

Bölüm 13

AĞIZ, DIŞ VE ÇENE CERRAHİSİNDE TRANSFÜZYONEL OLMAYAN TROMBOSİT ÜRÜNLERİ

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GİRİŞ

Ağız, diş ve çene cerrahisinde kullanım için transfüzyonel olmayan kan ürünleri, bir hastadan alınan kan örneğinin santrifüjlenmesi yoluyla hazırlanan otojen ürünlerdir. Bu ürünlerin potansiyel faydaları; sert ve yumuşak doku rejenerasyonunun (Marx & ark., 1998), yerel homeostazın (Sammartino & ark., 2011) ve yara iyileşmesinin hızlanmasının (Picard & ark., 2015) sağlanmasıdır.

TRANSFÜZYONEL OLMAYAN TROMBOSİT ÜRÜNLERİ

Trombositler

Trombositler, kemik iliğinde megakaryositler tarafından ortaya çıkarılan küçük, çekirdeksiz kan hücreleridir. Dolaşımında çekirdek taşımayan sitoplazma parçacıkları halinde bulunurlar. Boyutları yaklaşık 2-3 µm çapındadır. Dolaşıma günde ortalama 85 milyon trombosit girer. Trombositlerin başlıca fonksiyonu kan damarı duvarında birikim sonucu kanamanın önlenmesidir (Amable & ark., 2013). Periferik kandaki trombositler Wright- Giemsa boyası ile oldukça basit, elektron mikroskopisi ile de granüllü karmaşık bir yapı gösterirler. Trombositlerin iç organizasyonu birbirine bağlı ve doğrudan dış ortamla iletişimi olan açık kanallı bir sistem olarak bilinen, birbiriyle ilişkili kanal dizisinden oluşur ve bu sistem trombositlerin intrasellüler içeriklerini hızlı bir şekilde kana serbest bırakmasını kolaylaştırır. Trombositler yara iyileşmesinin yanında enflamasyon, anjiyogenez ve rejenerasyonda da görev alır (Broos & ark., 2012). Asıl görevleri kan pıhtısı oluşturmak olsa da bunun yanına büyüme faktörleri, enzimler ve diğer proteinleri de içerir. Büyüme faktörlerinin ana kaynağı içindeki alfa granülleridir (Harrison & Cramer, 1993). Bir trombosit içinde yaklaşık 50-80 alfa granülü bulunur ve granüller ortalama 500 nm büyüklüğündedir. Granül içerikleri ise he-retojendir (Blair & Flaumenhaft, 2009). Trombositler aktive olduğunda granüller içeriğini eksositoz yolu ile salar. Büyüme faktörleri 6-45 kDa ağırlığındaki küçük polipeptit yapılarıdır. Kemotaksi yeteneklerinden dolayı hücre fonksiyonla-

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Yara bakımı ve kozmetik

PRP, yara iyileşmesi için başarıyla kullanılmaktadır. Altta yatan biyolojik mekanizmalar, endotel hücrelerinin artmış proliferasyonu, vaskülarizasyon ve granülasyon dokusunun oluşumu üzerindeki uyarıcı etkilerle ilişkilidir(Sommeling & ark.,2013).

Trombosit jeller, kronik cilt ülserleri için kullanıldığında sadece yara iyileşmesinde değil, aynı zamanda morbidite ve sağlık maliyetlerinde düşüşe yol açan iyileşme ve hospitalizasyonu da iyileştirmişlerdir (Mazucco & ark.,2004; Saad Setta & ark.,2011).

Yakın zamanda, kozmetik cilt gençleştirici etkilerinden dolayı, PRP uygulanmasına olan ilgi artmaktadır (Sommeling & ark.,2013). Ayrıca, androjenetik alopesi için yeni bir terapi olarak denenmiş, kontrollerle karşılaştırıldığında artmış saç yoğunluğu (Alves & Grimalt, 2016), ortalama saç sayısında ve saç foliküllerinin sayısında PRP tedavisinden iki hafta sonra klinik bir iyileşme de bildirilmiştir (Gentile & ark.,2015).

Sonuç

Ağız, diş ve çene cerrahisinde transfüzyon dâhilinde olmayan trombosit konsantreleri uzun süredir klinikte kullanılmakta ve doku rejenerasyonuna katkı sağladığı bilimsel veriler ile desteklenmektedir. Özellikle kemik ögumentasyonu, osteonekroz tedavisi ve periodontal rejenerasyonda doku iyileşmesini hızlandırabildiği için klinik önem arz etmektedir. Ağız, diş ve çene cerrahisinde klinik yararlarını tam olarak değerlendirmek amacıyla erken ve geç post-operatif sonuçları değerlendiren rastgele, kontrollü, geniş çaplı klinik çalışmalara ihtiyaç vardır.

KAYNAKLAR

1. Adornato MC, Morcos I, Rozanski J (2007) The treatment of bisphosphonate-associated osteonecrosis of the jaws with bone resection and autologous platelet-derived growth factors. *Journal of American Dental Association*,(138) 971-977.
2. Alves, R., Grimalt, R. (2016) Randomized placebo-controlled, double-blind, half-head study to assess the efficacy of platelet-rich plasma on the treatment of androgenetic alopecia. *Dermatology and Surgery*, 42, 491-497.
3. Anitua, E., Sanchez, M., Orive, G., (2007) The potential impact of the preparation rich in growth factors (PRGF) in different medical fields. *Biomaterials*,(28) 4551-4560.
4. Bielecki, T., Dohan Ehrenfest, D.M. (2012) Platelet-rich plasma (PRP) and Platelet-Rich Fibrin (PRF): Surgical adjuvants, preparations for in situ regenerative medicine and tools for tissue engineering. *Current Pharmacology and Biotechnology*, (13), 1121-1130.
5. Blair, P., Flaumenhaft, R. (2009) Platelet alpha-granules: basic biology and clinical correlates. *Blood Review*, (23) 177-189.

6. Borzini, P., Balbo, V., Mazzucco, L. (2012) Platelet concentrates for topical use: Bed-side device and blood transfusion technology. Quality and versatility. *Current Pharmacology and Biotechnology*, (13) 1138–1144.
7. Borzini, P., Mazzucco, L. (2005) Platelet gels and releasates. *Current Opinion Hematology*, (12) 473–479.
8. Brogini, N., Hofstetter, W., Hunziker, E., Bosshardt, D.D., Bornstein, M.M., Seto, I., Weibrich, G., Buser, D. (2011) The influence of PRP on early bone formation in membrane protected defects. A histological and histomorphometric study in the rabbit calvaria. *Clinical Implant Dent Relation Research*. (13) 1–12.
9. Broos, K., De Meyer F., Feys B., (2012) Blood platelet biochemistry. *Thrombosis Research*, (129) 245–249.
10. Burnouf, T., Goubran, H.A., Chen, T.M., Ou, K.L., El-Ekiaby, M., Radosevic, M. (2013) Blood-derived biomaterials and platelet growth factors in regenerative medicine. *Blood Reviews*, (27), 77–89.
11. Cabaro, S., D'Esposito, V., Gasparro, R., Borriello, F., Granata, F., Mosca, G., Passaretti, F., Sammartino, J.C., Beguinot, F., Sammartino, G. (2017) White cell and platelet content affects the release of bioactive factors in different blood-derived scaffolds. *Platelets*, (21) 1–5.
12. Choukroun, J., Adda, F., Schoeffler, C., Vervelle, A. (2001) Une opportunité en parodontologie: le PRF. *Implantodontie*, (42) 55–62.
13. Choukroun, J., Ghanaati, G. (2016) Reduction of relative centrifugation force within PRF- (Platelet- Rich-Fibrin) concentrates advances patients' own inflammatory cells and platelets: First introduction of the Low Speed Centrifugation Concept. *European Journal of Trauma and Emergency Surgery*, 44(1) 87-95.
14. Del Corso, M., Vervelle, A., Simonpieri, A., Jimbo, R., Inchingolo, F., Sammartino, G., Dohan Ehrenfest, D.M. (2012) Current knowledge and perspectives for the use of platelet-rich plasma (PRP) and platelet-rich fibrin (PRF) in oral and maxillofacial surgery part 1: Periodontal and dentoalveolar surgery. *Current Pharmacology and Biotechnology*, (13) 1207–1230.
15. Della Valle, A., Sammartino, G., Marenzi, G., Tia, M., Espedito di Lauro, A., Ferrari, F., Lo Muzio, L. (2003) Prevention of postoperative bleeding in anticoagulated patients undergoing oral surgery: Use of platelet-rich plasma gel. *Journal Oral and Maxillofacial Surgery*, 61, 1275- 1278.
16. Demidova-Rice, T.N., Wolf, L., Deckenback, J., Hamblin, M.R., Herman, I.M. (2012) Human platelet-rich plasma and extracellular matrix-derived peptides promote impaired cutaneous wound healing in vivo. *PLoS ONE* , (7) 32146.
17. Dohan Ehrenfest, D.M., Andia, I., Zumstein, M.A., Zhang, C.Q., Pinto, N.R., Bielecki, T. (2014) Classification of platelet concentrates (Platelet-Rich Plasma-PRP, Platelet-Rich Fibrin-PRF) for topical and infiltrative use in orthopedic and sports medicine: Current consensus, clinical implications and perspectives. *Muscles Ligaments Tendons Journal*, 4, 3–9.
18. Dohan Ehrenfest, D.M.; Sammartino, G.; Shibli, J.A.; Wang, H.L.; Zou, D.R.; Bernard, J.P. (2013) Guidelines for the publication of articles related to platelet concentrates (Platelet-Rich Plasma—PRP, or Platelet-Rich Fibrin—PRF): The international classification of the POSEIDO. *Poseido Journal*, (1) 17–27.
19. Dohan, D.M., Choukroun, J., Diss, A., Dohan, S.L., Dohan, A.J., Mouhyi, J., Gogly, B. (2006) Platelet-rich fibrin (PRF): A second-generation platelet concentrate. Part I: Technological concepts and evolution. *Oral Surgery. Oral Medicine. Oral Pathology*.

- Oral Radiology. Endodontology, (101)* 37–44.
20. Dohan Ehrenfest, D.M., Bielecki, T., Mishra, A., Borzini, P., Inchingolo, F., Sammartino, G., Rasmusson, L. Everts, P.A. (2012) In search of a consensus terminology in the field of platelet concentrates for surgical use: Platelet-rich plasma (PRP), platelet-rich fibrin (PRF), fibrin gel polymerization and leukocytes. *Current Pharmacology and Biotechnology, (13)* 1131–1137.
 21. Dohan Ehrenfest, D.M., Rasmusson, L., Albrektsson, T. (2009) Classification of platelet concentrates: From pure platelet-rich plasma (P-PRP) to leucocyte- and platelet-rich fibrin (L-PRF). *Trends Biotechnology, (27)* 158–167.
 22. Dohan Ehrenfest, D.M., de Peppo, G.M., Doglioli, P., Sammartino, G. (2009) Slow release of growth factors and thrombospondin-1 in Choukroun's platelet-rich fibrin (PRF): A gold standard to achieve for all surgical platelet concentrates technologies. *Growth Factors, (27)*, 63–69.
 23. Everts, A., Knape, T., Weibrich, G., (2006) Platelet-rich plasma and platelet gel: a review. *Journal Extra Corporation Technology, (38)* 174–187.
 24. Gentile, P., Garcovich, S., Bielli, A., Scioli, M.G., Orlandi, A., Cervelli, V. (2015) The effect of platelet-rich plasma in hair regrowth: A randomized placebo-controlled trial. *Stem. Cells Translational Medicine, (4)* 1317–1323.
 25. Ghanaati, S., Booms, P., Orłowska, A., Kubesch, A., Lorenz, J., Rutkowski, J., Landes, C., Sader, R., Kirkpatrick, C., Choukroun, J. (2014) Advanced Platelet-Rich Fibrin: A New Concept for Cell-Based Tissue Engineering by Means of Inflammatory Cells. *Journal of Oral Implantology, (40)* 679–89.
 26. Gönen, Z.B., Yılmaz Asan, C. (2017) Treatment of bisphosphonate-related osteonecrosis of the jaw using platelet-rich fibrin. *Cranio, 35(5)* 332–336.
 27. Greenberg, M.S. (2004) Intravenous bisphosphonates and osteonecrosis. *Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontology, 98(3)* 259–260.
 28. Harrison, P., Cramer, E.M. (1993) Platelet alpha-granules. *Blood Review, (7)* 52–62.
 29. Hosny, N., Goubran, F., BadrEldin Hasan, B., Kamel, N. (2015) Assessment of vascular endothelial growth factor in fresh versus frozen platelet rich plasma. *Journal Blood Transfusion, (2015)* 706903.
 30. Jankovic, S., Aleksic, Z., Klokkevold, P., Lekovic, V., Dimitrijevic, B., Kenney, E.B., Camargo, P. (2012) Use of platelet-rich fibrin membrane following treatment of gingival recession: A randomized clinical trial. *International Journal Of Periodontics Restorative Dentistry (32)* 41–50.
 31. Kajikawa, Y., Morihara, T., Sakamoto, H., Matsuda, K., Oshima, Y., Yoshida, A., Nagae, M., Arai, Y., Kawata, M., Kubo, T. (2008) Platelet-rich plasma enhances the initial mobilization of circulation-derived cells for tendon healing. *Journal Cell Physiology, (215)* 837–845.
 32. Keen, D. A. (2008) review of research examining the regulatory role of lymphocytes in normal wound healing. *Journal Wound Care, 17*, 218–220
 33. Kim, J.W., Kim, S.J., Kim, M.R. (2014) Leucocyte-rich and platelet-rich fibrin for the treatment of bisphosphonate-related osteonecrosis of the jaw: a prospective feasibility study. *Br Journal Oral Maxillofacial Surgery, (52)* 854–859.
 34. Knighton, D.R., Ciresi, K.F., Fiegel, V.D., Austin, L.L., Butler, E.L. (1986) Classification and treatment of chronic nonhealing wounds. Successful treatment with autologous platelet-derived wound healing factors (PDWHF). *Annals Of Surgery, (204)* 322–330.

35. Kobayashi, E., Flückiger, L., Fujioka-Kobayashi, M., Sawada, K., Sculean, A., Schaller, B., Miron, R.J. (2016) Comparative release of growth factors from PRP, PRF, and advanced-PRF. *Clinical Oral Investigations*, 20(9) 2253-60.
36. Kon, E.; Filardo, G.; Delcogliano, M.; Presti, M.L.; Russo, A.; Bondi, A.; Di Martino, A.; Cenacchi, A.; Fornasari, P.M., Marcacci, M. (2009) Platelet-rich plasma: New clinical application: A pilot study for treatment of jumper's knee. *Injury*, (40) 598–603.
37. Kütük, N., Baş, B., Soylu, E., Gönen, Z.B., Yılmaz, C., Balcioglu, E., Özdamar, S., Alkan, A. (2014) Effect of platelet-rich plasma on fibrocartilage, cartilage, and bone repair in temporomandibular joint. *Journal of Oral and Maxillofacial Surgery*, 72(2) 277-284.
38. Lee, C.Y., David, T., Nishime, M. (2007) Use of platelet-rich plasma in the management of oral bisphosphonate-associated osteonecrosis of the jaw: a report of 2 cases. *Journal of Oral Implantology*, 33(6) 371-382.
39. Leo, M.S., Kumar, A.S., Kirit, R., Konathan, R., Sivamani, R.K. (2015) Systematic review of the use of platelet-rich plasma in aesthetic dermatology. *Journal Cosmetic and Dermatology*, (14) 315–323.
40. Marx, R.E., Carlson, E.R., Eichstaedt, R.M., Schimmele, S.R., Strauss, J.E., Georgeff, K.R. (1998) Platelet-rich plasma: Growth factor enhancement for bone grafts. *Oral Surgery. Oral Medicine. Oral Pathology. Oral Radiology. Endodontology*, (85) 638–646.
41. Matras, H., Dinges, H., Lassmann, H. (1972) Zur Nahtlosen interfazikularen nerven transplantation im tierexperiment. *Wein Med Wochenschr*, (112) 517–523.
42. Matras, H. (1970) Die Wirkungen verschiedener Fibrinpräparate auf Kontinuitätstrennungen der Rattenhaut. *Osterr Z Stomatology*, (67) 338–359.
43. Mazzucco, L.; Balbo, V.; Cattana, E.; Guaschino, R.; Borzini, P. (2009) Not every PRP-gel is born equal. Evaluation of growth factor availability for tissues through four PRP-gel preparations: Fibrinet®, RegenPRP-Kit®, Plateltex® and one manual procedure. *Vox Sanguinis*, (97) 110–118.
44. Mazzucco, L., Medici, D., Serra, M., Panizza, R., Rivara, G., Orecchia, S., Libener, R., Cattana, E., Levis, A., Betta, P.G. (2004) The use of autologous platelet gel to treat difficult-to-heal wounds: A pilot study. *Transfusion*, (44) 1013–1018.
45. Mishra, A., Harmon, K., Woodall, J., Vieira, A. (2012) Sports medicine applications of platelet rich plasma. *Current Pharmacology and Biotechnology*, (13) 1185–1195.
46. Murphy, M.B., Blashki, D., Buchanan, R.M., Yazdi, I.K., Ferrari, M., Simmons, P.J., Tasciotti, E. (2012) Adult and umbilical cord blood-derived platelet-rich plasma for mesenchymal stem cell proliferation, chemotaxis, and cryo-preservation. *Biomaterials*, (33) 5308–5316.
47. Park, J.H., Kim, J.W., Kim, S.J. (2017) Does the addition of bone morphogenetic protein 2 to platelet-rich fibrin improve healing after treatment for medication-related osteonecrosis of the jaw? *Journal Oral Of Maxillofacial Surgery*, (75) 1176-1184.
48. Passaretti, F., Tia, M., D'Esposito, V., De Pascale, M., Del Corso, M., Sepulveres, R., Liguoro, D., Valentino, R., Beguinot, F., Formisano, P. (2014) Growth-promoting action and growth factor release by different platelet derivatives. *Platelets*, (25) 252–256.
49. Pearl, R.M., Wustrack, K.O., Harbury, C., Rubenstein, E., Kaplan, E.N. (1977) Microvascular anastomosis using a blood product sealant-adhesive. *Surgery Gynecology Obstetry*, (144) 227–231.

50. Picard, F., Hersant, B., Bosc, R., Meningaud, J.P. (2015) The growing evidence for the use of platelet-rich plasma on diabetic chronic wounds: A review and a proposal for a new standard care. *Wound Repair and Reperation*, (23) 638–643.
51. Prakash, S.; Thakur, A. (2011) Platelet concentrates: Past, present and future. *Journal Maxillofacial and Oral Surgery*, (10) 45–49.
52. Rogers, M.J., Watts, D.J., Russell, R.G. (1997) Overview of bisphosphonates. *Cancer*, (80) 1652-1660.
53. Rosenthal, A.R.; Harbury, C.; Egbert, P.R.; Rubenstein, E. (1975) Use of a platelet-fibrinogen-thrombin mixture as a corneal adhesive: Experiments with sutureless lamellar keratoplasty in the rabbit. *Investigator Ophthalmology*, (14) 872–875.
54. Rosenthal, A.R., Egbert, P.R., Harbury, C., Hopkins, J.L., Rubenstein, E. (1978) Use of platelet-fibrinogen-thrombin mixture to seal experimental penetrating corneal wounds. *Albrecht Graefes Arch Klin Experimental Ophthalmology*, (207) 111–115.
55. Roffi, A., Filardo, G., Assirelli, E., Cavallo, C., Cenacchi, A., Facchini, A., Grigolo, B., Kon, E., Mariani, E., Pratelli, L., (2014) Does platelet-rich plasma freeze-thawing influence growth factor release and their effects on chondrocytes and synoviocytes? *Biomedical Research International*,(2014) 692913.
56. Ruggiero, S.L., Dodson, T.B., Fantasia, J., Goodday, R., Aghaloo, T., Mehrotra, B., O’Ryan, F. (2014) American association of oral and maxillofacial surgeons position paper on medication-related osteonecrosis of the jaw-2014 update. *Journal of Oral and Maxillofacial Surgery*, 72(10) 1938-1956.
57. Saad Setta, H., Elshahat, A., Elsherbiny, K., Massoud, K., Safe, I. (2011) Platelet-rich plasma versus platelet-poor plasma in the management of chronic diabetic foot ulcers: A comparative study. *International Wound Journal*, (8) 307–312.
58. Saadoun, A.P., Touati, B. (2007) Soft tissue recession around implants: Is it still unavoidable? Part II. *Practice Procedure Aesthetic Dentistry*, (19) 81–87.
39. Scully, C., Wolff, A. (2002) Oral surgery in patients on anticoagulant therapy. *Oral Surgery.Oral Medicine. Oral Pathology. Oral Radiology. Endodontology*, (94) 57–64.
59. Sammartino, G., Dohan Ehrenfest, D.M., Carile, F., Tia, M., Bucci, P. (2011)Prevention of hemorrhagic complications after dental extractions into open heart surgery patients under anticoagulant therapy: The use of leukocyteand platelet-rich fibrin. *Journal Oral Implantology*,(37)681–690.
60. Sammartino, G., Tia, M., Marenzi, G., di Lauro, A.E., D’Agostino, E., Claudio, P.P. (2005) Use of autologous platelet-rich plasma (PRP) in periodontal defect treatment after extraction of impacted mandibular third molars. *Journal Oral and Maxillofacial Surgery* (63) 766–770.
61. Sánchez, M., Anitua, E., Orive, G., Mujika, I., Andia, I. (2009)Platelet-rich therapies in the treatment of orthopedic sport injuries. *Sports Medicine*, (39) 345–354.
62. Schliephake H. (2002) Bone growth factors in maxillofacial skeletal reconstruction. *International Journal Of Oral Maxillofacial Surgery*, (31) 469–484.
63. Shiga, Y., Orita, S., Kubota, G., Kamoda, H., Yamashita, M., Matsuura, Y., Yamauchi, K., Eguchi, Y., Suzuki, M., Inage, K. (2016)Freeze-dried platelet-rich plasma accelerates bone union with adequate rigidity in posterolateral lumbar fusion surgery model in rats. *Science Replication*, (6) 36715.
64. Silverberg, G.D.; Harbury, C.B.; Rubenstein, E. (1977) A physiological sealant for cerebrospinal fluid leaks. *Journal Neurosurgery*, (46) 215–219.
21. Reed, G.L. (2004) Platelet secretory mechanisms. *Seminars In Thrombosis and Hemostasis*,(30)441–450.

65. Simonpieri, A., Del Corso, M., Vervelle, A., Jimbo, R., Inchingolo, F., Sammartino, G., Dohan Ehrenfest, D.M. (2012) Current knowledge and perspectives for the use of platelet-rich plasma (PRP) and platelet-rich fibrin (PRF) in oral and maxillofacial surgery part 2: Bone graft, implant and reconstructive surgery. *Current Pharmacology and Biotechnology*, (13) 1231–1256.
66. Simonpieri, A., Del Corso, M., Sammartino, G., Dohan Ehrenfest, D.M. (2009) The relevance of Choukroun's platelet-rich fibrin and metronidazole during complex maxillary rehabilitations using bone allograft. Part II: Implant surgery, prosthodontics, and survival. *Implant Dentistry*, (18) 220–229.
67. Simonpieri, A., Del Corso, M., Sammartino, G., Dohan Ehrenfest, D.M. (2009) The relevance of Choukroun's platelet-rich fibrin and metronidazole during complex maxillary rehabilitations using bone allograft. Part I: A new grafting protocol. *Implant Dentistry*, (18) 102–111.
68. Sommeling, C.E., Heyneman, A., Hoeksema, H., Verbelen, J., Stillaert, F.B., Monstrey, S. (2013) The use of platelet-rich plasma in plastic surgery: A systematic review. *Journal Plastic Reconstructive Aesthetic Surgery*, (66) 301–311.
69. Thorat, M.; Pradeep, A.R.; Pallavi, B. (2011) Clinical effect of autologous platelet-rich fibrin in the treatment of intra-bony defects: A controlled clinical trial. *Journal Clinical Periodontology*, (38) 925–932.
70. Torres, J., Tamimi, F.M., Tresguerres, I.F., Alkhraisat, M.H., Khraisat, A., Lopez-Cabarcos, E., Blanco, L. (2008) Effect of solely applied platelet-rich plasma on osseous regeneration compared to Bio-Oss: A morphometric and densitometric study on rabbit calvaria. *Clinical Implant Dent Relation Research*, (10) 106–112.
71. Weibrich, G., Hansen, T., Kleis, W., Buch, R., Hitzler, W.E. (2004) Effect of platelet concentration in platelet-rich plasma on peri-implant bone regeneration. *Bone*, (34) 665–671.
72. Whitman, D.H.; Berry, R.L.; Green, D.M. (1997) Platelet gel: An autologous alternative to fibrin glue with applications in oral and maxillofacial surgery. *Journal Of Oral and Maxillofacial. Surgery*, (55) 1294–1299.