Outcome of Locally Delivered Antibiotics via Bone Cement in Infective Nonunion, Chronic Osteomyelitis and Joint infections, A Case Series

Muhammad Shoaib Khan, Imran Ali, Abid Ali, Rashid Khan, Hidayatullah, Khabeer Ahmad Khattak, Muhammmad Afrasiyab

ABSTRACT

Objective: To determine the outcome of locally delivered antibiotics via bone cements in infective non-union, chronic osteomyelitis and joint infections

Methods: The study was conducted between January 2016 to June 2017. Patient with chronic osteomyelitis and infective non-union of long bones were chosen. Debribement / sequestrectomy and antibiotics beads placement was done in chronic osteomyelitis. In selected cases antibiotic, coated nail was put and in arthroplasties, antibiotic was added to spacer as prophylaxis to infection. The infected bone was scraped out leaving an opening in the bone. The antibiotic beads were then packed into the opening and the wound was closed for 4-5 weeks when they were removed. Bone was fixed in case of instability, when there were no signs of infections per operatively.

Results: Twenty-seven (90%) out of 30 patients showed no signs of recurrence of osteomyelitis at the mean of 15 months follow up. Infection subsided in 2 out of remaining 3 patients, with re-debridement and beads and 1 patient did not show any sign of improvement even after second procedure. No significant complication was noted during the study.

Conclusion: Antibiotics loaded Beads in the treatment of chronic osteomyelitis are safe and effective. Its advantages include lower cost, low systemic effects of the drug, shorter hospital stay and high concentrations of antibiotics at the site of infection.

This article may be cited as:

INTRODUCTION

The delivery of antibiotics locally, usually impregnated in cement has been used the treatment of chronic osteomyelitis for many decades. They were used in 1970, for the treatment of infected prosthesis. After that antibiotics beads are being used in management of bony infections. For the last 40 years non-absorbable polymethylmethacrylate (PMMA) has been used as a carrier to carry antibiotics to the site of infection. The gain for use of PMMA is dual, it acts as an effective carriage for the antibiotic to the infective parity and can be utilised as a spacer, to fill up the dead space, if any. Various antibiotics have been tried and tested over time. Ideal antibiotic for this modality of treatment should be heat stable and must have a potential to sustain an adequate amount of the drug distribution to the local tissue for longer duration [1]. Size and shape of the bead also effects the release of antibiotic [2], as does the type. Drugs like vancomycin are known for loss of their concentration in local tissue as early as 12th day [3]. Over the course of time, new advancement has been made in the way antibiotics are used locally. Biodegradable cement beads, which will be absorbed over time from the tissues, are rather new. This avoids the need of a second procedure for removal of cement beads. Antibiotic beads have several advantages. The systemic effects of antibiotics are evaded; studies show that serum concentration of the drug is almost negligible. Decreased hospital stay and elimination of intravenous line are other pros.

The value of antibiotic-impregnated beads in the treatment of chronic osteomyelitis is widely established. In a study on chronic osteomyelitis, the effect of gentamicin impregnated cement beads treatment was comparable to treatment with intravenous antibiotics. Data on antibiotic beads validates its safety. These have been used in the treatment of chronic osteomyelitis. In many cases they

Correspondence: Dr. Abid Ali
Email: hafiz_ali16@yahoo.com

were used concomitantly with systemic antibiotics. At present, antibiotic beads are effective supplements to debridement and systemic antibiotics in the treatment of chronic osteomyelitis.

METHODS

The study was conducted from March 2016 to May 2017. Thirty patients were selected, those with chronic osteomyelitis clinically and radiographically. Nineteen of the patients were male (63.33%), while 11 were females (36.66%). Debribement/ sequestrectomy and antibiotics beads placement was at first operation. Patient was taken to operation theatre. Once the area has been cleaned and sterilized, and anaesthesia has been administered, the surgeon makes the initial incision to gain access to the infected area. The infected bone was scraped out and removed. The antibiotic beads were placed into the open wound and closed over the beads followed with wound care and routine antibiotic coverage. The beads were removed after 4-5 weeks duration. If any fixation of the bone was needed, that was carried out at the time of beads removal, only if there were no signs of infection per operatively

TECHNIQUE

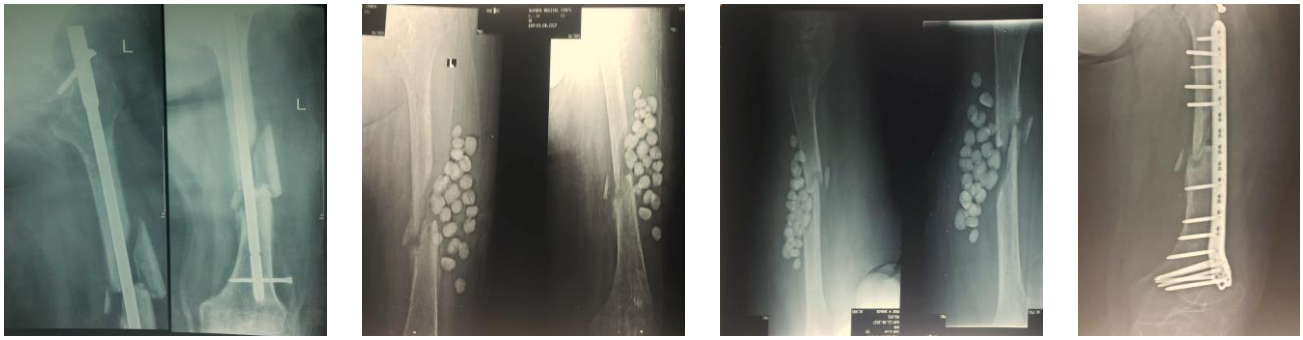
We have no experience with the use of premixed antibiotics beads due to non-availability and cost. We used 40 grams of cement with variable amounts of antibiotics like gentamycin and vanconmycin and 3rd generation caphalosporin. Hanssen recommended use of 3600 mg of antibiotic with 40 grams of cement [4]. Our range of antibiotic varied from 2-4 gram per 40g of cement.

We mixed antibiotics with PMMA after preparing the site. In the preparation of antibiotic beads, we us use the technique of mixing antibiotic with cement powder and then adding the solution. The components were thoroughly mixed it manually until it became doughy. The paste was then moulded by hands into small spheres, beads thus created which were mounted on a non-absorbable suture, mostly Prolene. The sutures act as the string for the beads once set. The time dough takes to solidify depends on the ambient temperature. As an optimum time is required for beads making, we place the packaged cement with solution in a refrigerator preoperatively, at lower temperatures. The beads on strings are then placed in the wound, for antibiotic delivery or packing the dead space. All the beads were removed on second surgery based on radiographic evidence.

RESULTS

Ninety percent (n=27/30) patients showed no signs of recurrence of osteomyelitis at the mean of 15 months follow up. Infection subsided in 2 out of remaining 3 patients, with re- debridement and beads. One patient did not show any sign of improvement even after second procedure. No significant complication was noted during the study. Most of the complications were attributed to surgery or anaeshesia and not to local antibiotics therapy, except difficult removal of beads in 4 cases.

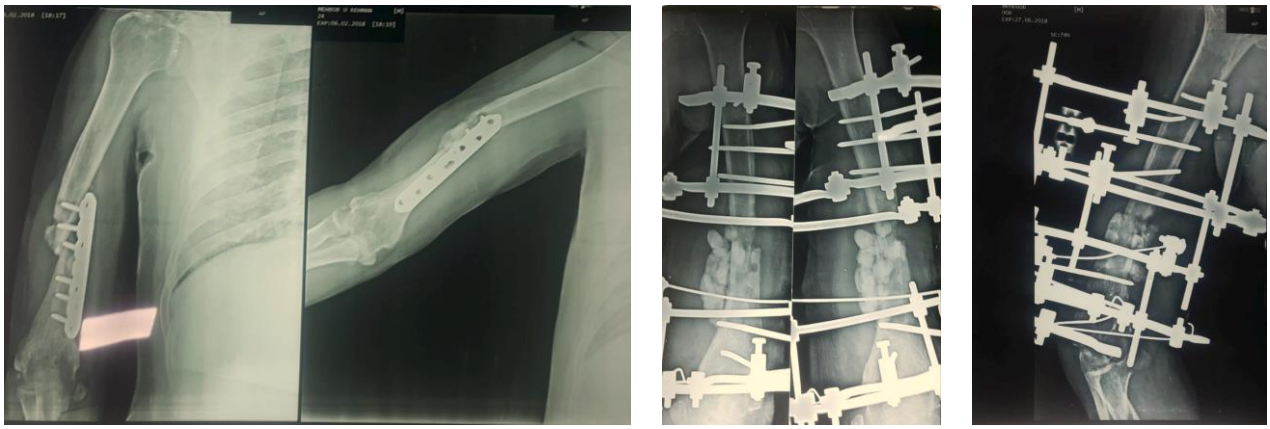
Case 1



A B C D

A. infected ILN femure
B and C. Post Op after antibiotic beads placement
D. after infection eradication and DFLP done

Case 2



A B C

A. infected DCP humerus
B. After plate removal, antibiotic beads and ilizarov applied
C. follow up xray

DISCUSSION

Local antibiotic therapy has long been used for treatment of chronic osteomyelitis and in treatment of infected joint prosthesis. Some have shown the use of antibiotic beads in management of open wound, as prophylaxis to infection. We do not have such an experience. Klemm used gentamicin-impregnated beads for covering of dead space after taking out of infected and necrotic bone. He reported a cure of 91.4% in his 100 patients [5].

Over the past three decades, numerous advantages with antibiotic-impregnated beads over systemic therapy have been recognized. The use of antibiotic beads is simple, mostly is it done at the time of debridement for chronic osteomyelitis. It helps with filling of dead space and provides the parity with high concentration of the drug imbibed. Systemic effects of the drug are also evaded.

The safety is validated in a review of its use in arthroplasty [6]. The cost of this treatment is much lesser than parenteral antibiotics, which are supposed to be taken for 6-8 weeks. Nonetheless, beads removal demands a second procedure, which means exposing the patient to the risk of anaesthesia, infection and haemorrhage. Multiple studies have been done on the use of biodegradable antibiotics beads, which will obviate the need of second surgery [7].

The most commonly used bone cement is polymethylmethacrylate (PMMA), which consists of solid polymer and a solution, which is a monomer, both can be combined to form a solid. In Europe premixed cement and antibiotics are available. Septopal chain is a good example which was popularised by Klemm [8].

Contemporary research has raised concerns over high doses of local antibiotics and their effect on healing of the tissue. Some say they are toxic to bone at this level, and fracture may not unite. With the use 0f 2-4 g/40g of powder, we have observed radiological and clinical signs of bone formation preoperatively. Yet, care must be taken in choosing of antibiotics and its vehicle.

Mendel 2005 in their study on rat models showed that gentamicin with collagen substrate significantly reduced bacterial colonies in experimental rat osteomyelitis than gentamicin with PMMA [11].

CONCLUSION

Locally delivered antibiotics through antibiotic cement beads have been found very useful and safe. If proper dose of antibiotic of appropriate type is used, bony infection can be eradicated. Delaying removal of antibiotic beads can cause various complications.

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AUTHORSHIP AND CONTRIBUTION DECLARATION

No	Author Name	Contribution to paper	Signature
1	Principal author Dr. Muhammad Shoaib Khan	Main operating surgeon, Data Collection.	
2	Second Author Dr. Imran Ali	Data analysis	
3	Third Author Dr. Abid Ali	Data analysis, proof readings	
4	Fourth Author Dr Rashid khan	Literature review	
5	Fifth Author Dr. Hidayatullah	Design the questionnaire	
6	Sixth Author Dr. Khabeer Ahmad Khattak	Maintained the record	
7	Seventh Author Dr. Muhammmad Afrasiyab	Record keeping & collected data	