procedure. Either tube could stimulate secretion by mechanical irritation of the gastric mucosa – this was how Beaumont sometimes obtained gastric juice from Alexis St Martin's stomach 150 years ago for *in vitro* experiments.³ Similarly, endogenous gastric secretions may be stimulated by insufflation of air during gastroscopy. The latter manipulation may also allow duodenogastric reflux to occur; no comment was made concerning bile-staining or pH value of the additional volume obtained after the initial, blind aspiration. The difference in volumes would have been more convincing if gastroscopy had been performed first in half the patients, and if the initial volume had been returned to the stomach before remeasurement using the alternative technique.

How important is absolute versus readily aspirated volume? Irrespective of the measuring technique, the variation from one patient to another is large. This occurs in patients who fast from midnight, those who ingest fluid 2–3 hr preoperatively, and in those who do or do not take an H₂ receptor blocker or other medication.⁴ Comparisons among large groups using the same sampling techniques are more important than precise measurements because we do not know the precise volume of gastric juice in the stomach required to cause pulmonary acid aspiration syndrome. The often-quoted 25 ml and pH 2.5 was derived by Shirley and Roberts from unpublished rhesus monkey experiments,⁵ and was the "maximum acid aspirate that does not produce significant changes in the lung." That volume was the volume injected into the lungs, not the volume which was in the stomach. This important fact is overlooked by those who claim that 25 ml *in the stomach* represents "high risk for pulmonary aspiration." If regurgitation occurs, does 25 ml gastric contents equal 25 ml in the lungs? It is unlikely that every drop of gastric fluid leaves the stomach, and some pooling may occur in the pharynx. This could explain why although 40 per cent of elective patients are designated "high risk," the incidence of clinically significant pulmonary aspiration is nearer 1 in 10,000 in elective inpatients, and death is extremely rare.⁶

J. Roger Maltby MB BChir, FFARCS FRCPC

Department of Anaesthesia

Eldon A. Shaffer MD FRCPC FACP

Division of Gastroenterology, Department of Medicine
Foothills Hospital at the University of Calgary
1403 29 Street NW
Calgary, Alberta T2N 2T9

REFERENCES

- 1 Taylor WJ, Barry AW. Measuring gastric contents during general anaesthesia: evaluation of blind gastric aspiration. *Can J Anaesth* 1989; 36: 1–4.
- 2 Hardy JF, Plourde G, Lebrun M, Cote C, Dube S, Lepage Y. Determining gastric contents during general anaesthesia: evaluation of two methods. *Can J Anaesth* 1987; 34: 474–7.
- 3 Beaumont W. Experiments and observations on the gastric juice and the physiology of digestion. Plattsburgh 1833: 134–5.
- 4 Maltby JR, Koehli, Ewen A, Shaffer EA. Gastric fluid volume, pH, and emptying in elective patients. Influences of narcotic-atropine premedication, oral fluid, and ranitidine. *Can J Anaesth* 1988; 35: 562–6.
- 5 Roberts RB, Shirley MA. Reducing the risk of aspiration during cesarean section. *Anesth Analg* 1974; 53: 859–68.
- 6 Hardy JF. Large volume gastroesophageal reflux: a rationale for risk reduction in the perioperative period. *Can J Anaesth* 1988; 35: 162–73.

Sir Robert Macintosh

To the Editor:

The recent death of Sir Robert Macintosh reminds us of the contributions of US and UK Universities to Canadian and worldwide anaesthesia. In 1947 Dr. Stewart Cullen, then of Iowa city, demonstrated "balanced anaesthesia" to an astonished group of surgeons at the University of Innsbruck, Tyrol, Austria. One of them, Dr. Bruno Haid, was so impressed that he took up anaesthesia and trained with Dr. Cullen. In 1959, Dr. Haid became the first professor of anaesthesia of an independent department in continental Europe in Innsbruck. Its 30th anniversary was recently celebrated at the 21st Central European Congress in Innsbruck. An impressive Festschrift was published which contained a letter from Dr. Macintosh in which he recounted how he helped to persuade the Government and the University to establish an independent anaesthesia department. One of Professor Macintosh's first assistants in Oxford was Dr. James Parkhouse, who became the first professor of an independent department at the University of Manitoba in 1967. At that time, Dr. Cullen had trained seven Canadians who all stayed in Manitoba, two becoming Heads and one (Dr. John Wade) a Dean.

This letter is written by a native of Innsbruck who trained in London and New York.

Christopher Wolkenstein MB FRCP
Associate Professor of Anaesthesia
University of Manitoba (ret.)