

The Effect of Platelet Gels on Lumbar Intertransverse Process Spinal Fusion in a Rabbit Model

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Objectives: Platelets contain many growth factors which enhance new bone formation. Platelet-rich plasma however has little adhesive strength. This limits its application to some situations in orthopedic surgery such as fracture or spinal fusion. In this study, platelet gels were used in spinal fusion surgery to provide new bone formation and adhesive strength and prolong the effective period of time.

Methods: Sixteen adult rabbits received posterolateral intertransverse process fusion at L5-L6 with the use of autogenous bone grafts. Rabbits were randomly divided into experimental and control groups. Two groups of animals received similar surgical procedures. The experimental group received an autogenous bone graft mixed with platelet gels. The control group received an autogenous bone graft only. Posteroanterior radiographs of the spine were taken pre-operatively and then post-operatively every week for 6 weeks. Rabbits were euthanized at 6 weeks after surgery. The spinal fusion was assessed by radiographic analysis and by manual palpation at the level of arthrodesis and at the adjacent proximal and distal levels. Histopathological examination was performed by a biopsy of the bilateral fusion mass and evaluating fusion quality using the Emery grading scales.

Results: One rabbit died on the fifth day after the operation for an unknown reason, while the other 15 rabbits (7 in the experimental group and 8 in the control group) survived until the 6th postoperative weeks. Each side of the spine was graded separately, and 11 of the 14 fusion masses (78.6%) in the experimental group and 10 of the 16 fusion masses (62.5%) in the control group had radiographic evidence of fusion. With gross manual palpation, 6 of the 7 motion segments (87.7%) in the experimental group versus 4 of the 8 motion segments (50%) in the control group were determined to have solid fusion. The difference was not statistically significant ($p>0.05$) for either the radiographic analysis or manual palpation. Histologically, however, the experimental group had a higher mean score (with a mean of 6.21 vs. 5.06, $p=0.03$) and a higher fusion rate (85.7% vs. 31.3%, $p=0.002$), which were both statistically significant.

Conclusion: Platelet gels can enhance new bone formation, thus increasing the fusion rate of posterolateral spinal fusion in a rabbit model.

Key words: platelet gels, growth factor, spinal fusion, bone graft, arthrodesis

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