will be needed to confirm and investigate the significance of these findings.

Competing interests None declared.

Neurogastroenterology and motility free papers

OC-089 TRANSIENT HIATUS HERNIA DURING TRANSIENT LOWER OESOPHAGEAL SPHINCTER RELAXATIONS

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Introduction In hiatus hernia there is proximal displacement of the gastro-oesophageal junction (GOJ) relative to the crural diaphragm impairing barrier function. Fluoroscopic studies have indicated proximal migration of the GOJ during TLOSRS but detailed study has been limited by radiation exposure. Using a non-radiological technique we have performed detailed examination of the GOJ during TLOSRS in healthy volunteers.

Methods In twelve subjects, a small magnet (2×1 mm) was endoscopically clipped to the GOJ and the combined assembly of Hall Effect probe and 36 channel high resolution manometer (Sierra Scientific Inc., USA) was passed nasally. After a 600-calorie test meal (Fortisip, Nurticia, UK), the subjects were studied for 90 min.

Results There was a median of 5 TLOSRS from each of the 12 volunteers. The median (range) amplitude and duration of GOJ migration from start to end of TLOSRS was 4.34 cm (1.6–8.8) and 23.63s (11.3–41.6) respectively. The proximal migration of GOJ during a TLOSRS was characterised by a slow start (phase A) before accelerating (phase B) to peak amplitude. Descent of GOJ started off quickly (phase C) before slowing down (phase D) to baseline. These four different phases of movement are confirmed using mathematical modelling. The polynomial equation (1) and its differential (2) allow the calculation of maximum rate achievable for the four different phases using Microsoft Excel 2010 software:

$$y = ax^6 + bx^5 + cx^4 + dx^3 + ex^2 + fx \quad (1)$$

$$dy/dx = 6ax^5 + 5bx^4 + 4cx^3 + 3dx^2 + 2ex + f \quad (2)$$

where y is amplitude (cm), dy/dx is the differential of y, x is time (s) and a to f are non-linear regression constants. The median (range) velocity of phase C was 0.92 cm/s (0.33–2.35) and this was faster when compared to phase B 0.67 cm/s (0.23–1.73), phase D 0.36 cm/s (0.06–0.99) and phase A 0.30 cm/s (0.03–2.31) respectively; $p < 0.0001$. Phase C velocity was strongly correlated with amplitude of GOJ migration with a correlation coefficient of 0.84 ($p = 0.0001$) but not the other three phases. None of the phases correlated with duration of GOJ migration during TLOSRS.

Conclusion The marked proximal movement of GOJ during TLOSRS represents transient and very severe herniation of the GOJ. Our study also suggests that the initial return of the GOJ to the diaphragmatic hiatus following TLOSRS may be controlled by elastic recoil of the phreno-oesophageal ligament.

Competing interests None declared.

OC-090 DIFFERENT EFFECTS OF FODMAP (FERMENTABLE OLIGO-, DI-, AND MONO-SACCHARIDES, AND POLYOLS) COMPONENTS ON SMALL BOWEL WATER CONTENT: AN MRI STUDY

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Introduction A randomised placebo controlled trial (RCT) has shown that FODMAPs exacerbate irritable bowel syndrome (IBS) symptoms in selected patients. FODMAPs are heterogeneous chemically, the major components being fructose and fructans. Both are poorly absorbed in the small bowel but fructose exerts a much greater osmotic effect than fructans which are fructose polymers. Whether this alters the overall impact is unknown. This study aims to test the hypotheses that (a) fructose will increase small bowel water content (SBWC) more than fructans; (b) adding glucose to fructose will reduce its effect, and (c) fructans will exert most of their effect as a result of colonic fermentation.

Methods 4-way, randomised, single blind, crossover study. 16 healthy volunteers underwent abdominal scans in a 1.5T MRI scanner after an overnight fast. They were then fed 500 ml of water containing 40 g glucose, fructose, fructan or 40 g glucose plus 40 g fructose and underwent scanning and breath H_2 measurement and completed bowel symptom questionnaires at hourly intervals for 5 h. SBWC was measured from heavily T2 weighted magnetic resonance scans. 1-way analysis of variance was used.

Results (Mean±SEM) All drinks were well tolerated with only minor symptoms of gas, bloating, abdominal pain and diarrhoea reported. Relative to glucose, fructose increased SBWC significantly (184 ± 35 ml vs 118 ± 24 ml glucose, $p = 0.001$), while fructans had little effect ($SBWC = 119 \pm 23$ ml, $p = 0.7$ vs glucose). Adding 40 g glucose to 40 g fructose decreased SBWC (145 ± 27 ml, but the difference was not significant, $p = 0.08$ vs fructose). Breath H_2 was initially higher for fructose than the other three solutions. (AUC was 8959 ± 1880 ppm.min) with fructans having the largest AUC at 14987 ± 2568 ppm.min). Values returned to baseline for fructose over the 5 h study, but increased to a maximum for fructan after 300 min. Glucose had no effect on breath H_2 concentration, but adding an equivalent amount to fructose significantly reduced breath H_2 relative to fructose alone ($p = 0.0006$).

Conclusion FODMAPs exert a variety of GI responses. Fructose but not fructans increases SBWC relative to glucose. Both fructose and fructans are malabsorbed as confirmed by breath H_2 measurements. Fructose malabsorption is significantly reduced by addition of glucose. These different gastrointestinal responses can be readily identified using our non-invasive MRI techniques.

Competing interests None declared.

OC-091 ONDANSETRON SLOWS TRANSIT AND IMPROVES STOOL CONSISTENCY IN PATIENTS WITH DIARRHOEA PREDOMINANT IRRITABLE BOWEL SYNDROME

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Introduction 5-Hydroxytryptamine three receptor antagonists (5HT3RA) are effective in diarrhoea predominant irritable bowel syndrome (IBS-D), with a number needed to treat (NNT) for

Alosetron of 7.¹ Due to safety concerns (constipation [25%] and ischaemic colitis [0.1%]) Alosetron is not licensed in the UK. Ondansetron (OND) is a 5HT₃ RA, widely and safely used for nausea, with constipation as a side effect.

Methods We recruited 125 patients meeting the Rome III criteria from primary and secondary care to a two centre randomised, double-blind, placebo-controlled, crossover trial. Screening comprised of blood tests, rectal biopsy and a 1-week baseline Bristol stool form diary before randomisation to placebo (PLA) or OND for 5 weeks. Efficacy was optimised by dose titration during weeks 1–3 starting at 4 mg daily, increasing (max 8 mg three times a day) or decreasing as required. A 2-week washout preceded 5 weeks of the opposite therapy to that received in treatment 1. Symptom diaries including stool form, frequency, pain, bloating and urgency were completed daily. Transit using the Metcalf method was measured after each treatment period.² The primary endpoint was the difference in average stool form between baseline and the last 2 weeks of each treatment. Stool consistency “responders” were defined as experiencing >50% reduction in the days/week with stool form 6 or 7. Analysis is presented by intention to treat.

Results 80 women and 28 men completed the study (mean age 40.8, range 18–72, and 41.5, range 25–60). The mode dose of OND was <4 mg a day. Stool form improved significantly in the OND arm, mean change 1.4 (95% CI 1.2 to 1.6), vs 0.5 (95% CI 0.3 to 0.7) compared to PLA, $p < 0.0001$. Stool frequency improved on OND, mean 0.86 (95% CI 0.8 to 1.4), vs 0.44 (95% CI 0.4 to 0.89) on PLA, $p < 0.01$, as did urgency score 0.6 (95% CI 0.8 to 0.4) vs 0.3 (95% CI 0.5 to 0.2) $p < 0.001$. There were no significant improvements in pain or bloating. 74% of patients preferred OND while 26% preferred PLA or had no preference, $\chi^2 p < 0.0001$. 70% were “stool consistency responders” while taking OND compared with 33% taking PLA giving a NNT of 2.7. Whole gut transit slowed significantly while taking OND, 25 (13.5–47.5) h compared to 16 (7–29) h with PLA $p < 0.001$. 9% receiving OND complained of constipation compared to 2% on PLA, all but one responded to dose reduction alone. 2% withdrew because of constipation. There was no case of ischaemic colitis.

Conclusion Using dose titration Ondansetron acts to slow whole gut transit and is highly effective in IBS-D with a low incidence of constipation.

Competing interests None declared.

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OC-092 CONTRALESIONAL APPLICATION OF THE NOVEL BRAIN STIMULATION INTERVENTION TRANSCRANIAL DIRECT CURRENT STIMULATION (TDCS) RESTORES BRAIN AND SWALLOWING FUNCTION IN THE HUMAN PHARYNGEAL MOTOR CORTEX

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Introduction Recovery of swallowing function in unilateral dysphagic stroke patients is associated with increased pharyngeal motor cortex excitability of the unlesioned hemisphere. “Virtual-lesioning” the human pharyngeal motor cortex transiently disrupts swallowing neurophysiological and behavioural function for up to 45 min. During this window of opportunity we trialled the effects of contralesional tDCS, a novel non-invasive brain stimulation technology, on “virtual-lesion” induced brain and behavioural changes to swallowing function.

Methods In 15 healthy volunteers (eight males, 21–61 years old) hemispheric lateralisation and cortical excitability of pharyngeal and hand motor cortex were mapped using Transcranial Magnetic Stimulation via an intraluminal catheter with electromyography and pressure sensors. Volunteers then received a “virtual-lesion” to the strongest pharyngeal projection and were randomised to either 10 min of 1.5mA Anodal tDCS (Active) or Sham to the unlesioned hemisphere on separate days. In *Experiment 1*, effects of tDCS on cortical excitability were compared to baseline over 60 min. In *Experiment 2*, swallowing behavioural measurements using a swallowing reaction time task were used to calculate a time window for challenge swallows. Swallowing behaviour was assessed for 60 min after tDCS and compared to baseline. Data were compared using repeated measures ANOVA.

Results *Experiment 1*; compared to sham, active tDCS abolished the inhibitory effects of the “virtual-lesion” bilaterally ($p = 0.017$) with a maximum increase in excitability from baseline of 34% in the unlesioned hemisphere (Abstract OC-092 figure 1). No significant changes were observed in the hand. *Experiment 2*; compared to sham, active tDCS significantly improved challenge swallow performance ($p = 0.025$) with a maximal improvement of 174%.

Abstract OC-092 Figure 1 Experiment 1—Changes in pharyngeal excitability.

Conclusion Contralesional tDCS reverses the neurophysiological and behavioural consequences of a “virtual-lesion” in healthy individuals and has therapeutic potential for dysphagia rehabilitation.

Competing interests None declared.

OC-093 AEROPHAGIA DURING MEALS AND POSTPRANDIAL GAS-CONTAINING REFLUX IN PATIENTS WITH GORD NOT RESPONDING TO PPI

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Introduction A significant number of GORD patients (30%) continue to perceive symptoms despite PPI therapy. Impedance-pH studies have shown that proximal extent of reflux and presence of gas in the refluxate are the only parameters associated with symptoms