SHORT COMMUNICATIONS

STUDIES OF GASTRIC CONTENT: COMPARISON OF TWO METHODS

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SUMMARY

In 20 patients studied under general anaesthesia, we found good agreement between gastric fluid volumes aspirated blindly and total volumes determined by fibreoptic gastroscopy (mean underestimation 6ml (22%); range 0-50ml). Gastric fluid acidity measurements using an electronic pH meter and pH indicator paper also provided results with good agreement (mean difference in pH 0.1; range —0.3 to 0.5). As the use of a standardized blind gastric aspiration technique and pH indicator paper is simpler and provided sufficiently accurate measurements for clinical study purposes, we think this method is preferable. (Br. J. Anaesth. 1993; 70: 360-362)

KEY WORDS


Both the volume of gastric fluid and its acidity are risk factors associated with the development of aspiration pneumonitis. Thus many studies have been carried out to explore the effects of fasting and premedication on gastric content. The majority of these studies have used blind gastric aspiration, although this may significantly underestimate gastric fluid volumes [1, 2]. To measure gastric fluid acidity, both electronic pH meters and pH indicator paper have been used, but the two methods have not been compared in this setting. We therefore studied the agreement between gastric pH values obtained with electronic pH meters and with pH indicator paper, and compared gastric volumes obtained by blind gastric aspiration with those from fibreoptic gastroscopy. The study was performed in the population most frequently studied for effects of various factors on gastric content: non-obese, young and otherwise healthy patients presenting for gynaecological surgery.

METHODS AND RESULTS

After Ethics Committee approval and informed consent, we studied 20 non-obese (< 130 % of ideal body weight), ASA I/II patients undergoing daytime laparoscopic sterilization under general anaesthesia. Patients with known diseases of the upper gastrointestinal tract were excluded. Subjects were aged 29-47 yr and weighed 48-70 kg. After induction of general anaesthesia and tracheal intubation, blind aspiration was carried out in a standard manner. A 18-French gauge multi-orificed and vented Salem Sump tube (Argyle Co., St Louis, Mo.) was advanced orally 60-70 cm past the incisors and correct position confirmed by auscultation or by aspiration of typical gastric content. To facilitate the insertion, the tubes had been stored in a refrigerator and the tip lubricated with lignocaine jelly. The sump tube was withdrawn gradually and rotated with intermittent aspiration using wall suction at a negative pressure not exceeding 50 mm Hg, and the whole procedure repeated once. Immediately after removal of the orogastric tube a flexible fibreoptic endoscope (Olympus GIF 020) was passed to the proximal part of the duodenum. All remaining gastric fluids (Fga) were then aspirated during slow withdrawal and continuous inspection. Total gastric fluid volume (Vtot) was calculated for each patient by adding blindly aspirated volume (Vasp) to Vga. Gastric fluid pH was measured using Merck Neutralite pH 0-10 and special indicator strips for pH 0-2.5, 2.5-4.5 and 4.0-7 (pHpap), discriminating pH values down to 0.2-0.3, and with an Orion Research digital ionalyzer/501 electronic pH meter (relative accuracy ±0.01 pH units) (pHel). Agreement between the different methods was assessed using the statistical methods proposed by Bland and Altman [3].

Correct location of the orogastric tube was confirmed by gastric aspirate in all patients, and no case of “dry aspirate” (Vasp = 0) occurred. Vasp, on average, was associated with a 6-ml (22 %) underestimation of Vtot, and this difference was less than 6 ml in 15 patients. The residual volume (Vgas) found was located in the fundus of the stomach. Vtot and Vasp showed good agreement, with only one patient having an outlying value (fig. 1A). The limits of agreement (mean difference between Vtot and Vasp±2 SD of the difference [3]) between the two methods were 0–30 ml. The 95 % confidence interval (CI) for the upper limit of agreement was 20–40 ml [3]. There was also good agreement between pHel

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and pHpap (fig. 1B), with the limits of agreement being -0.1 to 0.3 (95% CI of the lower and upper limits of agreement, -0.3 to 0.1 and 0.1-0.5, respectively).

COMMENT

Despite the large number of studies of gastric content in non-obese, female patients, this is the first attempt to validate the method of blind gastric aspiration by utilizing fiberoptic gastroscopy. This technique permits fluid aspiration under direct vision, thereby eliminating the uncertainty associated with volume estimations based on blind gastric aspiration, with and without external manipulation of the stomach, and various dilution techniques [1, 4, 5]. Not surprisingly, we found that blindly aspirated and total gastric fluid volumes correlated closely (r = 0.88). Bland and Altman [3] have demonstrated that the use of a correlation coefficient in this context is misleading, however, as it measures only strength of relation and does not provide information about the degree of agreement between two variables. The degree of agreement can be interpreted better by graphically displaying the differences between two methods for each patient vs the mean of these differences ±2 SD [3]. Using this method we found, except for one patient, a very good agreement between blind and gastroscopic-controlled volume measurements. Taylor and colleagues [2] used a gastroscopic technique similar to ours in 10 obese patients and found that, on average, blind aspiration underestimated gastric volume by 15 ml (range 4-23 ml)—corresponding to a mean 53% underestimation. The discrepancy from our results (mean 6 ml (range 0-50 ml)—corresponding to a mean 22% underestimation) may be explained partly by the different patient population studied.

We performed blind gastric aspiration as described elsewhere [1, 2, 5], except that our patients were not turned onto the side or to the Trendelenburg position in an attempt to improve collection of aspirate. Nonetheless, our procedure enabled almost complete emptying of the stomach in the great majority of patients. The endoscopic examination showed that residual fluids were located most frequently in the fundus. This is the lowest part of the stomach pouch in a supine patient, and thus the most difficult portion to access with a semi-rigid tube. One could speculate that this problem may be circumvented by elevation of the upper body during the aspiration procedure, to bring all gastric fluid to the antrum of the stomach. There was no case of "dry aspirate" (gastric volume = 0) in our study, although a frequency as great as 50% has been reported by others [5]. We had no problems in passing the sump tube or asserting proper location in the stomach, even in patients with very small total gastric volumes. This may be explained partly by storage of the tubes in a refrigerator to maintain them semi-rigid. We have shown previously that a totally empty stomach is a very rare occurrence [4], and we propose, therefore, that the frequency of "dry aspirate" should be used for technical quality assurance of studies examining gastric fluid volume. The main disadvantages of using the gastroscopic aspiration technique are financial and logistical. Thus a maximum of three gastroscopic examinations could be performed per week in our study.

A few of the differences in pH values as measured by the two methods were outside the limits of agreement [3]. Numerically, the differences were small and mostly within the technical limits of accuracy of both methods. Thus the results confirmed adequate agreement for both study and clinical purposes. In a recent study [6], the accuracy of interpretation of pH by different anaesthetists was found to be high using the same brand of pH indicator paper used in our study.

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REFERENCES


