Whole bowel irrigation should not be used routinely in the management of poisoned patients

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Abstract

Whole bowel irrigation is a method of gastric decontamination in the poisoned patient involving administration of large volumes of osmotically balanced polyethylene glycol-electrolyte solution to empty the gastrointestinal tract of ingested toxins before absorption, limiting systemic toxicity. While this approach may seem intuitive and it can lead to expulsion of tablets or packets in the rectal effluent, there is a lack of evidence correlating this with improved patient outcomes. Administration of whole bowel irrigation is also challenging to the inexperienced physician and associated with adverse effects, which may be serious. Recommendations for the consideration of whole bowel irrigation are limited to patients who have ingested modified release preparations, those of have ingested pharmaceuticals not adsorbed by activated charcoal, and for the removal of packages in body packers. Until more robust evidence is available from high-quality prospective studies demonstrating efficacy, the use of whole bowel irrigation should not be used routinely in poisoned patients.

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Gastric decontamination is a cornerstone principle in the management of poisoned patients. It is based on the theory that preventing absorption of an ingested poison from the gastrointestinal (GI) tract will limit systemic toxicity and reduce morbidity. The term gastric decontamination encompasses several interventions all aimed at reducing gut absorption, including gastric lavage to empty stomach contents, cathartics to stimulate expectoration of toxins, activated charcoal to adsorb toxins before systemic absorption, and irrigation of the GI tract to 'washout' toxins. For more than two decades, the safety and efficacy of these methods has been debated [1-4], with some interventions becoming obsolete or rarely used due to significant associated adverse risk [5,6], while others, such as activated charcoal, being commonplace in the early management of poisoned patients [7].

Whole bowel irrigation (WBI) is a method of gastric decontamination describing the administration of large volumes of osmotically balanced polyethylene glycol-electrolyte solution (PEG-ES) to empty the GI tract before absorption of potentially harmful toxins [8]. While the theory of this approach appears intuitive, there is a paucity of high-quality studies demonstrating beneficial outcomes in poisoned patients. Administration of WBI is also complicated by adverse effects and poor tolerability, due to the volumes of solution required (1-2 L/hour), often necessitating placement of a nasogastric tube. In the absence of a robust evidence base, a consensus view from the European Association of Poisons Centres and Clinical Toxicologists (EAPCCT) and the American Academy of Clinical Toxicology (AACT) was published as a joint position paper in 1997 [9] with updates in 2004 [10] and 2015 [11]. Recommendations for WBI include patients who have ingested modified release pharmaceuticals, particularly in cases presenting more than two hours after ingestion when activated charcoal is less effective; after large ingestions of potentially highly toxic agents not adsorbed by activated charcoal (e.g. iron, lithium); and for the removal of ingested packets of illicit drugs in 'body packers' [11]. Despite these recommendations, there remains uncertainty regarding appropriate utilization of WBI. Practical and ethical considerations mean that undertaking randomized controlled trials would be

challenging. We must therefore rely on less robust evidence drawn from volunteer studies, retrospective case series and case reports to inform clinical practice [11,12]. Until such evidence can provide a clear indication of clinical benefit, without significant adverse effects, WBI should not be used routinely in the management of poisoned patients but may be considered in specific scenarios.

Volunteer studies demonstrate WBI is associated with a significant reduction in bioavailability of ampicillin (67%) [13], enteric coated aspirin (73%) [14], and modified release lithium (67%) [15] when initiated within one hour of ingestion of 5g, 2.9g and 0.8mg/kg respectively. However, following therapeutic doses of sustained release carbamazepine, theophylline and verapamil, no additional benefit over activated charcoal alone was shown [16]. Indeed, in the case of carbamazepine, administration of WBI was associated with a significant reduction in the efficacy of activated charcoal [16]. Importantly, volunteer studies cannot completely replicate the poisoned patient scenario where ingested doses are significantly larger, the pharmacokinetic properties of drugs may differ, and the effect of co-administered interventions are not accounted for.

Analysing the effect of decontamination procedures on the pharmacokinetics and pharmacodynamics of venlafaxine in overdose demonstrated that activated charcoal increased clearance by 35%, while combined activated charcoal and WBI reduced bioavailability by 29% and was associated with lower venlafaxine peak concentrations [17]. Kumar *et al* [18] subsequently studied the relationship between decontamination and the incidence of seizures. Activated charcoal (OR: 0.48, 95%CI: 0.25-0.89) and a combination of activated charcoal and WBI (OR 0.25, 95%CI: 0.08-0.62) reduced the likelihood of seizures, with the combination providing greater overall benefit than the sum of the independent effects [18].

A recent retrospective multicentre study of 257 patients recommended for WBI reported that of the 150 (58%) patients to receive the intervention, it was deemed successful (defined by obtaining diarrhoea or evacuation of packets) in only 47 (31%) cases [19]. The agents ingested included lithium and other metals (e.g. potassium, iron), drug packets, and multidrug ingestions (with our without cardiotoxic drugs). Modified release tablets were involved in 81 (55%) cases. Adverse effects were reported in 27 (18%) patients, with vomiting the predominant feature (23 patients). Despite a low rate of completion, the authors concluded that patients who were treated with WBI were less likely to deteriorate than those not treated and that this clinical benefit was associated with an acceptably low risk of complications. However, the effect of any concomitantly administered interventions such as supportive care, antidotes, inotropes, or vasopressors, were not considered. Furthermore, the success of WBI was defined simply by the presence of diarrhoea or evacuation of packets, rather than an improved clinical outcome. Concluding the efficacy of WBI on this basis is premature. These limitations were discussed by Vodovar & Megarbane [20] who highlighted the need for well-designed large prospective cohort studies to provide robust evidence on which to base future clinical recommendations.

Lack of outcome data, treatment-associated morbidity, and poor tolerability are features of many other studies of WBI. A retrospective review of 270 cases of sustained release ingestions treated with WBI over a 6.5-year period demonstrated that only 57 (21%) cases completed treatment [21]. Activated charcoal was co-administered in 230 (85%) cases with no detail provided about the effect of this intervention. Adverse events or treatment failure was reported in 68 (25%) cases and included vomiting, abdominal distension, hypotension, and patient refusal. One death was recorded in a patient with abdominal distension and hypotension following ingestion of diltiazem. In another retrospective observational study of 59 patients with acute-on-chronic lithium poisoning, Deguigne *et al* [22] compared early (<12 hours after ingestion) and late (>12 hours) decontamination with sodium polystyrene sulfonate and/or WBI. While early decontamination overall was associated with a more favourable outcome, there was no difference for patients who received WBI either alone or in combination with sodium polystyrene sulfonate. Lo *et al* [23] described 176 paediatric patients (age range 4 months to 12 years; mean 2 years) who received WBI. Common agents included calcium channel blockers, iron and antidepressants, with 72 (41%) cases involving sustained release preparations. Abdominal x-rays confirmed the presence of pills in 16 cases, four of which showed a reduction in opacities on repeat imaging. Twelve patients (7%) had documented pills in their effluent. While the reduction of radiological opacities and detection of pills in the effluent may be reassuring to the treating physician, no

clinical outcome data was available to support conclusions about the efficacy of this intervention. Adverse effects, including abdominal pain and vomiting, were reported in 10% of patients.

The use of WBI to clear ingested packets of illicit drugs in body packers represents a unique indication for this intervention [24,25]. It is intuitive that hastening removal of packets of potentially lethal drugs from the GI tract before rupture, leakage and systemic absorption can occur would be advantageous. While a reduction in hospital length of stay has been demonstrated in this patient group (2.1 days when treated with WBI versus 2.8 days when treated with laxatives [24]), there is again a lack of outcome data confirming clinical benefit [24,26,27]. Administration of WBI in this patient group is also frequently complicated by poor tolerability and treatment refusal [24,26].

Administration of WBI is challenging to the inexperienced physician and not without risk. Nausea and vomiting, abdominal distension, bloating, and pain are commonly reported in up to 10-25% of patients [19,23,26]. More serious adverse effects including hypotension, aspiration, and even death may occur [28,29]. Treatment failure or refusal is a significant problem due to poor tolerance of the quantities of fluid required, often for many hours [19,21,23,24,26]. While a nasogastric tube may ease practical administration, this is in itself associated with adverse risks, including pulmonary aspiration secondary to a misplaced tube [28,30], emphasising the need for experienced physicians.

In conclusion, there are no trials demonstrating improved outcomes following WBI. In addition to retrospective case series and observational studies, many case reports describing the use of WBI with variable outcomes have been reported and reviewed in detail elsewhere [11]. The limitations of data from case reports, however, are well documented [31], and without more high-quality randomized trials it is difficult to draw definitive conclusions about efficacy. In addition to the lack of outcome data, there are practical difficulties associated with WBI administration and potentially serious adverse effects can occur in up to 25% of patients. Therefore, while there are some specific scenarios where WBI may be considered beneficial based on the best evidence currently available [11], until such time as higher quality randomised studies demonstrate improved outcomes for poisoned patients in general, WBI should not be considered a routine treatment for all.

Data availability statement

Data sharing not applicable to this article as no datasets were generated or analysed during the current study.

Competing interests:

None declared.

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