PLATELET RICH PLASMA IN ORAL AND MAXILLOFACIAL SURGERY

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Abstract : Platelet-rich plasma, or PRP, is now widey used in wound healing in the field of dentistry. Following any surgical procedure , blood clots initiate the healing and regeneration of hard and soft tissues. Several studies are being carried out to investigate the use of PRP in dentistry as a way to enhance the body's natural wound-healing mechanisms.

Keywords : Platelet rich plasma , transfusion medicine , dentistry , oral and maxillofacial surgery .

1. INTRODUCTION :

Platelet rich plasma is obtained by centrifugation of autologous whole blood and then mixing it with thrombin and calcium chloride. PRP gel consists of high concentration of platelets and native concentration of fibrinogen . This platelet concentrate is activated by the thrombin and calcium chloride , which thereby results in the release of several growth factors from the alpha granules of platelets . These growth factors have a major role in the regulation of growth and development of variety of tissues .

Some of these factors that are released include platelet derived growth factor (PGDF) , transforming growth factor (TGF), platelet-derived epidermal growth factor (PDEGF), platelet-derived angiogenesis factor (PDAF), insulin-like growth factor 1 (IGF-1), and platelet factor 4 (PF-4).

The use of platelet-rich plasma, or PRP, is a way to accelerate and enhance the body's natural wound-healing mechanisms[1]. A naturally formed blood clot contains mainly red blood cells, approximately 5 percent platelets and less than 1 percent white blood cells . Platelets primarily are involved in wound healing through clot formation and the release of growth factors that initiate and support wound healing.

PDGF is chemotactic for polymorphonucleocytes, macrophages, fibroblasts and smooth muscle cells. It stimulates cell replication of fibroblasts and endothelial cells , production of fibronectin which is a cell adhesion molecule used in cellular proliferation and migration during healing, osteoconduction and hyaluronic acid[2] . Thereby it helps to bring about wound contraction and remodeling.

TGF-β stimulates fibroblast chemotaxis and cellular production of collagen and fibronectin It simultaneously inhibits collagen degradation by decreasing proteases and increasing protease inhibitors, each one of these favor fibrogenesis. Topical

application of these growth factors aid in healing wound sites. Pierce et al. studied the composition, quantity and rate of extracellular matrix deposition within growth factor–treated rabbit ear excisional wounds[3]. They observed that PDGF accelerated wound closure primarily through triggering connective tissue matrix deposition at the site of new granulation tissue. It was thus concluded that PDGF accelerates early wound healing by enhancing glycosaminoglycan, hyaluronic acid and fibronectin deposition.

TGF-β stimulated new collagen deposition and maturation into large bundles at the site of the wound, creating a mature fibroblastic wound directly. Several studies have shown that PDGF and TGF-β stimulate new granulation tissue formation [4].

PREPARATION OF PRP :

Whitman et al. described a technique in which one unit of whole blood is collected in a standard collection bag containing citrate – phosphate dextrose anticoagulant [5]. This blood is centrifuged at 5600 rpm . The centrifuge is then slowed to 2400 rpm , to allow for further separation of platelets and leukocytes from the red blood cell pack Into the resultant PRP , thrombin -calcium chloride mixture is added . Within 5 to 30 seconds , a gel is formeD . This PRP gel is injected into the surgical site as required .

USE OF PRP GEL IN ORAL AND MAXILLOFACIAL SURGERY :

Platelet rich plasma increases the rate of bone deposition and the quality of the bone being regenerated . Hence it has been increasingly used for augmenting edentulous sites for implant placement .

Sanchez et al. that PRP can be used for the treatment of peri implant defects , by using it in combination with bone grafts and barrier membranes . Garg et al. suggested that resorbable barrier membrane materials be infused with PRP. They stated that a PRP-based membrane will act as a short-acting biologic barrier, since all platelets contained in PRP will degranulate within 3 to 5 days, and their initial growth activity expires within 10 days [6].

Marx et al. performed a study on the use of PRP in combination with bone grafts[7]. They evaluated the effect of PRP on bone graft reconstructions of mandibular continuity defects 5 cm or greater. The authors reported that bone grafts combined with PRP showed a maturity index more than twice and slightly less than twice the actual maturity at 2 and 4 months, respectively.

All the available literature reviewed on PRP measured the ability of PRP to increase the bone density .

In the field of periodontics, researchers are assessing the use of PDGF in regenerative therapy. Cho et al. carried out a study to assess the cell type and source that were most essential in regenerative therapy so they could select the most appropriate and functional growth factors to use for stimulating periodontal regeneration[8]. They found that PGDF is the only growth factor that stimulated periodontal ligament fibroblast migration , without ankylosis of teeth .

DISADVANTAGE OF PRP :

The use of topical bovine thrombin in the preparation of PRP , results in the development of antibodies to factors V and XI and thrombin , resulting in life threatening coagulopathies .
Some amount of research has been carried out in this line and its has been reported by Kassolis et al. that the use of autologous thrombin can help prevent such conditions[9] . Landesberg et al. described a new technology to activate PRP gel , such as the ITA gelling agent [10].

2. CONCLUSION :

Transfusion and regenerative medicine is a relatively new field , and still requires a lot of research .Recent technologies have aided the preparation of prp by using smaller volumes of blood . Since it is an autologous preparation , it eliminates the possibility of contracting external diseases and infections . PRP gel improves the properties of the various grafts that are used . In the recent times, researchers have been using Platelet rich fibrin , instead of platelet rich plasma as it doesn't involve the addition of any external components .

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