Case Report

Atropine-induced Psychosis in Organophosphate (OP) Poisoning Treatment : A Case Report

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Abstract

Background : Atropine is a naturally occurring alkaloid belonging to the Solanaceae family. Atropine blocks acetylcholine's muscarinic-like effects on the central and peripheral nervous systems. The most common side effects of atropine are xerostomia, photophobia, impaired vision, and tachycardia, typically manifesting at or below the therapeutic dose. In this case study, a 45-year-old male patient received atropine for Organophosphate (OP) poisoning and experienced psychosis symptoms like agitation, visual and auditory hallucinations and anxiety.

Key words : Atropine, Psychosis, Proximal delusions, Agitation, Organophosphate poisoning.

Atropine, a naturally occurring alkaloid derived from plants such as deadly nightshade (Atropa belladonna) and other members of the Solanaceae family, serves as a muscarinic acetylcholine receptor blocker at the postganglionic parasympathetic neuroeffector junction[1,2]. Taking long-term doses of atropine can lead to a number of adverse effects including dry mouth, blurred vision, tachycardia and photophobia. Moreover, atropine usage will also cause psychotic symptoms such as hallucinations, restlessness, delirium and excitement[3]. There are several adverse effects associated with atropine, including xerostomia, photophobia, impaired vision, and tachycardia, that often appear at or below therapeutic dosages[4].

Editor's Comment :

- This case report demonstrates that while atropine is essential in managing organophosphate poisoning, sometimes its high doses may trigger psychotic symptoms.
- Clinicians should be aware of this potential adverse effect and adjust treatment protocols accordingly.

Case Report

A 45-year-old male patient was admitted to the male medical ward 1 with the primary concern of suspected consumption of an organophosphate compound in combination with alcohol as an attempted suicide. The patient exhibited symptoms of vomiting and excessive sweating. The quantity of organophosphate consumed was undisclosed. The patient's medical history was devoid of prior illnesses or known allergies. On initial evaluation, the patient was alert and oriented, presenting with vital signs such as Blood Pressure of 140/90 mmHg, Pulse rate of 106 beats per minute, oxygen saturation of 96% in room air, and random blood glucose of 160 mg/dl. Cardiovascular examination revealed normal heart sounds, while respiratory assessment showed bilateral air entry. The neurological evaluation demonstrated an E4 L4 M6 consciousness scale with bilateral equal-sized pupils that reacted to light.

Laboratory investigations revealed a haemoglobin level of 14.9 g/dl, a Total Leukocyte Count of 17,600 cells/mm^3, with a differential count of neutrophils (63%), lymphocytes (13%), monocytes (3%) and eosinophils (1%). The electrocardiogram displayed sinus tachycardia. The Poisoning Severity Score (POP) indicated mild poisoning based on factors such as pupil size, respiration rate, heart rate, and level of consciousness.

Immediate interventions comprised gastric lavage with normal saline, followed by intravenous administration of atropine (10 ml in 100 ml normal saline) at a slow rate over 8 hours thrice daily. Additionally, Pralidoxime (PAM) 2 gm in 100 ml normal saline IV was administered thrice daily, along with Optineuron 1 amp in 100 ml normal saline IV twice daily. The patient was catheterized and received Pantoprazole IV 40 mg once daily and continuous monitoring of Blood Pressure, Heart Rate, Oxygen Saturation and Pupil size was implemented.

After three days, the patient exhibited agitation, visual and auditory hallucinations, anxiety and dry mouth symptoms. This constellation of symptoms was diagnosed as atropine-induced psychosis. To reduce these adverse symptoms, the dose of atropine was progressively reduced to 3 ml in 100 ml of normal saline and eventually

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discontinued after 3 hours. Treatment for psychosis encompassed Haloperidol 15 mg, Clonazepam 0.2 mg, and Escitalopram 10 mg, with resolution of the ADR. Subsequently, the patient was discharged with a prescription for Pantoprazole 40 mg once daily.

Causality assessment employing the Naranjo Causality Assessment Scale and the World Health Organization (WHO) - Uppsala Monitoring Center (UMC) scale indicated a probable association between psychosis and atropine, categorized as possible. Severity evaluation via Hartwig's Scale revealed a moderate severity level. The preventability assessment, following the Schumock and Thornton scale, classified the case as not preventable.

Discussion

For an extended period, atropine has been utilized for the treatment of organophosphate poisoning and poisoning from insecticides. Most adverse effects are attributed to its antimuscarinic impact and typically reverse upon treatment discontinuation. The severity and frequency of these side effects are dose-dependent. Severe outcomes often stem from an excessive dosage of atropine, whether administered through single or multiple injections.[4] Adverse reactions associated with atropine encompass cardiac dysrhythmias, tachyarrhythmias, dry skin, constipation, xerostomia, hypersensitivity responses, drowsiness, impaired vision, sensitivity to light, restlessness, irritability, confusion, hallucinations, and heightened excitement[5]. Atropine's anticholinergic effect triggers a toxic response with various peripheral and cerebral symptoms. This reaction is correlated with the significant variation in individual susceptibility to atropine (idiosyncrasy), potentially leading to hazardous consequences even at recommended doses[6]. It's important to note that atropine demonstrates heightened sensitivity in individuals with Down syndrome[7].

The criteria for diagnosing drug-induced psychosis, as outlined in the Diagnostic and Manual of Mental Disorders (DSM-IV) , consist of four key factors:

(1) Presence of proximal delusions

(2) Corroboration from historical records, physical assessments, or laboratory results must meet conditions (a) or (b). (a) The symptom mentioned in Criteria 1 manifests during substance intoxication or withdrawal within a month. (b) The disturbance is causally linked to medication use.

(3) The disorder cannot be primarily attributed to a non-substance-related psychotic disorder.

(4) The occurrence of the disturbance coincides with a state of delirium[4].

Atropine is an anticholinergic drug that blocks the action of acetylcholine, a neurotransmitter that regulates various functions in the central and peripheral nervous system. Acetylcholine is involved in memory, learning, attention, arousal, and mood[8]. Atropine crosses the blood-brain barrier and affects the cholinergic receptors in the brain, primarily the muscarinic receptors. Muscarinic receptors are responsible for modulating the activity of other neurotransmitters, such as dopamine, serotonin, glutamate and Gamma-aminobutyric Acid (GABA). Atropine disrupts the balance between these neurotransmitters and causes an imbalance in the brain's chemical signaling. This can lead to altered perception, cognition, emotion, and behaviour[9,10]. Atropine also affects the autonomic nervous system, which controls involuntary functions such as Heart Rate, Blood Pressure, Respiration, Digestion and Temperature Regulation. Atropine can cause Tachycardia, Hypertension, Hyperthermia, Dry Mouth, Blurred Vision, Urinary Retention and Constipation[8]. These physical symptoms can worsen the psychological distress and contribute to the psychosis[10]. Atropine-induced psychosis can be influenced by genetic factors, such as variations in the genes that encode for the enzymes that metabolize atropine or the receptors that bind to it. Some people may be more susceptible or resistant to atropine's effects than others[9,10]. Atropine-induced psychosis can also be triggered or exacerbated by environmental factors, such as stress, trauma, infection, or drug interactions. These factors can increase the brain's sensitivity to atropine or alter its pharmacokinetics[9,10].

Atropine-induced psychosis is a severe condition that requires prompt medical attention and treatment. The treatment usually involves stopping or reducing the dose of atropine and administering antipsychotic drugs or benzodiazepines to counteract its effects[8,10]. In some cases, Physostigmine, a cholinesterase inhibitor that increases acetylcholine levels in the brain, may be used as an antidote. Physostigmine has risks and side effects and should be used cautiously[8,10].

Tom, *et al* found that atropine-induced psychosis was 31.3% in medicine wards. The length of the hospital was increased due to ADR. A patient who is taking higher doses causes more incidences of psychotic symptoms than others. So, physicians should be vigilant while prescribing the doses[11]. Sowmya, *et al* observed complaints of salivation, vomiting, non-cooperation, and irritability, and the patient became unresponsive to the atropine therapy in OP poisoning. Antipsychotics and antidepressants can be used as a treatment for atropine-induced psychosis. Atropine is used to treat OP poisoning. It is imperative that emergency care is provided, especially intravenous administration, and that the offending drug is withdrawn as soon as possible in order to prevent further complications[12].

Conclusion

This case report provides a comprehensive overview of atropine-induced psychosis in the context of organophosphate poisoning, emphasizing the need for vigilance among healthcare providers. Recognizing and

managing such adverse reactions promptly is crucial for ensuring the best possible outcomes for patients. This case report also contributes valuable insights into the assessment and management of rare adverse drug reactions, ultimately benefiting healthcare professionals and researchers in the field of Toxicology and Emergency Medicine.

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References

1 Hollman A — Atropine. *Br Heart J* 1991; **66(5)**: 367. doi: 10.1136/hrt.66.5.367
2 Sungur M, Güven M — Intensive care management of organophosphate insecticide poisoning. *Crit Care* 2001; **5(4)**: 211-5.
3 Tom NR, Varghese GH, Alexander H, Swethalekshmi V, Ashok Kumar TR, Sivakumar T, *et al* — A Case Report on Atropine Induced Psychosis. *Int J Pharm Sci Res* 2016; **7(1):** 387-91..
4 Heba SF, Ali Shams MB — Atropine induced psychosis during the treatment of organophosphate intoxication: A case report. *Int Res J Pharm* 2017; **8(10)**: 17-77.
5 Basha SA, Sathiswara B — Atropine induced psychosis: a report of two cases. *Int Health Sci Res* 2017; **12**: 325-7.
6 Economacos G, Kanakis J — A case of hypersensitivity to atropine. *Anesthesie Analgesie, Reanimation* 1981; **38(11-12)**: 748.
7 Cramp J — Reported cases of reactions and side effects of the drugs which optometrists use. *Clin Exp Optom* 19761; **59(1)**: 13-25.
8 McLendon K, Preuss CV — Atropine. [Updated 2023 Jun 23]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK470551/
9 Bergman KR, Pearson C, Waltz GW, Evans R — Atropine-induced psychosis: an unusual complication of therapy with inhaled atropine sulfate. *Chest* 1980; **78(6)**: 891-93.
10 Nooreen M, Aziz S, Fatima S, Fatima Z — Atropine induced psychosis: a consequence during the organophosphate poisoning treatment. Indian Journal of Basic & Applied Medical Research. *Int J Basic Appl Med Res* 2018; **7(2)**: 159-62.
11 Tom NR, Varghese GH, Alexander H, Swethalekshmi V, Hemalatha S, Ashok Kumar TR, *et al* — Different patterns of atropine induced psychosis: prospective observational study. *Int J Pharm* 2016; **6(1)**: 88-94.
12 Sri Sowmya K, Yaswanth S, Sandra K — A case report on atropine induced psychosis in OP compound poisoning patient. *Int J novel Res Dev* 2022; **7(3)**: 616-8.