

# Treatment Of *Osteomyelitis* In New Zealand White Rabbit Using Impregnated Biomaterials With Gentamicin: *In Vivo* Study Outcome Of Bacterial Study And Micro-Computed Topography Evaluation

<sup>1</sup>Zulkifly AH, <sup>1</sup>Mohd Jan NH, <sup>1</sup>Ibrahim MZ, <sup>2</sup>Aziz A

<sup>1</sup>Department of Orthopaedics, Traumatology and Rehabilitation, Kulliyyah of Medicine, International Islamic University Malaysia, Jalan Hospital Campus, Kuantan, Pahang Darul Makmur, 25150, Malaysia.

<sup>2</sup>Department of Orthopaedics, Hospital Tengku Ampuan Afzan, Kuantan, Pahang Darul Makmur, 25150, Malaysia

## INTRODUCTION:

Treatment of *osteomyelitis* is still a major challenge in orthopaedic field. New Zealand White rabbit is acceptable experimental model described to develop effective local delivery of antibiotics *osteomyelitis* treatment as it can mimics the disease process in human. The objective of the study is to evaluate the outcome treatment of osteomyelitis in rabbit femur with impregnated Hydroxyapatite Gentamicin. Evaluation at stipulated durations using microCT Skyscan 1176 system.

## MATERIALS & METHODS:

*Osteomyelitis* is created by inoculation of *Staphylococcus aureus* ATCC 25923 into rabbit's distal femur. The rabbit were divided with 3, 6, 12, 26 week assessments. The response of the biomaterials (hydroxyapatite) impregnated with gentamicin against the infection were evaluated through micro-computed topography using Skyscan 1176 system. The bone analysis data were obtained by the software provided by Skyscan 1176 system. The distal femoral shaft were scanned using A1 1mm filter with 18  $\mu\text{m}$  pixel resolutions. Bacterial study of culture and sensitivity, coagulase test, catalase test and gram stain were done to determine the treatment is effective.

## RESULTS:

The data of bone analysis were for tissue volume (TV), bone surface (BS), bone volume (BV), and trabecular thickness (Tb.Th) in all groups were illustrated at Table 1. The bone healing noted in the treated group. The results showed no bacterial were grow in the agar and all test were negative at 26 weeks interval.

Table 1 showing the bone analysis through Skyscan1176 system.

Week & parameter	Tissue volume (mm <sup>3</sup> )	Bone volume (mm <sup>3</sup> )	Bone surface (mm <sup>3</sup> )	Trabecular thickness (mm)
3 W SHAM	156.692	66.962	399.351	0.045
3W post treatment	168.051	84.762	500.962	0.405
6W post treatment	409.204	104.952	1001.135	0.456
12 W treatment	590.716	113.485	1520.599	0.549
26w post treatment	635.955	124.958	1558.096	0.723

## DISCUSSIONS:

Osteomyelitic changes were noted in all rabbit after inoculation of bacteria at week three and six. The micro-computed topographic analysis at 3, 6, 12 and 26 weeks of interval, showed increase bone parameters in treated femur. The bone volume (BV) was increased with value 124.96 mm<sup>3</sup> compared to sham group (no treatment given) with bone volume 66.96 mm<sup>3</sup>. The density of biomaterials was decreased with duration of studies. This data showed that micro-computed topography studies is capable to provide information of bone microstructures in rapid and non-destructive way. The findings showed that impregnated biomaterials with gentamicin have potential to be used in osteomyelitis infection.

## CONCLUSION:

Computed topography results showed at 26 weeks of treatment, the impregnated biomaterials have a potential in treatment of *osteomyelitis*.