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Pulmonary rehabilitation program as supportive therapy to chemotherapy for improving functional performance in a case of malignant pleural effusion who underwent debulking surgery for ovarian cancer: A case report

Purva Mundada[1], **Vaishnavi Yadav**[2*], **Moli Jain**[3], **Pallavi Bhakaney**[3], **Vishnu Vardhan**[4]

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Authors' Affiliation:
[1]Intern, Ravi Nair Physiotherapy College, Datta Meghe Institute of Medical Sciences (DU), Sawangi Meghe, Wardha, Maharashtra, India
[2]Assistant Professor, Department of Cardiorespiratory Physiotherapy, Ravi Nair Physiotherapy College, Datta Meghe Institute of Medical Sciences, Sawangi Meghe, Wardha, Maharashtra, India
[3]Resident, Department of Cardiorespiratory Physiotherapy, Ravi Nair Physiotherapy College, Datta Meghe Institute of Medical Sciences (DU), Sawangi Meghe, Wardha, Maharashtra, India
[4]HOD & Professor, Department of Cardiorespiratory Physiotherapy, Ravi Nair Physiotherapy College, Datta Meghe Institute of Medical Sciences (DU), Sawangi Meghe, Wardha, Maharashtra, India

[*]**Corresponding Author**
Assistant Professor, Department of Cardiorespiratory Physiotherapy, Ravi Nair Physiotherapy College, Datta Meghe Institute of Medical Sciences, Sawangi Meghe, Wardha, Maharashtra, India
Email: vaishnavi1326@gmail.com

Contact Information

Purva Mundada	urvamundada4444@gmail.com
Vaishnavi Yadav	vaishnavi1326@gmail.com
Moli Jain	molijain05@gmail.com
Pallavi Bhakaney	pallavi.bhakaney@dmimsu.edu.in
Vishnu Vardhan	vishnudiwakarpt@gmail.com

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ABSTRACT

Malignant Pleural Effusion (MPE) is defined by cancer cells metastasizing into the pleural space, resulting in an increase in fluid buildup in the pleural space. It is curable but reduces chest expansion and causes lung collapse, restrictive ventilatory abnormalities, and respiratory failure over time resulting in impaired quality of life. These complications induced by structural lung damage result in physiological dysfunction that leads to impairment, respiratory problems, and a reduction in functional capacity, all of which have an impact on Activities of Daily Living (ADLs). In this study, we are describing a case of 55 year old female who was a known of ovarian cancer presented to this hospital with moderate dyspnea, chest pain, and cough with expectorations and after investigations diagnosed with malignant right sided pleural effusion which was primarily managed with chemotherapy and ICD and subsequently, physiotherapy rehabilitation was planned. The current case demonstrated that medical care combined with physiotherapy and/or Pulmonary Rehabilitation (PR) can improve patient outcomes.

Keywords: Papillary cystadenocarcinoma of the ovary, malignant pleural effusion, pulmonary rehabilitation

1. INTRODUCTION

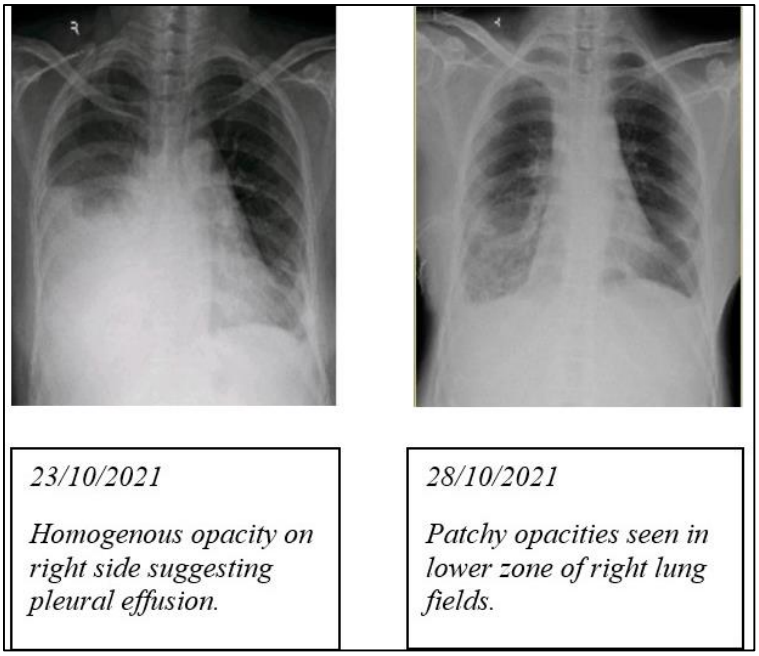
The most fatal gynecological cancer in women worldwide is ovarian cancer. Previous research identified the age group of 50–79 as the standard upon

diagnosis (Shabir and Gill, 2020). In 75% of patients, ovarian papillary cystadenocarcinoma is by far the most prevalent histological variant. The staging of patients with ovarian cancer is done following the International Federation of Obstetrics and Gynecology (FIGO) system (Song et al., 2011). At the time of diagnosis, 75% of patients have progressed to a late stage (III or IV) (Huang et al., 2018). Stage 4 is defined by – presence of cancer cells in the fluid surrounding the lungs and no additional sites of cancer spread outside the abdomen (Berek et al., 2018). The pleural cavity is the most prevalent site of metastases in ovarian cancer outside the abdomen (Porcel et al., 2012).

MPE is marked by the presence of cancer cells in pleural fluid as determined by cytology or histology of pleural tissue biopsy (Awadallah et al., 2019). The most common source of malignant pleural effusions in OC is direct pleural encroachment from neighboring structures such as - diaphragm, or transfer of cancer cells via diaphragm through pleural and peritoneal interconnections (Porcel et al., 2012). Pleural effusion limits chest expansion and produces lung atelectasis as the thorax's capacity is limited and excess fluid causes the lungs to collapse (Gunjal et al., 2015). Patients may acquire restrictive ventilatory abnormalities and respiratory failure over time, resulting in impaired quality of life (Croitoru et al., 2019). Chemotherapy is currently one of the most commonly used treatments for malignant pleural effusion (Jiang et al., 2016). However, individuals treated with chemotherapy have poorer muscle strength, physical activity and physical performance as compared to individuals not treated with chemotherapy. Throughout the chemotherapy sessions, PR is a helpful strategy in alleviating breathlessness, fatigue and improving functional performance and independence in ADLs.

2. CASE REPORT

A 55 year old female presented to respiratory department of tertiary care rural hospital with right sided chest pain, cough with mucoid expectoration, breathlessness MMRC grade 2, and fever on and off since 7 days. USG Thorax was done which was suggestive of gross right sided pleural effusion with underlying segmental lung collapse and showed approximately 1000 cc of fluid. Oncologist opinion was taken, and chemotherapy was started with injection Gemcitabine and injection Cisplatin (3 cycles). ICD was inserted in the 6th intercostal space in the right midaxillary line. The patient is known operated case of ovarian cancer diagnosed in 2019. She received 6 cycles of chemotherapy with injection Carboplatin and injection Paclitaxel (2 cycles before surgery and 4 cycles after surgery). She underwent debulking surgery for the same on 7 August 2020. On inspection and palpation, chest wall movement was reduced on the right side. Respiratory rate was 24 breaths/min, thoracoabdominal type, and regular. Chest excursion was reduced at apical, anterior and posterior on the right side. Chest expansion revealed a difference of 1cm, 2cm, and 2cm at an axillary, nipple, and xiphisternal levels respectively. Tactile vocal fremitus was absent over the right side. Stony dullness to percussion was heard over the same. On auscultation, breath sounds were absent over the right side and vocal resonance was also absent. Chest X-ray was carried out in Postero-anterior view. It is shown in figure 1.



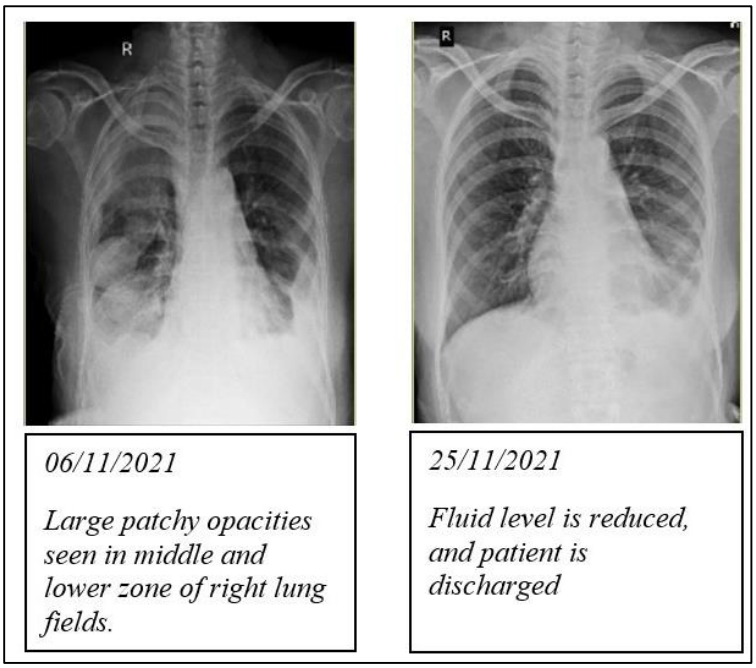


Figure 1 Chest X-rays

Pulmonary rehabilitation interventions

To alleviate anxiety

Patient Education (PE) and counselling: The patient was educated about her current condition, the importance of following the prescribed protocols, the importance of exercise adherence, and strategies for reducing dyspnoea as part of the physiotherapy regime.

To remove or to prevent accumulation of secretions

Airway Clearance Technique (ACT), Active Cycle of Breathing Technique (ACBT): The patient was instructed to practice ACBT for 10 minutes 2-3 times a day (Sultanpuram et al., 2016).

Breath staking exercise (after removal of ICD): 5 repetitions with 5 seconds hold 3 times a day was advised (Mohamed et al., 2021).

To reduce pain at the site of insertion of ICD

Transcutaneous Electrical Nerve Stimulation (TENS): The conventional mode of TENS was used with a frequency of 100-150 Hz, duration 10-15 minutes with intensity as tolerated by the patient. Electrodes were placed at the site of insertion of the ICD.

Splinted coughing: Whenever a patient needed to cough or sneeze, she is asked to keep her hand directly over the ICD tube insertion site to avoid the stretching of that site which could lead to pain.

To reduce work of breathing

Breathing Exercises: Pursed lip breathing (10 repetitions, 1 set), Diaphragmatic breathing (10 repetitions, 1 set), and segmental breathing exercises including apical and lateral coastal expansion (10 repetitions, 1 set) to promote the localized expansion of the involved area.

Dyspnea relieving positions: Dyspnea relieving positions such as forward-leaning while sitting, forward-leaning while standing, and side-lying chest to knee.

To increase chest expansion

Thoracic expansion exercises: After removal of ICD, the patient was asked to abduct both the shoulders and take a deep inspiration, hold it for 3 seconds, and while coming back or adducting the shoulder to exhale completely.

Incentive spirometry: 10 repetitions, 2 sets (after removal of ICD). Patient performing incentive spirometry is shown in figure 2.

To reduce fatigue induced by chemotherapy

Energy conservation and pacing activities: The patient was advised about energy conservation during activities of daily living, taking intervals of rest between the exerting activities, pacing the activities so that she requires fewer rest periods.

Figure 2 Patient performing incentive spirometer in an upright sitting position

To improve exercise tolerance

Graded exercise Program: A monitored supervised graded exercise program was initiated. Active Range of Motion (AROM) exercises for upper limb (10 repetitions, 2 sets) and lower limb (10 repetitions, 2 sets), ankle toe movements (20 repetitions, 2 sets), and dynamic quads (10 repetitions, 2 sets) 3-4 times/day. Monitored and supervised ambulation along the hallway 2 rounds 3-4 times a day. Upper limb strengthening exercises with 1 litre water bottle (10 repetitions, 2 sets) 3-4 times a day. Postural transitions from supine to sitting, in which the patient was supported and persuaded to sit at the edge of the bed.

To reduce reliance in ADLs

Advice on self-care and to achieve maximal independence: The patient was advised to appropriately pace the activities and use dyspnea relieving positions and PLB. She was thoroughly explained about medication timings and doses. The patient was also given home modifications such as attaching rods in the bathroom and anti-slippery rugs in the house. Patient follows up and outcome is shown in table 1.

Table 1 follow up and outcome

Outcomes	1st day of referral	After removal of ICD	At the time of discharge	Follow up
Dyspnea	III	II	I	I
RPE post mobilization (10-15 minutes)	6	5	3	2
6-minute walk test		180m	200m	220m
Karnofsky Performance Status Rating	50	60	60	70

3. DISCUSSION

Despite receiving appropriate medical treatment, patients with chronic respiratory disorders commonly encounter dyspnea, fatigue, exercise intolerance, trouble executing day to day tasks, and a reduced quality of life (Dos Santos et al., 2020). Chemotherapy and radiotherapy produce side effects such as impaired respiratory function, particularly diffusing capacity (Leo et al., 2004; Lopez Guerra et al., 2012). Shortness of breath, weariness, cough, discomfort, and sleeplessness are all signs of lung and pleural cancer. These frequently manifest as symptom clusters, causing significant patient suffering and interfering with everyday tasks (Cheville et al., 2011). Avoiding physical activity leads to a vicious cycle of inactivity and functional loss. When compared to healthy age-matched peers, lung cancer patients have lower peripheral muscular strength upon diagnosis (Granger et al., 2014). Exercise intolerance is likely to be exacerbated by skeletal muscle dysfunction (Morice et al., 1992). During and after lung

cancer therapy, peripheral muscle strength deteriorates much more (Granger et al., 2014). This weakness must be addressed as part of any cancer treatment by keeping in mind the role of peripheral muscle strength to overall physical function. PR addresses these issues, speeding up the recovery process. In studies, PR has been proven to relieve breathlessness and improve Quality of Life (QOL) in patients with acute pleural effusion (Croitoru et al., 2019). PE, ACTs, breathing strategies, and a graded exercise training program are some of the principal elements of PR that were implemented in the management of the current case.

Chest mobility exercises in combination with deep breathing exercises aids in increasing airflow on that side of the chest which is hypomobile (Sultanpuram et al., 2016). Segmental breathing exercises should be initiated as soon as feasible in patients with pleural effusion for early re-expansion and a better prognosis as they are beneficial in increasing chest expansion and lung function (Gunjal et al., 2015). It is usually speculated that pulmonary rehabilitation should last at least 8 weeks to have a significant impact on functional performance. In the present case, supervised pulmonary rehabilitation was given for 4 weeks and in the form of telerehabilitation at home for two weeks.

4. CONCLUSION

This study concluded that a properly planned and implemented pulmonary rehabilitation program is very effective and correlated with clinically significant improvements in functional performance as well as alleviation in dyspnea level and promotion of chest expansion in malignant pleural effusion.

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Author Contributions

All authors contributed equally to this work and they have read and agreed to the final manuscript.

Informed Consent

Written and oral consent was obtained from the patient involved in the study.

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Conflicts of interest

The authors declare that there are no conflicts of interests.

Data and materials availability

All data associated with this study are present in the paper.

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