

Washed Platelet Concentrates for Musculoskeletal Disorders

MEKAUCHE Mourad^{1*} and Tahar Aït Chabane²

¹Medical Office Bio-Orthopaedic and Rehabilitation, Oran, Algeria

²Biological Analysis Laboratory, Ghoulem Medical Center Oran, Algeria

***Corresponding Author:** MEKAUCHE Mourad, Medical Office Bio-Orthopaedic and Rehabilitation, Oran, Algeria.

Received: February 15, 2024; **Published:** February 24, 2024

Abstract

In osteo-articular, the PRP remains a technique of choice and first intention for a large number of pathologies. And this despite discrepancy in the published results. Efforts are still in progress to try to find the elements behind this variability. The presence of the anticoagulant which can interfere with the activity of the platelets can be an inhibitory element. Therefore, washed platelet concentrates characterized by a total absence of anti-coagulant were used. The results are very promising particularly in knee osteoarthritis.

Keywords: Washed Platelet Concentrates; PRP; Knee Osteoarthritis

Introduction

After tissue damage, vascular supply remains the key element that leads to healing. This vascular supply ensures a complete and continuous supply of the various elements of the blood necessary for healing.

A little or avascular area will have little or no healing potential. PRP element rich in platelets could allow a neo-angiogenesis, to lead to healing.

But in practice, the effectiveness of the PRP remains to date debated with discordance of the results. The presence of anticoagulant, which can interfere with platelet activity, may be part of this discrepancy.

The total absence of anticoagulant will help overcome this problem. And also avoid resorting to prior activation of the PRP.

Washed platelet concentrates may be a solution.

Preparation technique

1st step

Blood is collected in citrate tubes then centrifuged at 80-100 G for 10 minutes.

2nd step

The part of the plasma containing the platelets is aspirated, then transferred to another tube, centrifuged at 400 G for 20 minutes.

3rd step

- After a rest period, the plasma is completely aspirated from the tube without disturbing the platelet concentrate at the bottom of the tube.
- A quantity of physiological serum is added to the platelet concentrate to resuspend the platelets.



Figure: Washed platelet concentrates.

Discussion

Tissue repair depends essentially on the local vascular state called angiogenesis. This physiological angiogenesis allows in case of injury the arrival of different blood elements necessary for healing.

An avascular or poorly vascularized area will have incomplete or even absent healing [1]. Induction or promotion of local angiogenesis can be considered a promising approach for healing. The role of platelets in initiating angiogenesis is well known [2,3]. And PRP, a platelet-rich blood element, may be a solution. But the effectiveness of PRP is currently in dispute. The presence of the anticoagulant may be an important element of this problem.

The preparation of platelet-rich plasma requires the presence of the anticoagulant. And citrate remains the most used anticoagulant. It acts by creating citrate-calcium complexes which significantly reduces ionized calcium, thereby inhibiting the coagulation cascade and platelet activation [4]. As a result, the PRP injection may be accompanied by no platelet action and the PRP may return to the general blood circulation.

Some authors have proposed the addition of calcium, in the form of gluconate or calcium chloride, to PRP before injection. This leads to early activation of platelets even before contact with the lesion [5,6].

Similarly, allergic reactions to citrate have also been reported in some patients after local injection of PRP, suggesting that anticoagulants may exert a local deleterious effect, which interferes with the healing process [7].

Used for a long time in blood transfusion centers, washed platelet concentrates are characterized by the total absence of anticoagulant, this could perhaps be a solution. Additionally, washed platelets also have a high activation threshold by collagen which can be activated upon contact with even minimal lesions [8,9].

The light-spin/hard-spin (LS/HS) technique remains the widely used simple standard method for the preparation. The collected blood is first centrifuged to separate the platelet-rich plasma from the other components. Then a second centrifugation separates the platelets from the plasma to form a platelet concentrate [10-12]. Finally, the plasma is removed completely and the platelets are resuspended in a physiological solution, such as saline (0.9% NaCl) which is an isotonic solution. This last step allows the complete elimination of the anticoagulant [13,14].

Another point to note is that during preparation, platelets may not be completely resuspended [15,16]. The presence of platelet aggregates in the solution may cause an additional inflammatory reaction, which may interfere with the action of platelets [17]. Several solutions have been proposed. A rest time after manipulation, could allow these aggregates to dissipate [15,16,18]. Adding platelet-poor plasma (PPP) during the second centrifugation could also reduce platelet aggregation formation [19].

In practice, the technique is now used in our office for 02 years. The volumes of blood collected are less. Functional results are superior to previous PRP techniques, especially regarding the tolerance and acceptability. After injection, the inflammatory reaction and swelling are late, compared to previous techniques (activated PRP, LR PRP and PRP combined with prolotherapy) where it was early with important general signs.

Conclusion

Despite the criticisms based against the PRP concerning the absence of concrete and non-reproducible results. The technique is always very popular and in progress in use. This should not prevent us from studying the technique in depth to try to find the elements that cause this variability in the results. We have raised the question of the anticoagulant which seemed to us a major element. Thus, using a preparation without anti-coagulant called washed platelet concentrates. This technique has the advantage of being already used in the field of blood transfusions. The result very encouraged for knee osteoarthritis opening the way for other pathologies.

The technique washed platelet concentrates could give another dimension to the bio-orthopedic specialty.

Bibliography

1. Marcia G Tonnesen., *et al.* "Angiogenesis in wound healing". *Journal of Investigative Dermatology Symposium Proceedings* 5.1 (2000): 40-46.
2. Tony G Walsh., *et al.* "The functional role of platelets in the regulation of angiogenesis". *Platelets* 26.3 (2015): 199-211.
3. Elisabeth M Battinelli. "The role of platelets in angiogenesis". *Platelets* (Fourth Edition) (2019): 433-441.
4. M Monchi and V Manda. "Physiopathologie de l'anticoagulation au citrate". *Symposia/Transfusion Clinique et Biologique* 22.4 (2015): 183-200.

5. Anggraini Margono., *et al.* "The effect of calcium gluconate on platelet rich plasma activation for VEGF-A expression of human dental pulp stem cells". *European Journal of Dentistry* 16.2 (2022): 424-429.
6. Surena Vahabi., *et al.* "Comparison of the effect of activated or non-activated PRP in various concentrations on osteoblast and fibroblast cell line proliferation". *Cell and Tissue Banking* 18.3 (2017): 347-353.
7. Paula Oneto., *et al.* "Anticoagulants interfere with the angiogenic and regenerative responses mediated by platelets". *Frontiers in Bioengineering and Biotechnology* 8 (2020): 223.
8. Helge Schoenfeld., *et al.* "Platelet activity in washed platelet concentrates". *Anesthesia and Analgesia* 99.1 (2004): 17-20.
9. Helge Schoenfeld., *et al.* "The functional integrity of platelets in volume-reduced platelet concentrates". *Anesthesia and Analgesia* 100.1 (2005): 78-81.
10. W H Dzik. "Platelet suspensions and methods the preparation of platelet concentrates by the light-spin/hard-spin technique". *Transfusion Science* 12.3 (1991): 171-181.
11. Béatrice Hechler., *et al.* "Platelet preparation for function testing in the laboratory and clinic: Historical and practical aspects". *Research and Practice in Thrombosis and Haemostasis* 3.4 (2019): 615-625.
12. Amanda GM Perez., *et al.* "Relevant aspects of centrifugation step in the preparation of platelet-rich plasma". *ISRN Hematology* (2014): 176060.
13. Jean-Pierre Cazenave., *et al.* "Preparation of washed platelet suspensions from human and rodent blood". *Methods in Molecular Biology* 272 (2004): 13-28.
14. Kandler., *et al.* "Platelet suspensions and methods for resuspending platelet". United States Patent.
15. PF van der Meer., *et al.* "Aggregates in platelet concentrates". *Vox Sanguinis* 108.1 (2015): 96-100.
16. J Ringwald., *et al.* "Residual aggregates in platelet products: what do we know?" *Vox Sanguinis* 106.3 (2014): 209-218.
17. PW Braunstein., *et al.* "Platelets, fibroblasts, and inflammation: tissue reactions to platelets injected subcutaneously". *American Journal of Pathology* 99.1 (1980): 53-66.
18. Andrey Skripchenko., *et al.* "A rest period before agitation may improve some in vitro apheresis platelet parameters during storage". *Transfusion* 52.7 (2012): 1433-1438.
19. Marco Cattaneo., *et al.* "Platelet aggregation studies: autologous platelet-poor plasma inhibits platelet aggregation when added to platelet-rich plasma to normalize platelet count". *Haematologica* 92.5 (2007): 694-697.

Volume 15 Issue 2 February 2024

©All rights reserved by MEKAUCHE Mourad and Tahar Aït Chabane.