

CLOSURE OF RECALCITRANT TRACHEOCUTANEOUS FISTULA-BY USING TURN OVER PLATYSMAL MUSCLE FLAPS

Rahul A. Telang¹, Samir V. Joshi², Pooja Nagre³, Nikhil B. Kunjir⁴

¹Professor, Department of ENT, B. J. Government Medical College and Sassoon General Hospital, Pune, Maharashtra.

²Professor and HOD, Department of ENT, B. J. Government Medical College and Sassoon General Hospital, Pune, Maharashtra.

³Assistant Professor, Department of ENT, B. J. Government Medical College and Sassoon General Hospital, Pune, Maharashtra.

⁴Junior Resident, Department of ENT, B. J. Government Medical College and Sassoon General Hospital, Pune, Maharashtra.

ABSTRACT

BACKGROUND

The objective of the study was to determine efficacy of repair of recalcitrant tracheocutaneous fistula with the use of medial based turnover platysma muscle flaps; providing a double layer covering to the fistula with a cosmetic scar.

MATERIALS AND METHODS

This was a prospective study carried out in a Sassoon Government hospital on 10 patients who came with the complaint of a stomal opening in neck after prolonged tracheostomy. Persistent air leak through the stoma causes hampered vocalisation, coughing etc. In this series of ten cases we used platysma muscle turnover flaps to provide a strengthened anterior wall for the fistula. The cases were then regularly followed up for results and complications.

RESULTS

This method provides a relatively easy way to repair the soft tissue defect over the trachea and revise tracheocutaneous fistula. Ten Patients (4 male and 6 female) with average age of 32 yrs. with recalcitrant tracheocutaneous fistula seen at the SGH, Pune between Sept. 2016 to Aug. 2017, underwent repair using medially based turnover platysmal muscle flap.

It provides adequate bulk without tension and should be employed for repairing fistulae as well. The postoperative complications include subcutaneous emphysema and wound infection in 2 out of 10 patients.

CONCLUSION

Medially-based turnover platysma muscle flaps can be used to repair recalcitrant tracheocutaneous fistulae by providing a double-layer covering to the fistula with a cosmetic scar.

KEYWORDS

Recalcitrant tracheocutaneous fistula, turnover platysma muscle flaps.

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BACKGROUND

Persistent tracheocutaneous fistula is most commonly a result of prolonged cannulation. It is thought to be secondary to epithelialisation of the tract of tracheostomy stoma resulting in a fistula thus it is 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. Other known risk factors for persistent tracheocutaneous

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Corresponding Author:

Dr. Nikhil B. Kunjir,

Junior Resident,

Department of ENT,

B. J. Government Medical College and

Sassoon General Hospital,

Pune, Maharashtra.

E-mail: nikhilkunjir5050@gmail.com

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fistula formation include obesity, previous tracheostomy, previous neck irradiation, chronic aspiration/cough, local infections, and malnutrition. Tracheocutaneous fistulectomy followed by primary closure carries a high possibility of pneumomediastinum, pneumothorax, and wound breakdown. Because of persistent air leak through the stoma it causes significant morbidity in the patient's daily chores. Along with hampered vocalization; carrying out activities which need sub glottic pressure building viz. coughing, climbing, weight lifting etc., becomes difficult for the patient. Chronic tracheocutaneous fistula 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 If spontaneous closure does not occur, fibrosis of the surrounding tissue may result in a persistent TCF and iatrogenic laryngotracheal stenosis, the so-called A-frame deformity. Additionally, in cases when large areas of

cartilaginous support have been lost or deranged by scar, simple closure without restoring structure can also lead to A frame or Lambdoid deformity.

Reported rates of TCF are usually less than 1% in adult patients, many of who had required long-term ventilation.³ In paediatric populations, the rate has been estimated to be between 6% to 30%.⁴⁻⁶ Risk factors for persistent fistula are length of time with tracheostomy, age, radiation, history of previous tracheotomy, and obesity.⁴⁻⁶ It also is a cosmetic defect due to the unsightly scar.

In this series of ten cases we present the use of platysma muscle turnover flaps to provide a strengthened anterior wall for the fistula. The aim of the present study is to describe and report the results of a simple and effective surgical tracheocutaneous fistula closure technique feasible under local anaesthesia.

MATERIALS AND METHODS

All patients were from SGH, Pune. Recalcitrant tracheocutaneous fistula defined as persistence of fistula after 6 months of decannulation. Ten patients were treated presenting to us from Sept 2016 to Aug 2017, all for purely tracheocutaneous fistula reasons, and their concern related to the visible deformity resulting from the after effects of prolonged intubation. Patients with less than 6-month duration and infective stoma are excluded from study. Paediatric patients were excluded from this study.

Surgical Procedure

Written informed consent taken from all patients after explaining all the possible complications.

Out of 10, 6 patients operated under general anaesthesia and 4 under local anaesthesia. An incision was made at the edge of the tracheocutaneous fistula along its border with the normal skin (Fig. 1) using 15 no. blade. The platysma was identified and the skin surrounding the defect was undermined at the subcutaneous level leaving the platysma intact. The dissection was extended laterally for a distance of about 2 cm beyond the width of the defect. Two rectangular turnover platysma muscle flaps were designed with bases of approximately 1–2 cm preserved medially (Fig. 3). The rest of the flap was easily separated at the posterior surface from the loose areolar attachments using dissecting scissors. The lengths of the flaps were planned according to the width of the defect, which has already been determined at the wound borders. The lateral edge of each flap was cut and both flaps were turned over into the defect (Fig. 4), the one lying over the other, and sutured the superficial flap was also sutured at the periphery to ensure complete obliteration of the cavity. The skin was then closed carefully, preferably in a transverse fashion (Fig. 5), with excision of unavoidable dog-ears. It was sutured in two layers using interrupted 4/0 Vicryl sutures subcutaneously and 5/0 monofilament subcuticular continuous sutures for the surface, after leaving a small suction drain. Steri-strips were applied on top. Drain was removed after second post-operative day.

Follow Up

All patients kept admitted in the general ward for 5 days post op. Intravenous antibiotic and analgesic given for 5 days and discharged on 6th post op day on oral medications for 7 days. Dressing done daily. All patients were observed for any respiratory difficulty and monitoring done by using spo2 saturation probe.

Follow up done on 15 days, 1 month and 3 monthly.



Figure 1. Preoperative View of Recalcitrant Tracheocutaneous Fistula



Figure 2. Elliptical Skin Excised Around the Stoma



Figure 3. Platysmal Muscle Flap Being Raised



Figure 4. Platysmal Flaps are Turned Over and Sutured



Figure 5. Wound Sutured in Layers

RESULTS

All patients eventually have good results post operatively. All patients discharged within 7 to 10 days and follow up done upto 3 months. All wounds healed within 10 days. Only one patient developed post op wound infection and subcutaneous emphysema. All patients were asymptomatic at the end of second follow up. No further intervention was needed in any patient.

DISCUSSION

Tracheocutaneous Fistula is a vexing problem for both the patient and the surgeon. It is seen in 3.3-29% of all tracheostomies. There is no consensus on the best initial approach to the repair of a TCF, and it is largely up to expert opinion. Seen mostly due to Prolonged cannulation (>16 weeks). Other known risk factors for persistent tracheocutaneous fistula formation include obesity, previous tracheostomy, previous neck irradiation, chronic aspiration/cough, local infections, and malnutrition. Exuberant granulation tissue in the tract. Prolonged cannulation with chemo or radiotherapy. Patients present clinically with Poor cough reflex, Breathly voice, Complains of aspiration or water entry, Skin irritation and breakdown due to secretions, Dysphagia Recurrent LRTIs. Last but not least cosmesis. One of the important causes of recalcitrant tracheocutaneous fistula is lack of proper tracheostomy

care. It leads to tracheitis and further adds to local infection and results in persistent fistula.

Numerous techniques have been described for TCF closure. Choices for treatment and closure of persistent tracheocutaneous fistula have included local debridement or chemical cauterization and closure by secondary intention, primary closure, fistulous tract excision and layered primary closure, local random flap closure, muscle flap closure, and free flaps. A depressed scar may form after closure by primary or secondary intent.³ One of the common complications of closure results from a collapse of the local flaps on inspiration causing a visible respiratory deformity.⁴ Tracheocutaneous fistulectomy followed by primary closure carries a high possibility of pneumomediastinum, pneumothorax, and wound breakdown. 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-plasty, 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 anaesthesia.⁷

This method provides a relatively easy way to repair the soft tissue defect over the trachea and revise tracheocutaneous fistula. Simple skin mobilization and approximation results in a drum-like repair, which inevitably results in a stretched scar and recurrence of the hollow concavity. On follow-up at 3 months, patients reported no respiratory symptoms, including increased breathing effort, and elected to follow up on an as needed basis. The donor-site damage to the platysma is negligible leaving no secondary deformity.¹ Previous methods employing turn-in de-epithelialised flaps provide adequate bulk but produce further skin scarring.² Z-plasty of the subcutaneous fat and platysma provides single-layer cover and does not always fill the concavity.³ Approximation of the strap muscles may be effective⁴ but is done under tension, which may lead to eventual dehiscence of the moving muscles. The method suggested here provides adequate bulk without tension and should be employed for repairing fistulae as well.

Various Surgical Techniques Used for Closure-

1. Multilayered flap closure technique⁸

A medially based turnover skin flap closes the tracheal defect without tension and does not narrow the lumen. Double and layered local muscular coverage provides healthy soft-tissue coverage and eliminates a tethered and depressed scar appearance. Skin closure respects relaxed tension lines.

2. Conchal Cartilage Graft for Closure of Tracheocutaneous Fistula

Initially, the scar tissue of the stenotic area was resected. The conchal cartilage was then fixed to cover the defect of the anterior wall of the trachea, and the

skin was sutured with Z-plasty. The postoperative courses were uneventful. Three months after the above surgery, bronchoscopy revealed reconstructed tracheal mucous membrane, indicating stability of the cartilage as supporting tissue.

3. Use of a Fascia Lata Graft for Closure of Tracheocutaneous Fistulas

Skin incision was performed in the periphery of the fistula, and the soft tissue was exfoliated and removed in the opening of cartilaginous tracheales, and the mucosa was hinged and sutured. Fascia lata was onlay grafted, and the skin was sutured and shut by Z-plasty.

4. Management by transplantation of an ear cartilage graft and deltopectoral flap⁹

After local debridement and wound care, the peristomal necrotic tissue was excised down to the level of the trachea. The defect of the anterior tracheal wall was closed with an autogenous ear cartilage graft. The graft was harvested from the cavum conchae and sutured to the tracheal defect. The soft tissue defect was covered by transposition of a well-vascularized, fasciocutaneous deltopectoral flap. In both cases, the flaps healed satisfactorily. The donor defect was closed primarily.

5. Tracheocutaneous Fistula Closure with Turnover Flap and Polydioxanone Plate

The single-stage closure under local anaesthesia involves a fistulous tract turnover flap with a perforated 0.15 mm polydioxanone plate between the flap and the subcutaneous closure. PDS is a synthetic bioabsorbable polymer used in the production of suture, orthopaedic implants, and implantable stents. This compound undergoes hydrolysis, retaining 70% tensile strength at 2 weeks and 25% tensile strength at 6 weeks. Complete biologic resorption occurs by 6 months, and PDS is known to illicit only a minimal local foreign body reaction. Ethicon™ Polydioxanone PDS™ Flexible Plate (Mentor Worldwide LLC, Irving, Tex.) is available as a 50 × 40 mm plate in 3 thicknesses: 0.15 mm with perforations, 0.25 mm, and 0.5 mm.

- In our opinion the ideal technique should satisfy some criteria: 1) it should be simple since peristomal 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 haematoma, 4) it should be performed in local anaesthesia in order to reduce patient discomfort, 5) it should produce aesthetically acceptable results.
- Some also argue that healing by secondary intention is a more cost-effective strategy than primary closure, although Wine et al. did not find statistically significant differences in functional outcomes or complications in

primary closure versus secondary intention.¹⁰ Conservative operations may correct the defect, but the fistula will persist for some patients. While Especially in some early case reports of primary closure, feared complications including pneumomediastinum and subcutaneous emphysema led some clinicians to disregard primary closure as a viable surgical option.⁸

• Postoperative complications –

1. Subcutaneous emphysema – if post-op cough present.
2. Wound infection.
3. Pneumomediastinum.

CONCLUSION

Medially-based turnover platysma muscle flaps can be used to repair recalcitrant tracheocutaneous fistulae by providing a double-layer covering to the fistula with a cosmetic scar. In conclusion the reported technique was shown to be simple, straightforward, reliable, safe, and effective with excellent cosmetic results. However particular caution should be exercised in patients with chronic aspiration and cough which may cause wound dehiscence and fistula recurrence in the early postoperative period.

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