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Original Article

The impact of synthetic bone grafting for tissue regeneration: an *in vivo* study

ABSTRACT

Aims: This study aimed to examine the biological response of synthetic nanocomposite material on canine mandibular bone.

Methods: Nine healthy adult male local breed dogs aged 12 to 18 months and weighing 10.2 to 15.2 kg were used in the study. Based on healing intervals of 1 and 2 months, the dogs were divided into 2 groups. Each group had 3 subgroups with 3 dogs each. The division was based on the grafting material used to fill the created defect: an empty defect (Control-ve), Beta-Tricalcium Phosphate, and nanocomposite (Beta-Tricalcium Phosphate and nanosilver 1%). Surgery started after the dogs were anaesthetized. The surgical procedure began with a 5 cm parallel incision along the mandible's lower posterior border. After exposing the periosteum, a three 5mm-diameter, 5-mm-deep critical-size holes were made, 5mm between each one. Each group's grafting material had independent 3 holes. The defects were covered with resorbable collagen membranes followed by suturing of the mucoperiosteal flap. **Results:** Total densitometric analysis showed no significant differences between groups at 1-month intervals, with the nanocomposite group having a higher mean rank (165.66 ± 31.21) in comparison to other groups while at 2 months intervals that there was a highly significant difference between three groups as the *P*-value was (0.000) with the nanocomposite group having a higher mean rank (460.66 ± 26.40). **Conclusions:** In the current study, the use of nanocomposites improved osteoconductivity by accelerating new bone formation. Moreover, the incorporation of nanosilver enhanced growth factor activity. These attributes make nanocomposites a promising material for enhancing the bone healing process.