The Use of Platelet-Rich Fibrin in Combination with Biphasic Calcium Phosphate in the Treatment of Bone Defects: A Histologic and Histomorphometric Study

Nilüfer Bölükbaşi, PhD, Sinem Yeniyol, PhD, Merva Soluk Tekkesin, PhD, Kemal Altunatmaz, PhD
Background
Platelet-rich fibrin (PRF) is a leukocyte and platelet concentrate containing many growth factors. Its potential for hard tissue augmentation as a sole grafting material or in combination with other grafting materials has been investigated in many studies.

Objective
The aim of this histologic study was to evaluate the efficacy of PRF mixed with biphasic calcium phosphate (BCP) on bone regeneration in surgically created bone defects.

Methods
Defects 5 mm in diameter were created in both tibias of 6 sheep. The defects were left empty or grafted with BCP, PRF, or BCP (HA-to-TCP ratio 60:40; (4Bone, MIS Implants Technologies, Israel) + PRF (1:1 ratio). Animals were killed at 10, 20, and 40 days. The specimens underwent histologic and histomorphometric analysis.

Results
None of the groups displayed any signs of necrosis. Inflammation was observed in all groups at 10 days; 2 specimens of PRF+BCP and all empty defects showed inflammatory cell infiltration at 20 days. During the 40-day evaluation period, the PRF+BCP group showed the highest ratios of new bone. The other 3 groups showed statistically similar results. In the BCP and PRF+BCP groups, the residual graft ratios were decreased at consecutive time intervals. The difference between the 2 groups was not statistically significant during follow-up.

Conclusions
The current study revealed a histomorphometric increase in bone formation with the addition of PRF to BCP in surgically created defects in sheep tibia.

SUMMARY.

| Killing day | Empty defect | PRF | BCP | PRF+BCP |
|------------|-------------|-----|-----|---------|
| 10 days    | 3.4(0.7)    | 74(0.7) | 72(16) | 11.4(0.7) |
| 20 days    | 24.9(0.8)   | 29.5(16) | 29.6(17) | 42.2(0.9) |
| 40 days    | 39.7(3.1)   | 38.9(4.9) | 49.1(3.1) | 54.9(0.8) |

BCP, biphasic calcium phosphate; PRF, platelet-rich fibrin.