HOMOLOGOUS GRAFTING: NOVEL TECHNIQUE IN THE REPAIR OF PERSISTENT TRACHEOCUTANEOUS FISTULA

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ABSTRACT

Educational Objective:
At the conclusion of this presentation, the participants should be able to describe a novel technique for closure of a recurrent or persistent tracheocutaneous fistula using a homologous graft.

Objectives:
Tracheocutaneous fistula (TCF), a persistent fistula tract between the airway and the skin, is a known complication following decannulation after tracheostomy with an incidence approaching 70% in patients cannulated for over 16 weeks. Several TCF closure techniques have been described including primary closure, fistulotomy with layered closure, and inversion of the fistula tract in purse-string fashion with skin over-closure. However, recurrence is not uncommon, particularly in patients with history of irradiation and poor wound healing. While more complex procedures including pedicle and hinge flaps have been described, these have a higher rate of complications and require general anesthesia.

Study Design:
Here, we describe a novel technique utilizing homologous grafting in a case series of six patients that addresses prior closure failures while maintaining efficacy, can be performed expeditiously, is cost effective, and performed under local anesthesia.

Methods:
Patients with persistent or recurrent TCF with prior attempted closure using traditional techniques were selected to undergo the proposed procedure. The procedure involves placement of a homologous graft patch to repair the tracheal defect with a layered closure.

Results:
There were no recurrences of TCF in this series within 8 weeks of the procedure. The mean operative time was 34.4 minutes and all were performed successfully under local anesthesia.

Conclusions:
To our knowledge this is the first series to describe homologous grafting in the closure of persistent TCF and represents a novel technique for successful and safe TCF closure in patients with a history of recurrent or persistent TCF.

INTRODUCTION

Tracheocutaneous fistula (TCF), a persistent fistula tract between the airway and the skin, is a known complication following decannulation after tracheostomy. The incidence of TCF is as high as 70% in patients with duration of cannulation exceeding 16 weeks [1,2]. Persistence of the fistula tract carries complications including aspiration pneumonia, skin irritation from secretions, difficulty with vocalization, and poor cosmesis. The most commonly employed method involves an elliptical incision around the fistula tract, undermining the fistula tract, and inversion of the tract with closure in a purse-string fashion [2]. This can be performed with or without a drain and is often performed under local anesthesia [5]. However, recurrence of TCF is not uncommon, and more complex procedures may be necessary. Thus, a demand exists for a novel technique that addresses these failures without carrying excessive risk. As many of these patients carry various co-morbidities, such a technique should be expeditious, efficacious, cost-effective, and preferably performed under local anesthesia.

RATIONALE AND AIMS

Despite the high rate of TCF, particularly in patients with head and neck cancer, few simple repair techniques exist which address repair failures. Our center has developed a technique that addresses all of the demands listed above, namely a relatively short, cost-effective procedure carrying minimal to no additional risk or morbidity. The technique involves use to a homologous graft (AlloDerm®, LifeCell Corp, Branchburg, NJ), an acellular collagen matrix.

INCLUSION AND EXCLUSION CRITERIA

Patients were identified by medical record number for specific billing and diagnosis codes:

- Tracheocutaneous fistula.
- Recurrent tracheocutaneous fistula.
- Windpipe defect.

Patients were excluded from the study if they presented with the following:

- Poor surgical candidacy.
- Persistent airway anomaly precluding closure of the TCF.
- Recurrent disease.
- Vocal fold paralysis.
- Decline surgical intervention.

RESULTS

There were a total of six patients included in this case series that satisfied the inclusion criteria. The mean age is 56 years ± 3.67 years. All patients had a tracheostomy for the duration of at least 12 months. All patients had a history of radiation treatment to the neck. All patients included in the series failed spontaneous closure of the tracheocutaneous fistula by at least 3 months from decannulation. Two patients had an attempted closure by traditional means that failed and recurred within one month of closure. Following closure with the homologous grafting technique, there were no recurrences within 8 weeks of the procedure. The mean operative time is 34.4 minutes and all were successfully completed under local anesthesia.

CONCLUSIONS

To our knowledge this is the first series to describe homologous grafting in the closure of persistent TCF. This technique represents a novel, successful, and safe method for TCF closure, and should be considered particularly in patients with a history of recurrent or persistent TCF due to prior irradiation or other cause of poor wound healing.

REFERENCES


HOMOLOGOUS GRAFTING PROCEDURE

Figure 1: Patient with previously irradiated neck and subsequent decannulation with persistent tracheocutaneous fistula. A prior closure attempt failed.

Figure 2: The margins of the fistula tract is injected with 1% lidocaine in 1:100,000 epinephrine and excised down to the level of the trachea.

Figure 3: Following excision of the fistula tract, the airway defect is measured and a corresponding medium thickness AlloDerm graft is placed as the homologous graft.

Figure 4: The skin is closed over the homologous graft with mattress sutures using 4-0 Prolene suture.

Figure 5: Patient returns one week following closure for suture removal. Here we see complete closure of the tracheocutaneous fistula.

TECHNIQUE PROTOCOL

The surgical technique is as follows:

- The procedure is performed under local anesthesia with or without sedation. The patient ventilates by spontaneous breathing with nasal cannula.
- The surgical site is infiltrated with 1% lidocaine in 1:100,000 epinephrine for anesthesia and hemostasis.
- A peri-stomal incision is made encircling the fistula tract.
- A fistulotomy is performed which involves carrying down the dissection following the fistula tract down to the level of trachea, incised and discarded.
- The tracheal defect is then measured for sizing of an AlloDerm® homologous graft.
- The graft used is of medium (0.53 – 1.02 mm) thickness and prepared per manufacturer’s instructions [14].
- The graft is placed with the dermal side facing intraluminally and the basement membrane facing the closure, and then sutured in place using absorbable material.
- A primary layered closure is performed over the graft, re-apposing subcutaneous tissues and skin. The skin is undermined only as much as necessary to achieve primary closure.
- An airtight bolster dressing is then applied over the repair in standard fashion to prevent air leak during the wound healing process.
- The patient is discharged 1 hour post-operatively in the absence of airway distress or subcutaneous emphysema.