

EVALUATION OF GASTRIC EMPTYING IN REFLUX DISEASE AND DUODENAL ULCER PATIENTS

D. Dobrev, B. Kornovski, T. Traev*, Sht. Shterev, A. Klisarova,
G. Tranulov**, K. Ivanov**

*Department of General and Operative Surgery, *Department of Endocrinology and Gastroenterology and **Department of Roentgenology and Radiology, Medical University of Varna, Varna*

Thirty healthy volunteers, 77 hiatus hernia and reflux disease patients as well as 26 duodenal ulcer ones were studied by means of echographic planimetry and volumetry of antrum and corpus ventriculi and gamma camera as well in order to evaluate the gastric emptying before and after surgery. The mean semi-emptying antral time after esophagocruroplasty plus frontal semi-fundoplication was determined as 9,5 min whereas after Nissen fundoplication it reached the rate of 19,2 min (range 8-32 min; $p < 0,001$). The latter was related to a higher incidence rate of postoperative stomach bloating complaints with the Nissen patients. Ultrasound measurements of gastric emptying were of comparable sensitivity to scintigraphy in quantifying the fluid bolus evacuation.

Key-words: Gastroesophageal reflux, gastric emptying, ultrasonography, scintigraphy, Nissen fundoplication

The role of a regular and effective gastric emptying for a better outcome in surgically treated patients with symptomatic gastroesophageal reflux (GER) is widely discussed but it still remains controversial (1,2,5,7,11). GER due to gastric outlet obstruction is well-known and correctable by treating the gastric disorder (2,7). Functional antral motility disturbances act as an important factor together with the insufficiency of the lower esophageal sphinc-

ter and the depressed esophageal clearance in the development of GER (8). Antral emptying (AE) can successfully be examined by means of scintigraphic measurement or ultrasonographic assessment of antral area (6). At present, scintigraphy is the most preferred method for measuring AE, and it remains the gold standard (3,10). Ultrasound volume scanning could also determine gastric wall movements and reliably measure AE (9,11).

Address for correspondence:

D. Dobrev, Dept. of General and Operative Surgery, Medical University, 55 Marin Drinov St, BG-9002 Varna, BULGARIA

E-mail: dobromirdobrev@netscape.net

MATERIAL AND METHODS

Real time Doppler ultrasonography of the gastric antrum was per-

formed in 30 healthy volunteers (17 male and 13 female subjects, mean age 27, 8 years, range 21-35 years) as well as in 47 hiatus hernia (HH) and GER patients and 19 duodenal ulcer (DU) patients without a present pyloric obstruction before surgery. A total of 77 HH and GER patients and 26 ulcer disease patients were postoperatively studied. A floppy Nissen fundoplication (NF) was applied to 42 HH and GER patients, the other 35 were treated by modified esophagocruroplasty (ECP) plus frontal semifundoplication (SF) using a previously described technique (1,7). In all the 26 ulcer patients surgical treatment consisted of pylorus preserving super selective vagotomy (SSV) (Table 1). All subjects ingested 500 ml standard fluid bolus before the examination (beef-vegetable soup with 75 Kcal energetic value) and were observed in a sitting position (11). The technique of sonographic measurement of AE included sagittal antral planimetry followed by 2-dimensional antral volume determination by means of a built in calliper and calculation program. We used an ultrasound TOSHIBA CCA-340A Doppler with a 3,5-5 MHz sector transducer and automatic switch-over speed regimen. Following an overnight fasting period antral area measurements were taken in 5, 10, 15, 20 and 30 min after food ingestion. The measurements were continued in these intervals until 50 % had left the stomach (T50). T50 was defined

as the time when antral area decreased to half its maximum.

In addition, a scintigraphic isotope gastric test was postoperatively carried out in 30 HH and GER patients (15 NF and 15 ECP patients). Amount of 500 ml Tc99m-MMA fluid macro-aggregate per os ingested suspension was used with 2 mCi (74 MBq) activity while the gamma camera was set on dynamic regimen (DIACAM SIEMENS with loop 64/64 matrix collimator). The scanning technique included measurement of the total stomach in sagittal antero-posterior projection with the subject seated with their back against the gamma camera. Radionuclide data were acquired at a rate of 16 frames in every 2 min until at least 90 % of the drink had emptied, or for a maximum period of 60 min. A region of interest was drawn around the total stomach and gastric emptying curves representing the percentage of retained counts were derived. T50 was also calculated.

RESULTS AND DISCUSSION

The mean antral semi-emptying time estimated sonographically was 15,7 min with the healthy volunteers. We found a mean T50 of 23,5 min resulting from the sagittal planimetry and 17,5 mins mean T50 of the volume AE (range 8-20 min). The data of the post-operative sonographic investigation of AE after antireflux surgery showed a

Table 1

Surgical procedures in hiatur hernia GER and ulcer disease

Diagnosis	Pre-surgical patients	Post-surgical patients	Surgical procedures / patients	
HH and GER	47	77	ECP and SF - 35	NF - 42
DU	19	26	SSV - 26	

significantly delayed AE in the patients with NF in comparison with those operated on according to our modified surgical technique (mean T50 time of 19,2 min and of 9,5 min, respectively; $p < 0,001$). In the patients with clinically clearly expressed gas-bloat syndrome the antral T50 varied in the range from 14 to 40 min. Three GER patients had radiologically and endoscopically proved recurrent reflux. The ultrasound study showed a delayed AE in all of them with a mean T50 of 24, 24, and 25,5 min, respectively. In duodenal ulcer patients the mean T50 time was determined as 15,5 min before surgery and as 21,4 min after SSV with the patients classified with Visick I excellent results which we can assess as acceptable and logical due to the postvagotomy action

on stomach motor function. However, in the patients experienced postprandial fullness and meteorism the emptying time rates varied from 14 to 32 min while in one patient with clinically manifested dumping syndrome T50 was reduced to 4 min.

The scintigraphic measurement of gastric emptying established normal rates in 14 of 15 ECP patients (93,33 %) and in 9 of 15 NF patients (60 %) (Table 2) The other patients showed delayed T50 rates according to the obtained 60 min follow-up curves of isotope colloid disappearance from the stomach. All of them demonstrated some postprandial stomach distress reactions such as epigastric pain or fullness, gas-bloating, early satiation, meteorism, etc (1).

Table 2

Sonographic and scintigraphic determination of gastric emptying

	AE sonography (T50)				Postoperative stomach scintigraphy (T50)	
	Sagittal planimetry (T50)		AE (t50)		normal	delayed
controls	15,7 min		17,5 min			
	Pre-surgical	Post-surgical	Pre-surgical	Post-surgical		
HH and GER	23,5 min	SF-9,5 min NF-19,2 min	7,5 min	SF-8,3 min NF-16,8 min	ECP + SF	14 (93,33 %) 1 (6,67 %)
DU	15,25 min	SSV-21,14 min	5 min	10,63	NF	9 (60 %) 6 (40 %)

Our results confirm that ultrasound measurements of AE are of comparable sensitivity to scintigraphy in quantifying fluid bolus evacuation. Doppler ultrasonography permits evaluation of antral wall motor motion and correlates with the feeling of postprandial satiation that is very important to receive a better outcome in antireflux surgery (1,2,6). Real-time ultrasound can be used to assess AE and has major advantages over other techniques in that it is non-invasive, does not entail radiation, and is widely available (4,6,9,11).

Furthermore, we can recommend the ultrasound measurement of AE and volume as a routine screening diagnostic procedure in order to define stomach motor abnormalities responsible for postoperative patients' dyspepsia from those having recurrent GER. In a previous study we have showed that ECP may be followed by a higher recurrent GER rate but it provides a much better functional outcome after antireflux surgery as compared with the NF results (7). The latter is repeatedly confirmed with the present study.

REFERENCES

1. Добрев, Д., Б. Корновски, Щ. Щерев, К. Иванов. *Изв. Съюза на учените-Варна*, 1996, № 2, 9-13.- 2. Dobrev, D., B. Kornovski, B. Manevska. *Biomed. Rev.*, **8**, 1997, 101-109.- 3. Fried, M. *Dig. Dis. Sci.*, **39**, 1994, 114-115.- 4. Hausken, T., S. Odegaard, K. Matre, A. Berstad. *Gastroenterology*, **102**, 1992, 1583-1590.- 5. Hinder, R. A., H. J. Stein, C. G. Bremner, T. R. DeMeester. *Ann. Surg.*, **210**, 1989, 458-465.- 6. Hveem, K., K. L. Jones, B. E. Chatterton, M. Horovitz. *Gut*, **38**, 1996, 816-821.- 7. Kornovski, B., D. Dobrev, S. Shterev. *Scr. Sci. Med.*, **29**, Suppl. 3, 1997, 75-81.- 8. Ogorek, C., S. Cohen. *Gastroenterol. Clin. North Amer.*, **18**, 1989, 275-292.- 9. Ricci, R., I. Bontempo, E. Corazziari, A. La Bella, A. Torsoli. *Gut*, **34**, 1993, 173-176.- 10. Scott, A. M., J. E. Kellow, B. Shuter, H. Cowan, A. M. Corbett, J. W. Riley. *Dig. Dis. Sci.*, **38**, 1993, 2247-2254.- 11. Traev, T., D. Dobrev, K. Ivanov, B. Kornovski. *Scr. Sci. Med.*, **28**, 1991, Suppl. 1, 61-62.

Оценка на стомашната евакуация при болни с рефлуксна болест и дуоденална язва

Д. Добрев, Б. Корновски, Т. Траев*, А. Клисарова, Г. Транулов**,
Щ. Щерев, К. Иванов**

*Катедра по обща и оперативна хирургия, *Катедра по ендокринология и гастроентерология и **Катедра по рентгенология и радиология,
Медицински университет-Варна*

Резюме: Изследван бе мотилитетът на хранопровода и стомаха посредством ехографска планиметрия и волуметрия на антрума и корпуса на стомаха със стандартен хранителен болус, както и с гама-камерна сцинтиграфия при общо 30 здрави индивиди, 77 пациенти с хиатални хернии и рефлуксна болест на хранопровода и 26 - с дуоденална язва. Резултатите показаха сигнификантно забавена стомашна евакуация при пациентите с фундопликация по Нисан спрямо тези с непълна фундопликация и езофагокруропластика. Средното време на полуизпразване при пациентите от първата група възлезе на 19,2 min спрямо 9,5 min (между 8 и 32 min; $p < 0,001$) при тези от втората. Това се свързва с по-честите следоперативни нарушения в хранопроводния транзит при болните с фундопликация по Нисан. Ултразвуковите изследвания на изпразването на стомаха са със съпоставима чувствителност спрямо сцинтиграфията при количествената оценка на хранопроводния транзит.