**SMALL INTESTINAL ABSORPTION OF MINERALS DURING ENTERAL FEEDING SUPPLEMENTED WITH SOY POLYSACCHARIDES**

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Fibre supplemented polymeric enteral diets are currently being prescribed widely in the UK. There is no evidence that mineral absorption may be adversely affected by the addition of fibre to the normal diet. As a result, this patient study was carried out to quantitate and compare small intestinal absorption of the minerals Ca, Zn, Mg, Fe, Cu, and P during continuous intragastric infusion of: 1) polymeric enteral diet (PD) (6.3gP/l; 1xCa/ml), or 2) polymeric enteral diet (6.3gP/l; 1xCa/ml), supplemented with a soy polysaccharide (20g/l) fibre source (PDSP).

Thirteen normal subjects (PDSP n = 7, PD n = 6) were intubated with a multilumen tube, the distal end being positioned just proximal to the caecum. A 20 cm segment of terminal ileum was infused at 1ml/min with normal saline containing a non absorbable marker (0.5Cu/l 10P/ml), in order to quantitate steady state colonic inflows of minerals during continuous (7 h) intragastric infusion (82 ml/hr) of enteral diet. Total small intestinal absorption values (% of infused load ± SEM measured by flame photometry) for PD and PDSP respectively were: Ca 82.7 ± 2.18 vs 94.1 ± 1.09; Zn 60 ± 9.14 vs 83.5 ± 4.6; Mg 70.2 ± 2.77 vs 93.6 ± 1.85; Fe 65.3 ± 5.2 vs 67.5 ± 6.3; Cu 18.9 ± 8.9 vs 62.7 ± 3.2; P 90.9 ± 3.6 vs 97.5 ± 0.29 (% ± SE of 0.03)

These data show that the addition of 20g/l soy polysaccharides to polymeric enteral diet has no adverse effect on the absorption of Fe,Cu or P but significantly increases the absorption of Ca, Zn, and Mg.

Constitution and incontinence

**LONG TERM RESULTS OF POSTANAL REPAIR FOR IDIOPATHIC FAecal INCONTINENCE**


The long term results of postanal repair for idiopathic faecal incontinence are satisfactory but data on long term outcome is lacking. This study was carried out to document the short and long term results and to determine whether pre-operative tests predict outcome.

**Method:** 56 patients (55 F, mean age 57yrs) with idiopathic faecal incontinence were operated on by one surgeon between Sept 1985 and March 1991. Patients had resting (RP) and voluntary contraction (VCP) anal pressures and pudendal nerve terminal motor latencies (PNTML) measured pre-operatively. Symptoms were evaluated at 6 months after operation and again at a mean of 32 months (range, 6 - 72) in all 56 patients. Symptoms were classified as: Group A, no improvement or worse; Group B, minor improvement; Group C, marked improvement. 14 patients were available for post-operative physiology.

**Results:** At 6 months there were 6 (17%) patients in Group A, 12 (33%) in Group B and 18 (50%) in Group C. At final follow up there were 17 (47%) in Group A, 9 (25) in Group B and 10 (28%) in Group C. There were no significant differences in the pre-operative tests between the 3 groups at 6 months. Comparison of the pre-operative data in the final outcome groups showed (mean ± SEM): Group A vs Groups B & C: RP: 41 ± 12 cmH2O vs 24 ± 8 (P=0.2), VCP: 12 ± 3 vs 27 ± 7 (P=0.07), PNTML 3.3 ± 0.44 ms vs 3.16 ± 0.4 (P = 0.8). Mean differences between post-anal results were: RP 39 ± 9 cmH2O (P=0.09), VCP 26 ± 10 (P=0.22), PNTML -0.2 ± 0.5 ms (P=0.2). In 10 of the 14 patients tested the RP and VCP was increased postoperatively.

**Conclusion:** At 6 months 83% of patients had obtained some benefit from postanal repair but only 53% maintained this improvement with only 28% markedly better. There was a trend towards a more favourable outcome in patients with greater squeeze pressures pre-operatively but other tests were not of long term predictive value.

**ALTERATIONS IN ENZYME ACTIVITIES FOLLOWING CHRONIC LOW-FREQUENCY ELECTRICAL STIMULATION OF HUMAN GRACILIS MUSCLE**

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Chronic low-frequency electrical stimulation (LFES) of fast-twitch, fatiguable skeletal muscle has been shown in experimental animals to result in transformation into a slow twitch, fatigue-resistant muscle. This principle has been applied to the gracilis sling procedure for the treatment of patients with faecal incontinence in an attempt to achieve the fatigue-resistance appropriate for sphincteric function. This study aimed to determine whether the metabolic activity of the human gracilis muscle may be modified by LFES.

Muscle biopsies were taken from 5 patients undergoing the gracilis neosphincter procedure before and after a period (7-16 weeks) of LFES (2-10 Hz). Succinate dehydrogenase (SDH) and lactate dehydrogenase (LDH) activities were assayed using a photometric technique. The results are expressed as the mean (SD) of 4 separate determinations on each biopsy.

<table>
<thead>
<tr>
<th>Patient</th>
<th>Pre LFES</th>
<th>Post LFES</th>
<th>Pre LFES</th>
<th>Post LFES</th>
</tr>
</thead>
<tbody>
<tr>
<td>SDH µmolDCP/min/mg prot</td>
<td>1.49 (0.11)</td>
<td>1.79 (0.09)</td>
<td>0.60 (0.04)</td>
<td>0.64 (0.03)</td>
</tr>
<tr>
<td>2</td>
<td>0.09 (0.01)</td>
<td>0.51 (0.04)</td>
<td>0.26 (0.02)</td>
<td>0.27 (0.02)</td>
</tr>
<tr>
<td>3</td>
<td>0.73 (0.03)</td>
<td>1.10 (0.04)</td>
<td>0.67 (0.08)</td>
<td>0.48 (0.03)</td>
</tr>
<tr>
<td>4</td>
<td>0.29 (0.02)</td>
<td>0.32 (0.01)</td>
<td>0.70 (0.08)</td>
<td>0.81 (0.10)</td>
</tr>
<tr>
<td>5</td>
<td>0.67 (0.03)</td>
<td>0.86 (0.11)</td>
<td>0.66 (0.01)</td>
<td>0.56 (0.02)</td>
</tr>
</tbody>
</table>

These results indicate a significant increase (p=0.02, paired T test) in SDH activity but no significant overall change in LDH activity. This is consistent with a shift from predominantly anaerobic to aerobic metabolism, which would be expected to accompany an improvement in fatigue-resistance. The results also demonstrate the wide inter-patient variability in enzyme activities which has previously been reported.

This study demonstrates that the metabolic activity of the human gracilis muscle is modified by LFES.

**DEMONSTRATION OF NEUROPEPTIDES IN THE INTERNAL ANAL SPHINCR IN HEALTH AND FAecal INCONTINENCE**


Neuropeptides are important in control of intestinal motility and might play a central role in disease states. Little is known of their role in the normal internal anal sphincter (IAS) and whether abnormalities exist in incontinence.

**Method:** IAS from 16 women with IFF (mean age 58yrs, 26-83) undergoing post-anal repair and 12 cancer controls (age 61yrs, 51-74) were fixed in 4% paraformaldehyde. Cryostat sections (10µm) were incubated with primary antisera for 15 hrs. Rabbit antisera to vasoactive intestinal peptide (VIP), neuropeptide -Y (NPY), galanin, calcitonin -gene related peptide (CGRP), substance -P and peptide histidine isoleucine (PHI) were used. Sections were then incubated in goat-anti-rabbit fluorescein isothiocyanate (FITC)-conjugated 2° antisera. Sections were examined with a Zeiss microscope equipped for viewing fluorescence.

**Results:** Tissues obtained smooth muscle and some adjacent submucosa, but no longitudinal layer or myenteric plexus. Immunoreactivity was typically seen in nerve fibres between muscle bundles and in the submucosa. Generally the innervation was sparse with a greater density of innervation by VIP than of NPY or galanin, less PHI and very few CGRP or substance-P-immunoreactive fibres. In sections from incontinent patients the distribution of peptides was the same and there was no significant difference in the amount of immunoreactivity.

**Conclusion:** There is no alteration in the density or distribution of neuropeptide immunoreactivity in idiopathic incontinence. In both controls and patients there is a greater distribution of VIP and galanin containing nerve fibres than PHI, CGRP or substance-P immunoreactive fibres.
ANAL BIOFEEDBACK VS. RELAXATION TREATMENT OF CONSTIPATION WITH ANIMUS. G.K. Turner, P.G. Ritvo, J. Woolnough Dept. of Medicine and Psychology, Dalhousie University, Halifax, Canada

Anal or pelvic floor dysesthesia are terms to describe constipated patients who contract their anal sphincters on attempted defecation thus making rectal emptying impossible. We saw 50 female patients (pts.) with constipation who had intractable symptoms unresponsive to diet or laxatives before referral. Many pts. had evidence of anismus on anal sphincter EMG, defecography and anal manometry, 3 had idiopathic Hirschsprung's; 1 had Hirschsprung's and 30 had normal rectal emptying. Six of the 16 anismus pts. were excluded; 4 had improvement with high fiber diet compliance plus stool softeners before therapy; and 2 refused therapy. Ten female pts. (age 17-33; mean 27 yr) were randomly assigned to either general relaxation therapy (GRT) with external anal sphincter biofeedback (EASB) or GRT with sham feedback. Feedback signals were random and NOT indicative of EAS muscle tension. Therapy was 2-3 hours daily for one week. For 4 pts. received GRT + EASB and 6 received GRT + sham EASB. All pts. completed diaries of stool frequency (#), abdominal pain (AP) and bloating (%) for 4 weeks before and 12 weeks after therapy.

Eight pts. improved with therapy at 12 weeks; 5/6 sham EASB and 3/4 active EASB. In the eight patients responding to therapy, weekly #F increased from 1.9 to 3.6 (p<0.05), mean weekly #AP decreased from 20 to 11 (<p>0.05) and mean weekly #B decreased from 14 to 8 (NS). For all 10 pts. weekly #F increased from 1.8 to 3.3 (p<0.05), mean weekly #AP decreased from 13 to 10 (NS). For three pts. (all sham EASB) improved rectal emptying on defecography with relaxation on EAS post-therapy despite symptoms relief in the other 5 pts. Despite anal sphincter EMG, defecography and anal manometry in pts. after therapy, no parameter of rectal function predicted outcome with therapy.

Relaxation therapy appears to be an important component for achieving symptomatic improvement in women with anismus. Anal manometry did not predict response to therapy. These results show that despite continued anismus on objective testing, pts. can improve symptomatically with this therapy. Increased anal sensitisation and reduced anal muscle tension may be significant factors contributing to treatment success.

Patients rendered incontinent by surgery exhibit evidence of combined internal and external anal sphincter injury R. Paroud, G.B. Rutledge, D.C.C. Bartolo Department of Surgery, Royal Infirmary of Edinburgh

Incontinence following anorectal surgery is characterised by low anal squeeze pressures and abnormal sphincter appearance on endoanal ultrasonography. Sixteen patients (11 male; median age 43 years, range 23-71) rendered incontinent following minor anal surgery and seventeen controls (12 male; median age 36 years range 24-73) were examined with complementary anorectal EMG and manometry. Endoanal sonography revealed internal sphincter injury in 7 patients, with combined injury to the external sphincter in two.

The median internal sphincter EMG frequency was CONTROL 0.44 Hz. (0.36-0.48), TRAUMA 0.18 Hz. (0.11-0.22) (p<0.001). Resting anal pressures were lower in the incontinent group; median TRAUMA 35cm.H2O (18-62), CONTROL 90 cm.H2O (72-98) (p<0.001). Squeeze pressures were similarly reduced. The trauma patients; median TRAUMA 52 cm.H2O (28-74), CONTROL median 234 cm.H2O (170-386) (p<0.001). The frequency of transient internal anal sphincter relaxation was TRAUMA median 8/4 hour (6-12), CONTROL median 5 (4-6) (p<0.05). Recruitment of the external sphincter EMG in the incontinent group was poor in all patients during transient internal sphincter relaxation, measuring between 0-24 % (CONTROLS range 45 - 120 %) (p<0.001) suggesting episodes of incontinence.

Incontinence results because of combined internal and external sphincter injury. Such disruption is present in patients with anorectal symptoms appearing intact in seven of the patients studied.

Oesophagus

BIOFEEDBACK - AN ALTERNATIVE TREATMENT IN THE MANAGEMENT OF INTRACTABLE CONSTIPATION

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Twenty-two patients with symptoms of obstructive defecation were recruited for domiciliary biofeedback self-regulatory relaxation training. Each patient served as his or her own control for anorectal and proctographic assessments, before and after biofeedback treatment.

Biofeedback training improved the obstructive symptoms of the patients. Significant changes in various parameters suggesting the obstructive defecation syndrome were observed before and after biofeedback management, as follows. The rectal sensory threshold was improved (p<0.05). The external anal sphincter wire EMG voltage recorded during simulated defecation, via isotope proctography, was significantly reduced (p<0.0005), and this was associated with a greatly reduced anisnus index (p<0.0001). The defecation rate (% of evacuation/defecation time) was significantly increased (p<0.05), the anorectal angle was reduced (p<0.001), and the squeeze pressures were made more obuse (p<0.05) and the pelvic floor movements, as examined by isotope proctography were made more dynamic.

Biofeedback thus improves the act of defecation in patients suffering from inappropriate contraction of the pelvic floor. It appears that the modulating effects of the afferent and efferent innervation of the defecation reflex as well as its central control mechanism can be influenced by biofeedback self-regulatory means, which in turn leads to an improved quality of anorectal function.

EFFECT OF OMEPRAZOLE ON OESOPHAGEAL ACID EXPOSURE IN REFUX OESOPHAGITIS

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Omeprazole is a very effective drug for the treatment of reflux oesophagitis. Its chief mode of action is presumed to be through powerful acid inhibition but part of its efficacy may be due to reduction in the volume of gastric juice thus reducing the frequency of oesophageal reflux and possibly the volume of refluxate. We report our results of the effect of omeprazole on oesophageal acid exposure. Paired data from 31 patients with endoscopically documented oesophagitis who underwent 24 hour ambulatory oesophageal pH monitoring off and on omeprazole, as part of a separate study, were analysed. Within a week after endoscopy, 24 hour ambulatory oesophageal pH monitoring was performed. Following this the patients were treated with omeprazole 40 mg/day. Repeat endoscopy after a median duration of 10 weeks confirmed complete healing of oesophagitis. 24 hour oesophageal pH monitoring was then repeated while still on omeprazole 40 mg/day. There was a highly significant reduction in median % of time pH<4 for the total, supine and upright periods (10.7 v 0.8; 5.1 v 0.1; 10.9 v 0.9; p<0.004 for all three variables). The results were abnormal in 26 patients at the first stage and in 6 patients at the second stage. The % of total time the 6 patients at the second stage was 9.8, 9.8, 19.2, 12.8, 5.3 and 1.6. The corresponding figures for supine and upright postures were 12.1, 0.5, 39.3, 21.3, 12.1, 26.3 (supine) and 8.3, 14.1, 5.2, 8.1, 0.6, 2.0 (upright). We have demonstrated that oesophageal acid exposure is significantly reduced by omeprazole 40 mg/day. We have also shown that the patients remained free of uncontrolled substantial acid reflux as measured by 24 hour pH monitoring. This could be explained on the basis that omeprazole may have reduced the volume of the refluxate substantially in these patients - a potentially important factor which the pH monitoring does not measure.