

ABSTRACT

Utilization Of Digital X-Ray Radiography for Observing Bone Growth In Experimental Goat Model

By

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Research on the utilization of digital X-ray radiography for monitoring bone growth in an experimental goat model has been conducted. This study was initiated based on the critical importance of calcium nutrition during childhood development, contrasted with the ethical constraints of using direct X-ray radiation on children for research purposes. This study aimed to evaluate the application of digital X-ray radiography in monitoring bone development using an experimental goat model as a pediatric surrogate. The benefit of this research is to provide a safe and accurate method for evaluating skeletal growth based on animal modeling. The methods employed were quantitative experimental and qualitative approaches, dividing the subjects into a control group and a treatment group supplemented with dicalcium phosphate (DCP). Digital radiographic images were acquired periodically using a Direct Digital Radiography (DDR) system. Exposure factors were optimized at 80 kV, 50 mA, and an exposure time of 0.5 s. Digital image analysis was performed using ImageJ software to measure the length of the vertebrae and the bone density of the hindlimbs. The resulting image contrast was analyzed based on the mechanism of exponential material attenuation satisfying the Beer-Lambert law. The results concluded that calcium intake significantly accelerated bone length advancement, wherein the treatment group grew by (1.39 ± 0.03) mm (10%) from an initial size of (18.29 ± 0.03) mm to (19.68 ± 0.03) mm, which was higher than the control group that only grew by (0.98 ± 0.03) mm (6%) from (16.09 ± 0.03) mm to (17.07 ± 0.04) mm within the age range of 3.5 to 4 months. Conversely, regarding bone density, the control group was found to exhibit higher bone density than the treatment group. Therefore, calcium supplementation tends to stimulate bone growth toward axial elongation rather than matrix densification.

KEYWORDS : *digital x-ray radiography, bone growth, experimental goat model*