

# Continuous negative pressure-flush through a dual tube for the treatment of a complicated pharyngeal fistula: A case report

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Received March 8, 2015; Accepted December 10, 2015

DOI: 10.3892/ol.2016.4152

**Abstract.** The treatment of pharyngeal fistulas is complicated. It is more difficult to deal with pharyngeal fistula following surgical treatment for hypopharynx carcinoma, particularly in cases of pectoralis major muscle flap repair. The present study describes the case of a 56-year-old man who presented with a highly-differentiated pharyngeal squamous cell carcinoma located at the right side of the hypopharynx. The patient underwent a total laryngectomy and a right functional carotid dissection and tracheostomy; this was followed by post-operative radiotherapy. A pharyngeal fistula subsequently developed, but an attempt to repair this with a pectoralis major muscle flap failed. The complicated pharyngeal fistula was treated via continuous negative pressure-flush through a dual tube, without the requirement for incision, daily dressing or antibiotics. The favorable patient outcome represented a positive result, which was also able to reduce the psychological burden of the patient and improve their quality of life.

## Introduction

A pharyngeal fistula may occur due to saliva stored in an incision of the skin or tissue, which may result in the rupture of an abscess to form skin at the incision edge. Therefore, incisions in the hypopharynx and esophagus may grow towards the sinus cavity, with skin communicating through this channel. Eventually, the saliva or food may overflow from the incision, and the fistula between the pharynx and the sinus cavity is formed (1). A pharyngeal fistula is a frequent

complication that often occurs following the performance of a total laryngectomy. The incidence of a fistula occurring due to a primary total laryngectomy is 14.3% (1). Infection, the location of the primary tumor, for example on the glottis and transglottic region (2), preoperative radiotherapy (2), a preoperative tracheotomy (3), tumor cells at the surgical margin (4), chronic systemic disease (2,5-11), including diabetes, severe hypertension, anaemia, hypoproteinemia, renal insufficiency and thyroid dysfunction, and locally advanced tumors (T3 and T4 stages) (12) are all risk factors following a total laryngectomy for pharyngeal fistulas. Salvage surgery is associated with more complications compared with primary surgery; and the incidence of salvage laryngectomy fistula is 27.6% while the incidence of salvage surgery with flap-reinforced closure is 10.3% (1). Pharyngeal fistulas not only inflict increasing physical pain and psychological distress, but may also prolong hospitalization, negatively affect patient recovery (in terms of local infections, swallowing and vocal capabilities) and increase mortality (1,13,14). The treatment of pharyngeal fistulas is complicated; although smaller fistulas occasional heal well with a local dressing, fistulas >1 cm in diameter, and those occurring subsequent to radiotherapy, typically require surgical repair (14-17).

## Case report

In June 2012, due to the hypopharynx discomfort, a 56-year-old man was admitted to the Ganzhou Tumor Hospital (Ganzhou, China). Laryngoscopy examination identified a hypopharynx tumor on the right side of the hypopharynx, and subsequent pathological analysis of a biopsy (employing hematoxylin and eosin staining techniques) revealed disordered carcinoma nests and tumor cells with large nuclei, in addition to a number of prominent nucleoli, abundant cytoplasm and keratosis. Such observations lead to the diagnosis of highly-differentiated pharyngeal squamous cell carcinoma, and the clinical stage of the tumor was reported as cT2N1M0, stage III (18). Following 2 cycles of docetaxel (75 mg/m<sup>2</sup> on day 1), cisplatin (75 mg/m<sup>2</sup> on day 1) and 5-fluorouracil (0.5 mg/m<sup>2</sup> on days 2-5) induction chemotherapy, the patient underwent a total laryngectomy with a right functional carotid dissection and tracheostomy. Following the surgery, the incision appeared to heal well. A regimen of radiotherapy to the neck was then performed, with

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**Key words:** dual tube, continuous negative pressure-flush, pharyngeal fistula, pectoralis major muscle flap

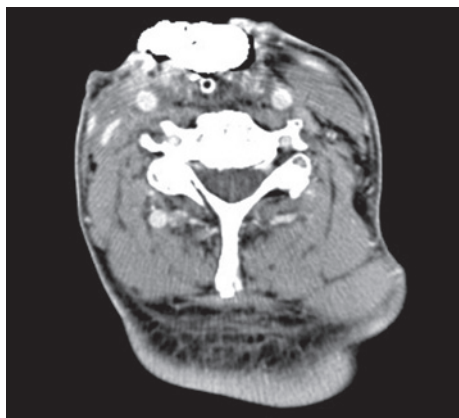


Figure 1. Computed tomography scan revealing a huge fistula packed with iodoform gauze.



Figure 2. Continuous negative pressure-flush through a dual tube. A small fistula was visible above the tracheal stoma fistula. Image captured on August 19, 2013.

a total dose of 66 Gy in 33 fractions for a duration of 45 days. Following 20 doses of radiation, a small amount of milk leaked from the edge of the tracheal stoma subsequent to eating and resulted in the patient choking; the possibility of a pharyngeal fistula was then considered. Relevant therapeutic processes, including fasting and nutritional support, were adopted and radiotherapy was continued. Following completion of the radiotherapy regimen and regular follow-up, no symptoms of a pharyngeal fistula were evident.

However, on May 25, 2013, a fistula was detected at the top of the tracheal stoma, with secretions being excreted continuously from the passage; aspiration and coughing symptoms also progressively worsened. The pharyngeal fistula was concurrent with the initiation of post-operative radiotherapy. Subsequently, the patient underwent pharyngeal fistula excision and local repair surgery under general anesthesia on June 28, 2013. However, it was observed that the negative pressure drainage tube was leaking 3 days later, and the neck incision was dehiscent after 6 days. The skin of the neck gradually became necrotic, and the hypopharynx was exposed, with foul-smelling secretions. A local anti-inflammatory treatment was applied [1.0 g ceftazidime three times a day (tid) and ciprofloxacin hydrochloride 0.2 g two times a day (bid) for 5 days], and the fistula was then washed and a dressing applied; however, the local infection persisted.

Computed tomography examination revealed no recurrence of the tumor, however, an irregular fistula (~7x5 cm) was identified in the neck on July 18, 2013 (Fig. 1), and was associated with oral secretions. A pharyngeal mucosal defect (5x3 cm) was present in the hypopharynx, and the entrance to the esophagus and stomach were directly visible. The tracheal stoma was 2.0x1.5 cm in size and was located below the neck fistula, with no signs of local swelling or abnormal secretions. The airway was smooth and the neck lymph nodes were not palpable. *Pseudomonas aeruginosa* was cultured from the fistula secretions. Despite regular treatment with hydrogen peroxide, saline and iodoform strips, no significant change was observed in the size of the fistula after 2 weeks, and the foul-smelling secretions persisted. In light of the emotional instability and suicidal ideation of the patient, the available treatment options were discussed with the patient and their family. In the Ganzhou Tumor Hospital, on August 6, 2013,



Figure 3. Healing after repair with pectoralis major muscle flap. Image captured on December 4, 2013.

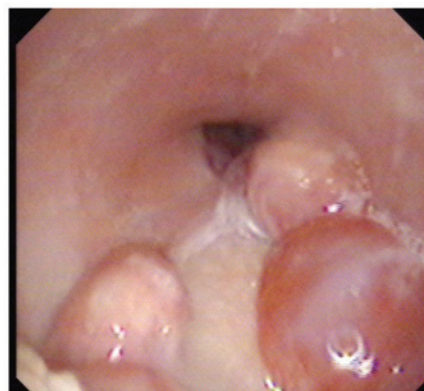


Figure 4. Electronic laryngoscopy examination showing the hypopharynx mucosal defect repaired with a pectoralis major muscle flap. Image captured December 4, 2013.

a pharyngeal fistula resection was conducted, with a right pectoralis major flap prosthesis, under general anesthesia, as approved by the hospital ethics committee. The hypopharyngeal mucosa and skin defects were repaired with a bi-folded pectoralis major muscle flap.

On day 3 post-surgery, a small amount of non-foul-smelling turbid liquid spilled from the drainage tube, however, this gradually decreased. *Pseudomonas aeruginosa* was cultured

from the drainage tube secretions on day 7 post-surgery, and antibiotic treatment (1.5 g cefoperazone-sulbactam bid combined with 0.2 g ciprofloxacin hydrochloride bid for 3 days) was selected to treat the infection. On day 10 post-surgery, *Escherichia coli* was cultured from the tracheal stoma secretions, and this infection was also treated with 1.5 g cefoperazone-sulbactam bid combined with 0.2 g ciprofloxacin hydrochloride bid for 2 days. By day 12 post-surgery, the drainage from the right upper neck tube had decreased; however, extensive secretions continued to be excreted from the area surrounding the tube. During a laryngoscopy, a gap of ~2 cm was detected at the upper left section of the hypopharyngeal mucosa, which had been repaired with the pectoralis major muscle flap. The right upper neck drainage tube was removed, and a dual tube was inserted to a depth of ~5 cm with continuous negative pressure-flush (Fig. 2). All antibiotics were stopped and nutritional therapy was strengthened. By day 35, the flush drainage was clear and the drain fluid intake and output were similar, with the skin incision surrounding the tracheal stoma fistula healing well. The dual tube, ~2 cm from the fistula, was removed with continuous flushing, and the depth of the double tube was gradually adjusted. At day 70 post-surgery, the dual tube was withdrawn from the fistula with no local exudate, and the fistula was packed with iodoform gauze. The patient underwent a laryngoscopic examination 5 days later, demonstrating that the fistula had closed, with the flap healing well, and the patient had returned to normal oral eating. The patient remained free from recurrence and metastasis throughout 15 months of follow-up examinations (Figs. 3 and 4).

## Discussion

In the present case, severe symptoms of a pharyngeal fistula reappeared ~6 months after the initiation of symptomatic treatment and radiotherapy to treat a highly-differentiated pharyngeal squamous cell carcinoma. Despite suturing the fistula directly, a larger pharyngeal fistula was observed with a skin defect of ~8x6 cm and a mucosal defect of ~6x4 cm. The patient exhibited suicidal tendencies with unstable emotions during hospitalization. Following careful consideration, the fistula was repaired with a bi-fold pectoralis major muscle flap; this has the advantages of a rich blood supply, strong resistance to infection and a rapid healing time. However, the pharyngeal fistula recurred 3 days after reconstructive surgery. Despite anti-infection treatment, nutritional therapy and drainage, the fistula worsened, with another fistula developing just above the tracheal stoma; this was now considered to be a complicated pharyngeal fistula. The treatment options available for this complicated pharyngeal fistula were limited, and prolonged dressing of the surgical incision was likely to lead to renewed suicidal ideation.

Continuous negative pressure-flush through a dual tube has been utilized successfully for the treatment of anastomotic fistulas (19). This approach involves using an outer tube, comprising a medical silicone pipe with a scale, with two to four pairs of holes punched in the sides (conducted using a leather hole puncher). The inner tube is a suction pipe, with its tip 3-5 cm from the outer pipe tip and fixed to the outer tube by a thread. Bacterial secretions and exudates in the body

cavities may be aspirated by a dual-tube continuous negative pressure-flush, thus reducing the risk of infection and local inflammation. This may also accelerate the development of novel blood vessels and granulation tissue, promoting healing of the fistula. Although spontaneous fistula closure occurs in the majority of cases undergoing conservative management, Wiseman *et al* (20) described a case of a post-laryngectomy pharyngocutaneous fistula that had developed in a previously irradiated patient; this case was successfully managed through the incorporation of fibrin glue into the surgical closure. However, fibrin glue-reinforced closure is only suitable for smaller pharyngeal fistulas, and was not applicable to the present case. A small number of pharyngeal fistulas may require surgical flap repair, whereby the inner mucosa and the outer skin are reconstructed (21). However, surgical repair of fistulas is challenging, with the likelihood of bleeding, infection and necrosis, and the fistula being substantially more difficult to treat post-surgery.

Following careful consideration, with the consent of the patient and his family, and with authorization from the hospital ethics committee, it was decided that continuous negative pressure-flush would be applied through a dual tube in the complicated pharyngeal fistula. Continuous negative pressure-flush was applied through a dual tube on day 12 post-surgery, without antibiotics. The depth of the dual tube was gradually adjusted, and the nutritional support of the patient was strengthened. The fistula had healed well by day 35 and the dual tube was removed at day 70 post-surgery. By day 75, the patient was considered to be cured. The dual tube was retained for a total of 58 days, suggesting that the condition of the patient may have worsened due to the administration of radiotherapy and also the possibility that the fistula infection was not fully controlled prior to surgery. The treatment strategies for pharyngeal fistula with flap-reinforced closure include re-operation repair, dressing and other nonsurgical treatments. The fistula increases the patient's pain and reduces the quality of life (15-17).

In conclusion, continuous negative pressure-flush through a dual tube to treat a complicated pharyngeal fistula has numerous advantages, including no requirements for an incision, daily dressing or antibiotics, whilst shortening the healing time of the fistula. Additionally, the lack of an incision is associated with positive cosmetic results. This technique may aid in reducing the psychological burden associated with pharyngeal fistulas, whilst also improving patient quality of life.

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