The Osteomyelitis Study In The New Zealand White Rabbit (NZWR) Model: An Approach To Treatment

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INTRODUCTION:

Treatment of osteomyelitis is still a major challenge in orthopedics. Study of osteomyelitis and infection requires the use of suitable animal. New Zealand white rabbit (NZWR) (*Oryctologus cuniculus)* is an acceptable experimental model. It is used for local delivery of antibiotics in osteomyelitis treatment as it mimic the disease process in human. The objectives of this study are to create osteomyelitis in rabbit femur and to analyze the treatment given via biomaterials impregnated with gentamicin beads.

MATERIALS & METHODS:

Osteomyelitis is induced by inoculation of *Staphylococcus aureus* ATCC 25923 into the drilled distal femur of NZWR. The weights of the rabbits were weight between 2.5 and 4.2 kg., all aged above 6 months old. Thirty-four (34) NZWR were used during the study. They were divided into 2 groups (hydroxyapatite(HA) and calcium sulphate (Ca2SO4) with four subgroups with 3, 6, 12 and 26 weeks. There are two surgeries for each NZWR, first to induced infection and second surgery is to undergo surgical debridement and biomaterial impregnated antibiotics implantation. The response of the treatments (biomaterials impregnated with *gentamicin*) against the infection were evaluated through gross presentations, radiograph, micro CT, microbiological and histological results. SPSS was used to evaluate the results.

RESULTS:

Osteomyelitic changes noted in all rabbit after inoculation of bacteria. The rabbits' weights reduced after 3 weeks of bacteria inoculation. After the treatment with biomaterial impregnated antibiotics, they showed significant increase in weights. Its showed significance weight difference ($p<0.05$) at week 12 and 26 in both groups. The evaluation was done at 3,6,12, and 26 weeks. The microbiology analysis at 26 weeks of interval showed no bacteria isolated. The holes at the drilled distal femur of the NZWR intended for bacteria inoculation was closed at 12 weeks' interval. The histological interpretation, revealed healing of the infected area with appearance of new bone formation at weeks 6 to 26. The micro CT results showed that trebaculae numbers increased significantly ($p>0.05$) with the treatment. The biomaterials containing calcium sulphate was reduce in size and disappear at week 26. The results show complete bone healing at 26 weeks of interval. There is no significant difference ($P<0.05$) between the hydroxyapatite impregnated Gentamycin and Calcium sulphate impregnated gentamycin in the area of Radiology, histology and micro CT assessment.

DISCUSSIONS:

Osteomyelitis is difficult to treat because it is often associated with necrosis of bone and poor vascular perfusion accompanied by infection of the surrounding tissues. The treatment of osteomyelitis mainly involves operative debridement, surgical removal of necrotic tissue and antibiotic therapy.The necessity of local antibiotic therapy as well as surgery has been recognized and various methods have been developed for delivering antibiotics. The antibiotics impregnated biomaterials are shown to be effective in the treatments of osteomyelitis. Drug delivery system will help in treatment of osteomyelitis.

CONCLUSION:

Biomaterial Impregnated gentamicin has great potential to be utilized as an implanted drug delivery intended for the treatment of osteomyelitis.