Poster Presentation (PF-32)

Radiography Assessment of Femoral Muscle and Bone Density in Rats as Response to Biodegradable Iron (Fe) Porous Implants

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INTRODUCTION

Iron (Fe) is considered as one group of metals that can be used as degradable metal implants (Schinhammer et al. 2010). Previous implantation studies have used porous Fe which purposes to increase the rate of degradation (Daud and Hermawan 2013). Changes in the condition of metal implants due to degradation and peri-implant muscle tissue reactions in the body can be observed using radiographic modality (Noviana et al. 2013). The aim of this study was to assess the radiographic density of implants, peri-implants and peri-implants-muscle as a response to Fe porous implants on the femur of the rats.

MATERIALS AND METHODS

This study used 60 Sprague Dawley adult male rats with an average body weight of 175 grams. Rats were divided into four implant-based treatment groups, namely 450 µm, 580 µm, 800 µm porous size and controls. Rats anesthetized using a combination of ketamine-xylazine at a dose of 20 mg/kg and 5 mg/kg BW. Intramuscular anesthesia is given to the semitendinosus and semimembranosus muscle. Implants were implanted in the right femoral bone of the rats and radiographic images were taken on the 7th, 14th and 30th postimplantation days. Radiography was analyzed with ImageJ® software (NIH, USA). Analysis was carried out on three parameters, i.e. the densitiy of the implant, peri-implant-bone, and the peri-implant-muscle respectively.

RESULTS AND DISCUSSIONS

Radiographic results show differences in opacity in implants, bones and muscles. The implant has more radioopaque opacity than bone, and bone is more radioopaque than muscle (Figure 1).

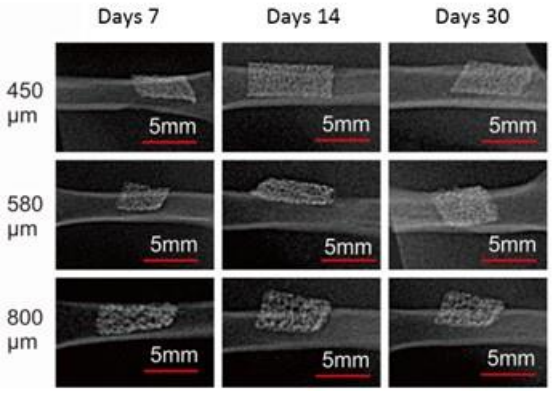

Figure 1 Radiography of Porous Fe implant: 450 µm, 580 µm, and 800 µm porous size on the right femur of the rat for 30 days of observation.

The implant density values at all porous sizes decreased at each time of observation (Figure 2). This shows the presence of degraded implant material. Porous structure is formed to accelerate the rate of degradation in Fe (Daud and Hermawan 2013). 450 µm porous Fe has the largest surface area, thus expanding the area of interaction with the tissue (Bauer et al. 2013). A wide area of interaction between tissues and implants causes a greater degradation process.

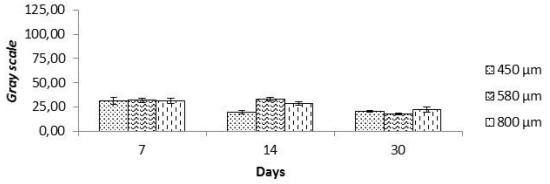

Figure 2. Graph density of implants in the femur of rat for 30 days of observation.

The value of peri-implant-bone density tends to be the same in all pore sizes indicating that the bone response to implants is very small (Figure 3). The presence of trauma to the bone will induce an inflammatory stage. 450 µm porous Fe has the largest surface area, so interaction with the network is also greater. This interaction causes the density in the peri-implant-bone region to increase

so that the density value increases.

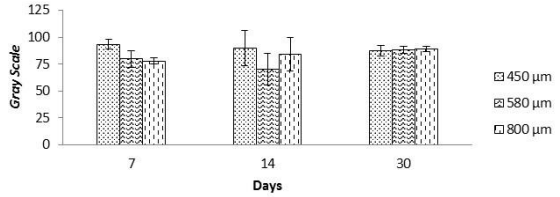

Figure 3. Graph density of *peri-implant-bone* of rats for 30 days of observation.

The value of the peri-implant muscle density tends to increase which indicates the response of the muscles around the implant to the implant (Figure 4). Other effects of degradation of implants in the body can cause disturbed peri-implant tissue growth, systemic physiological conditions, and accumulation or deposition of metal debris in certain tissues or organs. This causes changes in density in the peri-implant-muscle area.

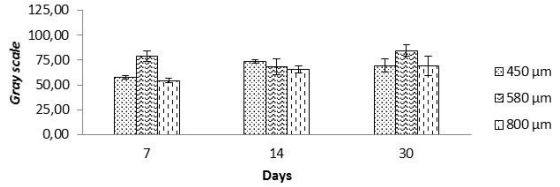

Figure 4. Graph density of *peri-implant-muscle* of femoral bone rats for 30 days of observation.

ACKNOWLEDGEMENT

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