CASE STUDY

A rare case of organophosphate poisoning presenting with acute kidney injury, seizures and its successful management

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ABSTARCT
Organophosphate (OP) poisoning is common in India. OP poisoning classically presents with symptoms of cholinergic excess but can rarely affect other organs and when it does, it can worsen a patient's overall prognosis. We present a case of 29 year old male with OP poisoning who landed in emergency in drowsy state, later had acute kidney injury (AKI),seizures and severe skin rashes and its successful course of treatment.

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INTRODUCTION

OP poisoning is common in developing countries and especially so in India. Poisoning occurs mostly by voluntary ingestion, inhalation, or by absorption through the skin. The typical toxidrome of OP poisoning comprises of the salivation, lacrimation, urination, defecation, gastric cramps, emesis (SLUDGE) symptoms The traditional approach to clinicalfeatures in acute OP poisoning has centered on receptor speciOic effects on muscarinic, nicotinic and central nervous system (CNS) receptors that result in diverse symptoms and signs. OP poisoning may manifest acutely with the cholinergic crisis, respiratory distress, and intermediatesyndrome or with delayed toxicity [1,2].

OP acts by blocking the activity of acetylcholinesterase thus stimulating cholinergic as well as nicotinic receptors. Cholinergic effects can be reversed by atropine but for most neurological manifestations, which are mediated through nicotinic effects, oximes are needed.[3]

OP can have an effect on other organ systems which although rare, can worsen the presentation and prognosis of the patient. One of the organs affected is the kidney.

AKI is deOined as an abrupt (within hours) decrease in kidney function, which encompasses both injury (structural damage) andimpairment (loss of function).

RIFLE criteria for classiOication and staging AKI and the modiOications proposed bythe AKIN network

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RIFLE criteria for classifica8on/staging AKI

Stage	GFR criteria	Urine output criteria
Risk	1.5fold increase in sCr or >25% decrease in GFR	UO < 0.5mL/ kg/h for 6h
Injury	2.0fold increase in sCr or >50% decrease in GFR	UO < 0.5mL/ kg/h for 12h
Failure	3.0fold increase in sCr or >75% decrease in GFR or sCr>4.0 mg/dL with an acute increase of 0.5 mg/	UO < 0.3mL/ kg/h for 24h or anuria for 12 h
Loss	Complete loss of kidney func6on for > 4 weeks	
ESKD	End stage kidney disease for > 3	

AKIN criteria for classifica8on/staging AKI

Stage	Serum Crea8nine criteria	Urine output criteria
Stage 1	Absolute increase in sCr ≥ 0.3 mg/dL (≥26.5 µmol/L) or ≥ 1.5 to 2.0 fold from baseline	UO < 0.5mL/ kg/h for 6h
Stage 2	Increase in sCR> 2.0 to 3.0 fold from baseline	UO < 0.5mL/ kg/h for 12h
Stage 3	Increase in sCr > 3fold from baseline or increase of sCr to ≥4.0 mg/dL (≥ 354 µmol/L) with an acute increase of at least 0.5 mg/dL (44 µmol/L)	UO < 0.3mL/ kg/h for 24h or anuria for 12h

ESKD=end stage kidney disease, AKI=acute kidney injury, GFR=glomerular Oiltration rate, sCr= serum creatinine, UO=urinary output

Although the exact mechanism of acute kidney injury (AKI) is unclear, numerous hypotheses have been proposed. Death can occur as a resultof multiple organ distress syndrome (MODS) or renal failure itself.[4]
We present a case of OP ingestion, presenting with low Glasgow ComaScale (GCS) score, later had AKI , seizures, severe skin rashes(steven Johnson syndrome??) which was successfully treated by ventilatory support, hemodialysis, atropine, oximes and anti convulsants based on clinical judgment.

CASE REPORT

29 year old male with no co morbidity taken to emergency by his attendants in delirium and drowsy state, with alleged history of ingestion of OP poisoning(bottle of chemical bought along with). Pt washaving excessive salivation, stool and urine were already passed in trouser. On general physical examination, patient was disoriented, confused and in semi conscious state with pinpointed pupil bilaterally. There were lot of oral secretions and cough reOlex was weak. Patient had bradycardia and tachypnea. Patient intubated with cuffed endotracheal tube and taken on ventilatory support, gastric lavage done and treatment started with pralidaoximes(PAM), atropine infusion, antibiotics and benzodiazepines. Baseline investigations were normal with serum urea and creatinine was 23 and 0.9 respectively with adequate (>50ml/hr) urine output.

Next day Patient's GCS improved to E4M6 with adequate effort and grade 6 power so extubated, but on day 3, S. urea and creatinine raisedto 73 and 3.92 respectively with adequate urine output. Also pt started to have rashes on lips and oral mucosa. Symptomatic treatment startedand urgent nephrologist and skin consultation done.
For next 4 days urine output remained well adequate but serum urea raised from 102,144,179, serum creatinine raised from 5.11, 6.54, 7.21. On day 7 serum urea raised to 217 and creatinine to 7.37 and Patient had 1 episode of generalized tonic clonic seizures(uremic ?? central??) and patient was planned for urgent hemodialysis(HD), started on anti convulsants , patient developed severe skin rashes over Olexor aspects of lower limbs, groins and scrotum (steven Johnson syndrome??), after derma consultation, pulse steroid therapy was started.
On day 8,9,10, same treatment continued and daily HD was done, urine output remained adequate throughout, serum urea and creatinine reduced to 128 and 3.37 on 12th day.
Sterile dressings, antibiotics, ointments prevented further infection from skin rashes. Patient remained stable with adequate urine output, did not had any GTCS during rest of hospital stay , steroids taperd gradually and other medications also taperd.
His overall condition improved and he was discharged home on 18th day in a stable condition.

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Psychiatry consult was ordered and follow-up was planned. On follow up visit his urea decreased to 87 and creatinine to 1.3 with adequate urine output and healed skin rashes .

DISCUSSION

India is a predominantly agrarian country with large rural population. As OP pesticides are easily and widely available in India, so used commonly for suicidal purpose. Although ingestion with suicidal intentis a common mode, occupational exposure while spraying in Oields is also an important modality of poisoning

OP compounds inhibit acetylcholinesterase by phosphorylating it. Some of the phosphorylated cholinesterases can dealkylate leading to "aged" enzyme which is a non-reversible state [5]. In doing so there isan uncontrolled stimulation of nicotinic and muscarinic receptors by acetylcholine (Ach)

The common clinical features of OP poisoning are as follows:

(i) acute cholinergic crisis, which manifests within 24 to 72 hours due to accumulation of acetylcholine at muscarinicand nicotinic sites(SLUDGE and muscle weakness) and accumulation in CNS leading to headache, giddiness, seizure,and altered sensorium

(ii) intermediate syndrome, which manifests after 24 to 96 hours due to prolonged activity of acetyl choline at nicotinicreceptors resulting in weakness of ocular, neck, limb, and respiratory muscles[6,7]

AKI has been seen rarely with OP poisoning and only a few cases have been reported in medical literature. Different mechanisms have been suggested that can cause AKI. OPs might also cause oxidative stress, direct damage to the renal tubules, rhabdomyolysis, and hypovolemia due to dehydration [4]. One cohort study found that patients with OP poisoning had a 6.17-fold higher risk of AKI compared with the comparison cohort [8].

The mortality rate for AKI was 10.8%, compared to 1.5% for cases without AKI. Larger increases in serum creatinine were associated with higher mortality rates: stage 1, 6.3%; stage 2, 16.5%, and stage

3, 23.7%[9].

SpeciOic antidotes include atropine and pralidoxime. Atropine inhibits muscarinic receptors and causes a decrease in acetylcholine- induced cholinergic effects while pralidoxime in contrast to atropine does not affect any speciOic receptors; rather it acts to regenerate acetylcholinesterase (AchE), which has been rendered non-functionalby the OPs[10].

Our patient presented with classical SLUDGE symptoms, managed initially with mechanical ventilatory support, atropine infusion, PAM, benzodiazepines. Patient responded well to treatment and extubated but inspite of having adequate urine output his RFT's continuously deteriorated and patient had seizures on 5th day, which were managed with daily basis HD and adequate hydration and anti biotic coverage, also patient had severe skin rashes (SJS??) which were managed with pulse steroid therapy and anti septic dressings. Eventually patient's renal status improved and was discharged in very satisfactory condition.

Very few cases have been reported about AKI in OP poisoning and its mechanism is also still unclear. Classical muscarinic and nicotinic symptoms respond very well to atropine and PAM therapy but there role in preventing and treating AKI is still debatable. So a concrete evidence regarding treatment for AKI in OP poisoning is still not sure. We managed our patient with HD and long duration PAM therapy which showed marked response in our patient.

Further studies are required to determine the mechanism causing AKI, role of pralidoxime and its effectiveness as an antidote for OP poisoning.

CONCLUSION

OP poisoning mostly present with muscarinic and nicotinic symptoms, which is managed successfully by atropine and PAM therapy, but rarely can present with AKI. Continuous monitoring of renal functions and urine output is of utmost importance in every OP poisioning patient. Early HD and continuous PAM showed promising results but further studies are required to draw the speciOic guidelines for management of AKI in OP poisioning.

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