

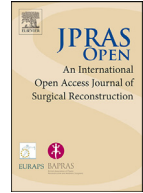


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Short Communication

Coverage of anterior mediastinal tracheostomy with bipediced anterolateral thigh flap

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ABSTRACT

Background: Cancer defects requiring anterior mediastinal tracheostomy (AMT) are complex, often accompanied by tracheo-laryngeal and pharyngeal defects with exposure of the great vessels and mediastinal cavity. The trachea has to be mobilised and exteriorised as an end-tracheostome through the anterior chest. A well-vascularised flap that can resurface skin defects, obliterate dead space and allow maturation of a reliable anterior mediastinal tracheostome is required. We describe a modification of using a centrally fenestrated bipediced chimeric anterolateral thigh flap (ALT) to address these challenges.

Methods: A free chimeric bipediced ALT flap was designed. The skin defect was resurfaced by a vertically-oriented skin paddle. Two chimeric muscle components were used to partition the mediastinum and the great vessels of the neck from the tracheostome. The mediastinal trachea was mobilised and matured through a centrally-fenestrated opening in the flap. Layered fascial sutures were employed to minimize dehiscence.

Results/Complications: Two patients with AMT underwent the modified ALT. No major complications such as flap-tracheostomy dehiscence occurred. One patient had a small peripheral demarcation of the flap which required revision and secondary closure.

Conclusion: The bipediced design of the modified ALT flap provided robust blood supply to the central fenestration through dual perforators, avoiding flap-tracheostomy separation. The chimeric

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muscle components obliterate dead space and protect the great vessels of the neck and mediastinum. The thin pliable nature of the anterolateral thigh skin also allowed for tensionless inset of the trachea.

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Introduction

Cancer defects requiring anterior mediastinal tracheostomy (AMT) are complex, often accompanied by tracheo-laryngeal and pharyngeal defects with exposure of the great vessels and mediastinal cavity. The trachea must be mobilised and exteriorised as an end-tracheostome through the anterior chest. A well-vascularised flap that can resurface skin defects, obliterate dead space and allow maturation of a reliable anterior mediastinal tracheostome is required.¹

Common reconstruction options include the latissimus dorsi, pectoralis major, deltopectoral, omental^{2–4} and the anterolateral thigh flaps.^{5,6} Common complications include distal flap necrosis and flap-tracheostomy dehiscence causing mediastinitis. We describe a modification of using a centrally-fenestrated bipediced chimeric anterolateral thigh flap (ALT) to address these challenges.

Methods

Surgical technique (Figure 1)

A large ALT skin paddle (20 × 10 cm) was raised. The skin laxity allowed the flap to “funnel-down” towards the tracheostome in a tensionless manner. The skin paddle was oriented vertically to allow the pedicle to reach the neck recipient vessels, namely, the transverse cervical artery, external jugular vein and a tributary of internal jugular vein. The flap was bipediced to allow a central opening for the tracheostome. Additional muscle components (TFL-tensor fascia lata, VL-vastus lateralis) covered the great vessels of the neck superiorly and mediastinum inferiorly respectively. In Fig. 1, the muscle components are down-sized to allow an appreciation of the underlying structures. They in fact covered the great vessels completely.

Suturing of the tracheostome to the skin was accomplished with single layer PDS 3-0 in far-and-near staggered bites to avoid tearing the mucosa and separation of the tracheal rings. Drains were placed to prevent seroma formation but avoiding direct suction on the vessels. Post operatively, a short length tracheostomy tube (UniPerc® Adjustable Flange) was inserted and secured firmly to ensure that its end stayed above the carina to avoid one-lung intubation.

Results

We describe 2 clinical cases. No major complications such as sepsis, pneumonia, mediastinitis or re-exploration occurred. Minor complications included minor flap demarcation and dehiscence in the periphery requiring secondary suture.

Case 1

A 74-year-old male chronic smoker presented with recurrent laryngeal cancer after chemo-radiotherapy. He underwent wide resection of the neck mass which included resection of the sternum, upper ribs and clavicular heads; a total laryngectomy, thyroidectomy and bilateral neck dissection. The resultant skin defect measured 20 × 12 cm with loss of the sternoclavicular joints bilaterally. (Fig. 2).

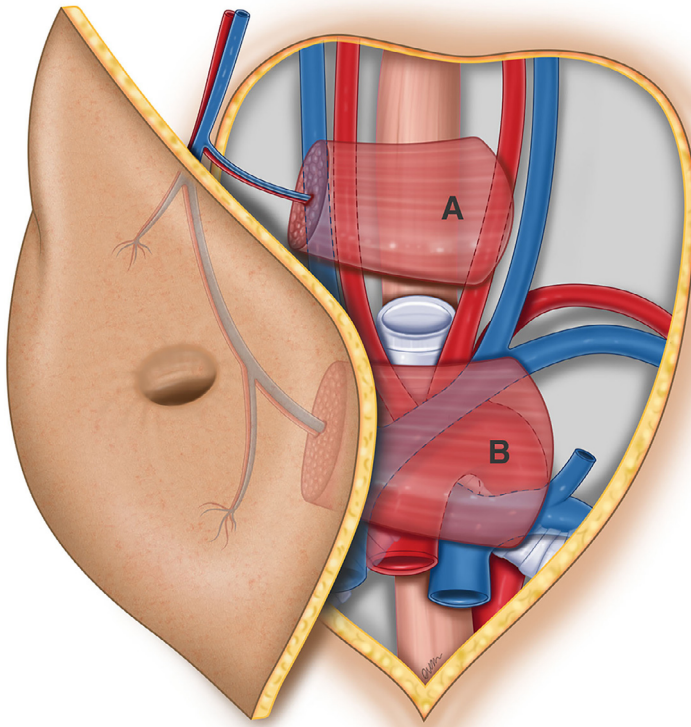


Figure 1. Inset of chimeric anterolateral thigh (ALT) flap in mediastinal tracheostomy. Dual perforator thin ALT with a central fenestration between perforators was used to line the tracheostome. Chimeric muscle components: tensor fascia lata (A) and vastus lateralis (B) were used to cover the neck vessels, and brachiocephalic vein and artery respectively.

Rigid reconstruction was achieved with a 2.4 mm reconstruction plate which was contoured and secured to the remnant clavicles bilaterally. In addition, a 2.0 mm reconstruction plate was used to bridge the sternal defect. A Gore-Tex sheet was wrapped around this construct as an interface between the plate and the great vessels. A chimeric ALT flap was raised with VL and TFL muscle components. The VL obliterated the mediastinal dead space, and the TFL obliterated the cervical dead space, both of which served a second function of protecting the neck vessels. The trachea was sutured to a hole created in the middle of the skin paddle. Post-operatively, the patient suffered a minor complication of distal skin paddle skin necrosis which was managed with debridement and secondary suture. At 2-year follow up, he was well and had undergone adjuvant radiotherapy (Fig. 3).

Case 2

A 52-year-old male ex-smoker presented with a locally advanced thyroid cancer with tracheal stenosis. He underwent a total thyroidectomy, laryngectomy, neck dissection, mediastinal split and mediastinal tracheostomy. The resultant skin defect measured 22×10 cm and exposed the superior mediastinum and great neck vessels. A right chimeric ALT flap was raised with skin, TFL muscle and VL muscle components. Revascularisation was achieved using the superior thyroid vessels. The VL was used to obliterate dead space and protect the mediastinal contents, while the TFL was used to cover neck structures. An opening was made in the skin paddle for the tracheostome. At 2-year follow up,

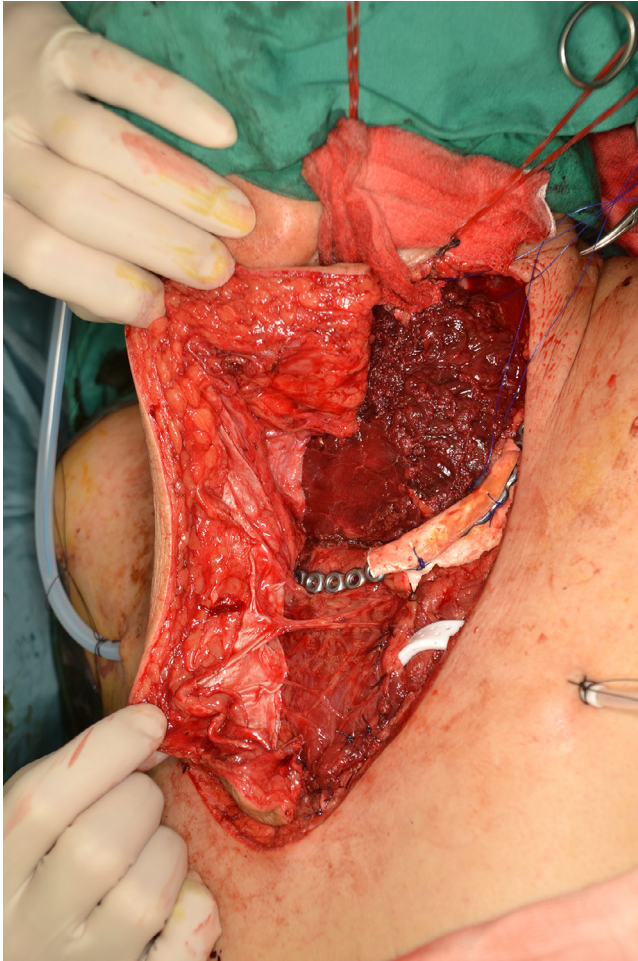


Figure 2. Patient 1. Dual perforator ALT flap and muscle components before complete inset.

the end-tracheostome remained healed and he reported successful oesophageal speech and good oral intake of soft diet well (Fig. 4).

Discussion

The key goal in this operation was to provide a thin well-vascularized skin to create a robust seal around the tracheostome. A second layer consisting of the chimeric muscle components protected the great vessels of the neck and mediastinum.

Including two perforators created a bipediced skin paddle to provide vascularity to the skin around the tracheostome. This was key to avoid marginal necrosis at the tracheostome suture line, thus preventing a leak. Minor leakage of tracheal secretions into the wound was inevitable, owing to wound tension from trachea retraction, the dependent nature of the suture line, and trauma from tracheal suctioning and coughing efforts. The muscle components were thus critical as additional covering over the great vessels to prevent blowout. Case 1 had a bridging sternal reconstruction plate with a Gortex wrap and the muscles served to obliterate dead space around the construct. Both cases received radiotherapy and their flaps contracted as expected, despite the initial redundancy and bulk.



Figure 3. Patient 1. 2-year follow-up.



Figure 4. Patient 2. A 52-year-old male with thyroid cancer involving the trachea. Chimeric ALT flap reconstruction over the mediastinal tracheostome, 2-year follow-up.

Perforators supplying the lateral thigh skin arise from the descending oblique and transverse branches of the lateral circumflex femoral artery. The first step was to mobilise the descending branch perforators with the vastus lateralis muscle component and then look proximally for either the transverse or oblique branch as the second pedicle. In practice, if the two systems converge distal to the rectus femoris branch, then the branch is spared. If, however, the two systems join proximal to the rectus femoris branch, the branch is sacrificed to capture the confluence of the two systems. If the two systems are divergent, two sets of anastomoses will be necessary to vascularize the flap. Revascularisation was usually accomplished using the transverse cervical artery as the recipient vessel.

Pre-operative imaging including CT angiography or high-resolution ultrasonography can assist in locating the perforators to give an indication of their origin.

In a previous successful case of mediastinal tracheostomy where the neck was too scarred from previous surgery and radiotherapy (not included in this report), we used both pectoralis major muscle flaps to line the tracheostome. Owing to the depth of the inset where the tracheostome was emerging from between the brachiocephalic vein and artery, solely muscle was used with skin grafts applied.

Other flap options include deltopectoral (DP), latissimus dorsi and omental flaps, either in isolation or in combination. The advantages of the chimeric ALT free flap are greater freedom of inset, better vascularity, reduced suture line tension and the availability of vascularized muscle for obliteration of dead space.

Declaration of Competing Interest

None declared.

Funding

None.

Ethical approval

Not required.

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