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Research Article

Role of multidose activated charcoal in acute organophosphorus poisoning – A randomized prospective study

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Abstract

Background: In India Organophosphorus compounds (OPC) is the most common poison that is used for suicidal purpose. This study was carried out, to compare and contrast the outcome of patients with OPC poisoning who were treated with or without Multi-dose activated charcoal. **Methodology:** Out of 124 OPC poisoned patients, 78 patients were initially managed with activated charcoal with the dose of 1gm / kg followed by gastric Lavage and continued with multi-dose activated charcoal 0.5 gm /kg every 6 hour for 48 hrs and the other 46 were not. Complications and outcome of patients with and without MDAC and their mortality were recorded**. Results:** Complications like respiratory distress, electrolytes imbalance, cardiac arrest, intermediate syndrome, delayed syndrome, renal failure, convulsions, etc were reduced. Though the patients who received MDAC had respiratory distress, only 3 (16.7%) required tracheostomy, in contrast to 11(29.7%) non MDAC patients required tracheostomy. There were no deaths among patients who received MDAC, whereas 6 patients died in non MDAC group. **Conclusion:** The study concludes that MDAC has been found significantly reduced hospital stay, complications and most importantly mortality in poisoned victims.

Keywords: Organophosphorus Compound/OPC poisoning, MDAC, Multidose activated charcoal.

Introduction

Organophosphorus Compounds (OPC), in addition to their use as insecticides in agricultural and domestic settings, they have been used as chemical warfare agents since World War II. Recently, it was used in the terrorist attack on the Tokyo subway in (Okumura *et al*., 1995). In South India, majority of these poisonings are suicidal.[0,0]Their common availability renders OP insecticide poisoning a worldwide health problem affecting millions of patients (Buckley *et al*., 2004; Jeyaratnam, 1990).

OPC inactivate acetyl cholinesterase (AChE) by phosphorylation leading to the accumulation of acetylcholine (ACh) at cholinergic synapses. Excess acetylcholine leads to constant acetylcholine receptor overstimulation, resulting in paralysis of cholinergic synaptic transmission in the CNS, in autonomic ganglia, at parasympathetic and some sympathetic nerve endings (e.g., sweat glands), and in somatic nerves. Apart from the clinical manifestations stated in Table 1, another symptom to be noted is the Intermediate neurotoxic syndrome, characterized by

cranial nerve palsies, weakness of the neck and proximal limbs, and respiratory paralysis. (Eddleston *et al.*, 1998; He, *et al.*, 1998).

As Organophosphorus poisoning is one of the common problems in emergency department and also the poor availability of Oximes due to the cost problem, this study was carried out, to compare and contrast the outcome of patients with OPC poisoning who were treated with or without Multi-dose activated charcoal.

Table 1: Clinical features of Acute OPC poisoning

Muscarinic
Salivation, Lacrimation, Urinary incontinence, Diarrhoea, Emesis (SLUDGE)
Miosis,
Bronchorrhoea, Bronchoconstriction
Bradycardia, Hypotension
Nicotinic
Fasciculations, Tremors
Muscle weakness with respiratory failure
Hypertension, Tachycardia
Sweating, Mydriasis
Central nervous system
Altered level of consciousness with respiratory failure
Convulsions

Materials and Methods

This was a randomized prospective study conducted, at Vinayaka Mission Kirupananda Variyar Medical College and hospital, Salem, from May 2006 to April 2008. A total of 124 patients admitted to ER with alleged history of consumption of Organophosphorus compound are identified and included in this study. Those who had mixed poisoning were excluded from this study.

As soon as we received the patient in ER, we followed the protocol of general management of poisoning, which includes Assessment & establishment of an adequate airway, Ensurance of appropriate air exchange, Circulatory support, etc. 78 patients were initially managed with gastric lavage followed by activated charcoal with the dose of 1gm / kg and continued with multi-dose activated charcoal 0.5 gm /kg every 6 hour for 48 hrs and the other 46 were not.

Multidose activated charcoal in ICU

Patients were managed with IV fluids, oral multi-dose activated charcoal 6 hourly for 48 hours and other standard supportive care including nasogastric tube and antiemetics to control vomiting, specific antidote like oximes and supportive treatment like atropine.. Any complication, including atropinisation, Intermediate syndrome, delayed syndrome, etc., developed during the period of treatment was addressed accordingly till the patient got discharged from the hospital.

The demographic details like age, sex, type of OPC, quantity consumed, time elapsed since ingestion, initial symptoms, any underlying disease, duration on mechanical ventilation in days, duration of stay in hospital in days, and complications like atropinisation, Intermediate syndrome were recorded. Outcome of patients with and without MDAC and their mortality were recorded. With the acquired results, the data were analyzed.

Data Analysis

All data were compiled into Microsoft Excel 2007 spread sheet and statistical analysis was accomplished using statistical method for calculations provided within "SPSS" software [version 11.5].

Results

In 124 patients who consumed OPC poisoning, 77 (62.1%) were male and 47 (37.9%) were female. Majority of the patient were between 20 - 40 years and all these poisonings were suicidal. Out of 124 patients, only 78 (62.9%) were treated with MDAC. 2 (1.6%) patients were unconscious on admission and the remaining was found to be conscious or drowsy.

55 (44.4%) patients went for respiratory distress and was on mechanical ventilation. Figure 1 shows how the use of MDAC prevented respiratory distress in OPC poisoning, where Intermediate syndrome is an important complication. Though the patients who received MDAC also had respiratory distress, only 3 (16.7%) required tracheostomy, in contrast to 11(29.7%) non MDAC patients required tracheostomy.

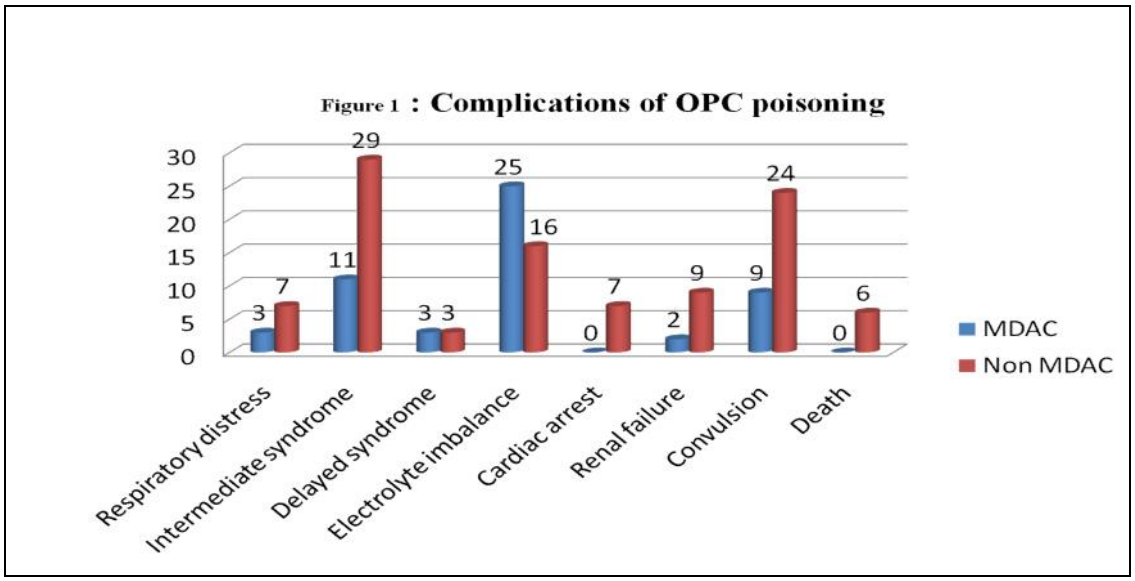

Figure 1 also depicts the effective role of MDAC in OPC poisoning by significantly reducing the complications like respiratory distress, electrolytes imbalance, cardiac arrest, intermediate syndrome, delayed syndrome, renal failure, convulsions, etc. Remarkably there was no deaths among patients who received MDAC, whereas 6 patients died in non MDAC group, which is statistically significant (p value <0.005).

Discussion

In India Organophosphorus compounds (OPC) is the most common poison that is used for suicidal purpose. The study showed that majority of the poison victims were between 20 – 40 years of age. This was attributed to the fact that these patients were subjected to stress, depression, mood swings and various social factors. These results were similar to the observation made by Lalith Senarathna et al who concluded the average age of person was 25 years of age. A study performed by Andrew Dawson et al noted a male predominance which is well supported by this study were in 62.1% of the patients were males.

The role of single dose of activated charcoal as been well proved beyond any doubts in various poisoning cases. Use of multidose activated charcoal (MDAC), though not being supported majority of centers worldwide, as definitely proven beneficial and as improved the outcome of our patients (Eddleston, 2004; Van der Hoek *et al.*, 2014).

Michael Eddleston and co-workers concluded that a single dose of activated charcoal as sufficient for patients who presented with consumption of poisons. But our study proved beyond doubt that patient who presented with a low GCS and significant time delay (24 hours) also made dramatic recoveries with the use of MDAC. So in this study, multi dose activated charcoal even if given several hours after poison ingestion has the potential to interface entero- vascular circulation and entero- hepatic circulation their by increasing the rate of poison elimination.

We found 4% of patients treated with MDAC had convulsions and 14% in non MDAC group. Wasantha Dissanayake et al in North Central Province, Srilanka in his study “Management after self poisoning with OPC or carbonates pesticide – a treatment protocol for junior doctors” observed similar decreased seizure activity those patients with MDAC.

Another significant observation made was that less than 5% who received MDAC developed hypokalemia. Paralytic ileus was seen in some patients as a result of prolonged hypokalemia and some even developed abdominal distention with signs of intestinal obstruction. Hence serum potassium should be monitored regularly and corrected promptly through a central line. One of the major complications in most of the patients on ventilator and those who had aspirated is acute lung injury followed by acute respiration distress syndrome. Since activated charcoal caused aspiration in previous studies, we noted this in our study and found that 2% of the patient who were given MDAC had ARDS but were successfully discharged.

Conclusion

The most important aim of medical practice is to improve clinical outcome of patients with medical illness, without any residual problems. This was well achieved in this trial were the mortality was reduced significantly with the use of MDAC when compared to the use of single dose AC for all patients who presented with consumption of poisonous substances. The study also proves that larger multi centric trial should be undertaken in order to confirm the role of MDAC in treating this group of patients.

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