Published by
Saidu Medical College

OPEN ACCESS

ISSN (P): 1819-4583
ISSN (E): 3007-9470

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Citation:
Ali M, Khan MA, Abdullah, Khan Z, Shah S, Khan MH, et al. Iatrogenic Esophageal Perforation Following Pneumatic Balloon Dilatation for Primary Achalasia Successfully Managed with Endoscopic Stenting and Conservative Therapy: A Case Report. *J Saidu Med Coll.* 2026;16(3):626–632.

Corresponding Author:
Dr. Mohsin Ali
Student,
Saidu Medical College, Swat, Pakistan
ma4055935@gmail.com

Funding:
The authors received no external funding for this study.

Conflicts of Interests:
The authors have declared that no competing interests exist.

Data Sharing Statement:
The data that support the findings of this study are available on request from the corresponding author. The data is not publicly available due to privacy or ethical restrictions.

Received: March 12, 2026
1st Revision: April 13, 2026
2nd Revision: May 03, 2026
Accepted: June 05, 2026

Case Report

Iatrogenic Esophageal Perforation Following Pneumatic Balloon Dilatation for Primary Achalasia Successfully Managed with Endoscopic Stenting and Conservative Therapy: A Case Report

Mohsin Ali[1], Muhammad Ayub Khan[2], Abdullah[2], Zeeshan Khan[2], Sabtain Shah[1], Muhammad Haris Khan[2], Muneeb Ali[3] & Adnan Khan[1]
[1]Saidu Medical College, Swat, Pakistan
[2]Saidu Group of Teaching Hospitals, Swat, Pakistan
[3]Khyber Medical College, Peshawar, Pakistan

https://doi.org/10.52206/jsmc.2026.16.3.1555

Abstract

Background: Achalasia is a rare primary esophageal motility disorder characterized by impaired relaxation of the lower esophageal sphincter (LES) and loss of normal esophageal peristalsis. Pneumatic balloon dilatation (PBD) remains one of the most widely employed minimally invasive therapeutic options for achalasia because of its high efficacy and cost-effectiveness. However, esophageal perforation is an uncommon but potentially life-threatening complication that requires prompt diagnosis and multidisciplinary management to minimize morbidity and mortality.

Case Presentation: A man in his fifth decade presented with progressive dysphagia involving both solids and liquids. Diagnostic evaluation, including upper gastrointestinal endoscopy, barium swallow examination, chest radiography, and esophageal manometry, confirmed primary achalasia. Owing to financial considerations and clinical suitability, the patient underwent pneumatic balloon dilatation using a 35-mm balloon. Immediately following the procedure, he developed neck pain, dyspnea, and subcutaneous emphysema. Emergency endoscopy confirmed a 4-cm iatrogenic distal esophageal perforation.

Management & Results: The patient was successfully managed with covered esophageal stent placement, percutaneous endoscopic gastrostomy (PEG) tube insertion for enteral nutrition, chest tube drainage for associated pneumothorax, broad-spectrum antibiotics, proton pump inhibitors, and supportive care. During recovery, he developed a lower respiratory tract infection that responded favorably to intravenous antimicrobial therapy. Follow-up endoscopy demonstrated complete healing of the perforation, permitting successful stent removal. Mild residual dysphagia persisted, consistent with the underlying esophageal aperistalsis associated with achalasia.

Conclusion: Esophageal perforation following pneumatic balloon dilatation is a rare but serious complication requiring early recognition and prompt multidisciplinary intervention. This case demonstrates that carefully selected patients with contained perforations can be successfully managed using endoscopic stenting combined with conservative medical therapy, thereby avoiding surgical repair and achieving favorable clinical outcomes.

Keywords: Achalasia, Endoscopic Stenting, Esophageal Perforation, Lower Esophageal Sphincter, Pneumatic Balloon Dilatation.

Introduction

Achalasia is a rare primary esophageal motility disorder resulting from progressive degeneration of inhibitory neurons within the myenteric (Auerbach's) plexus of the esophageal wall. This neurodegenerative process leads to impaired relaxation of the lower esophageal sphincter (LES), loss of coordinated esophageal peristalsis, and progressive functional obstruction of the distal esophagus. Clinically, patients commonly present with progressive dysphagia to both solids and liquids, regurgitation of undigested food, chest pain, weight loss, and impaired quality of life. The reported annual incidence ranges from 0.03 to 1.63 cases per 100,000 population, while the prevalence varies between 1.8 and 12.6 cases per 100,000 individuals, making achalasia an uncommon but clinically significant gastrointestinal disorder [1].

Current therapeutic strategies aim to reduce LES pressure and improve esophageal emptying rather than restore normal esophageal motility. Available treatment options include pharmacological therapy, botulinum toxin injection, pneumatic balloon dilatation (PBD), laparoscopic Heller myotomy, and peroral endoscopic myotomy (POEM). Among these, PBD remains one of the most frequently performed non-surgical interventions because it is minimally invasive, relatively inexpensive, and capable of providing durable symptomatic relief in appropriately selected patients [2]. Nevertheless, despite its established efficacy, PBD carries the risk of potentially serious complications, of which esophageal perforation is the most feared. The reported incidence of perforation ranges from approximately 1% to 5%, and delayed diagnosis may be associated with mortality rates approaching 25%–50% owing to mediastinitis, sepsis, and multiorgan failure [2,3].

Early diagnosis and appropriate management of esophageal perforation are critical determinants of patient outcome. The optimal therapeutic approach depends on multiple factors, including the size and location of the perforation, the timing of diagnosis, the degree of mediastinal contamination, patient stability, and the availability of local expertise. Contemporary management ranges from conservative treatment with antibiotics and nutritional support to endoscopic closure techniques or surgical repair, with endoscopic covered stent placement emerging as an effective minimally invasive option for selected contained perforations [3,4].

Although numerous studies have evaluated the efficacy of pneumatic balloon dilatation, reports describing successful non-operative management of large iatrogenic esophageal perforations remain relatively limited, particularly in resource-constrained settings. This case highlights the successful multidisciplinary management of a 4-cm esophageal perforation following pneumatic balloon dilatation using covered endoscopic stenting, percutaneous endoscopic gastrostomy for nutritional support, and conservative medical therapy. The report emphasizes the importance of early recognition, timely referral, and individualized treatment planning in achieving favorable clinical outcomes despite a potentially life-threatening complication.

Patient Information

A man in his fifth decade of life presented to the medical outpatient department with progressively worsening dysphagia involving both solid and liquid foods. The symptoms had an insidious onset and gradually increased in severity, significantly affecting oral intake. There was no documented history of caustic ingestion, esophageal surgery, malignancy, connective tissue disease, or previous endoscopic intervention. Owing to persistent dysphagia, the patient was referred to the Gastroenterology Department for further evaluation. Upper gastrointestinal endoscopy (esophagogastroduodenoscopy, EGD) demonstrated a dilated esophagus with a tightly contracted lower esophageal sphincter (LES). Despite increased LES tone, the endoscope could be advanced into the stomach without significant resistance. Examination of the stomach and duodenum revealed no remarkable abnormalities. Following endoscopy, a barium swallow examination demonstrated mild prominence of the mid-esophageal caliber with spasm involving the middle and distal esophagus, while the gastroesophageal junction remained patent. To further establish the diagnosis, chest radiography demonstrated the classical "bird-beak" appearance of the distal esophagus (Figure 1), and esophageal manometry confirmed aperistalsis with elevated LES resting pressure, establishing the diagnosis of primary achalasia.

Considering the patient's age, financial limitations, and the relatively lower cost of endoscopic treatment compared with surgery, pneumatic balloon dilatation (PBD) was selected as the preferred therapeutic option after multidisciplinary discussion.

Clinical Findings

Before intervention, the patient's predominant clinical manifestation was progressive dysphagia affecting both solids and liquids, consistent with esophageal motility dysfunction. Physical examination before the procedure was otherwise unremarkable.

The patient subsequently underwent pneumatic balloon dilatation using a 35-mm balloon inflated to 15 psi for approximately 30 seconds. Immediately after the

procedure, he developed sudden neck pain and shortness of breath. Physical examination revealed palpable crepitus over the neck and upper chest, raising strong suspicion of cervical subcutaneous emphysema secondary to esophageal perforation.

Emergency upper gastrointestinal endoscopy confirmed a 4-cm longitudinal esophageal perforation located approximately 38 cm from the incisors, with the lower esophageal sphincter situated at 40 cm. The patient remained hemodynamically stable and was promptly referred to a cardiothoracic surgery center for definitive management.

Several days following discharge from the tertiary care center, the patient re-presented with productive cough, exertional dyspnea, and chest tightness. Clinical examination demonstrated bilateral coarse crepitations on chest auscultation. Initial oxygen saturation was 89% on room air, blood pressure was 110/70 mmHg, and pulse rate was 87 beats/minute. Laboratory investigations demonstrated leukocytosis (18,600/µL) with neutrophilia, elevated inflammatory markers (CRP 160 mg/L and ESR 85 mm/hour), thrombocytosis, and transient renal dysfunction (serum creatinine 2.19 mg/dL), consistent with an infective process (Table 1).

Timeline

The chronological sequence of major clinical events is summarized in Table 2. Briefly, the patient initially presented with dysphagia on 17 June 2025 and underwent diagnostic evaluation with barium swallow, upper gastrointestinal endoscopy, chest radiography, and esophageal manometry, confirming achalasia. Pneumatic balloon dilatation was performed on 25 June 2025. Following the development of an iatrogenic esophageal perforation, the patient underwent covered esophageal stent placement, percutaneous endoscopic gastrostomy (PEG) tube insertion, and chest tube placement for associated pneumothorax at a specialized cardiothoracic center. Approximately one month later, he developed symptoms of lower respiratory tract infection requiring hospital admission and intravenous antibiotic therapy. After clinical improvement, the patient underwent scheduled follow-up, during which successful healing of the perforation was confirmed and the esophageal stent was removed.

Diagnostic Assessment

The diagnosis of achalasia was established through a combination of clinical presentation and complementary diagnostic investigations. Upper gastrointestinal endoscopy demonstrated a dilated esophagus with increased LES tone while excluding mechanical obstruction or malignancy. A barium swallow study demonstrated characteristic esophageal dilatation with distal spasm, and chest radiography revealed the classical bird-beak appearance of the distal esophagus. Definitive confirmation was achieved by esophageal manometry, which demonstrated aperistalsis together with elevated LES resting pressure.

Following pneumatic balloon dilatation, the sudden onset of neck pain, dyspnea, and subcutaneous emphysema prompted immediate evaluation for iatrogenic perforation. Emergency endoscopy confirmed a contained 4-cm perforation in the distal esophagus. The anatomical location and size of the perforation were carefully documented to facilitate therapeutic planning. During subsequent hospitalization for respiratory symptoms, laboratory investigations revealed marked inflammatory response characterized by elevated white blood cell count, CRP, and ESR, supporting the diagnosis of lower respiratory tract infection. Sputum acid-fast bacilli testing was negative, excluding pulmonary tuberculosis.

Therapeutic Intervention

Following confirmation of achalasia, the patient underwent pneumatic balloon dilatation using a 35-mm balloon inflated to 15 psi for 30 seconds. Although the procedure achieved disruption of the lower esophageal sphincter, it was complicated by an iatrogenic esophageal perforation.

The patient was immediately referred to a cardiothoracic surgery center for multidisciplinary management. Because the perforation was considered medium-sized and contained, endoscopic placement of a covered esophageal stent was performed rather than immediate surgical repair. To minimize passage of food through the injured esophagus and facilitate mucosal healing, a percutaneous endoscopic gastrostomy (PEG) tube was inserted to provide enteral nutritional support. In addition, a chest tube was placed for management of the associated iatrogenic pneumothorax.

Following discharge, the patient subsequently developed lower respiratory tract infection and was admitted for conservative management. Treatment consisted of intravenous cefoperazone-sulbactam (Q-Bact® 2 g), intravenous normal saline infusion, proton pump inhibitor therapy, supportive care, and close clinical monitoring for seven days. The patient demonstrated gradual clinical improvement with normalization of oxygenation and stabilization of renal function before discharge.

Follow-up and Outcomes

The patient attended scheduled outpatient follow-up four weeks after discharge. Endoscopic evaluation

demonstrated complete healing of the esophageal perforation, allowing successful removal of the covered esophageal stent without complications. The patient remained clinically stable and tolerated oral intake satisfactorily. Although complete closure of the perforation was achieved, the patient continued to experience mild residual dysphagia. This persistent symptom was considered consistent with the underlying pathophysiology of achalasia, in which pneumatic balloon dilatation effectively reduces LES outflow resistance but does not restore absent esophageal peristalsis. Consequently, mild swallowing difficulty may persist despite technically successful treatment. At the final follow-up visit, the patient remained hemodynamically stable without evidence of recurrent perforation, mediastinal infection, or stent-related complications. He was advised to continue regular gastroenterology follow-up for long-term surveillance and management of achalasia as required.



Figure 1: Chest radiograph demonstrating the classical bird-beak appearance of the distal esophagus, consistent with the diagnosis of achalasia. *(Image reproduced with the permission of the patient)*



Figure 2: Chest radiograph obtained following endoscopic management, demonstrating the percutaneous endoscopic gastrostomy (PEG) tube inserted for enteral nutritional support during healing of the esophageal perforation. *(Image reproduced with the permission of the patient)*

Table 1: Clinical Findings and Laboratory Investigations at Presentation Following Esophageal Perforation

Parameter	Result	Reference Range
Vital Signs		
Blood Pressure	110/70 mmHg	90/60–120/80 mmHg
Peripheral oxygen saturation (SpO_2)	89%	95–100%
Pulse Rate	87 beats/min	60–100 beats/min
Laboratory Investigations		
White Blood Cell Count	18,600/µL (Neutrophils 76%)	4,000–11,000/µL
Hemoglobin	14.9 g/dL	13–17 g/dL
Platelet Count	443,000/µL	150,000–400,000/µL
Alanine Aminotransferase (ALT)	16 U/L	7–56 U/L
Serum Creatinine	2.19 mg/dL	0.7–1.3 mg/dL
C-reactive Protein (CRP)	160 mg/L	<10 mg/L
Erythrocyte Sedimentation Rate (ESR)	85 mm/hour	0–15 mm/hour
Urinalysis		
Red Blood Cells	5–6/HPF	0–2/HPF
Pus Cells	5–6/HPF	0–5/HPF
Microbiology		
Sputum Acid-Fast Bacilli (AFB)	Negative	Negative

SpO_2, peripheral oxygen saturation; ALT, alanine aminotransferase; CRP, C-reactive protein; ESR, erythrocyte sedimentation rate; HPF, high-power field; AFB, acid-fast bacilli.

Table 2: Chronological Timeline of Clinical Events

Date	Clinical Event
17 June 2025	Initial presentation with progressive dysphagia
17 June 2025	Barium swallow examination performed
18 June 2025	Esophagogastroduodenoscopy (EGD) confirming suspected achalasia
25 June 2025	Pneumatic balloon dilatation (PBD) performed
16 July 2025	Esophageal stent placement and chest tube insertion for management of iatrogenic esophageal perforation
10 August 2025	Readmission with symptoms of lower respiratory tract infection
14 August 2025	Endoscopic stent removal following complete healing of the esophageal perforation

Discussion

Pneumatic balloon dilatation (PBD) remains one of the most established non-surgical treatment options for primary achalasia, providing long-term symptomatic relief in approximately 60%–90% of appropriately selected patients [5]. Compared with laparoscopic Heller myotomy or peroral endoscopic myotomy (POEM), PBD is less invasive, more economical, and can often be performed as a day-care procedure, making it particularly attractive in resource-limited healthcare settings. Nevertheless, despite its favorable efficacy profile, esophageal perforation remains the most feared complication because of its potential to rapidly progress to mediastinitis, sepsis, and death if not recognized promptly [6-10].

The present case illustrates the successful multidisciplinary management of a large (4-cm) iatrogenic distal esophageal perforation that occurred immediately after PBD. Early clinical recognition was facilitated by the rapid onset of neck pain, dyspnea, and palpable subcutaneous emphysema shortly after balloon inflation. These classical clinical findings prompted immediate endoscopic evaluation, allowing prompt localization of the perforation and timely referral for definitive management. This emphasizes the importance of maintaining a high index of suspicion following PBD, as early diagnosis remains the single most important determinant of patient outcome [11-14].

Several patient- and procedure-related factors have been associated with an increased risk of perforation during pneumatic dilatation. Advanced age, severe esophageal dilatation, prior dilatation procedures, thin esophageal wall, and the use of larger balloon diameters have all been reported as important risk factors [12]. Current guidelines generally advocate a graded dilatation strategy beginning with a 30-mm balloon followed by larger balloon sizes only when clinically indicated. In the present case, a 35-mm balloon was selected because of the patient's clinical characteristics and the treating team's objective of achieving adequate lower esophageal

sphincter disruption in a single treatment session. Although this approach may have contributed to the subsequent perforation, the decision reflected individualized clinical judgment balancing procedural efficacy with anticipated risk.

The diagnosis of esophageal perforation requires rapid confirmation using appropriate imaging modalities. Contrast-enhanced computed tomography is currently regarded as the preferred initial investigation because it accurately delineates the location and extent of perforation while identifying mediastinal contamination and associated pleural complications [3,7]. In our patient, however, emergency endoscopy was performed because it provided immediate visualization of the perforation and allowed precise assessment of its size and anatomical location, information that proved essential for selecting the most appropriate therapeutic strategy.

Management of esophageal perforation should be individualized according to the size and location of the defect, the interval between injury and diagnosis, the degree of contamination, patient stability, and institutional expertise [7]. Small contained perforations without evidence of systemic sepsis may be managed conservatively with fasting, broad-spectrum antibiotics, nutritional support, and close clinical observation.[8] Conversely, larger perforations or those associated with extensive contamination often require endoscopic or surgical intervention. In recent years, covered self-expanding esophageal stents have emerged as an effective minimally invasive alternative to surgery for carefully selected patients because they successfully seal the defect, limit further contamination, preserve esophageal continuity, and facilitate early enteral nutrition [9,10].

In the present case, placement of a covered esophageal stent, together with percutaneous endoscopic gastrostomy (PEG) for nutritional support and chest tube drainage for pneumothorax, resulted in complete healing without the need for operative repair. Although stent-related complications such as migration, bleeding, obstruction, and benign stricture formation have been reported [15], none occurred during our patient's treatment course. This favorable outcome supports growing evidence that endoscopic stenting represents a safe and effective treatment option for selected medium-sized contained perforations managed in experienced centers.

The patient subsequently developed a lower respiratory tract infection during the recovery period, likely secondary to aspiration risk, prolonged hospitalization, and the physiological consequences of esophageal perforation. Prompt administration of intravenous antibiotics and supportive therapy resulted in complete clinical recovery without further deterioration. This clinical course further highlights the importance of continued surveillance even after successful management of the initial perforation, as delayed infectious complications may significantly influence patient outcomes.

An additional noteworthy observation was the persistence of mild dysphagia despite complete healing of the perforation. This finding is pathophysiologically expected because pneumatic balloon dilatation primarily reduces lower esophageal sphincter pressure but does not restore normal esophageal peristalsis. Consequently, residual swallowing difficulties may persist despite technically successful intervention and should be discussed during patient counselling before treatment. This case demonstrates that early recognition, rapid multidisciplinary collaboration between gastroenterologists, cardiothoracic surgeons, radiologists, and intensivists, together with timely endoscopic intervention, can successfully manage even relatively large iatrogenic esophageal perforations while avoiding major surgery and its associated morbidity.

Limitations

This report has several limitations that should be acknowledged. First, as a single-patient case report, its findings cannot be generalized to all patients undergoing pneumatic balloon dilatation for achalasia. Second, financial and logistical constraints limited access to certain diagnostic investigations, particularly contrast-enhanced computed tomography, which may have provided additional information regarding the extent of mediastinal contamination and aided comprehensive radiological assessment. Third, although esophageal manometry confirmed the diagnosis of achalasia, the original manometric tracings were unavailable for independent review, precluding detailed classification according to the Chicago Classification subtypes. Fourth, the initial use of a 35-mm balloon deviated from the conventional graded dilatation protocol, thereby limiting direct comparison with current guideline-based practice. Finally, long-term follow-up beyond successful stent removal was unavailable; therefore, the durability of symptom relief, recurrence of dysphagia, development of gastroesophageal reflux disease, or late stricture formation could not be evaluated.

Despite these limitations, the report provides valuable clinical insights into the successful multidisciplinary management of a rare but potentially fatal complication and contributes additional evidence supporting the role of endoscopic stenting in carefully selected patients with contained esophageal perforations.

Conclusion

Esophageal perforation remains an uncommon but potentially life-threatening complication of pneumatic balloon dilatation for achalasia that requires immediate recognition and prompt multidisciplinary management. Careful post-procedural monitoring, early clinical suspicion, and timely diagnostic evaluation are essential for minimizing morbidity and mortality. This case demonstrates that medium-sized contained iatrogenic esophageal perforations can be successfully managed using covered endoscopic stenting, enteral nutritional support through percutaneous endoscopic gastrostomy, appropriate antimicrobial therapy, and close clinical surveillance, thereby avoiding surgical repair in selected patients. The favorable outcome observed in this patient underscores the importance of individualized treatment planning, early referral to specialized centers, and coordinated multidisciplinary care in optimizing clinical outcomes following this rare but serious complication.

Authors' Contributions:

All authors meet the ICMJE criteria for authorship.

Author 1: Substantial contribution to conception and design, drafting the manuscript, final approval, agreed to be accountable for all the work.
Author 2: Substantial contribution to conception and design, data acquisition, drafting the manuscript, final approval, agreed to be accountable for all the work.
Author 3: Analysis and interpretation of data, drafting the manuscript, final approval, agreed to be accountable for all the work.
Author 4: Analysis and interpretation of data, critical revision, final approval, agreed to be accountable for all the work.
Author 5&6: Substantial contribution to conception and design, drafting the manuscript, final approval, agreed to be accountable for all the work.
Author 7&8: Substantial contribution to conception and design, data acquisition, drafting the manuscript, final approval, agreed to be accountable for all the work.

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