Sonographic gastric volume and risk factors for full stomach in emergency surgery: an observational study

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Figure 2 : Concordance of clinical and sonographic diagnosis of full stomach

Background and Goal of Study: Perioperative pulmonary aspiration remains a life-threatening complication of emergency anesthesia. Clinical judgment based on risk factors for full stomach drives the choice of rapid sequence induction (RSI). Gastric ultrasounds (US) look promising. The primary goal was to investigate the relationship between clinical risk factors and US gastric volume. Secondary goals were concordance of clinical and US judgments and characterization of patients with undetected full stomach.

Materials and Methods: A prospective observational study was conducted at our University Hospital. Clinical judgment regarding the state of full stomach and 15 risk factors were collected, followed by US measurements of antral cross section area (CSA). A CSA $\geq 3.5\text{cm}^2$ defined a full stomach. Concordance between judgments was tested by Cohen's Kappa.

Results and Discussion: 210 patients were included. No relationship between clinical risk factors and US full stomach was found, except for clinical ileus ($p=0.03$). Concordance between clinical and US judgments was mediocre (Cohen's Kappa: 0.19). Patients with clinically undetected full stomach represented 37% of our cohort, but exhibited no specific risk factor but chronic kidney disease. They benefited from an adequate anesthesia (RSI or regional anesthesia) in only 70% of the cases.

Table 1 : Patients' characteristics considering sonographic full or empty stomach.

		Sonographic full stomach	Sonographic empty stomach	P
		(n=119)	(n=81)	
		n (%) or Median [CI 95]	n (%) or Median [CI 95]	
Demographic data				
Age		50 [39.3 - 54.7]	47 [34 - 55]	0.2
BMI (kg/m2)		23.7 [22.9 - 24.6]	23.2 [22.5 - 24]	0.56
Gender				0.89
	Male	63 (59.2%)	44 (54.3%)	
	Female	56 (47.1%)	37 (45.7%)	
ASA score (1/2/3/4)				0.11
	1	65 (52.1%)	50 (61.7%)	
	2	42 (35.3%)	25 (30.9%)	
	3	14 (11.8%)	6 (7.4%)	
	4	1 (0.8%)	0 (0%)	
Tobacoin		40 (33.6%)	27 (33.3%)	0.99
Type of surgery				0.39
Orthopedics-Trauma		78 (66.7%)	63 (77.8%)	
Visceral (Digestive & Gynecologic)		29 (24.8%)	8 (10%)	
Head and Neck (incl. Neurosurgery)		7 (6%)	5 (6.2%)	
Soft tissues		3 (2.6%)	5 (6.2%)	
Aspiration & Full Stomach Risk Factors				
GERD		23 (18.5%)	7 (8.6%)	0.07
Nause		13 (10.9%)	2 (2.5%)	0.03*
Morphine <4h before induction		27 (22.7%)	25 (30.9%)	0.25
Chronic Kidney Disease		7 (5.9%)	2 (2.5%)	0.32
Diabetes Mellitus		8 (6.7%)	6 (7.4%)	0.99
Nausea		21 (19.6%)	15 (18.8%)	0.99
Vomiting		13 (12.1%)	10 (12.5%)	0.99
Maximal Pain (Visual Analogic Scale)		6 [5.4 - 7]	7 [5 - 7]	0.98
Maximal Stress (Visual Analogic Scale)		5 [4.9 - 6]	5 [3 - 5]	0.17
Fasting Durations				
From last liquid intake to induction		11 [10.2 - 12.4]	12 [10 - 14.3]	0.49
From last solid intake to induction		15 [12.9 - 16.5]	15.9 [12.7 - 17.4]	0.83
Liquid intake <4h before induction		11 (9.6%)	8 (10%)	0.99
Solid intake <4h before induction		4 (3.5%)	2 (2.5%)	0.99
Sonography - Characteristics				
Antral Cross Section Area (cm2)		5.77 [5.04 - 6.3]	2.39 [2.1 - 2.6]	<0.0001*
Ease of sonography (Visual Analogic Scale)		6 [5.5 - 7]	5 [4 - 6]	0.047*
Duration (min)		5 [4 - 5]	5 [5 - 5.9]	0.03*

CI 95 : confidence interval 95%. BMI : Body Mass Index. GERD : Gastro-Esophageal Reflux Disease. * : p < 0.05

Conclusion(s): Studying the second largest cohort described to date concerning gastric US in emergency anesthesia, clinical risk factors seem to fail at predicting full stomach and may lead to inadequate anesthetic strategies. Patients with clinically undetected full stomach do not present a specific risk factors pattern. Those data question clinical judgment regarding full stomach and plead for larger implementation of gastric US in research and practice.

References:

1. Bouvet L. et al. Anaesthesiology. 2011
2. Perlas A. et al. Anesth Analg. 2013