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A case report of chronic osteomyelitis after tibia nailing treated by implant removal with biodegradable antibiotic coated beads

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Abstract
Chronic osteomyelitis of any bone is a difficult condition to treat once it sets in. Various modalities of treatments are available for osteomyelitis. Here we present a case of an infected tibia with intramedullary nail in situ. This was initially treated by removing the intramedullary nail and IV antibiotics, followed by packing of medullary canal of infected tibia with BIODEGRADABLE ANTIBIOTIC COATED BEADS. Outcome was studied.

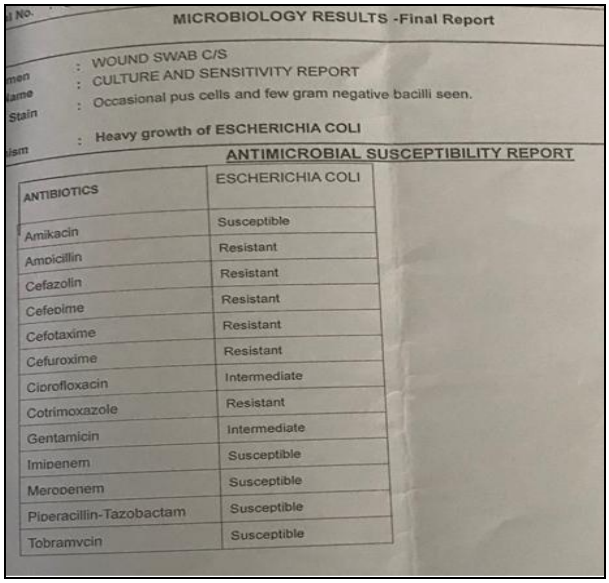
Keywords: antibiotic beads, biodegradable, osteomyelitis and IV antibiotics

Introduction
The parentral antibiotic concentrations required to penetrate and kill bacteria enclosed in the biofilm is about 10 to 100 times the standard bactericidal concentration, which makes the parentral therapy unsafe and also ineffective in such cases [1]. Parentral antibiotics are also associated with nephrotoxicity, ototoxicity and allergic side effects.
Osteomyelitis related with an implant in situ is caused by Staphylococcus epidermidis greater than 90% of the time [2]. Chronic infection of bone decreases cortical blood supply and can lead to the sequestra formation, pockets of necrotic cortical bone and are avascular also difficult to treat. The sequestra are often surrounded by involucrum, new bone formation is seen usually in response to sequestrum [3]. When there is sequestra formation in osteomyelitis it usually requires surgical intervention.
The treatment of osteomyelitis using local delivery of antibiotics has been used for decades. Various modalities of treatment are developed for controlling infection of bone. Thus biodegradable materials like calcium sulphate have recently become popular because it has various advantages and good outcomes in treatment and also in control of osteomyelitis of bone.
Thus we present a case report of an infected tibia with intramedullary nail in situ which we treated by implant removal along with antibiotic coated calcium sulphate beads.

Case report
51/M operated 4 years back for right tibia fracture with tibia intramedullary nail in situ came with complaints of discharge from right leg for the past six-months duration. Patient was evaluated with all base line investigations and wound culture and planned for removal of implant. Implant removal, wound debridement of discharging sinus was done patient was started on intravenous antibiotics. Post-operatively patient had persistent purulent discharge despite one week of intravenous antibiotics. Thus local delivery of antibiotic was planned for the patient. We took patient for surgery, we did serial reaming of medullary canal with reamer and packed the intramedullary canal of tibia with antibiotic coated calcium sulphate beads. Antibiotic used was MEROPENEM and for every 10cc of calcium sulphate we used 500mg of antibiotic. Antibiotic was decided according to culture sensitivity of the patients wound prior to surgery. Post-operatively discharge decreased over period and stopped. Patient improved well and was mobilized before discharge.

Fig 1: Pre-operative x-rays of patient

Fig 2: Post implant removal



MICROBIOLOGY RESULTS -Final Report

: WOUND SWAB C/S
: CULTURE AND SENSITIVITY REPORT
: Occasional pus cells and few gram negative bacilli seen.
: Heavy growth of ESCHERICHIA COLI

ANTIMICROBIAL SUSCEPTIBILITY REPORT

ANTIBIOTICS	ESCHERICHIA COLI
Amikacin	Susceptible
Ampicillin	Resistant
Cefazolin	Resistant
Cefepime	Resistant
Cefotaxime	Resistant
Cefuroxime	Resistant
Ciorofloxacin	Intermediate
Cotrimoxazole	Resistant
Gentamicin	Intermediate
Imipenem	Susceptible
Meropenem	Susceptible
Piperacillin-Tazobactam	Susceptible
Tobramycin	Susceptible

Fig 3: Wound culture report of patient

Fig 4: Intra-operative wound pictures and preparation of antibiotic beads

Fig 5: C-arm images intra-operatively

Fig 6: Post-operative X-Rays

Discussion

Chronic osteomyelitis is an infection tough to treat due to both multidrug resistance of common pathogenic microorganism and to poor penetration of antibiotics into bone [4]. Inadequate release of the antibacterial agent to the site of infected bone is a frequent problem associated with systemic antibiotic therapy and sometimes even with local drug delivery systems [5]. Disadvantage of PMMA is that the substance is non-biodegradable, making subsequent invasive procedures necessary to remove the implant. Additionally, PMMA has a poor elution profile, characterized by an initial bolus release of relatively high concentrations followed by a rapid decline to sub-inhibitory concentrations. They must be removed in a further surgical procedure if bone graft implantation is required. Biodegradable antibiotic beads is a synthetic hemihydrate form of Calcium Sulphate. It is produced using a synthetic process resulting in 100% purity with no traces of potentially toxic impurities which has been associated with naturally occurring mineral sources of Calcium Sulphate. Biodegradable antibiotic coated beads also has the advantage of delivering a wider spectrum of antibiotic combinations into the joint. It cures at a low temperature, thus allowing heat-sensitive antibiotics to be mixed with Biodegradable antibiotic coated beads. Synthetic calcium sulphate offers the advantages of predictability in the elution of antibiotic agents over a three to four-week period, buffering the local wound pH (towards physiologic), elimination/reduction of dead-space and compatibility with a number of antimicrobial agents. Subsequent procedures to remove implanted material and the recreation of dead space are avoided due to the ability of the beads to resorb. Surgical debridement, obliteration of dead space resulting from debridement and a long course of antibiotics remain the mainstay in the management of osteomyelitis. Many researches have demonstrated that combining debridement with the use of antibiotic impregnated material achieve better eradication of infection and possibly decrease the duration of systemic antibiotics needed [6, 7].

Conclusion

Chronic osteomyelitis has various modalities of treatment, using biodegradable antibiotic beads has been a recent advancement in the field of orthopedics which has the advantage over PMMA of not needing further surgical procedures to remove the same. More studies are yet to be done regarding biodegradable antibiotic beads.

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