



Novel Tracheal Reconstruction Using NEOVEIL® PGA Felt and Sternothyroid Flap

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Abstract

Background: Tracheal wall defects pose substantial reconstructive difficulties in head and neck surgery, particularly when complicated by chronic inflammation, fibrosis, and retained foreign material. Although multiple repair techniques have been documented, the application of absorbable Polyglycolic Acid (PGA) sheets in tracheal reconstruction remains infrequently reported.

Case Presentation: We describe a 54-year-old male who developed a recurrent cervical mass with airway compromise four years following right hemithyroidectomy for follicular adenoma with Hürthle cell changes. Imaging revealed a large right paratracheal lesion with tracheal displacement. Fine-needle aspiration cytology demonstrated necrotizing granulomatous inflammation without malignancy. Intraoperative exploration identified a retained surgical sponge (gossypiboma) from the prior procedure, accompanied by purulent collection and dense fibrosis. After foreign body removal and debridement, a lateral tracheal defect involving two cartilage rings was observed. Reconstruction was performed via primary mucosal closure with interrupted absorbable sutures, reinforced with a pedicled sternothyroid muscle flap, and covered with a NEOVEIL® absorbable PGA felt sheet.

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Results: The postoperative course was uncomplicated, with no evidence of air leak, subcutaneous emphysema, dysphonia, or respiratory distress. Follow-up bronchoscopy revealed satisfactory mucosal healing, preserved airway patency, and minimal granulation tissue. The patient remained asymptomatic throughout the one-month follow-up period.

Conclusion: Retained surgical sponges may rarely manifest as complex inflammatory neck masses with secondary tracheal erosion. The combined use of an absorbable PGA biomaterial scaffold and local muscle flap reinforcement appears to be a safe and effective approach for tracheal reconstruction in selected complex cases.

Keywords: Tracheal Reconstruction; Gossypiboma; Retained Foreign Body; Tracheal Erosion; Polyglycolic Acid Film; Thyroidectomy

Introduction

Tracheal defects remain among the most demanding conditions in head and neck and airway reconstructive surgery. The complexity of tracheal repair arises from the unique structural and functional requirements of the airway, including the necessity for luminal patency, structural rigidity, mucosal integrity, and resistance to microbial colonization. Inadequate repair may result in severe complications such as airway obstruction, tracheal stenosis, fistula formation, surgical emphysema, recurrent infection, and respiratory compromise [1, 2].

Tracheal wall defects may develop secondary to trauma, prolonged intubation, invasive malignancy, infection, iatrogenic injury, or previous cervical surgery. Retained surgical foreign bodies represent a rare yet serious postoperative complication that can provoke chronic inflammatory reactions, abscess formation, progressive fibrosis, granulomatous changes, and tissue destruction. In the cervical region, such retained materials may clinically and radiologically simulate recurrent malignancy or aggressive infectious processes, thereby complicating diagnosis and delaying definitive management [3].

Surgical management of tracheal defects depends on the defect dimensions, anatomical

location, degree of tissue loss, presence of active infection, and condition of surrounding tissues. Small defects may be amenable to primary closure, whereas larger or complex defects frequently require reinforcement with local muscle flaps, biological grafts, cartilage grafts, or synthetic materials. Various reconstructive techniques have been described, including sternocleidomastoid muscle flaps, strap muscle flaps, pericardial patches, and tissue-engineered scaffolds. However, reconstruction in chronically inflamed and fibrotic operative fields remains technically demanding and is associated with an increased risk of dehiscence and postoperative airway complications [4].

Recent developments in regenerative biomaterials and bioengineered scaffolds have created new opportunities for airway reconstruction. Absorbable Polyglycolic Acid (PGA) felt sheets have attracted increasing interest due to their biocompatibility, biodegradability, pliability, and capacity to reinforce fragile tissues while promoting tissue healing. These materials have been extensively employed in thoracic surgery to reduce postoperative air leakage and support tissue repair following pulmonary resections. Nevertheless, their application in tracheal reconstruction within the head and neck domain remains relatively limited [5, 6].

In this report, we present a rare case of retained surgical gauze manifesting years after hemithyroidectomy as a recurrent inflammatory neck mass associated with progressive airway symptoms and secondary tracheal wall erosion. The tracheal defect was successfully reconstructed using primary mucosal repair reinforced with a sternothyroid muscle flap and coverage with an absorbable PGA biomaterial sheet (NEOVEIL®). This case underscores both the diagnostic challenge of retained cervical foreign bodies and the potential utility of novel biomaterial scaffolds in complex tracheal reconstruction.

Case Presentation

A 54-year-old male presented with recurrent episodes of stridor, progressive dysphagia, and recurrent neck swelling one year following right hemithyroidectomy that had been previously performed for a thyroid lesion diagnosed histopathologically as follicular adenoma with Hürthle cell changes.

Clinical examination revealed a recurrent neck mass predominantly involving the right side of the neck. The swelling was firm to hard in consistency, non-tender, and associated with a previous cervical surgical scar. No skin changes or sinus formation were noted (Figure 1).

Flexible fiberoptic laryngoscopy demonstrated right vocal cord paralysis with the cord fixed in the paramedian position, while the left vocal cord was freely mobile (Figure 2).

Neck ultrasonography and contrast-enhanced Computed Tomography (CT) of the neck demonstrated a large heterogeneous hypoechoic lesion occupying the right paratracheal region, measuring approximately 7×3×3 cm, with dense calcification along its medial aspect. The lesion extended superiorly toward the submandibular region and inferiorly to the right supraclavicular area without retrosternal extension. Significant mass effect was noted, including elevation of the right sternocleidomastoid muscle, leftward displacement of the trachea, and lateral displacement of the right carotid sheath without radiological evidence of vascular invasion.

Ultrasonographic examination also revealed enlarged right submandibular and upper deep cervical lymph nodes with preserved



Figure 1: Preoperative view showing right-sided recurrent neck mass with previous cervical scar.



Figure 2: Preoperative flexible laryngoscopic view demonstrating right vocal cord fixed in paramedian position.

fatty hilum. The remaining left thyroid lobe demonstrated multiple nodules (Figure 3 & 4).

Fine-Needle Aspiration Cytology (FNAC) of the lesion revealed heavily necrotizing epithelioid granulomatous inflammation with suppurative neutrophilic infiltrates and no evidence of malignancy.

Surgical Technique

The decision for surgical exploration and completion thyroidectomy was made by the Head and Neck Surgery Unit at the General Surgery Department, Sohag University, to establish definitive diagnosis and manage the progressively enlarging neck lesion.

Under general anesthesia with oral endotracheal intubation, a nasogastric tube was inserted and the patient was positioned supine with neck extension. The previous Kocher cervical incision was reopened, followed by elevation of subplatysmal flaps. Midline separation of the superficial cervical fascia was performed, and the strap muscles were dissected to expose the thyroid bed.

Completion left hemithyroidectomy was carried out using the ENSEAL® device with careful preservation of the left recurrent laryngeal nerve and both superior and inferior parathyroid glands.

Further dissection and elevation of the right sternohyoid and sternothyroid muscles revealed marked fibrosis and dense adhesions. Intraoperatively, a retained surgical foreign body (gauze) from the previous surgery was unexpectedly identified. The retained gauze was associated with surrounding purulent collection and extensive inflammatory granulation tissue. Following removal of the foreign body and debridement of the infected cavity, a right paratracheal defect was identified with erosion of the lateral tracheal wall involving approximately two tracheal cartilage rings over a length of nearly 3

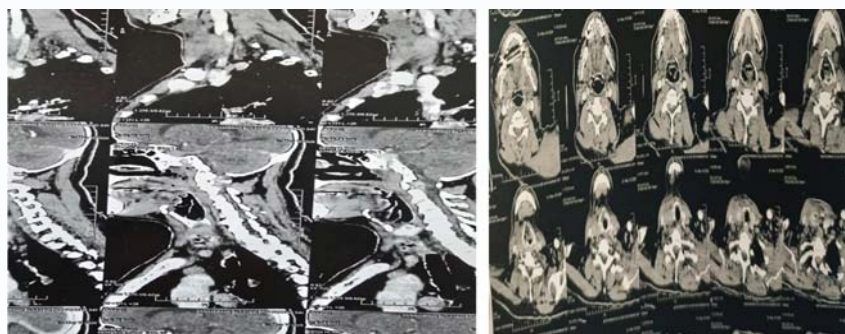


Figure 3 & 4: Contrast-enhanced CT of the neck demonstrating the large right paratracheal mass with tracheal displacement and calcification.



Figure 5: Intraoperative identification of retained surgical gauze (gossypiboma).

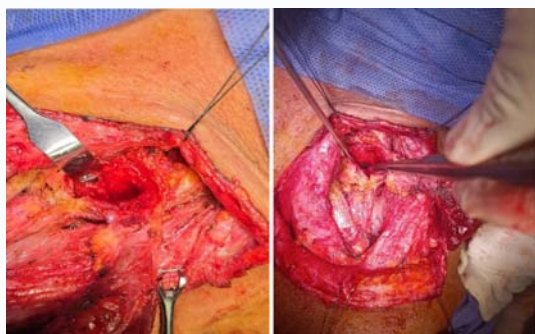


Figure 6 & 7: Tracheal defect with exposed cartilage and granulation tissue following foreign body removal.

cm, in addition to an associated tracheal mucosal defect measuring approximately 1 cm (Figure 5-7).

Intraoperative bronchoscopic examination performed by the otorhinolaryngology team demonstrated a lateral tracheal wall defect with minimal intraluminal granulation tissue that did not significantly compromise the airway lumen.

Primary tracheal repair was then performed. The tracheal mucosal defect was closed using 4-0 polyglactin (Vicryl®) simple interrupted sutures. Reinforcement of the repair was achieved using a local sternothyroid muscle flap secured over the repaired mucosa with interrupted 4-0 Vicryl® sutures. Additional coverage was provided using a sterile absorbable polyglycolic acid felt sheet (NEOVEIL®) as a biomaterial scaffold to support tissue healing and enhance repair

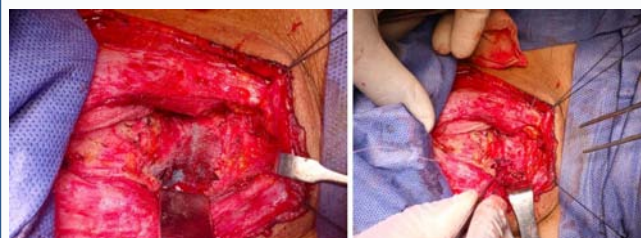


Figure 8 & 9: Application of NEOVEIL® PGA sheet over the sternothyroid muscle flap covering the tracheal repair.



Figure 10: Gelfoam® application at the surgical site.



Figure 11: Closure of strap muscles with secure hemostasis.

integrity (Figure 8 & 9).

An intraoperative Valsalva maneuver performed by the anesthesia team demonstrated no evidence of air leakage from the repair site. Hemostasis was secured and Gelfoam® was applied. A surgical drain was inserted. Layered wound closure was completed successfully using subcuticular sutures (Figure 10 & 11).



Figure 12: One-week postoperative view showing satisfactory wound healing.



Figure 13: NEOVEIL® PGA sheet packaging (sterile absorbable polyglycolic acid felt).

The patient was extubated in the intensive care unit and had an uneventful postoperative recovery. Follow-up evaluation demonstrated marked clinical improvement with complete resolution of stridor and absence of dysphonia, surgical emphysema, wound hematoma, or respiratory compromise.

Postoperative Outcome

The patient was transferred to the intensive care unit for close postoperative monitoring and was successfully extubated without respiratory compromise. The postoperative course was uneventful, with no evidence of stridor, dysphonia, respiratory distress, cervical emphysema, wound hematoma, or surgical site infection.

Clinical assessment demonstrated marked improvement in both respiratory and swallowing symptoms. The patient maintained adequate airway patency and did not require tracheostomy or additional airway intervention. Wound healing progressed satisfactorily without signs of dehiscence or local complications (Figure 12).

Postoperative flexible bronchoscopic examination revealed a well-healed tracheal repair with preserved airway lumen and satisfactory mucosal healing. No significant granulation tissue formation, tracheal stenosis, mucosal breakdown, or air leakage was identified.

The patient was followed for one month after surgery and remained clinically stable throughout the follow-up period. He reported complete resolution of preoperative stridor and significant improvement in dysphagia. No evidence of recurrent neck swelling, airway compromise, or procedure-related complications was observed.

These findings suggest that reconstruction using a sternothyroid muscle flap reinforced with an absorbable polyglycolic acid sheet

(NEOVEIL®) provided effective restoration of tracheal integrity with favorable short-term functional outcomes (Figure 13).

Discussion

Retained Surgical Foreign Bodies (RSFBs) remain uncommon but potentially devastating postoperative complications. Despite advances in operative safety protocols and sponge-counting systems, retained gauze continues to be reported following various surgical procedures. The estimated incidence ranges from 1 in 1,000 to 1 in 15,000 surgical interventions, although the true incidence may be underestimated because of medicolegal concerns and underreporting. Most reported cases involve abdominal and pelvic surgery, whereas cervical retained foreign bodies following thyroid surgery are exceedingly rare. The present case describes a neglected retained surgical gauze presenting years after hemithyroidectomy as a recurrent inflammatory neck mass associated with progressive airway compromise and tracheal wall destruction [7, 8].

The pathophysiology of retained gauze reactions has been well described. Two major biological responses may occur following retention of surgical material: an aseptic fibrotic granulomatous reaction or an exudative inflammatory reaction resulting in abscess formation and secondary infection. Chronic inflammation may subsequently lead to fibrosis, calcification, adhesions, tissue erosion, and fistula formation [9].

In the current case, the patient developed a chronic suppurative granulomatous inflammatory reaction associated with extensive fibrosis and purulent collection, eventually leading to erosion of the lateral tracheal wall. Similar delayed inflammatory presentations of retained gauze have been previously reported in cervical and thoracic regions, where lesions frequently mimic malignant or infective processes both clinically and radiologically [10].

The radiological appearance of retained gauze can be highly variable depending on the chronicity of the lesion and degree of surrounding inflammatory response. Computed tomography may demonstrate heterogeneous masses with internal gas formation, peripheral enhancement, calcifications, or spongiform appearance. However, these findings are often nonspecific and may resemble recurrent malignancy, necrotic lymphadenopathy, abscess formation, or granulomatous disease. In the present case, the lesion demonstrated heterogeneous hypoechoic appearance with dense calcification and marked displacement of the trachea and carotid sheath, creating significant concern regarding recurrent thyroid pathology. Fine-needle aspiration cytology revealed necrotizing granulomatous inflammation without evidence of neoplasia, findings that have similarly been described in previous reports of chronic foreign body reactions [11].

Airway involvement secondary to retained cervical foreign bodies is particularly unusual. Chronic inflammatory erosion of the trachea is rarely reported and represents a major reconstructive challenge. Successful tracheal reconstruction requires restoration of airway stability while preserving luminal patency and minimizing postoperative complications such as stenosis, air leakage, fistula formation, and respiratory compromise. Surgical management depends on multiple factors including defect size, location, extent of cartilage destruction, degree of contamination, and surrounding tissue viability [12].

Several reconstructive strategies for tracheal defects have been described in the literature. Small defects may be managed by primary

closure alone, whereas larger or complex defects often require reinforcement using vascularized tissue flaps or biological scaffolds. Regional muscle flaps including sternocleidomastoid, sternohyoid, sternothyroid, and infrahyoid muscle flaps have been widely utilized because they provide well-vascularized tissue coverage with minimal donor-site morbidity. Strap muscle flaps are particularly advantageous in cervical tracheal reconstruction owing to their close anatomical proximity, technical simplicity, and ability to support healing in contaminated operative fields [13].

In the present case, reconstruction was achieved using multilayer repair consisting of primary mucosal closure reinforced with a sternothyroid muscle flap and additional coverage using an absorbable Polyglycolic Acid (PGA) felt sheet (NEOVEIL®).

The use of PGA biomaterials in airway reconstruction remains relatively limited within head and neck surgery; however, these materials have gained widespread acceptance in thoracic surgery. PGA sheets have been extensively used for prevention of postoperative pulmonary air leakage following lung resection and for reinforcement of fragile tissues because of their favorable mechanical and biological properties [14, 15].

Experimental and clinical studies have demonstrated that PGA felt acts as a temporary scaffold that promotes fibroblast proliferation, collagen deposition, neovascularization, and tissue integration while gradually undergoing biodegradation [16]. Tanaka *et al.*, reported effective reduction of pulmonary air leakage using PGA felt reinforcement in thoracic surgery [17]. Similarly, Saito *et al.*, demonstrated favorable outcomes with absorbable PGA materials in thoracic tissue reinforcement with minimal inflammatory complications [18]. Choi *et al.*, further described successful application of absorbable PGA sheets for airway tissue reinforcement, supporting the concept of their potential use in tracheobronchial reconstruction [19].

The favorable outcome observed in the current patient may be attributed to several factors. First, the use of vascularized sternothyroid muscle flap reinforcement provided mechanical support and enhanced local tissue vascularity in an infected and fibrotic operative field. Second, the PGA felt sheet likely acted as an additional protective scaffold that minimized tension over the repair site and reduced the risk of postoperative air leakage or dehiscence. Furthermore, the absorbable nature of the material may reduce long-term foreign body reaction compared with permanent synthetic grafts [20].

Postoperative bronchoscopy in the present case demonstrated satisfactory healing with preserved airway patency and absence of significant granulation tissue formation or stenosis. The patient also experienced complete resolution of stridor and respiratory symptoms during follow-up. These findings support the safety and feasibility of combining local muscle flap reinforcement with absorbable biomaterial scaffolds in selected tracheal defects.

The present case additionally emphasizes the importance of strict adherence to operative safety protocols to prevent retained surgical foreign bodies. Early recognition remains difficult because delayed presentations may occur months or years following surgery with nonspecific clinical and radiological findings. Persistent or unexplained inflammatory neck masses following previous surgery should therefore raise suspicion for retained foreign material, particularly in the presence of chronic infection or atypical imaging

findings.

To the best of our knowledge, reports describing tracheal reconstruction using absorbable PGA felt sheets following tracheal erosion caused by retained cervical gauze are extremely limited. Therefore, the current report adds valuable clinical evidence regarding the potential role of novel biomaterial scaffolds in complex airway reconstruction and highlights a successful multidisciplinary surgical approach in managing this rare and challenging condition.

Conclusion

Retained surgical sponges may rarely present as complex inflammatory neck masses with secondary tracheal erosion years after thyroid surgery. This case demonstrates that reconstruction of tracheal defects using absorbable polyglycolic acid biomaterial sheets in combination with local muscle flap reinforcement is a safe and effective technique that may enhance tissue healing and airway stability in selected cases. Strict adherence to sponge-counting protocols and operative safety measures remains essential to prevent this potentially catastrophic complication.

Consent

Written informed consent was obtained from the patient for publication of this case report and any accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal.

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