Autologous platelet gel is now being used in many surgical specialties. It is appropriate for use in plastic surgery procedures that entail a significant risk of hematoma, such as breast surgery, face lifts, nasal surgery, and skin grafting. Advantages include adhesive benefits, a reduction in risk of bleeding, and the added bonus of increased leukocyte concentration. (Aesthetic Surg J 2001;21:377-379.)

A utologous platelet gel is a wound sealant that has properties similar to those of fibrin glue as well as many advantages of its own. Because it is produced in the operating room from the patient’s own blood, platelet gel eliminates risks associated with donor blood, such as compatibility problems, disease transmission dangers, and clerical or storage errors.

Platelets can also be produced in much larger volumes and at much less cost than cryoprecipitate. The fibrinogen content of concentrated platelets is the same as that of the blood from which it came: 2 to 4 mg/mL. Because this level is much lower than that found in cryoprecipitate, the resultant platelet gel does not have the same tensile strength as cryo-based fibrin glue. However, it is adequate for clinical use as a wound sealant and tissue adhesive.

Mechanism of Adhesion

The mechanism of fibrinogen adhesion combines 2 components—commercially available thrombin in solution with calcium chloride, and concentrated fibrogen and factor XIII drawn preoperatively from the patient’s whole blood—to mimic a portion of normal blood coagulation. When these components are mixed, thrombin transforms fibrinogen to fibrin monomers. Factor XIII is activated by thrombin in the presence of calcium ions, causing cross-linking and thus further stabilization of the fibrin coagulum. A firm coagulum is produced in 2 to 3 minutes. Increasing the concentration of thrombin allows more rapid coagulum formation at the cost of decreased tensile strength.

The inclusion of the buffy coat of platelet and leukocyte-enriched plasma appears to have several beneficial effects. Various cytokines and mediators found in the platelets and dense granules can promote angiogenesis and collagen synthesis, thereby enhancing soft-tissue healing. These factors include platelet-derived growth factor, platelet-derived epidermal growth factor, fibroblast growth factor, transforming growth factor-β, and platelet-derived angiogenesis factor.1-3 These mediators have been found to accelerate epidermal regeneration and angiogenesis and to enhance collagen synthesis. In addition to the growth factors listed above, release of local thrombin, thromboxane A2, and adenosine diphosphate from the platelet granules attracts additional platelets, enhancing the hemostatic response.4-6

Technique

After the patient is anesthetized, 1 unit of blood is withdrawn. The platelets are separated in a Medtronic Sequestra 1000 autotransfusion centrifuge (Medtronic, Parker, CO) (Figure 1). Once the platelets are separated, the blood is transfused back into the patient (Figure 2). One unit of blood will yield approximately 40 mL of platelets with the first pass with a 125-mL bowl, and 100 mL with a 225-mL bowl. Fibrinogen levels are between 2 and 4 mg/mL.7-9 The platelet count is approximately 5 to 10 × 10^8/mL. The processing time is approximately 22 minutes for the first pass and 12 minutes for each additional pass. On completion of the surgical procedure, operative hemostasis is obtained. Before wound closure, 7 mL of the platelets is drawn into a 10-mL syringe. Then 1 to 2 mL of thrombin-calcium solution is added, leaving 1 to 2 mL of “air space” in the syringe (Figure 3). The syringe is gently rotated back and forth. Within 30 to 60 seconds, the solution begins to gel. At this stage, the contents of the syringe are sprayed into the cavity or under the flaps (Figure 4). Tissues are then approximated with gentle
pressure for 1 to 2 minutes. Closure of the subcutaneous tissues and skin is then completed, and light compression dressings are applied.

Applications in Plastic Surgery

Autologous platelet gel can be used in plastic surgery procedures that entail a risk of hematoma formation, such as...
breast implant removal, surgical treatment of gynecomastia, and face lifts. Other uses include nasal surgery and skin grafting. My experience in using platelet gel in breast surgery procedures includes 46 consecutive cases of silicone gel breast implant explantation and capsulectomy without the use of drains. Bruising and swelling were minimal in all cases. Patients were able to go home the same day with a compressive dressing, without having to return for drain removal. The lone complication involved one patient who had a postoperative hematoma in the recovery room caused by use of an incorrect concentration of calcium to activate the platelets, which necessitated return of the patient to the operating room for drainage. Seven cases of male gynecomastia were treated with combined excision and lipoplasty, also without the use of drains. There were no incidents of postoperative hematoma.

In other procedures, platelet gel was used in 6 face lifts. No drains were used. Resorption occurred within 5 to 6 days postoperatively. In all 6 cases, postoperative edema and bruising were minimal. Platelet gel was also used instead of conventional packing in 6 patients who underwent rhinoplasty and septrhynoplasty. No postoperative bleeding occurred. The coagulum separated spontaneously between 5 and 7 days after surgery.

Platelet gel has the triple advantage of being an adhesive that is hemostatic and contains a high concentration of leukocytes. The cost is only slightly higher than with the use of drains and is justified by the decreased risk of hematoma. The fibrinogen content of concentrated platelets is the same as that of the blood from which it came: 2 to 4 mg/mL. The main disadvantage of the procedure is that it must be done by a qualified perfusionist and requires the use of a special centrifuge.

References


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