Review Article

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Role of Platelet Poor Plasma

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Abstract

Platelet Poor Plasma is the suspension of less than 10,000 platelets per microliter of plasma. PPP contains a concentration of growth factors that can help stimulate healing and also provide extended anti-inflammatory relief. PPP can be used to promote healing for soft tissue injuries involving tendons, ligaments and muscles. PPP provides encouraging solution for tissue adhesion with low post-operative edema. PPP also helps in reducing the formation of liquid buildup, seroma, and hematoma post-surgery.

Keywords: Platelet Poor Plasma, Wound, Management.

Introduction

Platelet Poor Plasma (PPP) is a biologic treatment that is derived from your own blood. It is similar to platelet rich plasma (PRP) except that it has a lower concentration of platelet cells and growth factors. Medical literature has shown that some injuries such as muscle tears may heal better with PPP. Oftentimes, if a robust inflammatory response is not desired or a combination biologic treatment is being used, platelet poor plasma may be more appropriate than PRP. PPP contains a concentration of growth factors that can help stimulate healing and also provide extended anti-inflammatory relief.

The medical literature has shown that these growth factors can supplement the existing cartilage in joints. PPP can be used to promote healing for soft tissue injuries involving tendons, ligaments and muscles. It can also be used for tissue injuries in joints including labrum and meniscus tears. Clinical research has shown strong evidence that biologic treatments with growth factors can provide relief for mild to moderate degenerative joint conditions such as arthritis and chondromalacia.

Background

The separation of platelets suspended in plasma finds applications in biomedical fields, such as in dermatology, surgery, coagulation studies, sports injury, cosmetic surgery, and has applications in disease diagnostics and prognostics. The suspension of platelets in plasma is broadly categorized based on the count of platelets per microliter of plasma. Plasma suspensions having a platelet count above or below the normal physiological level of 1.5−4.5 × 105 /µL in plasma are termed as platelet-rich plasma (PRP) or platelet-poor plasma (PPP), respectively. Specifically, PRP consists of 3−8-fold enrichment of platelets in the

plasma,[1-3] whereas the clinical definition of PPP is the suspension of less than 10,000 platelets per microliter of plasma.[4] In this context, the focus of the present study is the isolation of PPP from blood using a passive microdevice. PPP is extensively used in coagulation studies. Prothrombin time and activated partial thromboplastin time are the most frequent tests recommended for monitoring the coagulation disorder and anti-coagulation therapy.[4] Moreover, in the platelet aggregation test using a light transmission aggregometer, the limits of 0 and 100% aggregation need to be preset for the equipment. These limits are set using platelet-poor plasma sample and PRP before testing the actual samples.[5] Further, it has been recently reported that PPP provides encouraging solution for tissue adhesion with low post-operative edema. PPP also helps in reducing the formation of liquid buildup, seroma, and hematoma post-surgery.[6,7] The above examples underscore the importance of isolating PPP from blood in a convenient manner.

The accuracy of hemostasis (coagulation) testing depends upon the quality of the specimen submitted. Hemostasis specimens must be properly collected, labeled, stored, packaged, and transported. Since platelets contain clotting factors which can activate the clotting cascade, most coagulation tests require submission of platelet poor plasma (PPP) for analysis. Ideally, PPP should have a platelet count of less than 10 x 10E9 per liter (<10,000 /ul).

Method of collection

Specimens requiring Platelet Poor Plasma (PPP) must be collected and handled in the following manner:

Specimen Collection

1. Obtain venous blood by drawing a clearing tube prior to obtaining the specimen. Draw the specimen in a light blue top sodium citrate tube. Avoid stasis

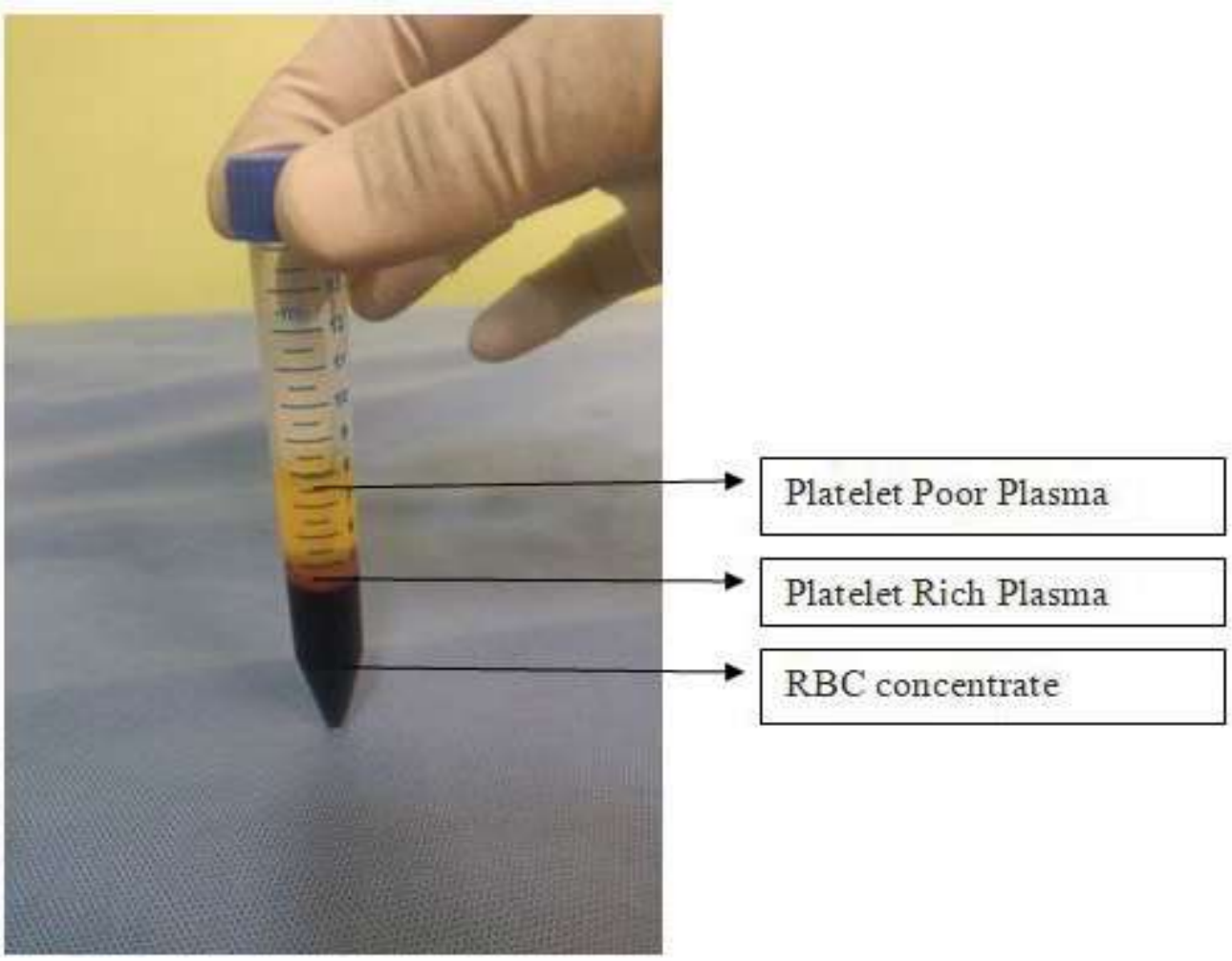

Fig 1: After centrifugation at 4000 rpm for 10 mins

and contamination of the specimen by tissue thromboplastin.

2. Mix blood with anticoagulant (3.2% buffered sodium citrate) by gentle inversion. An exact ratio of 9 parts blood to 1 part coagulant should be maintained.

Specimen Handling

- Prior to centrifugation, check specimen for clots with applicator sticks.

1. Centrifuge tube to obtain PPP.
2. Use a plastic transfer pipette to remove plasma (staying away from the buffy coat layer) and transfer top ⅔ of plasma to a plastic aliquot tube.
3. Centrifuge this aliquot tube at 4000rpm for 10 minutes. (figure 1)
4. Transfer top ¾ of plasma (do not disturb button at bottom of tube) into another plastic aliquot tube.
5. Label this tube with patient identification and a PLASMA sticker.
6. Freeze plasma immediately in -15°C to -20° C freezer until ready to transport. (may only be stored for up to 2 weeks at this temperature).

Uses of Platelet Poor Plasma (PPP)

To put it as simply as possible, platelet poor plasma enhances the body's ability to generate differentiated muscle cells or "myoblasts." This differentiation is necessary for muscle regeneration and repair.

PPP contains elevated levels of fibrinogen, a glycoprotein that circulates in the blood. In a wound environment, fibrinogen is transformed into a super-rich substance called fibrin that forms a clot that enables healthy cell migration and attachment. Wound bleeding is staunched, and the process of regenerating new muscle is activated. PPP therapy has also been used as for rapid and successful post-surgery healing.

Conclusion

PPP can be used to promote healing for soft tissue injuries involving tendons, ligaments and muscles. PPP provides encouraging solution for tissue adhesion with low post-operative edema.

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