

# The Bipolar Coagulation Forceps Prevented Salivary Fistula in Patients with Parotidectomy

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## Research article

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# Abstract

**Background:** Salivary fistula is a relatively common complication in patients with parotidectomy. The purpose of this study was to investigate the effect of bipolar coagulation forceps in salivary fistulas.

**Method and Material:** From March 2015 to June 2020, 177 patients for management of parotidectomy were recruited from the Department of Oral and Maxillofacial Surgery at the Second Xiangya Hospital, Central South University. The patients were divided into experimental group and control group according to application of bipolar coagulation forceps or suture, respectively.

**Results:** The draining output of experimental group was dramatically decreased compared to control group ( $p = 0.04$ ). The duration of pressure dressing application in experimental group was significantly increased compared to control group ( $p = 0.0003$ ). Moreover, the incidence of salivary fistula in experimental group (9.8%, 8/82) was notably lower than that in control group (34.7%, 33/95) ( $p < 0.0001$ ). In logistic regression model for salivary fistula development, both of bipolar coagulation forceps ( $p = 0.0026$ ) and draining output ( $p = 0.0186$ ) associated with salivary fistula.

**Conclusion:** Our findings indicated that bipolar coagulation forceps decreased the incidence of salivary fistula in parotidectomy patients. The bipolar coagulation forceps is a safe, effective, and convenient method to prevent salivary fistulas in parotidectomy patients.

## Introduction

Salivary gland tumor is relatively rare and constitute approximately 3–4% of head and neck tumors[1]. Moreover, parotid tumor is the most common salivary gland tumors, accounting for 80% of salivary gland neoplasms[2]. Although the most tumors in minor salivary gland are malignant, the majority tumors in parotid tumors are benign[1]. Parotid neoplasms vary widely in pathological diagnoses[3], while the complications present usually similarly due to common anatomic location. The surgical treatment is still a universally accepted therapy for benign parotid neoplasms. The parotidectomy inevitably destroy the entirety of parotid lead to various complications including facial nerve paralysis, salivary fistula and Frey's syndrome.

Salivary fistula is a relatively common complication that occurs between 5–39%[4], decreasing the quality of life in patients with parotidectomy. This complication also could cause visible scarring and wound infection. To meet this challenge, a continuing pressure dressing for the parotid region is necessary, which lead to esthetic morbidity, prolonged hospitalization, increased costs, and emotional instability[5]. Thus, it is important to identify a novel treatment that decrease the occurrence of salivary fistula.

In preset study, we aimed to investigate the effect of bipolar coagulation forceps in salivary fistulas. This study revealed that bipolar coagulation forceps can be applied in parotidectomy to reduce the incidence of salivary fistulas.

## Method And Material

### Patients and study design

The present study was a retrospective cohort study. From March 2015 to June 2020, 177 patients for management of parotidectomy were recruited from the Department of Oral and Maxillofacial Surgery at the Second Xiangya Hospital, Central South University. The study was approved by the institutional review board of the Second Xiangya Hospital and informed consent was obtained from all participants. The patients with parotidectomy history were excluded. The surgical procedures were performed by senior surgeons. The surgical procedures include tumor and partial superficial parotidectomy with branched facial nerve dissection, tumor and partial superficial parotidectomy with main trunk facial nerve dissection, tumor and total parotidectomy with main trunk facial nerve dissection. Then, the operative wound of parotidectomy were sealed by bipolar coagulation forceps (TIANEN TECHNOLOGY Co., Ltd, China) or sutured, respectively. The patients were divided into experimental group and control group according to application of bipolar coagulation forceps (Fig. 1) or suture, respectively. Finally, negative pressure drainage devices were used to collect postoperative secretion. The restraining bandage was used for maintaining a continuing pressure to operative region, postoperatively. The 24 h drainage were recorded for each day until the negative pressure drainage was uprooted with the criterion that the drainage was < 10 mL for two consecutive days or after 8 days[3]. All patients underwent routine observation and strict follow-up. Salivary fistula was defined when an effusion developed in surgical region after removing drainage device. The clinical parameters of patients were obtained from medical record. The tumor volume was measured using the following formula: tumor volume =  $0.5 \times \text{length} \times \text{width}^2$ .

### Statistical analysis

Data were analyzed using SPSS 17.0 (SPSS, Chicago, IL, USA). The significance of differences between groups were performed with the chi squared, t test, Fisher's exact test or the nonparametric Mann-Whitney U test depending on the type of data and distribution. Logistic regression analysis was performed with salivary fistula. All values were two sided, and  $p < 0.05$  was considered to be significant.

### Results

A total of 177 patients were collected in this study, 77 patients were female and 100 patients were male. The mean age of these patients were  $46.26 \pm 16.46$  years (range from 7 to 71 years). Of these patients, 94 (53.1%) had partial superficial parotidectomy with branched facial nerve dissection, 75 (42.4%) partial superficial parotidectomy with main trunk facial nerve dissection, 8 (4.5%) total parotidectomy with main trunk facial nerve dissection. The most common histological types were pleomorphic adenoma (63/177, 35.6%) and Warthin tumor (54/177, 30.5%).

The clinical parameter was recorded in Table 1, and there were no significant differences between experimental and control group. The postoperative characteristics was showed in Table 2. The draining output of experimental group was dramatically decreased compared to control group ( $p = 0.04$ ). The duration of pressure dressing application in experimental group was significantly increased compared to control group ( $p = 0.0003$ ). Moreover, the incidence of salivary fistula in experimental group (9.8%, 8/82) was notably lower than that in control group (34.7%, 33/95) ( $p < 0.0001$ ). In logistic regression model for salivary fistula development, both of bipolar coagulation forceps ( $p = 0.0026$ ) and draining output ( $p = 0.0186$ ) associated with salivary fistula.

## Discussion

Salivary fistula is a relatively common complication in patients treated with parotidectomy. Salivary fistulas could persist for a long period after complete wound healing, which may lead to visible scarring and wound infection. To meet this challenge, we aimed to investigate the effect of bipolar coagulation forceps in salivary fistulas. In this study, the results suggested that the parotidectomy patients treated with bipolar coagulation forceps had a lower incidence of salivary fistulas.

The disease management always consist of diagnosis and therapy. The recent study suggested that drain fluid amylase could serve as a predictor for postoperative salivary fistula in benign parotid tumors[3]. The parotid capsule's persistence was correlated with salivary fistula[3], while closure of the parotid capsule had no effect on decreasing of salivary fistula postoperatively[6]. The results indicated that the size of parotidectomy wound area determined occurrence of salivary fistula postoperatively. For decreasing salivary fistula incidence, the previous studies reported many therapeutic techniques including reduction in oral intake and parenteral feeding[7], sewn site of the salivary leak[6], application of restraining bandage[3], use of anticholinergic agents[8, 9], injection of botulinum toxin[10–12], application of cyanoacrylates after closing skin incision[13], the resection of tympanic nerve[14], and management of radiation therapy[15]. In present study, our results showed that the application of bipolar coagulation forceps decreased the incidence of salivary fistula in parotidectomy patients. It could serve as a novel treatment for salivary fistula. As we expected, the patients in control group had more draining output than experimental group.

Electrosurgical instruments, producing heating, was used to control bleeding in surgical procedures[16]. Bipolar coagulation forceps always applied as hemostatic devices in operation[17, 18]. In present study, we found that the patients treated with bipolar coagulation forceps had a lower incidence of salivary fistula. Due to fragile characteristic of parotid gland, the parotid wound region, treated with surgical suture, easily developed to wound dehiscence postoperatively, caused salivary fistula. However, the bipolar coagulation forceps could seal parotid wound region between the forceps, which facilitated the fresh gland wound healing. This may explain that the parotid wound treated surgical suture had a high incidence of salivary fistula. The study of Zou showed that methylene was injected into Stensen's duct for ligating the broken duct[19], while the broken intercalated duct and secretory duct hardly had been

ligated. The application of bipolar coagulation forceps could resolve the problem. The convenience is the most advantage of bipolar coagulation forceps with universal application for hemostasis.

## **Conclusion**

In this study, we found that bipolar coagulation forceps decreased the incidence of salivary fistula in parotidectomy patients. The bipolar coagulation forceps is a safe, effective, and convenient method to prevent salivary fistulas in parotidectomy patients.

## **Declarations**

### **Acknowledgements**

Not applicable.

### **Authors' contributions**

KW wrote the paper. KW and YY carried out data collection. KZ and SL were involved in statistical analysis. SZ modified the paper and designed this study concepts. All authors read and approved the final manuscript.

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Not applicable.

### **Availability of data and materials**

The datasets used and analyzed during the current study are available from the corresponding author on reasonable request.

### **Ethics approval and consent to participate**

The study was approved by the institutional review board of the Second Xiangya Hospital and informed consent was obtained from all participants.

### **Consent for publication**

Not applicable.

### **Competing interests**

All authors reported no conflicts of interest.

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## Tables

Table 1. Clinical characteristics of patients treated with or without bipolar coagulation forceps.

Group	No. Of patients (%)		p value
	with bipolar coagulation forceps (n = 82)	without bipolar coagulation forceps (n = 95)	
<b>Age(y)</b>	46.76 ± 16.01	45.66 ± 17.04	0.6590
<b>Gender</b>			0.3647
Man	43(53.7)	57(60)	
Woman	38(46.3)	38(40)	
<b>Surgical procedure</b>			0.4377
A	40(48.8)	54(56.8)	
B	37(45.1)	38(40)	
C	5(6.1)	3(3.2)	
<b>Pathology</b>			0.6983
Pleomorphic adenoma	30 (36.6)	33 (34.7)	
Warthin tumor	23 (28.1)	31 (32.6)	
Branchial cyst	0	1 (1)	
Basal cell adenoma	4 (5)	6 (6.3)	
Monomorphic adenoma	2 (2.4)	2 (2.1)	
Tuberculosis	0	1 (1)	
Hemangioma	1 (1.2)	2 (2.1)	
Benign lymphoepithelial lesion	4 (5)	5 (5.3)	
Lymphoma	0	1 (1)	
Squamous cell carcinoma	3 (3.7)	2 (2.1)	
Chronic sialadenitis	2 (2.4)	2 (2.1)	
Neuroendocrine carcinoma	0	1 (1)	
Oncocytic carcinoma	1 (1.2)	1 (1)	
Neurilemmoma	1 (1.2)	0	
Myoepithelioma	1 (1.2)	0	
Oxyphilic adenoma	0	0	
Ductal papilloma	1 (1.2)	0	
Cystadenoma	2 (2.4)	1 (1)	
Mucoepidermoid carcinoma	1 (1.2)	2 (2.1)	
Acinic cell carcinoma	5 (6.1)	2 (2.1)	
Adenoid cystic carcinoma	0	1 (1)	
Lipoma	0	1 (1)	
Salivary duct carcinoma	1 (1.2)	0	
<b>Tumor volume</b>	14.53 ± 19.05	14.35 ± 34.37	0.9681
<b>Alcohol history</b>			0.2402
Yes	43 (52.4)	42 (44.2)	
No	39 (47.6)	53 (55.8)	
<b>Smoking history</b>			0.8914
Yes	38 (46.3)	45 (47.4)	
No	44 (53.6)	50 (52.6)	

The data showed as mean  $\pm$  SD; Surgical procedure, A: tumor and partial superficial parotidectomy with branched facial nerve dissection; B: tumor and partial superficial parotidectomy with main trunk facial nerve dissection; C: tumor and total parotidectomy with main trunk facial nerve dissection.

Table 2. The postoperative characteristics of patients treated with or without bipolar coagulation forceps.

Group	No. Of patients (%)		p value
	with bipolar coagulation forceps (n = 82)	without bipolar coagulation forceps (n = 95)	
<b>Draining output (ml)</b>	80.72 $\pm$ 57.08	118.9 $\pm$ 158.5	0.0400
<b>Duration of pressure dressing application (day)</b>	3.488 $\pm$ 1.259	4.347 $\pm$ 1.724	0.0003
<b>Salivary fistula</b>			<0.0001
Yes	8 (10)	33 (34.7)	
No	74 (90)	62 (65.3)	

The data showed as mean  $\pm$  SD.

Table 3. Logistical regression analyses of Salivary fistula and clinical characteristics.

Group	Regression Coefficient	OR (95% CI)	p value
<b>Age</b>	0.0001429	-0.003561 to 0.003847	0.9394
<b>Gender</b>	0.07975	-0.06000 to 0.2195	0.2615
<b>Surgical procedure</b>	-0.02547	-0.1294 to 0.07845	0.6291
<b>Bipolar coagulation forceps</b>	-0.1890	-0.3112 to -0.06692	0.0026
<b>Tumor volume</b>	0.001104	-0.001013 to 0.003222	0.3047
<b>Alcohol history</b>	0.06540	-0.1060 to 0.2368	0.4522
<b>Smoking history</b>	-0.05534	-0.2431 to 0.1324	0.5615
<b>Draining output</b>	0.0007239	0.0001224 to 0.001325	0.0186
<b>Duration of pressure dressing application</b>	0.03501	-0.01294 to 0.08295	0.1513

CI, confidence interval; OR, odds ratio.

## Figures





**Figure 1**

The operative wound of parotidectomy were performed with bipolar coagulation forceps.