

A simple technique for tracheocutaneous fistula surgical closure

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Abstract

Tracheocutaneous fistula (TCF) is commonly regarded as a pathologic complication of temporary tracheostomy, resulting from failure of the spontaneous tracheostomy closure after decannulation. The aim of the present study is to describe and to report the results of a our simple TCF closure surgical technique. Ten patients with TCF were prospectively enrolled at the Sensory Organs Department of Policlinico "Umberto I", "Sapienza" University of Rome between February 2011 and May 2013. The surgical procedure, performed under local anesthesia, is described in detail. TCF surgical closure was accomplished successfully in all cases. All patients experienced regular postoperative courses during the first week without complications in terms of bleeding or airway compromise. Only 1 (10%) patient required a surgical revision consisting of debriding of the margins and closure with simple sutures. The reported technique was shown to be safe, simple and feasible. However particular caution should be required in patients with chronic aspiration and cough which may cause wound dehiscence and fistula recurrence in the early post-operative period.

Keywords: Tracheocutaneous fistula, tracheostomy, decannulation, tracheal cannula.

Introduction

Tracheocutaneous fistula (TCF) is commonly regarded as a minor complication of temporary tracheostomy attributed to an ingrowth of the cutaneous squamous epithelium along the stoma towards the tracheal mucosa that results in the failure of spontaneous tracheostomy closure after decannulation. Chronic TCF can significantly impair quality of life, vocalization, and local hygiene [1]. According to the scientific literature TCF incidence ranges from 3 to 43% but increasing significantly in case of delayed decannulation [2]. Kulber et al. reported that fistula incidence increases to 70% when the cannulation period is greater than 16 weeks [2]. Furthermore, with an increasing number of patients submitted to intensive care undergoing early tracheostomy, the frequency of TCF will likely continue to increase.

Numerous techniques have been described for TCF closure. Primary closure carries the risk of major complications such as subcutaneous emphysema and

pneumothorax. Other studies have recommended simple decannulation, debridement, and sterile dressing coverage. Layered closures, local rotational flaps, Z-plasties, muscular interpositions, free microvascular transfers have also been advocated. However, although multilayered closure guarantee better cosmetic results, most of the reported techniques require complex surgical skills, consistent tissue manipulation and should be performed under general anesthesia [3].

The aim of the present study is to describe and report the results of a simple and effective surgical TCF closure technique feasible under local anesthesia.

Materials and Methods

The present study was approved by the internal Institutional Review Board. All patients gave written informed consent for participation in the study. Ten patients (8 males and 2 females; median age 53 years, range 37-64) with TCF were prospectively enrolled at the Sensory Organs Department of Policlinico "Umberto I", "Sapienza" University of Rome between

February 2011 and May 2013. The inclusion criteria were as following: 1) adequate respiratory space before decannulation (i.e., the ability to maintain a closed tracheal cannula for at least 7 days before decannulation), 2) absence of steroid therapy for at least 1 month before decannulation, 3) adequate swallowing and/or adequate swallowing rehabilitation therapy, 5) adequate follow-up (at least 6 months after surgical TCF closure), and 5) TCF persistence for at least 2 weeks post-decannulation.

The surgical procedure was performed under local anesthesia. The patient's neck was prepared with the usual sterile procedure, and the patient was placed in the supine position with the neck moderately extended (Fig. 1a). The area around the stoma was infiltrated with 5 to 10 ml of solution containing 1% lidocaine with 1:100,000 epinephrine. After 3 minutes, a 2 to 3 cm horizontal skin incision passing through the lower border of the TCF and a second circular incision 2mm outside the TCF border were performed (Fig. 1b). Using these incision lines at the end of the surgery the skin suture will be far from the tracheal suture: we believe that this detail possibly could reduce the recurrence rate. A 2 cm sub-platysmal flap was elevated superiorly and 1 cm inferiorly. The flap was raised not only with the intention of getting sufficient surgical space but also to reduce skin tension after closure. When visible, the pre-laryngeal muscles

surgical plan was exposed and perifistular dissection was continued vertically up to the anterior tracheal wall (Fig. 1c). Then TCF was vertically closed using 3/0 vicryl suture (Fig. 1d) invaginating the perifistular tissues that in this way will be part of the anterior tracheal wall. Subsequently skin flaps are reapproximated and the redundant tissue of the superior flap is overflowed and then trimmed (Fig. 1e) to obtain a horizontal cosmetic suture (Fig. 1f). Closure of the skin is then completed. When significant dead space results, a small Penrose drain is usually left in place (removed after 3 days) to provide a preferential escape for blood or air in case of bleeding or tracheal leakage (Figure 1f). We use vicryl 3/0 suture for the subcutaneous tissue and nylon 4/0 suture for the skin. The latter is removed 9 days after the procedure. Oral antibiotic therapy is administered for 9 days in order to minimize local infection.

Results

TCF closure was accomplished successfully in all cases. All patients experienced regular postoperative courses during the first week without complications in terms of bleeding or airway compromise. Only 1 (10%) patient required a surgical revision consisting of debriding of the margins and closure with simple sutures. Data were analyzed by ADV and AG.

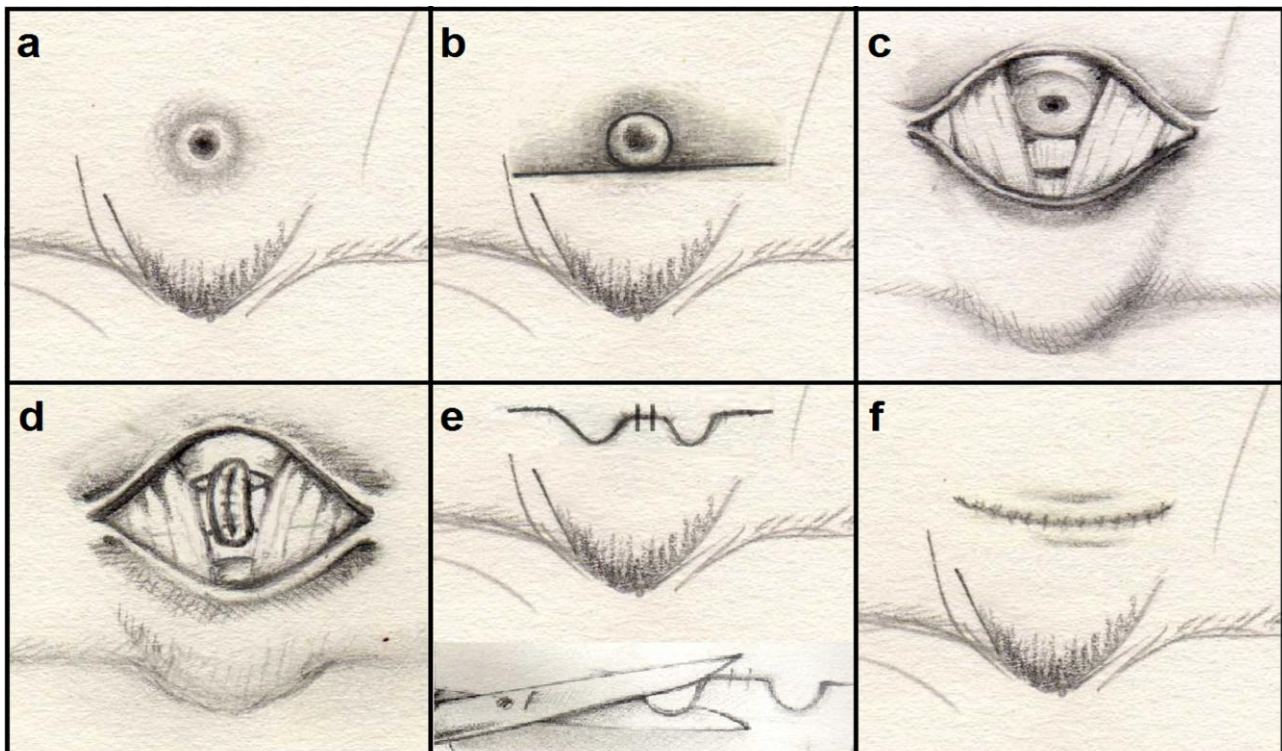


Figure 1. Surgical technique. a) The patient's neck is placed in the supine position with the neck moderately extended. b) A horizontal skin incision passing through the lower border of the tracheocutaneous fistula is made, and a second incision that circles the mucocutaneous border is also made. c) A 2-cm sub-platysmal flap is elevated, and the pre-laryngeal muscles are exposed. d) The fistula is vertically closed using 3/0 vicryl suture. e) The redundant tissue of the superior flap is overflowed and then trimmed to obtain a horizontal cosmetic suture (f).

Discussion

TCF is a complication of temporary tracheostomy that results from the failure of spontaneous tracheostomy closure after decannulation and that can significantly impair quality of life, vocalization, and local hygiene [1,2]. Despite its clinical impact, there are few studies in literature investigating its risk factors and pathogenesis.

Although decannulation time seems to be the only universally accepted TCF risk factor, previous irradiation of the neck, previous tracheostomies, obesity, and use of Bjork flap or 4-flap epithelial-lined tracheostomies have been suggested to be risk factors for TCF. TCF incidences of up to 70% have been reported when tracheostomies are maintained for more than 16 weeks [2]. Tracheocutaneous fistulectomy followed by primary closure is reported to be related to risks of major complications such as pneumomediastinum, pneumothorax, and exceptionally pneumopericardium [3]. In these cases, the trachea is not sutured, and complications are more likely to arise. For these reasons, many surgical techniques that involve multi-layered closures have been proposed. Most of these techniques require the surgical isolation and suture of the pre-laryngeal muscles, which are used as an additional layer to reinforce the tracheal closure.

For example, Bishop et al. [4] promote the separation of the trachea and skin as important components of successful repair and described a superiorly based skin flap requiring division and medial rotation of the sternohyoid for muscle coverage. Rennekampff and Tenenhaus [5] technique requires platysma and strap muscles isolation and medial interposition.

Perifistular tissues, especially in case of long-term tracheostomies, could be very difficult to manipulate due to the presence of scars and adhesions. Basing on our experience pre-laryngeal muscles could not be recognised and isolated in all the cases and local flaps are difficult to manipulate. Furthermore the isolation of the muscle structures requires a meticulous dissection which may require general anesthesia.

In our opinion the ideal technique should satisfy some criteria: 1) it should be simple since perifistular tissues are difficult to manipulate due to the presence of scars and adhesions, 2) multilayered tracheal

reconstruction should be used in order to reinforce the anterior tracheal wall and reduce recurrence rate, 3) minimal peritracheal tissue manipulation in order to avoid creation of dead spaces and to reduce complications such as pneumothorax and hematoma, 4) it should be performed in local anesthesia in order to reduce patient discomfort, 5) it should produce estetically acceptable results.

In our opinion our technique satisfy fully the criteria we illustrated. The procedure could be performed under local anesthesia since it is very simple. Indeed, following the fistula vertically we can easily reach and recognise the anterior tracheal wall without any other manipulations. Identification of the strap muscles is not necessary and the technique implies 2 layer closure: indeed perifistular tissues are sutured vertically in the midline reinforcing the anterior tracheal wall. Since the incision is made at the TCF inferior border, cutaneous horizontal sutures is located inferiorly and do not overlap with the vertical tracheal suture. This may contribute to reduce recurrence rate. The minimal peritracheal manipulation does not create dead spaces through which blood and air could spread to mediastinum or pleural spaces potentially determining tracheal compression and airway compromise. Finally the technique results in cosmetic acceptable results since it results in a 2-3 cm horizontal neck suture.

In our 9 patients (90%), surgeries were performed successfully without any complications. In 1 patient (10%) we observed a 1 mm fistula recurrence 3 days after suture removal. The latter was a patient who had undergone supracricoid partial laryngectomy, a surgical technique associated with post-operative cough and chronic aspiration. However, after 1 week, sutures were removed and closure was successfully accomplished. After 6 months no recurrences were recorded in all the patients.

Conclusion

In conclusion the reported technique was shown to be safe, simple and feasible. However particular caution should be required in patients with chronic aspiration and cough which may cause wound dehiscence and fistula recurrence in the early post-operative period.

Acknowledgments

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