INTRODUCTION

Although not life threatening, the development of a tracheocutaneous fistula (TCF) after decannulation is a vexing and relatively common long-term complication of a tracheostomy. Rates of TCF reported in the literature range from 13% to 70%. Although the rate of fistula formation is quite low with early decannulation, the risk increases with longer tracheostomy duration, and some studies suggest that as many as 70% of adult patients with a tracheostomy for longer than 16 weeks will develop a TCF. In the pediatric population, 57% of patients develop a TCF after decannulation, and having a tracheostomy in place for greater than 24 months more than doubles the risk of fistula persistence.

The presence of a TCF poses social and health challenges for patients: difficulty with phonation, soiling of clothing with mucous, skin irritation, ineffective cough, aspiration of matter via the tracheostomy tube, and inability to submerge under water can all negatively affect quality of life. The difficulty of successfully closing a TCF is evidenced by the variety of methods described in the literature: primary closure in layers, excision with temporary placement of a tracheostomy stent, excision without a tracheostomy stent, grafting, coblation, cautery, local or regional flaps, and free flaps.

Failure of a fistula to close postoperatively can present significant morbidity, including infection or collection of subcutaneous air leading to pneumomediastinum, pneumothorax, and subcutaneous emphysema of the neck and face. These latter complications may necessitate reopening of the fistula and, possibly, replacing of the tracheostomy. Here, a simple technique to close a tracheocutaneous fistula is presented that does not require major tissue rearrangement or grafting. This technique has been reported to be successful in the pediatric population, and there is one case report of a fairly similar technique in an adult patient. To our knowledge, this report represents the first reported series of adult patients who have undergone the suture-ligature technique of TCF closure.

METHODS

A retrospective chart review was performed to identify patients who had undergone tracheocutaneous fistula closure by the two senior authors at their respective institutions. Patients who underwent the same procedure for other indications (i.e., tracheostomy scar revision or tracheostomy stent removal) were excluded. Patients with persistent, severe obstructive sleep apnea, ongoing need for respiratory support, or those who had been decannulated for less than 6 weeks were not considered candidates for TCF closure.

The patient is positioned supine, and the neck is extended with the use of a shoulder roll. The procedure is performed under monitored anesthesia care or general anesthesia, depending on surgeon and patient preference. If general anesthesia is used, care is taken to avoid positive pressure ventilation postextubation. Typically, the planned surgical site is marked with a transverse elliptical incision in a resting skin tension line that incorporates the TCF; this is designed long enough to avoid standing cones for closure (Fig. 1). The planned incision is then infiltrated with intradermal local anesthesia with epinephrine for hemostasis. The neck is then prepped with betadine-based solution and sterilely draped. Incision is made with a #15 blade through the skin into the subcutaneous fat. The ellipse of skin and subcutaneous fat is then incised from the planned surgical site with a transverse elliptical incision in a resting skin tension line that incorporates the TCF; this is designed long enough to avoid standing cones for closure (Fig. 1). The planned incision is then infiltrated with intradermal local anesthesia with epinephrine for hemostasis. The neck is then prepped with betadine-based solution and sterilely draped. Incision is made with a #15 blade through the skin into the subcutaneous fat. The ellipse of skin and subcutaneous fat is then incised.
fistula tract is elevated circumferentially down to the level of the anterior tracheal wall but no further, taking great care not to perforate the tract. The fistula tract is further skeletonized off surrounding tissues, grasped with an Allis forceps, and retracted out of the wound bed (Fig. 2). A Crile clamp is placed across the fistula at its base (Fig. 3). A #15 blade is then used to divide the tube of skin from the clamp, leaving the clamp attached to the tract at the anterior tracheal wall. A 2-0 silk suture ligature is then passed through the tract and secured (Fig. 4). The neck is irrigated, and then the anesthesiologist or patient is asked to perform a Valsalva maneuver to evaluate for the presence of an air leak. The wound is then further irrigated and hemostasis is obtained. A small amount (1–2 mL) of fibrin sealant can be placed over the suture-ligated tract. The strap musculature is elevated off the trachea and reapproximated with 3-0 Vicryl horizontal mattress sutures. The skin edges are then elevated as needed for closure. A small (one-quarter-inch Penrose or rubber band) drain is placed under the strap musculature and brought out through the incision. The platysmal layer of the incision is then closed around the drain using buried, 4-0 Vicryl interrupted sutures followed by 5-0 interrupted or running nylon for the skin (Fig. 5). If a vertical scar revision is needed, the same technique is used, but a Z-plasty closure should be considered. The patient is admitted overnight for observation. If there is no

Fig. 1. Planned incision for tracheocutaneous fistula (TCF) closure. An elliptical incision is marked in a resting skin tension line that incorporates the TCF. [Color figure can be viewed in the online issue, which is available at www.laryngoscope.com.]

Fig. 2. Elevation of tracheocutaneous fistula tract. The tract is carefully dissected free from the surrounding soft tissue, taking care not to enter into the lumen. [Color figure can be viewed in the online issue, which is available at www.laryngoscope.com.]

Fig. 3. Clamping of tracheocutaneous fistula tract. After the tract is skeletonized down to the level of the anterior trachea, it is retracted out of the wound and clamped. [Color figure can be viewed in the online issue, which is available at www.laryngoscope.com.]

Fig. 4. Suture-ligature of the tracheocutaneous fistula tract. Once the tract is divided off the clamp, a nonabsorbable suture, such as a 2-0 silk, is used to perform a suture-ligature before removing the clamp. [Color figure can be viewed in the online issue, which is available at www.laryngoscope.com.]
crepitus and minimal drainage, the drain is removed and the patient is discharged the following morning.

RESULTS

Twenty-one patients with TCF underwent surgery from 2009 to present at two institutions. The mean duration of tracheostomy was 25.9 months (range, 1.6—108.0 months). The most common indication for tracheostomy was prolonged tracheostomy (61.9%), followed by upper airway obstruction (23.8%), neoplasia (9.5%), and obstructive sleep apnea (4.8%). The average duration of fistula was 12.0 months (range, 1.8—36.2 months). The mean fistula size was 78.3 mm² (range, 8.0—314.2 mm²).

Fifteen patients (71.4%) had characteristics that could negatively impact wound healing. Eight (38.1%) were current or recent smokers, six (28.6%) had diabetes, three (14.3%) had a history of prior radiation to the head and neck, and three (14.3%) were immunocompromised. Five (23.8%) of these patients had a combination of two adverse characteristics.

Two patients (9.5%) developed subcutaneous emphysema and required reopening of the tract on postoperative day one. Both of these patients were smokers, had small fistulae (12 and 20 mm²), and had a rubber band drain placed at the time of surgery. Fibrin glue was not used in either patient. Further attempts at closure were not undertaken in either patient. Of the remaining 19 patients, all had complete closure of their TCF at the time of last evaluation. Their average length of hospitalization was 1.0 days. The drain (either rubber band or Penrose) was removed on the first postoperative day in all but one patient, in whom the drain was removed on the second postoperative day given concern over the volume of output. The average length of follow-up was 4.1 months. At the time of last follow-up, there were no postoperative infections, wound dehisences, or cysts.

DISCUSSION

Tracheocutaneous fistulae are a common consequence of prolonged tracheostomy. Excision of the full fistula tract often necessitates complex closure to create an airtight closure and may fail due to the difficulty of reapproximating mucosa that is adherent to a rigid trachea. Various methods of closure with grafts and locoregional flaps have been described, including the use of rhomboid flaps, Z-plasty, palatal mucosal grafts, turnover skin flaps, cartilage grafts, interpositional grafts, absorbable plates, regional flaps, and free flaps. These techniques can be complex, involve lengthy operative time, and cause donor site morbidity. Furthermore, some of these studies report up to 20% failure rate for their technique. Others have only been described in one or a few patients. As such, it is unknown whether the success reported using them can be consistently replicated. Using the mucocutaneous lining of fistula tract to close a TCF presents a simple way to obliterate the tract without the need for tissue transfer or grafting. This technique has previously been reported in the pediatric population, and this study shows it to be highly effective in adults as well.

CONCLUSION

The surgical technique described here should be familiar and reproducible for all surgeons and can be performed in necks of any thickness. In our experience, the success rate with this technique is high, regardless of the size of the fistula or associated comorbidities, and its simplicity makes it an appealing treatment option in the care of patients with TCF.

BIBLIOGRAPHY


