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Original article

Ultrasound assessment of gastric content in elective surgery

Évaluation échographique du contenu gastrique en chirurgie réglée

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Résumé

Objectif : Déterminer la prévalence des patients présentant des signes échographiques d'estomac plein lors d'une intervention chirurgicale à l'hôpital Sominé Dolo de Mopti.

Méthodologie : Étude observationnelle prospective, monocentrique sur une période d'un mois incluant des patients en programme de chirurgie âgés de 18 à 85 ans. Nos données ont été collectées sur des fiches d'enquête individuelles et analysées avec le logiciel Epi info7.

Résultat : Sur un total de 140 patients, 41 patients ont été inclus dans notre étude, soit une fréquence de 29,28 %. L'âge moyen des patients était de 38 ans +/-17. L'indice de masse corporelle moyen était de 23 +/- 4,65. Les femmes prédominaient : 60,98% (n=25) contre 39,02% (n=16) pour les hommes, avec un sex-ratio de 0,6/1. La classification ASA était notée II chez 51,22 % des patients (n=21). L'antre gastrique a été visualisé chez 40 patients, soit une sensibilité échographique de 97,56%, dont sept (07) difficiles à voir et non visualisés chez un patient. Nous avons trouvé une relation entre un IMC élevé et des difficultés à visualiser le contenu gastrique (valeur P = 0,00001), mais aucune relation n'a été trouvée entre l'IMC et le score de Perlas (valeur P = 0,75411). Le score de Perlas était noté à 0 chez 85 % (n=34), un contenu liquidien était retrouvé chez 12,5 % (n=5) des patients tandis qu'un patient avait un contenu solide. Les patients ont observé une durée de jeûne préopératoire estimée en moyenne à 11 heures +/- 2,86.

Conclusion : Malgré la mise en place d'un protocole de jeûne préopératoire, des cas d'estomacs pleins restent à craindre et l'échographie au chevet des patients est un examen simple et rapide pour ajuster au mieux le protocole d'anesthésie.

Mots clés : estomac plein, antre gastrique, échographie, score de Perlas, Mopti.

Abstract

Objective: To determine the prevalence of patients with ultrasound signs of a full stomach during surgery at the Sominé Dolo Hospital in Mopti.

Methodology: Observational study investigated prospective, single-center over a period of one month include patients in surgery program aged 18 to 85 years. Our data was collected on individual survey

sheets and analysed with the Epi info7 software.
Result: Out of a total of 140 patients, 41 patients were included in our study, i.e. a frequency of 29.28%. The mean age of patients was 38 years +/-17. The average body mass index was 23+/- 4.65. Females predominated: 60.98% (n=25) compared to 39.02% (n=16) for males, with a sex ratio of 0.6/1. The ASA classification was rated at II in 51.22% of patients (n=21). The gastric antrum was visualized in 40 patients, i.e. an ultrasound sensitivity of 97.56%, of which seven (07) were difficult to see and not visualized in one patient. We found a relationship between high BMI and difficulty in visualizing gastric contents (P-value = 0.00001), but no relationship was found between BMI and Perlas score (P-Value = 0.75411). The Perlas score was rated at 0 in 85% (n=34), fluid content was found in 12.5% (n=5) of patients while one patient had solid content. Patients observed an estimated preoperative fasting duration of an average of 11 hours +/- 2.86.
Conclusion: Despite the implementation of a preoperative fasting protocol, cases of full stomachs are still to be feared and the ultrasound at the bedside of patients is a simple, quick examination to best adjust the anesthesia protocol.
Keywords: full stomach, gastric antrum, ultrasound, Perlas score, Mopti.

Introduction

The risk of inhalation of gastric contents during anesthesia has always been the dread of anesthesiologists all the time. Bronchial inhalation of gastric contents has been identified as one of the leading causes of anesthesia-related mortality and morbidity in developed countries (1) due to the resulting respiratory damage(2) on which the severity depends the nature, volume and acidity of the suction(3) a potentially serious complication, which causes a fifth of deaths wholly or partially attributable to anaesthesia(4). Trans-abdominal gastric ultrasound at Bedside is a feasible imaging tool to qualitatively and quantitatively assess gastric contents during the perioperative period, it is easy, simple(5), rapid and non-invasive(6), valid, and reproducible(7) as well as easy learning as a result of this Arzola and his colleagues (5)recently studied the learning curves in a group of anesthesiologists practicing the technique in male volunteers, and suggested the amount of training needed to acquire skills in this new skill and the average number of cases required to achieve success rates from 90% and 95% was estimated at 24 and 33, respectively(5). The prevention of the risks of inhalation of gastric contents is based on compliance with the rules of preoperative fasting. A 6-hour fast for solid foods and 2 hours for clear liquids is currently recommended before anesthesia(8). Despite this codifying protocol, it has also been shown that patients do not understand the value of fasting(9), and others said they were willing to lie to avoid postponing surgery(7)(10). Studies have shown that 35-56% of patients have full stomach ultrasound features in non-elective surgery(11) and one in twenty patients in elective surgery (7,22) Also, other medical circumstances associated with gastroparesis (old and poorly balanced diabetes for example) do not allow us to affirm that a patient is “empty stomach”, even after a night of fasting in scheduled surgery(12) . Hence the interest of our study, the main objective of which was to determine the prevalence of patients with ultrasound signs of a full stomach during menstrual surgery. The secondary objectives were to evaluate the risk factors for a full stomach and the influence of the ultrasound diagnosis of a full stomach on the anesthetic strategy planned in the consultation.

Methodology

After obtaining the approval of the Institutional Ethics Committee and informed consent, we conducted this prospective cross-sectional study on patients undergoing scheduled surgery. Our study took place in the anesthesia and intensive care department of the Sominé Dolo Hospital in Mopti, a 2nd reference hospital with a medical-surgical vocation. The patients

were recruited between May 1 and May 31, 2024. Inclusion criteria were: age 18 to 85 years, American Society of Anesthesiologists Class I-III physical condition and ability to understand the protocol and give informed consent, and patients considered fasted for at least six hours for solids, two hours for clear liquids. Exclusion criteria were: pregnancy, a history of upper gastrointestinal disease (including hiatal hernia and gastric tumors), and previous surgical procedures on the esophagus, stomach, or upper abdomen.

An antral ultrasound was performed immediately preoperatively, in the preanesthesia room, by an anesthesiologist-intensive care physician. The ultrasound examination was performed using a SonoSite FUJIFILM M-TURBO ultrasound device equipped with a low-frequency (2 to 5 MHz) HFL38 curvilinear transducer. The patient was positioned in the supine position with the probe placed under the xyphoid process (Figure 1). The gastric antrum was identified in a right sagital or parasagital plane. The anatomical landmarks were the left lobe of the liver anteriorly, the abdominal aorta and the inferior vena cava posteriorly (Figure 2). The ultrasound was validated if the antrum and the inferior vena cava or the aorta were visualized. A qualitative and quantitative evaluation of the gastric contents was carried out. In the absence of solids, the antral area was measured, apart from peristaltic contractions. The antral area was obtained by measuring the cranio-caudal (CC) and anterior-posterior (AP) diameters from serosa, where antral area = (CC x AP x π)/4. The antrum is easily visualized as a flattened ellipse or an anechoic circle, black, surrounded by a wall with several layers of variable echogenicity. In the fasting subject, with an empty stomach, the antrum appears as a more or less flattened structure, with the anterior wall in contact with the posterior wall. The presence of a clear fluid is accompanied by the appearance of an endocavitary lumen (Figure 3)., with hypoechoic antral content surrounded by a distended wall. The presence of solid content is described, immediately after the ingestion of the meal, in the form of hyper-echoic images, including shadow cone-like artifacts, giving a frosted glass appearance that hinders the visualization of deeper structures.

We then determined Perlas' score (13) grouping patients into three categories: Grade 0, 1 and 2 as well as the determination of a gastric contents greater than 340 mm2. A full stomach was defined by the presence of solids or a volume of fluid greater than 340 mm2. The characteristics of the patients (age, sex, height, weight, BMI, ASA), type of surgery, duration of solid and liquid fasting and the performance of the ultrasound were collected. Our data was collected on individual survey sheets and analysed with the Epi info 7 software.

Results

During this one-month period, one hundred and forty (140) patients were admitted to the operating room, among which 41 patients were included in our study, i.e. a frequency of 29.28%. Patients had a mean age of 38 years, +/-17 (25; 54), with extremes of 19 and 82 years, the age group]20-30] was the most represented (Figure 3). The mean patient weight was 60 kg (kg) +/-14.02 (52; 68) for extremes of 38 and 96 kg with a body mass index (BMI) of a mean of 23+/- 4.65 (20; 24). Females predominated: 60.98% (n=25) compared to 39.02% (n=16) for males, with a sex ratio of 0.6/1. The ASA (American Society of Anesthesiologists) classification was rated at II in 51.22% of patients (n=21) and all patients had a Glasgow score of 15/15 (n=41). The majority of patients had no medical-surgical history, i.e. a frequency of 60.98% (n=25), followed however by a history of surgery with 24.39% (n=10). The gastric antrum was visualized in 40 patients, i.e. an ultrasound sensitivity of 97.56%, of which seven (07) were difficult to see and not visualized in one patient. We found a relationship between high BMI and difficulty in visualizing gastric contents with T-TEST of a P-value = 0.00001, however, no relationship was found between BMI and Perlas score. P-Value = 0.75411. The Perlas score was rated at 0 in 85%

(n=34), fluid content with a volume greater than 340 mm2 was found in 12.5% (n=5) of patients (Figure 4) while one (01) patient had solid content. Sonography time averaged 1.2 minutes +/- 0.5 with extremes of 1 to 3 minutes. Urological surgery with 46.34% (n=19) followed by trauma surgery with 26.84% (n=10). The planned anesthetic technique was loco-regional anesthesia (spinal anesthesia) in 75.61% (n=31), the anesthesia technique was changed after visualization of the contents in 7.50% (n=3) of the cases, a planned sedation was converted to general anesthesia and two cases of general anesthesia to ultrasound-guided nerve block. Patients observed an estimated preoperative fasting of an average of 11 hours +/- 2.86 (9; 12) extremes of 6 and 6 p.m.

Figure 1: the tube placed under the xyphoid process

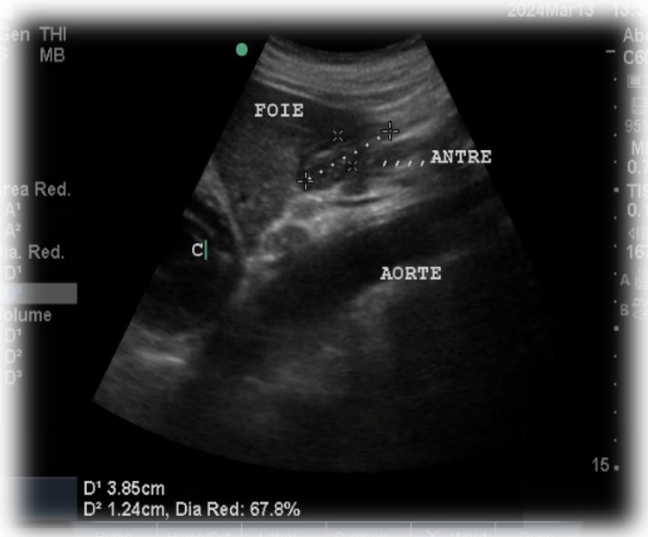

Figure 2: Gastric antrum

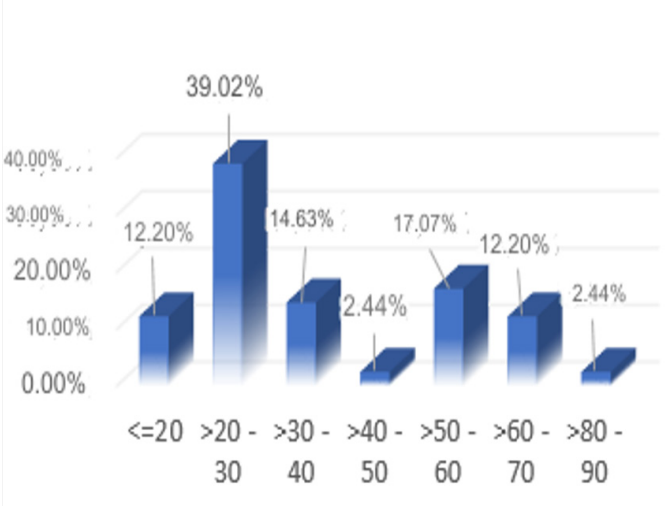

Figure 3: age group

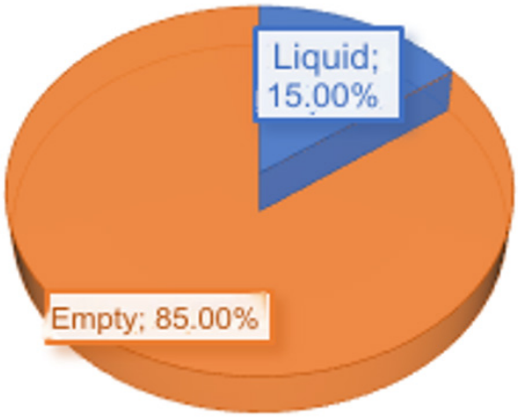

Figure 4: contents of the pyloric antra

Discussion

This work was a cross-sectional study with a prospective survey from May 01, 2024 to May 31, 2024, i.e. a one-month study period on the evaluation of gastric content in surgery regulated at the Sominé Dolo Hospital in Mopti. In our study a total of 41 gastric ultrasound was performed in patients in surgery programs out of a total of 140 patients, female patients, ASA II was in the majority with a sex ratio of 0.6/1, this result reflects the predominance of urological surgery such as vesicovaginal fistula with 46.34% during our study period. We found an average weight of 60 kg (kilograms) +/-14.02 with a body mass index (BMI) of an average of 23+/- 4.65, which is equivalent to the result found in the study by Lionel Bouvet et al(14). In our study, the performance of antral ultrasound led to a change in the anesthesia protocol in 7.50% (n=3), similar data were obtained by S. J. Baettig et al (15)in their studies, theRoutine preoperative gastric ultrasound has led to changes in the management ofanaesthesia in 379/2003 (19%) of patients, the'approach being more liberal in 303/2003 (15%) as well as A-C Gagey et al(16) with a change in anaesthesia protocol observed in 67 patients out of a total of 130 patients of the same Romain Delannoy (17)In his thesis of the 62 patients with full stomachs, 28 (45%) had a change in anesthesia protocol, with the difference that theA-C Gagey et al, which only concerned children in paediatric surgery and the anaesthesia technique, was appropriate in 85% of cases. The pyloric antrum could not be visualized in a patient due to the presence of very high fatty adipose tissue (BMI = 37) leading to an inability of the anesthesiologist to locate the anatomical structure of the same Lionel Bouvet et al (14) in their studies were unable to visualize the antrum pyloric in three patients (due to obesity in two patients and the presence of a significant amount of gas in the stomach in one patient) on the other hand, S. J. Baettig et al. in their studies of the Gastric ultrasound could not be performed in 34 of the 2003 patients (1.7%) for various reasons such as the inability to position the patient correctly due to pain or the inability to locate anatomical landmarks, a percentage difference that could be explained by the small size of our sample and the nature of their studies, which also concerned patients in elective and emergency surgery.The estimated fasting time averaged 11 hours +/- 2.86 (9; 12) the extremes of 06 and 18 hours, which is still much higher than the results of S. J. Baettig et al (15) with a median fasting duration (IQR range) was 16 (12-18 [0-96]) h for the solid meals and 5 (3-10 [0-72]) h for Liquids. Fasting, if the desired effect is to ensure gastric vacuity and thus limit the risks of inhalation, leads to significant physiological changes (metabolic and volumemic) and discomfort for the patient, which are all the more marked the longer it lasts. May lead to a decrease in the body's defense mechanisms, a decrease in the endocrine response to stress and the appearance of insulin resistance. The majority of our patients had a Perlas score of 0 (an empty stomach), however five (05) patients had a fluid content greater than 340 mm2 and one (01) patient had a solid content, they were considered to have a full stomach and we found no risk factors leading to an increase in gastric content,Nevertheless, several factors may be involved in the increase in gastric contents in case of emergency surgery, such as failure to apply preoperative fasting, gastroparesis related to acute pain or preoperative administration of opioids, and gastrointestinal obstruction related to surgical disease.(18,19), The prevalence of a full stomach was 48.1% (25/52) in diabetic patients in the (20) and colleagues and that of Anne Rüggeberg et al(21) Just recently Anahi Perlas et al(22) in their studies concluded that the baseline gastric volume in diabetic patients who have followed standard fasting instructions is no higher than that in non-diabetic patients.

Conclusion

The ancient practice of eating and drinking nothing from midnight the day before a scheduled operation («Nihil per Os», NPO) for any type of surgery must

be questioned, our study rightly demonstrates that despite the implementation of a preoperative fasting protocol, cases of full stomachs are still to be feared and the ultrasound at the bedside of the patients is a simple examination, quick to use to best adjust the anesthesia protocol.

Recommendations: In the light of our study, the application of the preoperative fasting protocol does not protect practitioners from the risk of inhalation of gastric contents in regulated surgery, it would be wiser or even essential to train practitioners in the practice of ultrasound of the gastric antrum in order to integrate it into the anesthetic practice in the operating room, thus allowing the anesthetic protocol to be best adapted to patients.

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