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Endoscopic treatment of pharyngocutaneous fistula after total laryngectomy: A retrospective analysis

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Abstract

Aim of the study: Pharyngocutaneous fistula (PCF) is the most frequent complication of total laryngectomy. The aim of this study is to evaluate the efficacy of the endoscopic treatment of pharyngocutaneous fistula after total laryngectomy as a minimally invasive alternative to traditional surgery.

Materials and methods: In this retrospective study, we analyzed the complications in 11 patients affected by PCF following total laryngectomy.

Contributing factors to the development of pharyngocutaneous fistula were considered, including anemia, hypoalbuminemia, insulin-dependent diabetes, neoadjuvant radiotherapy, chemotherapy or combined radio-chemotherapy, type of neck dissection, preoperative tracheostomy, fistula size, and length of hospitalization.

Results: This study demonstrates the validity of an endoscopic technique as a surgical option for the treatment of pharyngocutaneous fistula. The method requires antibiotic prophylaxis, is non-invasive, and reduces the duration of nasogastric tube dependence. Furthermore, early implementation of this technique safely shortens the time to oral feeding resumption.

Conclusion: The treatment appears well-tolerated and safe, as supported by the recent Technology Status Evaluation Report issued by the American Society for Gastrointestinal Endoscopy (ASGE).

Keywords: Pharyngocutaneous fistula; Laryngeal cancer; Laryngectomy complications; Chemotherapy; Radiotherapy; Salvage surgery; Squamous cell carcinoma.

Introduction

Hypopharyngeal malignancies rarely allow a conservative surgical approach via endoscopy. These tumors are typically treated with partial or total pharyngectomy in combination with laryngectomy. Among the complications of oncologic surgery in the hypopharyngeal area, such as hypopharyngeal perforation (10-30%) and pharyngeal stenosis, the pharyngocutaneous fistula (PCF) is the most frequent, with an incidence ranging from 4% to 38% [1]. Predisposing factors linked to the patient's general condition include poor nutritional status and comorbidities: age, sex, smoking and drinking habits, hypertension, diabetes, chronic bronchitis, chronic congestive heart failure, anesthesiology risk, cholinesterase level, pre and postoperative hemoglobin and albumin levels, previous tracheotomy, site of the origin tumor, surgical procedure, neck dissection, suture material, status of surgical margins, clinical and histological stage, hypothyroidism [2,3]. The incidence of PCF doubles when the surgical intervention involves not only total laryngectomy, but also partial pharyngectomy extending to the base of the tongue or piriform sinus [4,5]. Neoadjuvant radiotherapy or radio-chemotherapy significantly increases the risk of PCF (rates of 22,8% and 34,1% respectively), necessitating preventive procedures, combined with the salvage surgery, such as "onlay prophylactic tissue flaps". Effective prevention also depends on appropriate preoperative antibiotic therapy, careful selection of incision lines, especially in previously irradiated patients, good hemostasis to prevent subcutaneous hematoma and meticulous multilayer wound closure [6,7]. Clinical signs and symptoms of PCF become evident at full development, but early signs may include erythema around the surgical flaps, increased local skin tension, severe wound pain, and fever occurring after the sixth postoperative day. If untreated, PCF can result in severe complications such as sepsis, necrosis of the skin flaps, and exposure or rupture of major neck vessels. Management should be targeted and effective, including specific antibiotic therapy, disinfection of the external fistulous tract, and application of compressive dressings to promote adherence of the cervical flap to deep tissues, thereby diverting saliva medially from the neck's vascular bundles. Once the infection is controlled, small fistulas may resolve spontaneously in up to 70% of cases. If the tract persists, closure via direct suturing (effective in 80% of cases) or the use of pedicled or free myocutaneous flaps is indicated [8]. Several simpler and lower-risk endoscopic techniques have been proposed as alternative treatments [9,10].

Materials and methods

In this retrospective study, we analyzed 110 patients who underwent total laryngectomy. Among them, 11 developed pharyngocutaneous fistulas; of these, 4 had previously received radio-chemotherapy followed by salvage surgery. We assessed factors contributing to PCF onset, including hemoglobin levels, postoperative hypoalbuminemia, insulin-dependent diabetes, radiotherapy, chemotherapy, or combined treatment, type of lateral neck dissection, preoperative tracheostomy, fistula size, and hospital stay duration. Based on endoscopic imaging, fistulas were classified by size: Type I (<2 cm, 9 patients) and Type II (>2 cm, 2 patients). The characteristics described are summarized in Table I. All patients underwent fistulography before and after treatment (Figures 1 and 2). The endoscopic treatment use a standard gastroscope fitted with a CAP on the tip of endoscope (serving as a spacer), tissue adhesive consisting of components A and B in dual syringes that polymerize upon contact, a large-bore injection needle (21 or 19 G), biopsy forceps, and syringes filled with saline. The tissue adhesive is thawed at 37°C, and the needle pre-filled with saline. The CAP-equipped gastroscope is inserted into the pharynx to locate the fistula (Figure 3). If needed, the fistula was cleansed with saline using the needle with a retracted tip or a catheter. The fistula margins are debrided using biopsy forceps (Figure 4). Once selected injection site, the needle is inserted at the margin of the fistula and correct positioning verified the formation of wheal by saline injection (Figure 5). Component A is injected, followed by 2 cc saline (to avoid the contact between component A and B inside the needle), then Component B, and another 2-3 cc of saline to flush the B component. The needle is flushed again post-injection. Typically, two injections of 1 cc adhesive (0.5 cc each of A and B) are made at opposing margins of the fistula. Closure is confirmed endoscopically (Figure 6) and the endoscope withdrawn. If necessary, additional treatment sessions are performed at weekly intervals until definitive closure is achieved.

Discussion

Several endoscopic injection techniques have been proposed to manage gastrointestinal tract fistulas, including the use of cyanoacrylates (e.g., polidocanol, sulfated prolamin), as well as thermal treatments, clips, or stents. However, most of these are based on case reports or small open-label series, so it is currently not possible to definitively determine the most effective treatment. Nevertheless, the most extensive clinical experience concerns the use of fibrin sealant due to its properties: it is non-cytotoxic, provides mechanical compression through the formation of a submucosal clot, stimulates fibroblast proliferation, promotes the development of a collagen fiber network, and allows for repeatable treatments [11]. When endoscopic treatment of a digestive fistula is proposed, thorough diagnostic assessment is essential; first of all is important to evaluate the diameter and condition of the internal opening endoscopically (e.g., necrotic, inflamed, or fibrotic), to he etiology of the fistula and the course of the fistulous tract. This should be performed in addition to endoscopy, using fistulography and at least one imaging (US, CT or MRI). Due to the limited available data, validated selection criteria for endoscopic treatment are lacking. However, literature review highlights some prerequisites: accurate diagnosis of the fistula, proper drainage of any collections, afebrile patient status, antibiotic coverage, absence of digestive stenosis or prior endoscopic treatment, preferably post-surgical or post-radiation etiology and a fistula tract diameter less than 15 mm. Any abscess cavity must be adequately drained, and endoscopic treatment should only proceed when proper cavity cleansing is confirmed. If fever exceeds 38°C, it is generally recommended to delay treatment. Published cases involving fibrin glue report the highest success rates in post-surgical fistulas, which are also the most common etiology of fistulas of the digestive tract (approximately 75%). Post-radiation fistulas appear to be the only additional acceptable indication for fibrin glue therapy. Multiple variations in technique with the use of fibrin glue have been proposed, the most common technique used combines this infusion with submucosal injection at the fistula margins, aiming to enhance tissue repair through both biochemical stimulation and mechanical compression, facilitated by the clot, that typically persisting for 2-3 days. Injection

Table 1: Patient distribution according to demographic, clinical, and treatment characteristics and occurrence of Pharyngocutaneous Fistula.

11 Pharyngocutaneous fistula (PCF)/110 Total laryngectomy (TL)			
Sex	0 female	11 male	
Age	>60 years	11 pts	
Comorbidity	hypoalbuminemia post-op.	9 pts	
	diabetes mellitus (DM)	4 pts	
Predisposing factors	Hb (<12,5 d/dl) post-op.	11 pts	
Tumor site	Supraglottis	11 pts	
pT Stage	T2-T3	8 pts	
	T4	3 pts	
Type of treatment	Neoadjuvant CHT+RT	4 pts	
	Total laringectomy	11 pts	
	Selective bilateral neck dissection	11 pts	
Endoscopic approach	Fistula size	9 pts < 2 cm	2 pts > 2 cm
Hospital stay	Average hospital stay	23 days (fistula size <2 cm)	>35 days (fistula size >2 cm)

Figure 1: Pre-endoscopic treatment fistula X-ray. Barium swallow radiographs. On sagittal view fistula between the neopharynx and the skin at the C2-C4 level is visualized. The sagittal plane revealed a midline fistula between the pharynx and the skin at the level of C2-C4, with a narrow inlet at the junction between the tongue and the neopharynx, confirming the endoscopic finding.

volumes typically range from 0.5 to 1 ml per injection, for a total of 2–5 ml per session, depending on the fistula diameter. Thus, 4 to 10 injections may be required per session, this technique is similar to that used for ulcer bleeding management. The decision to use a single-lumen or dual-lumen catheter and needle depends on the department organization. Single-lumen needles are preferred when dealing with fibrotic or tough tissue, as dual-lumen devices are harder to penetrate in this type of tissue. If a dual-lumen needle is used, it is crucial to advance only a short segment from the endoscope tip and stabilize it to ease tissue penetration. Some authors recommend the debridement of the fistulous tract prior to injection, especially if the tract is fibrotic, ulcerated, or unresponsive to initial treatments. Endoscopic debridement can be performed using argon plasma coagulation (APC). We recommend, for large cavities or wide tracts, to inject

Figure 2: Post-endoscopic treatment fistula X-ray. As in shown on sagittal view, the PCF is closed.

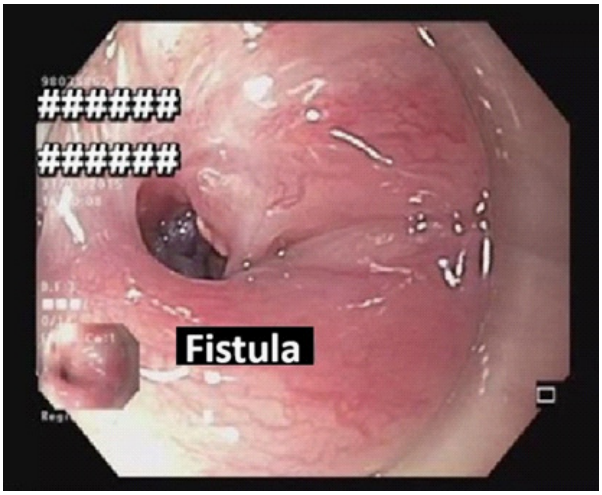

Figure 3: Identification of the fistula.

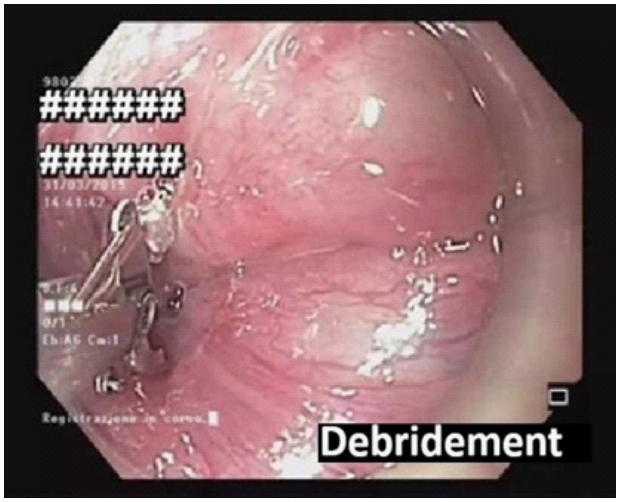

Figure 4: Debridement.

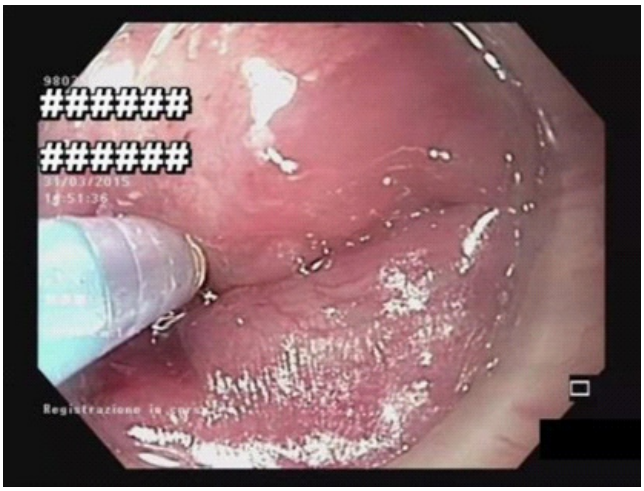

Figure 5: Injection of fibrin glue.

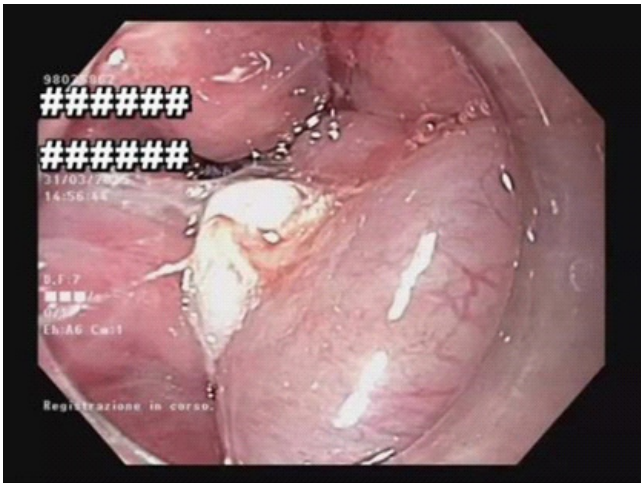

Figure 6: Outcome at the end of treatment.

fibrin glue directly into the tract and/or cavity. In these cases, a dual-lumen needle is preferred, allowing sequential injection into submucosal tissue and gradual needle withdrawal ("anchor technique"), to secure the clot to the tissue. Without this procedure fibrin glue may be expelled. If a stenosis is present, it is advisable to treat the stenosis prior to fibrin glue injection, as the glue may exacerbate the stenosis. In cases where the internal orifice is not reachable endoscopically, fistuloscopy using a bronchoscope or small-caliber gastroscope (6 mm) has been described. Thus, several questions remain unanswered: How long should one wait before initiating endoscopic treatment? Which fistulas are most suitable? What is the ideal volume of fibrin glue? What is the ideal time interval between the different treatment sessions? [13-16]. Based on our experience, we wait 2–4 weeks, and treat only those fistulas meeting the criteria described above. The only complications observed were an exacerbation of a pre-existing partial stenosis, requiring endoscopic dilation, and a case of fever that resolved with antibiotic therapy. Overall, this treatment appears well-tolerated and safe, as also supported by the recent Technology Status Evaluation Report on fibrin glue by the American Society for Gastrointestinal Endoscopy (ASGE) [17-19].

Conclusion

Pharyngocutaneous fistula represents the most common complication of total laryngectomy. This study shows the efficacy of endoscopic treatment based on fistula size. This technique proves to be non-invasive, shortens the duration of nasogastric tube placement, facilitates the safe resumption of oral feeding and reduce the average hospital stay.

Conflicts of interest: No conflict of interest.

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