Using autologous thrombin in making PRP gel – case reports–

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I. Introduction

Platelet Rich Plasma (PRP) is an autologous source of transforming and growth factor (TGF, PDGF, IGF, EGF, VEGF) that seems to improve the physiological process of healing in soft and hard tissue.

Through the course of making PRP, calcium chloride and commercial bovine thrombin are used to help coagulation generally. However, through many researches, the use of bovine thrombin may be associated with the development of antibodies of factor V, XI, and thrombin resulting in the risk of life-threatening coagulopathies.

In Italy, bovine thrombin is limited to use for hemostasis. Batroxobin (Thrombin-like snake venom enzyme) is used instead of bovine thrombin. For resolving this problem, in our hospital, we use autologous thrombin in making PRP. The aim of this study is to introduce a method of PRP preparation.

II. Materials and Methods

We recruited 40 patients (mean age 48.3 years old, male : female = 20 : 20), that underwent local anesthesia for implant surgery. For each patient the PRP gel was made during the surgery time. Times of gel formation were been recorded.

Procedures of making autologous thrombin are by following:
1. Withdraw 4–5ml of autologous blood with untreated tube.
2. Stand the tube and place calmly for 30 min.
3. Then centrifuge the tube under condition on 3600rpm for 12 min.
4. Collect the supernatant as autologous thrombin.
5. Mix autologous thrombin with 10% CaCl².

Fig.1. the condition of centrifuge.

Fig.2. 0.25ml 10% CaCl².
Case 1
Pt: 엄**
Age: 63
Sex: male
Tx. plan: 1. left and right Maxillary sinus graft with lateral window technique
2. #16: 4.7*13mm Tapered Screw-Vent (Zimmer Dental Inc, U.S.A) an #25, 26: 3.7*13mm, 4.7*13mm Tapered Screw-Vent (Zimmer Dental Inc, U.S.A)

Panorama and computer tomography was taken for analysis of residual bone and the shape of maxillary sinus. Lateral window technique and place of 3 implants were planned (Fig.6,7,8,9). During operation, we made PRP and mixed it with bone graft materials (Fig.10,11,12).
The coagulated bone graft materials were easily to position on graft site. (Fig. 13)

Case 2
Pt: 김**
Age: 44
Sex: female
Tx. plan: 1. #37: 4.7*13mm Tapered screw-vent (Zimmer Dental Inc., U.S.A) implant.
2. autogenous bone graft and PRP.

Computer tomography and panoramic analysis were done before operation. A large bone defect were find on left lower second molar area (Fig.
During implant operation, left lower third molar was extracted together and we got autogenous bone around extraction site using trephine bur (Fig. 20). The harvested bone mixed with PRP. When PRP and bone mixture were coagulated, we put it into the defect site (Fig. 21, 22, 23, 24).

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**Fig. 17.** Pre-op. panoramic view.  
**Fig. 18.** Post-op. panoramic view.  
**Fig. 19.** CT image analysis on #37.  
**Fig. 20.** Autogenous bone is harvested by using trephine bur around extracted site.  
**Fig. 21.** PRP+autogenous bone.  
**Fig. 22.** Large defect between implant and bone.  
**Fig. 23.** Coagulated PRP and bone.  
**Fig. 24.** Defect filled with PRP+bone.
Case 3
Pt: 장**
Age: 38
Sex: male
Tx plan: 1. #21, #22: 3.7 x 13mm Tapered screw-vent (Zimmer Dental Inc., U.S.A) implant.
   2. autogenous bone graft

Four months before implantation, this man had been received cyst enucleation and #21,22 extraction. After cyst was removed, autogenous bone, cerasorb, calmatrix were grafted on defect site (Fig. 25, 26).

We planned 2 implants and bone graft on labial side additionally (Fig. 28, 29).

When flap was performed, labial bone loss was observed. So autogenous bone from left ramus were grafted after implantation. And then bone graft material was covered with human pericardium membrane that treated with PRP (Fig. 30, 31, 32, 33, 34).

Fig. 25. Post-op. panoramic view.

Fig. 26. Post-op. panoramic view after bone graft.

Fig. 27. Post-op. panoramic view after implantation.

Fig. 28. CT image analysis on #21.

Fig. 29. CT image analysis on #22.

Fig. 30. Bone loss on labial side.

Fig. 31. After implantation.
Case 4  
Pt: 황**  
Age: 49  
Sex: female  
Tx.plan: 1. #11,12 ridge split and 3.7*13mm Tapered screw–vent (Zimmer Dental Inc., U.S.A) implant.  
2. autogenous bone graft  

This woman had old crown & bridge on her maxillary anterior area. We planed change it to implant (Fig. 36,37). On computer tomography analysis, the width of residual bone was too narrow for implantation, so ridge split and bone graft were planed (Fig. 38,39).  

When implants were placed, labial bone plate was too weak to preservation. For reinforce the labial side, PRP mixed autogenous bone was grafted and titanium mesh was used for maintain the shape of graft material (Fig. 40,41,42,43,44,45).
III. Result

In all 40 cases, PRP was coagulated perfectly with human thrombin. However the coagulation time had variation because of the content of thrombin were different in everyone. In almost cases coagulation time were under 5 minutes, the fastest one was 1 minute and the longest one was 15 minutes. The average coagulation time was 4.3 minutes.
IV. Discussion


Based on these data, we use autologous thrombin instead of bovine thrombin in making PRP gel.

V. Conclusion

Using autologous thrombin is very safe and effective method in making PRP gel, in all cases we
got PRP gel successfully. And we don't need to worry about "anti-bovine factor V" any more.

REFERENCES

Abstract

PRP 제조에 있어 autologous thrombin의 사용
-case reports-

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PRP는 수술 시 치유의 결과를 향상시켜주기 위해 사용되어왔다. 그 제작 과정 중 PRP의 응고를 돕기 위해 thrombin 이 사용되는데, 대부분의 경우에는 상용화된 bovine thrombin 을 사용하고 있다. 하지만 많은 연구에서 bovine thrombin 의 사용이 Bovine thrombin-induced antibodies 를 만들어 혈액 응고를 지연시킨다고 보고하고 있다. 심지어는 실험 경의 생물에 위험을 초래 할 수 있다고 보고하고 있다. 따라서 본원에서는 PRP의 제조와 정에서 bovine thrombin 의 사용을 대체하기 위한 방법을 생각해 왔으며, 현재는 PRP 제조를 위해 제조한 전혈을 이용해 autologous thrombin 을 만들어 사용하고 있다. Autologous thrombin 은 bovine thrombin 과 마찬가지로 PRP의 응고를 도왔으며, 거기에 따른 증례들을 정리해 보고자 한다.