Prevention of wound complications in salvage pharyngolaryngectomy by using well-vascularized flaps

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ABSTRACT

Background
We used coverage of suture lines with pectoralis major myocutaneous flaps (PMMCFs) and deltopectoral flaps (DPFs) in patients with high risk of pharyngocutaneous fistulas (PCFs) undergoing total laryngectomy (TL) or total pharyngolaryngectomy (TPL) to determine whether coverage of suture lines during salvage surgery can reduce the incidence of PCFs.

Methods
This retrospective study was based on a review of 52 patients who underwent salvage TL or TPL between 2001 and 2011; we have been using PMMCFs or DPFs during salvage surgery since 2008. Details of postoperative complications including PCFs were analyzed.

Results
The incidence rate of PCF was lower in the flap group (7.7%) than that in the non-flap group (30.1%). No carotid ruptures were observed in the flap group (0%) as contrasted with those in the non-flap group (7.7%).

Conclusions
We successfully reduced the incidence of PCFs in high-risk patients undergoing surgery using PMMCFs and DPFs to cover suture lines.

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INTRODUCTION

Recently, salvage surgery has been more frequently performed after curative radiation therapy because the use of chemoradiation therapy (CRT) has become common for laryngeal or hypopharyngeal advanced cancer. However, salvage surgery for laryngeal or hypopharyngeal cancer is associated with an increased risk of pharyngocutaneous fistula (PCF) formation as well as an increased probability of severe complications such as severe infections and carotid ruptures[1].

In our previous study, we reported that CRT was a significant risk factor for carotid ruptures and that total laryngectomy (TL) and total pharyngolaryngectomy (TPL) following CRT tends to induce more severe complications[2]. Avoidance of PCFs is, therefore, important for head and neck surgeries; considering prevention of and countermeasures against PCFs has become necessary. Currently reported methods of preventing PCF formation include procedures in which the pharyngeal suture line is directly covered with well-vascularized, non-irradiated tissues[3-5].

At our institution, suture lines in high-risk patients undergoing TL or TPL have been covered with pectoralis major myocutaneous flaps (PMMCF) and deltopectoral flaps (DPF) since 2008.

This study aimed to determine whether coverage of suture lines during salvage surgery can reduce the incidence of PCFs.

METHODS AND MATERIALS

This retrospective case-control study was based on a review of the hospital and outpatient clinical records of 52 patients who underwent salvage surgery for laryngeal and hypopharyngeal cancers at Tokai University Hospital from 2001 to 2011. TL was performed for laryngeal cancer and TPL for hypopharyngeal cancer, followed by immediate reconstruction with free jejunum flaps were performed.

Since 2008, from the patients who required salvage surgery, those who fulfilled at least one of the following criteria, had suture line coverage with PMMCFs or DPFs (Figure 1). The patients who were considered to be at high risk for PCF formation had undergone chemoradiation, were older than 80 years, had a history of head and neck surgery, or had systemic complications such as diabetes mellitus (DM).

Flap coverage was performed in 13 patients (flap group) but not in 39 patients (the non-flap group). In this study, Background factors shown in table 1 were analyzed. Details of postoperative complications including PCF formation were also examined for each group. Statistical analyses were performed using the chi-square test or the Fisher exact test to determine whether complications were reduced by the use of the flaps. Furthermore, we investigated whether patients who developed PCFs required operative closure.

RESULTS

Table 1. Patient Characteristics

Characteristics	All patients (n = 52) (%)	Non-flap (n = 39)	With flap (n = 13)	Significance (P value)
Age group (yrs)				
<69	27 (51.9)	22 (56.4)	5 (38.5)	NS
>70	25 (48.1)	17 (43.6)	8 (61.5)	(0.26)
Diabetes mellitus				
No	47 (90.4)	36 (92.3)	11 (84.6)	NS
Yes	5 (9.6)	3 (7.7)	2 (15.4)	(0.41)
T classification				
1, 2	31 (59.6)	26 (66.7)	5 (38.5)	NS
3, 4	21 (40.4)	13 (33.3)	8 (61.5)	(0.14)
TNM classification				
Stage Ⅰ, Ⅱ	28 (53.8)	24 (61.5)	4 (30.8)	NS
Stage Ⅲ, Ⅳ	24 (46.2)	15 (38.5)	9 (69.2)	(0.11)
Primary treatment				
Radiation	33 (63.5)	27 (69.2)	6 (46.2)	NS
Chemoradiation	19 (36.5)	12 (30.8)	7 (53.8)	(0.13)
Primary site				
LX	33 (63.5)	27 (69.2)	6 (46.2)	NS
HPX	19 (36.5)	12 (30.8)	7 (53.8)	(0.13)
Neck dissection				
Bilateral	14 (26.9)	11 (28.2)	3 (23.1)	NS
<Unilateral	38 (73.1)	28 (71.8)	10 (76.9)	(0.71)
Paratracheal node dissection				
Bilateral	18 (34.6)	12 (30.8)	6 (46.2)	NS
<Unilateral	34 (65.4)	27 (69.2)	7 (53.8)	(0.50)
Previous tracheostomy				
No	42 (80.8)	34 (87.2)	8 (61.5)	P < 0.05
Yes	10 (19.2)	5 (12.8)	5 (38.5)	(0.04)

Figure 1. coverage of PMMCFs and DPFs

Cervical skin resections were performed because of poor blood flow of the skin in several cases.

RESULTS

Table 1 shows the clinical and demographic characteristics of each group. Forty-nine men and three women were enrolled in this study. No significant differences were observed in terms of age, presence of DM, T classification, and tumor stage. Chemoradiation rate at the primary treatment was higher in the flap group compared with that in the non-flap group (53.8% vs. 30.8%), but the difference was not significant. In addition, no significant differences were observed in the primary site, presence of neck dissection, and presence of paratracheal lymph node dissection. A significant difference was observed between the flap and non-flap group in relation to the presence of preoperative tracheotomy (12.8% and 38.5%, respectively, P < 0.05).

Table 2 shows the details of postoperative complications. Complications developed in 18 of 52 patients (34.6%). No significant difference in complication rate was observed between the flap and non-flap groups. Among the major complications, the PCF rate was lower in the flap group (one patient; 7.7%) compared with that in the non-flap group (12 patients; 30.1%), but the difference was not significant. Although carotid rupture, which is the severest complication, was not observed in any patient (0%) in the flap group, it was observed in three patients (7.7%) in the non-flap group; however, this difference was not significant. Among the minor complications, no significant differences were observed between the groups in relation to the frequency of hematoma, wound infection, necrosis of the trachea, necrosis of the jejunum, partial necrosis of the skin, and osteomyelitis; significantly frequent partial necrosis of the flap was observed in the flap group. In terms of surgery for PCF closure, no patient required operative closure in the flap group compared with 10 patients (83.1%) in the non-flap group.

Table 2. Details of postoperative complications

Type of complications	Non-flap (n = 39) (%)	With flap (n = 13) (%)	Significance (P value)
Overall complications	13 (33.3)	5 (38.5)	NS (38.5)
Major complications			
Pharyngocutaneous fistula*	12 (30.1)	1 (7.7)	NS (0.19)
Carotid rupture	3 (7.7)	0 (0)	NS (0.30)
Minor complications			
Hematoma	1 (2.6)	0 (0)	NS (0.56)
Wound infection	2 (5.1)	3 (23.1)	NS (0.17)
Necrosis of trachea	2 (5.1)	0 (0)	NS (0.40)
Necrosis of jejunum	1 (2.6)	0 (0)	NS (0.56)
Partial necrosis of flap	0 (0)	3 (23.1)	P < 0.01 (0.002)
Partial necrosis of skin	1 (2.6)	1 (7.7)	NS (0.41)
Osteomyelitis	0 (0)	1 (7.7)	NS (0.56)
*PCF requiring closure surgery	10/12 (83.1)	0/1 (0)	P = 0.057

DISCUSSION

The suture line is covered directly with well-vascularized, non-irradiated tissues as a preventive measure for PCFs. We successfully reduced the incidence of PCFs in the flap group. In addition, cases with PCFs did not report carotid rapture, and the PCFs were conservatively closed. We believe that coverage of suture lines with well-vascularized tissues has certain advantages in preventing PCFs and severe complications.

Currently reported flaps include PMMFFs, FAFs and ALTFs. In this study, we used PMMCFs and DPFs to cover suture lines because skin resection disturbs cervical skin blood flow and a preoperative tracheostomy was simultaneously performed in several cases. The advantages of cutaneous flaps is that blood flow can be monitored and infection can be prevented because skin tension is alleviated, thereby decreasing the dead space. Cervical skin reconstruction has been reported to prevent severe complications [6]; therefore, it can be considered a better preventive method for severe complications. Our results are suggesting that the PCF rate does not substantially differ if well-vascularized flaps are used to cover sutures, regardless of the type of flap used. In terms of safety, pedicle flaps from outside the irradiated fields are desirable.

Clinically, patients eligible for flap coverage should be carefully selected. In this study, we selected the high-risk patients as previously described. Righini et al. [3] reported that flaps should be used for patients with DM, with a history of vascular disease, and with poor nutritional status. Gil et al. [4] also stated that flaps shouldn't be used for all patients who require salvage surgery. The selection criteria employed in this study could be considered suitable judging from the results obtained. In future, such suture coverage should be performed when necessary, taking into consideration the criteria presented by us for flap coverage and operative findings.

CONCLUSIONS

We performed suture coverage using PMMCFs or DPFs for high-risk patients who underwent TL or TPL and successfully reduced the incidence of PCFs. Such preventive surgery should be considered for high-risk patients in future to avoid the risk of severe complications.

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