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LETTER TO THE EDITOR

Bone mineral density assessment by dual energy X-ray absorbtiometry as multiple or single assessment of rat bones causes discrepancy

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Dear Editor;

Osteoporosis and associated problems are common health problems in the community. There are numerous studies about osteoporosis, risk of fractures, and bone strength [1, 2]. In most of these studies, animal subjects were used due to some tests cannot be implicated to the human directly. The most important determinant of bone strength has been considered to be the bone mineral density (BMD) measurements which were achieved by dual energy X-ray densitometry device [3]. The bone strength is the major validation in animal studies regarding osteoporosis [4] and the risk of fracture [5]; however, BMD analysis has also been considered as the most common method in determining the bone quality. The increase in BMD plays an important role in both fragility, strength loss and as well as healing of the bone [6]. Also many of the research regarding the treatment of osteoporosis also have been depended on the BMD analysis [7]. Thus, it is obvious that BMD analysis is the corner stone of the research in osteoporosis.

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We performed BMD analysis to rat femurs in our department which were subjected to an ongoing experimental study. We would like to report an interesting point that we observed during the differently treated rat cortical bones. In experimental studies with animal bone subjects, we performed the analysis by placing the bones together in the same scan group, respectively. However, we performed an additional analysis for these bones from all groups as a single scan for the single bone. We compared the area (square centimeter), bone mineral content (BMC; gram), and BMD (grams per square centimeter) values of the same bone in a multiple bone scan and in single scan by paired samples T test by SPSS version 14.0 and $p \leq 0.05$ was considered statistically significant. There was statistically significant difference between the mean area ($r=0.634$, $p=0.02$), BMC ($r=0.831$, $p=0.01$), and BMD ($r=0.792$, $p=0.05$) values of the right and left angelic ($n=5$), livial ($n=5$), sham ($n=5$), overectomy ($n=3$), and control ($n=3$) groups (Fig. 1). The both scans were performed in the same day and analyzed by the same staff.

The results shown in Fig. 1 are important since the reliability of our device's results is of great significance. In our opinion, such statistically significant difference between two sequential scans of the same bones might be a consequence of the geometrical factors in the placement of the bones. Since dual-energy X-ray absorptiometry analysis is a two-dimensional method, the position of the bones can influence the results. As Ammann et al. mentioned in their review article, BMD analysis is directly related to the area of the bone [1] and the estimation of area can be influenced by the altered geometrical localization of the bone. Thus, there would be a question "should we scan bones together or single?" and most probable answer would be, it does not make any difference to scan single or together. Either way of scanning is accurate in our opinion; however, we noticed that the evaluation of these scans together would cause an error. For example, if the bones

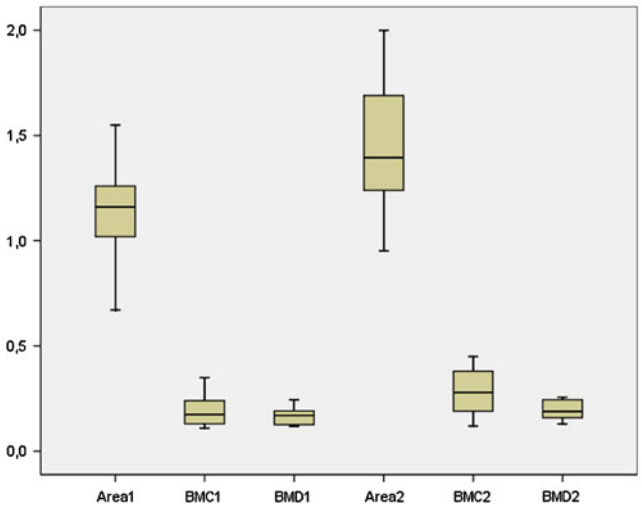

Fig. 1 Area, BMC, and BMD measurements of the same type of bones; BMD1, in the individually measured (of single bone) and BMD2, multiply measured bones, respectively

are scanned together, then it is needed to repeat the scans in a single manner and in a way that would lead us to inaccurate evaluation. However, further detailed analysis is warranted in this special issue as future studies.

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