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Original Article

Outcome of arthroscopic drainage and debridement with continuous suction irrigation technique in acute septic arthritis

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ABSTRACT

Purpose: The purpose of this study was to determine the clinical course and functional outcome of acute septic arthritis treated by arthroscopic drainage and debridement with continuous suction irrigation.

Methods: Eighteen subsequent cases of acute septic arthritis of hip and knee were included in this study. Complete hemogram, erythrocyte sedimentation rate (ESR), C-reactive protein (CRP), blood sugar, liver and kidney function test was done. Plain radiographs and ultrasound of affected joints were done. Joint aspirate was analyzed for gram staining, AFB staining, culture/sensitivity, biochemistry and cytology. Quantitative CRP was repeated every third day till normal CRP level was noted. Intravenous cloxacillin 25–50 mg/kg was started according to WHO protocol and was later changed to specific antibiotics after culture reports. Arthroscopic drainage and debridement of joints was done through standard portals and two tubes were placed in each joint for continuous suction and irrigation. Continuous suction irrigation was used till the effluent saline from the joint was clear. Functional outcome was documented as per Harris hip score for hips and Lysholm score for knee joint. Scoring was done before surgery, at one month and at three months. The duration of intravenous antibiotics and hospitalization was recorded.

Results: Out of eighteen cases 83.33% were males and 14.67% females. The mean age was 22 years (± 12.01). The mean duration of symptoms was 4.33 days (± 1.41). According to Gachter classification 88.88% of cases were stage 2 infection and 11.12% cases in stage 1 at the time of arthroscopy. The mean duration of hospital stay was 14.61 days (± 4.01). Intravenous antibiotics were given for a mean period of 9.33 days (± 2.16). The mean pre-operative Harris score was 13.6 (± 2.07) which improved to 98 (± 1.87) at 3 months and all the cases had painless normal range of movements. Mean pre-operative Lysholm score was 38.38 (± 4.29) and it improved to 98.84 (± 2.19) at 3 months. There were no sequelae of septic arthritis in any case.

Conclusion: Early arthroscopic decompression and debridement of septic arthritis with continuous suction irrigation can eradicate the infection. The duration of intravenous antibiotics and the hospital stay required is shorter. The functional outcome of joints is satisfactory.

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1. Introduction

Septic arthritis is a potentially fatal emergency associated with significant morbidity. If not managed timely and properly it can result in irreversible joint damage. The final outcome depends on magnitude and type of infecting pathogen and status of patient's immunity. It also depends on time lag in establishing diagnosis and instituting appropriate treatment. The outcome is seen in terms of eradication of infection and normal functional outcome.

Diagnosis of septic arthritis is clinically aided by hematological investigation, imaging studies aspiration and analysis of joint fluid. Till recently open arthrotomy and debridement was considered the gold standard.^{1–3} Although septic arthritis is treated successfully with this method, the functional result is mostly unsatisfactory.^{4,5}

Arthroscopic treatment of septic joint is getting established as preferred treatment.⁶ Arthroscopic lavage is considered the treatment of choice for patients with septic arthritis of the knee by several authors.⁷ It has also been used successfully in the treatment of patients with septic arthritis of the hip.^{7–9} Arthroscopic debridement of septic arthritis hip joint leads to a rapid post-operative recovery, full range of motion of the affected hip, with no reported complications.^{7,9,10}

Addition of continuous suction irrigation after arthroscopic debridement can improve the outcome. However only few studies have been done on management of septic arthritis by using both arthroscopic debridement and continuous suction irrigation.^{11,12}

The purpose of this study was to determine the clinical course and functional outcome of acute septic arthritis treated by arthroscopic drainage and debridement with continuous suction irrigation.

1.1. Hypothesis

Arthroscopic drainage and debridement with continuous suction irrigation in acute septic arthritis can provide complete functional recovery with eradication of infection.

2. Methods

This study was conducted on septic arthritis in age group more than 3 years. Ethical clearance was taken from institutional board. Eighteen subsequent cases of established diagnosis of acute septic arthritis of hip and knee joints were included in this study. Patients with fungal or tubercular infection, co-existence of osteomyelitis, underlying previous pathology or deformity of same joint, any neuromuscular disorder affecting same limb were not included in the study.

Detailed history was taken and examination was done at the time of presentation. This was followed by complete hemogram, erythrocyte sedimentation rate (ESR), C-reactive protein (CRP), blood sugar, liver and kidney function test. Plain radiographs and ultrasound of affected joints were done. Joint was then aspirated under strict aseptic conditions. Joint aspirate was analyzed for gram staining, AFB staining, culture/sensitivity, biochemistry and cytology. Quantitative CRP

was repeated every third day till normal CRP levels was noted. Intravenous cloxacillin 25–50 mg/kg and ceftriaxone 50–75 mg/kg was started according to WHO protocol and was later changed to specific antibiotics after culture reports.¹³ Harris hip score was used for hips and Lysholm score was used for knee joint to record the functional status. Scoring was done before surgery, at one month and at three month follow up (see Fig. 3).

Knee arthroscopic debridement was done by standard portal placement. Nine liters of saline was used to lavage the joint clear of debris and fibrin clots. Arthroscopic staging was done at the time of procedure according to Gachter classification.¹⁴ After the debridement two tubes were placed through the portals (Fig. 4). One tube was connected to sealed suction vac and other one connected to 6 L saline for continuous irrigation. Synovial tissue was sent for histo-pathological examination.

Hip arthroscopy was performed with the patient placed in a supine position on a fracture table. Gentle traction was applied to distract the joint. Portals used were anterolateral and anterior. The 4 mm 30° scope was used and switched between portals (Figs. 1 and 2). Arthroscopic drainage and debridement of the joint was carried out. Drain tubes were inserted through the arthroscopic sheath (Fig. 4). The portals were closed over suction drain.

Arthroscopy was followed by continuous suction irrigation with normal saline for 24–48 h. Irrigation was stopped when the effluent saline was clear in colour. The suction drain was removed after 6 h of obtaining clear fluid in suction tube. Patients were immobilized post-operatively until the drain was removed. Active range of movement exercise was initiated after removal of drain. Non weight bearing exercises were allowed on the affected limb for two weeks after the procedure followed by partial weight bearing using supports for another two weeks. Patients were switched to oral antibiotics when quantitative CRP levels fell to normal range and were discharged on oral antibiotics. Follow up was done in outpatient department at one month and three month post-operative period.

3. Results

Out of eighteen cases in this study 83.33% (15 cases) were males and 14.67% females (3 cases). The mean age of the

Fig. 1 – Synovial hyperemia in case of septic arthritis of hip joint.

Fig. 2 – Showing arthroscopic shaver in the hip joint through anterior portal.

patients of septic arthritis knee was 22 years (± 12.01). For hip joint the mean the age was 9.16 years (± 4.54). The incidence of knee joint involvement (72.22%) was more than hip joint (27.78%). The mean duration of symptoms was 4.33 days (± 1.41). At the time of presentation the mean erythrocyte sedimentation rate was 59.16 (± 13.4), mean CRP level was 63.33 (± 23.42) and mean total leukocyte count was 15,166.67 (± 3688.29) (Table 1). Two patients had type 2 diabetes mellitus. According to Gachter classification 88.88% of cases presented with a macroscopic stage 2 infection and 11.12% cases in stage 1 at the time of arthroscopy.

On analysis of initial radiograph it was observed that increased soft tissue shadows were present in all cases. Increased joint space was observed in 90% cases. Gram's staining was positive in 50% cases and in these cases Gram positive organisms were present. Culture was positive in only 50% of the cases. *Staphylococcus aureus* was the most common pathogen (77.77%) followed by streptococcus (22.23%). Ultrasonography displayed collection and increased joint space in all the cases.

The mean duration of hospital stay was 14.61 days (± 4.01) (Table 1). Intravenous antibiotics were given for a mean period of 9.33 days (± 2.16). Intravenous antibiotics were stopped when CRP returned to normal and patients were then put on oral antibiotics for another two weeks.

Fig. 3 – Showing inflow and outflow drain for suction irrigation in septic arthritis hip.

The mean pre-operative Harris score was 13.6 (± 2.07). After a month, mean Harris hip score was 79.8 (± 9.75). At one month 33.33% cases had fair, 50% cases had good and 16.64% cases had excellent results. Mean Harris hip score at 3 month follow up was 98 (± 1.87) and all patients had normal range of movements at hip with no pain or limping in daily activities.

The pre-operative Lysholm score in cases of septic arthritis knee was poor in all the patients. Mean pre-operative score was 38.38 (± 4.29). At one month of follow up 15.37% cases had fair to good, 69.23% cases had good to excellent and 15.37% cases had excellent result. Mean Lysholm score at one month follow up was 85.46 (± 5.04). At three months follow up 76.92% cases had excellent results and 23.08% cases had good to excellent result. Mean Lysholm score at 3 months follow up was 98.84 (± 2.19). None of the patients had poor results at final follow up.

Radiographs were normal at final follow up. There was no complication such as osteomyelitis, subluxation, dislocation, ankylosis, shortening or deformity at the final follow up.

4. Discussion

Septic arthritis continues to be a serious problem because of its potential to cause osteomyelitis, subluxation, dislocation, ankylosis, shortening or deformity and thereby an unsatisfactory functional recovery. This is more so with rising numbers of immunocompromised patients.

Early diagnosis is of utmost importance as it leads to early institution of treatment. With shorter duration of symptoms the chances of permanent articular damage caused by infective process is less. Wirtz et al had reported better results if treatment was started between 1 and 5 days compared to 6–10 days of onset of symptoms.¹⁵ Vispo Seara showed that time lapse between first symptom and surgical intervention had significant difference on final outcome.¹⁶ In this study the mean duration of symptoms was 4.25 days. Because of relatively early diagnosis all the cases on arthroscopy were found to be in only stage 1 and stage 2 of infection by Gachter classification. The reported outcome of septic arthritis is better if the affected joints are in Gachter stage 1 and stage 2 as compared to stage 3 and stage 4 is mostly associated with poor results.^{17,18} For early diagnosis the clinical and hematological examination is of utmost importance. We found significantly raised Quantitative CRP, ESR and leukocyte counts in all cases. We found ultrasound to be of great use to diagnose collection especially in hip. Radiographs did show enhanced soft tissue shadow and increased joint space but not in all cases. Gram staining was positive in only 50% cases.

Arthroscopy offers significant advantage over arthrotomy as magnified view in arthroscopy leads to better visibility of gutters and areas not visible by open arthrotomy and the assessment of joint is better. In arthroscopy the high rate of flow of normal saline in closed cavity of the joint creates increased intraarticular pressure and distention of joint resulting in thorough lavage and dislodgement of any necrotic material or pus in inaccessible areas of joint. The hyaline cartilage of joint does not get exposed to the air. The blood loss and post-operative scarring is also significantly lesser than arthrotomy. The requirement of resurgery in arthroscopic

Fig. 4 – Showing inflow and outflow drain for suction irrigation in septic arthritis knee.

drainage and debridement is lesser as compared arthrotomy.¹⁹ In none of our cases repeat surgery was required.

The post-operative pain which is a significant hindrance to early functional recovery is lesser in patients treated with arthroscopy as compared to arthrotomy allowing early mobilization of patients as well as lesser requirement of post-operative analgesics. In this study all the patients had minimal post-operative pain and because of early mobilization could attain complete functional recovery.

Continuous suction irrigation in combination with arthroscopic debridement has been used by few investigators previously.¹² In an already infected joint the debridement causes post-operative haemarthrosis, which can be excellent medium for bacterial growth. The continuous irrigation-suction washes out and removes any collection in the joint. This eliminates chances of reactivation of infection. We used suction irrigation only till the time we noticed clear saline emanating from the suction tube which is 24–48 h at the maximum.

Because of better joint clearance the infection is eradicated faster. It is shown by shorter duration of intravenous antibiotic requirement. The mean duration of intravenous antibiotics was 9.33 days (± 2.16). The duration of intravenous antibiotics was dictated by quantitative CRP values. Shorter duration of intravenous antibiotics is an advantage of using continuous suction irrigation after arthroscopic debridement. The duration of intravenous antibiotics reported by Sung-Jae Kim was 3 weeks, Wui K. Chung was 7–14 days and Chun-Lin Kuo was 13.5 ± 9.91 days.^{12,18,19}

Because of better control of infection and rapid recovery the required duration of hospitalization is less. In this study mean duration of hospital stay was 14.61 (± 4.01) days. The mean duration of hospitalization reported by Wirtz was 32 days in arthroscopy debridement group compared to significantly longer 50 days in arthrotomy group.¹⁵ The reported mean duration of hospital stay is even shorter when arthroscopic method is combined with suction irrigation system.¹²

In this study at final follow up all patients of septic arthritis hip had excellent result with normal range of movements at hip. The superiority of arthroscopic drainage over arthrotomy for Gatcher stage 1 and 2 septic arthritis in terms of functional recovery of patients is established.^{15,20} An addition of continuous suction irrigation may improve the functional outcome as infection is eradicated faster as shown by lesser duration of requirement of intravenous antibiotics. This modality of treatment has limited application in late presentation or septic arthritis in Gatcher stage 3 and 4 which otherwise also have poor prognosis.

Weakness of study: In our study number of subjects was small with shorter duration of follow up and there was no control group treated by arthroscopic debridement alone. More studies need to be done with large number of subjects including a control group of subjects treated by arthroscopic debridement alone before this method of combined arthroscopic drainage and debridement with continuous suction irrigation can be established as a better surgical method in management of acute septic arthritis.

Table 1 – Depicting pre-operative ESR, TLC, CRP and duration of intravenous antibiotic and hospital stay.

S. no.	Age	Pre-op ESR	Pre-op Leukocyte count	CRP	Duration of intravenous antibiotics	Duration of hospital stay in days
01	35	61	18,000	32	07	18
02	12	45	11,500	68	09	12
03	04	98	14,000	53	07	19
04	16	60	13,000	48	10	24
05	45	40	19,800	60	07	09
06	05	62	23,800	51	08	10
07	12	60	16,000	56	07	13
08	05	67	14,000	60	11	20
09	28	74	12,200	107	10	14
10	15	50	12,500	62	09	15
11	40	65	16,200	48	12	13
12	13	60	14,000	106	10	12
13	18	63	14,000	113	07	09
14	24	56	13,500	64	11	12
15	12	58	23,000	56	09	17
16	20	40	12,500	30	15	17
17	12	46	13,000	54	08	13
18	19	60	12,000	72	11	16

5. Conclusion

Arthroscopic approach allows complete debridement of necrotic synovium, drainage and thorough lavage of the infected joint. As there is minimal trauma to soft tissues; early post-operative pain relief, early mobilization and faster rehabilitation are significant outcomes with this method. Placing suction irrigation tubes in closed joint cavity (following arthroscopy) is effective in washing out the post-operative hematoma and collection thus reducing chances of resurgery.

Conflicts of interest

No benefits in any form have been received or will be received from a commercial party related directly or indirectly to the subject of this article.

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