



## Clinical evaluations of autologous fibrin glue and polyglycolic acid sheets as oral surgical wound coverings after partial glossectomy



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### ABSTRACT

Polyglycolic acid (PGA) sheets and commercial fibrin glue are commonly used to cover open wound surfaces in oral surgery. Compared to commercial fibrin glue composed of pooled allogeneic blood, autologous fibrin glue is less expensive and poses lower risks of viral infection and allergic reaction. Here, we evaluated postoperative pain, scar contracture, ingestion, tongue dyskinesia, and postoperative bleeding in 24 patients who underwent partial glossectomy plus the application of a PGA sheet and an autologous fibrin glue covering (autologous group) versus 11 patients in whom a PGA sheet and commercial fibrin glue were used (allogeneic group). The evaluated clinical measures were nearly identical in both groups. Remarkable wound surface granulation was recognized in two cases in the autologous group. No complications were observed in either group, including viral infection or allergic reaction. Abnormal postoperative bleeding in the wound region was observed in one case in the allogeneic group. Coagulation and adhesion of the autologous fibrin glue were equivalent to those of conventional therapy with a PGA sheet and commercial fibrin glue. Thus, our results show that covering wounds with autologous fibrin glue and PGA sheets may help avoid the risks of viral infection and allergic reaction in partial glossectomy cases.

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## 1. Introduction

Oral cavity tumors such as squamous cell carcinomas are generally resected along with some of the tissue surrounding the tumor. In the past, oral surgery cases that required wound procedures for small or moderate oral mucosal defects utilized primary closures. However, primary closures are associated with frequent postoperative complications including cicatricial contracture, motility disturbances in soft tissues, and cosmetic disturbances. To reduce these postoperative disturbances, skin grafting of the intermediate layer with collagen-based artificial dermis from cattle has been applied. However, a major problem associated with skin grafting is secondary invasion of the donor skin area. Moreover, other artificial materials are simply temporary

wound covering materials that cannot directly promote wound healing. Recently, the technique of covering the open wound surface with a polyglycolic acid (PGA) sheet and commercial fibrin glue has been widely used in many oral surgery cases, and the utility and convenience of this method have been reported (Takeuchi et al., 2011, 2013; Terasawa et al., 2013).

PGA is an absorbent and strong material that is gradually degraded by hydrolysis and that slowly loses strength *in vivo*; currently, PGA is used in the manufacture of absorbable surgical sutures. The PGA sheet material is a soft, nonwoven fabric known for its flexibility, elasticity, and low cost when used clinically as an absorbable reinforcing material. The use of PGA sheets with fibrin glue for the treatment of lung injury and pulmonary artery damage has been demonstrated, including reports in the field of thoracic surgery where the sheets were used to close pulmonary fistulas (Tokushima et al., 2004). In addition, this technique has been used to prevent bile leakage after hepatectomy (Hayashibe et al., 2006).

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Fibrin glue is a biodegradable and absorbable biological agent that is widely used in abdominal operations to close the wound and fistula tract, reduce leakage and bleeding, promote wound healing, and prevent adhesion. Conventional commercial fibrin glue used in oral surgery cases contains pooled allogeneic human blood, is expensive, and carries small risks of allergic reaction and blood-borne viral infection such as human parvovirus B19, human immunodeficiency virus, and hepatitis C virus (Beierlein et al., 2000; Evatt et al., 2000; Jackson, 2001; Kawamura et al., 2002; Oswald et al., 2003). In contrast, autologous fibrin glue is a biomaterial made from autologous plasma. While used similarly to commercial fibrin glue, it is less expensive, and has no risk of blood-borne viral infection or allergic reaction (Shimizu et al., 2009). In the present study, the clinical features and outcomes of patients treated with oral surgery wound coverings made with autologous fibrin glue and PGA sheets were evaluated and compared with coverings made from commercial fibrin glue and PGA sheets.

## 2. Materials and methods

### 2.1. Patients

The study participants were patients with a clinical diagnosis of epithelial dysplasia or early tongue cancer (T1N0 or T2N0) who were scheduled for partial glossectomy in our department between January 2014 and February 2015. Patients who were pregnant, or who had anemia, malnutrition, hematological disorders, or viral or bacterial infections were excluded. The study clinically evaluated 24 patients who underwent partial glossectomy plus the application of a wound covering made of autologous fibrin glue and a PGA sheet (autologous fibrin glue group) and 11 patients who underwent partial glossectomy plus wound covering with commercial fibrin glue and a PGA sheet (allogeneic fibrin glue group). The differences between the two groups were mainly related to treatment timing.

### 2.2. Autologous fibrin glue

The autologous fibrin glue was obtained as described below. We collected 200–400 mL of peripheral blood from the patient in advance. This whole blood was placed in a centrifugal separator and centrifuged at 4280  $\times g$  for 7 min to obtain blood plasma; the plasma was stored at  $-40^{\circ}\text{C}$ . Blood plasma that had been thawed to  $4^{\circ}\text{C}$  was centrifuged at 3660  $\times g$  for 20 min; the supernatant was removed and approximately 5–10 mL of autologous cryoprecipitate was preserved for surgery. The autologous fibrin glue was a mixture of this autologous cryoprecipitate, which was obtained by autologous blood transfusion, as the fibrinogen component, and commercial thrombin (Liquid Thrombin MOCHIDA Softbottle, Mochida, Tokyo, Japan), which was added to calcium chloride (CALCICOL, Nichi-iko, Toyama, Japan). A PGA sheet (NEOVEIL, Gunze Ltd., Osaka, Japan) with a thickness of 0.15 mm was selected in all cases.

### 2.3. Covering the wound with autologous fibrin glue and a PGA sheet

We performed the glossectomy procedure during surgery under general anesthesia. A 10% concentration of Lugol's solution was applied to the tongue for glossectomy, and resection was performed 10 mm away from the induration of the cancer and 5 mm away from the margin of the area unstained by Lugol's solution. After ensuring hemostasis by applying an electric knife or ligature to the wound, a small amount of autologous cryoprecipitate was rubbed and impregnated into the wound using a finger. Then, a PGA sheet trimmed to the same shape as the wound was affixed and an



Fig. 1. Spraying of autologous fibrin glue onto the PGA sheet.

autologous fibrin glue mixture of 5 mL each of 5000 units of thrombin with calcium chloride was added; autologous cryoprecipitate was sprayed onto the sheet and surrounding wound using a spray kit (Fig. 1). To confirm that it had hardened, excess fibrin glue was removed with scissors 1 min later.

The allogeneic fibrin glue (Bolheal, Chemo-Sero-Therapeutic Research Institute, Kumamoto, Japan) and a PGA sheet were affixed to the open wound after excision in the same manner as that described for covering the wound with autologous fibrin glue and a PGA sheet.

### 2.4. Clinical evaluations

We clinically evaluated the following: patients' scores on the Numerical Rating Scale (NRS) for postoperative pain, the number of days that rescue doses of medication for postoperative pain were taken, postoperative meal ingestion, dyskinesia of the tongue, postoperative bleeding, and the number of days until the PGA sheet was cast off in the autologous fibrin glue group versus the allogeneic fibrin glue group. Average NRS scores were evaluated at 1 week after surgery. Rescue doses of loxoprofen were administered for postoperative pain. Postoperative ingestion was evaluated by determining the average ingestion during the first 28 postoperative days. As a general rule, feeding by nasogastric tube was performed for 2 days after surgery; therefore, the meals consisted of liquid or chopped food that met each patient's nutritional requirements. Dyskinesia of the tongue was evaluated as protruding forward, upward, or laterally by referring to Matsunaga et al. (2002) and Rogers et al. (2002) on the 28th day after surgery. The criteria and scoring (on a scale of 7) that were used in this study are presented in Table 1. The average follow-up times for the patients were 34.9 days while under admission and at least 13 months as outpatients.

Table 1  
Scores evaluating dyskinesia of the tongue.

Evaluation criteria	Points
Tongue protrusion forward	
Immobile	0
To the alveolus	1
To the upper part of the lower lip	2
To the lower part of the lower lip	3
Lateral tongue movement	
Immobile	0
Contacts only the unilateral angle of the mouth	1
Contacts the bilateral angles of the mouth	2
Upper tongue movement	
Immobile	0
Does not contact the palate	1
Contacts the palate	2

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