

ORIGINAL RESEARCH

Comparison of the outcomes of anterolateral thigh flap and peroneal flap in total laryngectomy reconstruction

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Abstract

Background: We usually use an ALT or peroneal flap in total laryngectomy reconstruction, depending on the surgeons' preference. No direct comparison of the outcomes of the ALT flap and peroneal flap exists.

Methods: From 2014 to 2022, we reviewed patients who had total laryngectomy and were reconstructed with an ALT flap and peroneal flap. Patient characteristics and surgical outcomes were collected and compared.

Results: The peroneal group had a significantly higher risk of neopharynx leakage (40% vs. 13.2%, $p = .020$) and late pharyngocutaneous fistula formation (30% vs. 5.3%, $p = .009$) than the ALT group. Peroneal flap was found to be the only independent risk factor for neopharynx leakage ($p = .025$, odds ratio [OR] = 5.5) and late pharyngocutaneous fistula formation ($p = .02$, OR = 7.7) in multivariate logistic regression.

Conclusion: In the reconstruction of total laryngectomy, the ALT flap is preferable over the peroneal flap.

KEYWORDS

cancer, laryngectomy, peroneal flap, pharyngoesophageal, reconstruction

1 | INTRODUCTION

The peroneal flap is a useful flap. Its advantages include thin and pliable nature, constant and reliable perforators, a relatively short harvest time, a hidden donor site, and ease of carrying muscle and bone to make a chimeric flap.¹ Peroneal flaps are commonly used in head and neck reconstruction at our hospital. The technique of harvest the peroneal flap and the management of the donor site were well described by Lin et al.¹ Our institution published two articles about

the use of peroneal flaps in total laryngectomy reconstruction. We claimed that the peroneal flap had a low rate of pharyngocutaneous fistula formation and pharyngeal structure and that the surgical outcome was comparable to other existing commonly used flaps.^{2,3} However, no published data compared the peroneal flap to the anterolateral thigh (ALT) flap, which is widely used in total laryngectomy reconstruction, in the same institution. Our study's goal is to determine which of the ALT flap and peroneal flap is more appropriate for total laryngectomy reconstruction.

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2 | MATERIALS AND METHODS

Our institution's institutional review board approved this study. From January 2014 to August 2022, we used our electronic medical record to review patients who had total laryngectomy for hypopharyngeal or laryngeal cancer and received ALT flap or peroneal flap reconstruction. Patient characteristics include gender, age, body mass index (BMI), underlying disease (diabetes mellitus, hypertension, cardiovascular disease, renal disease, and hepatic disease), psychosocial factors (smoking, alcohol consumption, and betel nut chewing), disease-related factors (tumor staging, neck operation history, previous chemotherapy, previous radiotherapy, postoperative chemotherapy, and postoperative radiotherapy), defect type (circumferential or noncircumferential, depending on presence of residual mucosa of posterior wall), and flap type (ALT flap or peroneal flap). They were followed up at least 6 months. Flap loss, wound infection, neopharynx leakage, late pharyngocutaneous fistula formation (developed after reconstruction

>30 days), pharyngeal stricture, and reoperation were all documented complications. These patients were divided into two groups: ALT and peroneal. The Chi-square test was used to determine whether there was a difference in baseline condition and complications between the two groups. If the outcome differed significantly, we used a multivariate logistic regression forward selection model to determine whether the flap we used was an independent risk factor or not. The analysis was carried out using IBM SPSS Statistics 22 software. Statistical significance was defined as a *p*-value of .05.

3 | RESULTS

A total of 58 patients from five plastic surgeons were included in the study. The ALT group included 38 patients, while the peroneal group included 20 patients. Table 1 compares the characteristics of the patients of each group. Gender, age, BMI, underlying disease,

	ALT group (%) <i>n</i> = 38	Peroneal group (%) <i>n</i> = 20	<i>p</i> -Value
Gender			.462
M	37 (97.4%)	20 (100%)	
F	1 (2.6%)	0 (0%)	
Age (year)			.969
<60	23 (60.5%)	12 (60.0%)	
≥60	15 (39.5%)	8 (40.0%)	
Body mass index (BMI)			.309
BMI < 18.5	6 (15.8%)	2 (10.0%)	
18.5 ≤ BMI < 25	23 (60.5%)	16 (80.0%)	
BMI ≥25	9 (23.7%)	2 (10.0%)	
Tumor stage			.089
I	0 (0.0%)	3 (15.0%)	
II	4 (10.5%)	1 (5.0%)	
III	6 (15.8%)	2 (10.0%)	
IV	28 (73.7%)	14 (70.0%)	
Previous chemotherapy	18 (47.4%)	10 (50.0%)	.849
Previous radiotherapy	11 (28.9%)	8 (40.0%)	.394
Postoperative chemotherapy	21 (55.3%)	11 (55.0%)	.985
Postoperative radiotherapy	27 (71.1%)	11 (55.0%)	.222
Diabetes mellitus	7 (18.4%)	3 (15.0%)	.743
Hypertension	7 (18.4%)	4 (20.0%)	.884
Cardiovascular disease	2 (5.3%)	2 (10.0%)	.499
Renal disease	2 (5.3%)	2 (10.0%)	.499
Hepatic disease	5 (13.2%)	2 (10.0%)	.726
Smoking	14 (36.8%)	3 (15.0%)	.082
Alcohol consumption	13 (34.2%)	4 (20.0%)	.258
Betel nut chewing	3 (7.9%)	1 (5.0%)	.679
Defect type			.012*
Noncircumferential	31 (81.6%)	10 (50.0%)	
Circumferential	7 (18.4%)	10 (50.0%)	

TABLE 1 The comparison of baseline characteristics of the patients of the ALT and peroneal groups

*Statistical significance was defined as a *p*-value of .05.

TABLE 2 The comparison of outcomes of the ALT and peroneal groups

	ALT group (%) n = 38	Peroneal group (%) n = 20	p-Value
Flap loss	1 (2.6%)	3 (15.0%)	.077
Wound infection	11 (28.9%)	11 (55.0%)	.052
Neopharynx leakage	5 (13.2%)	8 (40.0%)	.020*
Late pharyngocutaneous fistula	2 (5.3%)	6 (30.0%)	.009*
Pharyngeal stricture	6 (15.8%)	4 (20.0%)	.687
Reoperation	10 (26.3%)	10 (50.0%)	.071

*Statistical significance was defined as a p-value of .05.

psychosocial factor, or disease-related factors did not differ significantly. However, the peroneal group had a significantly higher ratio of being used in circumferential defect reconstruction than the ALT group (50% vs. 18.4%, $p = .012$).

After the major operation, the patients were admitted to our intensive care unit in the first 72 h, and then they were transferred to ordinary ward if no special events. They started to try oral water intake as postoperative day 7–14 depending on the surgeon's preference. The nasogastric tube was removed if no leakage was detected. In terms of surgical complications (Table 2), the ALT group had one flap loss (2.6%), while the peroneal group had three flap losses (15%). The rate of flap loss was not significantly different ($p = .077$). The wound infection rate in the ALT group was 28.9%, while it was 55% in the peroneal group. The p -value was set at .052. The ALT group had 13.2% neopharynx leakage, and the peroneal group had 40%, a significant difference ($p = .020$). The rate of late pharyngocutaneous fistula formation was 5.3% in the ALT group and 30% in the peroneal group, also a significant difference ($p = .009$). The rate of pharyngeal stricture was 15.8% in the ALT group and 20% in the peroneal group ($p = .687$). The ALT group had 10 patients (26.3%, five leakage, three infection, one vein thrombosis, and one flap failure) received reoperation while the peroneal group had 10 patients (50%, four leakage, two infection, three flap failure, and one stenosis) received reoperation ($p = .071$).

The peroneal group had a significantly higher rate of neopharynx leakage and late pharyngocutaneous fistula formation than the ALT group. Furthermore, a multivariate logistic regression forward selection model was used to determine whether the potential contributing factors listed above were independent or not. The use of a peroneal flap during total laryngectomy was found to be the only independent risk factor for neopharynx leakage ($p = .025$, odds ratio = 4.4) and late pharyngocutaneous fistula formation ($p = .020$, odds ratio = 7.7). In the multivariate analysis, other factors were not significant.

4 | DISCUSSION

If the residual mucosa was adequate, it could be closed primarily during total laryngectomy reconstruction. If the residual mucosa was insufficient for primary closure or total loss, it should be reconstructed using flap interposition or tubularization. Many different types of flaps could be used in this type of reconstruction. However, there is currently no gold standard that tells us which flap is the best option. Although the

pedicled pectoris major flap can be performed without microsurgery and in less time, some studies have found that it results in a higher rate of leakage and a poorer functional outcome than free flaps.^{4–10} Although the jejunum flap has a lower stricture rate and leakage rate when used in circumferential defects, its disadvantages include a short ischemia tolerable time and visceral donor site complications.^{9–15} The ALT flap is a popular flap that has dependable perforators, a large donor site skin area, a long vascular pedicle, and a low donor site morbidity. The main concern in the use of the ALT flap in the reconstruction of total laryngectomy is its thickness and bulky volume, which are related to poor tubularization compliance and space overcrowding in extremely obese patients.^{9–11,16–18} Radial forearm (RF) flaps are also commonly used in total laryngectomy reconstruction. It is a thin and pliable flap with a long vascular pedicle and good compliance. The disadvantage of the RF flap is the relatively small donor site area and the poor cosmetic appearance of the donor site.^{9,10,18–21} Many articles have been written about which flap is a better choice in the reconstruction of total laryngectomy. The conclusion was still debatable.^{8,9,11} There was some variation in the outcomes.

In our institution, peroneal flap has nearly completely replaced RF flap. The peroneal flap is superior to the RF flap because it has more distinct and stronger perforators, a larger donor skin area, a hidden donor site scar, and is similarly thin and pliable.^{1,22} We published an article in 2013 introducing the use of peroneal flaps in the reconstruction of hypopharyngeal cancer. From 1997 to 2011, a total of 14 peroneal flaps were used in pharyngoesophageal reconstruction. The article reported no flap loss, a 14.3% rate of fistula formation, and a 7.1% rate of pharyngeal stricture rate.² Another article about double skin paddle peroneal flap for pharyngoesophageal reconstruction with a monitor flap was published in 2017. From 2013 to 2015, a total of 10 peroneal flaps were included. The article reported no flap loss, a 10% rate of fistula formation, and a 10% rate of pharyngeal stricture.³ Both two articles concluded that the peroneal flap was reliable in total laryngectomy reconstruction. However, these findings did not reveal which flap is superior in pharyngoesophageal reconstruction: the ALT flap or peroneal flap. Furthermore, no previous study compared ALT flap and peroneal flap in total laryngectomy reconstruction, so we conducted this study to answer this question.

In this study, we discovered that the peroneal group had a significantly higher rate of neopharynx leakage and late pharyngocutaneous fistula formation than the ALT group, as well as a higher trend to flap loss, wound infection, and reoperation, although these difference

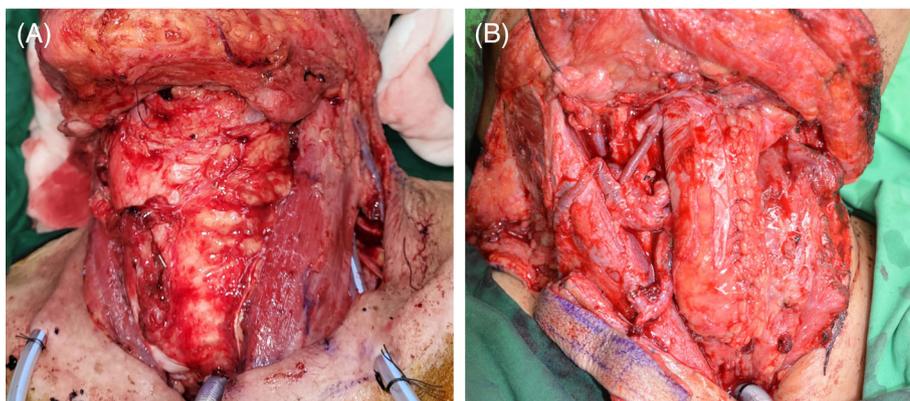


FIGURE 1 The images show an ALT flap and a peroneal flap being used to reconstruct circumferential pharyngoesophageal defects. (A) The adequate volume of ALT flap filled up the space left by total laryngectomy and easily made contact with surrounding tissue. It ensured the healing well. (B) In contrast, peroneal flap could not fill up the space. It increased the risk of poor healing

were not statistically significant. Despite the fact that the peroneal group was significantly more commonly used in circumferential defect reconstruction, multivariate logistic regression identified only the flap type as an independent risk factor for neopharynx leakage and late pharyngocutaneous fistula formation. This result cast doubt on the safety and reliability of using peroneal flap in total laryngectomy reconstruction. The discrepancy between our reports could be due to the following reasons. First, since 2014, our hospital has completely developed a paperless electronic medical record. As we could easily follow up on each patient and catch the point, the incidence of innocent omission has decreased. Second, previous studies had small case numbers and only provided descriptive statistics. There was no direct statistical comparison to other flaps in the same hospital during the same time period. It was impossible to determine who was superior. Last but not least, the senior single surgeon provided the database of previous reports. Different techniques and skills would have a significant impact on the outcome.

There are some shortcomings of the peroneal flap in total laryngectomy reconstruction that may lead to a higher complication rate. First, the thickness and volume of the peroneal flap are smaller than those of the ALT flap. The peroneal flap is a flexible and thin flap. A sonographic study of 201 healthy participants comparing the thickness of the ALT flap, peroneal flap, and RF flap revealed that in Asian people, the average thickness of the ALT flap was 0.98 ± 0.4 cm, the peroneal flap was 0.47 ± 0.17 cm, and the RF flap was 0.28 ± 0.08 cm.²² Because the contact healing surface after suture of the peroneal flap is relatively limited, this issue may result in wound disruption and leakage after the stitches lose tension. Furthermore, insufficient volume makes it difficult to fill up the large space after total laryngectomy, resulting in dead space without healing. The low volume flap also makes it difficult to make contact with surrounding tissue and achieve “back wall” healing behind the sutures. Many studies have discovered that an onlay flap can significantly reduce the incidence of leakage after total laryngectomy with the mucosa defect primary closed.^{10,23,24} Only the tension of the stitches and the contact healing surface of the suture themselves make it difficult to keep watertight. Before the stitches loosen, the backside rough surface of the suture lines must heal with the surrounding tissue, which will keep the approximated flaps



FIGURE 2 It is a design of peroneal flap for total laryngectomy reconstruction. The green zone, sat on the lateral and posterior compartments, is mainly supplied by the perforators of peroneal artery. In contrast, the red zone, sat on the anterior compartment, is mainly supplied by the perforators of anterior tibial artery

in place and watertight. If the flap volume was insufficient to fill up the space and heal with surrounding tissue, resulting in an “empty neck,” a higher risk of leakage and late fistula formation could be expected (Figure 1).^{17,25} This idea could be applied to the use of an RF flap. Many studies have found a higher risk of fistula formation in the RF flap reconstruction population,^{11,19,26} which could be the reason. However, in the reconstruction of a noncircumferential defect, a review article with a meta-analysis published in 2022 discovered that the RF group had the lowest rate of fistula, stricture, and feeding tube dependence compared to the pectoris major and ALT groups. The author assumed that the improved result was due



FIGURE 3 Leakage was noticed in a patient who received total laryngectomy and reconstruction by peroneal flap. The wound was explored. The left edge of the flap showed marginal necrosis. It was the part from the anterior compartment

to the benefit of the RF flap's thinness.⁸ Thus, the true mass effect of flap in total laryngectomy reconstruction requires further investigation.

The angiosome territory is the second shortcoming of the peroneal flap in pharyngoesophageal reconstruction. The perforators of the peroneal flap are supplied by the peroneal artery to the skin of the lateral and posterior compartments via the posterior intermuscular septum.²⁷ However, in the reconstruction of total laryngectomy, which requires a large and broad flap, the skin of the flap harvested will extend beyond the lateral compartment to the area of the anterior compartment, which is supplied by the anterior tibial artery (Figure 2). According to my observations, the skin harvested from the anterior compartment in the peroneal flap was not reliable and prone to partial necrosis, resulting in leakage and other complications (Figure 3).

Third, the peroneal flap is taken from the lower extremity, which is more prone to atherosclerosis and deep vein thrombosis.^{1,28} If these issues were not identified prior to surgery through physical examination and imaging, the flap would be lost owing to poor vascular quality.

In the reconstruction of total laryngectomy, our study found that the ALT flap was more reliable than the peroneal flap. ALT flaps have a large skin donor site, dependable perforators, and adequate volume to fill the dead space and are simple to design with a monitor flap and phonatory tube.^{25,29} The multilayer fascial underlay technique can also be used to reduce the rate of fistula formation even further.³⁰ In addition, the donor site of the ALT group usually could be closed primarily. In contrast, the donor site of the peroneal flap always needed skin graft. Graft loss over tendon was not uncommon in these patients. The use of peroneal flap also lead to loss the use of fibula flap. In my opinion, the ALT flap is preferable to the peroneal flap in the reconstruction of a total laryngectomy.

5 | LIMITATIONS

This is a retrospective study, and the baseline conditions between the two groups were generally the same, except that the peroneal group had a significantly higher ratio of being used in circumferential defect reconstruction than the ALT group. Because the number of cases in this study was still limited, some baseline differences (e.g., preoperative radiotherapy) and potential contributing factors (e.g., circumferential or noncircumferential defect) may have showed not significant and gone unnoticed. In addition, selection bias should be taken into account. The cases in this study came from five different plastic surgeons, and the effect of skill variation was not taken into account. There were no patients in our series who were extremely obese, which increased the applicability of the ALT flap. We had no issues with flap folding or tubularization, or with wound closure. We did not use tracheoesophageal voice prosthesis on a regular basis. In our study, phonation function was not assessed. The long-term functional outcome of these patients is difficult to assess owing to their poor prognosis.

6 | CONCLUSION

In the reconstruction of total laryngectomy in our hospital, the ALT flap showed a better result. Although there are still many limitations due to small sample size, it is preferable to use the ALT flap as a workhorse flap in total laryngectomy reconstruction.

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REFERENCES

1. Lin YS, Liu WC, Yang KC. Peroneal flap: how to harvest and clinical appraisal for head and neck reconstruction. *J Plast Reconstr Aesthet Surg*. 2021;74(7):1515-1523.
2. Lin YS, Liu WC, Chen LW, Yang KC. Peroneal flap in hypopharyngeal reconstruction. *Ann Surg Oncol*. 2013;20(13):4356-4361.
3. Hsueh JH, Hsieh YH, Lin YS, Lin YS, Yang KC, Liu WC. A novel application of double-paddle peroneal chimeric flap as external sentinel monitor in hypopharyngeal reconstruction. *Ann Plast Surg*. 2017; 78(3 suppl 2):S70-S75.
4. Chepeha DB, Annich G, Pynnonen MA, et al. Pectoralis major myocutaneous flap vs revascularized free tissue transfer: complications, gastrostomy tube dependence, and hospitalization. *Arch Otolaryngol: Head Neck Surg*. 2004;130(2):181-186.
5. Farlow JL, Birkeland AC, Hardenbergh A, et al. Speech and swallowing outcomes after laryngectomy for the dysfunctional irradiated larynx. *Eur Arch Oto-Rhino-Laryngol*. 2020;277(5):1459-1465.
6. Sharma S, Chaukar DA, Laskar SG, et al. Role of the pectoralis major myofascial flap in preventing pharyngocutaneous fistula following salvage laryngectomy. *J Laryngol Otol*. 2016;130(9):860-864.

7. Moriniere S, Gorphe P, Espalier F, et al. Assessment of swallowing function after circumferential pharyngolaryngectomy. A multicenter study by the GETTEC group. *Eur Ann Otorhinolaryngol Head Neck Dis.* 2019;136(1):3-5.
8. Costantino A, Festa BM, Kim SH, et al. Complications of pectoralis major myo-cutaneous flap, anterolateral thigh flap and radial forearm free flap after total laryngectomy with partial pharyngectomy: a systematic review and network meta-analysis. *Microsurgery.* 2023;43(3):286-296.
9. Piazza C, Taglietti V, Nicolai P. Reconstructive options after total laryngectomy with subtotal or circumferential hypopharyngectomy and cervical esophagectomy. *Curr Opin Otolaryngol Head Neck Surg.* 2012; 20(2):77-88.
10. Yeh DH, Sahovaler A, Fung K. Reconstruction after salvage laryngectomy. *Oral Oncol.* 2017;75:22-27.
11. Koh HK, Tan NC, Tan BK, Ooi ASH. Comparison of outcomes of Fasciocutaneous free flaps and Jejunal free flaps in Pharyngolaryngoesophageal reconstruction: a systematic review and meta-analysis. *Ann Plast Surg.* 2019;82(6):646-652.
12. Chan YW, Ng RW, Liu LH, Chung HP, Wei WI. Reconstruction of circumferential pharyngeal defects after tumour resection: reference or preference. *J Plast Reconstr Aesthet Surg.* 2011;64(8):1022-1028.
13. Perez-Smith D, Wagels M, Theile DR. Jejunal free flap reconstruction of the pharyngolaryngectomy defect: 368 consecutive cases. *J Plast Reconstr Aesthet Surg.* 2013;66(1):9-15.
14. Tan NC, Lin PY, Kuo PJ, et al. An objective comparison regarding rate of fistula and stricture among anterolateral thigh, radial forearm, and jejunal free tissue transfers in circumferential pharyngo-esophageal reconstruction. *Microsurgery.* 2015;35(5):345-349.
15. Coleman JJ 3rd, Tan KC, Searles JM, Hester TR, Nahai F. Jejunal free autograft: analysis of complications and their resolution. *Plast Reconstr Surg.* 1989;84(4):589-595. discussion 596-588.
16. Reiter M, Baumeister P. Reconstruction of laryngopharyngectomy defects: comparison between the supraclavicular artery Island flap, the radial forearm flap, and the anterolateral thigh flap. *Microsurgery.* 2019;39(4):310-315.
17. De Fremicourt MK, Temam S, Janot F, Kolb F, Qassemyar Q. The anterolateral thigh perforator flap in pharyngo-esophageal reconstruction. *Ann Chirurgie Plast Esthet.* 2018;63(1):69-74.
18. Sokoya M, Bahrami A, Vincent A, et al. Pharyngeal reconstruction with microvascular free tissue transfer. *Semin Plast Surg.* 2019;33(1):78-80.
19. Anthony JP, Singer MI, Mathes SJ. Pharyngoesophageal reconstruction using the tubed free radial forearm flap. *Clin Plast Surg.* 1994; 21(1):137-147.
20. Swanson E, Boyd JB, Manktelow RT. The radial forearm flap: reconstructive applications and donor-site defects in 35 consecutive patients. *Plast Reconstr Surg.* 1990;85(2):258-266.
21. Timmons MJ, Missotten FE, Poole MD, Davies DM. Complications of radial forearm flap donor sites. *Br J Plast Surg.* 1986;39(2): 176-178.
22. Hsu KC, Tsai WH, Ting PS, Hsueh JH, Chen LW, Lin YS. Comparison between anterolateral thigh, radial forearm, and peroneal artery flap donor site thickness in Asian patients: a sonographic study. *Microsurgery.* 2017;37(6):655-660.
23. Cabrera CI, Joseph Jones A, Philleo Parker N, Emily Lynn Blevins A, Weidenbecher MS. Pectoralis major Onlay vs Interpositional reconstruction fistulation after salvage Total laryngectomy: systematic review and meta-analysis. *Otolaryngol: Head Neck Surg.* 2021;164(5): 972-983.
24. Sayles M, Grant DG. Preventing pharyngo-cutaneous fistula in total laryngectomy: a systematic review and meta-analysis. *Laryngoscope.* 2014;124(5):1150-1163.
25. Elson NC, Martinez DC, Cervenka BP. Current opinions in otolaryngology and head and neck surgery: functional considerations in reconstruction after laryngectomy. *Curr Opin Otolaryngol Head Neck Surg.* 2020;28(5):355-364.
26. Azizzadeh B, Yafai S, Rawnsley JD, et al. Radial forearm free flap pharyngoesophageal reconstruction. *Laryngoscope.* 2001;111(5): 807-810.
27. Oexeman S, Ward KL. Understanding the arterial anatomy and dermal perfusion of the lower extremity with clinical application. *Clin Podiatr Med Surg.* 2020;37(4):743-749.
28. Patel SA, Abdollahi H, Ridge JA, Chang EI, Lango MN, Topham NS. Asymptomatic deep peroneal vein thrombosis during free fibula flap harvest: a review of the literature, strategies for preoperative assessment, and an algorithm for reconstruction. *Ann Plast Surg.* 2016;76(4): 468-471.
29. Lu YA, Pei YC, Chuang HF, et al. Speech performance after anterolateral thigh phonatory tube reconstruction for total laryngectomy. *Laryngoscope.* 2021;131(6):1349-1357.
30. Chen DW, Ellis MA, Horwich P, et al. Free flap inset techniques in salvage Laryngopharyngectomy repair: impact on fistula formation and function. *Laryngoscope.* 2021;131(3):E875-E881.

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