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Case Report

Effects of chest and limb physiotherapy along with mindfulness meditation, in promoting early discharge from the ICU, in a patient with intermediate syndrome: a case study

Dhruvi M. Satra*, Madhur S. Kulkarni

Department of Cardio - respiratory Physiotherapy, DR. APJ Abdul Kalam COPT, Pravara Institute of Medical Sciences (DU), Loni, Maharashtra, India

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***Correspondence:**
Dr. Dhruvi M. Satra,
E-mail: dhruvisatra01@gmail.com

ABSTRACT

Organophosphorus (OP) poisoning is a critical public health concern, particularly in developing countries like India, where it can lead to life-threatening complications. A major consequence of OP poisoning is Intermediate Syndrome (IMS), characterized by respiratory and proximal limb muscle weakness, often progressing to respiratory failure. Timely initiation of ventilatory support is crucial, as delays can be fatal. IMS patients frequently require prolonged ICU stays and mechanical ventilation, which may result in secondary complications such as Deep Vein Thrombosis (DVT), limb edema, atelectasis from pulmonary secretions, and ICU-acquired weakness. Prolonged ICU stays can also lead to significant anxiety and agitation in patients, making weaning from mechanical ventilation challenging due to persistent respiratory muscle weakness. This study evaluated the effectiveness of a combined physiotherapy and mindfulness-based intervention in promoting early ICU discharge in a 36-year-old male farmer diagnosed with OP poisoning and IMS, following ingestion of Tafgor under alcohol influence. The patient was intubated and placed on a ventilator. A one-week protocol was implemented, including chest physiotherapy, limb physiotherapy, and mindfulness meditation. Pre- and post-intervention assessments were conducted using the Chelsea Critical Care Physical Assessment Tool, Richmond Agitation-Sedation Scale, and ventilator weaning status. The results demonstrated significant improvement in physical and psychological parameters, with better ventilator weaning and reduced ICU stay. The study concluded that integrating physiotherapy and mindfulness practices can play a pivotal role in accelerating recovery and promoting early ICU discharge in patients with IMS secondary to OP poisoning.

Keywords: Chest PT, Intermediate syndrome, Limb PT, Mindfulness meditation, OPC poisoning, RASS

INTRODUCTION

Suicidal and intentional self-harm are serious public health concerns, particularly in middle- and low-income countries. Organophosphorus (OP) compounds are a broad category of neurotoxic chemicals widely used as chemical weapons and insecticides; because pesticides are easily obtained and widely available, they are often used for self-harm in developing nations.[1] Pesticide poisoning caused by OP compounds kills approximately 200,000 people in developing countries each year. According to the World Health Organization (WHO) Report 2012, there were approximately 193,460 deaths worldwide from unintentional poisoning and 370,000 deaths from suicidal pesticide poisoning. In Asia's rural areas, the issue is particularly severe.[2] A triphasic reaction, consisting of an acute cholinergic phase, an intermediate syndrome linked to a high death rate and a nonlethal delayed polyneuropathy with morbidity, characterizes the clinical manifestations of OPC poisoning.

The cholinergic phase is distinguished by symptoms caused by high acetylcholine (Ach) levels at the nicotinic, muscarinic and central nervous system receptors. It causes excessive salivation, lacrimation, abdominal pains, vomiting and loose stools. They occur within minutes or

hours of ingesting the substance. Tachycardia or bradycardia, hypotension, miosis, oral foaming, sweating, bronchospasm and fasciculations are among the symptoms. These clinical signs determine the severity of the poisoning and have prognostic value.[2]

Intermediate syndrome (IMS) commonly develops 2-4 days following oral exposure to OP toxin. It is observed in approximately 20% of cases of OP poisoning. IMS's typical signs include respiratory muscle paralysis and peripheral limb paralysis.[3] There is weakness in the respiratory muscles, particularly the diaphragm, intercostal and auxiliary muscles, as well as in the neck and proximal limb muscles.

The fundamental pathophysiology of IMS (previously known as nicotinic syndrome) is that it necessitates the inhibition of at least 80% of synaptic AChEs, resulting in hyperstimulation of neuromuscular junctions by excessive ACh, causing fasciculations, paralysis and loss of neuromuscular function. IMS's impact may last between 2 and 18 days.[4]

Delayed neuropathy is a sensory-motor peripheral neuropathy characterized by distal motor weakness, cranial nerve and proximal muscle involvement and distal sensory symptoms such as paraesthesia or numbness. OPP can have serious negative effects.

Metabolic diseases such as hyperglycemia and glycosuria, diabetic ketoacidosis, respiratory failure, seizures, aspiration pneumonia, delayed neuropathy and death.

Physiotherapy has demonstrated great success in improving both; respiratory function and quality of life in Organophosphorus Compound poisoning.[5] Hemodynamic parameters are improved in organophosphorus poisoning patients with chest manipulation.[6]

Early mobilization is recommended for ICU patients, from the day of admission, since it is safe, feasible and useful. Early mobilization, either alone or combined with other treatments, has improved ICU-Acquired weakness and physical performance.[7]

It has been shown that around 50% of patients on mechanical ventilation, with a ventilation duration of more than 48 hours develop ICU-AW. By eliminating airway secretions, pulmonary rehabilitation seeks to improve respiratory function, reduce work of breathing and increase lung inflation.

Reduced chances of atelectasis, improved lung recruitment and oxygenation can be achieved by using a variety of physiotherapy techniques.

Studies in the ICU with mechanically ventilated patients revealed that chest physical therapy reduced the risk of extubation failure.[8] Patients who underwent, an early mobilization program, showed improved Quality of life and decreased limitations in their daily activities after getting discharged from the hospital.[9]

Mindfulness meditation is a realistic, useful and well-tolerated mind-body therapy that has received widespread attention in the literature.

Mindfulness meditation is a psychological coping strategy that can alleviate stress and the resulting physical, psychological and social reactions that hamper quality of life. It develops and enhances the innate mental capacity; to pay attention to, be aware of and accept current experiences in a non-judgmental manner. It has been shown to have a wide range of health benefits in several psychiatric and medical conditions.[10]

Hence, the aim of our study, is to study the effects of Chest physiotherapy, limb physiotherapy and Mindfulness meditation; in promoting early discharge from the ICU, in a patient with intermediate syndrome, secondary to OPC poisoning.

CASE REPORT

A 36-years-old farmer was brought home unconscious, with increased mouth secretions and profuse sweating, from his farm, by a stranger. The stranger also noticed a bottle of insecticide and alcohol beside him, which confirmed that he had consumed insecticide under the influence of alcohol, as he was a chronic alcoholic.

Immediately he was rushed to a nearby civil hospital by his family, where his first line of treatment started, which included injection of atropine 2 ml/hour. On the way to the hospital, the patient had 2 episodes of vomiting and continuous tremors in his hands and legs. Due to a lack of ICU facilities, within a few hours patient was shifted to Vitthalrao Vikhe Patil, Pravara Rural Hospital, medicine ICU.

On admission, all the necessary investigations were done and the patient was diagnosed with OPP with Tafgor compound. The patient was intubated with an ETT, with the Volume control mode of Ventilator and all the required medical management was started.

The patient started having increased respiratory muscles and proximal limb muscles weakness and it became more difficult to wean him from the ventilator. Thus, after 5 days of admission, he was diagnosed with intermediate syndrome. Towards the end of 1 week, tracheostomy was performed and the patient was kept on SIMV mode.

Since the patient was in the ICU, immobilized and on the ventilator for a long time, chest physiotherapy and limb physiotherapy were started for the patient.

The patient had financial issues as revealed by his family and thus, remained anxious, agitated and stressed, so mindfulness meditation was also started for the patient.

Among all the investigations, an X-ray (AP view) was performed, which showed bilateral Haziness in the middle and lower lung fields.

Outcome measures

Chelsea critical care physical assessment tool

The Chelsea Critical Care Physical Assessment tool, is a tool to measure physical morbidity in adults admitted in the ICU. It is a performance-based test that assesses physical and respiratory function in critically ill patients. It has 10 domains, each rated on a 6-point scale from 0 (dependent) to 5 (independent). The total score is out of 50. A higher score indicates greater functional ability. It has a sensitivity of 80% and a specificity of 70%.

Richmond agitation sedation scale

Richmond agitation sedation scale (RASS), is a 10-point scale used to evaluate a patient's level of consciousness and agitation. It is commonly used in adults in critical care units. The RASS score ranges from +4 to -5, with 0 indicating a calm and alert patient. Positive scores indicate aggressive behaviour, while negative scores indicate less responsiveness.

It is easy to administer and can be completed in less than a minute. The sensitivity and specificity of this tool are 99% and 64%, respectively.

By observing the process of weaning of Ventilator.

Intervention

Once IMS was diagnosed, a one-week exercise program was designed for the patient, with pre-and post-assessment using the Chelsea critical care physical assessment tool, RASS and by observing the weaning of the ventilator.

There was a remarkable difference seen in the pre- and post-values of the patient. Before starting the protocol, when the patient was assessed by using the Chelsea Critical Care Physical Assessment tool, it showed a 4/50 score. After giving a 1-week protocol, in the form of Chest-PT and Limb PT, when the patient was reassessed, the score found was 21/50.

Similarly, the pre-score of RASS showed that the patient was agitated, but after delivering mindfulness meditation, as a part of the protocol for 1 week, the patient improved and the post-score of RASS showed that the patient was restless.

Thus, his agitation decreased. By observing the process of weaning the patient from the Ventilator, it was observed that it was very difficult to wean in the beginning, but by the end of 1 week of the PT protocol, it became much easier to wean the patient from the ventilator.

Figure 1: X-ray findings.

Figure 2: On the day of discharge from the ICU, the patient could sit in a chair and his vitals were stable. 3 days after the 1-week PT protocol, the patient was shifted to the Ward from the ICU.

Now, the patient has been discharged from the hospital and is doing much better. His ICU stay was reduced and his quality of life has also improved after this PT management.

The patient benefited from chest PT, limb PT and mindfulness meditation, given to him in a 1-week protocol.

Table 1: A structured 1-week protocol designed for the patient.

1-week protocol	The patient is with tracheostomy	Chest physiotherapy	Limb physiotherapy	Mindfulness meditation (using Mobile)
Day 1	Mode SIMV PEEP 5 cm H_2O FiO_2 70%	Respiratory PNF and Modified PD followed by suctioning	Ankle pumps and wrist pumps	For 5 mins
Day 2	Mode AC-VC PEEP 5 cm H_2O FiO_2 50%	Respiratory PNF and Modified PD followed by suctioning	Ankle pumps and wrist pumps	For 10 mins
Day 3	Mode CPAP PEEP 5 cm H_2O FiO_2 40%	Respiratory PNF, BE and Modified PD followed by suctioning	Ankle pumps, wrist pumps and heel slides	For 10 mins
Day 4	Mode CPAP PEEP 3 cm H_2O FiO_2 30%	Respiratory PNF, BE and Modified PD followed by suctioning	Ankle pumps, wrist pumps and heel slides	For 15 mins
Day 5	Weaning started with a T-piece for 1 hour (8 liters of O_2) followed by ventilator for 4 hours	BE, Modified PD followed by suctioning and TEE	Ankle pumps, wrist pumps and heel slides	For 15 mins
Day 6	T-piece for 3 hours (6 liters of O2) followed by ventilator for 2 hours	BE, Modified PD followed by suctioning and TEE	Edge of the bed sitting for 5 mins; Ankle pumps, wrist pumps and heel slides	For 15 mins
Day 7	T-piece for 4 hours (4 liters of O_2) followed by ventilator for 1 hour	BE, Modified PD followed by suctioning and TEE	Edge of the bed sitting for 10 mins with dynamic quads, ankle pumps, wrist pumps and heel slides	For 20 mins

Table 2: Description of exercises with its dosage.

Respiratory PNF (proprioceptive neuromuscular facilitation)	Direct vertebral pressure, abdominal co contraction and intercoastal stretch	5 reps and 2 sets
Modified PD (Postural drainage) followed by suctioning	Percussion and vibration (Using mechanical vibrator)	10 reps and 2 sets
BE (Breathing exercise)	Diaphragmatic breathing exercise and pursed lip breathing	5 reps and 2 sets
Deep breathing exercise	TEE (Thoracic expansion exercise)	5 reps and 2 sets
Limb physiotherapy	Ankle pumps/ ankle toe movements	10 reps and 2 sets
Limb physiotherapy	Wrist pumps	10 reps and 2 sets
Limb physiotherapy	Heel slides	5 reps and 2 sets
Limb physiotherapy	Dynamic quads	5 reps and 2 sets

Table 3: Chelsea critical care physical assessment tool.

Domains	Pre-level	Post-level
Respiratory function	1	3
Cough	1	3
Moving within the bed (e.g. Rolling)	1	3
Supine to sitting on the edge of the bed	0	2
Dynamic sitting (i.e., Sitting on the edge of the bed/unsupported sitting)	0	2
Standing balance	0	0
Sit to stand	0	1

Continued.

Domains	Pre-level	Post-level
Transfer, from bed to chair	0	3
Stepping	0	0
Grip strength	1	4

Table 4: Richmond agitation sedation scale.

RASS	Pre-score	Post-score
	+2	+1

DISCUSSION

This case study showed the effectiveness of a combination of PT interventions, including chest and limb PT, along with mindfulness meditation, in reducing ICU stay and helping in faster weaning of ventilation in patients with intermediate syndrome secondary to OPC poisoning.

Respiratory PNF includes a variety of techniques like IC stretch, Direct vertebral pressure, Abdominal co-contraction and so on. The Intercostal stretch technique helps to restore the normal breathing pattern. When the Direct vertebral pressure technique is applied to the upper and lower thoracic cage, it activates the dorsal intercostal muscles. Abdominal co-contraction helps to facilitate respiration by increasing the tone of abdominal muscles and activating the diaphragm.

Breathing exercises include diaphragmatic breathing, which improves the diaphragmatic excursion and relaxes the accessory muscles of respiration. They also include pursed lip breathing, which induces relaxation, by reducing dyspnoea and work of breathing. Deep breathing exercises in the form of thoracic expansion exercises, improve thoracic mobility, which in turn improves the gaseous exchange, ventilation-perfusion ratio, lung volumes, capacities, SPO2 and decreases RR and V/Q mismatch.

Percussion and vibration (given with a mechanical vibrator), as a part of modified postural drainage, help to mobilize the adhered secretions from the distal airways to the trachea, which can then be easily removed, by suctioning. It prevents the accumulation of secretions in the lungs, which generally occurs due to prolonged immobilization. Secondary complications like atelectasis and pneumonia can be prevented by using this chest PT technique. The combined effects of all the chest PT techniques help in the early weaning of patients from ventilators.

Ankle pumps, wrist pumps, heel slides and dynamic quads are the most efficient limb PT techniques that prevent DVT and edema, which commonly occur due to prolonged immobilization. It also helps to maintain joint integrity. Mindfulness meditation helps to reduce stress, agitation and hospital-acquired anxiety in patients with prolonged ICU stays. It also increases patients' acceptance and positivity towards their condition and the treatment given. This helps to calm the patient and also helps him get better faster. Alhawatmeh et al conducted a study on "Effects of mindfulness meditation on trait mindfulness, perceived stress, emotion regulation and quality of life in haemodialysis patients. A randomized controlled trial," in 2022. This study showed the effectiveness of mindfulness meditation as a coping tool for end-stage renal disease patients undergoing haemodialysis to manage stress and health.[10] Our study also concluded that mindfulness meditation, when administered to an IMS patient secondary to OPP, reduced his agitation, stress and anxiety and facilitated his early discharge from the ICU.

A study was done by Vikhe et al in 2024, on "a comprehensive physiotherapy approach to regain functional independence in intermediate syndrome secondary to organophosphate poisoning: a case report." This study demonstrated that Comprehensive physiotherapy is effective in managing IMS secondary to OPC poisoning. It concluded that physiotherapy interventions significantly improved the patient's functional independence, mobility and overall well-being.[11] Similarly, our study also showed the beneficial effects of using Chest PT and Limb PT in an IMS patient to promote his early discharge from the ICU.

Another study was done by Mahesh et al, Mahadevan et al, in November 2022 on "Impact of Physiotherapy on the Functional Status and Length of Stay of Patients Admitted to the Intensive Care Unit." This study demonstrated that the implementation of physiotherapy intervention and early mobilization in critically ill patients undergoing treatment in intensive care unit resulted in early weaning from ventilator support and supplemental oxygen therapy, with improvement in functional status leading to reduced length of ICU stays compared to the patients who were not given physiotherapy intervention and early mobilization.[12] Similarly, our study also demonstrated the beneficial effects of using Chest PT and Limb PT in an IMS patient, helping him to wean faster from the ventilator and promoting his early discharge from the ICU.

A study was conducted by Cox et al, in May 2024 on "mobile mindfulness intervention for psychological distress among intensive care unit survivors: a randomized clinical Trial."

This study concluded that a mindfulness intervention for survivors of critical illness that included an app-based introduction, twice-daily guided meditation and app-based management of increasing depression symptoms was optimal, considering effects on psychological distress symptoms, adherence and feasibility.[13] Likewise, our study also concluded that mindfulness meditation, when administered to an IMS patient secondary to OPP, reduced his agitation, stress and anxiety and facilitated his early discharge from the ICU.

CONCLUSION

Our present study concluded that a combination of PT interventions, including Chest PT and Limb PT along with mindfulness meditation proved to be beneficial in promoting early discharge from the ICU, in a patient with Intermediate syndrome, secondary to OPC poisoning.

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REFERENCES

1. Sinha SN, Kumpati RK, Ramavath PN, Sangaraju R, Gouda B, Chougule P. Investigation of acute organophosphate poisoning in humans based on sociodemographic and role of neurotransmitters with survival study in South India. Scientific Reports. 2022;12(1):16513.
2. Kamath SD, Gautam VK. Study of organophosphorus compound poisoning in a tertiary care hospital and the role of peradeniya organophosphorus poisoning scale as a prognostic marker of the outcome. J of Family Med and Prim Care. 2021;1(11):4160-7.
3. Kaeley N, Vempalli N, Bhardwaj BB, Samal B. A case of organophosphate poisoning with intermediate syndrome and acute pancreatitis–A rare complication. J of family medicine and primary care. 2021;10(1):564-6.
4. Fouad MM, Zawilla NH, Moubarez DA. Successful treatment of intermediate syndrome in a COVID-19 patient with severe organophosphate toxicity. International J of Critical Illness and Injury Sc. 2023;13(3):145-7.
5. Bhakaney PR, Yadav VD, Nagore AA, Kulkarni CA. Resurgence to life: a case report on inpatient rehabilitation in organophosphate poisoning followed by intermediate syndrome. Cureus 2023;15(11):56.
6. Londhe SP, Pawadshetty VS, Dagat P, Patil R. The immediate effect of chest manipulation and neurophysiological facilitation on haemodynamic parameters in ventilator dependent organophosphorus poisoning patients. Int J Health Sci Res. 2020;10(11):106-11.
7. Azmi AB, Kamsan SS. The effects of early physiotherapy intervention on patients in intensive care unit: a systematic review. International J Allied Health Sci. 2024;8(2):3009-19.
8. Eimer C, Freier K, Weiler N, Frerichs I, Becher T. The effect of physical therapy on regional lung function in critically ill patients. Frontiers in physiology. 2021;12:749542.
9. De Paula MA, Carvalho EV, de Souza Vieira R, Bastos-Netto C, de Jesus LA, Stohler CG, et al. Effect of a structured early mobilization protocol on the level of mobilization and muscle strength in critical care patients: A randomized clinical trial. Physiotherapy Theory and Practice. 2024;40(9):2004-13.
10. Alhawatmeh H, Alshammari S, Rababah JA. Effects of mindfulness meditation on trait mindfulness, perceived stress, emotion regulation and quality of life in hemodialysis patients: A randomized controlled trial. International J of Nursing Sciences. 2022;9(2):139-46.
11. Vikhe CS, Yadav V, Brahmane NA. A comprehensive physiotherapy approach to regain functional independence in intermediate syndrome secondary to organophosphate poisoning: A case report. Cureus. 2024;16(7):63929.
12. Mahesh AH, Mahadevan R, Krishnarao CS. Impact of physiotherapy on functional status and length of stay of patients admitted to intensive care unit. Current Respiratory Medicine Reviews. 2022;18(4):267-74.
13. Cox CE, Gallis JA, Olsen MK, Porter LS, Gremore T, Greeson JM, et al. Mobile mindfulness intervention for psychological distress among intensive care unit survivors: A randomized clinical trial. JAMA Internal Medicine. 2024;184(7):749-59.

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