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Review Article

Various applications of platelet rich fibrin in dentistry: A literature review

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ABSTRACT

Platelet rich fibrin is a part of platelet concentrate, that is derived from human blood and made through the process of centrifugation. It is an autogeneous bio material, which basically constitutes various growth factors, and cytokines that are entrapped in its matrix of fibrin. Platelet rich fibrin provides ideal environment for healing of the wound and the regeneration of the tissue. Platelet rich fibrin helps in regulating the inflammation process and increases the healing process.

1. Introduction

Healing is a complex process, which comprises of organization of different cells, chemical signals and matrix which is extracellular for the process of tissue repair.[1] Platelets plays an important role in the healing process by the action of hemostasis. Literature revealed that platelets contains growth factors that are responsible for the production of the collagen, they also plays an important role in growth of blood vessels and also helps in migrating the cells at the site of the injury.[2] Platelet rich fibrin is a bioactive surgical additive, that can be applied locally at the site of the injury, and ultimately helps in reducing the inflammation at the site of the injury.[3]

Literature revealed that platelet rich fibrin provides osteoconductive environment, which constitutes of growth factors that helps in regenerative process after any injury.[4] Following any injury, healing of any wound takes place by initiation of clot formation following inflammation, which is further followed by stage which is proliferative and comprises of epithelization , granulation and angiogenesis, which is followed by deposition of collagen, and finally leads to the stage of collagen maturation and contraction.

In 1970's, the use of fibrin glues, which are the derived products of blood concentrates , which were formed by the process of polymerization of thrombin , calcium with fibrinogen. It was found that the stability and quality of the glue fibrin was found to be low because of less concentration of fibrinogen in the blood plasma.[5,6]

Platelet rich fibrin was firstly used in the year 2004 by Choukroun et al. it is made up of autologous matrix of fibrin. It has some advantages like, it is easier to make, no chemical manipulation of the blood is needed in the fabrication of platelet rich fibrin.

Platelet rich fibrin basically constitutes of leukocyte platelet autologous fibrin matrix.[7] Which is made up of tetra molecular structure of tetrakines, stem cells and platelets which are present with in it.[8] That helps in epithelial migration of cells at its surface and helps in the formation of new blood vessels at its site. Platelet rich fibrin acts as a vehicle in transporting the cells in the process of tissue

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regeneration. And helps in continuous release of growth factors, which is quite helpful in regeneration process at the tissue injury site along with reducing the inflammation at the injury site. It constitutes of strong fibrin matrix.[9–11]

Literature revealed that platelet rich fibrin has a great potential of bone as well as soft tissue regeneration without any negative response of inflammation, and it can be used directly to close the surgical wound alone or can be used with combination of bone graft to cover the defect.[12,13] Some of the in vitro studies demonstrated that platelet rich fibrin have the great ability potential to increase cell attachment at the site of application. Some studies stated that platelet rich fibrin also have some anti-bacterial properties in itself, that helps in the degranulation of the leukocyte.[14–16]

In surgical procedure like guided bone regeneration, platelet rich fibrin helps in preventing the migration of undesirable cells in to the surgical site area. Platelet rich fibrin which is applied over the surgical site has the ability to be degraded itself with in 7 to 14 days.[15]

Platelet rich fibrin can be used in the treatment of infrabony periodontal pocket, helps in accelerating hard as well as soft tissue healing.[16]

Platelet rich fibrin membrane can also be used in the process of maxillary sinus augmentation as a whole grafting material.[17,18]

Platelet rich fibrin membrane can be used in implant surgical procedure. After the placement of the implant before the surgical closure, placement of platelet rich fibrin membrane over the osteotomy site helps in reducing the inflammation at the surgical site. And if there is any bony defect, so platelet rich fibrin membrane can be used along with the bone graft, so to fill the bony defect and close the surgical site with the PRF membrane, ultimately helps in reducing the inflammatory response at the surgical site.

Preparation of platelet rich fibrin

Blood from the patient is collected in a test tube and the test tube with the collected blood is placed in the centrifugal machine without any addition of anti coagulants or bovine thrombin. Blood sample is collected in glass coated plastic tube. After the sample is centrifuged at 3000 rotations per minute for atleast 12 to 15 minutes. After the desired time the clot is retrieved from the glass coated tube. It consisted of three layers, the top most layer is of cellular plasma, the middle layer constitute of platelet rich fibrin clot and the bottom layer consists of red corpuscles. After than the platelet rich fibrin clot is squeezed between the two sterile guaze, so that the platelet rich fibrin clot is transformed in to the membrane.

1.1. Advantages of platelet rich fibrin

1. Fabrication of platelet rich fibrin is less technique sensitive, as it requires only a centrifugal machine, for the fabrication of platelet rich fibrin membrane.
2. It is fabricated by a blood sample, which is totally autologous in nature
3. This process requires minimum blood manipulation
4. This procedure does not require addition of any external anticoagulant with in it
5. This platelet rich fibrin membrane, have the ability to be used alone to close the defect surgically or can also be used with bone graft.
6. It increases the healing rate of the soft tissue
7. It decreases the inflammation rate
8. Very much economical, as it requires only the centrifugal machine, for the fabrication of the platelet rich fibrin membrane.
9. It avoids discomfort at the surgical site, where it has been placed

1.2. Disadvantages of platelet rich fibrin membrane

1. Final amount of the platelet rich fibrin that is available is very much low, when compared to the amount of the sample taken.
2. The final success rate of the platelet rich fibrin is totally dependent over the handling procedure of the prf membrane, as prf membrane constitutes of three layers.
3. Possible refusal of treatment by the puncture required for blood collection

1.3. Some other uses of platelet rich fibrin

1. It can be used in periodontal bony defects
2. In the reduction of osteitis
3. To preserve the height of alveolar ridge in cases where multiple extractions are required
4. In plastic surgeries platelet rich fibrin membrane can directly be harvested over the traumatic injury site.
5. Platelet rich fibrin can specifically be used in implant surgical phases, like in cases of immediate implant placement, as well as normal implant surgical phase. Platelet rich fibrin membrane can can also be used in combination with the bone graft to fill the bony defect and cover the osteotomy site with the help of platelet rich fibrin.

2. Conclusion

The use of platelet rich fibrin gives promising results in the process of wound healing as well as tissue regeneration process.

3. Conflict of Interest

The authors declare that there are no conflicts of interest in this paper.

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