EDORIUM Journals

Int J Case Rep Images 2025 Jul-Dec;16(2):25–30.
www.ijcasereportsandimages.com

CASE REPORT PEER REVIEWED | OPEN ACCESS

Pleural space infection and air leak due to non-expandable lung post-VATS managed with stoma bags and ambulatory chest drainage in a patient with malignant pleural mesothelioma

Muhammad Hashim Naseer, Karl Jackson, Avinash Aujayeb

ABSTRACT

Video-assisted thoracoscopy surgery (VATS) is a well-established approach used in the investigation of unexplained exudative pleural effusions and in the treatment of pleural space infection. We describe a case of a patient who presented with a presumed pleural space infection which was actually due to a malignant pleural mesothelioma (MPM) who developed a prolonged air leak and pleural space infection post-VATS and managed with ambulatory chest drainage and stoma bags.

Keywords: Empyema, Large bore drain, Mesothelioma, Pleural effusion, Pleural infection, Prolonged air leak, Stoma bag

How to cite this article

Naseer MH, Jackson K, Aujayeb A. Pleural space infection and air leak due to non-expandable lung post-VATS managed with stoma bags and ambulatory chest drainage in a patient with malignant pleural mesothelioma. Int J Case Rep Images 2025;16(2):25–30.

Article ID: 101517Z01NM2025

Muhammad Hashim Naseer[1], Karl Jackson[1], Avinash Aujayeb[1]

Affiliation: [1]Department of Respiratory Medicine, Northumbria Healthcare NHS Trust, Northumbria Way, Cramlington NE23 6NZ, UK.

Corresponding Author: Dr. Avinash Aujayeb, Department of Respiratory Medicine, Northumbria Healthcare NHS Trust, Northumbria Way, Cramlington NE23 6NZ, UK; Email: avinash.aujayeb@nhct.nhs.uk

Received: 23 May 2025
Accepted: 23 August 2025
Published: 16 September 2025

****

doi: 10.5348/101517Z01NM2025CR

INTRODUCTION

Pleural malignancy often presents with a pleural effusion, but co-existing empyema is rare. While the management of empyema is well established as well as ambulatory management of prolonged air leaks post treatment, some nuances exist, and the use of stoma bags is not well described. Stoma bags are widely available, cheap and easy to apply—their use could be much broadened and this case report will highlight the above points.

CASE REPORT

A 77-year-old male presented to the Accident and Emergency with a few month's long history of progressive dyspnoea. He had no constitutional symptoms or chest pain but had significant weight loss. He had a 20-pack year smoking history, 40 years ago. He had worked in power stations, with possible asbestos exposure during that time.

His past medical history included a previous radical prostatectomy for prostate cancer and osteoarthritis.

On examination, he was comfortable at rest with a normal cardiac examination, with saturations of 95% on air and a respiratory rate of 15 breaths per min. He had no clubbing or palpable lymphadenopathy. He had dullness to percussion at the right base extending to halfway up his hemithorax, with reduced air entry over that same area. There was no peripheral edema.

A chest X-ray showed a large right pleural effusion, which was seen on thoracic ultrasound as being hyperechoic, with no septations, locules or pleural thickening.

Hematological investigations revealed haemoglobin of 153 g·L^{-1} (normal range 130–180 g·L^{-1}), white cell count of 17.41×10^9 per L (normal range 4–11×10^9 per L), platelet count 644×109 per L (normal range 140–400×10^9 per L). Plasma lactate dehydrogenase (LDH) levels were 252 U·L^{-1}. His total protein was 56 g·L^{-1} (normal range 60–80 g·L^{-1}) and albumin 21 g·L^{-1} (normal range 25–50 g·L^{-1}). N-terminal prob type natriuretic peptide levels were 350 ng L^{-1} (normal range less than 400). An echocardiogram was done which was normal.

With the appropriate consent and under asepsis, a 12 French Gauge (Fg) Seldinger chest drain was inserted. Dark brown pleural fluid was easily drained sent for microbiological, cytological, and biochemical analysis.

Figure 1 shows a chest radiograph showing large, right-sided pleural effusion and Figure 2 shows the post-drain insertion chest radiograph with a resultant hydropneumothorax.

Pleural fluid analysis was then available: fluid 1580 LDH U·L^{-1}, fluid protein 37 g·L^{-1}, fluid pH 7.30 and fluid glucose less than 0.6 mmol·L^{-1}, confirming the fluid as an exudate by applying Light's criteria [1]. Microbiology and cytology were negative. The pleural fluid was noted to be pauci-cellular and had only scant lymphocytes.

A venous contrast enhanced computed tomography (CT) scan of the thorax was performed. Figure 3A and B shows slices of the chest CT with a large pleural effusion with a hydropneumothorax, air locules, and pleural enhancement. It was noted that the patient had a similar admission a month ago in another local hospital and had been treated for a presumed pleural space infection, with antibiotics and intrapleural fibrinolytics.

As this was his second admission for the same problem, a decision was made for surgical clearance of his pleural space via VATS. With single lung ventilation, and under general anesthesia, a 2 port VATS was performed. The pleural surfaces were grossly hemorrhagic with exudates and loculations seen. The pleural space was thus debrided, washed out and 2 large bore drains were inserted. One of those was removed after 48 hours as there was no output from it. Random pleural biopsies were also taken, as per normal practice. Post-operatively, he had an air leak, and the remaining drain was connected to an ambulatory bag. The patient was discharged with outpatient management planned. He had a non-expandable lung, which did not alter with the application of thoracic suction (Figure 4).

The right pleural biopsies showed sections with expanded parietal pleura due to invasion by a spindle neoplasia composed of atypical spindle cells showing solid and fascicular patterns. The cells had wide eosinophilic cytoplasm and vesicular, irregular, and hyperchromatic nuclei. There was invasion into the deep adipose tissue. Mitoses were seen. No foci of necrosis were identified. Immunohistochemistry demonstrated that the tumour cells express pancytokeratin AE1/3, CK7, SMA, and GATA3. There was focal expression for calretinin and D2-40. WT1 was focally and weakly expressed. There was no expression of CEA(m), BerEP4, p40, CK5/6, TTF-1, NKX3.1, desmin, H-Caldesmon, CD31, ERG, and S100. INI1 expression was retained. The appearances were of a malignant spindle cell neoplasia with immunophenotype favoring a sarcomatoid mesothelioma. Four-week post-VATS, the air leak was still ongoing, and he still had a non-expandable lung on serial radiographs. Pleural fluid culture grew a fully sensitive *Enterococcus faecium* and the patient had a 4-week course of co-amoxiclav.

Due to ongoing issues with air leak, pleural space infection, and poor rehabilitation from surgery, the patient's World Health Organization performance status was 3, which precluded any systemic anti-cancer treatment. Six weeks later, he presented with increased pain at the site of the large bore drain and a new foul-smelling discharge from it, as well as progressive constitutional symptoms. His chest radiograph was unchanged, but his white cell count had risen to 33, and C-reactive protein (CRP) was 232 mg L^1 (normal less than 5). His drain site was infected with pus and air still filling up the attached ambulatory bag (Figures 5 and 6).

A new large bore drain (26 French Gauge [Fg]) was inserted in the intercostal space just above the infected wound. When attached to an underwater seal bottle, it was bubbling and swinging. The large bore drain was removed, and the wound washed out. Pus and air audibly came out of it. As that wound was very large (approximately 5 cm with skin breakdown, Figure 7), a stoma bag was placed on it, which immediately filled with air (Figure 8), but a small hole at the top of the bag was made, to allow deflation and air to come out. The stoma bag had a strong adhesive (the cover can simply be peeled away on application) on the underside towards the skin and so the risk of detachment was minimal.

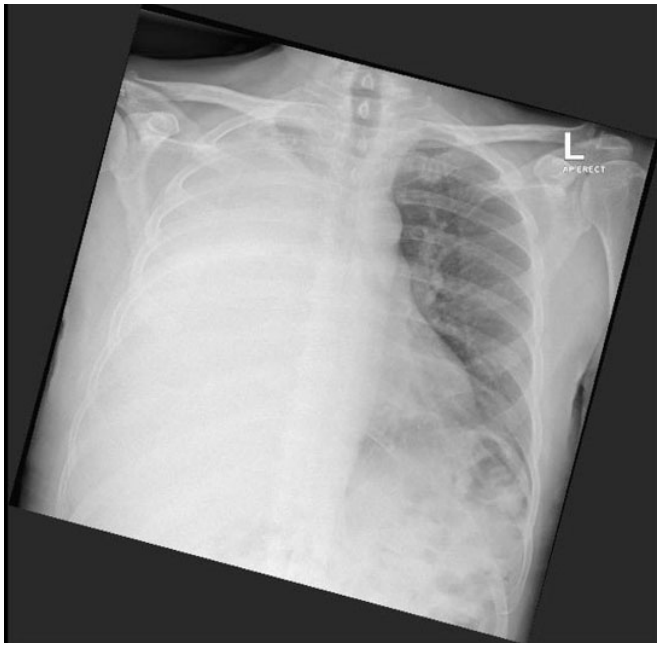

Figure 1: A chest radiograph showing large, right-sided pleural effusion—which is demonstrated by the white homogenous opacification in the right hemithorax.

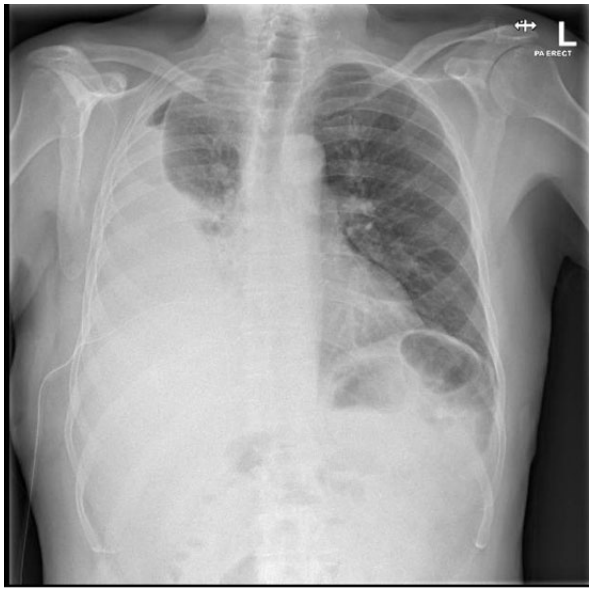

Figure 2: A post-drain insertion chest radiograph with a resultant hydropneumothorax. This is shown by the appearance of the pocket of air at the right apex on top of the white opacification, which is the fluid.

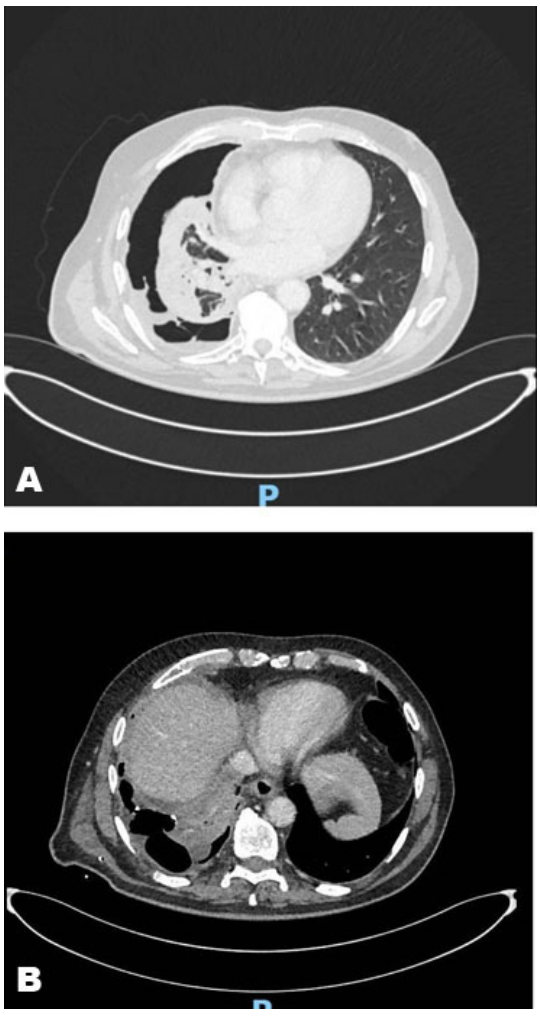

Figure 3: (A and B) Slices of the chest CT with a moderate pleural effusion (fluid at the bottom of the CT scan) with a hydropneumothorax (presence of air in the hemithorax), air locules (pockets of gas in the fluid), and pleural enhancement.

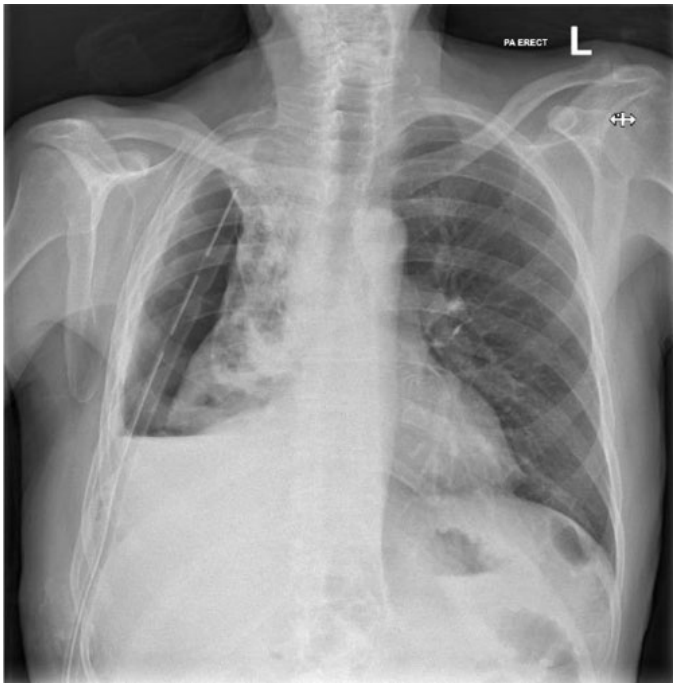

Figure 4: Chest radiograph showing non expandable lung—a large bore drain is clearly seen with the lung collapsed down and air present in the hemi-thorax.

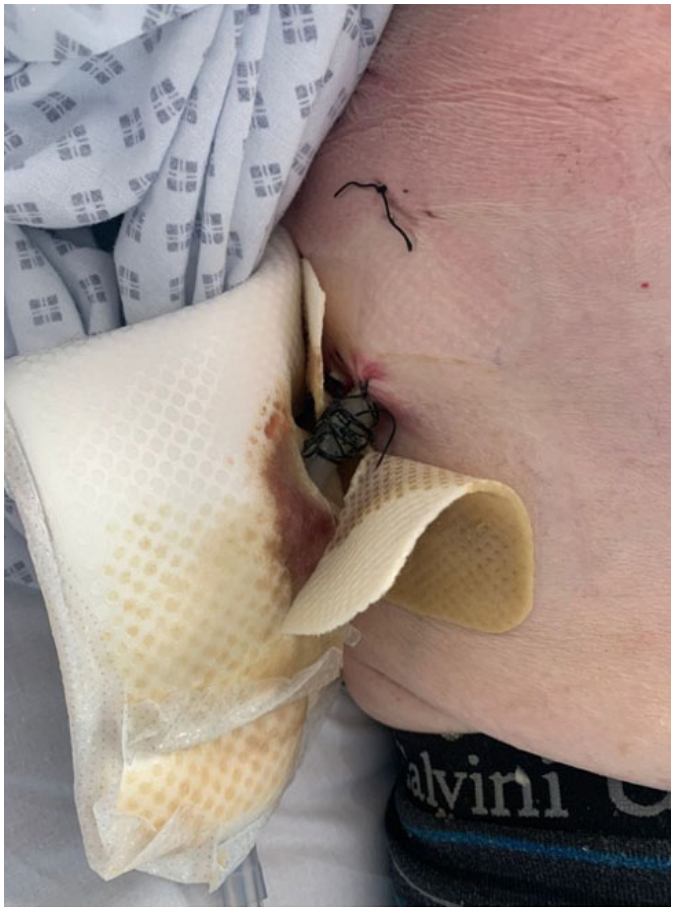

Figure 5: Infected drain site.

Figure 6: Pus in the ambulatory bag.

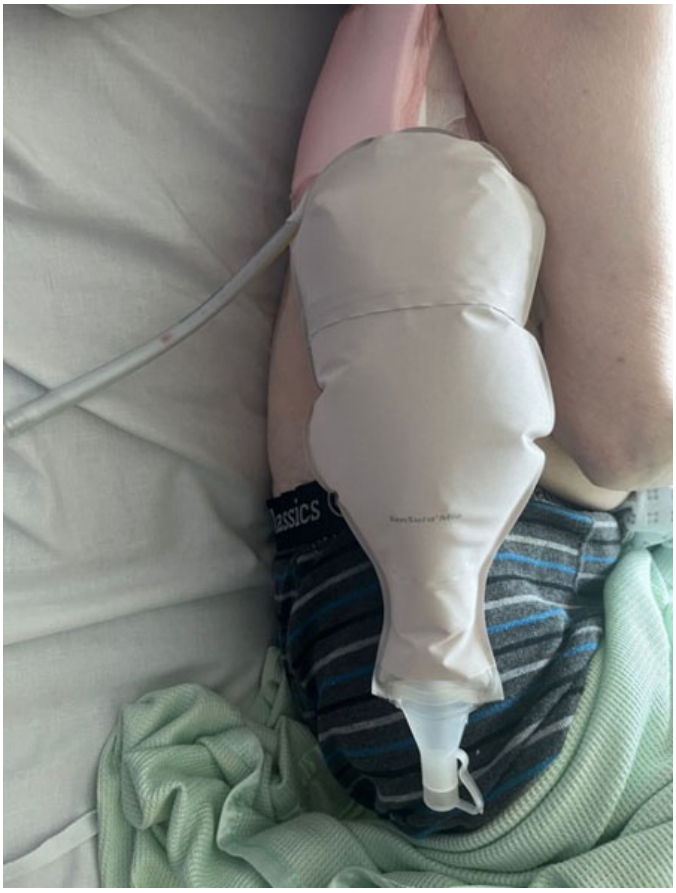
Figure 7: Large wound leaking air and pus.

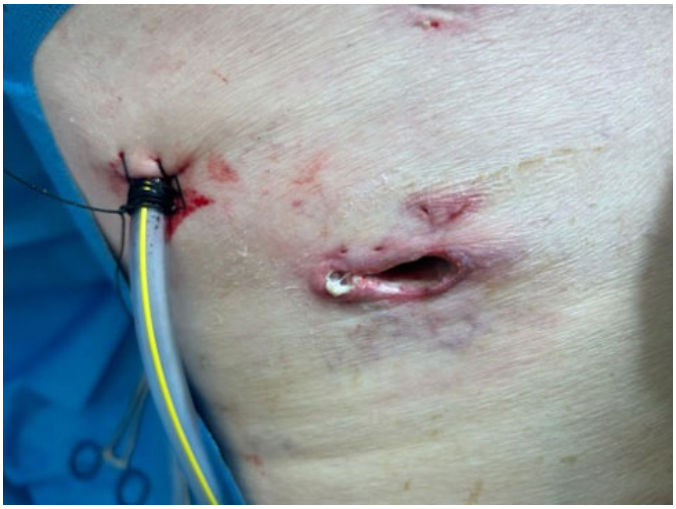
Figure 8: Stoma bag full of air.

The patient was not fit for further surgical intervention, and after a prolonged course of antibiotics (*Enterobacter hormaechei*, *Neisseria mucosa,* and *Corynebacterium propinquum*) were grown in the pleural fluid, sensitive to piperacillin/tazobactam and co-amoxiclav), he continued to deteriorate. To facilitate transfer to a hospice for end-of-life care, the large bore drain was removed and a similar stoma bag with a hole at the top was placed on the resultant hole. The patient died shortly thereafter.

DISCUSSION

We describe an empyema post-VATS, which resulted in a pleurocutaneous fistula due to the relatively long-term presence of a large bore drain. Pleural fistulas are well described and can affect any adjacent structures such the oesophagus, the bronchus, the pericardium, and any subdiaphragmatic organs [1]. Fistulas to the skin can happen in the context of empyema necessitans which is when an uncontrolled pleural infection dissects through the subcutaneous layers—this is well described in for example atypical infections [2]. However, pleurocutaneous fistulas are most common in the context of previous interventions [1, 2].

Given the initial presentation, radiographic appearances and biochemical values, the presumption was that this was a non-resolving pleural space infection. The treatment of choice for such cases after “medical” treatment with prolonged antibiotics as well as intrapleural therapy is cardiothoracic surgical intervention, although the timing of that intervention remains unclear [3]. Often, a VATS procedure with decortication, wash out and drain placement is enough, but there is a risk of conversion to open thoracotomy. Video-assisted thoracoscopy surgery is a very safe procedure, but as with any surgical intervention, complications can happen, at a prevalence of less than 5% [4]. These can be prolonged air leaks, bleeding, pain, and further infection [5].

The incidence of empyema and pleural malignancy is low (less than 1%), but co-existence with lung cancer and pleural mesothelioma has been described in the literature [6–8]. The admission CT scans have been looked at retrospectively, but associated radiographic findings had low positive predictive values or low sensitivity and hence are not useful [9]. Pleural biopsies or cytological analyses are crucial if the index of suspicion is high. Our patient also had non-expandable lung (NEL). Non-expandable lung happens when visceral pleural disease prevents the underlying lung from re-expanding, so that a permanent cavity is formed between the pleural surfaces. It can also happen due to an obstructing tumour in the bronchi. It is common in patients with pleural mesothelioma (rates up to 33%) and is an independent risk factor for mortality [10]. Prolonged air leaks are also a risk factor for mortality in such patients [11, 12].

Our patient thus had an initial empyema and an underlying pleural mesothelioma. He had NEL and prolonged air leak post-operatively and was frail. He was not suitable for further surgical intervention, which probably would have meant an open window thoracostomy [13]. The VATS port was large and the skin had broken down. Stoma bags have been described for use in empyema, either attached directly to a chest tube or placed over the wound [14]. We have used stoma bags before for pleural fluid leaks around indwelling pleural catheters [15]. However, as far as we know, the use of stoma bags over a thoracic wound with a hole cut in it to manage an empyema as well as an air leak has not been described in print before (a search of PubMed and Google Scholar using the terms stoma bag, stoma, pleural effusion, empyema, pleural infection yielded no results), although we were sure it has been done.

CONCLUSION

The above case presented a number of challenges in the diagnostic and treatment pathway and combines a number of rare entities—co-existing pleural malignancy and empyema, NEL, and prolonged air leak in this context, and palliative management with a stoma bag with a small hole cut into it.

REFERENCES

1. Kapoor H, Gulati V, Gulati A, Donuru A, Parekh M. Comprehensive imaging review of pleural fistulas from diagnosis to management. Radiographics 2022;42(7):1940–55.
2. Karnakoti S, Conley E, Vadiyala MR, Arias-Sanchez PP, Duke JD, Audil H, et al. Nonsurgical management of a pleurocutaneous fistula from mycobacterium avium complex: A case report. Chest 2023;164(4):A1515–6.
3. Bedawi EO, Stavroulias D, Hedley E, Blyth KG, Kirk A, De Fonseka D, et al. Early video-assisted thoracoscopic surgery or intrapleural enzyme therapy in pleural infection: A feasibility randomized controlled trial. the third multicenter intrapleural sepsis trial-MIST-3. Am J Respir Crit Care Med 2023;208(12):1305–15.
4. Wait MA, Beckles DL, Paul M, Hotze M, Dimaio MJ. Thoracoscopic management of empyema thoracis. J Minim Access Surg 2007;3(4):141–8.
5. Łochowski MP, Kozak J. Video-assisted thoracic surgery complications. Wideochir Inne Tech Maloinwazyjne 2014;9(4):495–500.
6. Leporati A, Raveglia F, Cioffi U, De Simone M, Ghelma F, Baisi A. Metastatic lung cancer presenting as thoracic empyema. A Case report. Clin Case Rep 2020;8(3):484–6.
7. Yao YH, Kuo YS. Malignant pleural mesothelioma mimics thoracic empyema: A case report. World J Clin Cases 2023;11(35):8372–8.
8. Matsuoka K. Malignant pleural mesothelioma presenting as acute empyema with severe leukocytosis. Ann Thorac Cardiovasc Surg 2014;20 Suppl:513–6.
9. Lee HY, Goo JM, Lee HJ, Lee CH, Chun EJ, Im JG. The value of computed tomography for predicting empyema-associated malignancy. J Comput Assist Tomogr 2006;30(3):453–9.
10. Bibby AC, Halford P, De Fonseka D, Morley AJ, Smith S, Maskell NA. The prevalence and clinical relevance of nonexpandable lung in malignant pleural mesothelioma. A prospective, single-center cohort study of 229 patients. Ann Am Thorac Soc 2019;16(10):1273–9
11. Matsuoka K. Malignant pleural mesothelioma presenting as acute empyema with severe leukocytosis. Ann Thorac Cardiovasc Surg 2014;20 Suppl:513–6.
12. Lapidot M, Mazzola E, Freyaldenhoven S, De León LE, Jaklitsch MT, Bueno R. Postoperative empyema after pleurectomy decortication for malignant pleural mesothelioma. Ann Thorac Surg 2022;114(4):1214–9.
13. Reyes KG, Mason DP, Murthy SC, Su JW, Rice TW. Open window thoracostomy: Modern update of an ancient operation. Thorac Cardiovasc Surg 2010;58(4):220–4.
14. Velanovich V, Adams CW. The use of colostomy bags for chest tube drainage. Ann Thorac Surg 1988;46(6):697–8.
15. Jackson K, Johnston R, Mackay L, Aujayeb A. A difficult pleural effusion in a cirrhotic patient. Breathe (Sheff) 2020;16(2):200049.

****

Author Contributions

Muhammad Hashim Naseer – Conception of the work, Design of the work, Acquisition of data, Analysis of data, Interpretation of data, Drafting the work, Revising the work critically for important intellectual content, Final approval of the version to be published, Agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved

Karl Jackson – Conception of the work, Design of the work, Acquisition of data, Analysis of data, Interpretation of data, Drafting the work, Revising the work critically

for important intellectual content, Final approval of the version to be published, Agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved

Avinash Aujayeb – Conception of the work, Design of the work, Acquisition of data, Analysis of data, Interpretation of data, Drafting the work, Revising the work critically for important intellectual content, Final approval of the version to be published, Agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved

Guarantor of Submission
The corresponding author is the guarantor of submission.

Source of Support
None.

Consent Statement
Written informed consent was obtained from the patient for publication of this article.

Conflict of Interest
Authors declare no conflict of interest.

Data Availability
All relevant data are within the paper and its Supporting Information files.