e - ISSN - 2349 - 8005

INTERNATIONAL JOURNAL OF ADVANCES IN CASE REPORTS

Journal homepage: www.mcmed.us/journal/ijacr

NEAR-DROWNING IN SUMMER 2014

Adem Dirican[1], Sevket Ozkaya[2*], Ilknur Kitapci[3], Esra M Ulu[4], Koksal Atalay[4], Aysenur Karagol[4], [5]Ferah Ece[5]

[1]Pulmonologist, Samsun Medicalpark Hospital, Department of Pulmonary Medicine, Samsun, Turkey.
[2]Pulmonologist, Bahcesehir University, Faculty of Medicine, Department of Pulmonary Medicine, Istanbul, Turkey.
[3]Anaesthiologist, Samsun Medicalpark Hospital, Department of Intensive Care Unit, Samsun, Turkey.
[4]Radiologist, Samsun Medicalpark Hospital, Department of Radiology, Samsun, Turkey.
[5]Professor, Pulmonologist; Bahcesehir University, Faculty of Medicine, Department of Pulmonary Medicine, Istanbul, Turkey.

Corresponding Author:- **Sevket Ozkaya**
E-mail: ozkayasevket@yahoo.com

Article Info
Received 15/04/2015
Revised 27/04/2015
Accepted 22/05/2015

Key words: Near-drowning, Non-cardiogenic pulmonary edema, Treatment, respiratory failure.

ABSTRACT

Near drowning is defined as survival for more than 24 hours from suffocation by submersion. Near drowning pulmonary oedema is considered an aetiological subtype of non-cardiogenic pulmonary edema. These patients require aggressive supportive intensive care with attention toward optimizing cardiac and pulmonary function. Total 12 patients who suffered from submersion were admitted to Samsun Medicalpark Hospital in Summer 2014. The range ages of patients were 16 and 53 years old and the male to female ratio was 3/9. The pool near-drowning occurred in 1 patient, sea water near-drowning occurred in 11 patients and two of them had been exposed to dirty sea water. 9(75%) the patients had PaO2/FiO2 ratio < 300 mm Hg. Non-cardiogenic pulmonary edema was present on the chest radiographs and thoracic CT scans in 9(75%) of patients. Non-invaziv mechanical ventilation (NIMV) was required for 6(50%) patients and invaziv mechanical ventilation (IMV) was required for 2(16.6%) patients. All of patients received prophylactic antibiotics and mannitol treatment. The mean durations of hospital stay, ICU stay, NIMV and IMV were 2.08,1.6,1.3 and 1.5 days, respectively. There is no any death and complication due to treatment. Corticosteroids, mannitol and prophylactic antibiotic treatment can be administered as standard treatment protocol in patients with near-drowning. The low duration of hospitalization and accelerating the clinical, radiological improvement was achieved with this treatment protocol.

INTRODUCTION

Drowning is death within 24 hours from suffocation by submersion in a liquid, normally fresh water or sea water. Near drowning is defined as survival for more than 24 hours (even if temporary) from suffocation by submersion. Worldwide, they are the fourth most common injuries after road traffic accidents, self-inflicted injuries and violence, particularly in children and adolescents [1]. These patients require aggressive supportive intensive care with attention toward optimizing cardiac and pulmonary function. In addition, a number of controversial therapeutic interventions have previously been advocated in these patients. Many of these therapies, such as giving high doses of steroids, have recently been shown to have no effectiveness. We aimed to present our experience and treatment results of patients with near-drowning.

PATIENTS AND METHODS

Total 12 patients who suffered from submersion were admitted to Samsun Medicalpark Hospital in Summer 2014. The characteristics of patients including age, gender, symptoms, and radiological and spirometric findings were retrospectively evaluated and presented. The patients characteristics and treatment results were shown in the table and figures. Written consents of our patients and the

approval of the institution were obtained to carry out our study.

Treatment Protocol

100% supplemental oxygen was administered to the patients. If the patient remains dyspneic on 100% oxygen or has a low oxygen saturation, continuous positive airway pressure (CPAP) and early intubation, with appropriate use of PEEP were applied.

The ICU admission criteria: Dyspnea with;

- PaO_2/FiO_2 ratio < 300 mm Hg
- Altered level of consciousness and inability to protect airway or handle secretions
- High alveolar-arterial (A-a)gradient: PaO_2 of 60-80 mm Hg
- Respiratory failure

Drug treatment

Methylprednisolone 1-2mg/kg/daily, 100 ml %20 mannitol/daily, furosemide 40mg-80mg/daily, antibiotic prophylaxis (Ampicillin/sulbactam) and intravenous fluid replacement were given.

RESULTS

Total 12 near-drowning victims were treated in Samsun Medicalpark Hospital, Department of Pulmonary Medicine and Intensive Care Unit. The patients characteristics were shown in the table 1 and figures (Figures 1,2,3 and 4). The minimum and maximum ages of patients were 16 and 53 years old. The male to female ratio was 3/9. The pool near-drowning occurred in 1 patient, sea water near-drowning occurred in 11 patients and two of them had been exposed to dirty sea water. 9(75%) the patients had PaO2/FiO2 ratio < 300 mm Hg. Non-cardiogenic pulmonary edema was present on the chest radiographs and thoracic CT scans in 9(75%) of patients. Non-invaziv mechanical ventilation(NIMV) was required for 6(50%) patients and invaziv mechanical ventilation(IMV) was required for 2(16.6%) patients. All of patients received prophylactic antibiotics and mannitol treatment. The mean durations of hospital stay, ICU stay, NIMV and IMV were 2.08, 1.6, 1.3 and 1.5 days, respectively. There is no any death and complication due to treatment.

Table 1. Patients Characteristics

Age /Sex	Water	Radiology	RF	ICU/day	NIMV/day	IMV/day	Total Hospitalization	Survive	Complication
22y/F	Pool	Bilateral air space consolidation(NCPE) and ground glass opacities	Yes	Yes/2	Yes/1	No	3 day	Yes	No
16y/F	Sea	Bilateral air space consolidation(NCPE) and ground glass opacities	No	No	No	No	2 day	Yes	No
53y/F	Sea	Bilateral air space consolidation(NCPE) and ground glass opacities	Yes	Yes/1	Yes/1	No	2 day	Yes	No
17y/M	Sea	Bilateral air space consolidation(NCPE) and ground glass opacities	Yes	Yes/1	Yes/1	No	2 day	Yes	Sputum
46y/M	Sea	Bilateral air space consolidation(NCPE) and ground glass opacities	Yes	Yes/2	Yes/2	No	3 day	Yes	No
29y/F	Sea	Bilateral air space consolidation(NCPE) and ground glass opacities	Yes	Yes/4	No	Yes/2	4 day	Yes	Sputum
19y/M	Sea	Bilateral air space consolidation(NCPE) and ground glass opacities	Yes	Yes/1	No	Yes/1	2 day	Yes	No
35y/F	Dirty Sea	Bilateral reticular-alveolar consolidation	No	No	No	No	1 day	Yes	Purulent sputum
17y/F	Dirty Sea	Bilateral reticular-alveolar consolidation	es	1/day	Yes/1	No	2 day	Yes	Purulent sputum
21y/F	Sea	Bilateral air space consolidation(NCPE) and ground glass opacities	Yes	1/day	No	No	1 day	Yes	No
38y/F	Sea	Bilateral air space consolidation(NCPE) and ground glass opacities	No	No	No	No	1 day	Yes	No

Figure 1. 6th patient in the table: Bilateral air space consolidation (non-cardiogenic pulmonary edema) and ground glass opacities and daily (1st,2nd and 3th) response to treatment were seen in figure 1A. HRCT images (bilateral air space and ground glass opacities) at hospital admission and response to treatment were seen in figure 1B.

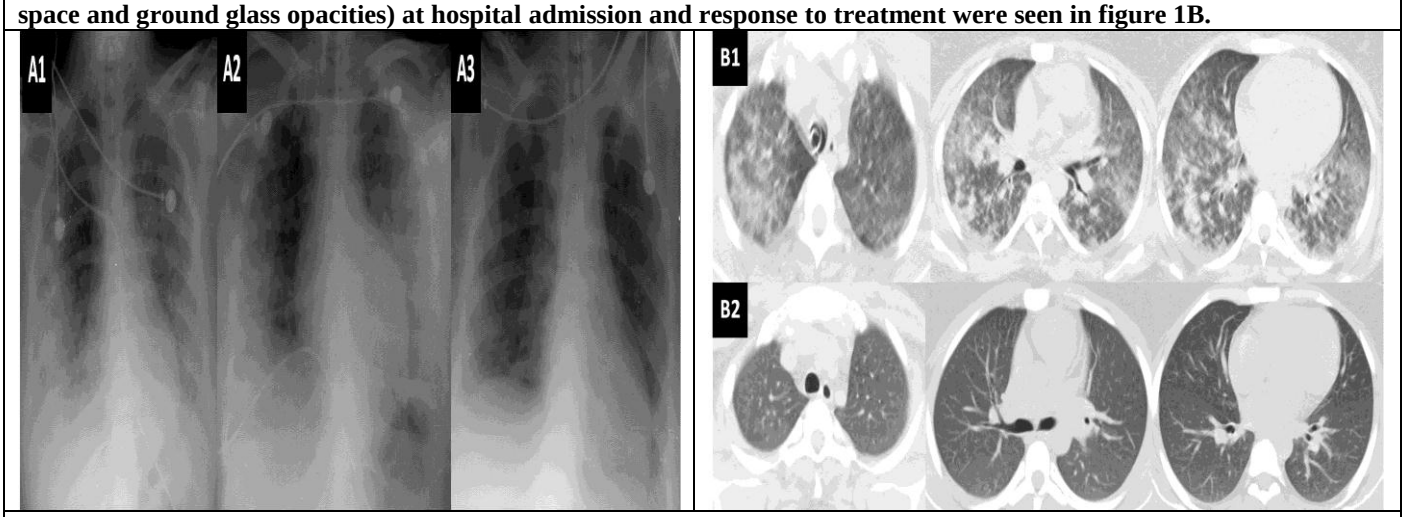


Figure 2. 5th patient in the table: Bilateral air space alveolar consolidation (non-cardiogenic pulmonary edema) and daily (1st,2nd and 3th) response to treatment were seen in figure 2A. HRCT images (bilateral alveolar consolidations) at hospital admission and response to treatment were seen in figure 2B.

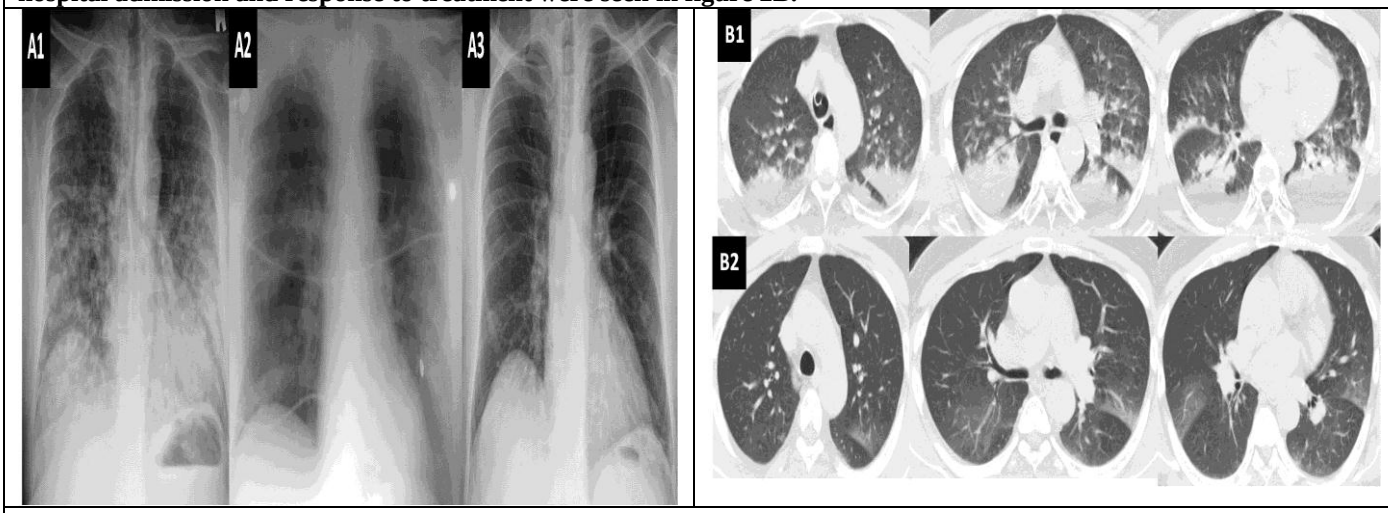


Figure 3. 4th patient in the table: Bilateral air space consolidation (non-cardiogenic pulmonary edema) and ground glass opacities and daily (1st and 2nd) response to treatment were seen in figure 3A. HRCT images (bilateral air space and ground glass opacities) at hospital admission and response to treatment were seen in figure 3B.

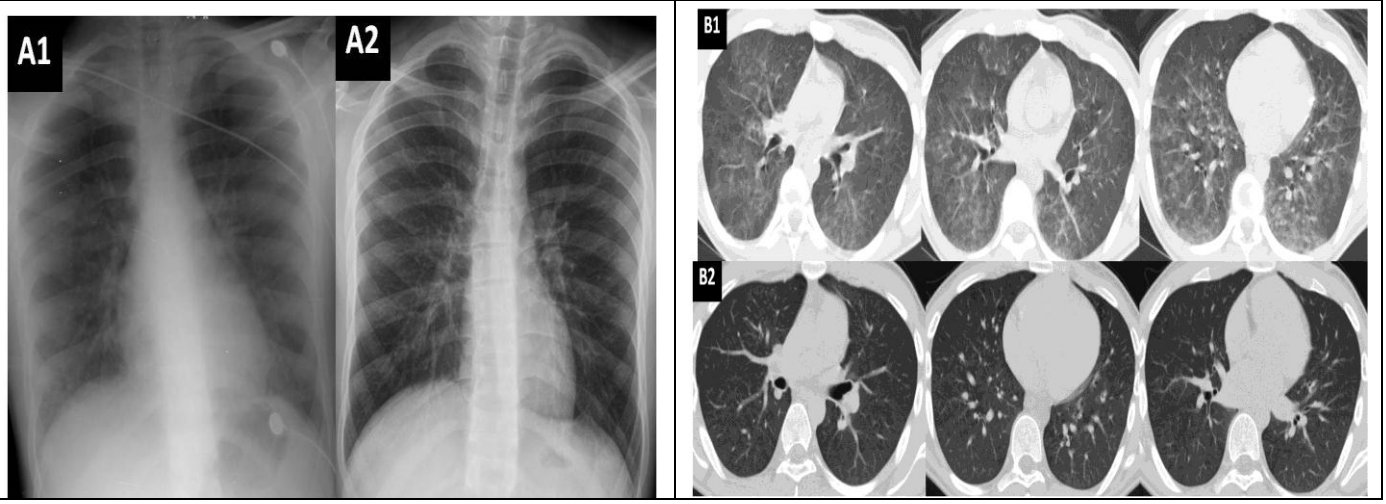
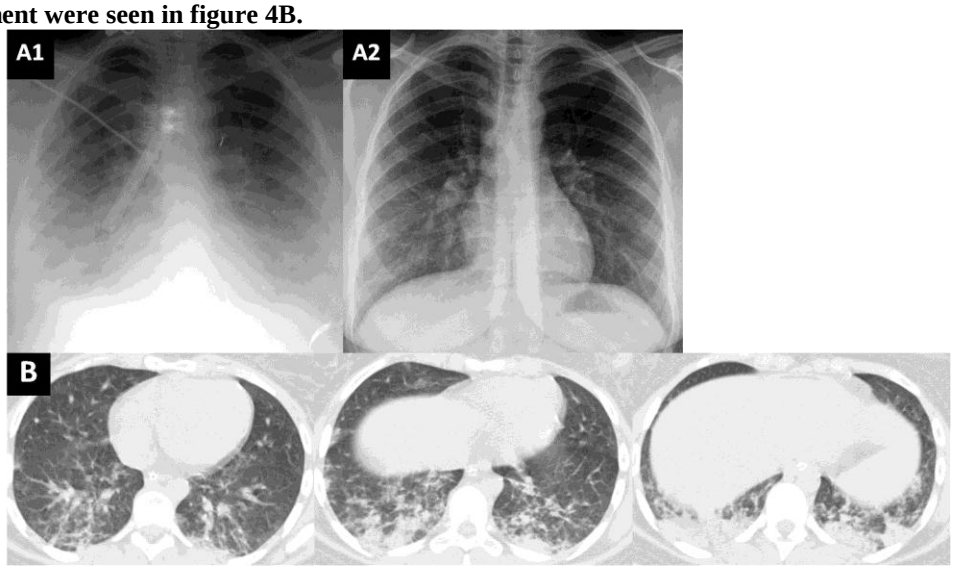


Figure 4. 9th patient in the table: Bilateral reticular-alveolar consolidation opacities and daily (1st and 2nd) response to treatment were seen in figure 4A. HRCT images (reticular-alveolar consolidation opacities) at hospital admission and response to treatment were seen in figure 4B.



DISCUSSION AND CONCLUSION

Drowning results in hypoxia, which can damage multiple organs, including the lungs and brain. Treatment is supportive, including reversal of respiratory and cardiac arrest, hypoxia, hypoventilation, and hypothermia. Drowning is one of the leading causes of accidental deaths worldwide, particularly in children and adolescents <19 yr. The key to success in the treatment of near-drowning victims is providing aggressive and effective respiratory support at the earliest opportunity. Near drowning pulmonary oedema is considered an aetiological subtype of non-cardiogenic pulmonary edema. In our series, 4(33.3%) of patients were ≤19 years-old and non-cardiogenic pulmonary edema was observed in 9(75%) of patients. It can occur with either salt or fresh water drowning. Alveolar hypoxia may cause noncardiogenic pulmonary edema [2,3]. Saltwater, which is hyperosmolar, increases the osmotic gradient and therefore draws fluid into the alveoli, diluting surfactant (surfactant washout). Protein-rich fluid then exudates rapidly into the alveoli and pulmonary interstitium. Compliance is reduced, the alveolar-capillary basement membrane is damaged directly, and shunting occurs. This results in rapid induction of serious hypoxia. Aspiration, especially with particulate matter or chemicals, may cause chemical pneumonitis or secondary bacterial pneumonia and may impair alveolar secretion of surfactant, resulting in patchy atelectasis. Extensive atelectasis may make the affected areas of the lungs stiff, noncompliant, and poorly ventilated, potentially causing respiratory failure (ARDS) with hypercapnia and respiratory acidosis. Perfusion of poorly ventilated areas of the lungs (V/Q mismatch) worsens hypoxia. There is no enough data about treatment of near-drowning. All hypoxic or moderately symptomatic patients are hospitalized. In the hospital, supportive treatment continues, aimed primarily at achieving acceptable arterial O_2 and CO_2 levels. Mechanical ventilation may be necessary. Patients are initially given 100% O_2; the concentration is titrated lower based on ABG results. Positive end-expiratory pressure ventilation is usually necessary to help expand or maintain patency of alveoli to maintain adequate oxygenation. Pulmonary support may be necessary for hours or days. If adequate oxygenation is impossible despite maximizing ventilator settings, extracorporeal membrane oxygenation may be considered. Nebulized β_2-agonists may help reduce bronchospasm and wheezing. Patients with bacterial pneumonia are treated with antibiotics targeting organisms identified or suspected based on results of sputum testing and/or blood cultures. Corticosteroids are not used but it is controversial. The benefits of corticosteroid treatment has not been established [4,5]. In our case series; 9(75%) the patients had respiratory failure (PaO2/FiO2 ratio < 300 mmHg). Non-invaziv mechanical ventilation (NIMV) was required for 6(50%) patients and invaziv mechanical ventilation (IMV) was required for 2(16.6%) patients. All of patients received standard treatment. The mean durations of hospital stay, ICU stay, NIMV and IMV were 2.08, 1.6, 1.3 and 1.5 days, respectively. There is no any death and complication due to treatment.

In conclusion; corticosteroids, mannitol and prophylactic antibiotic treatment can be administered as standard treatment protocol in patients with near-drowning. The low duration of hospitalization and accelerating the clinical, radiological improvement was achieved with this treatment protocol.

Competing interests

The authors declare that they have no competing interests.

REFERENCES

1. Modell JH. (1989). Drown versus near drown: a discussion of definitions. *Critical Care Med*, 9, 351-352.
2. Golden FC, Tipton MJ, Scott RC. (1997). Immersion, near-drowning and drowning. *Br J Anaesth*, 79, 214-225.
3. Van Beeck EF, Branche CM, Szpilman D, et al. (2005). A new definition of drowning: towards documentation and prevention of a global public health problem. *Bull World Health Organ*, 83(11), 853-6.
4. Lee KH. (1998). A retrospective study of near-drowning victims admitted to the intensive care unit. *Ann Acad Med Singapore*, 27(3), 344-6.
5. Panacek EA. (1989). Treatment of Near-Drowning. *The West J Med*, 151(1), 69.