

Modulation of Wound Response and Soft Tissue Ingrowth in Synthetic and Allogeneic Implants With Platelet Concentrate

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Objective: To evaluate the modulation of wound healing and soft tissue ingrowth in synthetic and allogeneic implants with platelet gel. Attempts to influence wound healing with exogenous growth factors are highly dependent on the timing and dosing of treatment. Platelet gel made from autologous platelet concentrate (PC) and activated with calcium thrombin is increasingly used to enhance healing of surgical and chronic wounds, based on the assumption that proteins found in the blood can promote healing.

Methods: Adult New Zealand white rabbits underwent phlebotomy, and the blood was used to produce nonconcentrated autologous blood clot, platelet-poor plasma (PPP), and PC for each animal. Disks of porous high-density polyethylene (PHDPE) and acellular dermal graft (ADG) were implanted into each animal in a subcutaneous location. Implants of each type were treated with isotonic sodium chloride solution, PPP, PPP followed immediately with PC, or autologous blood clot (by means of manual impregnation). Animals were killed at 2, 7, 14, and 21 days after implantation. Implants were harvested with surrounding soft tissue and examined by means of light microscopy for evidence of acute and chronic inflammatory cells and vascular and fibroblast invasion.

Results: A platelet gel with platelet concentrations averaging 5.8 times greater than those of peripheral blood significantly improved wound healing and soft tissue ingrowth

in surgically implanted grafts. Early inflammatory infiltrates were enhanced in PHDPE and ADG implants by PC and autologous blood clot compared with control implants, as evidenced by significantly increased neutrophil and macrophage counts at day 2. Compared with controls, statistically significant increases in fibroblast and endothelial cell counts were noted at day 7 in PC-treated implants (fibroblasts, 61% increase [$P < .001$] in PHDPE implants and 52% increase [$P < .001$] in ADG implants; capillaries, 95% increase [$P < .05$] in PHDPE and 97% increase [$P < .001$] in ADG implants). Lymphocyte counts were increased by PC in PHDPE and ADG implants (71% [$P < .001$] and 100% [$P < .05$], respectively). There were no statistically significant differences in any cell count variables beyond 7 days.

Conclusions: Treatment with PC prepared at 5 times the baseline platelet count significantly accelerated maturation of experimental wounds. By 14 days, the degree and quality of wound cellularity were equivalent among all treatment groups. Rapid wound healing was expected with this surgical model, which was chosen to observe the biological effects on early wound healing of a platelet gel in a noncompromised wound. Treatment with PC may be useful in scenarios in which enhancement and acceleration of early wound healing is desired.