

Effect of Anterolateral Thigh Perforator Flap Repair on the Appearance, Language and Masticatory Function of Oral Cancer Patients after Radical Surgery

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Purpose: The purpose was to explore the application effect of anterolateral thigh perforator flap (ALTP) and pectoralis major myocutaneous flap on repairing the tissue defects after oral cancer surgery.

Methods: 100 oral cancer patients treated in our hospital from January 2018 to December 2020 were selected as the research objects. After both groups of patients received extended resection of tumors, neck lymph node dissection and other routine treatment, the control group was repaired by pectoralis major myocutaneous flap while the study group was repaired by ALTP to compare the flap survival rate, language, masticatory function and other related indicators between the two groups. **Results:** The flap harvesting time and defect repair time in the control group were shorter than those in the study group ($P < 0.05$); The language, masticatory function and swallowing function in both groups after treatment were significantly better than those before treatment ($P < 0.05$); The total incidence of complications in the study group was significantly lower than that in the control group ($P < 0.05$); After treatment, the quality of life scores in both groups were significantly higher than those before treatment ($P < 0.05$).

Conclusion: Both ALTP and pectoralis major myocutaneous flap can be used to repair the tissue defects after radical resection of oral cancer, which can effectively improve the postoperative appearance, language and masticatory function of oral cancer patients. However, pectoralis major myocutaneous flap has easier operation and shorter operation time while ALTP can significantly reduce the incidence of postoperative complications with higher safety.

Keywords: anterolateral thigh perforator flap (ALTP); flap survival rate; oral cancer; pectoralis major myocutaneous flap; tissue repair

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INTRODUCTION

Oral cancer is a general term for malignant tumors that grow in the oral cavity. Common oral cancer includes gingival cancer, tongue cancer, lip cancer, jaw cancer and buccal mucosal cancer, with its pathogenesis closely related to oral mucosal tissue^[1-4]. If the texture and color of oral mucosa change significantly, or oral mucosal ulcer is not cured for a long time, the possibility of oral cancer should be considered because the above features are

precursory manifestations of oral cancer. At present, surgery is the main treatment method of oral cancer. After effective control, oral cancer has a relatively high cure rate at early stage. The incidence of oral cancer is usually related to lifestyle, diet structure, biology, environment and other factors, and patients should pay attention to the precancerous state of the mouth in time^[5-8]. Although surgical resection is the main treatment for oral cancer, surgery can cause large buccal and

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facial defects to patient, which is difficult to suture. If the defects were not repaired in time after radical resection of oral cancer, it can easily lead to appearance damage and dysfunctions in language, swallowing function and masticatory function, causing serious adverse consequences for the prognosis, life quality, and physical and mental health of the patients. The repair of tissue flap defects in the same period is an effective method to help patients recover the appearance and main functions. In clinical treatment, it is necessary to select flap tissue with good flexibility, moderate thickness, sufficient blood supply, small impact on the donor area and easy operation^[9-12]. Anterolateral thigh perforator flap (ALTP) is free flap and the pectoralis major myocutaneous flap is pedicled flap. Though as different types of flap transplantation in medicine, they are common flaps for repairing head and neck tissue defects and both of them have advantages and disadvantages. However, it is not common to

apply them to the repair of tissue defects after radical resection of oral cancer. Based on this, this study mainly compared and explored the application effect of anterolateral thigh perforator flap (ALTP) and pectoralis major myocutaneous flap on repairing the defects after oral cancer surgery, aiming to provide data reference for the repair of defects in patients with oral cancer.

METHODS

General Information

100 oral cancer patients treated in our hospital from January 2018 to December 2020 were selected as the research objects, and randomly divided into control group and study group, with 50 cases in each group. There was no significant difference in baseline data between the two groups ($P>0.05$), which could be used for comparative study, as shown in Table 1.

Table 1
Comparison of baseline data between the two groups

	Control group (n=50)	Study group (n=50)	X^2/t	P
Age (years old)	55.39±6.71	54.96±9.24	0.2663	0.7906
Gender			0.1984	0.656
Male	35(70)	37(74)		
Female	15(30)	13(26)		
Cancer types			0.6410	0.423
A	22(44)	26(52)		
B	13(26)	11(22)		
C	10(20)	9(18)		
D	5(10)	4(8)		
Clinical staging			0.0404	0.841
I	14(28)	15(30)		
II	23(46)	22(44)		
III	8(16)	9(18)		
IV	5(10)	4(8)		
Pathological differentiation			0.4566	0.499
Low	3(6)	5(10)		

Middle	9(18)	10(20)		
High	38(76)	35(70)		
Treatment methods			2.0597	0.151
Surgery	16(32)	23(46)		
Surgery + chemoradiotherapy	34(68)	27(54)		

Inclusion Criteria

① The patients had primary oral cancer diagnosed by pathological examination; ② The patients had indications of surgical resection, and all patients underwent extended tumor resection and neck lymph node dissection in our hospital; ③ The patients did not receive chemoradiotherapy before surgery, and had complete clinical medical records; ④ The patients had no extensive infiltration or distant metastasis in the surrounding tissues; ⑤ The study was approved by the hospital ethics committee, and all the patients and their families knew the purpose and process of the study, voluntarily accepted the self-tissue repair, and signed the informed consent.

Exclusion Criteria

① The patients were complicated with brain, heart, kidney, liver, and other organ and tissue lesions; ② The patients had distant metastasis of tumors; ③ The patients were unable to cooperate or refused to cooperate with researchers due to personal reasons; ④ The patients had surgical intolerance.

Methods

The patients in the two groups were treated with tumor resection and neck lymph node dissection. Skin flaps of appropriate size, shape and thickness were prepared according to the degree of facial soft tissue defects.

The defects in the control group were repaired by pectoralis major myocutaneous flap. The thoracoacromial artery was found as the center, and the surgical incision was determined below the distal areola. The incision was cut to the pectoralis major muscle, and fingers were extended from the plane between the pectoralis major muscle and the chest wall and upward for blunt separation to expose the pectoralis branch of the thoracoacromial artery behind the pectoralis major muscle. The pectoralis major muscle was separated and the flap was cut, with attention to the protection of the perforator vessels^[13-15]. The blood freed the pedicle under the

vessel, pulled the flap from the subclavicular fascia and the subcutaneous tunnel in the neck, and then flipped the flap to cover the oral defect. The recipient area was sutured and a negative pressure drainage was placed under the flap, while the donor area was closed, sutured and fixed under pressure bandaging.

The defects of the study group were repaired by ALTP. The patient's non-dominant leg was selected, and the distribution area of perforator vessels was marked in advance, namely, the 3 cm range of the midpoint of the line between anterior superior iliac spine and lateral patella. The perforator vessels were detected by color Doppler ultrasound, based on which the size and shape of the flap were designed. The skin was incised to reach lower part of the deep fascia to open the fascia between the lateral femoral muscle and the rectus femoris, and the rectus femoris was pulled to the inside. From the front to the rear, the lateral perforator vessel was found on the surface of the muscular fasciae, and the perforator vessel with a diameter of 0.5-1.0 mm was marked on the skin with the thicker perforator side of the vessel. Based on the mark, and the shape and size of the flap were designed again. The free vascular pedicle was reversely dissected along the perforator vessel, and then the small descending and transverse branches of the lateral circumflex femoral arteries and veins were cut and ligated. The trunk and the accompanying vein were dissected upward to the starting point, and the veins with strong reflux were marked. According to the required vessel length of the recipient area, the vascular pedicle was ligated and cut. Appropriate flap and pedicle were taken, then the free flap was transplanted to the defect. After treatment, the mucosa and flap were sutured. The position and length of the vascular pedicle were adjusted to prevent distortion and then microvascular anastomosis was performed^[16]. The donor area was sutured in layers and fixed under pressure bandaging. All patients underwent routine head and neck brake after surgery. The blood supply of the skin flap was closely observed within 72 hours, and the blood supply, elasticity and color of the patients were recorded. At the

same time, appropriate anti-infection, edema and spasmolysis treatment were given to the patients according to their conditions. If the drainage volume was no more than 15 ml in 3-5 days, the drainage could be removed.

Observation Indexes

Perioperative conditions. The flap area, flap harvesting time, defect repair time, the postoperative drainage volume and flap survival rate were counted in the two groups.

Language, masticatory and swallowing functions. Language, masticatory and swallowing functions were assessed in both groups before and after treatment.

Incidence of complications. Postoperative complications were recorded, and the incidence of complications in the two groups was calculated.

Quality of life: The modified UW-QOL quality of life questionnaire was used to follow up the patients for half a year, and their quality of life before and after treatment was evaluated. The evaluation scale mainly involved pain, physical function, mental state, appearance and other

aspects, with a total score of 100. The higher the score was, the better the life quality of the patients was.

Statistical Treatment

In this study, SPSS20.0 was selected as the data processing software, and GraphPad Prism 7 (GraphPad Software, San Diego, USA) was used to draw pictures of the data. The study included count data and measurement data, tested by χ^2 , t test and normality test. The difference was statistically significant when $p < 0.05$.

RESULTS

Comparison of Perioperative Conditions between the Two Groups

The flap harvesting time and defect repair time in the control group were shorter than those in the study group ($P < 0.05$), with statistical significance. There were no statistical differences in flap area, postoperative drainage volume and flap survival rate between the two groups ($P > 0.05$), as shown in Table 2.

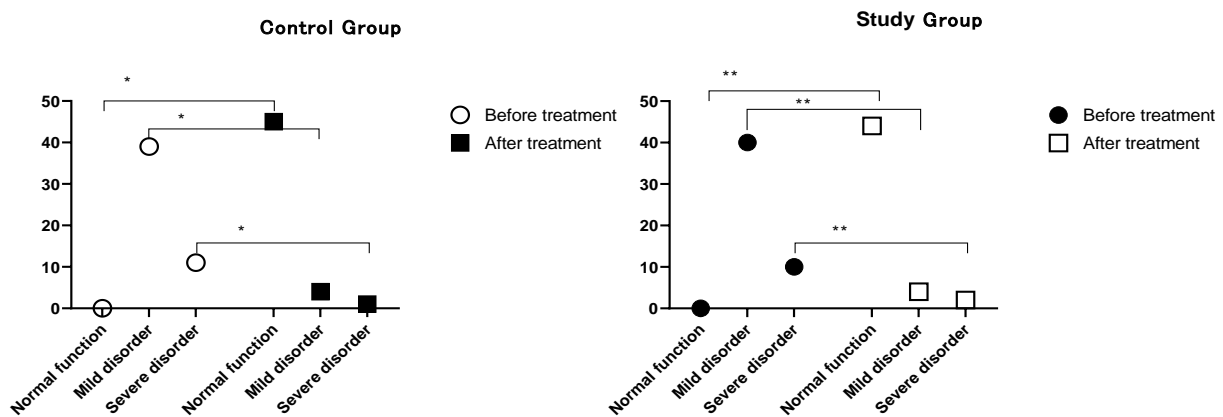
Indicators	Control group (n=50)	Study group (n=50)	t/ χ^2	P
Flap area (cm ²)	36.43±9.62	37.53±10.37	0.5499	0.5836
Flap harvesting time (min)	49.25±14.28	57.16±12.73	2.9237	0.0043
Defect repair time (min)	34.05±8.14	43.58±9.86	5.2704	0.000
Drainage volume (ml)	28.31±6.32	26.87±9.02	0.9245	0.3575
Flap survival rate	45(90)	49(98)	2.8369	0.092

Comparison of Language, Masticatory Function and Swallowing Function between the Two Groups

The language, masticatory function and swallowing function in both groups after

treatment were significantly better than those before treatment ($P < 0.05$), with no significant difference between the two groups, as shown in Figures 1, 2 and 3.

Figure 1
 Comparison of language function between the two groups



Note: The abscissa represents the assessment dimensions of language function (normal function, mild disorder and severe disorder), and the ordinate represents the number of people.

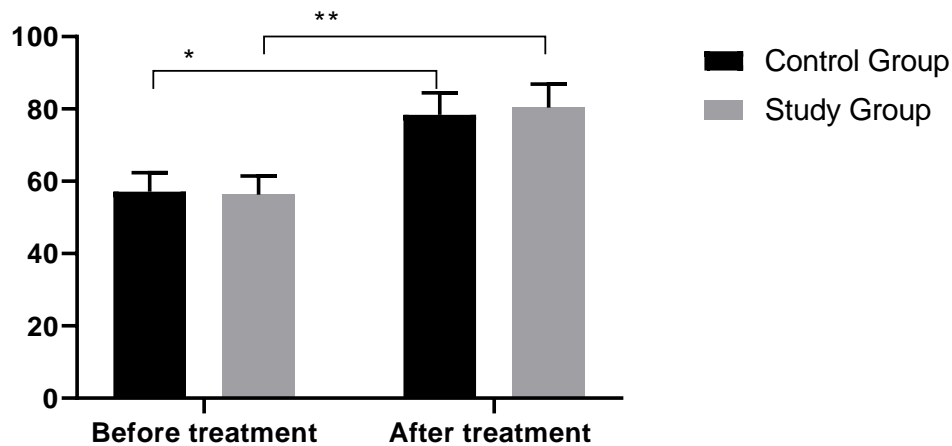
In the control group, the ratio of patients with normal function, mild disorder and severe disorder was 0:39:11 before treatment while that was 45:4:1 after treatment.

* from top to bottom indicated significant differences in the dimensions (normal function, mild disorder and severe disorder) of the control group before and after treatment (t=81.8182, 49.9796, 9.4697; P<0.05);

In the study group, the ratio of patients with normal function, mild disorder and severe disorder was 0:40:10 before treatment while that was 44:4:2 after treatment.

** from top to bottom indicated significant differences in the dimensions (normal function, mild disorder and severe disorder) of the study group before and after treatment (t=78.5714, 52.5974, 6.0606; P<0.05).

Figure 2
 Comparison of masticatory function between the two groups($\bar{x}\pm s$)



Note: The abscissa represents before and after treatment, and the ordinate represents masticatory efficiency (%).

The masticatory efficiency of the control group before and after treatment was (57.13±5.21) and (78.34±6.14).

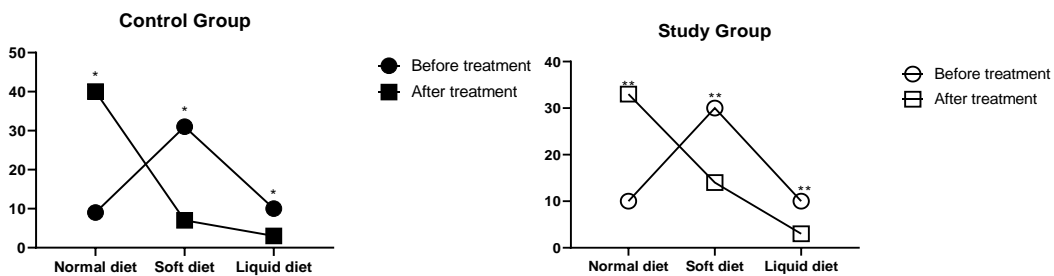
The masticatory efficiency of the study group before and after treatment was (56.27±5.18) and (80.35±6.52) respectively.

* indicated a significant difference in the masticatory efficiency of the control group before and after treatment (t=18.6248, P=0.000).

** indicated a significant difference in the masticatory efficiency of the study group before and after

Figure 3

Comparison of swallowing function between the two groups



Note: The abscissa represents the assessment dimensions of swallowing function (normal diet, soft diet and liquid diet), and the ordinate represents the number of people.

In the control group, the ratio of patients with normal diet, soft diet and liquid diet was 9:31:10 before treatment while that was 40:7:3 after treatment.

* from left to right indicated significant differences in the dimensions (normal diet, soft diet and liquid diet) of the control group before and after treatment (t=38.4554, 24.4482, 4.3324; P<0.05);

In the study group, the ratio of patients with normal diet, soft diet and liquid diet was 10:30:10 while that was 33:14:3 after treatment.

** from left to right indicated significant differences in the dimensions (normal diet, soft diet and liquid diet) of the study group before and after treatment (t=21.5830, 10.3896, 4.3324, P<0.05).

Comparison of the Incidence of Complications between the Two Groups

the control group (P<0.05), with a statistically significant difference, as shown in Table 3.

The total incidence of complications in the study group was significantly lower than that in

Table 3

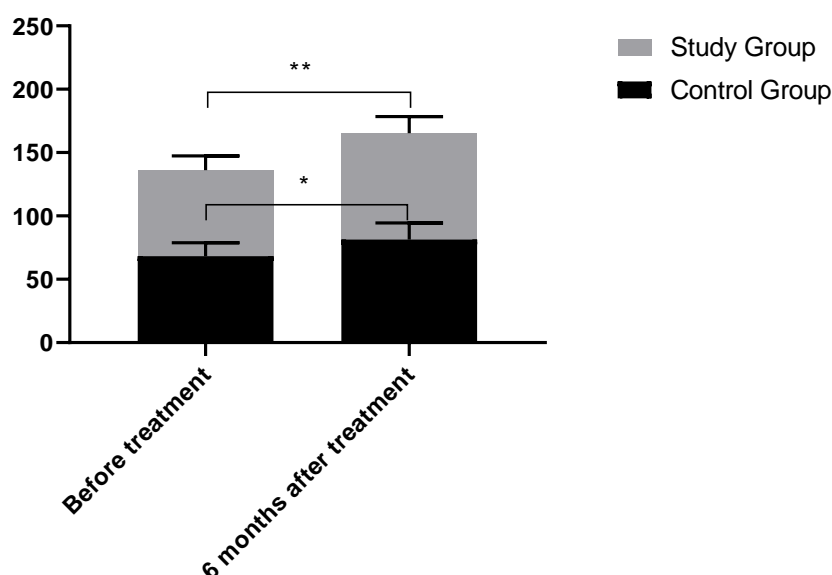
Comparison of the incidence of complications between the two groups [n(%)]				
	Control	Study	X ²	P
	group(n=50)	group(n=50)		
Wound fat liquefaction	4(8)	0(0)		
Scar hypertrophy	2(4)	1(2)		
Infection	2(4)	1(2)		
Surgical fistula	1(2)	0(0)		
Functional hyperplasia	3(6)	0(0)		
Flap contracture	2(4)	1(2)		
Total incidence	14(28)	3(6)	8.5755	0.003

Comparison of Life Quality between the Two Groups

before treatment (P<0.05), and the quality of life score in the study group was higher than that in the control group, with no significant difference between the two groups.

After treatment, the quality of life scores in both groups were significantly higher than those

Figure 4
Comparison of life quality between the two groups($\bar{x} \pm s$)



Note: The abscissa represents before treatment and 6 months after treatment, and the ordinate represents the score;

The quality of life scores in the control group before treatment and 6 months after treatment were (68.28 ± 10.56) and (81.25 ± 13.16) , respectively.

The quality of life scores in the study group before treatment and 6 months after treatment were (67.85 ± 11.35) and (84.03 ± 13.17) , respectively.

* indicated a significant difference in the quality of life scores in the control group before and after treatment ($t=5.4354$, $P=0.000$).

** indicated a significant difference in the quality of life scores in the study group before and after treatment ($t=6.5806$, $P=0.000$).

DISCUSSION

At present, autologous tissue is mainly used to repair the defects after radical resection of oral cancer. The common flap types include adjacent flap, free flap and pedicled flap, in which the common adjacent flap is submental island flap with the advantages of low technical requirements, simple anatomical operation, easy flap harvesting, broken pedicle and no vascular anastomosis. However, it is not suitable for patients with large defect area, cervical lymph node metastasis or lush whiskers^[17-20]. In addition, the main feature of pedicled flap and free flap is that the application effect is related to the anatomical position. Pedicled skin flap has the advantages of simple operation and no need for vascular anastomosis, but pedicled flap is prone to vascular pedicle torsion and compression during flipping and subcutaneous tunnel operation, which will form flap blood supply disorder and even necrosis. Free flap also had distinct advantages and disadvantages, the former lies in the multiple donor areas and large tissue capacity,

and the latter lies in the difficulty in operation and requirement for closer postoperative monitoring. In this study, the pectoralis major myocutaneous flap used in the control group was a pedicled skin flap. The pectoralis major muscle has a large area for resection, thus providing more tissue for the surgery. The muscle also has nutrient vessels with sufficient blood supply and strong anti-infection ability. When pedicled skin flap repair is performed, vital vessels can be protected by covering the neck and face. The donor site can be directly closed and sutured after incision, and no vascular anastomosis is needed in the recipient area. In addition, the simple operation greatly reduces the operation time. Moreover, the structure, elasticity, and color of the pectoralis major flap can match the oral and maxillofacial defects^[21-24]. However, in the practical application of pectoralis major myocutaneous flap, the wound has a certain degree of fat liquefaction, which is easy to dehiscence and difficult to heal, with the risk of surgical fistula and infection. Besides, the occurrence of

vascular compression due to the hypertrophy of the pectoralis major myocutaneous flap may result in flap necrosis, and the diet of patients after surgery may be affected by the muscular pedicle atrophy and traction. In the preparation of pectoralocutum major flap, the resection of part breast tissue may change the breast shape and even lead to thoracocyllosis, which brings troubles to female patients. Compared with pectoralis major musculocutaneous flap, the ALTP used in the research group has moderate thickness and can be thinned or thickened appropriately, which has excellent effect on repairing large defects of tongue body and mouth floor. The veins accompanying ALTP belong to deep venous system. The flaps supply blood sufficiently without affecting the main blood vessels and have little influence on the donor area. Besides, no valve between the veins, normal blood flow and sufficient reflux make it hard to form thrombus. Since the flap was taken from the lateral thigh, the wound was hidden, which could be sutured directly within 8 cm. It has low risk of complications and is more acceptable to the patients. With a long distance from each other, the donor area and recipient area of the flap can be operated simultaneously to avoid cross infection. However, the anterolateral femoral perforator vessels have certain variability, which increases the difficulty of flap harvesting and requires high anatomical ability and strain capacity of the surgeon. In addition, the vigorous hair on the lateral thigh in many male patients adds trouble to flap harvesting.

This study showed that flap harvesting time and defect repair time in the control group were shorter than those in the study group ($P < 0.05$), and there were no statistical differences in flap area, postoperative drainage volume and flap survival rate between the two groups, which is related to the simple preparation without microvascular anastomosis of pectoralis major myocutaneous flap. The language, masticatory function and swallowing function in both groups after treatment were significantly better than those before treatment ($P < 0.05$), with no significant difference between the two groups; The total incidence of complications in the study group was significantly lower than that in the control group ($P < 0.05$). Therefore, timely attention to the risk factors leading to fat liquefaction of pectoralis major myocutaneous flap is required in clinical treatment to reduce postoperative infection. After treatment, the quality of life scores in both groups were significantly higher than those before treatment ($P < 0.05$), and the quality of life score in the study group was higher than that in the control group,

with no significant difference between the two groups. This is consistent with that of Daniela O. h. Suzuki et al.^[25] who have stated in their study that both pectoralis major myocutaneous flap and ALTP can be used to repair tissue defects after oral cancer surgery, effectively improving patients' maxillofacial physiological function with higher lifequality, which merits clinical promotion and application.

In conclusion, both ALTP and pectoralis major myocutaneous flap can be used to repair the tissue defects after radical resection of oral cancer, which can effective improve the postoperative appearance, language and masticatory function of oral cancer patients. However, pectoralis major myocutaneous flap has easier operation and shorter operation time while ALTP can significantly reduce the incidence of postoperative complications with higher safety.

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