SciForschen
Open HUB for Scientific Research

ISSN 2381-8689

Journal of Gastric Disorders and Therapy

Short Communication Volume: 3.1 Open Access

Evaluation of Gastric Pool in Surgical Patients with Ultrasonographic Technique

Dioscoridi L* and Bechi P

**Department of Surgery and Translational Medicine, Careggi Teaching Hospital, Florence, Italy*

***Corresponding author:** Dioscoridi L, Department of Surgery and Translational Medicine, Careggi Teaching Hospital, Via A Mari 5, 50014, Fiesole (FI), Florence, Italy, Tel: 0039-3334950733; Fax: 0039-0557947399; **E-mail:** dioscoridi.lorenzo@virgilio.it

Received date: 13 Jul 2016; **Accepted date:** 01 Nov 2016; **Published date:** 07 Nov 2016.

Citation: Dioscoridi L, Bechi P (2016) Evaluation of Gastric Pool in Surgical Patients with Ultrasonographic Technique. J Gastric Disord Ther 3(1): doi http://dx.doi.org/10.16966/2381-8689.128

Abstract

Background: The assessment of gastric pool is of crucial importance both post-operatively and in intestinal obstruction. Till nowadays, the evaluation of the presence of persistent gastric pool is obtained by positioning a naso-gastric tube. Considerable gastric pool may be present as occasional finding of some imaging studies (such as traditional X-ray, ultrasound or CT). Gastric pool assessment is very important in surgical patients. Moreover, naso-gastric tube positioning is an invasive procedure and it is often overused. On the contrary, ultrasonography is non-invasive and commonly used in medical wards in order to face a variety of problems.

Aim: The main aim of the study is to evaluate the feasibility of gastric pool assessment by ultrasound.

Materials and Methods: We have set an ultrasound evaluation of gastric pool using two ultrasonographic projections in 10 healthy volunteers and we have verified it in 20 operated patients.

Results: Gastric pool is well visible and can be quantified in all the cases. The method is simple and easily reproducible bed-side.

Discussion: Evidences from the present study suggest the evaluation of gastric pool with this ultrasonographic technique: a non-invasive, repeatable, low-cost and bed-side ultrasound technique.

Conclusions: The gastric pool's assessment using ultrasounds is possible and useful in surgical patients in order to select good indications for naso-gastric tube positioning.

Keywords: Bedside US; Gastric pool evaluation; Surgical patient

Introduction

Gastric Pool (GP) is carefully and constantly evaluated in surgical patients as ratio of the representing peristalsis after operations, of gravity in intestinal occlusion and in case of gastroparesis- for example after the mobilization of duodenum [1]. In the historical literature, gastric suction by means of nasogastric tube (NGT) is recommended in all the patients who present with nausea and/or vomiting due to the above-mentioned causes [1]. Traditionally, the evaluation of the correct position of NGT is performed bedside by a chest X-ray or by water recovery test [2-4]. It often happens that NGT positioning results in an abusive manouvre due to negative results of gastric suction: symptoms such as nausea and vomiting can be also caused by anesthetic and/or antibiotic drugs. Malpositioning of the NGT may produce false negative results and, due to repetitions of the manouvre may result in unbearable invasiveness. On the other hand, ultrasound (US) is becoming more and more important in the everyday clinical practice and a surgical ward without its own US represents an exception [5]. Many operating-room and ward procedures take advantage from US with low costs, no radiations, repeatability and bed-side feasibility. Therefore, although the results of the classical method for GP measurement trough NGT could be considered satisfactory, a less invasive technique is needed in order to define better indications for NGT placement. The aim of our study is to evaluate a non-invasive technique for GP assessment using US. Moreover, bedside feasibility and indications, contraindications and limitations of this method are investigated.

Materials and Methods

The study was performed with a Nemio 20 Toshiba (model CC-15M71-MA, Otawara-Shi, Japan) ultrasonographic machine with convex probe and abdominal preselection. Two probe positions were employed:

1- At 45° to the right in right hypocondrium in order to visualize in standard conditions left liver, epiploon minor and the greater gastric curve.

2- Horizontal in epigastrium in order to evaluate in standard conditions the pancreas, the gastric body and the superior mesenteric vessels.

In standard conditions, the operator can visualize:

1-Left liver, epiploon minor and greater gastric curve

2-Pancreas, gastric body, superior mesenteric vessels

If no GP is present, the stomach is well visible, and although it appears usually shrinked, in standard patients, the different layers of the gastric wall are recognizable. The other anatomical structures are more or less distinguishable depending on patient and on operator. GP was evaluated in 10 healthy patients (5 males, 5 females; mean age: 27; mean BMI: 22 Kg/m^2) immediately after the assumption of known quantities of still water till 600 ml. The US evaluation was performed few seconds after drinking, in supine position, at the value of 0 ml (no GP), 120 ml (not yet GP), 240 ml (low GP), 360 ml (medium GP), 480 ml (high GP), 600 ml (massive GP). The US study lasted from 120 to 180 seconds for each step of measurement. This first part of the study was preliminary in order to confirm the best US set and to verify the feasibility of the study. The

US evaluation was then extended to 20 operated patients complaining of nausea during the postoperative course (12 males, 8 females; mean age: 73; mean BMI: 28 kg/m^2; 10 after anterior rectal resection; 8 after right colectomy; 2 after intermediate colectomy) without giving them any additional amount of water. Both groups of patients (healthy and operated patients) have been informed about the modality and the aim of the study and everyone has signed a proper informed consent. This study has been approved by our ethical review board in order to assure, both in advance and by periodic review and that appropriate steps are taken to protect the rights and welfare of humans participating as subjects in the present study.

Results

The results were identical in all the examined cases. Hereunder, the results in the healthy group are given in order to show the differences in US findings at increasing values of GP and to afford both quantitative and qualitative relevance to the study.

At 0 ml (no GP), the previously described anatomical structures are well recognizable (Figure 1). We consider it as 0 value because we can see all the anatomical structures surrounding the stomach properly.

At 120 ml (not yet GP), the structures are still well distinguishable. In position 1, the water sometimes with small air bubbles is evidenced (Figure 2).

At 240 ml (low GP), in position 1, the water is well seen up to the margin of the left liver and, in position 2, the water is evidenced inside the stomach (Figure 3).

At 360 ml (medium GP), in position 1, the gastric wall is in contact with the margin of the liver that seems to be "pushed to the left" and the gastric content can be easily shown; in position 2, the water inside the stomach covers most part of the pancreas (Figure 4).

At 480 ml (high GP), in position 1, the stomach with the water inside covers partially also the liver; in position 2, the gastric content prevents the visualization of pancreas (Figure 5).

At 600 ml (massive GP), the gastric stretching prevents even the visualization of wall stratification and the liquid mixed with air bubbles is well seen in both positions (Figure 6).

All the 10 healthy volunteers present mild transient nausea at 600ml.

16 of the 20 patients presented medium GP and they were treated only with antiemetic drugs with subsequent symptoms resolution; 2 patients presented a high GP and 1 patient a massive GP and all 4 were treated by NGT positioning. 1 patient had an important bowel distension that cannot permit US performance; we, so, decided to treat him with NGT placement with a 300 ml GP.

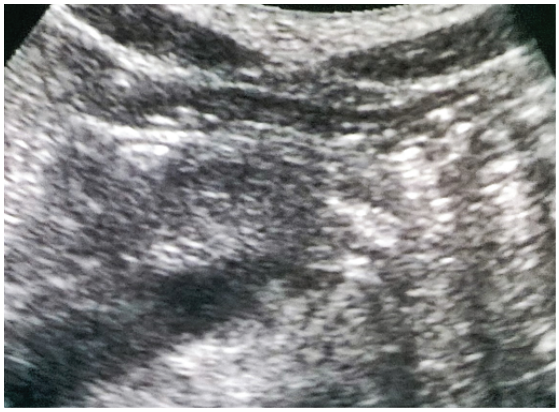

Figure 1: The stomach, without GP, is well seen up to the pancreas in position 2.

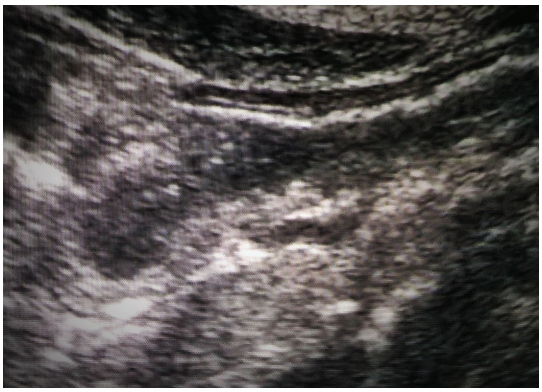

Figure 2: The stomach shows few US artefacts inside and the pancreas is still well recognizable.

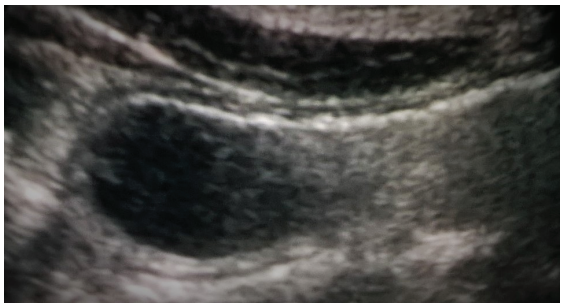

Figure 3: The stomach starts to be loosening from the liquid inside.

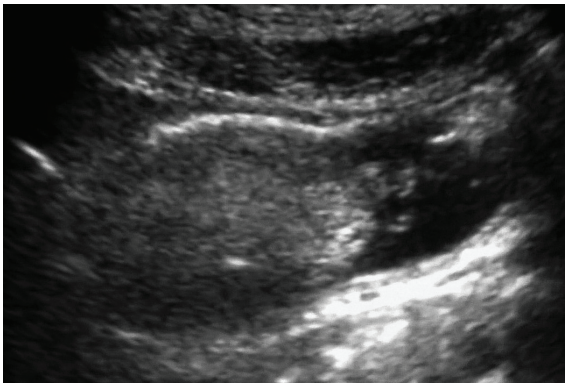

Figure 4: The stomach is much more loosening and the visibility of pancreas is poor because of the US artefacts due to the liquid.

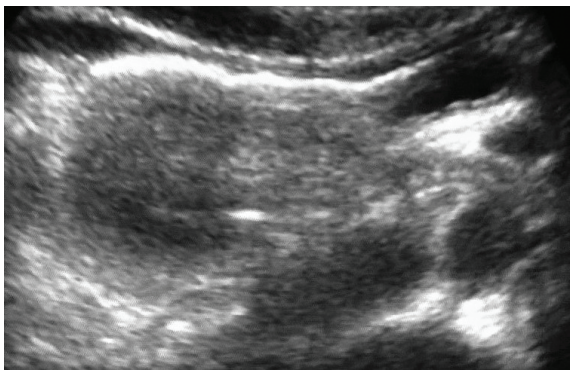

Figure 5: The liquid inside the stomach "pushes to the left" the liver and pancreas is almost not visible.

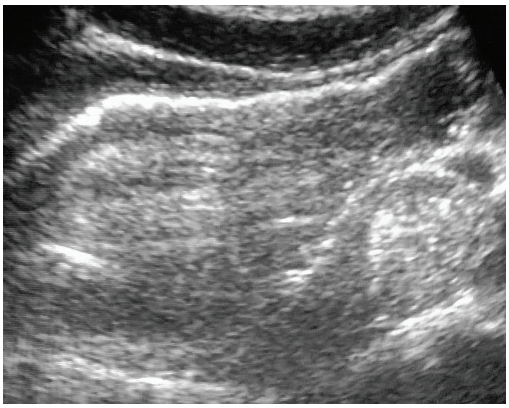

Figure 6: The stomach is so full that any other structure is not visible.

Discussion

GP evaluation is feasible by means of the above described US technique. This allows a delay in NGT positioning. Nausea onset, in fact, can be caused by many factors in postoperative course and NGT positioning is useless in case of symptoms due to drugs (morphine, antibiotics). Moreover, it limits NGT to those patients with US-demonstrated persistent GP and spares to the others an invasive procedure. We, in fact, decided to place the NGT only in patients with high to massive GP.

The main indications to ultrasonographic evaluation are represented by:

- Nausea or vomiting in postoperative course after NGT removal
- Nausea or vomiting in patients without intestinal obstruction
- Accidental removal of NGT in postoperative course
- Postoperative evaluation in patients at high risk for GP (right colectomy, for example)

US criteria that stand for NGT placement are:

- Marginalization of the left liver in position 1
- Drop in or disappearance of the pancreas in position 2
- Liquid visualisation in both positions

When the above mentioned criteria are present all together, NGT positioning is mandatory. These are morphological and qualitative more than quantitative criteria because the US volume calculation with standard method (available for volume evaluation of the urinary bladder) cannot be applied to the stomach. As a matter of fact, the stomach cannot be completely included, especially in surgical patients and in case of massive GP, in a single projection. Moreover, it is not always possible to measure the major diameters of the organ both longitudinally and transversally.

We recommend, for this technique, a preliminary preoperative baseline evaluation in fasten patients, performed by the same operator who will perform the subsequent examinations in order to reduce the variability between patients and operators. Contraindications are the same as for diagnostic US (obese patients, air retention/distension of the bowel). The main limitation is the absence of clinical correlation with US findings. However, it is important to consider that sometimes a medium to high GP could not present with any clinical symptom, but they can lead to massive GP and subsequent vomiting.

Finally, it needs to be underlined that, in the postoperative period, gallbladder loosening, the air inside the bowel and skin medications can partially compromise the US assessment. However, in a low percentage of cases (1 of the 20 operated patients, 5% in our series), they are responsible for unreliable measurements.

References

1. Tympner F, Rosch W (1982) Sonographic measurement of gastric emptying time. Ultraschall Med 3: 15-17.
2. Lewis GP, Janes JO, Datz FL, Nelson JA (1981) Radiographic evaluation of the gastric stapling procedure for obesity in 100 patients. Invest Radiol 16.
3. Maughan RJ, Leiper JB (1996) Methods for the assessment of gastric emptying in humans: an overview. Diabet Med 13: S6-S10.
4. Gilja OH (2007) Ultrasound of the stomach--the EUROSON lecture 2006. Ultraschall Med 28: 32-39.
5. Findlay JM, Prescott RJ, Sircus W (1972) Comparative evaluation of water recovery test and fluoroscopic screening in positioning a nasogastric tube during gastric secretory studies. Br Med J 4: 458-461.