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The Role of Ultrasonography to Estimate Gastric Content in a Case with Aspiration Risk

Aspirasyon Riski Olan Bir Olguda Mide İçeriğinin Tahmininde Ultrasonografinin Rolü

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ABSTRACT

In this case report we present our experience in measuring the gastric volume of a mentally-motor retarded patient for percutaneous endoscopic gastrostomy replacement. The antrum of the stomach was visualized in the subcostal region of the sagittal plane with an ultrasound probe. Anteroposterior, and right-left lateral diameters were measured. Using these measurements, the antrum cross-sectional area and then the gastric volume were calculated. Ultrasonography should be kept in mind as a good alternative approach to evaluate the gastric volume in cases with aspiration risk.

Keywords: *pulmonary aspiration, gastric volume, ultrasonography, antrum cross-sectional area*

ÖZ

Bu olgu sunumunda perkütan endoskopik gastrostomi değişimi için başvuran mental motor retarde hastanın işlem öncesi mide doluluğunu saptamadaki ultrasonografi deneyimimizi sunmayı amaçladık. Ultrasonografi probu ile sagittal planda, subkostal bölgede midenin antrumu görüntülendi. Ön-arka ve sağ-sol yan çapı ölçüldü. Bu ölçümlerden önce antrum yüzey kesit alanı ve sonrasında mide hacmi hesaplanarak gastrik volüm ölçüldü. Aspirasyon riskli olgularda mide hacmini değerlendirmede ultrasonografi iyi bir alternatif yaklaşım olarak akılda tutulmalıdır.

Anahtar kelimeler: *pulmoner aspirasyon, gastrik hacim, ultrasonografi, antrum yüzey kesit alanı*

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INTRODUCTION

Pulmonary aspiration was one of the most debated and fearful issues for anesthesiologists after a 15-year-old girl had died because of aspiration following chloroform anesthesia used for nail surgery 150 years ago. One of the important complications of anesthesia is pulmonary aspiration of gastric contents which may result in morbidity or mortality. The risk of aspiration risk can be evaluated according to patient's fasting times [1]. Many different methods have been used to estimate gastric emptying and all have advantages and disadvantages. In recent years, by using ultrasonography more frequently in clinical practice, it has become easier to detect gastric fullness.

By reducing the volume and acidity of gastric contents, the risk of morbidity and mortality decreases. Preoperative fasting guidelines are prepared in this perspective which are reliable for elective, healthy patients. However these guidelines may be insufficient for emergency cases and patients with comorbidities [2,3].

Hypoglycemia and hypovolemia caused by long periods of fasting are causes of concern in specific cases. Therefore, it is important to know gastric fullness both in order to avoid the risk of aspiration and complications of long-term fasting. Also this helps to avoid unnecessary delays, cancellations and airway maneuvers [2,4].

In this study, we aimed to present our experience of ultrasonography to determine gastric fullness before the procedure in a 33-year-old, 27 kg, 121 cm, mentally-motor retarded patient scheduled for percutaneous endoscopic gastrostomy (PEG) replacement.

CASE PRESENTATION

The patient was followed with the diagnosis of cerebral palsy due to birth hypoxia and was fed through percutaneous endoscopic gastrostomy (PEG) tube. He was admitted to gastroenterology clinic for PEG replacement. The patient was fed with formula which was discontinued 6 hours before the replacement.

Since the patient was mentally retarded, it was learned from her relatives that long-term fasting agitated the patient. After informed consent was obtained from the relatives of the patient, ultrasonographic examination was performed. The patient was placed in the right lateral decubitus (RLD) position. The antrum of the stomach was visualized in the subcostal region of the sagittal plane with the curvilinear low frequency (C 1-5) ultrasound probe of GE Logiq S7 (General Electric Healthcare, Little Chalfont, United Kingdom). Anteroposterior (2.29 cm), and right-left lateral diameters (2.20 cm) were measured (Figure 1). The antrum cross-sectional area (CSA) and then the gastric volume were calculated using the method described by Perlas et al. [5] and the gastric volume was measured as 42 mL. The patient was premedicated with 1 mg midazolam and taken to the endoscopy unit, and 40 mL clear liquid was aspirated endoscopically (Figure 2). A total of 50 mg of propofol together with 20 mcg of fentanyl was administered during the procedure. The procedure was completed without any problem and then the patient was taken to the recovery unit.

Figure 1. Ultrasonographic view

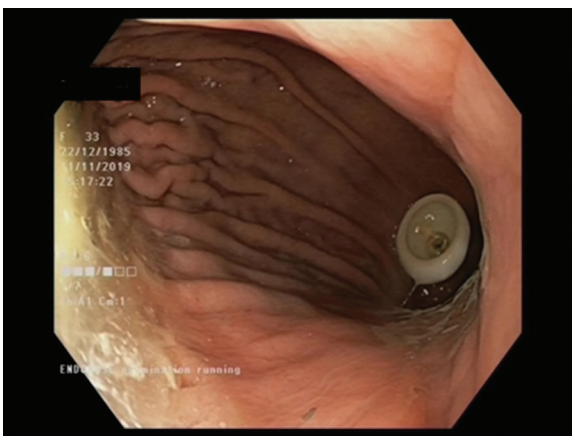

Figure 2. Endoscopic view

DISCUSSION

Although the ultrasonography has been used in anesthesia practice, the preoperative evaluation of stomach content is still based on patient's own expression. Regarding the serious consequences of aspiration, a cautious approach is often recommended when the risk is uncertain. Common strategies include postponing or canceling the operation in elective cases, and applying airway manipulations such as rapid sequential induction in urgent cases. But, rapid sequential induction may be troublesome for patients whose surgery cannot be postponed. In confronting this dilemma, it seems reasonable to use gastric ultrasound as a way of objectively assessing the risk of aspiration [4,5].

The purpose of gastric ultrasound is to visualize the antrum of the stomach and measure CSA. Recommended method is applied as follows; in the right lateral decubitus position, a low-frequency (2-5 MHz) probe is placed on the subcostal region in front of the pancreas adjacent to the liver, while the superior mesenteric artery and aorta are visualized, images are taken between the peristaltic contractions [4,5].

The antrum can be measured directly by measuring the anteroposterior (AP) and craniocaudal (CC) diameters of the antrum to calculate the cross-sectional area with the aid of the ultrasound device.

$$CSA = AP \times CC \times \pi 4$$

The total gastric volume is estimated using the following formula and is called the predicted volume:

$$Volume\ mL = 27 + 14{,}6 \times RLD\ CSA - 1{,}28 \times AGE$$

Perlas et al. [5] have suggested that this formula can be used to estimate gastric volumes between 0 and 500 mL in non-pregnant adults with a body mass index below 40, and although there is no definite value for increased aspiration risk, it is believed that this calculation is reliable for volumes up to 1.5 mL kg^{-1}. The exact value of the volume of stomach content can be determined by aspiration. This is called the observed volume [4]. Although Perlas et al. [5] excludes this calculation in pediatric cases, we evaluated the volume measured by ultrasonography and the endoscopically aspirated volume very close.

A three-point rating system is used for the assessment of aspiration risk If the antrum appears empty in both the supine and the right lateral decubitus positions, it is classified as 'grade 0'. This indicates that the stomach does not contain any fluid or contains minimum fluid. In RLD if the calculated volume is below 1.5 mL kg^{-1}, it is classified as 'grade 1'. If it is above 1.5 mL kg^{-1}, it is classified as 'grade 2'. Grades 0 and 1 indicate low risk, and grade 2 indicates high risk [4,5]. We calculated the volume by ultrasonography (42 mL) and evaluated this as a boundary value. Since both the patient and his family did not want to increase his long-term hunger anxiety, we decided to start the procedure.

CONCLUSION

As a result, we evaluated gastric volume correctly with ultrasonography as we predicted, and aspiration did not occur. Although our patient was in the adult age group, she was more similar to the pediatric age group in terms of her general appearance, height, weight and cognitive status. Although there are accepted studies to evaluate gastric volume in adults, it is limited in the pediatric age group. However, we think that ultrasonography is a good alternative approach for evaluating gastric volume. We believe that large-scale studies should be done in this perspective.

Conflict of Interest: None
Informed Consent: Yes

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