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QUANTITATIVE EVALUATION OF EXPERIMENTAL FRACTURE REPAIR IN AN OVINE MODEL BY USE OF DUAL-ENERGY X-RAY ABSORPTIOMETRY M. I. Dias(1), J. Azevedo(2), P. Lourenço(3), A. Rodrigues(3), A. Ferreira(4), A. S. Cabrita(5)

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An experimental fracture model, subject to different treatments, was employed to assess bone mineral density (BMD) at the fracture gap long the time of fracture repair by dual-energy X-ray absorptiometry (DEXA). A middle diaphyseal 4 mm osteoperiosteal segmental defect, stabilized by a buttress plate, was created in the left tibia of 36 ewes. The 36 ewes were divided in 6 groups (n=6). In groups I, II and III, the defect remained empty and the animals were euthanatized at 3rd, 6th and 12th weeks, respectively. In groups IV, V and VI, the defect received an autogenous cancellous bone graft and the same healing periods were allowed, respectively. A 7th group formed by 18 intact tibias was included for comparison with a normal situation (Group VII). The one-way ANOVA of BMD by global classification of the radiographs was statistically significant ($P<0.0001$) but, in detail, there was significant difference ($P<0.01$) only when the classification was comprised among 0 and 2. The selected regions of interest (ROIs), subjected to DEXA, were in the middle of the medullary canal (R1), between the extremities of the medial (R2) and lateral cortical bone (R3) of the fracture gap and an area representative of some possible periosteal reaction (R4). In both treatments and in all the ROIs included in the fracture gap (R1, R2 and R3) there was a progressive increase of the BMD over the time. In all the control and grafted groups, the BMD of the ROIs included in the gap progressively increased from the 3rd to the 12th week after surgery. The whole model of ANOVA that study the response of the BMD with the treatment (bone defect sites empty or grafted), time (3rd, 6th and 12th weeks) and ROIs included in the gap fracture was statistically significant ($P<0.0001$) and without significative interactions ($P>0.1$). The BMD was significantly affected by the time and treatments ($P<0.0001$) and by the ROI selected ($P<0.01$). The contrasts between the same ROI in the two treatments were a significant difference ($P<0.001$) and the comparisons between the R2 and R3 of the cancellous bone graft group at 6th ($R2<R3$; $P<0.05$) and 12th week ($R2<R3$; $P<0.1$) were significant. If we considered that the weekly BMD increase had an identical progress within the same time period, in the whole of the three ROIs mean of the control groups, the percentage of the weekly BMD increase was 59.0% superior in the second time period (6th to 12th week) relatively to the first time period (3rd to 6th week) but in the grafted groups the increase was 82.3% superior in the first time period comparatively to the second time period.