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Research Article

FIBRIN GLUE-A SEALANT FOR ORAL AND MAXILLOFACIAL SURGERY

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ABSTRACT

Aim: To present the applications of Fibrin Glue in various cases related to Oral and Maxillofacial Surgery and to discuss the clinical outcome.
Material and Methods: Fibrin Glue, composed of human fibrinogen and human thrombin was used in various cases like coverage of raw areas after fibrotomy in Oral Submucous Fibrosis, closure of oroantral Fistulae, to seal soft -tissue defects, fixation of bone grafts and coverage of denuded bone and to control intra-operative and postoperative bleeding.
Results: Intraoperatively, instant hemostasis was achieved with complete sealing of raw area. Post operative healing was satisfactory and faster as compared to the areas treated without Fibrin Glue. Patients were comfortable, no Ryles tubes were required and no immediate or delayed adverse reactions reported. All patients are under follow up.
Conclusion: Fibrin Glue can be used safely and routinely in various cases of Oral and Maxillofacial Surgeries.

INTRODUCTION

A number of surgeries in the oral and maxillofacial region inevitably leads to creation of large soft and hard tissue defects. Primary closure of these areas may not be always possible thereby necessisating the need for a biological dressing for these raw areas. Fibrin glue proves to be one such excellent material. Over the years, Fibrin glue has proved to be a perfect blend of tissue adhesive and hemostatic properties, maintaining a favourable balance between the two.

Bergel[1] was the first to use Fibrin Glue as a hemostatic agent in 1909. Grey[2] in 1915 used fibrin glue in cerebral surgery for achieving hemostasis. The tissue adhesive property of Fibrin glue was studied in 1940 by Young and Medawar[3].The first biologic adhesive, a mixture of bovine thrombin with plasma fibrinogen was produced in 1943 by Cronkite *et al*[4]. Tidrick and Warren[5] used fibrin glue for fixation of skin grafts. Matras *et al* in 1972[6] improvised fibrin glue by increasing its fibrinogen concentration. Several homologous preparations of Fibrin glue are available such as Tisseel™, Reliseal™, Evicel™.

The usual components of Fibrin Glue can be listed as in Table 1

Table 1 Components of Fibrin Glue

Sr.No	Components
1	Sealer Protein Concentrate Lyophilized for Sealer protein Solution,Human ,Vapour heated Total protein Factor XIII Fibrinogen(clottable protein Fibronectin Plasminogen
2	Aprotinin solution ,Solvent for Sealer Protein Solution Concentrate Lyophilized,Aprotinin,synthetic
3	Human Thrombin Lyophilized for Thrombin Solution,Human ,Vapour Heated
4	Calcium Chloride Solution, Solvent for Thrombin Powder Ca^{+2}

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Table 2 Various Commercially Available Preparations of Fibrin Glue

Components / Product	Fibrinogen (mg/ml total protein)	Thrombin	Aprotonin	Other components
TISSEEL Lyo	72 - 110	500 IU , human	3000 KIU/ml, synthetic	Calcium Chloride Solution
EVICEL	80 - 120	800 - 1,200 IU, Human	---	Arginine hydrochloride, Glycine, Sodium chloride, Sodium citrate, Calcium chloride, , Human albumin, Mannitol, Sodium acetate, Water for injection (WFI)
Reliseal	70	500 IU, human	3000 KIU	

Preparation of Fibrin Glue includes multiple steps and needs approximately 10 to 15 minutes. The vials containing Fibrin and Aproptinin solution are placed in a mechanical heating and mixing device which heats both the solutions to 37 degree C. With the help of a syringe, aproptinin is transferred into Fibrin vial. This constitutes first component. The Fibrin vial contains a mixing rod which helps a uniform mixing and dissolving of the product when placed in the heating device. Calcium Chloride is added to the heated thrombin via a syringe –this constitutes second component. A dual syringe delivery system helps quicker and thorough mixing of both components while delivery and their simultaneous application.

This article documents the results in 50 patients who received Fibrin Glue during maxillofacial procedures.

MATERIAL AND METHODS

Over a period of 10 years, from 2006 to 2016, Fibrin glue was used in 50 patients who underwent maxillofacial surgical procedures. The post operative course of each patient was noted.

In 40 patients of Oral Submucous Fibrosis, the raw areas after fibrotomy were covered with FG. In 3 patients with benign tumors of the palate, where palatal mucosa was involved in the lesion and had to be sacrificed during excision of tumor mass intra operatively, the exposed palatal bone intraorally was covered with Fibrin Glue™ . Fibrin Glue™ was also used as a sealant over suture lines in critical areas with little or no bony support in 2 patients.

Persistent oro-nasal oro-antral fistulae were repaired using a combination of local flaps and Fibrin Glue™. Fibrin glue was used in each instance to help with closure of the nasal and antral lining. A combination of sutures and Fibrin Glue was used to provide oral closure in 5 patients.

RESULTS

Patients treated with Fibrin Glue were kept under observation for a minimum of 6 months and maximum of 10 years. 50 patients treated with Fibrin Glue had successful results. None of the patients showed any adverse reactions. Both intra operative and post operative bleeding was well controlled. Intraoperatively, instant hemostasis was achieved with complete sealing of raw area. Post operative healing was satisfactory and faster as compared to the areas treated without Fibrin Glue. Patients were comfortable.

Oronasal and oroantral fistulae remained closed. One of the patients showed recurrent oro nasal commumnication.

Table 3 Various Conditions In Which Fibrin Glue Was Used

Indication	No of patients
Coverage of raw areas in osmf	40
Coverage of denuded bone	3
Soft tissue sealant in Oronasal , Oroantral communication	5
As a Sealant over suture line	2

DISCUSSION

Fibrin glue resembles the final stage of the coagulation cascade in which thrombin cleaves fibrinopeptides A and B from fibrinogen. Thus forming a fibrin monomer which later crosslinks by the action of factor XIII (Fibrin Stabilizing Factor) in the presence of calcium resulting in a stable fibrin clot. Hemostasis is thus possible, even in the case of a coagulation defect.

In Oral Submucous Fibrosis Patients, after excision of the bands intraorally, wide raw areas are created. These raw areas tend to bleed both intra operatively and post operatively and heal by secondary intention in approximately 2 weeks. Also, these raw areas are very painful for the patient especially during post operative physiotherapy for mouth opening. Application of FG in these raw areas helps control intraoperative bleeding; reduces post operative healing time thereby resulting in decreased pain; thus facilitating better compliance for post operative physiotherapy.

In patients of oronasal and oroantral fistulae, local flaps were used for closure. In combination with that, FG application over it holds the flap well in position and strengthens the sutures thereby providing adequate closure of fistulae.

In cases where the flaps do not rest on a sound bone after removal of bony pathology intraoperatively, after approximation of the flaps and suturing ,FG application helps proper sealing of soft tissues thereby minimizing or almost nullifying the chances of post operative wound gaping. Advantages of FG can be summarised as follows:

1. As an adhesive dressing over raw areas ;reduces pain
2. Hemostatic properties.
3. Biological resorption properties;biocompatibility.
4. Reduces post operative inflammation and hastens wound healing.
5. Easily available, easy to handle and ready to prepare.
6. Patients can resume normal functions in immediate post operative period as no Ryles tube is required; decreased hospital stay.

Fibrin Glue has multiple applications in the field of oral and maxillofacial surgery. It is a safe, although not cost effective in developing countries, yet a clinically proven method of providing hemostasis, securing or glueing hard and soft tissue in proper position, and sealing friable or difficult-to-reach tissues. It does not and can never, however' replace good surgical technique. Future applications of this product include using FG as vehicle for the delivery of antibiotics and growth factors. Improved methods of producing autologous fibrin glue and recombinant products are also under development. These include lower cost, ease of procurement and better mechanical properties. The only disadvantage is the possibility of disease transmission. However, no cases of disease transmission have been documented with administrations of the product.

Our experience with Fibrin Glue in oral and maxillofacial surgical procedures was satisfactory. Fibrin Glue does not replace a good surgical technique but can be safely used in oral and maxillofacial surgery to get the best results.

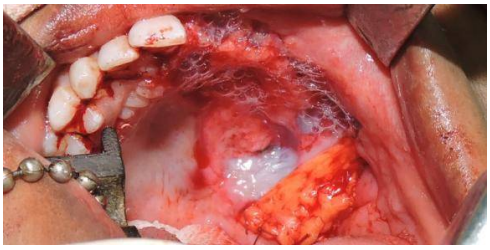

Fig 1 Denuded palatal bone covered with fibrin glue.

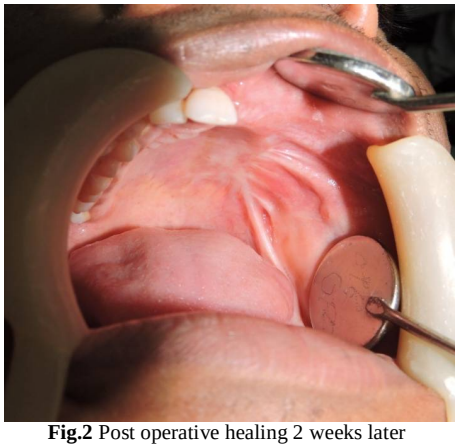

Fig.2 Post operative healing 2 weeks later

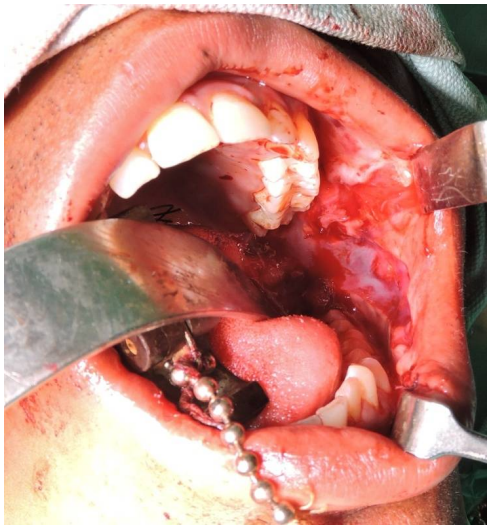

Fig 4A Fibrin Glue application over raw areas in Submucous Fibrosis

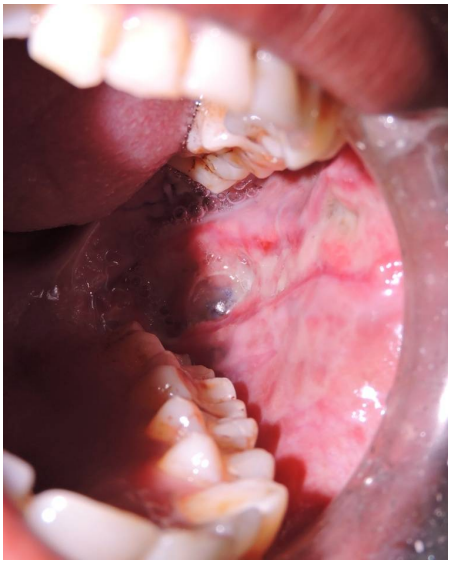

Fig. 4B Healing of raw areas 2 weeks later

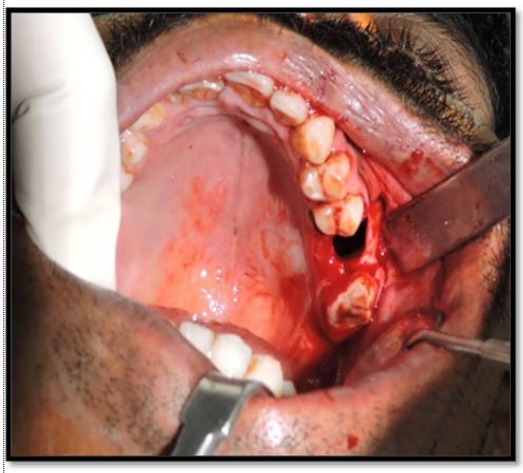

Figure 3A Combination of sutures & Fibrin Glue for Closure of oroantral fistula.

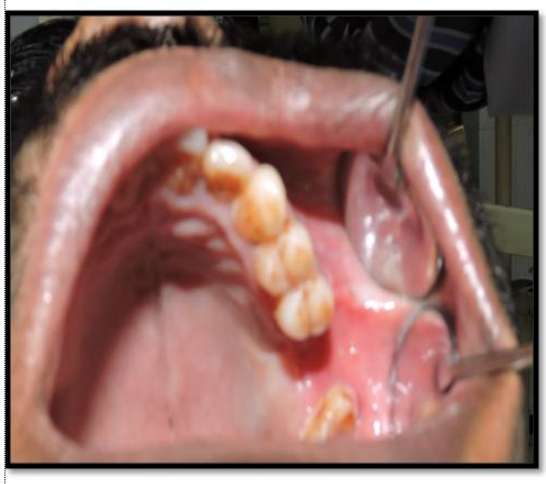

Figure 3B Healing after 2 weeks.

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