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Case Report

Drowning Induced Acute Respiratory Distress Syndrome (ARDS): A Case Report

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I N F O

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A B S T R A C T

Introduction: Drowning is still one of the leading causes of accidental deaths worldwide while Acute Respiratory Distress Syndrome (ARDS) is the main component of drowning pathophysiology. During drowning which often leads to aspiration, pneumonitis may develop an inflammatory response and release of inflammatory mediators and activation of immune mediated responses. This cascade of events causes the development of Acute Respiratory Distress Syndrome, (ARDS).

Case: We received a case of a male patient in the emergency room having a history of an accidental fall in the well and drowning for 5 minutes. When rescued he was conscious and after an hour, he developed cough and breathlessness. On arrival, his routine clinical examination and laboratory and radiological investigation were performed and in view of Acute Respiratory failure patient was shifted to the intensive care unit for further managementas. As per his chest radiogram with clinical signs of hypoxia he immediately required endotracheal intubation and mechanical ventilation.

Result and Conclusion: Appropriate invasive mechanical ventilation and sound intensive care with judicial use of antibiotics can benefit such cases of drowning and ARDS.

Keywords: Acute Respiratory Distress Syndrome, ARDS, Drowning, Respiratory Impairment, Invasive Mechanical Ventilation, Surfactant Dysfunction

Introduction

Drowning is one of the leading causes of accidental deaths worldwide. Around 3,72,000 deaths occur each year after unintentional drowning according to the World Health Organization (WHO).[1] Acute Respiratory Distress Syndrome (ARDS) is the main component of drowning pathophysiology. This leads to surfactant dysfunction, pulmonary edema, a decrease in pulmonary compliance and an increase in the ventilation-perfusion mismatch, frequently leading to profound hypoxemia and Acute Respiratory Distress Syndrome (ARDS) and ultimately causing cardiovascular collapse and death.[2] This condition is still considered as a relevant medical challenge as clinical data is still lacking on the best medical strategy toapply for this problem. This case report highlights the successful management of drowning related ARDS with invasive mechanical ventilation.

Case

A 52-year-old male with prior history of Hypertension came to the emergency room at Dr. Hedgewar Hospital, Aurangabad after submersion in a farm well for 5 minutes. When rescued, the patient was conscious and stable.

After one hour, he developed a productive cough and breathlessness at home and he came to the hospital for further evaluation and management. The patient was admitted to the ICU as he was hypoxic. The physical examination revealed, pulse rate 110/min, BP 120/84 mmhg, spontaneous respiration with RR 36/min with oxygen saturation of 60% on room air. He had bilateral crackling sounds on chest auscultation. An ECG was suggestive of sinus tachycardia. Capillary blood glucose was 127 mg/dl. The chest X-ray showed diffuse alveolar opacities on both sides. ABG Ph-7.47, PaO2- 50, SPO2-85%, PCO2-38, HCO3-18 on O2 by mask 6-8 lit/min. The patient was shifted to the ICU and immediately intubated with No 8.5 endotracheal tube with suction aid (subglottic suction facility), under sedation by Midazolam and Fentanyl with the short acting muscle relaxant agent succinylcholine to prevent trauma.

The patient was put on volume control mode with PEEP 10, with FiO2 100%, ABG done- ph-7.47, PaO2- 93.5, SPO2-100%, PCO2-35.3, HCO3-18. PaO2/FiO2 ratio- 93.5.

As per ICU standard care Ryle's tube, Foley's catheter and an IV line were secured.

Endotracheal tube secretion was sent for culture and sensitivity. Antibiotics started as per standard antibiotic policy, covering Anaerobes and gram-positive organisms.

Bedside 2D ECHO screening was done to rule out a cardiac cause of pulmonary oedema and overall functioning of heart.

RT feeding started 100 ml/hr as per the dietician's advice to maintain adequate nutrition and maintain gut motility. ICU protocol for stress ulcer prophylaxis, VAP prevention, bed sore prevention started.

Initially the patient was kept in Volume Control mode (VC mode). Further ventilator settings changed as per ARDS Net protocol.

On day 4 a tracheostomy was done as the patient needed to be on mechanical ventilation for a longer period. The cuff pressure was maintained between 20-25 cm of water frequent subglottic suction to prevent aspiration of oropharyngeal secretion.

On day 5 initial endotracheal tube culture showed no growth. On 6th day of admission, the patient had an episode of fever. So, again ETT and blood cultures were sent, antibiotics was changed as per the hospital antibiotic policy.

On the 8th day of admission ventilator settings changed to pressure support mode, which was tolerated well by the patient. The T-piece trial started on the 9th day and decannulation was done on the 10th day and the patient was shifted to the general ward.

The report of repeat blood and ETT culture showed no growth, and the patient was discharged on the 13th day.

With appropriate intensive care management and nursing care and infection control protocol, we were able to prevent VAP, CAUTI, CRBSI.

Image 1.Chest Radiogram on Day 1 (Dated:18/05/2022)

Image 2.Chest Radiogram on (Dated:23/05/2022)

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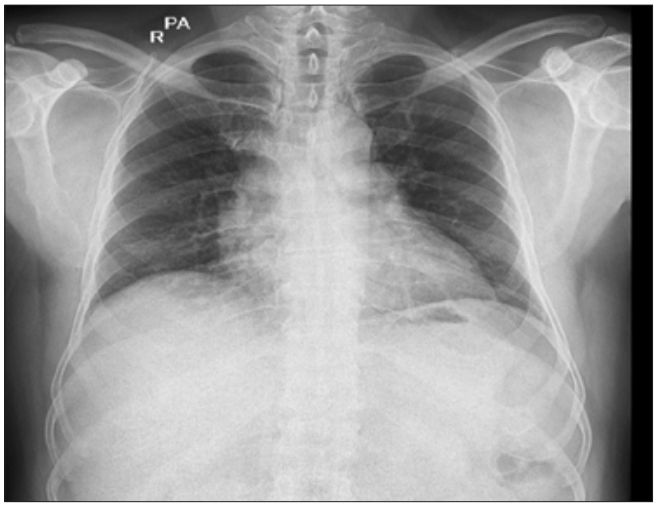

Image 3.Chest Radiogram on (Dated:06/06/2022) (On Follow up)

Investigations

Table 1.Blood Investigation

Date	18/5/22	20/5/22	22/5/22	24/5/22	27/5/22
HB 12.9		10.1	10	10.9	12
TLC	140-00	10400	7800	12200	10900
Platelet count	244-000	182000	227000	337000	594000
Sodium	120	142	142.3	137.4	-
Potassium	4.57	4.32	3.77	4.99	-
Creatinine	1.31	1.65	1.10	0.95	-
B. Urea	45.3	-	65	-	-

Table 2.Blood Investigation/ABG

ABG	18/5/22	22/5/22	25/5/22	28/5/22 (After Extubation)
PH	7.47	7.44	7.41	7.4
PCO2	35.3	36	33.3	34.4
PaO2	93.5	146	166	95.4
HCO3	18	20.9	21.8	23.4
FiO2	1	0.7	0.5	0.21
PaO2/FiO2	93.5	208.5	332	454.3

Discussion

According to WHO the definition of drowning is: "Drowning is the process of experiencing respiratory impairment from submersion/ immersion in liquid."[1]

The drowning process begins with respiratory impairment as the person's airway goes below the surface of the liquid (submersion) or water splashes over the face (immersion). If the person is rescued at any time, the process of drowning is interrupted, which is termed a nonfatal drowning. If the person dies at any time because of drowning, this is termed fatal drowning. Any submersion or immersion incident without evidence of respiratory impairment should be considered a water rescue and not a drowning.

A knowledge of the techniques of BLS should become part of the general education of modern man. The exact measures carried out by the eyewitness at the scene of the accident are crucial for survival of the victim. Early initiation of BLS measures increase the chances of survival up to 2-4 times.

In the ICU, the current treatment of people who have been rescued from drowning resembles that of patients with the acute respiratory distress syndrome (ARDS). Guidelines for ventilation in ARDS should be followed. However, since the pulmonary lesion is caused by a temporary and local injury, patients with pulmonary distress due to a drowning incident tend to recover much faster, and late pulmonary sequelae are uncommon. It is usually best not to initiate weaning from mechanical ventilation early, even when gas exchange appears to be adequate. The local pulmonary injury may not have resolved sufficiently, and pulmonary edema may recur, necessitating reintubation and leading to a prolonged hospital stay and further morbidity.[3]

The risk of pneumonia increases during prolonged mechanical ventilation and can be detected by the third or fourth day of hospitalization, when pulmonary edema has nearly resolved. Pneumonia is often related to nosocomial pathogens. Once a diagnosis is made, empirical therapy with broad-spectrum antibiotics, covering the most predictable gram-negative and gram-positive pathogens, should be started, and definitive therapy should be substituted once the results of culture and sensitivity testing are available. Fungal and anaerobic infections should be considered but can await culture results.

In most persons who have been rescued from drowning, the circulation becomes adequate after oxygenation, rapid crystalloid infusion, and restoration of normal body temperature. Early cardiac dysfunction can occur in patients with a presentation of grade 4 to 6, which adds a cardiogenic component to the non-cardiogenic pulmonary edema. No evidence supports the use of a specific fluid therapy, diuretics, or water restriction in persons who have been rescued from drowning in salt water or fresh water.

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If volume replacement with a crystalloid infusion fails to restore hemodynamic adequacy, echocardiography can help inform decisions about the use of inotropic agents, vasopressors, or both.

Result & Conclusion

With appropriate intensive care management, nursing care and infection control protocol, we were able to prevent VAP, CAUTI, CRBSI & or. We discharge the patient early without any complications.

Conflicts of Interest: None

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