Case Report

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Comprehensive Postoperative Physiotherapy for Pulmonary Function, Functional Recovery and Quality of Life in a Patient with Pancreatopleural Fistula: A Rare Case Report

Physiotherapy Section

DINKEY A MANKAD[1], G PALANI KUMAR[2], KALPESH SATANI[3]

ABSTRACT

Pancreatopleural Fistula (PPF) is a rare complication of pancreatitis that occurs approximately in 0.4% of patients characterised by an abnormal communication between the pancreatic duct and the pleural cavity. Surgical intervention is often required in severe or necrotising cases. Comprehensive physiotherapeutic rehabilitation plays a vital role in PPF. A 25-year-old male patient presented to the hospital with complaints of lower abdominal pain, fever, nausea, vomiting, cough with whitish expectoration left-sided chest pain and breathlessness {Grade 4 modified Medical Research Council (mMRC)}. He had a history of alcohol consumption for the last ten years. Based on abdominal Computed Tomography (CT) scan findings, he was diagnosed with a left PPF along with left pleural effusion. The patient subsequently underwent a pancreatic necrosectomy. After obtaining informed consent, a detailed physiotherapy evaluation was conducted and a tailor-made pulmonary rehabilitation program included early mobilisation in the Intensive Care Unit (ICU), active breathing exercises, incentive spirometry, exercise training (aerobic and resisted exercises), positioning, and airway clearance techniques. mMRC Dyspnoea Scale showed improvement from Grade 4 to Grade 2. The Six-Minute Walk Distance increased from 120 meters to 350 meters and SF-36 (36-Item Short Form Survey) score improved from 20 to 36. Findings of this case report indicate that comprehensive postoperative physiotherapeutic rehabilitation is both feasible and effective and demonstrated significant improvement in pulmonary function, functional recovery, and better quality of life in the postoperative period in patients with PPF. A structured rehabilitation program can effectively prevent postsurgical complications, and improve functional recovery in such rare and complex thoraco-abdominal conditions.

Keywords: Pancreatic diseases, Postoperative care, Pulmonary rehabilitation, Recovery of function

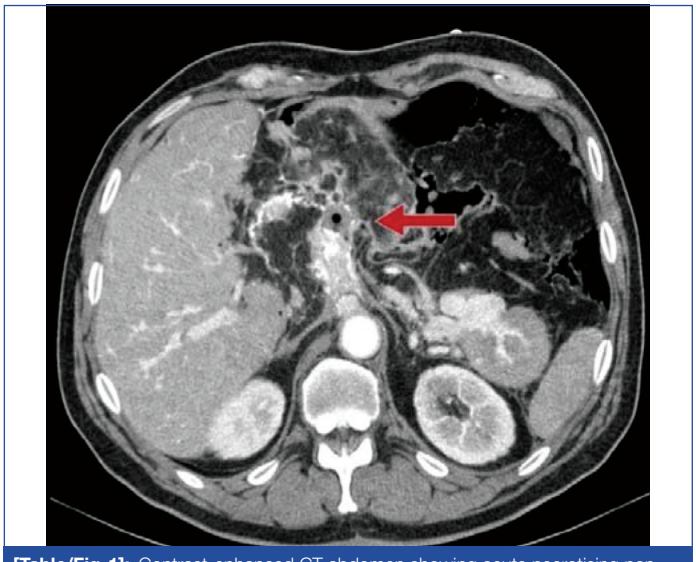
CASE REPORT

A 25-year-old male patient presented to the hospital with a chief complaint of lower abdominal pain (right-sided, dull aching, radiating to the back), fever, nausea, and vomiting, which had been present for the past one month and were insidious in onset and gradually progressive in nature. During the last 15 days, he also developed respiratory symptoms including cough with whitish expectoration, left-sided chest pain, and breathlessness (Grade 4 mMRC) [1], which progressively worsened. He initially went to a local hospital. At a local hospital, the patient underwent a Contrast-Enhanced Computed Tomography (CECT) scan of the whole abdomen, which revealed acute necrotising pancreatitis with a left-sided PPF [Table/Fig-1]. The patient was managed with conservative medical therapy for 10 days, which included supportive treatment and symptomatic management.

Personal history revealed that the patient had a history of chronic alcohol consumption for the past 10 years, approximately 150 mL per day, consumed three times per week, and tobacco chewing for the past five years, approximately two packets/day.

As the patient's condition gradually worsened over time, he again presented to the hospital with the same gastrointestinal complaints (lower abdominal pain, fever, nausea, and vomiting) along with respiratory symptoms (cough with whitish expectoration, bilateral chest pain, and breathlessness Grade 4 mMRC). At this time, further investigations were carried out, including chest X-ray, CT scan of the abdomen, Ultrasonography (USG), and Complete Blood Count (CBC) to reassess his condition.

The chest X-ray revealed left-sided pleural effusion [Table/Fig-2]. The CT scan of the abdomen again demonstrated features of

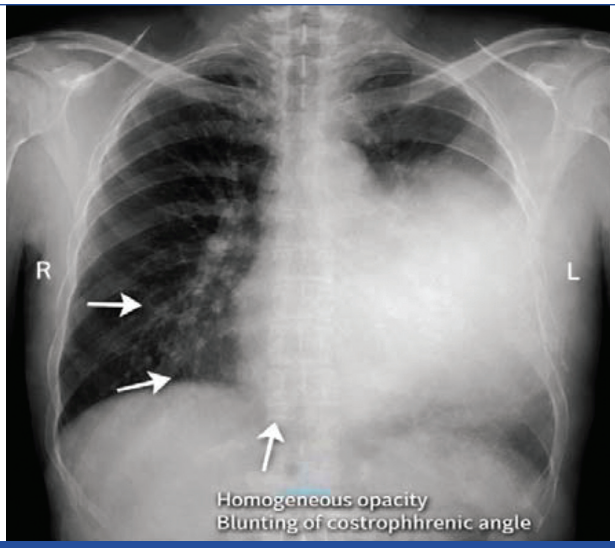


[Table/Fig-1]: Contrast-enhanced CT abdomen showing acute necrotising pancreatitis with left-sided Pancreatopleural Fistula (PPF).

acute necrotising pancreatitis with a left-sided PPF [Table/Fig-3]. USG of the abdomen showed features suggestive of pancreatic inflammation with peripancreatic fluid collection [Table/Fig-3]. The CBC revealed elevated total leukocyte count (15,000 cells/mm^3) indicating infection/inflammation, with mild anaemia (11 g/dL) which supported the ongoing inflammatory process.

These findings were consistent with and confirmed the previous diagnosis of acute necrotising pancreatitis with PPF.

The patient underwent pancreatic necrosectomy via exploratory laparotomy under general anaesthesia. A vertical midline incision



[Table/Fig-2]: Chest X-ray showing left-sided pleural effusion with homogeneous opacity and blunting of the costophrenic angle.

Name of investigations	Findings
Chest X-ray	There is blunting of left costophrenic angle with homogenous opacity noted involving left middle lung zones with loss of cardiac silhouette involving left hydrothorax [Table/Fig-2]
CT scan of whole abdomen	Mild heterogenous enhancement of pancreas suggestive of pancreatitis. Extensive necrotising collection with extension and changes of left pancreatopleural fistula formation [Table/Fig-1]
USG of whole abdomen	Bulky and hypoechoic pancreas with ill-defined margins. The presence of peripancreatic fluid collection further supports the diagnosis of acute pancreatitis and indicates associated local inflammatory changes.

[Table/Fig-3]: List of investigations.

was used for the procedure. Immediately following surgery, the patient was admitted to the ICU, for one week. He was on mechanical ventilator in the immediate postoperative period. A pleural Intercostal Chest Drain (ICD) was inserted for pleural drainage. Medical management was continued for one month and included intravenous antibiotics (meropenem (1 g i.v. TDS), metronidazole (500 mg i.v. TDS), levofloxacin (500-750 mg OD), and ceftriaxone (1-2 g i.v. OD) analgesia with tramadol, and gastroprotection with pantoprazole. After weaning from mechanical ventilation, the patient was started on supplemental oxygen therapy at 6 L/min via oxygen support for 10 days. During hospitalisation, the patient underwent the required medical and supportive management, and some medications were also prescribed at the time of discharge for continued treatment. Physiotherapy management was initiated from postoperative day 2, when the patient was haemodynamically stable but still experiencing breathlessness and reduced chest expansion.

A detailed physiotherapy evaluation was performed on postoperative day 2 and again at one-month follow-up. On observation, the patient was on 6 L/min of oxygen via face mask. The breathing pattern was abdominothoracic, with use of accessory respiratory muscles present [Table/Fig-4]. On palpation, the trachea was centrally positioned, and tactile vocal fremitus was reduced over the left lower lung zones. Chest percussion revealed dullness over the left lower lung zones. Vital signs assessment demonstrated tachycardia (pulse rate: 114 beats/min) and tachypnoea (respiratory rate: 26 breaths/min). Oxygen saturation was 95% on 6 L/min of supplemental oxygen and 92% on room air. Chest expansion assessment revealed mild to moderate restriction, measuring 2.5 cm at the axillary level, 2 cm at the nipple level, and 2.5 cm at the xiphisternal level, suggesting reduced thoracic mobility likely associated with pain, pleural involvement, and respiratory compromise. On auscultation, bilateral air entry was adequately

[Table/Fig-4]: Clinical photograph of the patient.

present in all lung zones but reduced in both lower lung zones, with crackles present at the bilateral lower lung fields.

A structured physiotherapy program was initiated focusing on respiratory function, functional capacity, psychological wellbeing (depression due to prolonged hospitalisation), and quality of life. The intervention was provided throughout the one-month hospital stay. The patient was admitted to the Surgical Intensive Care Unit (SICU) for the first seven days, where physiotherapy was given three times daily. After stabilisation, he was shifted to the surgical ward, where physiotherapy was continued twice daily until discharge.

Patient education was provided regarding the disease condition and the benefits of rehabilitation. Dyspnoea management included pursed-lip breathing, dyspnoea-relieving positions, energy conservation techniques, and relaxation training. Airway clearance was facilitated using the Active Cycle of Breathing Technique (ACBT) (5 cycles) and postural drainage. Ventilatory efficiency was improved through diaphragmatic breathing, segmental breathing, thoracic expansion exercises, and incentive spirometry. Peripheral muscle strengthening was performed according to American College of Sports Medicine (ACSM) Guidelines [2] prescribed according to ACSM guidelines, was initiated after the patient was shifted, prescribed according to ACSM guidelines, one was initiated after the patient was shifted from the Surgical ICU to the surgical ward on day 7. A home exercise program consisting of breathing exercises, limb mobility exercises, and ambulation was advised twice daily [Table/Fig-5].

S. No.	Goals	Physiotherapy intervention	Repetitions	Progression
1	Patient education	To explain the present condition and the advantages of a physical rehabilitation program to the patient	NA	Reinforced daily, patient encouraged for self-management
2.	To reduce dyspnoea	Pursed lip Breathing Dyspnoea-relieving positions Energy conservation technique, (pacing, planning, prioritising, positioning) Relaxation training.	5 Reps* 2 sets	Increased duration of breathing control, positions practiced during Activities of Daily Living (ADLs)
3	To mobilise and remove secretions	Active Cycle of Breathing Technique (ACBT) Postural Drainage (positions: left lateral for right lung, right lateral for left lung, upright sitting for upper lobes)	Five cycles	Increased cycles and added huffing/ coughing as tolerated
4	To improve ventilation	Diaphragmatic breathing. Segmental Breathing. Thoracic expansion exercise. Incentive Spirometry (900cc)	5 Reps*2 Sets	Increased repetitions and hold time, spirometry volume gradually increased

5	To improve muscle strength	Resisted exercise F- 3 days /Week I- 40% of 1RM T-15 Min T-weight cuff	10 reps × 1 set (Major Muscles of upper limb and lower limb)	Progressed to 2-3 sets; resistance increased (weight cuffs) based on tolerance
6	To improve aerobic capacity	Aerobic exercise. F-5 Days/Week I-11-13 RPE T-15-20 Min T-Brisk Walking	NA	Duration increased up to 30 min; intensity progressed gradually
7	To improve the QOL of the patient	The home exercise regimen includes deep breathing exercises, mobility exercises for the upper and lower limbs, and ambulation	Twice a day	Progressed by increasing duration and independence in ADLs

[Table/Fig-5]: Summary of physiotherapy treatment.

After one month of physiotherapy, dyspnoea severity improved on the mMRC [3] scale from Grade 4 to Grade 2. Quality of life scores (SF-36) [4] increased from 20 to 36, while psychological distress measured by Hospital Anxiety and Depression Scale (HADS) [5] reduced from 12 to 10. Functional exercise capacity improved on the 6-minute walk test distance [6] from 120 m to 350 m, and PEFR [7] increased from 170 L/min to 350 L/min [Table/Fig-6].

Outcome	Pre (baseline POD-2)	Post (after one month)
Modified Medical Research Council dyspnoea grading scale [3]	Grade-4	Grade-2
SF-36 [4]	20	36
Hospital anxiety and depression scale (HADS) [5]	12	10
6MWT/symptom limited test [6]	120 m	350 m
Peak Expiratory Flow Rate (PEFR) [7]	170 L/min	350 L/min

[Table/Fig-6]: Outcome measures [3-7].

DISCUSSION

The PPF is a rare condition that often leads to respiratory impairment, reduced physical capacity, and poor quality of life due to prolonged illness, surgery, pleural involvement, and ICU stay. Previous studies have reported that patients frequently present with dyspnoea, chest pain, and pleural effusion, with comparatively fewer abdominal symptoms, which aligns with the presentation observed in the present case [8,9]. In the present case, a comprehensive postoperative physiotherapy program resulted in significant improvement in pulmonary function, functional capacity, dyspnoea, and QOL.

Improvement in quality of life and psychological status may be due to enhanced physical independence, reduced symptoms, and patient education with a home exercise program, which encourages active participation in recovery [10]. Although literature on physiotherapy specifically in PPF is limited, the findings of this case are consistent with studies supporting postoperative respiratory physiotherapy and early rehabilitation following major abdominal and thoracic surgeries [11-14]. The improvement in pulmonary function and dyspnoea can be explained by the early use of breathing exercises, lung expansion techniques, and airway clearance strategies. Diaphragmatic breathing, thoracic expansion exercises, and incentive spirometry help improve lung volumes and prevent postoperative complications such as atelectasis. Airway clearance techniques like ACBT and postural drainage aid in secretion removal, thereby improving ventilation and peak expiratory flow rate [Table/Fig-7] [8-16].

Parameter	Present case	Findings from literature
Symptoms	GI + predominant respiratory symptoms (dyspnoea, chest pain, pleural effusion)	Predominantly respiratory symptoms with pleural effusion [8,9]
Treatment	Conservative + surgical + structured physiotherapy	Medical/surgical management with supportive care [10,11]
Physiotherapy	Early, structured, ICU to ward progression	Early respiratory physiotherapy recommended [12-14]
Pulmonary function	Significant improvement	Improved with breathing exercises and airway clearance [12-14]
Dyspnoea	Reduced (mMRC improvement)	Improved with breathing strategies [12-14]
Functional capacity	Improved (6MWT)	Improved with mobilisation and exercise [15,16]
Quality of life	Improved	Enhanced with rehabilitation and education [16]

[Table/Fig-7]: Comparative summary of present case with existing literature [8-16].

The reduction in breathlessness, reflected by improvement in the mMRC dyspnoea grade, may be attributed to better breathing efficiency, reduced work of breathing, and improved oxygenation achieved through pursed-lip breathing, dyspnoea-relieving positions-findings that are in agreement with existing respiratory rehabilitation studies [15]. The marked improvement in functional exercise capacity, as seen in the 6-minute walk test, can be linked to early mobilisation, aerobic training, and progressive muscle strengthening. Structured resistance and aerobic exercises help restore muscle strength and endurance [15].

Improvement in quality of life and psychological status in the present case may be attributed to increased physical independence, reduction in symptom burden, and structured patient education, including a home exercise program. Previous studies have also highlighted the role of rehabilitation in reducing anxiety, depression, and improving overall wellbeing in patients with prolonged hospital stays and critical illness [Table/Fig-7] [16].

This case highlights the importance of integrating early and structured physiotherapy as part of multidisciplinary postoperative care to improve overall recovery outcomes in rare and complex conditions.

CONCLUSION(S)

Findings of this case report indicate that comprehensive postoperative physiotherapeutic rehabilitation is both feasible and effective and demonstrated significant improvement in pulmonary function, functional recovery, and better quality of life in the postoperative period in patients with PPF. A structured rehabilitation program can effectively prevent postsurgical complications, enhance lung re-expansion, and improve functional recovery in such rare and complex thoraco-abdominal conditions.

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PARTICULARS OF CONTRIBUTORS:
1. Assistant Professor, Department of Cardio Respiratory, College of Physiotherapy, Sumandeep Vidyapeeth Deemed to be University, Piparia, Waghodia, Vadodara, Gujarat, India.
2. Professor and Dean, Department of Neurological and Psychosomatic, College of Physiotherapy, Sumandeep Vidyapeeth Deemed to be University, Piparia, Waghodia, Vadodara, Gujarat, India.
3. Professor, Department of Cardio Respiratory, College of Physiotherapy, Sumandeep Vidyapeeth Deemed to be University, Piparia, Waghodia, Vadodara, Gujarat, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:
Dr. Dinkey A Mankad,
Assistant Professor, Department of Cardio Respiratory, College of Physiotherapy, Sumandeep Vidyapeeth Deemed to be University, Piparia-391760, Vadodara, Gujarat, India.
E-mail: mankaddinkey@gmail.com

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