Journal of Toxicology: Clinical Toxicology

ISSN: 0731-3810 (Print) (Online) Journal homepage: http://www.tandfonline.com/loi/ictx19

Position Statement: Gastric Lavage

Clinical Toxicology, 35(7), 711-719 (1997)

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American Academy of Clinical Toxicology;
European Association of Poisons Centres
and Clinical Toxicologists

ABSTRACT

In preparing this Position Statement, all relevant scientific literature was identified and reviewed critically by acknowledged experts using agreed criteria. Well-conducted clinical and experimental studies were given precedence over anecdotal case reports and abstracts were not usually considered. A draft Position Statement was then produced and subjected to detailed peer review by an international group of clinical toxicologists chosen by the American Academy of Clinical Toxicology and the European Association of Poisons Centres and Clinical Toxicologists. The Position Statement went through multiple drafts before being approved by the boards of the two societies and being endorsed by other societies.

The Position Statement includes a summary statement for ease of use and is supported by detailed documentation which describes the scientific evidence on which the Statement is based.

Gastric lavage should not be employed routinely in the management of poisoned patients. In experimental studies, the amount of marker removed by gastric lavage was highly variable and diminished with time. There is no certain evidence that its use improves clinical outcome and it may cause significant morbidity. Gastric lavage should not be considered unless a patient has ingested a potentially life-threatening amount of a poison and the procedure can be undertaken within 60 minutes of ingestion. Even then, clinical benefit has not been confirmed in controlled studies. Unless a patient is intubated, gastric lavage is contraindicated if airway protective reflexes are lost. It is also contraindicated if a hydrocarbon with high aspiration potential or corrosive substance has been ingested.

The initial draft of this Position Statement was prepared by J A Vale.

This Position Statement is endorsed by the American Board of Applied Toxicology and the Canadian Association of Poison Control Centers.

SUMMARY STATEMENT

INTRODUCTION

- Overall, the mortality from acute poisoning is less than one percent and the challenge for clinicians managing poisoned patients is to identify promptly those who are most at risk of developing serious complications and who might potentially benefit, therefore, from gastrointestinal decontamination.

RATIONALE

- Gastric lavage involves the passage of an orogastric tube and the sequential administration and aspiration of small volumes of liquid with the intent of removing toxic substances present in the stomach.

ANIMAL STUDIES

- Three studies[1-3] have been performed in animals and none has demonstrated substantial drug recovery, particularly if lavage was delayed for 60 minutes.

- If gastric lavage was undertaken within 15–20 minutes of dosing, the mean recovery of marker was 38%[1] and 29%.[3] When lavage was performed at 30 minutes, the mean recovery was 26%.[2] Gastric lavage undertaken at 60 minutes resulted in mean recoveries of 13%[1] and 8.6%.[2]

VOLUNTEER STUDIES

- Five volunteer studies provide insufficient support for the clinical use of gastric lavage: three[4-6] were performed less than 20 minutes after dosing; two[7,8] were undertaken at 60 minutes.

- The recovery of marker was highly variable when lavage was undertaken less than 20 minutes after dosing. When performed at 5 minutes, the mean recovery of marker was 90% ($p < 0.001$);[4] when performed at 10 minutes, the mean recovery of marker was 45% ($p < 0.005$),[5] and when gastric lavage was undertaken at a mean time of 19 minutes, the mean recovery was 30.3%.[6]

- In the studies performed at 60 minutes postdosing, the mean reduction in area under the curve (AUC) was 32% (NS) in one study[7] and in the second[8] the mean reduction in salicylate excretion was 8% ($p < 0.025$).

- Other studies suggest that tablet debris may be found in the stomach after lavage and that lavage may propel material into the small intestine, thus increasing the possibility of enhanced drug absorption.[9]

CLINICAL STUDIES

- Clinical studies[10-13] have not confirmed the benefit of gastric lavage alone even when it was performed less than 60 minutes after poison ingestion and there is the possibility that drug absorption may be enhanced by its use.

- In one study,[14] benefit from lavage was demonstrated in a small subset ($n = 16$) of obtunded patients in whom this procedure was undertaken and activated charcoal administered less than 60 minutes after ingestion; there were only three patients in the comparison group who received charcoal alone. Small group sizes and selection bias limit the conclusions that can be drawn from this study.

- In a similar though larger study,[15] benefit from gastric lavage was not demonstrated irrespective of the time postingestion.

- Although descriptive reports indicate that occasionally impressive returns are achieved, there is no strong clinical evidence to support the view that, overall, gastric lavage will benefit the poisoned patient.

- In one study,[13] gastric lavage was associated with an increased occurrence of aspiration and admission to an ICU.

INDICATIONS

- Based on experimental and clinical studies, gastric lavage should not be considered unless a patient

has ingested a potentially life-threatening amount of a poison and the procedure can be undertaken within 60 minutes of ingestion.

CONTRAINDICATIONS

- Unless intubated, the loss of airway protective reflexes, such as in a patient with a depressed state of consciousness.
- Ingestion of a corrosive substance such as a strong acid or alkali.
- Ingestion of a hydrocarbon with high aspiration potential.
- Patients who are at risk of hemorrhage or gastrointestinal perforation due to pathology, recent surgery, or other medical condition, that could be further compromised by the use of gastric lavage.

COMPLICATIONS

- Aspiration pneumonia.
- Laryngospasm.
- Hypoxia and hypercapnia.
- Mechanical injury to the throat, esophagus, and stomach.
- Fluid and electrolyte imbalance.
- Combative patients may be at greater risk of complications.

SUPPORTING DOCUMENTATION

INTRODUCTION

Gastric lavage has been employed widely for some 180 years to facilitate removal of poisons from the stomach. However, evidence of substantial clinical benefit accruing to the majority of poisoned patients undergoing lavage is lacking. Few adequate clinical studies have been performed and, therefore, the value of gastric lavage remains controversial. Yet, as Proudfoot[16] has argued, "To advocate abandoning it is to attack one of the very pillars of management of poisoning by ingestion and cannot be supported lightly. However, endorsement by common usage should not blind physicians to its limitations or prohibit it from critical appraisal."

RATIONALE

Gastric lavage involves the passage of an orogastric tube and the sequential administration and aspiration of small volumes of liquid with the intent of removing toxic substances present in the stomach.

ANIMAL STUDIES

Experimental studies were undertaken, particularly in the 1960s, to provide support for the clinical reintroduction of gastric lavage both in Europe and North America. However, the results of gastric emptying studies in experimental animals require a degree of caution when extrapolating to cases of human poisoning. "Anesthetized animals are dissimilar to overdosed patients in several important ways. Animals are generally given anesthetic or analgesic agents that may slow gastrointestinal motility, are placed in a prone position, intubated and ventilated, and then administered an overdose of a single medication that may not be in the form of intact tablets".[17] Moreover, the experimental studies reviewed below fail to demonstrate that gastric lavage is of significant benefit even when undertaken up to 60 minutes after dosing. As most poisoned patients arrive at a treatment facility more than 60 minutes after overdose, the clinical relevance of these experimental studies is even less certain.

Sodium Salicylate. The value of gastric lavage was investigated in fasted nonanesthetized dogs (6–10 kg) who were pretreated with chlorpromazine 25 mg or promethazine 25 mg IM or promethazine 37.5–50 mg IV to prevent spontaneous vomiting.[1] Pretreatment occurred 30 minutes prior to the administration of sodium salicylate 500 mg/kg in broken tablet form. Lavage was undertaken via a 16 French gauge tube at 15 or 60 minutes after dosing. When lavage was performed at 15 minutes (n = 46), a mean of 38% (range 2–69%) of the administered salicylate was recovered and when treatment was delayed for 60 minutes (n = 24), a mean of only 13% (range 0–40%) was recovered.

Barium Sulfate. Abdallah and Tye[2] also studied the use of gastric lavage in nonanesthetized dogs (2.2–5.4 kg) using barium sulfate 5 g as a marker. The lavage tube had an outer diameter of 19 mm and lavage was undertaken either at 30 minutes (nine dogs) or 60 minutes (six dogs). Lavage led to a mean recovery of 1.3 g (SEM ± 0.29) barium sulfate at 30 minutes but only 0.43 g (SEM ± 0.2) at 60 minutes. The data represent mean recoveries of 26% and 8.6% at 30 and 60 minutes, respectively.

Gastric lavage was also investigated in six nonanesthetized fasting puppies using barium sulfate (2 g) as a marker.[3] The diameter of the lavage tube was not stated, but tap water 100 mL was instilled into the stomach by nasogastric tube. Lavage at 20 minutes postdosing resulted in a mean recovery of 29 ± 10% (range 10–62%) of marker.

Aspirin. Six dogs (20–30 kg) were given aspirin 500 mg/kg 30 minutes before lavage was undertaken and activated charcoal (1.5 g/kg; a 3:1 ratio of charcoal to salicylate) was administered.[18] Prior to lavage, acepromazine maleate 0.25 mg/kg was given intravenously as a sedative. Lavage was performed using a 34 French gauge lavage tube. A 37% reduction ($p < 0.05$) in salicylate concentration at 4 hours postingestion was found when compared with controls, though the benefit resulting from the use of lavage alone is unknown.

EXPERIMENTAL STUDIES IN VOLUNTEERS OR POISONED PATIENTS

Volunteer studies suffer from several basic limitations: it is difficult to extrapolate data from simulated overdoses in volunteers (with nontoxic doses) to poisoned patients (who have ingested large amounts) because the amount ingested may affect the dissolution and absorption of the drug concerned. Furthermore, the time from ingestion to lavage is usually no more than 60 minutes which makes extrapolation to overdose patients difficult as they usually present later to a treatment facility.

Three studies[4,9,19] performed in poisoned patients are also included in this section since their design was experimental and precluded assessment of clinical benefit.

General Value of Lavage. An endoscopic study performed in 17 poisoned patients [seven had ingested acetaminophen (paracetamol) alone or with another drug] demonstrated that after lavage using a Faucher tube size 33, most patients (88%) still had residual tablet or food debris in the stomach; 12 of 17 patients had tablet debris.[19]

Gastric lavage may also cause gastric contents to be propelled into the small bowel, thereby potentially increasing the amount of drug available for absorption.[9] In a study of 20 poisoned patients who swallowed 20 polythene pellets (3 mm barium sulphate-impregnated pellets) 5 minutes before gastric lavage (3.5–6 L of water), 207 of 400 (51.8%) pellets were retained in the gut and of these 69 (33.3%) were counted in the small intestine on X ray undertaken at a mean time of 33 (range 10–90) minutes after pellet ingestion. When compared to a control group of 20 patients, there was a highly significant ($p < 0.0001$) difference between the two groups in regard to the number of residual pellets in the small bowel (33.3% vs 16.3%).

Ampicillin. A mean 32% reduction in the AUC was noted after 10 fasting volunteers had been lavaged using a 34 French gauge orogastric tube 60 minutes after the administration of ampicillin 5 g as twenty 250 mg capsules.[7] This reduction was not statistically significant.

Aspirin. Lavage performed using a 30 French gauge orogastric tube 60 minutes after administration of aspirin 1.5 g as twenty 75 mg tablets to 12 volunteers did not produce a clinically important reduction in the absorption of aspirin as judged by salicylate recovery in the urine.[8] Mean (± SD) recovery of salicylate was 55.5% (± 8.8) in the lavage group and 60.3% (± 13.3) in the control group; this represents a reduction of only 8% by lavage. However, salicylate excretion in the urine was followed for only 24 h, whereas if the period of urine collection had been extended to 48 h, salicylate recovery could have been as high as 96%.[20] Therefore, a greater difference between the lavage and control groups may have been observed.[21] Moreover, the analytical method used quantitatively underestimated some of the aspirin metabolites. In addition, neither the area under the plasma drug concentration-time curve (AUC) nor the peak salicylate concentration were measured so that the efficacy of lavage could not be assessed using standard kinetic calculations.

Cyanocobalamin. Tandberg *et al.*[5] found that lavage with a 32 French gauge orogastric tube 10

minutes after the administration of cyanocobalamin (twenty-five 100 μg tablets) as a marker resulted in a mean recovery of cyanocobalamin of 45 ± 13% (range 19–68%). This study, however, has little relevance to clinical practice due to the very early use of lavage.

Tc^{99m}. Seventeen fasting volunteers ingested 30 gelatin capsules prepared with Tc^{99m} bound to sulfur colloid, a nonabsorbable radioactive marker.[6] At a mean time of 19 minutes (range 9–42 minutes) later, gastric lavage was performed and the mean recovery of tracer was 30.3% (± SD 17.4). Wide subject-to-subject variation was noted.

Thiamine. Auerbach *et al.*[4] performed gastric lavage on 37 patients using a 24 French gauge Harris Flush Tube with additional drainage holes; 33 were drowsy or obtunded when the procedure was performed. Thiamine 100 mg (as a liquid preparation) was administered via the gastric tube 5 minutes before lavage was undertaken. The mean thiamine recovery at lavage was 90 ± 34% of administered dose. The reason for some of the thiamine recoveries exceeding the maximum possible recovery was not explained adequately by the authors. It must be emphasized that since the time interval between marker administration and lavage was so short, the extrapolation of these data to cases of poisoning is difficult.

CLINICAL STUDIES

General Value of Lavage. Continued absorption of drug after lavage is known to occur[11,22] and drug concretions may be found in the stomach[23,24] or at postmortem examination[25] even after gastric lavage.

Acetaminophen (Paracetamol) Poisoning. Underhill *et al.*[26] examined the value of gastric lavage using a 36 French gauge orogastric tube in limiting the absorption of acetaminophen in 14 patients admitted to two hospitals who were thought to have ingested this drug within the previous 4 hours. A control group of patients treated at one of these hospitals was included, though the control arm of the study was stopped at five patients because serum acetaminophen concentrations increased between the first and last samples drawn in four of these five patients. Blood samples for measurement of acetaminophen were taken prior to treatment, following treatment, and at 60, 90, and 150 minutes after the first sample. These data were presented graphically and the authors claimed, without including the relevant statistical analysis of gastric lavage treated vs no treatment groups, that the mean (± SD) percentage fall between the first (admission) and last plasma acetaminophen concentrations in lavaged patients was 39.33% (± 14.67).

Barbiturate Poisoning. The value of gastric lavage was investigated by Harstad *et al.*[27] in 71 cases of barbiturate poisoning. In 40 of these cases, no barbiturate was recovered by lavage using 10 L of water. In 86% of cases, less than 100 mg barbiturate was recovered; in only two cases was more than 450 mg recovered. Approximately 2.4 L of fluid were retained by each patient and particles of charcoal added to the lavage fluid were later found in the lungs of those who died. The authors suggested that barbiturate absorption was increased by the procedure because drug was "washed" into the small bowel. In addition, as Matthew *et al.*[12] commented, Harstad *et al.*[27] estimated the amount of barbiturate recovered by an inaccurate analytical method which would give spuriously low readings for barbiturate.

Wright[28] found that in three of six cases lavaged within 4 hours of overdose, more than 200 mg barbiturate were recovered while in six others treated more than 4 hours after overdose, less than 130 mg were retrieved.

The value of gastric lavage was reviewed by Allan[10] in 68 patients poisoned with barbiturates. Fifty-three were unconscious on admission to the hospital and were allocated to one of two groups. Twenty-five of the 53 had taken an overdose within 3 hours of admission (Group 1); the remainder were admitted more than 3 hours after overdose (Group 2). Fifteen patients who were conscious on admission comprised Group 3. In Group 1, a mean of 220 mg of barbiturate were recovered; in Group 2 a mean of 110 mg were recovered, whereas only a mean of 39 mg were recovered in those conscious on admission. Although there were no complications in conscious patients or those who were deeply comatose with absent pharyngeal and laryngeal reflexes, temporary cyanosis occurred in 10 patients, nine of whom developed laryngeal spasm during attempted endotracheal intubation; five patients had evidence of gastric aspiration into the lungs. Observing that in most cases of barbiturate overdose, gastric lavage

removed only small quantities of ingested barbiturate, Allan concluded that routine lavage of unconscious patients should be regarded as potentially dangerous in all cases and of no value in most.

Matthew *et al.*[12] analyzed the lavage specimens (between 2–7 L) of 259 poisoned patients who underwent gastric lavage with a large bore tube (Jacques 30 English gauge). Of the 148 patients who had ingested barbiturates, at least 200 mg of drug were recovered in 17% of cases. Sixty-five patients were lavaged within 4 hours of ingestion and in 37% of these cases, more than 200 mg of barbiturate were recovered, whereas in only one of 65 cases lavaged after 4 hours were more than 200 mg recovered. Overall, the best results for lavage were obtained from deeply unconscious patients, presumably reflecting the fact that unconscious patients were more severely poisoned and, therefore, had ingested more drug.

Salicylate Poisoning. Matthew *et al.*[12] analyzed the lavage specimens of 23 patients with salicylate poisoning. Lavage led to the recovery of more than 1000 mg of salicylate in only 6 of 23 cases.

In another study the value of lavage followed by emesis (with syrup of ipecac) was compared with emesis followed by lavage in children who were thought to have ingested aspirin.[29] Significantly more ($p < 0.01$) salicylate was recovered when emesis was performed prior to lavage though the amount recovered was small in most cases. However, the use of small bore nasogastric tubes limits the applicability to current practice.

Tricyclic Antidepressant Poisoning. In a study of eight patients who were moderately or severely poisoned with a tricyclic antidepressant, a mean of 94 mg (range 6–342 mg) of drug was recovered at lavage at a mean time of 2.5 hours in patients presenting less than 6 hours after overdose.[30]

Unselected Cases of Poisoning. Comstock *et al.*[11] evaluated the efficacy of lavage using a 34 French gauge tube. In patients ingesting short-acting barbiturates (n = 36) and phenobarbital (n = 22), lavage yielded more than 10 therapeutic doses in 6% and 14% of cases, respectively. Lavage yielded more than 10 therapeutic doses of amitriptyline in 5 of 15 patients poisoned with this drug. Overall, in only 10 of 73 patients were more than 10 therapeutic doses of ingested drug recovered. The authors concluded that except in the case of tricyclic antidepressant poisoning and massive overdose, poor recovery of drug was likely if lavage was performed more than 2 hours after overdose.

The value of gastric lavage (30–40 French gauge orogastric tube) was compared in 72 obtunded patients who also received supportive care and activated charcoal with 42 patients who received activated charcoal and supportive care.[14] Gastric lavage and activated charcoal led to an improved clinical course in obtunded patients if lavage was performed and activated charcoal was administered within 60 minutes of ingestion ($p < 0.05$). It should be noted that there were only 16 patients in this group who were treated with lavage and charcoal and only three patients in the comparative activated charcoal group and there was also selection bias. Therefore, conclusions based on these data are limited. One of the lavaged patients developed esophageal perforation and required major surgery.

Pond *et al.*[15] reported a prospective randomized, controlled trial involving 876 patients (a further 124 patients were excluded by defined criteria) more than 13 years of age who had ingested an overdose less than 12 hours previously; 184 of 876 (21%) patients were severely poisoned. All patients received activated charcoal and sorbitol (70%) 200 mL and the treatment groups were well-matched for age, sex, and severity of overdose, though the nonemptying group received activated charcoal earlier (mean 55 minutes) than the gastric emptying group (mean 91 minutes). Obtunded patients (n = 347) either underwent gastric lavage and received activated charcoal and sorbitol (n = 209) or were administered activated charcoal and sorbitol alone (n = 133); five patients defaulted from treatment. No significant difference in outcome between the gastric lavage group and the nonemptied group was observed. The authors concluded that gastric emptying can be omitted from the treatment regimen for adults after acute oral overdose, including those who present within 60 minutes of overdose and those who manifest severe toxicity.

A prospective study to evaluate the efficacy of gastric emptying in symptomatic patients was performed by Merigian *et al.*[13] Eighty-three patients underwent gastric lavage, two patients received lavage and syrup of ipecac, and 82 patients were given syrup of ipecac. All patients received

activated charcoal 50 g after gastric emptying. The patients undergoing gastric emptying were compared to a group of patients who received either activated charcoal 50 g orally (alert patients) or activated charcoal 50 g administered via a nasogastric tube after aspiration of stomach contents. No data are available for each treatment group and there was considerable selection bias. The authors' conclusions that gastric emptying did not alter significantly the length of stay in the emergency department, mean length of time intubated, or mean length of stay in the ICU may therefore not be supportable. The use of gastric lavage and ipecac was associated with a significantly higher occurrence of aspiration pneumonia ($p < 0.0001$) and admission to the ICU ($p < 0.0001$).

INDICATIONS

Experimental studies indicate that the amount of marker removed by gastric lavage is highly variable and diminishes with time. Clinical studies[10–15] have not confirmed the benefit of gastric lavage alone even when it was performed less than 60 minutes after poison ingestion. There are, however, descriptive reports that indicate that gastric lavage occasionally produces impressive returns. Based on experimental and clinical studies, gastric lavage should not be considered unless a patient has ingested a potentially life-threatening amount of a poison and the procedure can be undertaken within 60 minutes of ingestion. Even then, clinical benefit has not been confirmed in controlled studies.

CONTRAINDICATIONS

Gastric lavage is contraindicated if the patient has an unprotected airway, such as in a patient with a depressed level of consciousness without endotracheal intubation. Gastric lavage is also contraindicated if its use increases the risk and severity of aspiration (e.g., a patient who ingests a hydrocarbon with high aspiration potential). Patients who are at risk of hemorrhage or gastrointestinal perforation due to pathology, recent surgery or other medical condition, could be further compromised by the use of gastric lavage.

COMPLICATIONS OF LAVAGE

The potential complications of gastric lavage are well-documented though, in practice, serious sequelae occur only rarely.

Aspiration pneumonia is particularly likely to ensue if petroleum distillates have been ingested or lavage is carried out in a patient with depressed airway protective reflexes without an endotracheal tube *in situ*. However, aspiration has been reported in alert patients even when hydrocarbons were not involved.[12,29,31]

Laryngospasm has been observed[10] particularly when a semiconscious patient has resisted the procedure, either intentionally or as a consequence of the agent ingested. Thompson *et al.*[32] demonstrated in a group of 42 patients that the mean ($\pm$ SD) PaO_2 fell significantly ($p < 0.001$) from 95 $\pm$ 13 to 80 $\pm$ 19 mm Hg during lavage. This fall was significantly greater in conscious than unconscious patients, in smokers than in nonsmokers, and was most marked in male smokers aged 45 years or older. Tension pneumothorax and charcoal empyema have also been described after lavage and the administration of charcoal via an Ewald tube.[33]

In one study of 42 patients,[32] the mean ($\pm$ SD) pulse rate rose significantly ($p < 0.001$) from 92 $\pm$ 19 to 121 $\pm$ 23 bpm. There was a greater rise in the pulse rate in conscious than unconscious patients. Atrial and ventricular ectopic beats were also observed and transient ST elevation developed during lavage in two patients, one of whom had a history of a previous myocardial infarction.

Mechanical injury to the gut is very uncommon though esophageal perforation has been observed rarely.[12,14,33–36] Gastric hemorrhage has also been reported very rarely.

Hypernatremia due to lavage with large quantities of normal saline has been described. Water intoxication has been reported[37] as a result of overzealous lavage, particularly in children.

Small conjunctival hemorrhages are observed commonly and are particularly likely to occur in those who are not fully cooperative with the procedure.

APPENDIX: TECHNIQUE FOR PERFORMING GASTRIC LAVAGE

If lavage is considered appropriate, it is essential that the staff undertaking the procedure should be experienced in its execution to reassure the conscious patient and to reduce the risk of complications. Gastric lavage is not recommended outside a health care facility.

The procedure should be explained to the patient if conscious and not confused and verbal consent obtained. A patient without previous experience of the procedure should be told that a tube will be passed into their stomach so that the poison can be washed out and that although the procedure is uncomfortable, it may lead to a faster recovery. If consent is refused for whatever reason, the procedure should not be attempted, not only because a technical assault will then be committed but also because complications may be more likely.

In case of emesis, and before undertaking lavage, it is essential to ensure that a reliable suction apparatus is available and functioning.

Endotracheal or nasotracheal intubation should precede gastric lavage in the comatose patient without a gag reflex. An oral airway should be placed between the teeth to prevent biting of the endotracheal tube if the patient recovers consciousness or has a convulsion during the procedure.

The patient should be placed in the left lateral/head down position (20° tilt on the table). The length of tube to be inserted is measured and marked before insertion.

A large bore 36–40 French or 30 English gauge tube (external diameter approximately 12–13.3 mm) should be used in adults; and 24–28 French gauge (diameter 7.8–9.3 mm) tube in children. The orogastric tube should be for single-use only. The lavage tube should have a rounded end and be sufficiently firm to be passed into the stomach via the mouth, yet flexible enough not to cause any mucosal damage. The tube should be lubricated with a hydroxyethylcellulose jelly before being passed. A nasogastric tube is of insufficient bore to produce a satisfactory lavage as particulate matter including medicines will not pass; moreover, damage to the nasal mucosa may produce severe epistaxis.

Force should not be used to pass the tube, particularly if the patient is struggling. Once passed, the position of the tube should be checked either by air insufflation, while listening over the stomach, and/or by aspiration with pH testing of the aspirate. Traditionally, an aliquot of this sample has been retained for toxicological analysis though, except in the case of forensic examinations, the majority of laboratories now prefer blood and urine for analysis.

Lavage is carried out using small aliquots of liquid. In an adult, 200–300 mL of preferably warm (38°C) fluid, such as normal saline (0.9%) or water, should be used. In a child, 10 mL/kg body weight of warm normal saline (0.9%) should be given. The volume of lavage fluid returned should approximate to the amount of fluid given. Water should preferably be avoided in young children because of the risk of inducing hyponatremia and water intoxication. Small volumes are used to minimize the risk of gastric contents entering the duodenum during lavage, since the amount of fluid affects the rate of gastric emptying.[38] Warm fluids avoid the risk of hypothermia in the very young and very old and those receiving large volumes of lavage fluid.

Lavage should be continued until the recovered lavage solution is clear of particulate matter. It should be noted that a negative or poor lavage return does not rule out a significant ingestion.

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