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Effect of Collagen Matrix and Platelet-Rich Fibrin on Periodontal Regeneration

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Objectives To histologically evaluate the effect of a volume-stable collagen matrix (VCMX) and liquid platelet-rich fibrin (PRF) on periodontal regeneration.

Methods One-wall intrabony defects were surgically created in six beagle dogs and randomly assigned to one of the following four treatment modalities: empty defect (group 1, control), liquid PRF (group 2), VCMX (group 3), VCMX + liquid PRF (group 4). Liquid PRF was prepared from venous blood using a low-speed centrifugation concept (600 rpm; 44 g; 8 min). After 12 weeks, the dogs were euthanized, and the specimens were scanned by micro-CT followed by histological processing. Micro-CT, histologic evaluation, and statistical analysis were then performed.

Results Healing was uneventful in all animals and all 48 defects (12 defects per group) were available for evaluation. Histologically, periodontal regeneration occurred to varying degrees in all groups. Residual VCMX was still present in groups 3 and 4 and showed integration into new bone and soft connective tissue. Degradation of VCMX appeared to be more advanced in group 4 compared to group 3. Cementum formation was not always continuous from the apical to the coronal end of the defects. Consequently, measurements were differentiated between highest point of continuous and interrupted cementum. The highest point of cementum was located more coronally in groups 2, 3, and 4 (4.23 ± 0.26 mm, 4.35 ± 0.58 mm, and 4.29 ± 0.67 mm) compared to group 1 (3.49 ± 0.48 mm). The difference between group 1 and group 2 reached statistical significance ($p=0.03$). Regarding continuous cementum formation, groups 2, 3, and 4 (2.92 ± 1.14 mm, 2.40 ± 1.09 mm, and 3.96 ± 0.67 mm) showed higher values compared to group 1 (1.08 ± 0.76 mm). Group 4 was statistically significantly better than group 1 ($p=0.01$). New bone formation was higher in groups 2, 3, and 4 (3.19mm, 3.24mm, and 3.22mm, respectively) compared with group 1 (2.68 mm) but did not reach statistical significance.

Conclusions The groups treated with liquid PRF and/or VCMX showed more favorable results in terms of periodontal regeneration compared to the empty control. Liquid PRF with or without VCMX appears to represent a viable treatment modality for intrabony defects and warrant further preclinical and clinical investigations.