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Case Note

A case report and overview of organophosphate (OP) poisoning

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Abstract
A case of organophosphate (OP) poisoning who recovered after requiring almost 1000 mg of atropine, 10 gm of PAM and ventilatory support for 7 days is presented here. The overview of organophosphate poisoning and its management is given. With the approach adopted, the mortality reported in the general medicine unit in the central hospital in Nepal is 7.4%. The two important aspects of the management are vigilance of the atropine drip, especially at night, and other physical and psychological support care of the patients.

Key words: Organophosphate poisoning, atropine drip, counselling, Nepal.

Case Report
MR a 26 year old unmarried male was brought to the emergency within an hour of ingestion of 500 ml of metacid® (methyl parathion). Oxygen, atropine, and pralidoxime were started. Gastric lavage was done and 50 gm of activated charcoal was administered at the end. But within two hours he had respiratory arrest and was put on ventilator in ICU. The patient required ventilator support for 7 days, and then he could be successfully weaned. Atropine and pralidoxime had been continued. He received total 1558 ampoules (934 mg) of atropine and 9.5 gm of PAM. He had previous history of deliberate self-harm and drug addiction. So, after recovery he was transferred under psychiatry care for evaluation and management.

Overview of organophosphate poisoning

1. Introduction

Poisoning is one of the commonest causes of admission of young adults in the medical ward in Nepal.[1-13] Most of such events are really not to commit suicide and the patients do not repeat such attempt. Self-poisoning is commonly a 'cry for help'. If the patients recover from the acute effect, the long term prognosis is good. So it is better called 'deliberate self harm' or 'self-poisoning' rather than 'attempted suicide' or 'parasuicide', as the word 'suicide' gives negative or wrong impression for the patients and among health care workers or relatives of the patients. Apart from infections, self-poisoning is the common easily managed fully reversible conditions in medical wards. Otherwise most the other conditions in medical wards are chronic and difficult to reverse. Thus, considering the common occurrence, relatively younger age of patients and fully curability of the condition, the successful management of poisoning should be given the top priority by all health care workers. Organophosphate is one of the commonest poisons consumed,[2-14] as it is easily available. Among the organophosphorous compound, methyl parathion (metacid®) is the most commonly used[11,13] the other common is dichlorovos (nuvan®)[13].

2. Clinical syndromes[15]

Acute toxicity

The muscarinic signs can be remembered by use of one of two mnemonics :

- **SLUDGE/BBB**: Salivation, Lacrimation, Urination, Defecation, Gastric Emesis, Bronchorrhea, Bronchospasm, Bradycardia.
- **DUMBELS**: Defecation, Urination, Miosis, Bronchorrhea / Bronchospasm / Bradycardia, Emesis, Lacrimation, Salivation.

It should be noted that these mnemonics do not take into account the critical CNS and nicotinic effects of these toxins. The nicotinic effects include fasciculations, neuromuscular junction. This mechanism is analogous to the depolarizing effects of succinylcholine in producing neuromuscular blockade.

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Nicotinic and muscarinic receptors also have been identified in the brain, and may contribute to central respiratory depression, lethargy, excitability, seizures and coma. Respiratory insufficiency can result from muscle weakness, decreased central drive, increased secretions, and bronchospasm.

Intermediate Syndrome

Intermediate syndrome occurs 24 – 96 hours after exposure. Bulbar, respiratory, and proximal muscle weakness are prominent features and it generally resolves in 1 – 3 weeks. Intermediate syndrome (IMS) – first termed by Wadia et al as type II paralysis in 1974 – is a syndrome characterized by muscle paralysis following the acute cholinergic phase.[16] The terminology was later changed by Senanayake and Karalliedde in 1987 to intermediate syndrome as it arises between the period of early cholinergic syndrome and late onset peripheral neuropathy.[17,18]

Organophosphorous Agent-Induced Delayed Peripheral Neuropathy (OPIDN)

Organophosphorous agent-induced delayed peripheral neuropathy usually occurs several weeks after exposure. There is primarily motor involvement. It may resolve spontaneously, but can result in permanent neurological dysfunction.

3. Diagnosis

History and clinical features

History of ingestion, availability of bottles and typical clinical symptoms and signs help to diagnose the OP poisoning. Many organophosphorous agents have a characteristic petroleum or garlic – like odour, which may be helpful in establishing the diagnosis.

Atropine challenge

If doubt exists as to whether an organophosphate or carbamate has been ingested, a trial of 1 mg atropine in adults (or 0.01 to 0.02 mg/kg in children) may be employed. The absence of signs or symptoms of anticholinergic effects following atropine challenge strongly supports the diagnosis of poisoning with an acetylcholinesterase inhibitor.

RBC acetylcholinesterase

Direct measurement of RBC acetylcholinesterase (RBC AChE) activity provides the measure of the degree of toxicity, but the test is not usually available. An assay for plasma (or pseudo) cholinesterase activity is more easily performed but does not correlate well with severity of poisoning and should not be used to guide therapy.

Chemical analysis of vomitus or gastric aspiration

Chemical analysis of vomitus or gastric aspiration may identify the poison. Such service is available in Kathmandu. Chemical analysis may also be particularly important in case of self-poisoning using multiple compounds. Thus, after gastric lavage or vomiting, the aspirate or vomitus should be preserved.

Contacting poison information centre

If there is any confusion about the type of chemicals (whether carbamate or organophosphate) or management of poisoning, contacting poison information centre helps. Such service is available in Nepal as well 24 hours a day.

4. Treatment of Acute Toxicity

Atropine

2 – 5 mg IV bolus (0.05 mg/kg IV in children). Escalate (double) dose every 3 – 5 minutes until bronchial secretions and wheezing stop. Once the patient is fully atropinized, atropine infusion is set up by giving every hour 20% to 30% of the total amount that was required to atropinize the patient initially. The infusion dose is maintained for 2 to 3 days maintaining the full atopinization, then the infusion dose is daily reduced by 1/4th to 1/3rd of the previous day's dose. Thus to write new order, it is necessary to know how much atropine the patient actually received the previous day. Tachycardia and mydriasis are not contraindications to atropine use. If the patient is not properly atropinized, the dose of atropine may have to be increased and if the patient is severely atropinized, the dose has to be reduced. Close observation of the patient with the assessment of the dose of atropine is required. Hundreds of milligrams may be needed over several days in severe poisonings, as in the case reported. In one series reported from Nepal, the mean amount and duration of atropine used in the total treatment of the patients were 136.7 mg (range 20 – 600 mg) and 5.5 days (range 2 – 20 days) respectively.[11] The dose and duration of the atropine also depend on the type and amount of the organophosphate compound consumed. Methyl parathion (metacid®) is one of the relatively toxic organophosphate compound consumed locally.

- To write new order, it is necessary to know how much atropine the patient actually received the previous day

Pralidoxime

Oxime therapy is recommended in patients with evidence of cholinergic toxicity in patients with organophosphorous poisoning. PAM is not

recommended for poisoning due to carbamate (reversible inhibitor of acetyl cholinesterase) poisoning. The standard recommended dose of PAM is 2 g (25 – 50 mg/kg in children) IV over 30 minutes, with continue infusion at 8 mg/kg/hour in adults (10 – 20 mg/kg/hour in children).[19] We usually give PAM in the dose of 1 gm of bolus followed by 0.5 to 1 gm 6 to 8 hourly in our adult patient population. The PAM therapy can be continued as per the severity of poisoning. Pralidoxime should not be administered without concurrent atropine, to prevent worsening symptoms due to transient oxime-induced acetylcholinesterase inhibition.

Oxygen and ventilatory support

Deliver 100 percent oxygen via facemask; strongly consider intubation in moderate to severe poisoning. In addition, patients who appear mildly poisoned may rapidly develop respiratory failure due to combination of CNS respiratory centre depression, nicotinic receptor mediated diaphragmatic weakness, bronchospasm, and copious secretions. Respiratory failure occurred in 23.1% (15 out of 65) patients in one series reported here.[13] With adequate supportive treatment, including artificial ventilation, majority of the patients recover, as 73.3% (11 out of 15) patients recovered in the above report.[13] Thus, patients with moderate to severe poisoning should also be considered for early endotracheal intubation. Atropine and oxime therapy along with ventilatory and other supportive measures, as required, can prevent most deaths in poisoning due to organophosphate compounds. In OP poisoning, death is commonly due to respiratory arrest and occurs quietly without the patients complaining or making noises. Stoppage of drip of atropine at night is a common cause of death. Thus, the atropine drip has to be continuously monitored. It has to be assured that atropine drips do not stop at night. The relatives attending the patients have to be involved and explained to watch the drip and to inform immediately.

Benzodiazepine therapy

Diazepam 0.1 – 0.2 mg/kg/ IV, can be given, repeated as necessary, if seizures occur. The early use of diazepam may reduce morbidity and mortality.

Decontamination

In case of topical exposure with potential dermal absorption, aggressive decontamination with complete removal of the patient's clothes and vigorous irrigation of the affected areas should be performed. The patient's clothes and belongings should be discarded since they absorb organophosphorous agents, and reexposure may occur even after washing.

Gastric lavage and activated charcoal

Emptying the stomach by gastric lavage is most useful if attempted within 1 to 2 hours after ingestion of a potentially life threatening amount of poison. If the patient is unconscious, the time since ingestion may be less relevant since it is obvious that a toxic dose has been ingested and the gastrointestinal stasis which often accompanies deep coma can delay gastric emptying.[20] It is therefore recommended that gastric lavage be carried out in every unconscious poisoned patient if the airway can be protected.[21] As many of the compounds consumed here are toxic, gastric lavage may be more important in such situation.[22] Activated charcoal (1gm/Kg) should be considered in cases of organophosphorous agent.

Fluid and electrolyte balance and other supportive measures

Other usual supportive measures are also important. Fluid and electrolyte balance are particularly important. Patients may require extra fluids and electrolytes to compensate for loss due to vomiting, diarrhoea, and high fever, and for decreased intake. Thus, apart for the daily minimum requirement of fluids (e.g. about 2 litres), sodium and potassium, IV fluids may have to be given for extra-fluid and electrolyte replacement. Investigations to rule out associated diseases like diabetes or complications like aspiration pneumonia are required. Antibiotics may be required for aspiration pneumonia.

Sympathetic and caring discussion with patients

As self-poisoning is mostly a 'cry for help', all patients require a sympathetic and caring approach and a psycho-social assessment by the treating doctors and nurses. The three important points in this regard are

- finding out the reason of consumption,
- letting the patients vent their feelings and
- discussing with them different aspects of their situations giving them different paradigms.

Most of the times such support and discussion are enough and have to done by the doctors and nurses involved in the management of the patients. Counselling services by psychiatrists are as such difficult to get in developing countries like Nepal. A few patients require referral for psychiatric treatment. Less than 20% of patients of self-poisoning make a repeat attempt.[23]

Most of the cases usually require hospitalization for 7 to 10 days. In one series here, the mean hospital stay

was 10.2 days.[13] With the approach discussed above, the mortality reported in the general medicine units in the central hospital in Nepal is 7.4%.[24] In other series reported from Nepal, the mortality associated with organophosphorous poisonings were 6%[13] and 13%[9].

- Doctors and nurses have to be vigilant that the atropine drips do not stop at night.
- Relatives have to be involved as well and explained to watch the drip and to inform immediately if the drips stop.
- Appropriate fluid and electrolyte balance are also other important aspects of acute management.
- Finding out the reason of consumption, letting the patients vent their feelings and discussing with them different aspects of their situations giving them different paradigms are important points to be taken care by the treating doctors during the counselling after recovery of the acute episode.

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