

**Motility T97-T104**

**T97**

**A PROSPECTIVE STUDY OF OESOPHAGEAL FUNCTION IN PATIENTS WITH NORMAL CORONARY ANGIOGRAMS AND CONTROLS WITH ANGINA.**

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There have been few prospective reports of oesophageal function testing on patients with normal coronary angiograms, and almost none comparing the incidence of abnormalities in patients with angina. In a prospective observational study design the incidence of oesophageal abnormalities, and their correlation with chest pain in patients with normal coronary angiograms (61 patients, Group A) were compared against controls with angina (25 patients, Group B). Simultaneous contractions were significantly more common (6.7% vs 0.8%,  $p < 0.01$ ), and the mean duration of peristaltic contractions was longer (2.9 s vs 2.4 s,  $p < 0.01$ ) in Group A than in Group B. There were no differences between the groups in the amplitude of peristalsis, and none had nutcracker oesophagus. 10 (20%) patients in Group A, and none in Group B had diffuse spasm ( $p < 0.05$ ). 21 (34%) patients in Group A, and five (20%) in Group B had abnormal gastrooesophageal reflux (total percentage reflux time  $\geq 5.5\%$ ) ( $p > 0.05$ ). There was no significant difference between Groups A and B in the number of patients whose pain was temporally related to pH events, 27 (44%) vs nine (36%) patients ( $p > 0.05$ ). No particular chest pain characteristics, nor the presence of additional oesophageal symptoms were predictive of an oesophageal abnormality. In conclusion, oesophageal function tests commonly implicate the oesophagus as a source of pain in patients with normal coronary angiograms. With the exception of a lower incidence of simultaneous contractions during manometry, however, the incidence of abnormalities and in particular the correlation of pH events with chest pain are as common in patients with normal coronary angiograms as in controls with angina.

**T99**

**VECTOR VOLUME ANALYSIS OF THE LOWER OESOPHAGEAL SPHINCTER IN ACHALASIA BEFORE AND AFTER TREATMENT**

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The effect of balloon dilatation of the lower oesophageal sphincter (LOS) in achalasia cardia may be assessed by a dysphagia score, radiologically or by measuring mean LOS pressure manometrically. We have used vector volume (VV) analysis which constructs a 3-dimensional (3D) pressure profile of the LOS. VV analysis was performed with a multi-lumen manometry catheter with 8 side-reading ports arranged radially 1cm from the catheter tip. The catheter was withdrawn through the LOS at a rate of  $\frac{1}{2}$ cm per second by a continuous pull-through technique. An integrated hardware/software package (Gastrosoft and Synectics Inc, Irving, Texas) generated a 3D pressure profile, vector volume (cm<sup>3</sup>) and symmetry index. A symmetry index of 1 indicates complete symmetry (ie a circle) and 0 is complete asymmetry. Fourteen VV studies (6 pre and 8 post treatment) in 8 patients (5 men) were performed. Mean vector volumes pre and post dilatation fell from 168.7 to 73.1 cm<sup>3</sup> respectively. 3D pressure profiles demonstrated that balloon dilatation resulted in asymmetric disruption of the LOS with the symmetry index falling from 0.83 to 0.72. This may be due to the semicircular orientation of muscle fibres in the region of the LOS. Resolution of dysphagia was seen in patients with a reduction of pressure to 15mmHg or below in at least two quadrants of the LOS. VV analysis may be a useful tool in the assessment of patients with achalasia and post dilatation results may help to predict the longterm outcome of treatment.

**T98**

**OESOPHAGEAL ACID AND BILE REFLUX CORRELATE WELL: NO RELATIONSHIP TO ALKALINE pH.** REK Marshall, A Angginsah, WA Owen, WJ Owen. Dept. of Surgery, Guy's Hospital, London SE1 9RT, U.K.

**Introduction.** The role of duodenal contents in the pathogenesis of gastro-oesophageal reflux disease (GORD) is not fully understood. Until recently oesophageal 'alkaline reflux' on pH monitoring has been taken to imply duodenogastrooesophageal reflux. However, using Bilitec 2000, it is now possible to detect the presence of duodenal contents in the oesophagus on an ambulatory basis and explore the relationship between pH and bile reflux.

**Methods.** 28 patients presenting routinely to this department for further investigation of GORD underwent static manometry, followed by combined dual channel (gastric and oesophageal) pH and Bilitec monitoring. The oesophageal pH sensor and bile probe were placed 5cm above the manometrically defined lower oesophageal sphincter. Total, upright and supine periods were analysed for pH <4, pH >7 and bilirubin absorbance >0.14.

**Results.** 15 (54%) of the 28 patients had significant acid reflux and 13 (46%) did not. 'All patients', those 'with acid reflux' and those 'without acid reflux' were analysed separately.

	% total time pH<4 median (range)	% total time pH>7 median (range)	% total time bilirubin absorbance>0.14 median (range)
All patients n=28	4.4 (0.1-24.8)	9.3 (0.8-78.6)	4.7 (0-67.3)
Acid reflux n=15	7.5 (4.1-24.8)	7.4 (0.8-34.1)	5.8 (0-67.3)
Noacid reflux n=13	0.8 (0.1-4.0)	19.8 (1.8-76.8)	0.9 (0-39.7)

Statistical analysis revealed a significant correlation between acid reflux and bile reflux in all three groups ('all patients'  $p < 0.05$ , 'acid reflux' group  $p < 0.05$ , 'no acid reflux' group  $p < 0.01$  Spearman rank correlation). In the 'all patients' group and in the 'acid reflux' group there was a significant correlation between acid and bile reflux in the supine period ( $p < 0.002$ ,  $p < 0.05$  respectively). There was no correlation between bile and alkaline reflux in any period in any group ( $p > 0.05$ ).

**Conclusions.** The majority of patients with reflux symptoms have significant oesophageal acid reflux, although some do not. Bile reflux is increased in patients with acid reflux and the two correlate well. Isolated bile reflux in this group was rare (occurring in only 1 patient). The term 'alkaline reflux' is a misnomer: it does not imply the presence of duodenal contents in the oesophagus.

**T100**

**GASTRO-OESOPHAGEAL REFLUX POST CHOLECYSTECTOMY: IS IT REDUCED BY THE LAPAROSCOPIC APPROACH?**

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Gastro-oesophageal reflux is increased following cholecystectomy. While laparoscopic surgery minimises metabolic and mechanical complications, no study has examined its effect on gastro-oesophageal reflux. This study compared the effect of open and laparoscopic cholecystectomy on gastro-oesophageal reflux.

**Method:** We prospectively studied patients scheduled for cholecystectomy who provided informed consent. Cholecystectomy was performed at open operation early in the study, but almost exclusively by laparoscopic technique latterly. 24hour pH studies and manometry were performed pre-operatively and repeated at 3 months post-operatively. Upper GI endoscopy was performed and biopsies were taken. Pathological acid reflux was defined as a DeMeester acid score of 15.0 or greater.

**Results:** Fifty patients were studied pre- and post-operatively; 28 had open cholecystectomy and 22 had laparoscopic cholecystectomy. The DeMeester acid scores increased in both groups. Decrease in mean sphincter pressure in both groups was not significant.

	Pre-op mean(SEM)	Post-op mean(SEM)	p
Acid score (open)	14.75(12.6)	34.0(34.7)	*0.006
Acid score(laparoscopic)	13.88(11.6)	28.9(19.4)	*0.001
Sphincter pressure(open)	16.35(4.4)	15.57(5.6)	ns
Sphincter pressure (laparoscopic)	12.0(2.39)	10.76(3.9)	ns

(Wilcoxon signed rank test)

**Conclusion:** Gastro-oesophageal reflux and oesophagitis increased within 3 months of surgery in both study groups. Despite being less invasive, laparoscopic cholecystectomy did not influence the degree of oesophageal dysfunction. The cause remains to be established.

## T101

**CORTICAL SWALLOWING PATHWAYS ARE MODULATED BY SITE SPECIFIC PHARYNGO-OESOPHAGEAL SENSATION IN MAN**

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**Background:** Whilst animal data indicate that sensation from the swallowing tract facilitates central swallowing pathways, little data exist on these interactions in intact man. **Aims:** To determine the effects of human pharyngo-oesophageal sensory stimulation on the cortico-fugal pathways to the pharynx and oesophagus. **Methods:** Seven healthy volunteers were studied, 4 male, age range 22-44 yrs. Two sets of bipolar ring electrodes, a recording pair and a stimulation pair, were positioned in the pharynx and in the striated muscle of the upper oesophagus. Swallow muscle EMG responses to diffuse suprathreshold magneto-electric stimulation of the cerebral cortex were then recorded; (i) at rest; and (ii) during continuous repetitive electrical stimulation of either the pharynx or the oesophagus, at varying frequencies between 0.2 and 10Hz, using intensities that produced definite sensation. **Results:** (i) *Cortical stimulation alone:* always evoked responses in the pharynx and oesophagus, with mean latencies of  $8.4 \pm 0.3$  and  $10.0 \pm 0.3$  msec respectively. (ii) *Pharyngeal stimulation:* at high frequencies (5-10Hz), facilitated both the cortically evoked pharyngeal and oesophageal responses, pharyngeal latencies shortening to  $7.2 \pm 0.1$  msec,  $p < 0.03$ , and oesophageal latencies shortening to  $8.9 \pm 0.3$  msec,  $p < 0.02$ . However, at lower frequencies (0.2-2Hz), only the oesophageal responses were facilitated,  $p < 0.03$ . *Oesophageal stimulation:* had no effect on the pharyngeal responses at any frequency,  $p = 0.7$ , but facilitated the oesophageal responses at a frequency of 5 Hz, the latency shortening to  $9.1 \pm 0.4$  msec,  $p < 0.02$ . **Conclusions:** Sensation from the swallowing tract has site and pattern specific modulatory effects on cortically initiated swallowing. Our results indicate that sensory feedback plays an important role in the control of swallowing, a finding which may aid the development of treatment strategies for dysphagic gastrointestinal patients.

## T103

**NITRIC OXIDE AND ABNORMAL GALLBLADDER FUNCTION - DO GUT HORMONES HAVE A ROLE?**

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We have previously shown that infusions of nitric oxide (NO) donors (nitroglycerine (NG) and sodium nitroprusside (SNP)) impair postprandial gallbladder emptying in man (1). It is unclear whether this is a direct effect upon the gallbladder smooth muscle or whether it is a consequence of cholecystokinin (CCK) and gastrin (G) release.

Postprandial gallbladder emptying (GE) was measured ultrasonically on separate occasions in 6 healthy volunteers during infusions of normal saline (P; 3ml/minute); NG, median dose 60 mg/kg/min and SNP, 1 mg/kg/min; hydralazine (H, 200 mg/min) as a hypotensive control agent and the NO synthase inhibitor L-NMMA (L; 3mg/kg over 20 minutes). NG, SNP and H were infused in doses sufficient to reduce systolic blood pressure by 10%; L significantly increased blood pressure. Infusion was started one hour before and maintained for 90 minutes after ingestion of a fatty meal (two eggs omelette). Gallbladder volumes were serially measured by ultrasound. CCK and gastrin were measured by radioimmunoassay.

Ejection fraction (EF) of over 85% was achieved at 90 minutes during infusions with P, L and H. Both NO donors impaired postprandial GE with EF of only 50% at 90 minutes. Integrated CCK and G release were calculated by area under the curve with graphic software Graphpad Prism Version 1.03.

	Infusates				
	P	NG	SNP	H	L
CCK (ng/L)±SE	237±36	245±28	214±44	264±36	260±51
Gastrin (ng/L)±S	978±10	1071±192	1138±17	1235±6	922±10
E	9		4	6	7

ANOVA; p=not significant.

Pharmacological doses of NO donors do not affect postprandial release of CCK and gastrin. Therefore the impairment of postprandial GE observed is most likely due to direct relaxation of gallbladder smooth muscle.

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## T102

**PROSTACYCLIN CONTRIBUTES TO THE IMPAIRED GALLBLADDER MOTILITY IN GALLSTONE DISEASE. RRS# Greaves<sup>1</sup>, LJD O'Donnell<sup>2</sup>, MJG Farthing<sup>1</sup>, Digestive Diseases Research Centre, St.Bartholomew's and the Royal London School of Medicine and Dentistry, London, UK<sup>1</sup>, and Mayo General Hospital, Castlebar, Ireland<sup>2</sup>.**

Indomethacin, a cyclo-oxygenase inhibitor, is known to have different effects on gallbladder contractility in normal and diseased human gallbladders *in vivo*. We investigated the basis for this differential effect by comparing the effects of prostaglandins PGE<sub>2</sub>, PGF<sub>2α</sub>, the thromboxane A<sub>2</sub> mimetic U46619, and cholecystokinin-octapeptide (CCK-8) on *in vitro* contractility in human gallbladders obtained from patients undergoing cholecystectomy for gallstones, and in gallbladders free from gallstones obtained from patients undergoing incidental gallbladder resections as part of major abdominal surgery.

**Methods:** Isometric tension was measured in gallbladder muscle strips mounted in organ baths containing gassed Krebs solution at 37°C in the presence of indomethacin 3µM. EC<sub>50</sub> (the concentration of agonist which produced 50% of the maximum contraction) was calculated for each agonist.

**Results:** In both normal (n=10) and diseased gallbladders (n=8) CCK-8 produced the strongest maximum contractions. Prostaglandins were, however, active at lower concentrations such that the rank order of potency in normal gallbladders was PGE<sub>2</sub> > U46619 > CCK > PGF<sub>2α</sub> (EC<sub>50</sub> values [SEM]: 43nM [16], 56nM [13], 154nM [42] and 1.8µM[0.5]) and in diseased gallbladders was U46619 > PGE<sub>2</sub> > CCK > PGF<sub>2α</sub> (and 13nM [1], 30nM [9], 231nM[45] and 1µM [0.3]). The EC<sub>50</sub> for U46619 was significantly lower in diseased gallbladders compared to normal gallbladders (p=0.0385). Although prostacyclin produced no relaxation in normal strips pre-contracted with CCK-8 (300nM), it produced concentration-dependent relaxation in diseased CCK-8 pre-contracted strips by a maximum of 79±6% of control, reaching significance at concentrations of 0.3nM upwards.

**Conclusions:** PGE<sub>2</sub>, PGF<sub>2α</sub> and U46619 are potent contractile agents in normal and diseased gallbladders, whereas prostacyclin relaxes only gallbladders containing gallstones. As inflamed gallbladders are known to produce large amounts of prostacyclin, this prostacyclin-induced relaxation may be an important determinant of the impaired gallbladder motility in gallstone disease.

## T104

**PROLONGED AMBULANT MANOMETRY FROM THE UNPREPARED HUMAN LEFT COLON - A NEW TECHNIQUE TO AVOID CATHETER DISPLACEMENT. J Rogers, SM Scott, \*MJ Benson, \*AH Raimundo & \*DL Wingate. Academic Surgical and GI Science Research Units, St Bartholomew's and The Royal London School of Medicine and Dentistry, London.**

Colonic phasic motor activity exhibits marked diurnal variation and occurs infrequently. It is recognised that prolonged recordings are a pre-requisite for accurate quantification of this activity. Previous prolonged studies have been limited in that either the colon has been "cleaned" prior to insertion of the manometric catheter, rendering the subsequent data unphysiological, or that the catheter is displaced aborally by the faecal stream during the study period with the result that the precise location of the pressure sensors within the colon and their spatial separation is unknown. We describe a new technique to overcome these methodological problems.

Left colonic phasic motor activity was recorded in 9 healthy volunteers (8M, 1F; age 21 - 33 ys) using a flexible catheter incorporating 6 micro-pressure transducers spaced over a 30 cm 'test' segment. A short loop of thread (< 2 cm) was attached to the tip of the catheter. This was grasped in an endoscopic clipping device (Olympus) that had been passed down the biopsy channel of a flexible sigmoidoscope. The scope/catheter assembly was passed into the anorectum and advanced until the most distal sensor was located in the anal canal. The clip was deployed onto a mucosal fold, securing the catheter by the thread to the bowel wall. No subject received a laxative/enema prior to, or a sedative during, positioning of the catheter. A portable recorder (Synectics) was used for data acquisition. Throughout the study period, subjects were freely ambulant, and food was allowed *ad libitum*.

The median recording period was 24 h (range: 7.5 - 25.5 h). The catheter was removed electively in 5/9 by application of gentle traction to the catheter. In 4/9, the catheter was expelled during defaecation. There were no adverse events reported. The predominant phasic activity was single, mainly non-propagated, contractions (20 - 80 mmHg) occurring at all but the most distal recording loci. Three different morphological bursts of phasic activity (3 - 6 cm) occurred: (i) clusters (1 - 3 min duration), (ii) rectal motor complexes (5 - 15 min duration), (iii) prolonged phasic bursts (25 - 60 min), although this was observed to last up to 240 min in 4/9 subjects. Over 95% of this activity was non-propagated. Overall, phasic activity was greatest on waking and after food.

This new technique allows catheters to be safely and reliably attached to wall of the left colon for prolonged periods. The lack of colonic preparation ± sedation minimises non-physiological data. The absence of aboral catheter migration will permit detailed analysis of temporo-spatial relationships of phasic activity. We believe this technique will permit a better understanding of left colonic motor activity in both health and disease states.