Management of the poisoned patient

Micheala M McGlone

Stewart C Teece

Abstract

Poisoning is a common reason for attendance to emergency departments, medical assessment and critical care areas. This, in the main, is due to deliberate self-harm, however, there is an increasing concern that toxins may be deliberately released as part of a terrorist attack. In many cases it can be unclear from the history the exact toxins responsible. Knowledge of toxidromes, a group of symptom clusters identified by the receptors targeted may guide further management. Management of overdose utilizes methods of gastric decontamination to prevent toxin absorption along with supportive measures for the patient and, where available, the use of specific antidotes.

In the response to deliberate-release toxins there is a risk to treating staff by contamination with the poisons used. Key to the management is the use of personal protective equipment and the decontamination of casualties before invasive medical care begins. There are a small number of expected chemical agents likely to be used in deliberate release, each has its own clinical characteristics and management.

Keywords Antidotes; decontamination; overdose; PPE; toxbase; toxicology; toxidrome

Royal College of Anaesthetists CPD Matrix: 1A02, 2A04, 2C01, 2C02, 2C04, 3I00

Learning objectives

After reading this article, you should be able to:

- perform an initial assessment on any patient presenting with poisoning
- recognize common toxidromes, the receptors they act on and their clinical features
- consider the need for decontamination, charcoal and gastric lavage
- be aware of the specific antidotes for poisoning agents
- formulate a plan to deal with patients presenting with deliberate-release agents

Introduction

Deliberate poisoning was responsible for 140,000 UK hospital admissions during 2011/2012.[1] While the vast majority of patients can be observed in the emergency department or acute medical admission units, certain patients require admission to critical care areas.

A combination of political instability and large crowd gatherings at sporting, music and religious events, has resulted in increasing concerns regarding the potential for deliberate release of poisons.

Assessment of the poisoned patient

When a patient presents with the result of poisoning several things must be considered:

- the poison ingested
- the quantity and the timing of exposure
- the potential for poison-induced end-organ toxicity
- individual patient characteristics.

Initial assessment of any patient critically ill as a result of a suspected poisoning requires:

- rapid A–E assessment
- history and collateral history.

Details regarding the type of poison, quantity and timing of exposure are not always immediately available, particularly as the patient may be in extremis. Whilst every effort should be made to source an accurate collateral history from family, friends, police or paramedic colleagues this should not delay emergency treatment. Simultaneous initiation of management should focus on resuscitation and end-organ support while correcting any physiological derangement. Specific treatment for the poison themselves may be initiated as the source of poisoning becomes clearer.

A toxidrome is defined as a group of signs and symptoms constituting the basis for a diagnosis of poisoning. The clinical features that result from the ingestion of a toxin occur due to their interaction with their receptor system. The recognition of a toxidrome and, by extension, the receptors involved can guide management when patient history is scanty. Table 1 contains a list of common toxidromes and their clinical features.

Management

Regardless of the poison ingested, management plans are based on some key principles, as follows.

Gastric decontamination

Charcoal: Gastric decontamination is aimed at limiting poison absorption and promoting poison elimination. The most common agent is activated charcoal.[2] Ideally this can be given if the poison has been ingested less than 1 hour previously and longer if the poison is known to delay gastric emptying. One limitation with charcoal is that it requires airway protection in patients with reduced consciousness. Also, some common poisons will not bind to charcoal, these include:

- cyanide
- ions (Li, Fe etc)
- methanol, ethanol, ethylene glycol
- strong acids/alkalis
- petroleum distillates.

Micheala M McGlone *MB ChB MCEM is a Specialist Trainee 4 in Emergency Medicine at Monklands District General Hospital, Airdrie, UK. Conflict of interest: none declared.*

Stewart C Teece *MB ChB MD MRCP FRCS FCEM is a Consultant in Emergency Medicine at Monklands District General Hospital, Airdrie, UK. Conflict of interest: none declared.*

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Common toxidromes, cell receptors involved and potential toxins

Toxidrome	Receptors	Example toxin	Clinical features
Cholinergic	Nicotinic Muscatine	Organophosphates	Lacrimation Meiosis Emesis Urination Defaecation Bradycardia Tachycardia
Anticholinergic	Nicotinic Muscarinic	Tricyclics Antihistamine Antipsychotics	Dry mouth Dry skin Mydriasis Tachycardia Hyperthermia Urinary retention
Serotonin	$5HT_2$	SSRI MAOI Tricyclics Venlafaxine MDMA Cocaine Amphetamines Triptans	Agitation Confusion Tremor Hyper-reflexia Hypertonia Fever Flushing Restlessness
Sympathomimetic	Multiple molecular effects	Cocaine Amphetamine	Tachycardia Tremor Hyper-reflexia Seizure Hypo/hypertension
GABA	GABA	Gabapentin Pregabalin Benzodiazepines	Drowsiness Vomiting Tachycardia Respiratory depression Slurred speech Dizziness Ataxia
Opioid	Opioid	Opiates	Hypoventilation Pinpoint pupils Decreased GCS Hypotension

GABA, Y-aminobutyric acid; GCS, Glasgow Coma Scale score; MAOI, monoamine oxidase inhibitors; MDMA, 3,4-methylenedioxymethamphetamine; SSRI, selective serotonin reuptake inhibitors.

Table 1

Multiple doses of activated charcoal have been shown to decrease absorption of a number of toxins, however as doses in this type of study are not life threatening there is not sufficient evidence to confirm or refute their use in toxic doses. A further consideration with multiple doses is the risk of ileus particularly with ingested toxins that depress gut motility.

Gastric lavage: The joint position statement of both American and European toxicology bodies states that gastric lavage 'Gastric lavage should not be performed routinely, if at all, for the treatment of poisoned patients.'[3]

A robust assessment of risk versus benefit must be made when considering lavage. Risks include aspiration, laryngospasm, hypernatraemia, arrhythmias and perforation of the oesophagus or gut.

It has been thought that lavage can push poisons beyond the pylorus, which in turn can lead to more rapid absorption of toxins. A review by Eddleston et al. showed insufficient evidence to confirm or refute this.[4]

Given the above, lavage is best only considered in the intubated patient with a recent, large overdose of a high toxicity compound that is poorly absorbed by charcoal with no known antidote or antidote of poor efficacy in which symptoms cannot be managed by supportive measures alone.

Specific antidotes

When the poison has been identified, the care provider can consider administration of an antidote specific to the poison.

Although there is much experience of antidotes to more commonly used, often over-the-counter, poisons there is little evidence about the use of antidotes in the rarer poisons. For example, glucagon has been suggested as a treatment in both β-blocker overdose and in tricyclic overdose refractory to the use of sodium bicarbonate, however, the evidence base for this is limited to case reports.[5,6] The rarity of some types of poisoning

Summary of some of the available antidotes used in overdose

Poison	Antidote
Benzodiazepines	Flumazenil
β-blockers	Glucagon
Calcium channel blockers	Calcium Glucagon Insulin/dextrose
Carbon monoxide	High flow O_2 Hyperbaric O_2
Cholinergics	Atropine Pralidoxime
Cyanide	Hydroxocobalamin Dicobalt edetate Sodium nitrite with sodium thiosulphate
Digoxin	Digoxin antibodies
Iron	Desferrioxamine
Lead	Sodium calcium edetate
Mercury salts	Egg albumen orally causes binding of salts
Opiates	Naloxone
Paracetamol	N-Acetylcysteine
Toxic alcohols	Fomepizole Ethanol
Tricyclics	Sodium bicarbonate Glucagon has been used

Table 2

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