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Effect of Adding Continous Irrigation to Arthroscopic Debridement of Septic Knee: A Retrospective Study

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ABSTRACT

Even with current advancements in the field of orthopedics, septic/infective arthritis of knee remains an unsettling nightmare. Early mobilization and rehabilitation has now become possible with the advent of arthroscopic debridement, but still recurrence remains awful. The aim of this study is to retrospectively analyze the outcomes of patients who were treated with a novel method of continuous irrigation following arthroscopic debridement in patients who presented with infective/septic arthritis. The data of all the patients who were treated with continuous irrigation for following arthroscopic debridement, between Jan 2018 to Dec 2022 were collected and retrospectively analyzed. After a mean follow up of 25 months there was no recurrence in all the 24 patients who qualified our inclusion criteria, 3 patients had post operative stiffness among them 2 were treated with physical therapy and one who didn't improve with physical therapy also denied surgical correction. The mean post operative KOOS score was 78.2 ± 3.8 which was significantly higher compared to their pre-operative scores. Adding continuous irrigation to arthroscopic debridement proves to be an effective, promising treatment for septic/infective arthritis rather than arthroscopic debridement alone to avoid recurrences.

Keywords: *continuous irrigation, arthroscopic debridement, septic arthritis, knee.*

1. INTRODUCTION

Septic arthritis is considered an orthopaedic emergency with an incidence of 4-29 per 1 lakh population .Gainer in 1984 introduced continuous irrigation without debridement in a medically unfit patient and was successful[1]. Knee being the most commonly affected joint followed by hip, shoulder, elbow, ankle and sterno-clavicular joint. It is defined as the inflammation of a joint secondary to infective etiology. Treatment is usually emergent surgical irrigation and debridement followed by culture derived IV antibiotics. The etiology can be primary or secondary, Primary due to direct seeding of bacteria into the joint from blood and secondary due to direct inoculation of bacteria into the joint during trauma or surgery or following contagious spread from adjacent osteomyelitis Septic arthritis causes irreversible destruction of cartilage in the involved joint within 8 hours due to release of proteolytic enzymes from inflammatory cells.

The most common pathogen identified is staphylococcus aureus accounting to 50 % of cases, Neisseria gonorrhea is also common among otherwise healthy sexually active adolescent and young adults manifests as bacteremic syndrome in 60 % localized septic arthritis in 40 %. Gram negative bacilli is rare and accounts for 10-20%, mostly affecting neonates, IV drug abusers,immunocompromised and elderly. The most common gram negative organisms are *E.coli, Proteus, klebsiella, Enterobacter Propioini bacterium* acnes is commonly associated with shoulder infections following surgery. Salmonella or *streptococcus pneumonia* seen in patients with sickle cell disease. *Bartonella henselae* seen in patient with HIV, *Pseudomonas aeruginosa* seen in patients with history of IV drug abuse. Pasterulla multicida seen in patients after dog or cat bite. Eikinell acorrodens seen in patients after human bite fungal/ candida found in immunocompromised host.\ The superiority of arthroscopic debridement over arthrotomy is already proven. Still a recurrence of infection following arthroscopic debridement is nightmare for both the surgeon and the patient. The hunt towards measures to reduce the

incidence of recurrence is still not rewarding. The effect of continuous irrigation on infections in the brain, abdomen and joints in medically unfit patients for surgery seems promising. The purpose of this study is to find the effect of adding continuous irrigation following arthroscopic debridement in reducing the recurrences and to evaluate the functional and radiological outcomes in short term (2 years).

2. MATERIAL AND METHODS

Study Center is Karpaga Vinayaka Institute of Medical Sciences and Research Centre. This is a retrospective case study, Patients who were operated for septic arthritis of knee between January 2018- December 2022 with a minimum follow up of 24 months. All patients between 30 and 70 years of age who presented with acute onset knee pain and swelling associated with fever, with elevated leucocyte count (>15000 cells/microliter) and elevated inflammatory markers (pro-calcitonin >0.5ng/ml and CRP >50mg/dl), Gächter stage 1 and 2 and gave consent to participate in the study were included. Those with history of chronic knee pain, symptoms of inflammatory arthritis or associated evidence of systemic infection were excluded. Functional outcome was assessed based on KOOS (Knee injury and Osteoarthritis Outcome Score) and Lysholm Score. Gacthter staging was done based on intra-op assessment during arthroscopy. The pre-operative demographic, functional and laboratory data were collected from medical records department (MRD).

Table 1: Description of Inclusion and Exclusion Criteria.

INCLUSION CRITERIA	EXCLUSION CRITERIA
Age between 30 to 70 years,	Previous history of chronic knee pain
Acute onset knee pain and swelling with history of fever	Symptoms of inflammatory arthritis or on treatment previous knee injury,
Elevated WBC count (>15000), and	e/o other systemic infections
Elevated inflammatory markers (procalcitonin >0.5ng/ml, CRP >50)	Denied consent to participate
Gachter stage 1 and 2	

3. PROCEDURE

All patients were operated by one senior arthoscopy trained orthopaedic surgeon in supine position with knee flexed to 90° under spinal anesthesia. Arthroscopic debridement was done through standard anteromedial and anterolateral portals, synovial samples was collected and sent for microbiological and histopathological examination. Gram stain, Acid fast bacilli stain, fungal stain, culture sensitivity was done. Gram stain/AFB / fungal stain / bacterial culture and sensitivity samples collected in 4 separate tubes which are sent immediately to the laboratory for processing. Biopsy material collected for histopathological examination.

Subtotal synovectomy was done by arthroscopy, posteromedial and posterolateral compartments were addressed if indicated through appropritate extra portals. Suprapatellar prepatellar medial and lateral tibiofemoral joint space all the joint compartments are visualize and debrided . On completion of synovectomy, continuous irrigation was instilled.INLET / OUTLET for irrigation of fluid is established with two tubes of 14 or 16 French gauge (FG) was inserted into suprapatellar pouch, inlet tube was inserted laterally and was connected to a 3Litre (L) saline hung at 6feet height through TURP (Trans Urethral Resection of Prostate) set with switch control set at 2nd serration . The speed of flow was calculated to be 600 ml/hr based on Poiseille's equation viscosity-1.0016mPa.s, pressure 2.6Ps]. The medial tube is outlet tube is kept at medial suprapatellar pouch connected to a drain bellow with switch at 3rd serration, continuous irrigation maintained for minimum a minimum period of 24 hours or until clear fluid is drained out.

Figure 1: Knee Arthroscopic Images

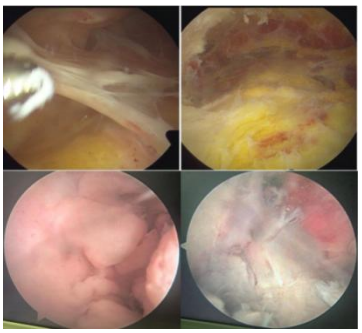

Figure 2: Post Operative X-ray

Broad spectrum antibiotics was started immediately following sample collection, pathogen specific antibiotic was started after culture reports and was continued for 6 weeks. Intravenous antibiotics were continued until CRP reduced to <50 and was discharged with oral antibiotics. Active knee Range of Motion was started immediately after removal of drain tubes, weight bearing was started with walker aid as tolerated bi- weekly follow up after discharge was done for 3 months with CRP. All the patients were called up for follow up on completion of two years, their functional scores was collected and radiological assessment was done based on plain weight bearing knee antero-posterior(AP) and lateral radiographs. Functional scores were assessed based on a questionnaire that was filled by the patient during final follow up. All data were documented and statistical analysis was done.

4. RESULTS

26 patients qualified our inclusion and exclusion criteria, among which two denied consent to participate in the study. The mean follow up was 25.8 ± 6.8 months. The demographic data is tabulated in **Table 2.** Pyogenic bacteria was encountered in 14 patients among which 10 were Staphylococcus aureus and 4 were Streptococcus pyogenes. Pathogen could not be isolated in 10 patients, among which two turned out to be tuberculosis. **Table 3** They were included in the study based on intraoperative findings that was suggestive of pyogenic infection.The preoperative VAS decreased from mode of 8 to 3 at three months follow up. CRP values reduced significantly from 86.4 ± 112.8mg/dl to 9.4 ± 2.8mg/dl (p-0.0001) and ESR decreased from 112 ± 54 to 18 ± 6 (p-0.002). **Table 4** At final follow up the mean KOOS score was 78.2 ± 3.8 and Lysholm score was 74.3 ± 4.9. Minor complications were encountered in 5 patients and are documented in **Table 5.**

Table 2: Demographic characteristics of the study

No of patients	24
Mean follow up	25.8± 6.8 months
Mean age	58.5± 12.8 years
Mean duration of symptoms	6.8± 2.3 days

Male / female	16/8
Mean IV antibiotics	5.2± 3.2 days
Co-morbidities	Diabetes: 19 CKD-1

Table 3: Details of Bacterial Etiology

Pyogenic Bacteria	14 (Staph >Strepto)
Tuberculosis	2
No growth (pus cells on cytology	8

Table 4: Inflammatory Markers

Clinical Markers	**Pre op**	**Follow up (3 Months)**	**P-value**
VAS	8 (mode)	3 (mode)	
CRP	86.4 ± 112.8	9.4 ± 2.8	0.0001
ESR (1 hour)	112 ± 54	18 ± 6	0.002

Table 5: Clinical Complications

Stiffness	4	16.6%
Recurrence	nil	-
Secondary osteoarthritis	1	4%

5. DISCUSSION

The most important finding of this study is significant reduction in the duration of hospital stay and intravenous antibiotics compared to arthroscopic debridement alone. Similar findings were reported by studies by Wui K, Chung and Chun-Lin Kuo in their studies respectively. Continuous irrigation aids in keeping the joint free from post-operative hematoma inside the joint which might act as a substrate for the pathogens. Arthroscopic debridement aids in clearance of all pus necrotic material, followed by continuous irrigation aided in faster recovery as evidenced by shorter duration of hospital stay and intravenous antibiotic requirement which was 5.2 ±3.2 days, which is better compared to studies that reported arthroscopic debridement alone. This finding was similar to the findings by Sung jae Kim, Wui K. Chung (7-14 days)and Chun-Lin Kuo (13.5 ±9.9) days.[12,18,19] Septic arthritis is more common and serious problem with rising number of immunocompromised patients early institution of treatment to prevent potential complications early diagnosis is at most important to decrease the bacterial load to avoid irreversible complications. Wirtz et al had reported better results when treatment was started between 1 and 5 days. Vispo Seara et al also found that time lapse between the first symptom and surgical intervention had significant difference on the final outcome [6]. In our study mean duration of symptoms was 6.8 ± 2.3 days which was similar to the above mentioned

studies, all the patients in our study was classified to be Gächter 1 or 2 on arthroscopy, reinforcing that early diagnosis and intervention will have effect on long term outcomes.

Early clinical and haematological examination is of atmost importance. Radiographs did not show enhanced soft tissue shadow and increased joint space. 14 cases (60%) which aided in prompt administration of appropriate antibiotics that aided in treatment.

Magnified view through arthroscopy leads to better visualization of gutters and areas not visible by open arthrotomy, the high rate of flow of normal saline creates distension of the joint resulting in thorough lavage and displacement of the necrotic materials pus in inaccessible areas of infected joints.The affected joint cartilage is not exposed to air, the blood loss is significantly lesser than open arthrotomy .The post operative pain which hinders early mobilization and recovery in open procedure in arthroscopy, lesser analgesics, early functional recovery compared to open arthrotomy.Open arthrotomy, debridement causes post operative haemarthrosis, where as in arthroscopic debridement, continuous irrigation washes out and removes any collection in the joint there by preventing resurgery.

Duration of intravenous antibiotic reported by sung jae Kim was weeks, Wui K. Chung was 7-14 days and Chun-Lin Kuo was 13.5 ±9.91 days.[12,18,19] Continuous irrigation is already a proven and effective in other organ infections like brain and abdomen. Ours is the first study to report the functional outcomes at two years of follow up, previous studies have reported only about infection free status with maximum follow up of 3 months. The limitations of this study are, this is a retrospective case series with low level of evidence, smaller sample size, and effect of continuous irrigation on functional outcomes of worser Gachter stages was not studied.

6. CONCLUSION

Continuous irrigation is an effective and promising additive tool to arthroscopic debridement in reducing the duration of hospital stay, intravenous antibiotics and to avoid recurrences with better functional outcomes.

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Consent to Publication: "Author(s) declared taking informed written consent for the publication of clinical photographs/material (if any used), from the legal guardian of the patient with an understanding that every effort will be made to conceal the identity of the patient, however it cannot be guaranteed."

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