The Risk of Pulmonary Aspiration in Patients After Weight Loss Due to Bariatric Surgery

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BACKGROUND: We conducted a study including patients with gastric banding or gastroplasty who previously underwent plastic or functional surgery to assess the risk of pulmonary aspiration.

METHODS: A retrospective case–control study was performed including all patients undergoing a plastic or functional surgery over a 5-yr period (2000–2005) at Rouen University Hospital. Two groups were defined: the postbariatric group included patients who previously had bariatric surgery (laparoscopic adjustable gastric banding or Mason's vertical gastroplasty) before undergoing the plastic surgery; all other patients were assigned to the control group. Data included all anesthetic management and were recorded in the hospital computer database. The incidence of pulmonary aspiration was the outcome variable.

RESULTS: One hundred ninety-eight plastic and functional operations (66 cases and 132 controls) were performed. Pulmonary aspiration was significantly (P < 0.006) higher in the postbariatric group (4 patients: 6%) than in the nonbariatric group (0 patient). For this complication, all patients had previously undergone gastric banding. One patient who did not receive prokinetic prophylaxis required intensive care for severe pulmonary alteration.

CONCLUSION: The risk of perioperative pulmonary aspiration in a patient after weight loss due to gastric banding was considered significant. (Anesth Analg 2008;107:1257-9)

Obesity is a major health problem throughout the world. Management by dietary restriction is associated with a poor rate of success.¹ Bariatric surgery is increasingly common in morbidly obese patients. Laparoscopic adjustable gastric banding, vertical banded gastroplasty, and other techniques (e.g., Roux-en-Y or biliopancreatic gastric bypass) may decrease excess weight by 50%.² The anesthetic techniques for bariatric surgery are well described.³

It is frequently necessary to remove excess skin after the weight loss produced by bariatric surgery.⁴ Moreover, major changes in gastric anatomy and physiology may occur after bariatric surgery. For example, there is a decrease in esophageal-gastric peristalsis and an impairment of lower esophageal sphincter relaxation.⁴ These changes may increase the risk of esophageal regurgitation and bronchial aspiration during general anesthesia,⁵ increasing the possibility of aspiration pneumonia and long-term pulmonary complications.⁶ To the best of our knowledge, there are no

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guidelines on anesthetic management for patients with major weight loss after surgical gastric banding or a gastroplasty.

The aim of this study was to assess the risk of pulmonary aspiration in patients with major weight loss after gastric banding or gastroplasty.

METHODS

This retrospective study was conducted from 2000 to 2005 at Rouen University Hospital. According to French law and after consultation with Departmental Ethical Committee, this study did not require approval of the Local Ethical Review Committee. Using the hospital database, we reviewed the records for all obese patients who had undergone plastic surgery. All patients who had previous bariatric surgery for morbid obesity were included in the postbariatric group. The control group consisted of obese patients who had not previously undergone bariatric surgery.

The following data were obtained from each patient: age, sex, body mass index (BMI) immediately before plastic surgery, and any comorbid disease. We also calculated the BMI before bariatric surgery in the postbariatric group to indicate the extent of the weight loss. Specific conditions that may predispose patients to pulmonary aspiration were also considered, including gastroesophageal reflux disease, pregnancy, concurrent opioid administration, and diabetes. Preoperative fasting, prokinetic drug

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administration, and conditions of induction and maintenance of general anesthesia were recorded.

Each group was divided into four subgroups according to fasting modalities and protocol for induction of anesthesia:

- 1. Standard induction was defined by sufentanil, hypnotic, muscle relaxant, and normal meal the evening before surgery;
- 2. Standard induction and liquid meal: soup and stewed fruit the evening before surgery;
- 3. Rapid-sequence induction with hypnotic, succinylcholine, and normal meal the evening before surgery; and
- 4. Rapid-sequence induction and a liquid meal the evening before surgery.

All perioperative complications were recorded. Pulmonary aspiration was defined as either the presence of bilious secretions or particulate matter in the tracheobronchial tree on direct examination, or the presence of an infiltrate on postoperative chest radiograph that was not identified by preoperative radiograph.⁷ Tracheal intubation was considered difficult if a trained anesthesiologist required more than two attempts or more than 10 min to successfully place an endotracheal tube.

The primary outcome measure was the incidence of pulmonary aspiration. Statistical analysis of the difference in the incidence of pulmonary aspiration between the two groups was determined using Fisher's exact test. Significance was considered when P < 0.05. The data were expressed as mean \pm SEM.

RESULTS

One hundred ninety-eight plastic surgeries were performed during the study period. There were 52 patients with a medical history of bariatric surgery (postbariatric group), who subsequently underwent 66 general anesthetics for plastic surgery. Surgical treatments for obesity were laparoscopic gastric banding in 28 patients (54%) and Mason's vertical gastroplasty in 24 patients (46%). After bariatric surgery, BMI decreased from 50 ± 6 to 29 ± 4 at the time of the plastic surgery. The mean interval between the procedures was 30 ± 12 months.

The control group consisted of 120 other patients who underwent 132 procedures. Demographic data for the postbariatric and control groups are summarized in Table 1. The postbariatric group included 47 women and 5 men with a mean age 41 ± 7 yr (range, 22–57 yr). The control group included 118 women and 2 men, with a mean age of 37 ± 10 yr and a BMI of 25 ± 3. BMI and the mean age were higher in the postbariatric group (P < 0.05).

The surgical procedures are described in Table 2. No statistically significant difference was found between the groups regarding surgical procedures.

 Table 1.
 Patient Characteristics

	Postbariatric	Control	P
	group	group	value
Female/male	47/5	118/2	< 0.05
Age (yr)	41	37	< 0.05
BMI	29	25	< 0.05
Hemorrhage	1	3	NS
Thromboembolic disease	0	0	NS
Factors predisposing to pulmonary aspiration	12	5	< 0.05
Total procedures	66	132	
PMI — body moos index			

BMI = body mass index

 Table 2.
 Characteristics of Surgery

	Postbariatric group	Control group
Abdominoplasty	39	96
Thighplasty and arm plasty	21	24
Mammoplasty	6	12
Total	66	132

During induction of anesthesia, pulmonary aspiration occurred in four patients (6%) in the postbariatric group. There were no cases of aspiration in the control group. (P < 0.006). The four cases of aspiration occurred in paralyzed patients, and were not associated with difficult intubation. Three of the four patients were observed in the recovery room and discharged without sequelae. One patient developed arterial oxygen desaturation postoperatively for 2 h and required intensive care admission for 24 h, with complete recovery.

Table 3 summarizes the last meal and the induction technique in the postbariatric surgical group and in the nonbariatric group. In the control group, all patients had a normal meal, and a standard induction. There was no association between the type of induction, or the type of meal, and the incidence of aspiration.

Clinical details regarding the four patients who developed pulmonary aspirations are summarized in Table 4. There was no apparent association between any of the risk factors and the incidence of aspiration.

DISCUSSION

The main finding of our study was that patients having bariatric surgery appear to be at higher risk of pulmonary aspiration on induction of anesthesia than obese patients undergoing similar procedures. This frequent incidence (6%) may be real, but it may also reflect increased concern by clinicians about aspiration in obese patients. Data from long-term prospective studies and retrospective reviews report an incidence of significant clinical aspirations as low as 1.5 to 9/10,000 anesthetics for elective general surgery.^{7–9}

	Table 3.	Risk of	Pulmonary	/ Aspiration	by Fas	ting Mo	dalities	and	Induction	of	Anesthesia
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	Gastric banding	Mason's vertical gastroplasty	Pulmonary aspiration
Standard induction, standard last meal $(n = 17)$	12	5	2
Standard induction, liquid last meal $(n = 19)$	7	12	1
Rapid-sequence induction, standard last meal $(n = 7)$	2	5	1
Rapid-sequence induction, liquid last meal $(n = 23)$	13	10	0
Total $(n = 66)$	34	32	5

Table 4	4.	Characteristic	of	Patients w	/ith	Documented	Pulmonary	Aspiration
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Group	Sex	Age	BMI before gastric surgery/before plastic surgery	Delay between surgeries (yr)	GERD	Prokinetic prophylais	Severe complication
Standard induction/ standard meal	F	45	55/29	3.5	_	_	_
Standard induction/ standard meal	F	22	45/30	2	_	—	+
Standard induction/ liquid meal	F	43	53/29	2.2	+	+	_
Rapid-sequence induction/ standard meal	F	43	47/28	3	+	+	_

The risks of pulmonary aspiration may be related to the physiological modifications induced by bariatric surgery. Several studies have suggested that esophageal-gastric peristalsis is altered after gastric banding.^{10,11} Moreover, lower esophageal sphincter relaxation impairment is also reported.^{10,12} After vertical banded gastroplasty, a decrease in basal lower esophageal sphincter pressure and an increase in acid reflux were also observed.¹³

None of the four cases of aspiration resulted in severe pulmonary complications. This low morbidity has several possible explanations. The aspirate in each case was liquid, which is associated with less severe pneumonitis than when the aspirate is composed of solid particles.^{14,15} Most patients had received histamine H2 antagonists, and thus the aspirate was probably not acidic, decreasing injury.^{16,17} Interestingly, pulmonary complications developed only in the patient who had no premedication with H2-antagonists.

In conclusion, the risk of perioperative pulmonary aspiration appears to be increased after bariatric surgery, despite dramatic weight loss. These patients should be considered at risk for pulmonary aspiration and managed accordingly.

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