

Indwelling Pleural Catheter for Recurrent Pleural Effusion in a Centenarian: A Case Report

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AIM: Recurrent pleural effusion represents a clinical challenge, particularly in elderly and frail patients. While talc pleurodesis is traditionally considered the treatment of choice, the use of tunneled indwelling pleural catheters (IPCs) offers a less invasive alternative with fewer associated risks. This case report describes the management of recurrent malignant pleural effusion in a centenarian using a tunneled indwelling catheter.

CASE PRESENTATION: A 100-year-old woman, not eligible for invasive treatments due to her advanced age and frailty, was initially managed with talc pleurodesis using the “slurry” technique. The treatment was unsuccessful, with recurrence of the effusion observed after 20 days. The patient was subsequently treated with the placement of a 15F tunneled catheter (UNICO™ In-Vita CH 15, REDAX, Poggio Rusco, Italy) under local anesthesia for long-term effusion control. Caregivers managed the catheter at home, supported by periodic outpatient follow-ups.

RESULTS: Despite the advanced age and complexity of the clinical case, the catheter effectively controlled symptoms without complications such as infections or dislocations. The patient reported significant improvement in dyspnea and quality of life, with a favorable course until her death, which occurred 60 days after catheter placement. The mild inflammation induced by the catheter, as reflected by a 15 mg/L increase in C-reactive protein, likely contributed to progressive pleurodesis, gradually reducing pleural fluid production. This case underscores the role of IPCs as a safe and effective option for managing recurrent pleural effusions in elderly patients, providing symptom relief and improved quality of life with minimal complications.

CONCLUSIONS: Tunneled IPCs represent a valuable therapeutic option for elderly patients who are not candidates for more invasive procedures. Adequate caregiver education and regular follow-up are essential to optimizing outcomes and minimizing complications. Further prospective studies are needed to validate these findings and refine treatment strategies for this vulnerable patient population.

Keywords: lung cancer; adenocarcinoma; indwelling pleural catheter; recurrent pleural effusion; elderly patient; geriatric oncology; pleurodesis; home care management; case report

Introduction

Recurrent pleural effusion (RPE) is a common condition in elderly patients, with malignant pleural effusion (MPE) being the most frequent etiology. Its prevalence increases with age, affecting up to 10% of cancer patients, particularly those with advanced malignancies [1]. MPE accounts for approximately 15% of effusions in patients with advanced cancer, with lung and breast malignancies as the most common primary sites. Median survival varies widely, ranging from as short as 4 months for lung cancer to up to 12 months for mesothelioma [2,3]. In addition to malignancies, causes such as heart failure and chronic in-

fections contribute to pleural effusions in elderly patients. This condition severely impacts quality of life, leading to debilitating dyspnea, reduced physical activity, and psychological distress, underscoring the need for tailored management strategies.

Talc pleurodesis remains the standard treatment for controlling MPEs, particularly when performed using video-assisted thoracoscopic surgery (VATS) with the “poudrage” technique. This approach achieves recurrence rates as low as 11%, significantly better than the “slurry” technique using pleural drainage, which can reach recurrence rates of up to 30% [4]. However, pleurodesis is not always feasible in elderly patients or those with compromised clinical conditions, as it may carry a higher risk of complications such as infections, respiratory distress, and prolonged recovery times. Furthermore, the reduced respiratory reserve and increased prevalence of comorbidities in this population often limit the effectiveness and safety of pleurodesis, necessitating alternative approaches tailored to frail patients [5,6].

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In recent years, tunneled indwelling pleural catheters (IPCs) have emerged as a valuable alternative for managing RPEs, particularly in patients where pleurodesis is not feasible. IPCs provide symptom relief and enable home-based care, reducing hospitalizations [7]. Current guidelines, including those from the American Thoracic Society (ATS), Society of Thoracic Surgeons (STS), and Society of Thoracic Radiology (STR), recommend IPCs as the first-line option for patients with symptomatic MPE who are unsuitable for pleurodesis due to trapped lung, frailty, or comorbidities [8,9]. Compared to repeated thoracentesis, IPCs deliver more consistent symptom control, reduce procedural risks, and minimize hospital visits. Among elderly patients with limited life expectancy or non-expandable lungs, IPCs have demonstrated success rates of 70–85% in improving dyspnea and quality of life, highlighting their role in effective palliative management [9,10].

This case report describes the treatment experience of a 100-year-old female patient with RPE secondary to lung carcinoma. The patient was initially treated with pleurodesis using the “slurry” technique, but due to recurrence, a tunneled indwelling catheter was subsequently placed. This case highlights the role of IPCs in improving symptom control in very elderly and frail patients, showcasing both the benefits and challenges of this approach. This case has been reported in line with the Case Report (CARE) Guidelines to ensure the accuracy and completeness of the report (**Supplementary material**).

Case Presentation and Methods

Medical History and Clinical Presentation

A 100-year-old woman was admitted to the Thoracic Surgery Unit with progressive dyspnea and palpitations. Her medical history included hypertension and mild cognitive impairment, both managed with regular medications, as well as a history of osteoarthritis, which occasionally limited her mobility but did not necessitate daily assistance. Laboratory tests at admission revealed hemoglobin of 12.1 g/dL, white blood cell count of 7500/ μ L, and normal renal and hepatic functions. Electrolyte levels were within normal ranges. Functional assessment indicated a performance status of 3 according to the Eastern Cooperative Oncology Group (ECOG) score value, reflective of her advanced age and frailty. These factors, along with a high risk of complications from invasive procedures, strongly influenced the treatment plan.

On admission, a chest X-ray revealed a massive left pleural effusion. Subsequent computed tomography (CT) imaging showed a cavitated lung mass in the lower lobe of the left lung, measuring approximately 60 × 34 mm, associated with pleural effusion and hilar lymphadenopathy (Fig. 1A). Cytological analysis of the pleural fluid confirmed the diagnosis of adenocarcinoma, providing the basis for subsequent therapeutic decisions.

Diagnosis and Initial Procedure

The pleural effusion was drained using a thoracic catheter under local anesthesia, resulting in the evacuation of a significant volume of serous exudative fluid. Cytological examination confirmed the presence of neoplastic cells, leading to a diagnosis of lung adenocarcinoma.

To control the RPE, the patient underwent talc pleurodesis using the “slurry” technique. Talc pleurodesis was initially chosen due to the patient’s functional status, which allowed for local anesthesia and bedside management. The procedure aimed to provide long-term effusion control while minimizing the need for frequent follow-ups. Additionally, successful pleurodesis was expected to eliminate the need for a permanent drain, thereby reducing the burden of dressing changes and avoiding the discomfort of a foreign body. Talc pleurodesis was performed under local anesthesia by instilling 4 grams of sterile asbestos-free talc suspended in 120 mL of saline solution combined with lidocaine for pain control. Following talc infusion, the catheter was temporarily clamped to allow uniform distribution of the talc within the pleural cavity. The patient was repositioned at intervals of approximately 30 minutes (sitting, supine, right lateral, and left lateral) to optimize contact between the talc and the parietal and visceral pleura.

Despite treatment with the “slurry” technique, the patient experienced progressive worsening of dyspnea, with recurrence of the effusion noted 20 days after discharge (Fig. 1B). This recurrence necessitated exploring alternative options for pleural effusion control, ultimately leading to the decision to use a tunneled IPC.

Treatment With Tunneled IPC

Due to the recurrence of the effusion and considering the patient’s overall condition, the decision was made to place a 15F tunneled pleural catheter (UNICO™ In-Vita CH 15, REDAX, Poggio Rusco, Italy). Precautions were taken to account for the patient’s advanced age and frailty, including careful pre-procedure coagulation assessment to minimize bleeding risks. The procedure was performed under local anesthesia with additional monitoring for vital signs and comfort. Ultrasound guidance was used for precise catheter placement, reducing the risk of complications such as pneumothorax or misplacement. Following the creation of a subcutaneous tunnel to prevent infections, the catheter was securely fixed and connected to a one-way drainage system.

Placement Technique (In Brief)

- (1) Ultrasound identification of the pleural space and confirmation of the effusion site.
- (2) Local anesthesia with lidocaine.
- (3) Insertion of the catheter using a Veress needle, followed by the creation of a subcutaneous tunnel to prevent infections.

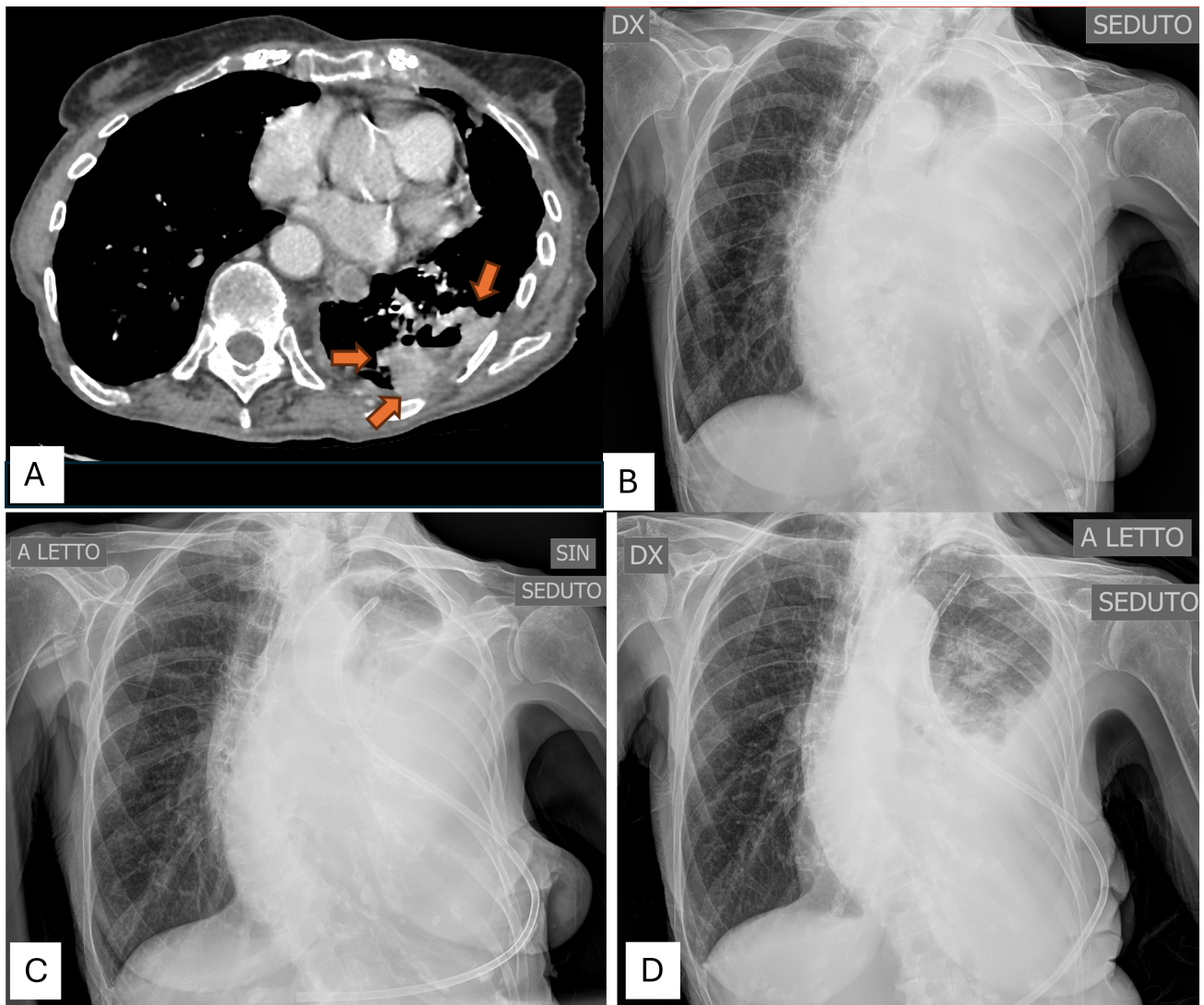


Fig. 1. Radiological findings in the management of recurrent pleural effusion. (A) Computed tomography image showing the cavitated lung mass (red arrows). (B) Left recurrent pleural effusion, 20 days after talc slurry. (C) Chest X-ray after indwelling pleural catheter positioning. (D) Chest X-ray at discharge.

(4) Catheter fixation and detailed instructions provided to the patient and family members for home management.

The procedure began with ultrasound localization of the pleural space to determine the optimal insertion site. After administering local anesthesia with lidocaine, a small incision was made at the determined site, and a Veress needle was used to access the pleural cavity. A guidewire was introduced through the needle, and the tunnel tract was created subcutaneously using a blunt dissection technique to reduce infection risk. The 15F catheter (UNICO™ In-Vita CH15, REDAX, Poggio Rusco, Italy) was inserted over the guidewire and secured with sutures and an adhesive dressing. Ultrasound was used throughout the procedure to confirm proper placement. Post-procedure care included patient and caregiver education on catheter management. The placement technique and equipment used are illustrated in Fig. 2.

Clinical Course and Follow-Up

The post-procedural course was uneventful, with no immediate complications and satisfactory Chest-X-Ray (Fig. 1C,D). The patient was discharged with home care support managed by family members, who were instructed on the proper management of the catheter. In the following weeks, scheduled outpatient visits were arranged to monitor catheter patency and assess for potential complications.

Outcome

Following the placement of the tunneled pleural catheter, the patient reported significant improvement in dyspnea, as documented through patient-reported outcomes collected during follow-up visits. These outcomes included subjective relief from respiratory distress and an increased ability to perform basic daily activities. The catheter allowed for continuous drainage of approximately 200–400 mL of

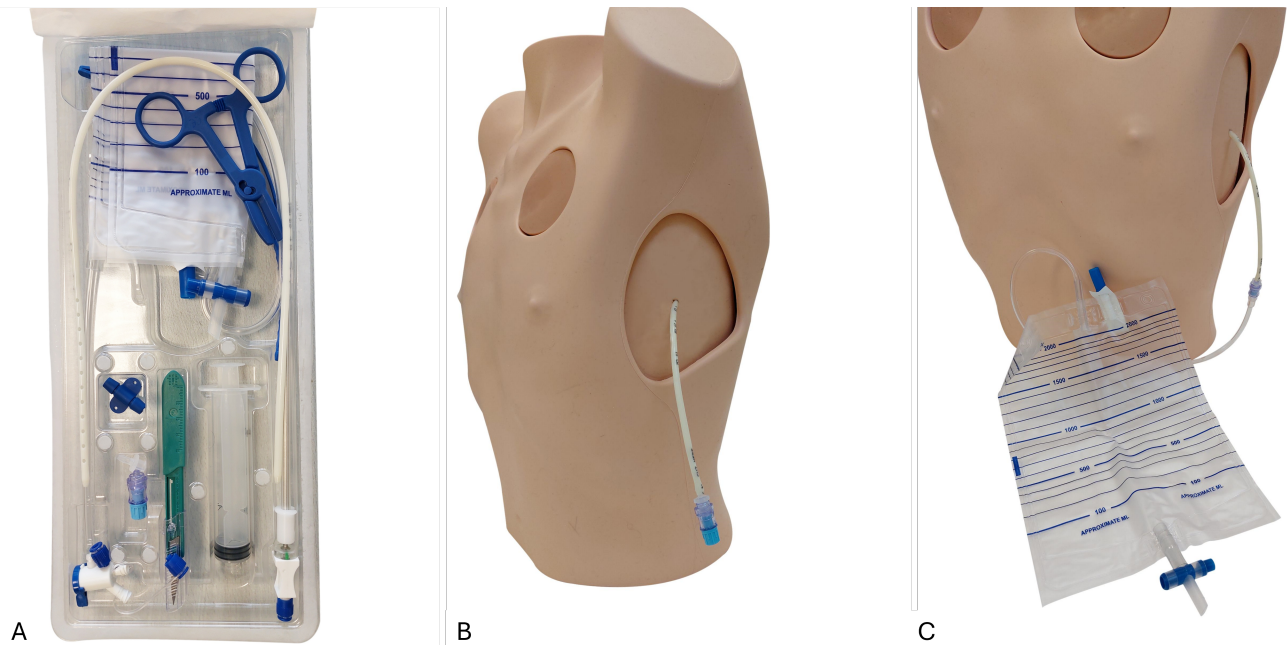


Fig. 2. Equipment and placement of tunneled indwelling pleural catheter. (A) 15F tunneled indwelling pleural catheter kit (UNICO™ In-Vita CH15, REDAX, Poggio Rusco, Italy). (B) Standard positioning of IPC in lateral position on a mannequin. (C) Collection system, equipped with one-way valve. IPC, indwelling pleural catheter.

pleural fluid daily during the initial two weeks, which gradually reduced to less than 100 mL per day by the fourth week. This reduction corresponded with symptomatic improvement and stabilization of pleural effusion. Caregivers also reported noticeable reductions in respiratory discomfort during routine monitoring at home. The patient managed the catheter effectively without complications such as infections or blockages, thereby maintaining a good quality of life. However, approximately two months later, the patient passed away due to the progression of the underlying oncological disease. The catheter remained patent until the time of death, providing effective palliation of symptoms and ensuring comfort until the end.

Discussion

RPE, particularly MPE, represents a significant burden in oncological patients, with profound clinical and economic implications. Globally, MPE affects approximately 15–20% of cancer patients, with an estimated 500,000 cases annually in the United States and Europe [1]. The condition is most commonly associated with lung and breast cancers, but is also frequently observed in patients with lymphomas and mesothelioma. The prognosis for MPE is generally poor, with median survival ranging from 4 months in lung cancer to 12 months in mesothelioma. This highlights the critical need for effective, patient-centered management strategies that prioritize symptom palliation and quality of life while minimizing procedural risks. In elderly and frail patients, the complexity of managing RPE is further compounded by the high prevalence of comorbidities

and limited functional reserve, necessitating tailored therapeutic approaches [1,11].

Literature Review on the Treatment of RPEs

RPEs present a significant clinical challenge, particularly in oncological patients and those with multiple comorbidities. The traditional management of these patients often involves repeated thoracentesis or talc pleurodesis, which can carry a significant risk of complications, especially in elderly or frail patients [5].

In recent years, the use of IPCs has gained popularity as a less invasive and more manageable option, especially for patients requiring long-term management. Available study indicates that IPCs provide effective symptom control, reducing the need for repeated hospitalizations and improving patients' quality of life [9]. A survey conducted by the American Association of Bronchology and Interventional Pulmonology (AABIP) found that IPCs are the preferred choice in 65% of MPE cases [4]. Recent studies have emphasized the role of IPCs in improving not only symptom relief but also the psychological well-being of patients with RPEs, particularly those with malignancy [7,8]. A meta-analysis published in 2023 found that IPCs are associated with reduced hospital readmissions and better patient satisfaction compared to traditional pleurodesis approaches [6].

Differences Between “Traditional” and Tunneled IPCs

Historically, “traditional” medium-term pleural drains have been used for the treatment of RPEs. However, home management of these devices is often complex, with a high inci-

dence of complications such as insertion site infections and catheter dislocation [8–10].

In contrast, tunneled IPCs, thanks to the creation of a subcutaneous tunnel, significantly reduce the risk of infections and dislocations, offering a safer solution for long-term drainage [1,9]. Additionally, home management of these catheters is facilitated by their ease of use and self-drainage capability, reducing the burden on caregivers [9,10].

Complications Described in the Literature

IPCs are generally safe but can be associated with a range of complications, which can be classified into two main categories: complications related to the placement procedure and those related to the long-term presence of the catheter.

Procedure-Related Complications

Complications that may arise during placement include pneumothorax, subcutaneous emphysema, bleeding, and immediate insertion site infections. These complications have an incidence rate ranging from 2.8% to 6% [5,6,11], similar to other pleural drainage procedures. However, while metastatic seeding along the tract of surgically placed drains is rare, metastatic seeding along the catheter tract can occur, particularly in patients with pleural mesothelioma [12]. The incidence of this complication is generally below 5%. It is believed to be due to the implantation of neoplastic cells along the catheter tract, possibly facilitated by high intrapleural pressure during insertion.

The most common long-term complications include infections, which occur with a frequency ranging from 4% to 9% [7]. A multicenter study found that, among a population of 1021 patients, 4.9% developed pleural infections that were manageable with antibiotic therapy without the need for catheter removal [13]. Tunnel infections are less common and can generally be managed with antibiotics without removing the device [1,5–7].

Another complication is pleural fluid loculation, which occurs in approximately 14% of cases [14]. This can reduce the effectiveness of drainage and may require the use of fibrinolytics to restore catheter patency [15].

Catheter Occlusion and Displacement

Partial or complete catheter occlusion is reported in fewer than 5% of cases, often resolved with saline flushes or fibrinolytics. Catheter displacement can be caused by improper positioning or patient movement, particularly in cachectic individuals.

Chest Pain

Transient chest pain after catheter placement is common, with an incidence of 36% in the initial days, but it typically resolves within three days without further intervention [16]. These complications, while present, can generally be managed conservatively, making IPCs a viable option for long-term management of RPEs.

Key Findings From the Case

In the present case, we treated a 100-year-old patient with recurrent MPE. Due to her advanced age and overall condition, the patient was not a candidate for invasive procedures such as VATS. The use of a tunneled IPC was chosen as the optimal option for symptom control. Despite the need for the catheter to remain in place for an indefinite period, no complications such as infections, occlusions, or loculations were observed.

This study is limited by being a case report, which precludes generalization. Additionally, the lack of long-term follow-up data restricts conclusions on the durability of symptomatic relief and potential for spontaneous pleurodesis. Future multicenter studies are needed to validate these findings and establish standardized protocols.

The outcomes of this case align closely with existing literature, where multicenter studies report a 70–85% improvement in dyspnea and quality of life following IPC placement, similar to the symptomatic relief achieved in our patient [8,12]. While complications such as infections and loculations are commonly reported in 4–14% of cases, the absence of these issues here is notable, particularly given the patient's advanced age and frailty [5,9]. This may reflect the meticulous procedural approach taken, as well as the effective education provided to caregivers on managing the catheter at home. During the follow-up period, one challenge was ensuring consistent catheter drainage by caregivers, which required periodic reassessment during outpatient visits. Additionally, mild discomfort at the catheter site was reported initially but resolved with conservative management. These observations underscore the importance of continuous education and support for caregivers in managing home-based IPCs.

This case highlights the role of IPCs as a safe and effective alternative to pleurodesis in frail or elderly patients for whom invasive procedures are unsuitable. It underscores the importance of individualized care strategies that prioritize both symptom control and quality of life, even in highly vulnerable populations like centenarian patients.

Treatment Efficacy and Potential Pleurodesis Induced by the Catheter

Our experience with this patient demonstrated that the use of a tunneled catheter resulted in a significant improvement in quality of life, providing effective control of dyspnea without the need for hospitalization. A plausible explanation for the observed clinical improvement could be the mild inflammation induced by the presence of the catheter as a “foreign body”, which might have facilitated a gradual pleurodesis. This process is thought to occur as inflammation promotes adhesion formation between the parietal and visceral pleura, driven by fibrin deposition and subsequent fibrosis, effectively obliterating the pleural space and preventing fluid reaccumulation. This hypothesis is indirectly supported by the moderate increase of 15 mg/L in C-

reactive protein observed after catheter placement, a marker often associated with systemic inflammation. However, the relationship between CRP levels and successful pleurodesis remains speculative and requires further investigation. While controlled inflammation may contribute to pleural fluid resolution over time, as suggested by some literature, additional prospective studies are needed to confirm this phenomenon and its potential implications for catheter removal in clinically stable patients [7,10].

Moreover, our experience highlighted the crucial role of caregivers in the home management of tunneled pleural catheters [17,18]. Adequate education for family members and healthcare providers was crucial for catheter maintenance, early recognition of potential complications, and ensuring timely interventions. This approach minimized the risk of infections or mismanagement, directly contributing to the overall success of the treatment and the patient's improved quality of life [18,19]. Therefore, caregiver education, combined with regular outpatient follow-up, is essential to optimize the effectiveness of IPCs, thereby improving the quality of life for frail patients and reducing the risk of unnecessary hospitalizations [17–19].

Applications of IPCs Across Etiologies

The management of RPE is highly dependent on the underlying cause. For MPEs, IPCs are the preferred option for palliative care, providing effective and sustained symptom relief [11]. In contrast, non-malignant effusions, such as those caused by heart failure or infections, often require a multifaceted approach that combines IPC placement with adjunctive therapies, including diuretics or antibiotics, to address the primary condition [4].

Personalized treatment plans are critical for optimizing outcomes, especially in elderly and frail patients. These plans should consider factors such as age, functional status, comorbidities, and patient preferences. Compared to repeated thoracentesis, IPCs deliver more consistent symptom control, minimize hospitalization rates, and reduce risks of procedural complications, including pneumothorax and pain [3,8,9,18].

However, IPCs are not without risks. Potential complications such as infections, loculations, and catheter occlusions necessitate careful monitoring and follow-up. Compared to talc pleurodesis, IPCs offer a less invasive alternative, which is particularly advantageous for patients with limited life expectancy or those who are unsuitable for surgical interventions due to poor functional status [4,9,11].

Future Perspectives and Study Design

This case highlights the potential of IPCs as a safe and effective option for managing RPEs in elderly and frail patients. However, further research is required to better understand the broader applicability of these observations [7,10]. A prospective multicenter study focusing on this population could provide critical insights.

Such a study should include patients with comparable baseline characteristics, such as advanced age, frailty, and pleural effusion etiology, to minimize confounding variables. The primary endpoints could include symptom relief, quality of life improvements, and the frequency of complications such as infections, loculations, and catheter occlusions. Secondary endpoints might evaluate the role of caregiver education and support in optimizing treatment outcomes, as well as the potential for catheter removal in cases of spontaneous pleurodesis.

This approach would not only validate the safety and efficacy of IPCs but also help refine guidelines for their use in vulnerable populations, ensuring better clinical outcomes and improved quality of life.

Conclusions

The use of tunneled IPCs represents a safe and effective option for the long-term management of RPEs, particularly in patients who are not candidates for more invasive surgical interventions, such as VATS pleurodesis. Our experience with a centenarian patient demonstrated that, despite advanced age and comorbidities, the use of a tunneled catheter provided effective symptom control without significant complications.

The available literature confirms that, although IPCs may be associated with complications such as infections, loculations, or obstructions, these issues are generally manageable with conservative treatments, without the need for catheter removal. In the case presented, the absence of complications and the improvement in the patient's quality of life suggest that IPCs can serve as a viable alternative to pleurodesis, especially in more fragile patients, helping to reduce the burden of hospitalization and offering a better quality of life.

Furthermore, the mild inflammation induced by the presence of the catheter may have promoted a gentle and progressive pleurodesis, contributing to a reduction in pleural fluid production over time. This phenomenon could potentially allow for the removal of the catheter in the future if clinical stabilization is observed.

In conclusion, tunneled IPCs provide an effective therapeutic strategy for controlling RPEs, improving patient quality of life, and reducing the burden on healthcare services. Further prospective studies are warranted to better clarify the long-term benefits and potential complications associated with these devices, with particular focus on the elderly and frail population, especially regarding the induction of progressive pleurodesis.

Availability of Data and Materials

The data presented in this study are available upon request from the corresponding author.

Author Contributions

Conceptualization: PS, CEG, GN. Data Analysis: PS, CEG. Methodology: PS, SC, ER, FI, GA, GN, CEG. Writing-Original Draft: PS. All authors contributed to important editorial changes in the manuscript. All authors read and approved the final manuscript. All authors have participated sufficiently in the work and agreed to be accountable for all aspects of the work.

Ethics Approval and Consent to Participate

The Azienda Socio Sanitaria Territoriale (ASST) Valtellina e Alto Lario Review Board deemed the study exempt from review. This study was conducted in accordance with The Declaration of Helsinki. Written informed consent was obtained to publish this case report.

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Conflict of Interest

The authors declare no conflict of interest.

Supplementary Material

Supplementary material associated with this article can be found, in the online version, at <https://doi.org/10.62713/aic.3866>.

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