NEW MINIMALLY-INVASIVE METHOD OF TREATING INTRAMEDULLARY CHRONIC OSTEOMYELITIS OF LONG BONES- A PRELIMINARY REPORT

Anand Shankar¹, Vishvendra Kumar Sinha²

¹Senior Resident, Department of Orthopaedics, Indira Gandhi Institute of Medical Sciences.
²HOD, Department of Orthopaedics, Patna Medical College, Patna.

BACKGROUND

The classical method of treatment of chronic osteomyelitis with sequestrum needs saucerization and sequestrectomy which become quite difficult when small sequestrae are spread over a long span in medullary canal. To saucerize such a long segment is not only difficult, it may be dangerous because of excessive blood loss and mechanically the bone become weak. A pathological fracture or iatrogenic fracture is definite possibility. Intramedullary reaming has its selected indication in osteomyelitis of long bones when remnants of dead infected bone are intramedullary embedded in an endosteal new bone formation. Previously intramedullary reaming with irrigation and suction was devised for treatment of this type of chronic osteomyelitis of long bones. This needed complex and costly instrumentation which cannot be afforded by all the orthopaedic surgeons. So, a new technique was developed without any extra instrumentation and expenditure ensuring complete removal of sequestrum.

MATERIALS AND METHODS

The suitable patients coming to OPD were selected. Total of 5 patients were treated by this method and results noted in the form of recurrence, subsidence of discharge and range of motion of adjacent joints, hospital stay, need of dressing, morbidity, pain level.

RESULTS

In very short follow up of about 2-4 years there has been no recurrence (clinically and radiologically), complete subsidence of discharging sinuses and without any further loss of range of motion of adjacent joints.

CONCLUSION

The presenting operative procedure for achieving the goal of treating chronic intramedullary osteomyelitis in short term period was very well achieved in all the cases. Since there is no extra instrumentation and no extra learning needed, this procedure can be done by any orthopaedic surgeon without involving any extra cost to the patients.

KEYWORDS

Intramedullary COM, Long bones, Reaming.


BACKGROUND

Intramedullary osteomyelitis is defined as infection in to the medullary cavity of long bones.¹ It can result from open injury, operative procedures or, more rarely, haematogenous spread. The condition may vary in its duration and severity. The presence of a sequestrum is considered the most appropriate way to define an infection as chronic.²⁻⁴ Infection may delay healing⁵,⁶ and is a challenging complication of trauma, requiring surgery, prolonged medical treatment, with increased morbidity for the patient, and often a poor functional result.⁷⁻⁹ Treatment is determined by the extent of the local bony and soft-tissue involvement, the presence or absence of fixation and implants, the progression of healing of the fracture and comorbidities.¹⁰⁻¹⁵ There is a consensus that accurate microbiological diagnosis and targeted antibiotic treatment requires sampling of intramedullary tissue, as well as extensive debridement and irrigation.¹⁵,¹⁶,¹⁷,¹⁸,¹⁹

Intramedullary infection in long bones represents a complex clinical challenge, which is increasing in incidence due to the increasing use of intramedullary fixation.²⁰ Reaming, together with thorough irrigation of the medullary canal, excision of any sinuses and debridement of the infected soft-tissue envelope, have conventionally been used.¹,¹⁶,¹⁷,²⁰,²¹ Systemic and the local delivery of appropriate antibiotics represent the second main pillar of treatment.⁴,²⁰,²¹,²²,²₃

The introduction in 2003 of the Reamer– Irrigator– Aspirator (RIA) system (Synthes®, Inc. West Chester, Philadelphia)²⁵ offers an advance on existing reaming devices, as it is less traumatic to the already compromised patient.²⁰,²¹,²₄,²₅,₂₆,₂₇ In addition, it has been adopted as a
method of harvesting large volumes of autologous morcellised bone graft. It is now used in the debridement and irrigation of the intramedullary canal of the femur and tibia in septic or oncological cases.

Initially during late 20th century by few of the surgeons, same type of intramedullary osteomyelitis was treated by just intramedullary rimming. Contemporary practice favors using intravenous broad-spectrum antibiotics following the collection of deep samples until the results of microbiological and histopathological analysis are available. Treatment is subsequently adjusted according to the sensitivities of the pathogens. An initial period of two weeks of parenteral administration is usually followed by a period of four weeks of oral treatment, provided that the biochemical and clinical indicators are improving and that there are oral agents of the appropriate spectrum and tissue penetration. All the above modalities of treatment have been done either by expensive instrumentation (RIA) or just rimming and continuous drainage. Whatever the technique has been used they were done in a closed tube which doesn’t ensures complete extraction of the sequestrum and these procedures may push the sequestrum deep in the medullary canal. In this study, we have done the rimming and irrigation technique with a little difference so that the sequestrum can be removed completely and effectively without impacting the sequestrum deeper in the medullary canal, with no extra cost and no continuous drainage.

**MATERIALS AND METHODS**

All the patients coming to Patna Bone and Spine Hospital Pvt. Ltd. with intramedullary chronic osteomyelitis of long bone were treated by intramedullary rimming and irrigation with additional change to previous techniques. Written consent was taken and after fitness by anaesthesia they were taken for surgery.

All patients with open wound followed up every alternate day till two weeks or till suture removal if the wound is closed. Then they were discharged and followed every two weeks till three months of operative treatment. Then every month for next three months (bone graft if needed was done) and then every 6 monthly till two years of operative treatment.

At every 6 weeks of interval x-rays taken and observed for any left-over or formation of any new sequestrum, new bone formation and healing of the bone gap.

Total five patients were treated by this method four male and one female. All of them were between 25 to 45 years of age. Three of them were treated initially by interlocking nail somewhere else and two of them were treated by external fixator initially for 7-10 days and then one of them treated by interlocking nail and another by plating. All of them presented to our setup at different time interval from the date of injury (ranging from 5 years to 15 years). Two of the cases had the infection from 2 weeks only of primary fracture treatment, one of the case had infection since beginning of treatment (the one with primary external fixator and then secondary treatment with interlocking nailing), one of the cases had start of infection after secondary treatment with plating, the fifth case was reported with infection at the time of implant removal (i.e. about 3 years of primary treatment by interlocking nailing).

Three cases had involvement of femur, one tibia and one had involvement of humerus. After reported infection all of the cases had under-went various treatment modalities at different places for a varying period of 1-2 yrs. All the cases came to us with single to multiple discharging sinus, union of the fracture site, intramedullary sequestrum and large area of sclerotic bone.

All of them underwent routine blood investigation with CRP. Everyone had raised CRP and ESR levels. TLC was raised in three cases and in two cases it was near to higher limit.

![Figure 1. Showing Pre-operative Radiograph](image)

**Surgical Procedure**

After fitness for anaesthesia they were taken for surgery. With the help of image intensifier, the distal end of the sequestrum and the sclerosis was marked and accordingly the aseptic draping was done. At the distalmost involved segment an appropriate window (The Change) as made in the medullary canal in a downward standing direction.

The distal medullary canal was plugged, so as to prevent any sequestra or debris going in to the distal medullary canal or being impacted in that. A proximal entry point was made in the line of the medullary canal according to the bone e.g. in femur trochanteric fossa, tibia extra-articular position of upper tibial plateau, superolateral aspect of humeral head medial to greater tuberosity. Starting from appropriate lower diameter reamer (8 for femur and tibia, 6 for humerus) reaming was done cautiously and gradually increasing the diameter of the reamer. Only hand reaming was done till there was some scraping of the cortex and a uniformly wide medullary space was created. From the very first reaming debris and intramedullary sequestra started coming out of the lower opening or window. The medullary canal was washed thoroughly after every rimming and outcome was collected at the distal wound. The medullary canal was checked in image frequently to look for the...
sequestra and cavities, which if any were removed by subsequent reamer.

Power reamer was avoided to the most for fear of forming another layer of dead bone due to heat produced which may become another layer of endosteal sequestrate. However, a slow moving (low RPM) power reamer may be used. An important precaution would be to use hand reamer 0.5 mm thicker than the last used power reamer.

An important precaution is to keep the reamer tip up to lower opening or window otherwise the gauge plug or the sequestrae/debris may be forced into the distal medullary canal. Washing of long medullary canal may need Nelaton’s catheter. In the last the medullary canal was washed with weak betadine solution with saline. One may put antibiotic beads in the medullary canal to be removed at 3 weeks.

All the sinuses were excised or thoroughly curetted. Wound for window in the bone was kept open and packed with gauge for first two days, the other wound for rimming was sutured in layers.

### Post-Operative Management

After operative treatment, all the patients were given broad spectrum antibiotics for 2 weeks intravenously and then shifted to oral drugs. Two days after the operation the wound which was packed was checked for any discharge and was allowed to heal by secondary healing. All the patients with wound for secondary healing healed well without any discharging sinus formation. All the cases underwent physiotherapy guidance for range of motion of adjacent joints.

### OBSERVATION AND RESULTS

Till now all the cases has been followed up for more than 2 years (range 2 years to 4 yrs.). Till now no recurrence has been seen. All the cases doing well with near normal range of motion of adjacent joints as compared with the normal limb, except one with involvement of tibia. He has severe muscle to muscle and muscle to bone adhesion before start of treatment. His ankle movement was severely affected (just 5-10 degrees of movement) and at knee he was able to bend up to 110 degrees. After operative treatment, there was no improvement in ankle function, and no deterioration of knee function. No one had to leave or modify their work. The one with chronic osteomyelitis of tibia was given protected weight bearing in the form of functional brace for 3 months.

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Name</th>
<th>Age/Sex</th>
<th>Bone involved</th>
<th>Duration of disease</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Roshan Kumar</td>
<td>25/M</td>
<td>Femur</td>
<td>2 yrs.</td>
</tr>
<tr>
<td>2.</td>
<td>L. Paswan</td>
<td>45/M</td>
<td>Femur</td>
<td>4 yrs.</td>
</tr>
<tr>
<td>3.</td>
<td>S. K. Yadav</td>
<td>28/M</td>
<td>Tibia</td>
<td>7.5 yrs.</td>
</tr>
<tr>
<td>4.</td>
<td>Sulekha Kumari</td>
<td>32/F</td>
<td>Humerus</td>
<td>1.5 yrs.</td>
</tr>
<tr>
<td>5.</td>
<td>Kamla Kumar</td>
<td>40/M</td>
<td>Femur</td>
<td>6 yrs.</td>
</tr>
</tbody>
</table>

### Table 1. Patient Details
In two cases the ROM of knee which was restricted (0°-80°) improved to near normal (Fig. 3).