Peran dosis Bmp-2 terhadap penyembuhan fraktur dengan defek tulang luas pada rattus novergicus strain sprague dawley = Bmp-2 dosage on fracture healing with large bone defect in rattus novergicus strain sprague dawley

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Abstrak

ABSTRAK
 Pendahuluan. Kesulitan dalam tatalaksana defek tulang yang luas merupakan salah satu tantangan dewasa ini. Selain tatalaksananya yang kompleks juga dapat memberikan dampak jangka panjang negatif yang berat. Penggunaan BMP-2 dalam tatalaksana fraktur dengan defek tulang yang luas memegang peranan penting. BMP-2 berperan pada proses osteogenesis dan chondrogenesis dan menghambat osteoclastogenesis melalui RANKL signaling. Penelitian ini bertujuan untuk mengetahui efek dari perbedaan dosis BMP-2 terhadap penyembuhan fraktur dengan defek tulang yang luas.

Metode. Penelitian dilakukan di Laboratorium Animal Gizi di FKUI dan Laboratorium Patologi Anatomi FKUI-RSCM, pada bulan Juli hingga September 2015. Desain penelitian adalah randomized post test control group. Sejumlah 25 ekor tikus putih Sprague Dawley dengan usia 3-4 bulan dan berat badan antara 250 ? 350 gram, dibagi secara acak menjadi kelompok kontrol hidroksiapatit (HA) saja dan kelompok kombinasi HA + BMP-2 1 μg/ml, HA + BMP-2 5 μg/ml, HA + BMP-2 10 μg/ml, HA + BMP-2 20 µg/ml. Tiap kelompok dilakukan tindakan berupa frakturisasi dengan defek tulang 10mm pada femur kanan dan dilakukan fiksasi interna dengan menggunakan intramedullary k-wire ukuran 1,4 mm secara retrograd. Setelah 6 minggu dilakukan penilaian secara histomorfometri, radiologis dan Scanning Electron Microscope (SEM).

Hasil. Berdasarkan hasil penelitian secara histomorfometri ditemukan terdapat perbedaan rerata total area kalus yang bermakna diantara kelompok penelitian (p<0,001),terdapat perbedaan bermakna rerata area penulangan antara kelompok kontrol dengan kelompok 1 μg/ml, 5 μg/ml, 10 μg/ml, 20 μg/ml (masing-masing p=0,009, p=0,016, p=0,009 dan p=0,016), terdapat perbedaan bermakna rerata area kartilago antara kelompok kontrol dengan kelompok 1 μg/ml, 5 μg/ml, 10 μg/ml, 20 μg/ml (masing-masing p=0,009, p=0,009, p=0,009 dan p=0,028), terdapat perbedaan bermakna rerata area fibrosis antara kelompok kontrol dengan kelompok 1 μg/ml dengan kelompok kontrol dan 10 μg/ml(masing-masing p=0,047 dan p=0,009).Secara radiologis dengan RUST score didapatkan perbedaan bermakna antara kelompok kontrol dengan kelompok 1 μg/ml, 5 μg/ml, 10 μg/ml, 20 μg/ml (masing-masing p=0,005, p=0,006, p=0,005 dan p=0,006). Dengan SEM didapatkan gambaran kalus yang lebih homogen dan padat pada kelompok 10μg/ml dibandingkan dengan 5 μg/ml dan 20 μg/ml.

Kesimpulan: Pemberian BMP-2 dapat menstimulasi proses penyembuhan fraktur pada defek tulang luas (critical bone defect) yang bermakna secara statistik, histomorfometri, radiologis maupun secara kualitatif dengan SEM. Terdapat dosis optimal dalam pemberian BMP-2.ABSTRACT
 Introduction: Difficulties in the management of extensive bone defects is one of today's challenges. It is not only complex treatment but also can provide long-term negative severe effects. The use of BMP-2 in the treatment of fractures with extensive bone defect plays an important role. BMP-2 plays a role in the process of osteogenesis and chondrogenesis and inhibits osteoclastogenesis via the RANKL signaling. This study aims to determine the effect of differences in doses of BMP-2 on the healing of the fracture with extensive bone defects.

Methods: The study was conducted at the Laboratory of Animal Nutrition at the Faculty of Medicine University of Indonesia (FMUI) in July until September 2015. The study design was randomized posttest control group. A number of 25 Sprague Dawley rats aged 3-4 months and bodyweight between 250-350 grams, were randomly divided into a control group of hydroxyapatite (HA) alone and HA+BMP-2 1 µg / ml, HA+BMP -2 5 ug / ml, HA + BMP-2 10 µg / ml, HA + BMP-2 20 ug / ml. Each group carried out fracturization with 10mm bone defect in right femur and internal fixation by using intramedullary K-wire size of 1.4 mm retrograde. After 6 weeks we did histomorfometri assessment, radiological and Scanning Electron Microscope (SEM).

Results: Based on the research results histomorfometrcally found there are differences in the mean total area of callus significantly between the study group (p <0.001), there were significant differences in the mean area of woven bone between the control group with group 1 ug / ml, 5 µg / ml, 10 µg / ml, 20 ug / ml (respectively p = 0.009, p = 0.016, p = 0.009 and p = 0.016), there were significant differences in the average area of the cartilage between the control group with group 1 ug / ml, 5 µg / ml, 10 µg / ml, 20 ug / ml (respectively p = 0.009, p = 0.009, p = 0.009 and p = 0.028), there were significant differences in the average area of fibrosis between the control group with group 1 ug / ml in the control group and 10 mg / ml (respectively -masing p = 0.047 and p = 0.009) .In radiologist assessment with RUST scores obtained significant differences between the control group and group 1 ug / ml, 5 µg / ml, 10 µg / ml, 20 µg / ml (respectively p = 0.005 , p = 0.006, p = 0.005 and p = 0.006). SEM features with callus more homogeneous and dense in the group of 10μg / mL compared with 5 ug / ml and 20 µg / ml.

Conclusion: Administration of BMP-2 could stimulate the process of fracture healing in large bone defects

(critical bone defect) which was statistically significant with histomorfometri assestment, radiological and qualitatively with the SEM. There is an optimal dose in the administration of BMP-2.;Introduction: Difficulties in the management of extensive bone defects is one of today's challenges. It is not only complex treatment but also can provide long-term negative severe effects. The use of BMP-2 in the treatment of fractures with extensive bone defect plays an important role. BMP-2 plays a role in the process of osteogenesis and chondrogenesis and inhibits osteoclastogenesis via the RANKL signaling. This study aims to determine the effect of differences in doses of BMP-2 on the healing of the fracture with extensive bone defects.

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Conclusion: Administration of BMP-2 could stimulate the process of fracture healing in large bone defects (critical bone defect) which was statistically significant with histomorfometri assestment, radiological and qualitatively with the SEM. There is an optimal dose in the administration of BMP-2.