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SYNOVECTOMY IN BACTERIAL ARTHRITIS

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Twenty patients with bacterial arthritis with either delay in diagnosis or no response to treatment are presented. Synovectomy, even when performed after 5 days and up to 4 weeks later, could prevent joint destruction in the knee but not in the hip. The average follow-up time was 5 (2–9) years.

Key words: bacterial arthritis; hip; knee; synovectomy

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Joint destruction and even mortality have been reported in bacterial arthritis during the last 10 years, showing that there are still difficulties with diagnosis and treatment (Howard et al. 1976, Kelly et al. 1970, Lidgren & Lindberg 1973, Newman 1976, Sharp et al. 1979).

The aim of this investigation is to report the results of synovectomy in 20 consecutive patients with bacterial arthritis with either delay in diagnosis or no response to early antibiotic treatment.

PATIENTS AND METHODS

During the period 1973–1980, 20 patients with bacterial arthritis were synovectomized. Seventeen of these operations were performed at the Department of Orthopaedic Surgery, Lund, and three in other hospitals after consultation. This is one third of all patients treated for bacterial arthritis during the period. All patients with foreign material in the joint have been excluded from this study.

There were 14 men and six women, with an average age of 42 years (range, 5 weeks to 72 years). Seven of the patients were younger than 16 years (Table 1). The infection was haematogenous in nine cases and post-traumatic or postoperative in 11 cases (Table 1).

The criteria for infection in these patients included at least one of the following:

1) Positive culture taken by sterile aspiration.
2) Positive culture biopsy from the synovium.
3) Radiographic changes showing osteomyelitis.
4) Fistulation from the joint.

Three patients had negative cultures but were treated with penicillin before admission. Two of these had radiographic osteomyelitic changes (Case 5, 13) and the third had an infected wound with communication to the knee joint and severe secretion of pus (Case 15). Two patients had positive culture from synovial tissue biopsies (*Bacteroides* and *Propionibacterium acnes)* but negative cultures from aspirated material (Case 2, 14).

Antibiotic treatment was, in most cases, started after joint fluid analysis without waiting for the result of culture (Griffin 1979, Lloyd-Roberts 1979, Nade 1977, Petersen et al. 1980, Russell & Ansell 1972). The antibiotic treatment given during the period was either cefuroxime or a combination of ampicillin and cloxacillin parenterally for 1–2 weeks in adequate doses, as well as orally for an average of 4 months (range 1–8 months).

In all coxitis or postoperative infections, an arthrotomy was performed immediately after diagnosis. Haematogenous bacterial arthritis in other joints was treated initially by repeated aspiration and irrigation of the joint and if the symptoms had not decreased within 1–2 days or if pus was found, an arthrotomy, as above, was performed.

For coxitis, we used a dorsal approach and the femoral head was not luxated. Most of the pannus could be removed by rotating the femoral head. The joint was drained and flushed several times during the operation

Table 1. Twenty patients with bacterial arthritis operated with synovectomy

Case	Sex	Age (years)	Localisation	Aetiology	Duration of infection before synovectomy	Bacterial culture	Follow-up		
							Duration (Months)	ESR	Results
1	M	22	Knee	Haematogenous	6 months	*Mycobacterium tuberculosis* Human type	107	8	Good
2	M	14	Hip	Haematogenous	5 months	*Bacteroides*	101	6	Poor. 10–45 degrees flexion. No pain.
3	F	5 weeks	Hip	Haematogenous	9 days	*Staph. aureus*	100	5	Poor. Positive Trendelenburg. 20–135 degrees of flexion. Abduction 30 degrees. Rotation 20 degrees 4 cm shortening. No pain.
4	F	5	Hip	Haematogenous	3 days	*Staph. aureus*	100	5	Good
5	M	9	Knee	Post-traumatic	13 days	Negative	93	3	Good
6	F	4	Hip	Haematogenous	3 days	*Staph. aureus*	92	6	Good
7	M	25	Knee	Postop. shaving of the patella	7 days	*Staph. aureus*	76	3	Good
8	M	73	Hip	Haematogenous	1.5 years	*Staph. aureus*	75	2	Poor. No recurrence. Total hip arthroplasty.
9	M	9	Knee	Haematogenous	18 days	*Staph. aureus*	70	7	Good
10	M	23	Knee	Postop. suture of anterior cruciate ligament	14 days	*Staph. aureus*	64	5	Good
11	M	53	Knee	Postop. extraction of Ender nails	28 days	*Staph. aureus*	52	5	Good
12	M	38	Knee	Postop. menisc-ectomy	22 days	*β-streptococci*	48	7	Good
13	F	3	Knee	Haematogenous	10 days	Negative	47	6	Good
14	M	60	Hip	Haematogenous	3 months	*Proponi-bacterium acnes*	46	40	Poor. No recurrence. Total hip arthroplasty.
15	M	8	Knee	Post-traumatic	11 days	Negative	35	6	Good

Case	Sex	Age (years)	Localisation	Aetiology	Duration of infection before synovectomy	Bacterial culture	Follow-up		
							Duration (Months)	ESR	Results
16	M	24	Knee	Postop. suture of anterior cruciate ligament	4 days	*Staph. aureus*	32	2	Good
17	F	37	Knee	Postop. open reduction screw fixation of lateral tibial condylar fracture	17 days	*Staph. aureus* *Klebsiella*	24	3	Fair. 10–120 degrees flexion. Slight pain at weight bearing
18	M	79	Knee	Post-operative arthrography	7 days	*Staph. aureus*	23	5	Good
19	F	60	Knee	Postop. wire cerclage of patella fracture	7 days	*Staph. aureus*	23	20	Fair. 0–130 degrees flexion. Slight pain at weight bearing
20	M	43	Knee	Postop. extraction of AO condyle plate	22 days	*Staph. aureus*	22	5	Good

ESR = erythrocyte sedimentation rate.

with physiological saline, a thick drainage tube was left in the joint cavity and the wound was closed with a few sutures. In two patients with considerable delay in diagnosis and treatment (3 months and 18 months) (Case 14, 8), the joint destruction was so advanced that femoral head resection and synovectomy were performed, followed by a Girdlestone period and then a total hip arthroplasty with gentamicin cement (Carlsson et al. 1978).

For the knee joint, a conventional para-patellar medial incision with luxation of the patella was used. Where pannus was growing over the cartilage, this was thoroughly cleansed away. All granulation tissue around the collateral and crucial ligaments was thoroughly removed. In cases of underlying bone destruction, the osteomyelitis was thoroughly eradicated. The operation, when possible, was performed in a bloodless field. Continuous suction irrigation drainage with 10–15 l Ringer acetate solution at body temperature was instituted for 3–8 days, followed by 2 days of suction (Hedström et al. 1980). The joint was immobilized for the first postoperative week. Active motion was then started, followed by gradual weight bearing after 6 weeks. If the flexion of the knee joint after 2 weeks of active training was less than 90 degrees, a mobilization in general anaesthesia was performed. This was done for seven patients; one patient was mobilized twice, and one three times.

The patients were followed clinically and radiographically for an average of 5 years (range 1.8–8.9 years). The erythrocyte sedimentation rate (ESR) was taken. For comparison, a radiogram was taken of the contralateral joint. In patients treated for arthritis of the knee, varus and valgus stress diagrams were taken. At the clinical investigation, pain at rest or weight bearing, joint motion, and working capacity or daily activity were recorded.

The patients were graded into three groups:

Good: Patients with no pain, normal motion, normal radiogram and normal daily activity.

Fair: Radiogram showing narrowing grade 2 (according to Ahlbäck 1968), slight pain at weight bearing, and slight limitation of mobility.

Poor: All remaining patients.

RESULTS

At follow-up all patients had ESR below 20 mm, except one who had classical rheumatoid arthritis (ESR 40 mm). There have been no recurrences of infection. The results of the treatment of various patients are shown in Table 1, and the results related to the delay in treatment in Table 2.

Two patients in the second group (Table 2) with an average delay of 15 days, both women, had at the same time a fracture of the patella and the lateral tibial condyle, respectively. These are the only two patients rated "fair". In the last group, with more than 4 weeks of delay, one patient had symptoms for 6 months and synovial tuberculosis. Eight years later, he had a normal knee joint, clinically and radiographically. The three other patients in the last group had advanced bone destruction after coxitis. Two were treated with resection of the femoral head and later had a successful total hip arthroplasty. The third patient had severe destruction of the hip with a motion of 10–45 degrees in extension flexion but no pain. In Table 3, results regarding mortality and joint destruction are compared with other materials from the last 12-year period.

Table 2. Follow-up result related to delay in treatment for 20 patients with bacterial arthritis operated with synovectomy

	Delay in treatment		Follow-up			
Group	Days	Mean duration	Hip	Knee		Total
I	0–5	3	2 good	1	good	3
II	6–28	21	1 poor	12<	10 good 2 fair	13
III	>28	180	3 poor	1	good	4
Total			6	14		20

CASE REPORT

A 9-year-old boy (Table 1) (Case 9) was admitted 5 days after start of symptoms, with fever and pain in the right knee. Cultures from the joint fluid and blood showed growth of a non-resistant *Staphylococcus aureus*. Initial treatment started with cloxacillin 0.8 g four times daily. Synovial fluid was aspirated repeatedly but the pain was only slightly reduced and the patient still had a temperature between 38 and 39°C. Because of the persistent symptoms a synovectomy was performed

Table 3. Results of treatment reported by other authors

Authors	Publication year	Follow-up years	Number of patients	Number of joints	Results in survivors		
					Good* joints	Poor** joints	Death no. of patients
Kelly et al.	1970	2–10	78	67	16	51	12
Paterson	1970	2–9	96	96	70	26	0
Russell & Ansell	1972	1–10	28	46	34	12	2
Lidgren & Lindberg	1973	6	21	22	11	11	0
Goldenberg & Cohen	1976	3–10	59	55	35	20	5
Gérard et al.	1977		26	26	19	7	0
Wiley & Fraser	1979	1–4	50	56	41	15	0
Newman	1980	7	134	124	87	37	1
Rosenthal et al.	1980	2–8	63	64	32	32	5
Mielants et al.	1982	4	30	22	15	7	0
Total			585	582	355 (61%)		25 (4.3%)

* The patients in this group are classified according to the criteria of each author. All other patients (fair and poor) are in the poor group.

** The patients who died are not included.

on the 18th day after onset. Five cultures from the synovial tissue showed growth of *Staphylococcus aureus*. The patient improved dramatically, fever dropped, and after a week active motion was started. The antibiotic treatment was continued with oral fusidic acid and penicillin for 3 months. Two weeks after the synovectomy a mobilization of the knee in general anaesthesia was performed. At follow-up 6 years later he had no pain, full flexion and a normal radiogram.

DISCUSSION

In 1876, Thomas reported that aspiration of an infected joint by means of fluctuation could prevent cartilage destruction. Synovectomy was described as early as 1879 by Volkmann for synovial tuberculosis. Later investigations confirmed the good results of synovectomy for tuberculous arthritis (Wilkinson 1962). In the last decade, many investigations have shown that bacterial arthritis has to be treated intensively with antibiotics within 24–48 h after onset of symptoms, or irreversible joint cartilage damage will result (Goldenberg & Cohen 1976, Ho & Su 1982, Howard et al. 1976, Paterson 1970). High joint pressure and/or enzymatic degradation are the main reasons for the cartilage destruction (Fraser 1981, Paterson 1978, Salvati 1979). Therefore early antibiotic treatment and drainage with irrigation in order to reduce pressure and flush the joint are important (Lloyd-Roberts 1979, Wiley & Fraser 1979). However, in spite of these treatment principles, secondary joint changes have been known to develop and the sepsis may even lead to mortality (Griffin 1979, Kelly et al. 1970, Newman 1976, Russell & Ansell 1972, Sharp et al. 1979). The hip joint especially is very sensitive and many authors have recommended drainage within the first few days (Griffin 1979, Howard et al. 1976, Kelly et al. 1970, Lloyd-Roberts 1979, Nade 1977, Newman 1976, Paterson 1970). We found that synovectomy in bacterial arthritis as indicated by Gerard et al. (1977), even performed after 5 days and up to 4 weeks later, could prevent secondary joint destruction in the knee but not in the hip (Case 1) (Table 2). The results were also better in comparison with other published materials where synovectomy was not performed (Table 3).

As in other investigations (Ho & Su 1982, Paterson 1970), no complications developed in the patients who were treated within 5 days (Table 2). None of our patients treated with aspiration and antibiotic treatment alone are included in this study. If the patients came later with bone destruction, there was often no possibility of restoring the anatomy. It is, however, important to arrest and eradicate the infection for later reconstructive arthroplastic surgery (Table 1).

Low-virulent haematogenous anaerobic infections in joints without foreign material are rare and often missed (Lidgren et al. 1978). Two of our patients were treated for 3 and 5 months (Table 1) before diagnosis. Cultures from synovial biopsy gave growth of anaerobic bacteria in two of our patients (No 2, 14) with initial negative cultures. Other reports also showed that although repeated cultures from the joint fluid are negative, the patient can still have bacterial arthritis (Nade 1977, Petersen et al. 1980, Wiley & Fraser 1979). If there is a clinical suspicion of bacterial arthritis verified by the joint fluid analysis (Griffin 1979, Parker 1977), intensive antibiotic treatment and eventually operation should not be delayed.

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