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Therapeutic Potential of Autologous Fibrin Glue in Regenerative Dentistry: A Review

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Abstract

In the evolving era of surgeries, an innovative solution has emerged. This advancement not only streamlines surgical procedures but also helps clinicians meet the increasing expectations of modern dental patients. That solution is fibrin glue. The two fundamental components of fibrin glue are fibrinogen and thrombin. When combined, these solutions replicate the final stages of the coagulation cascade. Fibrin sealants can be utilized across a broad range of procedures and surgical applications, serving as an adjunct or alternative to sutures, hemostatic agents, and packing materials.

Keywords: Autologous fibrin glue, periodontal surgery, fibrin sealant.

Introduction

Fibrin glue, referred to as the Fibrin-Fibronectin Sealing System (FFSS), is composed of two distinct components. The first contains a high concentration of fibrinogen, Factor XIII, fibronectin, and minor amounts of other plasma-derived proteins. The second consists of thrombin, calcium chloride, and antifibrinolytic agents such as aprotinin. Upon mixing, these components activate the coagulation pathway, resulting in the formation and stabilization of a cross-linked fibrin

matrix.[1] Fibrin sealant, commonly referred to as fibrin glue, is utilized in surgical procedures both as a tissue adhesive and as an agent to promote hemostasis.[2] These benefits support early wound healing by allowing improved oral hygiene. Fibrin glue used in clinical practice can be broadly classified into three main subtypes: autologous glue, which is prepared from the patient's own plasma and processed to retain only the fibrin-rich components; homologous glue, which is derived from the pooled plasma of multiple human donors and processed to become fibrin-rich; and bovine glue, in which fibrin proteins are extracted from bovine plasma for therapeutic application.[3] Derived from a patient's own blood, offers a promising alternative to commercial fibrin sealants, particularly in terms of safety and efficacy. Its use eliminates the risk of allergic reactions and disease transmission associated with allogeneic products.[4] Fibrinogen, a key plasma protein, plays a central role in blood clot formation. When applied to a wound, it is activated by thrombin, converting it into fibrin monomers. Factor VIII facilitates the crosslinking of these monomers, resulting in the formation of an insoluble fibrin clot.[5] Calcium ions promote these reactions, which is why a small amount of calcium is included in the fibrin component mixture. Fibrin is widely used across surgical specialties—especially in cardiovascular, ENT, and neurosurgery.[6]

Rationale of Fibrin Glue in Dentistry

Autologous Fibrin Glue for Bone Regeneration in Tissue Engineering

Fibrin is an excellent natural scaffold for tissue engineering due to its biocompatibility, biodegradability, and ability to support stem cell stability. It enhances cell migration, proliferation, matrix formation, and tissue repair by accelerating angiogenesis and delivering growth factors.[7]

Fibrin Glue as an Alternative for Sutures

The use of fibrin sealant allows for precise tissue alignment and effective hemostasis, making it a preferable option over sutures. These benefits support early wound healing and helps in easier maintenance of oral cleanliness.[8]

Versatility in Periodontal Applications

Free Gingival Grafts (FGG) - Fibrin glue has been used in conjunction with free gingival grafts to treat gingival recession. The fibrin clot, which adheres firmly to the application site, functions as a fluid-tight sealant that stabilizes tissues or materials in the desired configuration while also providing effective hemostasis.[9]

Flap Surgeries and Mucogingival Surgeries

The use of autologous fibrin glue significantly enhances clinical outcomes and loweres pro-inflammatory cytokine levels, demonstrating its effectiveness as a healing adhesive in the advancement of suture-less periodontal flap surgery. When applied to the surgical site, it helps in stabilizing the flap, ensuring close adaptation of tissue edges, and creating a fluid-tight seal. This improves wound closure and minimizes micromovement, promoting more predictable healing.[10]

Preparation Technique and Application [11]

- 10 ml of the patient's blood will be collected in sterile vacutainers containing 0.9% sodium citrate.
- The blood will be centrifuged at 3000 rpm for 10 minutes. After centrifugation, three layers will be formed consisting of platelet-poor plasma on top, platelet-rich plasma in the center, red blood cells at the bottom.
- The platelet-poor plasma and platelet-rich plasma will be drawn into separate sterile syringes.
- Each plasma sample will be transferred into separate test tubes without anticoagulant.

- Protamine sulfate (10 mg/ml) will be added to both the platelet-poor and platelet-rich plasma to precipitate fibrinogen.
- The test tubes will be centrifuged at 1000 rpm for 5 minutes.
- After centrifugation, two layers will be observed with top layer of serum containing autologous thrombin and bottom layer of fibrinogen precipitate.
- The top serum will be carefully removed, leaving 0.5 ml behind to dilute the fibrinogen precipitate.
- The diluted fibrinogen precipitate will be aspirated into one syringe.
- A second syringe will be filled with calcium chloride (0.025 mmol/l).
- The solutions from both syringes will be applied in equal amounts under the surgical flaps.
- The surgical flaps will be held under digital pressure for 2-3 minutes.

Figure1 (a), (b), (c), (d): Procedure for the preparation of autologous fibrin glue [12]

Figure 1 (a): Elements necessary for the production of fibrin glue

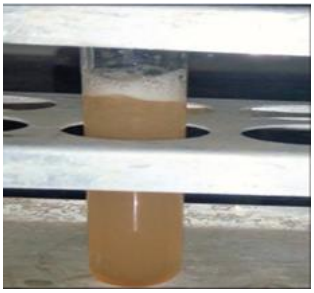

Figure 1 (b): Initial centrifugation leads to separation of PPP and PRP

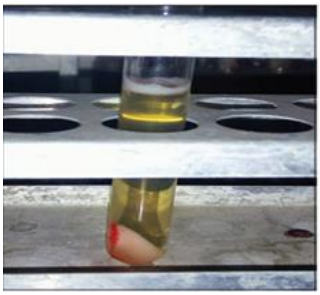

Figure 1 (c): Fibrinogen precipitate forms a sediment layer after the second spin

Figure 1 (d): Application of Fibrin glue

Limitations

Preparation Time and Equipment - The preparation of fibrin glue is challenging due to the need for multiple components (fibrinogen, thrombin, antifibrinolytics and calcium chloride) temperature sensitivity and complex, time-consuming chairside procedures.[12]

Volume Limitations - Volume is limited by the safe amount of blood that can be drawn, which may be insufficient for larger surgical sites.[13]

Risk of Incomplete or Unstable Clot Formation- Physiological levels of fibrinogen and thrombin vary among individuals, leading autologous fibrin glues to have lower adhesive strength, weaker clot formation, and longer coagulation times compared to commercial fibrin glues.[13]

Precautions

Sterile Technique - Careful adherence to sterile technique is crucial during Autologous Fibrin Glue preparation and application to minimize contamination and infection risks.

Training and Expertise: Healthcare providers should be adequately trained in the preparation and application of autologous fibrin glue to ensure optimal outcomes and minimize complications.

Proper Storage and Handling: Timely application of autologous fibrin glue is essential, as its potency diminishes over time and unsuitable storage can further degrade its quality.

Role of Autologous Glue

Autologous fibrin glue (AFG) has gained prominence as a multifunctional biomaterial in surgical practice, presenting notable benefits over conventional approaches like sutures and synthetic adhesives. Its inherent qualities such as excellent biocompatibility, natural biodegradability, and effective hemostatic action make it well-suited for a wide range of clinical applications.[13] Autologous fibrin glue has proven effective in various surgical fields. In ophthalmology, it reduces operative time and discomfort in pterygium surgery. In dermatology, it improves skin graft adherence and supports second-intention healing, leading to better patient outcomes.[14] In bone tissue engineering, especially in maxillofacial surgery ,autologous fibrin glue functions as an effective scaffold for delivering stem cells. Its natural structure facilitates cell migration and proliferation, and when combined with mesenchymal stem cells, it shows significant potential for regenerating bone and cartilage.[15] Autologous fibrin glue is generally considered safe, with a low rate of adverse effects. However, potential complications such as allergic reactions and thromboembolic events may occur, especially if the glue enters the bloodstream. Therefore, careful patient selection and correct application techniques are essential to minimize these risks.[16]Although autologous fibrin glue offers several benefits, it also has limitations. Its use is contraindicated in specific scenarios, such as within blood vessels, due to the risk of clot formation. Moreover, while various studies have demonstrated its effectiveness, inconsistencies in study quality and methodology emphasize the need for standardized protocols and larger clinical trials to confirm its safety and efficacy across diverse surgical fields.[17] Fibrin glue stands out as the only adhesive material routinely available that offers such versatility and safety. It possesses several key characteristics ideal for wound healing applications, including biodegradability and biocompatibility. Composed of components naturally involved in the body's wound healing process, adheres to tissues through physiological mechanisms and maintains strong adhesion even on moist surfaces.[18]

Conclusion

Autologous fibrin glue (AFG) has gained prominence as a multifunctional biomaterial in surgical practice, presenting notable benefits over conventional approaches like sutures and synthetic adhesives. Its inherent qualities—such as excellent biocompatibility, natural biodegradability, and effective hemostatic action—make it well-suited for a wide range of clinical applications.[19]

References

1. Jathal B, Trivedi A, Bhavsar N. Use of fibrin glue in periodontal flap surgery. Journal of Indian Society of Periodontology. 2008 Jan 1; 12(1):21-5.
2. Pulikkotil SJ, Nath S. Fibrin sealant: a review of its applications in periodontal surgery. International Journal of Experimental Dental Science. 2015 Dec 1; 4(1):40-6.
3. Paw E, Vangaveti V, Zonta M, Heal C, and Gunnarsson R. Effectiveness of fibrin glue in skin graft survival: A systematic review and meta-analysis. Annals of Medicine and Surgery. 2020 Aug 1; 56:48-55.

4. Moraes AM, Annichino-Bizzacchi JM, Rossi AB. Use of autologous fibrin glue in dermatologic surgery: application of skin graft and second intention healing. Sao Paulo Medical Journal. 1998; 116:1747-52.
5. Jain R, Wairkar S. Recent developments and clinical applications of surgical glues: An overview. International journal of biological macromolecules. 2019 Sep 15; 137:95-106.
6. Brennan M. Fibrin glue. Blood reviews. 1991 Dec 1;5(4):240-4.
7. Khodakaram-Tafti A, Mehrabani D, Shaterzadeh-Yazdi H. An overview on autologous fibrin glue in bone tissue engineering of maxillofacial surgery. Dental research journal. 2017 Mar; 14(2):79.
8. Mounsif M, ezzahraa Smouni F, Bouziane A. Fibrin sealant versus sutures in periodontal surgery: A systematic review. Annals of Medicine and Surgery. 2022 Apr 1; 76:103539.
9. Srinivas BV, Rupa N, Kumari KH, Rajender A, Reddy MN. Treatment of gingival recession using free gingival graft with fibrin fibronectin sealing system: A novel approach. Journal of Pharmacy and Bioallied Sciences. 2015 Aug 1; 7(Suppl 2):S734-9.
10. Pradhan N, Anup Belludi S, HR V, James R. Evaluation and comparison of the efficacy of autologous fibrin glue with 4-0 silk sutures in periodontal flap closure and wound healing-A split mouth randomized controlled trial. Journal of Biomaterials Applications. 2023 Sep; 38(3):412-23.
11. Sunny R, Devisree R V, Krishnankutty N , T. P. Padmakumar, Azeez M, Harikrishnan B Comparative Evaluation of Simplified Autologous Fibrin Glue and Silk Suture in Healing
12. Dave BP, Sathyanarayana S. Periodontal flap closure using a simplified autologous fibrin glue preparation: A report of two successful cases. J Indian Soc Periodontol. 2020 Nov-Dec; 24(6):579-582. doi: 10.4103/jisp.jisp_630_19. Epub 2020 Sep 21. PMID: 33424178; PMCID: PMC7781247.
13. Fernández-Vega-Cueto L, Persinal-Medina M, Vázquez N, Chacón M, Alfonso-Bartolozzi B, Alonso-Alonso S, Sánchez T, Berisa-Prado S, Martínez-López LM, Merayo-Lloves J, Meana Á. A simple, safe, and effective method for preparing autologous bio-based fibrin glue for ophthalmic use. Pharmaceutics. 2022 Oct 28;14(11):2325.
14. Spotnitz WD, Burks S. Hemostats, sealants, and adhesives: components of the surgical toolbox. Transfusion. 2008 Jul; 48(7):1502-16.
15. Rekha BK, Girimallanavar SV. Efficacy of autologous fibrin glue versus sutures for conjunctival autograft in pterygium surgery: A 1-year randomized controlled study. Journal of Clinical Ophthalmology and Research. 2020 Jan 1; 8(1):24-9.
16. Ortiz AD, Fideles SO, Pomini KT, Reis CH, Bueno CR, Pereira ED, Rossi JD, Novais PC, Pilon JP, Rosa Junior GM, Buchaim DV. Effects of therapy with fibrin glue combined with mesenchymal stem cells (MSCs) on bone regeneration: a systematic review. Cells. 2021 Sep 5; 10(9):2323.
17. Tawes Jr RL, Sydorak GR, DuVall TB. Autologous fibrin glue: the last step in operative hemostasis. The American journal of surgery. 1994 Aug 1; 168(2):120-2.
18. Sierra DH. Fibrin Sealant Adhesive Systems: A Review of Their Chemistry, Material Properties and Clinical Applications. Journal of Biomaterials Applications. 1993; 7(4):309-352.
19. Reiss RF, Oz MC. Autologous fibrin glue: production and clinical use. Transfusion Medicine Reviews. 1996 Apr 1; 10(2):85-92.