Clinical Pharmacology & Toxicology Pearl of the Week

~ Activated Charcoal (AC) ~

Background and Rationale

- ✓ The purpose of single-dose activated charcoal is to decrease absorption of the xenobiotic, whereas the purpose of multiple-dose activated charcoal (MDAC) is to interrupt the enterohepatic or enteroenteric recirculation of a xenobiotic.
- ✓ The use of AC is relatively safe in the absence of any contraindications to its administration. Adverse effects include emesis, constipation, diarrhea, pulmonary aspiration, intestinal obstruction, and peritonitis (if AC is given in the setting of GI perforation).
- ✓ Even substances not known to prolong gastric emptying in therapeutic situations may do so in the overdose setting thus increasing the window for GI decontamination.
- ✓ The risk of charcoal aspiration is highest in patients with CNS depression, poor airway control, and seizures. This can lead to lung injury, airway obstruction, difficulty with intubation, hypoxia, cardiac arrest, and death. Aspiration risk is reduced, but not eliminated, with intubation.
- ✓ While studies involving single and multiple-dose activated charcoal do not demonstrate a survival benefit in all poisoned patients, there are some clinical situations in which AC is likely to be beneficial. These include xenobiotics with life-threatening toxicities for which few therapies are available, and sustained release preparations that are likely to be present in the GI tract for several hours after ingestion.

Administration

- ✓ AC should not be routinely administered to all poisoned patients. In every case, a risk: benefit analysis should be carried out prior to the administration of AC. In addition to the indications and contraindications below, the xenobiotic, patient's mental status, airway status, and presence of a normal abdominal examination without distention or signs of an acute abdomen are essential prior to recommending the administration of AC.

The following are indications and contraindications for both single and multiple-dose AC:

Single dose activated charcoal

Indications	**Contraindications**
Ingestion of potentially toxic amount of xenobiotic known to adsorb to AC	Non-intubated patients with a GCS <15, seizures, somnolence, respiratory depression, or absent airway protective reflexes
Within a time frame where adsorption to AC is possible or clinical features to suggest ongoing absorption (see note on timing)	Gastrointestinal obstruction or decreased GI motility. • AC should be withheld until the stomach is decompressed to reduce the risk of vomiting and aspiration.
Ingestion of a potentially life threatening amount of xenobiotic regardless of time frame as long as no contraindications	High suspicion for gastrointestinal perforation (e.g. caustic ingestion)

The patient is awake and alert with intact protective airway reflexes and the ability to safely take PO, or the airway has been protected with an endotracheal tube	AC may increase the risk and severity of aspiration (e.g. hydrocarbons with high aspiration potential).
	Xenobiotic not adsorbed to AC
	Endoscopy will be an essential diagnostic modality (e.g. caustic ingestions).

Timing:

- There is no absolute time cut-off to administration of AC
- There are several factors to consider when deciding if ongoing absorption of a xenobiotic is occurring:
    - Ingestion or co-ingestion of antimuscarinics and/or opioids
    - Ingestion of sustained release medications
    - Large ingestions
    - Possibility of pharmacobezoar formation
    - Just being unwell can delay GI motility

Dosing:

- 1 g/kg body weight (adults and children) PO/NG/OG
    - Combining activated charcoal with sorbitol products is no longer recommended.
- In large ingestions or with sustained release preparation, it may be indicated to repeat this single dose for the purpose of completing GI decontamination (e.g. if the 10:1 ratio is not obtained with 1 g/kg of AC)
- A second dose of AC may be indicated for large ingestions of extended-release products, xenobiotics that prolong GI motility, or xenobiotics that form concretions or bezoars, especially if the desired 10:1 ratio of AC: xenobiotic is not reached with a single dose of AC. Examples include bupropion, venlafaxine, or salicylates.

Multi-dose activated charcoal

Indications	**Contraindications**
Ingestion of a life-threatening amount of a xenobiotic that undergoes enterohepatic or enteroenteric recirculation • Most data for the use of MDAC is for carbamazepine, dapsone, phenobarbital, quinine, or theophylline. • Other xenobiotics that may be considered for MDAC include colchicine, Amanita sp., valproic acid, and yellow oleander.	Any contraindication to single-dose AC.
	Presence of ileus or other causes of diminished peristalsis.

Dosing:

- 1 g/kg body weight (adults and children) PO/NG/OG followed by 0.5 g/kg every 4-6 hours for 12-24 hours. This should be tailored to the dose and dosage form of the xenobiotic, clinical status, and serum concentrations of the xenobiotic (if available).
    - Combining activated charcoal with sorbitol products is no longer recommended.

References

1. Hoegberg LCG, Gude AB. Chapter 5 – Techniques Used to Prevent Gastrointestinal Absorption. Hoffman RS et al Eds. Goldfrank's Toxicologic Emergencies 11 Edition, McGraw Hill, NY, NY, 2019.

2. Dorrington C et al. The frequency of complications associated with the use of multiple dose activated charcoal. Ann Emerg Med 2003; 41:370-377.

3. Moll J et al. Incidence of aspiration pneumonia in intubated patients receiving activated charcoal. The Journal of Emergency Medicine, Vol. 17, No. 2, pp. 279– 283, 1999.

4. Adams BK et al. Prolonged gastric emptying half-time and gastric hypomotility after drug overdose. The American Journal of Emergency Medicine. 2004 Nov;22(7):548–54.

5. Isbister GK et al. Aspiration pneumonitis in an overdose population: frequency, predictors, and outcomes. Critical Care Medicine. 2004 Jan 1;32(1):88–93.

6. Chiew AL, Fountain JS, Graudins A, Isbister GK, Reith D, Buckley NA. Summary statement: new guidelines for the management of paracetamol poisoning in Australia and New Zealand. Med J Aust. 2015 Sep 7;203(5):215–8.

7. Hoegberg L.C.G., et al., Systematic review on the use of activated charcoal for gastrointestinal decontamination following acute oral overdose. Clin Toxicol (Phila), 2021. 59(12): p. 1196-1227.

8. American Academy of Clinical Toxicology, European Association of Poisons Centres and Clinical Toxicologists Position Statement and Practice Guidelines on the Use of Multi-Dose Activated Charcoal in the Treatment of Acute Poisoning. Journal of Toxicology: Clinical Toxicology, 1999. 37(6): p. 731-751.

9. de Silva H.A., et al., Multiple-dose activated charcoal for treatment of yellow oleander poisoning: a single-blind, randomised, placebo-controlled trial. Lancet, 2003. 361(9373): p. 1935-8.

10. Miyauchi M., Hayashida M., and Yokota H., Evaluation of residual toxic substances in the stomach using upper gastrointestinal endoscopy for management of patients with oral drug overdose on admission: a prospective, observational study. Medicine (Baltimore), 2015. 94(4): p. e463.

The Clinical Pharmacology (CP) physician consultation service is available Mon-Fri, 8am-5pm. The on-call physician is listed in ROCA on the AHS Insite page. CP consultations are also available through Netcare e-referral and Specialist Link. You can also find us in the Alberta Referral Directory (ARD) by searching "Pharmacology" from the ARD home page. Click HERE for more details about the service.

The Poison and Drug Information Service (PADIS) is available 24/7 for questions related to poisonings. Please call 1-800-332-1414 (AB and NWT) or 1-866-454-1212 (SK). Information about our outpatient Medical Toxicology Clinic can be found in Alberta Referral Directory (ARD) by searching "Toxicology" from the ARD home page.

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