in 1). Optimal stone localisation was achieved using fluoroscopy and direct visualisation, allowing application of electrohydraulic lithotripsy (EHL) using a Boston Scientific EHL probe for stone fragmentation. In one case 8 mm-10 mm sequential dilatation of an anastomotic stricture was performed. In one case a surgical stitch across the anastomosis was visualised – the likely nidus for stone formation. Stone clearance was successful in all cases where IHD stones were identified. In one case the IHD stones had cleared since the index PTC. There were no recorded procedural complications.

Conclusion In this small case series direct visualisation of the biliary tree using percutaneous SpyGlass cholangioscopy was safe, successful and expanded the therapeutic capabilities of PTC. This technique could also be used to enhance the investigation and treatment of post-surgical biliary anastomotic stricturing, where retrograde endoscopic access is not feasible.

ADTH-06 MICROSCOPIC RESIDUAL LESION AFTER APPARENT COMPLETE EMR OF LARGE LESIONS: EVIDENCE FOR MECHANISM OF RECURRENCE

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Introduction Endoscopic mucosal resection (EMR) of large colorectal superficial neoplastic lesions (CSNL) is associated with significant recurrence and the risk of recurrence is significantly higher with piecemeal EMR (pEMR). The mechanism for recurrence has not been proven but has been postulated to occur as a result of microscopic areas of residual adenoma left between areas of sequential snare capture during pEMR. We aimed to determine the incidence of residual microadenoma in apparently normal mucosa left at the margin of the defect following EMR.

Methods Following EMR/pEMR of 31 large CSNL, the base and margin of the resulting defect were examined with magnification chromoendoscopy and NBI/BLI to ensure complete resection. The apparently normal mucosa at the defect margin was then resected using the EndoRotor() device, removing and sampling the full extent of the defect margin. Areas of submucosal fibrosis or diathermy artefact at the base were also sampled if present. Data on the lesion characteristics, resection technique, number of pieces for pEMR, histopathology findings of the lesion and the mucosa at the margin were collected.

Results Mean lesion size was 46.7 mm (range 32 mm-130 mm). Mucosa at the defect margin was sampled in all cases and 100% of the margin was achieved in 28 (90%). Final histopathology of resected lesions was adenoma in 27 (87%), serrated adenoma in 2 (6%) and adenocarcinoma in 2. Microscopic residual lesion was detected in the margin of apparently normal mucosa in 4 cases (13%). In 3 cases this was adenoma with low grade dysplasia and in one case a serrated lesion with no dysplasia was found in at the margin of a resected tubular adenoma. Microscopic residual lesion was detected in the base in 4 cases: 1 was microadenoma, 2 were serrated lesions without dysplasia in the base of resected adenomas and 1 was residual adenocarcinoma. There was no association with pEMR in >3 pieces and residual microscopic lesion or pEMR ≤3 pieces (OR 0.89, 95% CI 0.16-4.8, p=0.89). There were no complications.

Conclusions To our knowledge, this is the first series examining the findings after continuous sampling of the full circumferential margin of apparently normal mucosa left at the defect after EMR of large CSNL. Despite examination with magnification suggesting complete resection, microscopic residual lesion at the margin was present in 13%. This study provides evidence that microscopic residual lesion left after EMR underlies the pathophysiology of recurrence and lends support for techniques that continuously resect or ablate the circumferential margin of the defect to reduce recurrence.

ADTH-07 DEEP LEARNING BASED CLASSIFICATION OF INTRAPAPILLARY CAPILLARY LOOPS FOR DETECTION OF EARLY OESOPHAGEAL SQUAMOUS NEOPLASIA

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Introduction Narrow band imaging with magnification endoscopy (ME-NBI) allows detailed assessment of microvascular patterns within early squamous cell neoplasia (ESCN). The Japanese Endoscopy Society (JES) AB classification describes ESCN and predicts invasion depth based on the intrapapillary capillary loop (IPCL) pattern. Early lesions are amenable to endoscopic therapy (EET). We have designed a novel deep convolutional network (CNN) able to classify IPCL patterns as normal (A) or abnormal (B1/B2/B3), in order to alert endoscopists to abnormal areas in ESCN during lesion assessment.

Methods 17 patients were recruited at a referral centre in Taiwan. Endoscopies were performed using ME-NBI (Olympus). IPCLs were classified for each video by 2 experts as normal (type A), or abnormal (type B1/B2/B3), using the JES classification. Matched tissue was obtained by ESD for histologic evaluation of invasion depth. Images were quality controlled to remove uninformative (blurred) images. Our full dataset consisted of 7046 images. A CNN was developed with five-fold cross validation. On average, each fold used 3962 images for training, and 1637 unseen images (846 normal and 791 abnormal) for testing. Accuracy, F1 scores, sensitivity and specificity for abnormal IPCL detection were calculated.

Results 17 patients were included (10 had early neoplasia [1 high grade intra-epithelial neoplasia (HGIN) 4 carcinoma *in situ* (CIS) invading to the lamina propria, 4 to the muscularis mucosa and 1 to the submucosa] and 7 were normal). Our algorithm operates at video rate and had an accuracy for differentiating abnormal IPCL patterns (type B1, B2, B3) from normal (type A) of 93.69%. The average F1 score for identifying abnormal areas of ESCN based on IPCL classification was similarly high at 92.2%. Our network also achieved a sensitivity and specificity for abnormal IPCL detection of 89.3% and 98% respectively.

Conclusion We introduce a novel application of deep learning by developing a real-time CNN, with promising results in classifying squamous mucosa as normal or neoplastic based on the JES IPCL classification. Our system demonstrates impressive accuracy, sensitivity and specificity for differentiating type A from type B1/2/3 IPCLs. Further work is underway to develop a multiclass classifier to distinguish between the

subtypes of IPCL patterns. Such a validated system could be used *in vivo* to alert endoscopists to the presence of ESCN and direct planning of appropriate EET.

ADTH-08 ROBOT MAGNET-CONTROLLED UPPER GASTROINTESTINAL CAPSULE ENDOSCOPY: NON-INVASIVE INVESTIGATION WITH EXCELLENT PATIENT TOLERANCE

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Introduction Gastroscopy (OGD) is invasive and not always well tolerated. The NaviCam® (Ankon Technologies Co. Ltd., Shanghai, China) combines capsule endoscopy technology with external robot magnetic control. Operator joysticks command the robot to steer the capsule within the stomach. Real-time visualisation is displayed on two workstation monitors. When compared to OGD, the NaviCam® has already demonstrated high sensitivity and specificity for identifying focal gastric lesions.¹ The focus of this study was to grade imaging quality and patient tolerance of the NaviCam®.

Method Patients with dyspepsia were recruited. Patients swallowed 100 mls of water (containing 10 mls simethicone) 15 min prior to 1L of water followed by the NaviCam®. Clarity of views and adequacy of gastric distension were assessed (1, poor; 2, reasonable; 3, good), as was completeness of views of the oesophagogastric mucosa (1, >75% obscured; 2, >50% obscured; 3, <50% obscured; 4, <25% obscured; 5, 100% visualised). Patient tolerance scores were collected (worst-best=0–10). All patients subsequently had OGD and tolerance scores were compared to those of the NaviCam®.

Results Eighteen participants were included (mean age 53 ±16.1 years, 27.8% male). The NaviCam could be held stationary within the stomach (resisting peristaltic waves) and could cartwheel over rugal folds to a chosen proximal location using a preset programme activated by a 'shoot' button on the joystick. Mean examination duration was 25±3.4 mins. Mean clarity (2.3±0.7) and distension scores (2.9±0.3) were good. Complete views (5±0) for all areas of the gastric body (greater and lesser curvature, anterior and posterior wall) and distal stomach (antrum and pylorus) were achieved. Views of the oesophagus (4.3±1.3) and proximal stomach (cardia, 4.9 ±0.2; fundus 4.8±0.3) were also good. Duodenal images were not assessed real-time (but are provided after the capsule traverses the pylorus). Tolerance scores for anxiety, discomfort and pain were all lower with MACE compared to OGD (2.2 ±1.4 vs 5.8±3, 1.3±1 vs 4.9±3, 2.4±2.4 vs 3.4±2.5, respectively; $p<0.05$ for all). Tolerance scores for undesirable symptoms associated with upper gastrointestinal (GI) endoscopy, namely gagging, choking and bloating were also more favourable with MACE compared to OGD (1.4±1.6 vs 5.4±3.3, 1.3 ±1.2 vs 4.8±3.3, 1.2±0.5 vs 2.9±2.0, respectively; $p<0.05$ for all).

Conclusion The NaviCam® demonstrates excellent oesophago-gastric views. The NaviCam® is extremely well tolerated compared to OGD and patients experience significantly fewer undesirable symptoms associated with upper GI endoscopy.

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ADTH-09 CAPSULE ENDOSCOPY HAS BETTER DIAGNOSTIC YIELD THAN GASTROSCOPY IN RECURRENT IRON DEFICIENCY ANAEMIA

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Introduction Repeat upper gastrointestinal (GI) examination and small bowel capsule endoscopy should be considered in iron deficiency anaemia (IDA) when recurrent/refractory. Magnetically assisted capsule endoscopy (MACE) using a handheld magnet to steer the MiroCam Navi (Intromedic Ltd., Korea) capsule around the stomach followed by passive small bowel transit might satisfy both requirements as a single procedure.

Methods MACE was performed in patients with recurrent/refractory IDA who were due gastroscopy (OGD). Total (upper GI and small bowel) and upper GI diagnostic yields and patient tolerance of the two modalities were compared. Assuming a diagnostic yield of 25% and 55% for OGD and small bowel capsule endoscopy (SBCE) respectively in recurrent/refractory IDA, 41 patients were needed to achieve 80% power and 5% two-sided significance. McNemar's test was used to measure differences in paired proportions. To allow for withdrawal, 50 patients were recruited. MACE mucosal visualisation was also assessed.

Results OGD was performed within 2 days (IQR=13) of MACE in 49 patients (one failed to attend for OGD; median age 64 years (IQR=13), 39% male). Combined upper and mid-gut examination using MACE and passive SBCE yielded pathology in more patients than OGD alone (32 vs 6 (CI, 0.37 to 0.69); $p<0.0001$). Comparing only upper GI examination (proximal to D2), MACE identified more total lesions than OGD (88 vs 52, $p<0.0001$). If only lesions recognised as sources of IDA are included (oesophagitis, altered/fresh blood, angiodysplasia, ulcers and villous atrophy), a difference remains (20 vs 10; $p=0.04$). Small bowel (distal to D2) pathology was present in 24 (49%) patients (angiodysplasia (n=15), erosions (n=6), polyp (n=1), active bleeding (n=1), small bowel varices (n=1) and diverticulae (n=1)), considered to cause IDA in 11 (22%) patients who had no upper GI cause. Median scores (worst-best=0–10) for pain (0 vs 2), discomfort (0 vs 3) and distress (0 vs 4) were significantly lower for MACE than OGD respectively ($p=0.0001$ for all). Visualisation of gastric regions differed significantly ($\chi^2=209.5$, $p<0.05$, Kruskal-Wallis H test). Better rank visualisation scores of ≥ 350 were seen for the greater and lesser curve, anterior and posterior body, antrum, pylorus and D2 while lower for the oesophagus (222), GOJ (103), cardia (267), fundus (189) and D1 (198).

Conclusions Combined upper GI and small bowel examination with the MiroCam Navi yields more pathology than OGD alone in patients with recurrent/refractory IDA. MACE also has better diagnostic yield than OGD in the upper GI tract and was better tolerated.

ADTH-10 EFFICACY AND SAFETY OF 1L-PEG AND ASCORBATE BOWEL PREPARATION NER1006 VERSUS 2L-PEG WITH ASCORBATE

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