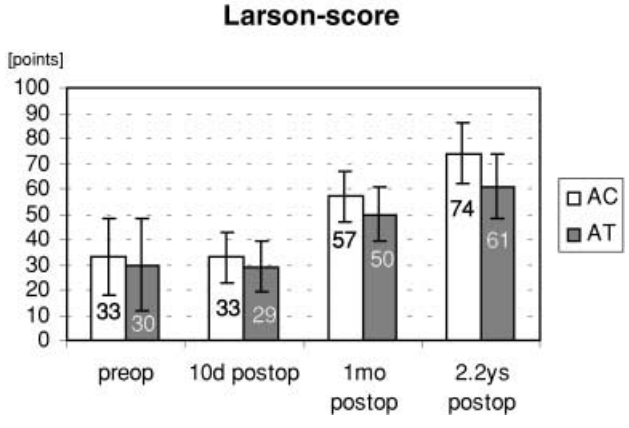

Fig. 1 Pre- and postoperative Larson scores [6]

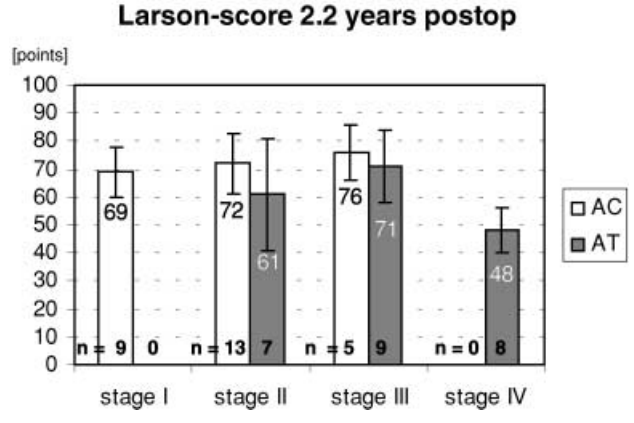

Fig. 3 Larson score at last follow-up in relation Gächter's stages [2]

Acceptable results were found in Gächter's stage I to III without significant difference between the 2 treatment groups (Fig. 3). In Gächter's stage III the patients also gained functionally from the arthroscopic procedure. However, the delay of treatment for the 5 patients in stage III treated by arthroscopy was less than 5 days.

Discussion

Delay in diagnosis and failure to start treatment promptly are the most common reasons for late complications in septic arthritis of the knee [2, 15]. Although this study is retrospective and not randomized the number of patients we studied was high.

The group treated by early arthroscopy had the best functional results. When the inflammation is restricted to the intraarticular space the advantage of debridement, lavage and drainage by arthroscopy seems to be that the synovial membrane is preserved. Intraarticular fibrosis followed by a reduced range-of-motion can be avoided and the synovial membrane, which acts as a biological barrier remains intact. In Gächter's stage I and II [3] arthrotomy with subtotal or complete synovectomy is unnecessary. With adequate antibiotic therapy a high local concentration will be found in the synovial membrane and the joint fluid [7]. Simultaneous evacuation of the intraarticular purulent material by debridement and lavage often leads to an effective resolution of the infection. Sufficient irrigation is essential and loculations and adhesions can be removed with the shaver under scope control. Postoperatively early remobilization is needed to avoid intraarticular pannus formation followed by joint contracture and muscle atrophy.

The arthroscopic procedure is also recommended in Gächter's stage III with an early onset of the inflammatory symptoms (less than 5 days). Necrotic areas of the synovial membrane and articular cartilage are to be resected, while hyperemic and hypertrophic parts of the synovial membrane can be preserved.

Our results conflict with other reports in literature where open arthrotomy and early synovectomy is favored [5, 8, 9, 10]. A complete restitution can only be attained by using the arthroscopic technique if the articular cartilage is intact and the inflammatory process is restricted to the synovial membrane. In Gächter's stage III, where the infection has spread to the capsule and the infectious symptoms have lasted more than 5 days, arthrotomy with wide resection of all inflammatory and necrotic tissues must be performed. Without adequate treatment, further exposure of the articular cartilage to bacterial toxins leads to biochemical cartilage changes of both matrix and collagen with inflammatory destruction of the joint [12].

Arthrotomy is also the treatment of choice in Gächter's stage IV with osseous involvement. In such cases the arthroscopic procedure is contraindicated, as there is no chance of resolving the infection within the extraarticular structures.

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