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Original article

Arthroscopic treatment of septic arthritis of the knee in children



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ABSTRACT

Introduction: Childhood septic arthritis of the knee is a serious disease that can impair growth and cause serious functional sequelae. There are few data on arthroscopic treatment in children, and series were always less than 20 cases.

Hypothesis: The objective of this study was to assess clinical and radiographic results of arthroscopic drainage combined with antibiotic therapy for the treatment of childhood septic arthritis of the knee. The hypothesis was that arthroscopic treatment is also effective in children.

Materials and methods: A retrospective study, conducted between January 2003 and December 2012, included patients under 15 years of age with septic arthritis of the knee treated by arthroscopic drainage with a minimum of 2 years' follow-up.

Results: Fifty-six patients, with a mean age at surgery of 3.4 years (range, 3 months to 12 years), were included. *Staphylococcus aureus* was the most common causative organism. Two patients (3.6%) had recurrence, successfully treated by repeat arthroscopic drainage. Mean Lysholm score was 96.9 (range, 70–100) and mean KOOS-Child pain, symptoms, daily life, sports and quality of life scores were respectively 97 (81–100), 95 (75–100), 98 (89–100), 93 (71–100) and 95 (70–100) at a mean 65 months' follow-up. Ranges of motion were normal. Radiology found no joint damage.

Discussion and conclusion: Arthroscopic drainage combined with antibiotic treatment is a simple and effective treatment for childhood septic arthritis of the knee and is for our reference attitude. It can also be indicated in case of recurrence.

Level of evidence: IV, retrospective study.

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1. Introduction

Childhood septic arthritis is a potentially serious pathology which can lead to severe functional sequelae or death [1–5]. All joints are exposed, but the knee and hip are the most frequently involved [6–10].

Arthrotomy results at a mean 5 years' follow-up were reported to be excellent in 68% of cases and good in 20% [11]. The essential predictive factor is time to treatment [3–5,7,10,12–14]; any delay in diagnosis or ineffective treatment may result in osteomyelitis, chondrolysis, physeal growth disorder, lower-limb length discrepancy or severe sepsis [1–5,7,11,12].

The choice of joint drainage technique is controversial between needle aspiration, arthrotomy or arthroscopy. In adults, arthroscopic drainage with synovectomy is the consensual treatment of choice in septic arthritis of the knee, with lower rates of infectious recurrence than needle aspiration and better functional results than

open surgery [15–19]. In children, there have been fewer studies and the interest of arthroscopy remains to be clearly demonstrated [20–24].

The present study assessed medium-term clinical and radiological results of arthroscopic treatment of childhood septic arthritis of the knee. The study hypothesis was that arthroscopy is effective in children.

2. Materials and methods

2.1. Study population

The study design was observational, retrospective and single-center. Case files for childhood septic arthritis of the knee were retrieved from our center's database. All procedures were performed by senior surgeons, between January 2003 and December 2012.

All patients aged less than 15 years at surgery and with a minimum 2 years' follow-up, presenting purulent effusion at the knee (white blood cells [WBC] > 50,000/μL and/or > 90% neutrophils) or

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with retrospectively confirmed positive joint fluid culture were included.

Patients with associated osteomyelitis or subperiosteal abscess were excluded.

2.2. Surgical technique

All patients underwent emergency surgery. Preliminary needle aspiration was performed under general anesthesia. When suspected septic arthritis was confirmed by macroscopic analysis of the joint fluid, an anterolateral approach was performed for the 5-mm arthroscope plus an anteromedial approach for aspiration. The knee joint was washed with 2–3 L of physiological saline until the fluid became clear. Synovectomy was not performed. A drain was fitted in one of the approaches at end of surgery. Postoperative care was standardized, with long-leg cast immobilization and probabilistic parental antibiotic therapy. Antibiotics were then adapted in the light of the bacteriology findings, with oral relay as soon as the inflammatory syndrome showed clinical and biological improvement. Treatment success was defined as symptom resolution and a reduction in inflammation markers; failure was defined by a need for revision surgery. No rehabilitation was performed.

Patients were followed up by an independent examiner. At last follow-up, clinical work-up assessed range of motion, joint effusion, clinical limb-length discrepancy and return to sport. Functional assessment comprised Lysholm and KOOS-Child scores. Radiology comprised AP and lateral views centered on the knee, analyzing joint status in terms of degeneration and growth disorder.

3. Results

Sixty-six patient files (35 females, 31 males) were retrieved from the center's database. Six patients were lost to follow-up, although without known complications at more than 24 months. Four refused participation. Fifty-six patients were thus included for analysis (Table 1). Mean follow-up was 65 months (range, 26–141 months). Mean age at surgery was 3.4 years (range, 3 months to 11 years). Mean interval between symptom onset and admission was 3.2 days (range, 0–16 days). At admission to the emergency department, 14 patients (25%) were afebrile; all were in pain; 55 (98.2%) had joint effusion. CRP was elevated in 49 patients (87.5%), white blood cell count was elevated in 42 (75%) and sedimentation rate in 27 (48.2%).

Table 1
Epidemiological data.

Number of patients	56
Age (years)	3.4 (range, 0.3–11)
Male	25
Female	31
M/F sex-ratio	0.8
Right side	26
Left side	30
Fever	42 (75%)
Effusion	55 (97.5%)
Pain	56 (100%)
Time from onset (days)	3.2 (range, 0–16)
WBC (10^9 cells/L)	14.8 (range, 7.5–26.6)
CRP (mg/L)	57.3 (range, 3–273)
ESR (mm/h)	41.9 (range, 11–130)
Plain X-ray	56 (100%)
Ultrasound	17 (30.3%)
Hematogenic	52 (92.9%)
Deep wound	4 (7.1%)
Parenteral antibiotic therapy (days)	7.8 (range, 5–12)
Oral antibiotic therapy (days)	33.2 (range, 13–40)
Total antibiotic therapy (days)	40.9 (range, 21–45)
Hospital stay (days)	9.8 (range, 6–23)

Table 2
Isolates.

Bacterium	Cases
<i>Staphylococcus aureus</i>	11 (40.7%)
<i>Kingella kingae</i>	7 (25.9%)
<i>Streptococcus pyogenes</i>	5 (18.5%)
<i>Enterobacter</i>	1 (3.7%)
<i>Streptococcus pneumonia</i>	2 (7.4%)
<i>Neisseria meningitidis</i>	1 (3.7%)

Systematic AP and lateral knee X-ray performed in the emergency department found no abnormalities. Seventeen patients (30.3%) had an ultrasound knee scan due to difficult clinical examination; joint effusion was systematically disclosed.

Etiology was considered to be hematogenic in 52 patients and secondary to direct joint inoculation in 4. Mean antibiotic therapy duration was 40.9 days (range, 21–45 days). Bacteriology identified a bacterium in only 27 cases (48.2%); 11 cases with *Staphylococcus aureus*, 7 with *Kingella kingae*, 5 with *Streptococcus pyogenes*, 2 with *Streptococcus pneumonia*, 1 with *Enterobacter* and 1 with *Neisseria meningitidis* (Table 2).

The aspiration drain was removed at a mean 5.3 days (range, 1–9 days). Mean hospital stay was 9.8 days (range, 6–23 days). Mean immobilization time was 26.1 days (range, 12–55 days).

There were 2 cases of in-hospital recurrence (3.6%), managed by a single repeat arthroscopic drainage; arthrotomy was not performed. In 1 case, aspiration drainage was not performed; in the other, with *S. aureus*, treatment took 15 days.

At last follow-up, none of the patients reported pain in the operated knee. Mean range of motion was 0.3° (range, 0°–10°) in extension and 148.8° (range, 120°–160°) in flexion and was symmetrical. Three cases showed <5 mm limb-length discrepancy on clinical examination. All patients resumed sport at their previous level.

In the series as a whole, at last follow-up, mean Lysholm score was 96.9 (range, 70–100), with 82% excellent, 14% good and 4% moderate results. Mean KOOS-Child scores at end of follow-up were 95 for symptoms (range, 75–100), 97 for pain (range, 81–100), 98 for daily life (range, 89–100), 93 for sport (range, 71–100) and 95 for quality of life (range, 70–100). In the 2 cases with recurrence, the Lysholm scores were 97 and 100 and the KOOS-Child scores respectively 100, 97, 100, 98 and 100 and 100, 100, 100, 100 and 100.

In the 56 patients with radiologic assessment of the operated knee, there were no physeal or epiphyseal growth abnormalities or cases of joint impingement.

4. Discussion

Arthroscopic treatment of childhood septic arthritis of the knee was effective in 96.4% of cases in the present series.

Demographically, the present series was comparable to those reported in the literature. Forty-five patients (80.4%) were under 5 years of age and 6 (10.6%) under 1 year; mean age was 3.2 years, comparable to 3 years 4 months in the series reported by Glorion et al. [11]. The early signs of septic arthritis are insidious, which accounts for the mean 3.2 days' mean time to admission, which was identical to that reported by Griffet et al. [13]. Elevated CRP and WBC count are important prognostic factors [3,4,10,12]; 87.5% of the present series showed CRP elevation and hyperleukocytosis. Pus aspirated from the joint is the main diagnostic criterion [3,4,10,12,13,25]; definitive diagnosis is retrospective, founded on positive culture or purulence (WBC > 50,000/μL and/or > 90% neutrophils) found in the joint fluid.

The present rate of 48.5% positive culture was comparable to literature reports [6,8,10–13,26,27]. *S. aureus* was the most

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