Physiotherapy for a patient with nosocomial pneumonia following multistage abdominal surgeries- A case study

Prithwish Gozi[1], Sourov Saha[2,*]

[1,2]Assistant Professor, Nopany Institute of Healthcare Studies, Kolkata, West Bengal, India

***Corresponding Author:**
Email: sourov.saha.pht@gmail.com

Abstract

Nosocomial pneumonia is defined as pneumonia that occurs 48 hours or more after admission to the hospital. This study describes the role of physiotherapy for a sixty six years old bed ridden and critically ill patient who developed nosocomial pneumonia following multistage abdominal surgeries. The patient was referred to physiotherapy when she was mechanically ventilated following the development of nosocomial pneumonia. Physiotherapeutic interventions during the period of mechanical ventilation include postural drainage, chest percussion, vibration, manual hyperinflation, suctioning, strengthening of upper and lower limbs as well as mobilization which progressed from bedside sitting to independent standing. Post extubation active cycle of breathing technique (ACBT), positive expiratory pressure (PEP) therapy, incentive spirometry and diaphragmatic breathing exercises were incorporated in the treatment sessions along with progressive mobilization from standing and spot marching to independent walking in the hospital corridor. The breath sounds, ABG values, chest radiographs and Borg's scale of Perceived Exertion during ambulation were used as the outcome measures for the patient and all the parameters showed significant improvement following interventions. We concluded that the morbidities associated with nosocomial pneumonia can be minimized and the functional recovery of the patients can be optimized with proper and timely application of the physiotherapy.

Keyword: Nosocomial Pneumonia, Early mobilization, Chest physiotherapy, Physiotherapeutic interventions in ICU, Physiotherapy in abdominal surgeries.

Introduction

Nosocomial pneumonia is defined as pneumonia that occurs 48 hours or more after admission to the hospital.[1] The episode of nosocomial pneumonia for a hospitalized patient is suspected if the patient has a radiographic infiltrate that is new or progressive, along with clinical findings suggesting infection, which includes fresh onset of fever, purulent sputum, leukocytosis, and decline in oxygenation.[2] Nosocomial pneumonia is associated with mortality rates of up to 70% and attributable mortality rates up to 33% to 50%.[3] It can occur as a post-operative pulmonary complication especially after abdominal and thoracic surgery.[4,5] Nosocomial pneumonia may necessitate the requirement of mechanical ventilator support in ICU due to severe hypoxemia.[6] It consequently prolongs the hospital stay and increases the cost of management.[7] Physiotherapy plays an important role in prevention and management of pulmonary complications as well as circulatory and musculoskeletal problems.[8] Physiotherapeutic interventions in ICU include mobilization, conventional and advance bronchial hygiene therapy, manual hyperinflation, suctioning, breathing exercise, peripheral muscle training.[9,10] This case study describes the role of physiotherapy in a patient who developed nosocomial pneumonia following abdominal surgery.

Case Description

A sixty-six year old lady had undergone laparoscopic oophorectomy for right sided ovarian cyst. Seven days after the surgery she developed subacute intestinal obstruction (band obstruction). Laparoscopic removal of the same was done. Ten days after the surgery, the patient was again diagnosed to have giant serous cyst adenoma, which was removed through laparotomy via midline incision. Postoperatively the patient was shifted to ward. But on the third post-operative day she developed respiratory distress. Chest x-ray and ABG showed pneumonia with hypoxemic respiratory failure. The patient was shifted to ICU & required mechanical ventilator support for further management. The patient was referred to physiotherapy after she was intubated and mechanically ventilated.

Physiotherapy Intervention

Dyspnea reduced post intubation, but tachycardia persisted (120 beats/min) with hyperthermia (body temperature 100° F). The problems noted were accumulation of secretion and impaired gas exchange due to pneumonia and weakness of both upper and lower limbs. The limb weakness was likely contributed by prolonged immobility due to multiple episodes of surgery and long hospital stay.

The initial goals of physiotherapy were to drain the pulmonary secretion and to promote active mobilization and ambulation of the patient as early as possible. The physiotherapeutic interventions during the mechanical ventilation were delivered twice daily includes postural drainage, clapping and vibration, manual hyperinflation, suctioning, strengthening of upper and lower extremities, active mobilization and also supported standing.

Head down position was used for postural drainage. Chest clapping and vibration were applied when the patient was put on the postural drainage position. Manual hyperinflation was performed with a self-inflating bag following postural drainage. Sodium bicarbonate was instilled with a syringe into the endotracheal tube prior to manual hyperinflation as the secretion was very tenacious. Suctioning was performed after manual hyperinflation and both the procedure were continued repeatedly till there was visible secretion in the endotracheal tube. Fourteen sessions of bronchial hygiene therapy were performed prior to extubation.

Strengthening exercises of the upper and lower extremities were started from the first treatment session. One kilogram weight cuff was used for strengthening of both upper and lower limbs, after few sessions of free active movements. Strengthening of lower limbs was done in supine and side lying position and long sitting position was used for the upper limb. Strengthening of quadriceps was emphasised in high sitting position with resistance applied just proximal to the ankle joint.

The patient was made to sit in long sitting position with back support after active mobilization in the first session. Short sitting at the edge of the bed was introduced on the next day. But the patient had backward sway in this new position, so manual support was needed from back. The support required was decreased gradually and the patient was able to sit independently in short sitting position after two days of treatment. On the 4th day the patient was made to stand. On initial standing, her knees buckled. Her knees had to lock manually by the treating physiotherapist during standing. After a few minutes of standing, the patient showed symptoms of postural hypotension (as diastolic blood pressure dropped 12mmHg) and she was shifted back to the bed. With regular interventions the patient was able to tolerate the standing position for longer duration, and could stand independently for ten minutes one day prior to extubation.

The patient was on mechanical ventilator for seven days. She was extubated in the morning. Fourteen sessions of mobilization and strengthening were performed prior to extubation. The weaning was successful and the patient was revisited on the same day afternoon.

Incentive spirometry, diaphragmatic breathing exercise, active cycle of breathing technique (ACBT) and low pressure positive expiratory pressure (PEP) therapy were incorporated in treatment as the chest physiotherapeutic maneuvers[11] following extubation. The sessions of ACBT and PEP were supervised by physiotherapist. The patient was instructed to perform the breathing exercises and incentive spirometry ten times each during every awaking hour.[4]

Spot marching while standing was introduced following extubation. Though the patient became dyspnic initially, spot marching was encouraged up to the point prior to dyspnea. Spot marching was also performed with the instruction of breathing control (i.e. inhale while lifting and placing one leg, exhale while lifting and placing the other leg).[12] After two days, as the dyspnea during spot marching was reduced (SpO_2 94%), the patient was encouraged to walk with assistance in the ICU. Assistance was provided by the physiotherapist and ICU nurse.

The patient was shifted to the general ward four days post extubation. Gradually the patient was able to ambulate with the help of walker. She was taken to the corridor for further ambulation while in general ward. Independent walking was encouraged and the patient was able to walk without any support on ground after two days. On sixth day patient was discharged. Total 18 sessions of treatment were carried out following extubation.

Outcome measures and progress

During the first visit, bronchial breath sound was heard during auscultation on right lung as well as lower lobe of left lung along with bilateral scattered crackles and wheeze. The bronchial breath sounds as well as crackles and wheeze were reduced prior to extubation. The breath sounds were normal on the day of discharge.

The chest radiograph (AP view) taken during the development of dyspnea showed consolidation of right lung. It was reduced on the radiograph taken one day after extubation. (Fig. 1)

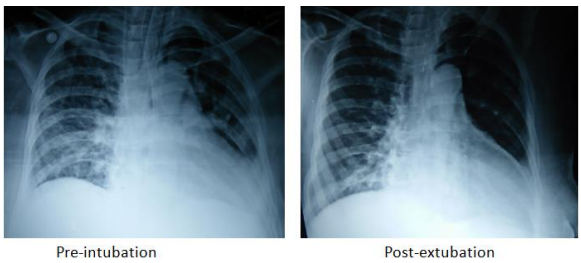

Fig. 1: Chest radiograph (AP view)

Pre intubation ABG showed hypoxemia (PaO_2 55 mmHg), which was resolved ($PaO_2$78 mm Hg) prior to extubation.

The patient walked 20 meters on the first day of ambulation after 2 days of extubation. The Rate of Perceived Exertion (RPE) noted on Borg scale of Perceived Exertion was ‘somewhat hard’. On the day of discharge patient was able to walk 80 meters without pause and the RPE noted at the end of ambulation was ‘light’.

Discussion

Physiotherapy intervention in this study was aimed to drain the pulmonary secretion as well as optimizing the mobility of the patient. Two main therapies used were bronchial hygiene therapy and mobilization. Bronchial hygiene therapy including postural drainage, chest clapping and vibration are effective treatment

modalities for sputum retention,[11,13] and prevent atelectasis and further chest infection.[14] In this case also bronchial hygiene therapy was proved to be beneficial for the patient by means of improvement in the breath sounds, chest x-ray and ABG values. Strengthening exercise was incorporated to overcome the weakness of the upper and lower limbs. Special emphasis was given to promote the mobility of the patient. Active mobilization and ambulation have several beneficial effects on different body systems of critically ill.[11-12, 15-16] In this study the beneficial effect of mobilization and ambulation can be explained by the improvement of RPE on Borg scale.

In conclusion, this case study has highlighted the potential role and contribution of physiotherapy for the bed ridden and critically ill patients who have developed nosocomial pneumonia and hypoxemic respiratory failure following abdominal surgery, due to prolong hospital stay. Morbidity associated with nosocomial pneumonia can be minimized and the functional recovery of the patients can be optimized with proper and timely application of the physiotherapy.

Acknowledgement

The authors gratefully acknowledge Dr. Shabnam Agarwal, PhD, Director-Education, Nopany Group of Institutions, for her support and encouragement for this publication. We appreciatively acknowledge Dr. SubhasisSaha and Dr. Manoj Kumar Pal, from Phoenix Hospital, Dankuni, Hooghly, who contributed to the surgical and medical management of the patient. We thank Dr. Belay Roy, from Phoenix hospital, who provided all the medical reports and photographs required for this study. We also want to express our sincere gratitude to the faculty members of Nopany Institute of Healthcare Studies.

References

1. Raid PT, Innes JA. Respiratory Disease. In: Walker BR, Colledge NR, Ralston SH, Penman ID, editors. Davidson's Principles and Practice of Medicine.22nd Ed. China.Churchill Livingstone; 2014.
2. Guidelines for the Management of Adults with Hospital-acquired, Ventilator-associated, and Healthcare-associated Pneumonia This official statement of the American Thoracic Society and the Infectious Diseases Society of America was approved by the ATS Board of Directors, December 2004 and the IDSA Guideline Committee, October 2004.
3. Chawla R. Epidemiology, etiology, and diagnosis of hospital-acquired pneumonia and ventilator-associated pneumonia in Asian countries. *Am J Infect Control* 2008;36:S93-100.
4. Kacmarek RM, Stoller JK, Heuer AJ editors. Egan's Fundamentals of Respiratory Care. 11th Ed. Canada. Elsevier; 2017.
5. Thomas A, Skinner A, Piercy J. Tidy's Physiotherapy. 12th Ed. United Kingdom.Butterworth-Heinemann Ltd; 1991.
6. Esteban A, Anzueto A, Alia I et al. How Is Mechanical Ventilation Employed in the Intensive Care Unit? An International Utilization Review. *Am J RespirCrit Care Med* 2000;161:1450-58.
7. Pradhan NP, Bhat SM, Ghadage DP. Nosocomial Infections in the Medical ICU: A Retrospective Study Highlighting their Prevalence, Microbiological Profile and Impact on ICU Stay and Mortality. *J Assoc Physicians* India 2014;62:18-21.
8. Kumar JA, Maiya AG, Pereira D. Role of physiotherapists in intensive care units of India: A multicenter survey. *Indian J Crit Care Med* 2007;11:198-203.
9. Clini E, Ambrosino N. Early physiotherapy in the respiratory intensive care unit. *Respirat Med* 2005;99:1096-104.
10. Ciesla ND. Chest physical therapy for patients in the intensive care unit. *Phys Ther* 1996;76(6):609-25.
11. Frownfelter D, Dean E editors. Principles and Practice of Cardiopulmonary Physical Therapy.3rd Ed. Missouri. Mosby; 1996
12. Prior AP, Webber BA editors. Physiotherapy for Respiratory and Cardiac Problems. 2nd Ed. United Kingdom.Churchill Livingstone; 2001.
13. Jelic S, Cunningham JA, Factor P. Clinical review: Airway hygiene in the intensive care unit. *Critical Care* 2008;12:209-18.
14. Morran CG, Finlay IG, Mathieson M et al. Randomized Controlled Trial of Physiotherapy for Postoperative Pulmonary Complications. *Br J Anaesth* 1983;55:1113-17.
15. Green M, Marzano V, Leditschke IA et al. Mobilization of intensive care patients: a multidisciplinary practical guide for clinicians. *J Multidisciplinary Healthcare* 2016;9:247-56.
16. Hashem MD, Parker AM, Needham DM. Early Mobilization and Rehabilitation of Patients Who Are Critically Ill. *Chest* 2016;150(3):722-31.