



## Evaluation of the Operative Treatment in Chronic Haematogenous Pyogenic Osteomyelitis by Sequestrectomy and Saucerisation in Children

Md. Mamun-or-Rashid<sup>1</sup>, Md. Aminur Rahman<sup>2</sup>, AKM Anisuzzaman Choudhury<sup>3</sup>,  
Khursheda Akhtar<sup>4</sup>, Khodeza Akhtar<sup>5</sup>

<sup>1</sup>Assistant Professor, Department of Orthopaedics, Col. Malek Medical College, Manikgonj, Bangladesh; <sup>2</sup>Assistant Professor, Department of Orthopaedics, Col. Malek Medical College, Manikgonj, Bangladesh; <sup>3</sup>Assistant Professor, Department of Orthopaedics, Col. Malek Medical College, Manikgonj, Bangladesh; <sup>4</sup>Lecturer, Department of Community Medicine, Mugda Medical College, Dhaka, Bangladesh; <sup>5</sup>Assistant Professor, Department of Conservative Dentistry, Chittagong Medical College, Chittagong, Bangladesh

[Received: 7 March 2018; Accepted: 20 May 2018; Published: 1 June 2018]

### Abstract

**Background:** Complete resolution occurs in many other types of infections with the use of antibiotics but not always with chronic pyogenic osteomyelitis. **Objective:** The aim of the present study was to evaluate the effectiveness of most conventional method of surgical treatment of chronic pyogenic osteomyelitis by sequestrectomy and saucerisation in Children. **Methodology:** This present study was a prospective study conducted at Bangabandhu Shekh Mujib Medical University (BSMMU), Dhaka, Bangladesh from January 2015 to December 2016 for a period of two (2) years. Patients aged up to 16 years were included in the study. Purposive sampling was done. Only chronic osteomyelitis of haematogenous origin were included after proper selection of the patients. Sequestrectomy and saucerisation was done. Wound was kept open and allowed to heal from bottom and sides of the wound. **Result:** A total 36 patients aged up to 16 years were included in the study. Among the cases two third were male 26(72.23%) and rest were female 10(27.77%). The male female ratio was 2.6:1. Therefore the incident was significantly high in males ( $p<0.01$ ). Most of the patients 28(77.77%) were in 6 to 16 age group, which was significantly high ( $p<0.01$ ) and mean age was 9.83years. Average time taken for wound healing was 3.75 weeks. Regarding antibiotics, Cap Flucloxacillin was the maximum choice. Patients were followed up to maximum 2 years and evaluated clinically and radiologically. Maximum patients 31(86.10%) had satisfactory (good and fair) outcome, but only 5(13.88%) patients had poor outcome. There was a significant association among sequestrectomy and saucerisation with final outcome ( $p<0.001$ ). **Conclusion:** It was concluded that describing operative technique is still method of choice for surgical treatment of chronic haematogenous pyogenic osteomyelitis. [Bangladesh Journal of Infectious Diseases 2018;5(1):15-20]

**Keywords:** Haematogenous; Pyogenic Osteomyelitis; Sequestrectomy; Saucerisation

**Correspondence:** Dr. Khursheda Akhtar, Lecturer, Department of Community Medicine, Mugda Medical College, Mugda, Dhaka, Bangladesh; Cell no.: +8801714712174; Email: [khurshedaakhter11588@gmail.com](mailto:khurshedaakhter11588@gmail.com)

**Conflict of interest:** There is no conflict of interest to any of the authors of this article.

**Funding agency:** The study was not funded by any authority.

**Contribution to authors:** Rashid MMO, Rahman MA, Choudhury AKMA, Akhtar K, Akhtar K conceived and designed the work, sample collection; Choudhury AKMA, Akhtar K, Akhtar K prepared and revised the manuscript.

**How to cite this article:** Rashid MMO, Rahman MA, Choudhury AKMA, Akhtar K, Akhtar K. Evaluation of the Operative Treatment in Chronic Haematogenous Pyogenic Osteomyelitis by Sequestrectomy and Saucerisation in Children. Bangladesh J Infect Dis 2018;5(1):15-20

**Copyright:** ©2018. Rashid et al. Published by Bangladesh Journal of Infectious Diseases. This article is published under the Creative Commons CC BY-NC License (<https://creativecommons.org/licenses/by-nc/4.0/>). This license permits use, distribution and reproduction in any medium, provided the original work is properly cited, and is not used for commercial purposes.

## Introduction

Osteomyelitis is a serious disabling disease with pain destruction and crippling chronicity that last for years together even with attempts of cure by best medical and surgical means. Once osteomyelitis is established it is almost impossible to eradicate<sup>1</sup>. No other disease in the orthopedic surgery has been as difficult to treat as dreadful as sepsis involving bone, the treatment of which is a real complexity.

The incidence of bone infection has greatly reduced in developed countries but in a developing country like Bangladesh where living status of vast majority of people is below average the poor hygienic condition are principal factor responsible for suffering of infants and children by various shorts of infective lesion in the body. As the health care for overall population in the country is yet to be developed these soft tissue infections are not properly managed in its early stage and as a consequence these sites acts as a source for bone infection by haematogenous route when conditions favour.

The bone infection in its acute stage is also not managed or improperly managed due to ignorance and superstitions from the part of parents, partly due to lack of facilities for treatment and partly due to improper treatment by inadequately & irregular doses of antibiotics by inexperienced and unqualified persons in rural areas. Even the cases which reaches to the qualified doctors in their acute stage the diagnosis becomes difficult by the injudicious use of antibiotics which alter the natural history and clinical appearance of the disease. As a result when the patient comes to the hospital, we see them in most of the cases in its chronic stage.

The history of treatment of chronic pyogenic osteomyelitis is full of disappointments complete resolution occurs in many other types of infections with the use of antibiotics but not always with chronic pyogenic osteomyelitis. This failure of treatment is due to inherent nature of the pathological process in bone infection in which dead bone acts as a substrates for bacterial adhesion in much same way as foreign implants, ensuring the persistant of infection until they are removed or discharged through draining sinuses. The dense scar tissue surrounding the infection serves as a barrier to circulating antibiotics & antibodies<sup>2</sup>.

The concept of treatment of chronic osteomyelitis has been changed in recent years. As a significant percent of our hospital beds are filled up with cases

of bone infection and we have to face and manage many cases of haematogeneous chronic osteomyelitis with sequestrum for which various methods have been tried. Most of the orthopedic surgeon still uses the old method and allowed to heal the wound from the bottom & secondary closure if necessary. Therefore this present study was undertaken to evaluate the effectiveness of sequestrectomy and saucerisation in children with chronic haematogenous pyogenic osteomyelitis.

## Methodology

A prospective study was done to assess the result of operative treatment in chronic haematogenous pyogenic osteomyelitis by sequestrectomy and saucerisation in children and to follow up the patients after proposed treatment to evaluate the final outcome. Total 36 patients (up to 16 years old) were selected purposively from Bangabandhu Sheikh Mujib Medical University, BSMMU, and Dhaka during the period from January 2015 to December 2016. Ethical clearance was taken from IRB of BSMMU. The patients were clinically and radiologically assessed and also assessed by laboratory finding. Clinical assessment was done as age and sex of the patients, their history of infection –spontaneous, secondary to distant primary infective focus or minor trauma, site of infection and by clinical findings –pain fever, local tenderness, swelling and increases girth of the limb, presence of sinus, shorting of limb, pathological fracture and stiffness of nearby joints. Radiological assessment was done to find out whether diffuse sclerosis of bone and formation of involucrum with cavities and presence of sequestrum was present or not. Laboratory assessment was done by routine blood count and by culture and sensitivity test. Data were collected compiled and tabulated according to key variables. All statistical analysis of different variable were analyzed according to standard statistical method, by Z test and calculations were done by using scientific calculator.

### **Surgical Technique: Preoperative management:**

The general condition of the patients were assessed and associated helminthic infection was treated in most cases. In case of debilitated anaemic patients were tried to improve the general condition and anaemia by giving high protein diet, vitamins, milk, iron etc. and blood transfusion if necessary. A deep swab was taken from the discharging sinus for culture and sensitivity. Antibiotics were chosen accordingly mostly on the availability of the drug from the pharmacy. All the patient of the series got

antibiotic routinely according to sensitivity in preoperative period.

**Surgical method:** Only tentative operative plans can be made from the appearance of the sinus and radiography. The duration of operation was variable for that blood was made available for preoperative transfusion.

**Tourniquet:** A pneumatic tourniquet without esmarch was employed whenever feasible after giving general or spinal anesthesia. The tourniquet was not released until closure of the wound and application of pressure bandage. Temporary release of tourniquet during operation was made in those cases which were lengthy and prolonged beyond the period considered safe for the tourniquet occlusion<sup>3</sup>.

**Incision:** The operative incision was sufficiently extensive to expose the normal bone at the extreme of the lesion without endangering important blood vessels, nerves and muscles. The incision was first comprise a simple excision of the sinus by passing a probe through it, then it was enlarged as the operation progresses by linear or curvilinear extension. Often previous scar dictate incisions which considerably modified the most direct approach.

**Excision:** All fibrosed soft tissue with an inadequate blood supply were excised down to periosteum. No matter how distant from the sinus or apparently free from infection. This was the longest stage of the operation dissections was slow and careful because fibrosis often grips the great vessels as in a vice, was believed that complete excision was essential. In order to preserve osseous blood supply the periosteum was excised flush with the subjacent bone and was not stripped from it with a drill cortical window was made at the appropriate site for removal of all sequestrum, purulent materials, scarred necrotic tissue<sup>4</sup>. The bone cavity was exposed and excision was continued until no sclerosed bone was left and normal blood showed on the surface bone. Bone involvement was usually found more extensive than that of the soft tissue and further exposure was necessary. The wall of the saucerised area were leveled off to make a shallow cavity so that the soft tissue could fall into and help in obliteration of the cavity. The wound was then thoroughly cleaned and irrigated with normal saline mixed with povidon iodine. The cavity was packed carefully with povidon iodine soaked gauze to allow the wound to heal from the bottom. If the excision of the sinus tract was not feasible it was curetted thoroughly. A pressure bandage was given and plaster of paris cast

was given when excessive amount of bone had to remove to avoid the danger of post-operative pathological fracture. The aim of the operation was to remove all scarred tissue and this was kept in mind when excising sclerosed bone. Affected bone could be removed without permanently weakening the limb. Even though more than half of the diameter of the shaft may be involved. New bone was formed rapidly if the operation was successful and infection was overcome<sup>3</sup>.

**Post-operative care:** No drain was used. The limb was immobilized and elevated. Antibiotic therapy was continued for about 6-8 weeks and in some cases 12 weeks till the successive culture report became negative. A cautionary watch was kept both in clinical and blood count for any evidence of infection. The first dressing was changed after 48 hours and pack was removed. The wound was washed by antiseptic solutions like povidone iodine and closely packed with gauze with aseptic precaution. Thereafter change of dressing was done usually twice for 1<sup>st</sup> 3-4 weeks or as necessary and then more infrequently. After the healing of the wound & controlling of infection skin was closed either by secondary closure or if necessary by split thickness skin graft. The patients were followed up as outdoor patients after discharge and each follow up patients were evaluated following points. 1) Subjective- Pain, fever; 2) Functional- Walking, Working ability; 3) Clinical- Any evidence of infection like wound infection, discharging sinus any deformity like shortening and pathological fracture; 4) Radiological- Sign of radiological evidence of recovery from the disease like, appearance of normal density of the bone, formation of new bone; At the final follow up the result of the treatment of all 36 patients with chronic haematogenous osteomyelities by the method of sequestrectomy and saucerization, keeping the wound open packed with povidon iodine soaked gauze and allowed to heal the wound from the bottom and side of the wound, evaluated clinically and radiologically.

The end results of treatment were categorized in the following criteria<sup>5</sup>. **Good:** No recurrence of following saucerisation and keeping the wound open and patients were asymptomatic at follow up. **Fair:** Recurrence of pain and discharging sinus but no evidence of sequestrum and the sinus healed with antibiotics or a single minor operation like curettage and remained asymptomatic thereafter at follow up. **Poor:** Recurrence of discharging sinus and persistence of the sinus during follow up with or without sequestrum formation even after repeated curettage.

## Results

Out of 36 patients 26(72.23%) were male and 10(27.77%) were female. The male female ratio was 2.6: 1. The incident was significantly high in male ( $p<0.01$ ). Table 1 showing the sex distribution of the patients.

**Table 1: Shows Sex Incidence**

Sex	Frequency	Percent
Male	26	72.23**
Female	10	27.77
Total	36	100

\*\*  $p<0.01$  in Z test

Out of 36 patients, 28 (77.77%) patients were in age group 6 to 16 years, which was significantly high ( $p<0.01$ ). Mean age was 9.83 years. Table 2 showing the age distribution of patients.

**Table 2: Age distribution Among Study Population (n=36)**

Age Group	Frequency	Percent
<1 Years	2	5.55
1 to 5 Years	6	16.66
6 to 10 Years	12	33.33
11 to 16 Years	16	44.44
<b>Total</b>	<b>36</b>	<b>100</b>

\*\*  $p<0.01$  in Z test

Out of 36 patients, 27 (75%) patients were infected by *Staphylococcus aureus*, which was significantly higher than others  $p<0.01$  (Table 3).

**Table 3: Showing Organisms Found In Culture**

Isolated Bacteria	Frequency	Percent
<i>Staphylococcus aureus</i>	27	75**
<i>Streptococcus pyogen</i>	4	11.11
<i>E. coli</i>	3	8.33
<i>Pseudomonas</i>	2	5.55
<b>Total</b>	<b>36</b>	<b>100</b>

\*\*  $p<0.01$  in Z test

Out of 36 patients, Flucloxacillin was used in 20(55.55%) and Cephadrine was used 16(44.44%) patients (Table 4).

**Table 4: Showing use of antibiotics after admission**

Antibiotics	Frequency	Percent
Flucloxacillin	20	55.55
Cephadrine	16	44.44
Gentamycin	11	30.55

Ciprofloxacin	4	11.11
Amoxyclav	2	5.55
Colxacillin	2	5.55
Cotimoxazole	1	2.77
Amikacin	1	2.77

\*Multiple response

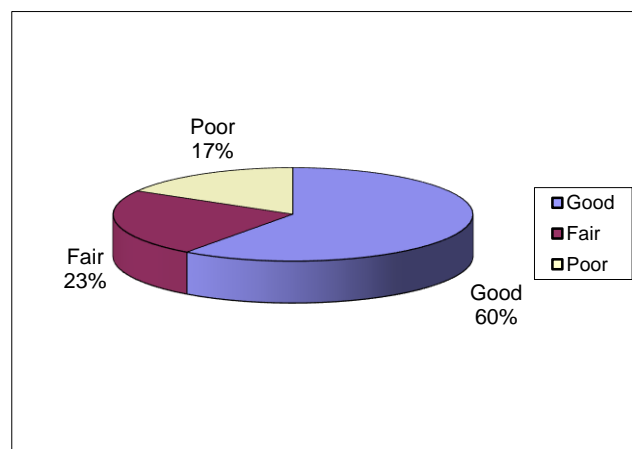
Table 5 showing the time taken for wound healing. Average time was taken for wound healing in 36 patients was 3.75 weeks.

**Table 5: Showing Time Taken To Wound Healing**

Time of Wound Healing	Frequency	Percent
2 Weeks	6	16.66
3 Weeks	17	47.22
4 Weeks	10	27.77
6 Weeks	3	8.33
<b>Total</b>	<b>36</b>	<b>100</b>

Figure I Shows that out of 36 patients 24(66.66%) patients had good, 7(19.46%) patients had fair and 5(13.88%) patients had poor outcome. Satisfactory (good and fair) results were obtained in 31(86.10%) patients, which was significantly high  $p<0.001$ .

**Figure I: Showing the final outcome**



## Discussion

Chronic pyogenic osteomyelitis is a common disease among the children in our country. In most of the cases bone is infected by haematogenous spread of organism from a pyogenic infective foci elsewhere in the body. In the developed countries the disease has been practically almost eradicated by improve status of living and improve health service. Yet new cases of osteomyelitis more commonly in its acute stage are found. From a study it was reviewed 66 cases in osteomyelitis and found 22.24% cases among infants under one year. 22.72% cases 1-3 years and 40.19% cases between 4-12 years and 4.55 % cases between 13 to 15 years were involved in our

country<sup>6</sup>, another study also reviewed 52 patients with chronic osteomyelitis and found 1.25% cases among infants, 21.25% from 1-5 years and about 60% in between 6-16 years<sup>7</sup>. In present study, among 36 patients, it was found 5.55% among infants, 16.66% between 1 to 5 years and 77.77% between 6-16 years which was more or less similar to the study by Sanaullah. Apparently less incidence of the disease among the infants and under 5 age group in our country is probably due to ignorance and illiteracy of our parents to report for proper treatments. The apparently high incidence in older children (6-16) was because children at this age group were more susceptible to trauma which may not be the major one usually during playing without supervision of trained physical instructor and these cases were treated by unqualified doctors and presented as a chronic stage.

Boys are more susceptible to osteomyelitis than girls in a proportion of about 4:1<sup>8</sup>. In Sanaulla's series male female ratio was 3.44:1. Increased susceptibility of boys to injury than girls. The male female ratio becoming closer day by day due to the facts that now a days girls are almost equally engaged in outdoor games like boys therefore girls are become susceptible to trauma and injury like boys.

A bacteriological diagnosis was obtained in all patients included in this series. Staphylococcus aureus were found in 27(75%) cases. Streptococcus pyogen were found in 5 (13.88%) cases. In 3(8.33%) cases were found Eschrechia coli, in 2 (5.55%) cases were found Pseudomonas. In Sanaulla's series Staphylococcus aureus were present in 88% cases which was higher than present series.

Antibiotics were used according to bacteriological sensitivity report. Initially broad spectrum antibiotic was started which was subsequently modified according to sensitivity report. Antibiotic was used single or in combination according to the severity of the disease and most used combination was cephradine and flucloxacillin. Flucloxacillin was used in 20 (55.55%) cases. Cephradine was used in 16(44.44%) cases. Parenteral gentamycin was used in 11(30.55%) cases. Ciprofloxacin was used in 4 cases. Amoxyclav and cloxacillin were used in 2 cases each and co-trimoxazole and amikacin was used in one cases each.

In 24 cases the wound were healed by epithelialization from the surrounding tissue and by scar formation which was need average 3 weeks. 7 cases were needed secondary suture and 5 cases were needed split thickness skin graft. Average time for wound healing in 36 cases were 3.75 weeks. The

patients were discharged after complete wound healing and followed up as an outdoor patients and in each follow up patients were evaluated clinically, haematologically, and radiologically for recovery. Initially patients were followed up monthly and then 3 monthly. The mean period of follow up of 36 patients were 14.41 months.

At the final evaluation of 36 patients with chronic osteomyelitis treated surgically by the method mentioned above were reviewed. The results of present study was categorized as good, fair, poor (shown in figure 1) depending on clinical condition, laboratory investigation and radiological findings during follow up. According to this category it was found 66.66% good, 19.44% fair, and 13.88% poor result. Satisfactory results (Good and Fair) in this study was 86.10% which was statistically significant ( $p < 0.001$ ). In Sanaulla's series there were 80% (Good and Fair) and 20% Poor result. The percentage of success in present series a bit higher than that of Sanaullah's series was probably due to better operative technique, invention of newer and stronger antibiotics and also due to increase awareness of the patients towards the disease.

## Conclusion

The treatment of chronic haematogenous osteomyelitis of long bone is prolonged and troublesome with the view we can conclude that the percentage of resolution of infection by the method of sequestrectomy and saucerisation keeping the wound open and allowing the wound to heal from the bottom and sides accompanied with appropriate that followed in this study was in about 86.10% (Fair and good) which was not low. The follow up period of present study was very short for proper appraisal of the efficacy of the treatment. A follow up period of 5-10 years would possibly give more definite result. During surgery adequate removal of all dead and necrotic tissue including sequestrum and covering the wound with surrounding soft tissue is essential, which facilitates wound healing possibly by enhancing the local tissue nutrition and increase the level of antibiotic concentration. It has been observed that the cause of recurrence and persistence of infections were delay in taking definitive treatment, inadequate removal of dead and necrotic tissue and sclerosed bone, failure to take proper dose and full duration of antibiotics and above all inherent nature of the disease. To sum up it is concluded that the method of treatment of chronic haematogenous osteomyelitis by sequestrectomy and saucerisation keeping the wound open and allowing the wound to heal from bottom and sides of the wound is satisfactory.

**References**

1. Christopher J.K Bulstrode CJK, Disease of bones and joints: infection, in Baily and Love's, Short practice of surgery Russell RCG, Williams NS, Bulstrode CJK, 23<sup>rd</sup> edition, Arnold, London 2000:403
2. Solomon L, Warwick D, Nayagam S, Apleys system of orthopaedics and fracture 8<sup>th</sup> edition, Arnold 2001: p-37
3. Rowling DE, Kirkcaldy, Scotland, The positive approach to chronic osteomyelitis. J Bone and Joint Surg, 1959; 41V: 681-88
4. William PL, Worwick R, Dayson M, Bannister LH, Grays Anatomy 37<sup>th</sup> edition, Churchill Livingstone, Edinburgh,1989; 300
5. Buchman J, Blair JE, The Surgical management of chronic osteomyelitis by saucerisation, primary closure and antibiotic control, J Bone and Joint Surg, 1951, 33A:107-113
6. Winter JL, Irvin C, Acute haematogenous osteomyelitis, J Bone and Joint Surg, 1960; 42A, 691-703
7. Sanaullah MD, A study of treatment of chronic haematogenous osteomyelitis with sequestrum in long bones by open method( MS thesis) University of Dhaka, 1984
8. Mercer M, Duthie RB, Orthopaedic surgery, Edward Arnold 6<sup>th</sup> edition 1967;290-308