Closure of a persistent tracheal stoma

Anna Jang, B.A, Elizabeth A. Calle, M.D., Ph.D, Hugh G. Auchincloss, M.D., M.P.H

PII: S2666-2507(23)00411-X
DOI: https://doi.org/10.1016/j.xjtc.2023.11.004
Reference: XJTC 1560

To appear in: JTCVS Techniques

Received Date: 22 September 2023
Revised Date: 26 October 2023
Accepted Date: 1 November 2023

Please cite this article as: Jang A, Calle EA, Auchincloss HG, Closure of a persistent tracheal stoma, JTCVS Techniques (2023), doi: https://doi.org/10.1016/j.xjtc.2023.11.004.

This is a PDF file of an article that has undergone enhancements after acceptance, such as the addition of a cover page and metadata, and formatting for readability, but it is not yet the definitive version of record. This version will undergo additional copyediting, typesetting and review before it is published in its final form, but we are providing this version to give early visibility of the article. Please note that, during the production process, errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Copyright © 2023 The Authors. Published by Elsevier Inc. on behalf of The American Association for Thoracic Surgery
Closure of a persistent tracheal stoma

Anna Jang, B.A., 1 Elizabeth A. Calle, M.D., Ph.D., 2 Hugh G. Auchincloss, M.D., M.P.H. 2,3

1 Baylor College of Medicine
2 Department of Surgery, Massachusetts General Hospital
3 Division of Thoracic Surgery, Massachusetts General Hospital

Disclosures:
The authors of this manuscript have no conflicts of interest to disclose.

Funding:
No funding to report.

IRB/ERB number and date of approval: N/A

Informed Consent: The patient provided written informed consent.

Corresponding author contact information:
Hugh G. Auchincloss
Massachusetts General Hospital
55 Fruit St., Founders 7, Boston, MA 02114
hauchincloss@mgh.harvard.edu.

Manuscript Word Count: 742
Central Message:

In this case, a persistent tracheal stoma was closed using a simple pedicled circular flap that epithelializes the surface facing the trachea, preventing recurrence and granuloma formation.

Central Picture Legend:

Persistent tracheal stoma before and after operation.

Background

Tracheostomy is a common, routine thoracic surgical procedure. A persistent stoma - a residual lumen connecting the external environment and the airway that persists 3 to 6 months after decannulation - can occur in up to 29% in adults, and even 54% of children. Herein, we present a case of a successfully closed persistent tracheal stoma using a pedicled skin flap, using the method described by Grillo and colleagues.

Case Report

A 66-year-old male with history of traumatic C6 fracture complicated by paraplegia, hypoxemic respiratory failure, extended critical illness, and tracheostomy placement was admitted to the Medical service with pneumonia. He had been decannulated for just over 5 months. The site never healed.

During admission, Thoracic Surgery was consulted to manage the patient’s persistent stoma. CT showed a tract of air from the anterior surface of the neck to the trachea (Figure 1A, 1B). On exam, there was a stoma opening at the center of the prior trach cannula site (Figure 1C). There
was no surrounding erythema, tenderness, purulent drainage, or other signs of infection. There was no crepitus in the surrounding skin.

In the operating room, a flexible bronchoscopy showed a pit in the anterior wall of the trachea, between the second and third tracheal rings. A well-epithelialized tract was visualized. The trachea appeared healthy in this area. There was no mass of granulation tissue, narrowing of the tracheal lumen, or tracheomalacia.

The anterior neck was prepped and draped in standard fashion. A circle was drawn immediately around the tracheal stoma, to indicate the boundaries of the planned pedicled skin flap, followed by a larger, transverse ellipse (Figures 1D, 2A). The skin was incised along the perimeter of the peri-stomal circle (Figure 2B). The remaining areas of skin delineated by the boundaries of the ellipse were excised (Figure 2C). The circular area of peri-stomal skin was undermined towards the stoma lumen, taking care to preserve the blood supply. The circle of skin was folded in half transversely, with the lumen of the stoma at the center and the two epidermal surfaces in contact with one another. The edges were secured with Vicryl stitches, with the epidermal surface facing the internal surface of the trachea (Figure 2D). The strap muscles were approximated over the flap and the skin closed in layers (Figure 2E). Skin glue was applied to create a water and air tight seal. The patient was discharged the following day. Twenty days later the incision had healed well. Six months following the operation, the patient’s site of operation was well-healed with only a visible scar and no defects (Figure 3). The patient was diagnosed with left tonsillar squamous cell carcinoma 8 months after the operation and therefore has had many head and neck CT scans up to date. The CT image performed 2 years later (Figure 4B) demonstrate no major
difference from the CT image performed 3 months following surgery (Figure 4A). A remaining
defect in the anterior tracheal wall is still seen, but there is no extension of a tract to the
cutaneous surface, proving successful and durable closure of the persistent tracheal stoma.

IRB/ERB number and date of approval: This study is a review of medical records for a case
report of one patient, not involving the formulation of a research hypothesis that is prospectively
investigated, and therefore was exempt from Mass General Brigham Institutional Review Board
approval.

Informed Consent: The patient provided written informed consent for the publication of their
data.

Discussion

Tracheostomy

An estimated 250,000 tracheostomies are performed annually in high-resource countries,\textsuperscript{10}
including approximately 10\% of intensive care unit patients that require prolonged mechanical
ventilation, and 1.3\% of all ICU patients.\textsuperscript{9} Median duration of tracheostomy is 16 days\textsuperscript{6} with
55\% of patients decannulated before discharge.\textsuperscript{6} At the peak of the COVID-19 pandemic, 8\% of
ventilated patients underwent tracheostomy; 34.9\% of these patients were decannulated
successfully, an average of 18 days after placement.\textsuperscript{11} Compared to endotracheal intubation,
tracheostomy reduces sedation needs, improves the ability of the patient to communicate with
providers, family, and friends, increases mobility, and improves patient comfort.\textsuperscript{1}

Persistent Tracheal Stoma/Tracheocutaneous Fistula
Tracheal stomas usually close without intervention after decannulation.\textsuperscript{13} However, if squamous epithelium from the skin migrates along the stoma, toward the trachea, a persistent, non-healing stoma may form.\textsuperscript{2,14} Prolonged time in place, low nutritional status, and high dose steroid use are risk factors for persistent stoma;\textsuperscript{2,8} 70\% of tracheostomies in place longer than 16 weeks are associated with formation of a tracheocutaneous fistula.\textsuperscript{15} A persistent stoma increases the risk of aspiration, infection, and visible secretion of mucopurulent discharge, which impair patient quality of life.\textsuperscript{6,7}

There are multiple methods to close persistent stomas,\textsuperscript{4,16} including a rhomboid flap and Z-plasty,\textsuperscript{5,6} a hinged skin flap,\textsuperscript{7} a turnover flap,\textsuperscript{17} and a pectoralis major musculocutaneous flap.\textsuperscript{13} There is no standard method. Choice of method depends on surgeon experience and the size and complexity of the defect.\textsuperscript{18} Large amounts of scarring or decreased blood supply to the area can make closure more difficult.\textsuperscript{16} The method described by Grillo and used here is a simple, one-stage method that closes the persistent tracheal stoma with a pedicled circular flap that epithelializes the surface facing the trachea.\textsuperscript{8} This helps prevent the recurrence of a tracheocutaneous fistula and granuloma formation.\textsuperscript{3} Caution is taken while raising the margins of the circular flap to maintain adequate local blood supply,\textsuperscript{8} which provides rapid healing post operatively,\textsuperscript{16} minimal scarring, and nearly normal tissue fullness.\textsuperscript{3}
References


Legends

FIGURES

**Figure 1.** Pre-operative computed tomography (CT) and physical examination. A) Axial view showing a tracheocutaneous fistula. B) Sagittal view showing an oblique 3.5 mm wide, 2.5 cm long air-filled tract from the skin to the anterior trachea. C) Persistent tracheal stoma 5 months after decannulation and two non-surgical closure attempts. D) Boundary markings of planned skin
flap: circular marking immediately around stoma and transverse ellipse encompassing the circle.

**Figure 2.** Figures from Grillo et al., describing the technique. Epidermis that is circumscribed as a pedicled flap and inverted over the tracheal opening is highlighted in blue. A) Location of pedicled peri-stomal skin flap, anterior view. B) Axial view of tracheal defect; dashed lines indicate lateral boundaries of skin flap, which will be incised. C) Axial view, with lateral edges of skin flap liberated from surrounding tissue, ready to be brought together over the defect. D) Edges of skin flap are brought together with absorbable suture. E) Final closure, with epidermis that was originally facing outward, now inverted, and providing closure over the tracheal defect.

**SUPPLEMENTAL VIDEOS**

**Operative video:** Video of persistent tracheal stoma closure using a pedicled skin flap.

**SUPPLEMENTAL REFERENCES**


SUPPLEMENTAL FIGURES

Figure 3. Scar 6 months post-operatively after persistent tracheal stoma closure. Scar is visible, no defects.

Figure 4. Post-operative computed tomography (CT). A) Sagittal view 3 months post-operatively showing a remaining defect in the anterior tracheal wall, but no extension of a tract to the cutaneous surface. B) Sagittal view 2 years post-operatively showing persistent anterior tracheal wall defect but still no tract to the cutaneous surface. Only a difference in the amount of soft tissue present anterior to the protrusion of the anterior airway seen.