

## **ABSTRACTS**

of presentations to  
the Annual Meetings of the

Canadian Society  
of Colon and Rectal  
Surgeons

Canadian Association  
of General Surgeons

Canadian Association  
of Thoracic Surgeons

## **RÉSUMÉS**

des communications présentées  
aux congrès annuels de la

Société canadienne  
des chirurgiens du côlon  
et du rectum

Association canadienne  
des chirurgiens généraux

Association canadienne  
des chirurgiens thoraciques

## **CANADIAN SURGERY FORUM**

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# Canadian Surgery Forum 2006

## Forum canadien de chirurgie 2006

### Canadian Society of Colon and Rectal Surgeons

### Société canadienne des chirurgiens du côlon et du rectum

1

**CUSUM ANALYSIS DURING INTRODUCTION OF LAPAROSCOPIC COLORECTAL SURGERY.** *P. Colquhoun.* University of Western Ontario, London, Ont.

The purpose of this study was to detect changes in conversion rates, morbidity and mortality associated with laparoscopic colorectal surgery during the introduction of laparoscopic colorectal surgery into practice, allowing for variations in case mix. An observational study of postoperative outcomes was performed from July 2002 to July 2005. Thirty-day and in-hospital morbidity and mortality were assessed. A risk-adjusted cumulative-sum method was used to compare observed conversion rates, morbidity and mortality versus predicted outcomes using validated scoring systems (Cleveland Clinic laparoscopic colorectal conversion model: CCLCCM and P-POSSUM, respectively). Thirty-four patients underwent laparoscopic colorectal operations including: 19 women and 15 men, average age was 54 (range 23–79) years. Operations performed included 2 small bowel operations, 12 right colon operations, 17 left colon operations and 2 rectal operations. Predicted conversion, morbidity and mortality rates were 19.6%, 26.6% and 1.9%, respectively. Observed conversion, morbidity and mortality rates were 22.2%, 17.6% and 0%, respectively. A cumulative sum model (CUSUM) was then used to analyze outcomes adjusting for risk of conversion and morbidity on a case-by-case basis. This revealed a flat curve for analysis of conversion and a significant downward trend over time for morbidity. **Conclusions:** CUSUM methodology is allowing for documentation of quality of control during introduction of laparoscopic colorectal surgery. Flat curve for conversion suggests acceptable proficiency and further validates the use of the CCLCCM as a measure of risk of conversion. Downward trend in morbidity suggests no additive morbidity through the introduction of laparoscopic colorectal surgery into practice.

2

**CUSUM ANALYSIS OF J-POUCH SURGERY REFLECTS NO LEARNING CURVE POST BOARD CERTIFICATION.** *P. Colquhoun.* University of Western Ontario, London, Ont.

The purpose for this study was to detect changes in morbidity and mortality associated with ileal j-pouch surgery performed during the first 3 years of a single surgeon's practice to determine the presence or absence of a learning curve post-fellowship training. An observational study of postoper-

ative outcomes was performed from July 2002 to July 2005. Thirty-day and in-hospital morbidity and mortality were assessed. A risk-adjusted cumulative-sum method was used to compare observed outcomes versus predicted outcomes using a validated scoring system (P-POSSUM). Thirty-seven patients underwent the surgery: 17 female and 20 male, average age was 32 (range 16–51) years. Operations were performed for ulcerative colitis ( $n = 31$ ), familial adenomatous polyposis ( $n = 4$ ) and indeterminate colitis ( $n = 2$ ). Thirty-two were diverted, 5 were not. Predicted morbidity and mortality were 31.79% and 1.48%. Observed morbidity and mortality were 28.6% and 0%. A cumulative sum model (CUSUM) was then used to analyze outcomes adjusting for risk on a case-by-case basis. This revealed a flat curve trending down over the duration. **Conclusions:** CUSUM methodology is allowing for documentation of quality control during first 3 years of practice. Experience of a single board-certified colorectal surgeon reveals acceptable results in the first 3 years of practice with no obvious learning curve. Results suggest fellowship training and board certification have allowed for reasonable proficiency in j-pouch surgery before onset of practice.

3

**IMPACT OF OBESITY ON SURGICAL OUTCOMES OF LAPAROSCOPIC COLECTOMY.** *M. Zerey, K.W. Kercher, A.E. Lincourt, D.S. Stefanidis, T.S. Kuwada, K.S. Gersin, B.T. Heniford.* Division of Gastrointestinal and Minimally Invasive Surgery, Carolinas Medical Center, Charlotte, NC.

The influence of obesity on laparoscopic surgical outcomes is not clearly defined. We present the effects of obesity on patient outcomes following laparoscopic colectomy.

We retrospectively surveyed all laparoscopic colectomies performed at our institution from 1998 to 2005. Patients were categorized as obese (body mass index [BMI]  $> 30$  kg/m<sup>2</sup>) or non-obese (BMI  $\leq 30$  kg/m<sup>2</sup>). Data obtained included demographics, perioperative data, length of stay (LOS), complications and charges. Standard statistics were used to determine significance ( $p < 0.05$ ).

A total of 224 patients were included for analysis, 63 (28.1%) of whom were obese. Sex distribution was similar in both groups, but obese patients were younger than non-obese patients (male sex: 51.5% v. 48.5%;  $p = 0.61$ ; age  $53.7 \pm 16.1$  yr v.  $59.5 \pm 12.8$  yr;  $p = 0.01$ ) and more likely to have comorbidities (58.7% v. 39.1%;  $p = 0.01$ ). Mean operating room (OR) time and conversion rates were not significantly different

(OR: obese 195.5 min, non-obese 184.0 min,  $p = 0.19$ ; conversions: obese 14.3%, non-obese 12.4%,  $p = 0.71$ ). In patients undergoing colectomy for cancer, proximal margin, distal margin and lymph nodes resected did not differ significantly between obese and non-obese groups ( $8.3 \pm 7.6$  v.  $11.4 \pm 12.8$  cm,  $p = 0.20$ ;  $7.5 \pm 4.7$  v.  $11.1 \pm 11.5$  cm,  $p = 0.33$ ;  $14.7 \pm 8.0$  v.  $17.5 \pm 12.1$  nodes,  $p = 0.55$ ). Complication rates, length of stay (LOS) and total charges were not statistically different between obese and non-obese groups (overall complications: 15.9% v. 9.9%,  $p = 0.21$ ; pneumonia: 1.59% v. 1.86%,  $p = 1.0$ ; wound infection: 11.1% v. 5.6%,  $p = 0.15$ ; LOS: 5.9 d v. 6.1 d,  $p = 0.57$ ; total charges: \$23 494.87 v. \$21 857.39,  $p = 0.81$ ).

Despite higher comorbidity rates and operating times in obese patients, short-term outcomes following laparoscopic colectomy are similar to the non-obese. Obesity should not be a contraindication to laparoscopic colectomy.

#### 4

**A HIGH INCIDENCE OF SYNCHRONOUS LESIONS WITH OBSTRUCTING COLORECTAL CANCER.** *J.M. Hwang, W.D. Buie, J. Heine, P. Beck, A.R. Maclean.* Department of Surgery, University of Calgary, Calgary, Alta.

A retrospective chart review to determine the incidence of synchronous tumours in the context of obstructing colorectal cancer.

We identified patients who underwent cancer operations for left-sided colorectal lesions at 2 centres between Jan. 1, 2000, and May 30, 2005. These patients were cross-referenced with our endoscopic database which identified patients who had an incomplete preoperative colonoscopy due to luminal obstruction. The medical charts of all patients with obstructing colorectal cancers were retrieved and evaluated for tumour pathology and postoperative colonoscopy (within 6 months of the procedure). Synchronous lesions including polyps and cancers were identified.

One-hundred and twenty-eight patients with obstructing colorectal cancers were identified. In this population, a total of 14 synchronous cancers (10.9%) were found (13 by postoperative colonoscopy and 1 by intraoperative palpation). In addition, 42 patients (32.8%) were found to have synchronous adenomatous polyps.

The incidence of synchronous cancers in the context of obstructing colorectal cancers is higher than previously cited in the literature. We suggest that more aggressive preoperative evaluation of the proximal colon may be warranted with obstructing colorectal cancers to avoid a second procedure.

#### 5

**ANAL CANCER IN PATIENTS WITH PERIANAL CROHN'S DISEASE (PCD).** *K.M. Devon, C.J. Brown, M. Burnstein, C. Swallow, H. MacRae, Z. Cohen, R.S. McLeod.* Department of Surgery, Mount Sinai Hospital, St. Michael's Hospital, Toronto, Ont.

Between 32% and 80% with Crohn's disease will develop perianal disease. Cancer is a rare but recognized complication. The purpose of this study is to describe the demographics, diagno-

sis, pathologic features and current treatment survival of patients with PCD who develop anal cancer.

From 1981 to 2005, over 2000 patients with Crohn's disease have been treated by subspecialty surgeons at the Mount Sinai and St. Michael's hospitals in Toronto. The medical records of all patients diagnosed with Crohn's disease and anal cancer were reviewed.

Ten patients (8 women, 2 men) had anal cancer with a mean age at diagnosis of 45 (range 31–58) years. Initial diagnosis of PCD ranged from 1 to 20 years before the diagnosis of anal cancer. Six cancers were diagnosed preoperatively, 7 were adenocarcinomas and 3 were squamous cell carcinomas. Treatment included abdominoperineal resection and adjuvant chemo- and/or radiotherapy in all patients. After a median follow-up of 17.5 months, 50% of patients were alive without disease, 4 patients were alive with metastatic disease and 1 patient had died from their carcinoma.

Our data suggest that anal carcinoma arising in PCD occurs at a relatively young age. The diagnosis of anal carcinoma in PCD is difficult and often delayed due to the scarred and indurated perineum commonly seen in these patients. Aggressive multi-modality, multi-disciplinary therapy is warranted in these patients.

#### 6

**LAPAROSCOPIC COLON RESECTION FOR CANCER. A SINGLE COLORECTAL SURGEON'S INITIAL EXPERIENCE.** *A. Bouchard, R.C. Grégoire, J.P. Gagné.* Centre Hospitalier Universitaire de Québec, Que.

The purpose of this study was to review the very initial experience of a colorectal surgeon with laparoscopic colon resection (LCR) for cancer.

This is a retrospective study of LCR for cancer done by a single colorectal surgeon at one academic health sciences centre over a decade. Charts and billing data were reviewed. Data extracted included demographics, ASA classification, body mass index (BMI), types of procedures, conversions, complications, operative room data, American Joint Committee on Cancer (AJCC) staging, resection margins, 30-day mortality, hospital stay and survival.

Over a 12-year period (1993–2005), 165 cases (53% female) were completed. There were 63 right colon resections, 84 left colon resections, 17 abdominoperineal resections (APR) and 1 total colectomy. Median age was 70 years. ASA classification was as follows: class 1, 19%; class 2, 64%; class 3, 15%. Mean BMI was 26 (17–42). Conversion and complication rates were 11.5% and 31.5%, respectively. Median operative time was 195 (range 90–360) minutes, while median blood loss was 100 mL. AJCC staging was as follows: stage 0, 0.6%; stage I, 37.6%; stage II, 30.3%; stage III, 21.2%; stage IV, 10.3%. All resection margins were clear with a median distal length of 9 cm, excluding APRs and the total colectomy. Thirty-day mortality was 2.4%. Median hospital stay was 5 (range 2–86) days. Median follow-up was 2.6 (range 0–11.5) years. There were 10 cancer-related deaths in stage I, II and III patients. There was 1 trocar-site recurrence.

Outcomes of LCR for cancer performed by a colorectal surgeon without any prior laparoscopic training are similar to results reported by centres dedicated to laparoscopic surgery.

7

**THE KOCK CONTINENT ILEOSTOMY (KP): LONG-TERM OUTCOME AND QUALITY OF LIFE (QL).** *S.E. Cowie, Z. Cohen, R.S. McLeod.* Department of Surgery, Samuel Lunenfeld Research Institute, Mount Sinai Hospital, University of Toronto, Toronto, Ont.

To evaluate the long-term outcome and quality of life in individuals with a KP.

Charts of all patients with a KP treated at the Toronto General Hospital and Mount Sinai Hospital between 1975 and 2005 were reviewed. Patients were contacted by mail to ensure complete clinical follow-up data. In addition, patients completed a questionnaire assessing pouch function, the Quality of Life in Inflammatory Bowel Disease questionnaire and the Short Form-35 Health Survey.

Two-hundred and twenty-nine patients were identified. Twenty-seven were excluded because they had their initial or subsequent surgery performed elsewhere, leaving 202 patients (92 male, 110 female; mean age at initial Kock pouch surgery was 34.8 years) in the analysis. One-hundred and seventy-five of these had their initial KP surgery at this centre. The most common indications for KP were ulcerative colitis (86.6% of patients), congenital colorectal disease (5%), Crohn's disease (4%) and familial adenomatous polyposis (2.5%). In 44 patients, the KP was constructed at the time of total proctocolectomy. With a mean follow-up of 76 months, 160 (79%) had required hospital admission for a pouch-related complication and 147 (72.8%) required surgical intervention. Forty-five patients (22.3%) underwent excision of their KP after a mean duration of 113 months since initial KP creation (range 3–420 mo) because of valve dysfunction (56%), peristomal fistula (31%) or refractory pouchitis (9%). Quality of life data are pending.

These results demonstrate that KP patients have a high rate of revisional surgery, primarily due to dysfunction of the nipple valve mechanism. However, despite the need for further surgery, a large proportion have a functioning KP at long-term follow-up.

8

Withdrawn

9

**PREDICTORS OF PELVIC POUCH (PP) FAILURE.** *S. Forbes, B.I. O'Connor, W. Yoon, Z. Cohen, H.M. MacRae, R.S. McLeod.* Departments of Surgery and Health Policy, Management and Evaluation, Samuel Lunenfeld Research Institute, Mount Sinai Hospital, University of Toronto, Toronto, Ont.

To determine the risk of and factors predictive of failure in patients with PP.

All patients registered in the MSH IBD database who had a PP for more than 12 months were included in the study. Pouch failure was defined as PP excision or permanent diversion.

Of 1552 patients having a PP between 1981 and 2004, 104 (6.7%) patients (53 male, 51 female; mean age 32.1 yr) experienced PP failure due to septic complications (45), poor function (27), chronic pouchitis (19), perianal disease (9), cancer

(1) or dysplasia (3). Median time to the initial complication or problem was 9 (range 0–211) months and to PP failure, 45 (range 1–232) months. PP failure strongly correlated with the year of PP creation ( $r = -0.85$ ). Overall, 206 patients developed septic complications of whom 45 (22%) had failed P. In this subgroup on univariate analysis, PP failure was higher in CD versus UC (87% v. 21%); handsewn versus stapled IAA (37% v. 22%); tension on IAA (57% v. 24%); associated fistula versus no fistula (57% v. 22%); diagnosis of sepsis > 30 versus < 30 days after surgery (45% v. 17%) and required surgical versus nonoperative treatment (35% v. 22%). On multivariate analysis, only CD (odds ratio [OR] 14.25, 95% confidence interval [CI] 2.62–55.54) and associated fistula (OR 5.12, 95% CI 1.80–14.60) were predictive.

The risk of PP failure is low and has decreased over time. Septic complications are the most common cause of failure. Furthermore, patients with CD or a fistula are at highest risk of failure.

10

**SURGISIS® AFP: A CHANGING PARADIGM IN THE TREATMENT OF FISTULA IN ANO?** *M. Poirier, J. Cintron, R.L. Nelson, M. L. Prasad, H. Abcarian.* Department of Surgery, University of Illinois at Chicago, Chicago, Ill.

To present clinical results and outcome using a bioabsorbable matrix plug, the anal fistula plug (AFP), for the treatment of transphincteric fistula in ano (TFIA) and to discuss notable clinical observations from this experience.

Clinical course and outcome for patients undergoing AFP procedure between June and November 2005 were obtained from a prospective colorectal database. Early technical failure is defined as dislodgement of AFP at  $\leq 2$  weeks, success is defined as fistula closure, failure is defined as persistent fistula at  $\geq 3$  months and indeterminate is defined as fistula still present at < 3 months.

A total of 27 patients underwent 28 AFP procedures (15 male, 12 female). Thirteen patients presented with primary (not previously treated) TFIA and 14 presented with recurrent TFIA. In short, 28 AFP procedures were performed; of these, 15 of 28 (54%) have been successful, 2 (7%) have failed, 5 of 28 (18%) are indeterminate and 5 of 28 (18%) experienced dislodgement. Notably, all patients with dislodgement were female, in the recurrent group and treated in the first 2 months of AFP use. No patient in this series suffered fecal incontinence.

These data suggest that AFP is an acceptable alternative to more invasive or multi-step procedures for repair of TFIA. Primary presenters have a trend toward improved outcome compared with recurrent TFIA patients. There is a learning curve apparent based on the dislodgment experience in this series. The association between gender and dislodgment needs further investigation. Overall only 7% of patients treated experienced a treatment failure, suggesting a value for this approach if the positive outcome is supported by long-term study in large patient series.

11

**TRANSPHINCTERIC (YORK MASON)/PARACOCYGEAL APPROACH: OUTCOMES OF AN OLD PROCEDURE WITH EX-**

**PANDED INDICATIONS.** *M. Poirier, H. Abcarian.* Department of Surgery, University of Illinois at Chicago, Chicago, Ill.

To present an institutional experience with the York Mason (YM) approach for expanded indications beyond recto-urinary fistula (RUF) and to discuss patient outcome.

Clinical course and outcome for patients undergoing YM (1992–2005) were obtained from a prospective colorectal database. Success is defined as complete removal of lesion without recurrence or fistula closure at 12 months.

Twenty-eight patients were identified (17 male, 11 female). Excision of rectal villous adenoma (RVA) was the most frequent indication (36%), followed by retrorectal cyst (29%), RUF (21%), supralelevator fistula (2%) and low anastomotic complication (2%). The standard YM was modified in retrorectal cysts to exclude sphincter division. Outcome for 25 of 28 patients is documented; 20 have had successful outcome, 5 have failed, 2 are < 12 months from procedure and 1 is lost to follow-up. A total of 6 complications occurred in 4 patients.

The data presented support YM for expanded indications beyond RUF. In this series, morbidity occurred in only 14% of patients and success in 80% of completely evaluable patients. Most notable is the success for RVA excision without recurrence. This is a potential patient benefit by avoidance of trans-abdominal proctectomy in risky patient populations. Retrorectal cysts were similarly successfully treated with only 1 of 8 patients experiencing recurrence. Based on these data, YM is recommended as a safe procedure in operations involving difficult midrectal exposure.

### 12

**NEOADJUVANT CHEMORADIATION IMPAIRS LYMPH NODE ASSESSMENT AND STAGING IN RECTAL CANCER.** *A. Govindarajan, A. Kiss, A.J. Smith, C.H.L. Law.* Division of General Surgery, Sunnybrook Health Sciences Centre, Institute of Clinical Evaluative Sciences, Toronto, Ont.

This retrospective cohort study examined the impact of neoadjuvant chemoradiotherapy on lymph node (LN) assessment and ability to adequately stage the nodal status in patients with rectal cancer.

All patients  $\geq 18$  years old treated curatively for primary rectal or rectosigmoid cancer at the study institution from 2000–2004 were identified. Patients were excluded if they had extended surgical resection (pelvic exenteration, extended colectomy) or a non-standard course of radiation. All surgical specimens were examined for LN in a standardized manner. Patients were stratified into those who received neoadjuvant therapy followed by surgery (NEO) and those who had surgery only (SURG). Multivariable analysis was used to determine the independent effect of neoadjuvant therapy on the number of LN assessed, the detection of positive LN and the diagnosis of node-positive patients, while controlling for patient, tumour, operative and provider-related confounders.

A total of 128 patients were identified (NEO: 49 patients; SURG: 79 patients). The mean number of LN assessed was 16.0 (NEO: 14.5; SURG: 17.0;  $p = 0.09$ ). In multivariable analysis, the NEO group had 18% fewer LN assessed (3.1 nodes) than the SURG group ( $p = 0.02$ ). Within the NEO

group, significantly fewer LN were assessed in patients classified as node-negative than in patients classified as node-positive (13.0 v 17.6,  $p = 0.04$ ). After adjusting for confounders, this relationship persisted as the number of patients classified as node-positive increased as more LN were assessed (8.5% increase for each additional LN assessed,  $p = 0.0068$ ).

Neoadjuvant chemoradiation significantly reduces the number of LN assessed in patients with rectal cancer. This finding is clinically relevant as decreased LN assessment significantly impairs the ability to detect patients with node-positive disease, thus resulting in potential understaging of nodal status. Further research is required to improve LN staging in the setting of neoadjuvant therapy.

### 13

**THE ROLE OF CT PET IN THE PREOPERATIVE STAGING OF RECTAL CANCER.** *C.S. Richard, T. Vuong, B. Stein, R. Lougnarath, P. Charlesbois, R. Lisbona, G. Artho, K. Waschke, C. Reinhold.* Departments of Surgery, Radiation Oncology, Radiology, Nuclear Medicine, McGill University Health Centre, Centre Hospitalier Universitaire de Montréal, Montréal, Que.

Total mesorectal excision (TME) is an invasive procedure with potential morbidity. Therefore, preoperative accurate staging is crucial for selection of potentially curative surgical candidates. CT PET is a new imaging modality recently introduced in the staging of patients with rectal cancer. The purpose of this study was to assess the impact of this modality on patient management.

Between 2004 and 2005, 130 consecutive patients with newly diagnosed rectal cancer referred for neoadjuvant radiation treatment were evaluated using conventional staging (chest x-ray, abdominal and pelvic CT scan, pelvic MRI, endoscopic rectal ultrasound) plus CT PET. Those patients with positive uptake on CT PET not documented on conventional imaging underwent further diagnostic modalities to prove metastatic disease, including percutaneous biopsies and laparoscopy. Patients with negative CT PET with abnormal findings on conventional staging also underwent further investigation to prove absence of metastatic disease before neoadjuvant treatment and TME surgery.

Conventional staging revealed 9% (12/130) of patients with metastasis compared with 18% (23/130) with CT PET with the following location: lung, 6 patients versus 7; liver, 8 versus 13; bone, 0 versus 2; retroperitoneal nodes, 2 versus 5; mediastinum, 0 versus 2; carcinomatosis, 0 versus 2; and abdominal wall, 0 versus 1. With conventional imaging, 13 false positives were documented in patients as follows: liver 5, lung 4, mediastinum 1, adrenal 2, carcinomatose 1. With CT PET, 5 false positives were documented in the neck region and 2 in the bowel (adenoma).

CT PET changed the management of 28% of the patients with newly diagnosed rectal cancer; it therefore should be considered as part of the initial tumour staging.

### 14

**CHARACTERIZATION OF GERMLINE *EPH2* VARIANTS IN FAMILIAL COLORECTAL CANCER.** *G. Zogopoulos, J. Bacani, A. Montpetit, L. Chad, C. Greenwood, M. Cotterchio, B. Zanke, T. Hudson, S. Gallinger.* Samuel Lunenfeld Re-

search Institute, Toronto, Ont., McGill University and Genome Québec Innovation Centre, Montréal, Que., Hospital for Sick Children, Cancer Care Ontario, Toronto, Ont.

Familial clustering of colorectal cancer (CRC) is observed in about 20% of cases, however recognized cancer syndromes (FAP, HNPCC, MYH-Associated Polyposis [MAP]) comprise only a small fraction of this disease. Thus, the genetic basis for the majority of hereditary CRC remains unknown. Several lines of evidence suggest that *EPHB2* is a candidate familial-CRC gene: *EPHB2* maps to a chromosomal region (1p36.1) often deleted in CRC; *EPHB2* expression is under WNT/TCF4 control; and *EPHB2* inactivation is important during progression of CRC. We screened for germline *EPHB2* sequence variants in 120 population-based familial CRC cases (FAP, HNPCC, MAP excluded). We detected 3 novel nonsynonymous missense changes. Two of these missense variants may result in mutant *EPHB2* proteins (A438T and G787R), and the third leads to a fairly conservative carboxy-terminus residue substitution (V945I). The former 2 variants were found only once in the 120 cases, while the V945I variant was present in 2 cases. Tumour tissues from the 2 cases with the A438T and G787R variants were found to manifest LOH, with loss of the wild-type allele. Genotyping of additional patients with CRC and control subjects revealed that the A438T and G787R variants likely represent rare *EPHB2* mutations. In summary, our data suggest that rare germline *EPHB2* missense variants may contribute to a small fraction of hereditary CRC.

#### 15

**ACCURACY OF PROVINCIAL GENETIC TESTING CRITERIA FOR HEREDITARY NON-POLYPOSID COLORECTAL CANCER.** *S. Holter, B. Bapat, S. Gallinger.* Familial Gastrointestinal Cancer Registry (FGICR) and Ontario Familial Colorectal Cancer Registry (OFCCR), Department of Surgery, Mount Sinai Hospital, University of Toronto, Toronto, Ont.

There are several established criteria for the clinical diagnosis of hereditary non-polyposis colorectal cancer (HNPCC). In 2001, the Ontario Ministry of Health and Long-term Care (MOHLTC) established 5 genetic testing eligibility criteria for HNPCC. These include: 1) known mismatch repair gene mutation, 2) Amsterdam I or II criteria family history, 3) 3 affected family members, 2 in a first-degree relationship, 1 under age 50, 4) 2 primary HNPCC cancers, 1 colorectal cancer and under age 55, and 5) colorectal cancer under age 35.

Within the clinic-based FGICR, 74 families who met at least 1 MOHLTC criteria were tested. In the population-based OFCCR, of 198 families that underwent genetic testing, 34 fulfilled Amsterdam I or II criteria. Results from analysis of the *bMLH1* and *bMSH2* genes by full sequencing and/or multiplex ligation probe-dependent amplification were available. The sensitivity and specificity of each of the 5 MOHLTC criteria within the FGICR and Amsterdam I and II criteria in the OFCCR were calculated.

Of the 74 FGICR families, 42 fulfilled criterion 2, 6 criterion 3, 4 criterion 4 and 2 criterion 5. The sensitivity and specificity of criteria 2–5 were 84% (95% confidence interval

[CI] 70–92) and 58% (95% CI 37–77), 50% (95% CI 22–78) and 26% (95% CI 16–39), 40% (95% CI 14–73) and 25% (95% CI 15–38), and 0% (95% CI 0–80) and 28% (95% CI 18–40), respectively. Within the OFCCR, the sensitivity and specificity of the Amsterdam I and II criteria were 62% (95% CI 44–77) and 85% (95% CI 78–90).

The Ontario MOHLTC criteria for testing suspected cases of HNPCC demonstrate high sensitivity and reasonable specificity. Surgeons need to be aware of local clinical testing criteria and their utility in identifying cases of HNPCC who will benefit from counseling and testing.

#### 16

**PRELIMINARY OUTCOMES AFTER TOTAL MESORECTAL EXCISION (TME) WORKSHOPS IN BC.** *P.T. Phang, H. Kennecke, J.K. MacFarlane, K. Ng, G. McGregor, T. Strack, D. DesLauriers, J.H. Hay.* Department of Surgery, University of British Columbia, Surgical Oncology Network, British Columbia Cancer Agency, Vancouver, BC.

BC surgeons and pathologists attended TME education workshops held in 2002 and 2003. We are reporting preliminary management outcomes for rectal cancer patients in BC after these education workshops.

In the first year after the workshops, 405 patients were referred to the BC Cancer Agency for adjuvant management of rectal cancer. One-hundred and eighty-seven patients received short course preoperative radiation for mobile resectable tumours. Long course preoperative radiation and chemotherapy was given to 64 patients for locally advanced tumours and to 10 patients to enhance sphincter-sparing resection. One-hundred and forty-four patients did not receive preoperative radiation; of these, 57 received postoperative radiation and chemotherapy. TME was reported in 31% of cases.

Positive radial margin ( $\leq 1$  mm clearance) rates for mobile resectable tumours were 12.5% in the upper rectum, 4.0% in mid rectum and 31.1% in the distal rectum. Clear margins were achieved in 63.9% of locally advanced tumours and in all cases where long course preoperative radiation and chemotherapy was given to enhance sphincter-sparing resection. Cases that did not receive preoperative radiation had positive radial margin rates of 15% in the upper rectum, 12.5% in mid rectum and 36.4% in the distal rectum.

We conclude that TME technique remains underreported. Operating room reporting templates have potential to improve TME reporting. Radial margin positivity rates are similar to the Dutch TME trial, which were 14%, 13% and 26% for upper, mid and distal rectum, respectively. This surgical outcome holds the promise that local recurrence rates in BC will be similar to the Dutch experience. The high radial margin positivity rate for distal rectal cancers indicates that there is need for improvement in our treatment of cancer in this location. We now recommend preoperative long-course chemoradiation for patients with distal rectal cancer to decrease radial margin positivity and local recurrence, and to increase sphincter-sparing resection for distal rectal cancer.

#### 17

**NEOADJUVANT CHEMORADIATION AND ANASTOMOTIC LEAK AFTER TOTAL MESORECTAL EXCISION FOR RECTAL CANCER.**

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Septic complications resulting from an intestinal anastomotic leak can be potentially life threatening but can often be minimized with the use of a temporary diverting stoma. Several disease and patient risk factors predispose to anastomotic dehiscence, however there remains some uncertainty as to whether the recent increased use of neoadjuvant chemoradiation therapy in patients with rectal cancer predisposes to anastomotic dehiscence. The aim of this study is to determine if the neoadjuvant chemoradiation should be considered a risk factor for anastomotic leak after total mesorectal (TME) excision for rectal cancer.

A retrospective analysis was performed for all patients who underwent curative TME for rectal cancer with primary anastomosis with and without neoadjuvant therapy between January 2000 and October 2005. Patient demographics, anastomotic risk factors, operative procedure and postoperative clinical course were analyzed. Anastomotic dehiscence was defined based on both clinical symptoms and radiological demonstration of a leak. Neoadjuvant chemoradiation included 5040 Gy in conjunction with 5-FU-based chemotherapy.

Two-hundred and thirty-three TME were performed for rectal cancer. Fifty-four patients received neoadjuvant chemoradiation therapy, while 179 patients did not receive neoadjuvant treatment. Patients in both treatment groups were matched with respect to demographic feature, technique of the anastomosis, diversion and for additional known risk factors for anastomotic leak including level of the anastomosis, comorbidities, anemia, smoking and perioperative blood transfusion. A temporary diverting ileostomy was performed in 26% of patients receiving neoadjuvant therapy and in 10% of patients undergoing surgery alone. The leak rate in patients who received neoadjuvant treatment was 5.5%, and in patients who underwent surgery alone was 7.8%.

Within the limitations of a retrospective review we find no evidence that neoadjuvant therapy is a risk factor for anasto-

motomic leak in TME for rectal cancer. This may in part be a result of the increased usage of a diverting stoma in this patient population.

### 18

**SENTINEL LYMPH NODE (SLN) MAPPING IN COLON CANCER: IMPLEMENTATION OF A MULTICENTRE PROTOCOL.** *S. Ainslie, J. Smith, H. Hwang, K.W. Wiseman, D. Filipenko, D. Owen, G. McGregor, P.T. Phang.* Departments of Surgery and Pathology, University of British Columbia, Vancouver, BC.

The purpose of this study is to determine whether ex vivo SLN mapping to identify occult metastases in colon cancer could be successfully applied to patients at our 2 academic hospitals, and to correlate findings with long-term outcomes.

Thirty-three patients with intraperitoneal colon tumours undergoing resection were studied prospectively. SLNs were identified as the first blue-stained node(s) after ex vivo peritumoral injection of isosulfan blue dye. Additional lymph nodes were harvested in accordance with standard pathological evaluation for colon cancer. All nodes were routinely examined by hematoxylin and eosin (H&E). SLNs that were negative on H&E were further analyzed by multilevel sectioning and immunohistochemistry (IHC) staining using anti-cytokeratin monoclonal antibody.

Of the 33 study patients, mean number of nodes retrieved was 14. SLNs were identified in 30 (91%) cases. Overall, SLNs accurately reflected the status of the entire lymph node basin in 29 of 33 (87%) patients. In 1 patient with negative nodes by H&E, subsequent IHC staining of the SLN was positive; in 1 other patient, IHC staining was equivocal. In 2 others with negative nodes, the SLN was positive with multisectioning (H&E).

In conclusion, the ex vivo technique of SLN mapping for colon cancer is feasible. SLNs were identified in most patients (91%) in the current study. Furthermore, this technique may have upstaged 4 patients from stage II to stage III. Whether this upstaging will ultimately affect overall survival has yet to be determined.

# Canadian Surgery Forum 2006

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**VALIDATION OF ESOPHAGEAL DOPPLER FOR NON-INVASIVE HEMODYNAMIC MONITORING DURING PNEUMOPERITONEUM.** *A. Okrainec, S. Bergman, L.S. Feldman, S. Demyttenaere, F. Carli, G.M. Fried.* Steinberg-Bernstein Centre for Minimally Invasive Surgery, McGill University, Montréal, Que.

Commonly used perioperative measurements of hemodynamics, like Swan-Ganz catheters, are invasive and may not be reliable under pneumoperitoneum. The purpose of this study was to validate the use of esophageal Doppler (ED) for noninvasive hemodynamic monitoring under pneumoperitoneum in an experimental pig model.

Eleven female pigs were submitted to two 30-minute study periods: 1) baseline, no interventions; 2) pneumoperitoneum, 12 mm Hg CO<sub>2</sub> pneumoperitoneum. One pig was excluded due to tachycardia > 140 at baseline. A Swan-Ganz pulmonary artery catheter was used to measure cardiac output (CO-SG), central venous pressure (CVP-SG) and pulmonary capillary wedge pressure (PCWP). An ED was inserted and stroke volume (SV-ED), cardiac output (CO-ED) and corrected flow time (FTc), an index of preload, were recorded.

Transthoracic echocardiography was used to measure left ventricular end-diastolic diameter (LVEDD) and cardiac output (CO-TTE). Pearson correlation was used to assess individual associations between measured hemodynamic parameters.

There was good correlation between CO-ED and CO-SG ( $R = 0.529$ ,  $p < 0.001$ ). There was excellent correlation between CO-ED and CO-TTE ( $R = 0.815$ ,  $p < 0.001$ ). SV-ED correlated well with SV-SG ( $R = 0.508$ ,  $p < 0.01$ ) and SV-TTE ( $R = 0.732$ ,  $p < 0.001$ ). These relationships were consistent when analyzed separately at baseline and under pneumoperitoneum (data not shown). There was no correlation between FTc and LVEDD or PCWP.

Esophageal Doppler monitoring is a valid noninvasive method to measure cardiac output and stroke volume at baseline and during pneumoperitoneum in a porcine model. Corrected flow time did not correlate with other estimates of preload at baseline or during pneumoperitoneum.

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**OUTCOMES FOLLOWING LAPAROSCOPIC NEPHRECTOMY ARE IMPROVED WITH HAND-ASSISTED SURGERY.** *M. Zerey, C.S. Joels, J.R. Porter, A.E. Lincourt, B.T. Heniford, K.W. Kercher.* Division of Gastrointestinal and Minimally Invasive Surgery, Carolinas Medical Center, Charlotte, NC.

Laparoscopy has become the preferred method for nephrectomy in many medical centres. We compare our experience with hand-assisted laparoscopic nephrectomy (HALN) and standard laparoscopic nephrectomy (LN).

Data were prospectively collected on 119 consecutive patients undergoing laparoscopic nephrectomy between August 2000 and November 2002. Outcomes were compared for LN versus HALN using Wilcoxon rank sum tests for quantitative outcomes and Fisher's exact tests and  $\chi^2$  for qualitative outcomes.

Thirty-nine patients underwent LN: 16 live donor, 16 radical and 7 simple nephrectomies. Eighty patients were treated with HALN: 47 live donor, 32 radical and 1 simple nephrectomy. There were no differences in mean age (49.2 yr LN v. 47.7 yr HALN,  $p = 0.60$ ) or weight (192.2 lb LN v. 179.2 lb HALN,  $p = 0.12$ ). Mean tumour size (4.77 cm LN v. 7.12 cm HALN,  $p = 0.07$ ) and length of extraction incision (8.37 cm LN v. 7.87 cm HALN,  $p = 0.08$ ) were similar. Total hospital charges (\$19 352 v. \$18 505,  $p = 0.29$ ) and length of stay (3.68 d v. 3.72 d,  $p = 0.15$ ) were equivalent for LN and HALN. Average operative time for HALN was significantly shorter (202 min v. 258 min,  $p = 0.0001$ ) and blood loss was less for HALN (71.7 mL v. 113.1 mL,  $p = 0.007$ ). Wound complications rates were similar (6.5% HALN v. 13% LN,  $p = 0.34$ ), but overall morbidity rates were higher after LN (28.2% v. 6.3%,  $p = 0.001$ ).

Compared with pure laparoscopic nephrectomy, the hand-assisted approach reduces operative time and blood loss without increasing total hospital charges or length of stay. In our patients, HALN was also associated with fewer postoperative complications than standard laparoscopic nephrectomy. Hand-assisted laparoscopy may allow for the performance of increasingly complex procedures while maintaining the benefits of minimally invasive surgery.

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Withdrawn.

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**ESTIMATING RECOVERY ONE WEEK AFTER UNCOMPLICATED LAPAROSCOPIC CHOLECYSTECTOMY.** *S.V. Demyttenaere, L.S. Feldman, N. Mayo, D.D. Stanbridge, G.M. Fried.* Departments of Surgery and Epidemiology and Biostatistics, McGill University, Montréal, Que.

To estimate to what extent patients have recovered 1 week after uncomplicated laparoscopic cholecystectomy (LC) using outcomes including functional exercise capacity, health-related

quality of life, activity level and patient self-report.

Twenty-eight patients (8 male, 20 female) undergoing LC at a single institution were evaluated prospectively at baseline and at 1 week postoperatively. Functional exercise capacity was measured using the 6-minute walk test (6MWT), and health-related quality of life was assessed with the Short Form-36 (SF-36) and Gastrointestinal Quality of Life Index (GIQLI). Data were analyzed with paired *t* tests (continuous) and Wilcoxon signed rank (non-continuous) tests,  $p < 0.05$  significant.

The population had median (inter-quartile range [IQR]) age of 51 (32) years, BMI 26 (6) kg/m<sup>2</sup> and ASA 1 (1). The operative time was 64 (32) minutes, and 57% of patients were employed. Comparing baseline with 1 week after surgery, mean 6MWT distance (400 v. 382 m,  $p = 0.27$ ), GIQLI (103 v. 101,  $p = 0.6$ ) and SF-36 Mental Component Summary score (50 v. 50,  $p = 0.84$ ) were not different. However, the Physical Component Summary score (45 v. 40,  $p = 0.057$ ) was decreased due to a difference in the Role Physical (RP) domain (81 v. 73,  $p = 0.001$ ). Fatigue and pain scores returned to baseline on the third ( $p = 0.17$ ) and seventh (0.49) postoperative days. By 1 week after surgery, patients felt 85% recovered, and > 80% of patients were climbing stairs and performing light housework. However, most patients were not yet driving, and only 36% had returned to work.

On average, patients have returned to baseline functional exercise capacity and physical health 1 week after LC except in the RP domain of the SF-36. Most, however, have not yet returned to work. Assessment of submaximal exercise capacity is insufficient to fully assess the recovery process following LC. A comprehensive assessment needs to include the identification of the time to return to higher level activities.

### 23

**LAPAROSCOPIC SURGERY FOR ACHALASIA: SHORT-TERM AND INTERMEDIATE PATIENT-CENTRED OUTCOMES.** *G.N. Polybronopoulos, A. Okrainec, L.S. Feldman, L.E. Ferri, S. Demyttenaere, S. Mayrand, D.D. Stanbridge, G.M. Fried.* Steinberg-Bernstein Centre for Minimally Invasive Surgery, McGill University, Montréal, Que.

Laparoscopic Heller myotomy and Dor fundoplication (H-D) is widely used to treat achalasia. We assessed the durability of H-D on symptoms and quality of life (QOL) using validated questionnaires and determined whether short-term improvements in patient-centred outcomes predict intermediate results.

Prospectively collected data on all H-D performed (1999–2005,  $n = 55$ ) were reviewed. Outcomes measured preoperatively and postoperatively at 3 months, 6 months and annually were: General (SF-12), gastroesophageal reflux disease (GERD)-specific QOL (GERD-HRQL) and dysphagia (0: best–5: worst). Manometry was performed preoperatively and 3 months postoperatively. The proportion of patients with daily bothersome symptoms of dysphagia (score  $\geq 3$ ) was calculated for each period and change over time assessed. Groups were defined based on dysphagia scores and manometry 3 months postoperatively, and 2-year outcomes were compared.

There was an improvement in dysphagia,\* GERD-HRQL,\*

SF-12 QOL\* ( $*p < 0.0001$ ) at 3 months versus preoperatively. There was significant improvement in dysphagia from preoperative to all postoperative intervals but no significant change throughout follow-up. Thirty-one patients were > 2 years postoperative, and 24 had complete (questionnaire) data for analysis. Dysphagia scores improved from 4 at baseline, to 0 ( $p < 0.0001$ ) at 3 months, and increased at 2 years to 2, ( $p = 0.036$  v. 3 mo,  $p < 0.0001$  v. baseline). At 3 months, 18 had no bothersome dysphagia (group 1) and 6 had bothersome symptoms (group 2). Of patients in group 1, 94% remained free of daily dysphagia symptoms at 2 years. Of patients in group 2, none were worse at 2 years. Comparison at 2 years showed a small difference in dysphagia scores between the groups (1 v. 2,  $p = 0.013$ ), but no significant difference in general or GERD-specific QOL. When groups were stratified by lower esophageal sphincter pressure (LESP) ( $\leq$  or  $>$  12 mm Hg) 3 months postoperatively, there was no difference in dysphagia scores and QOL at 2 years.

H-D provides durable control of achalasia up to 48 months after surgery, with no significant increase in GERD symptoms. QOL scores improve to and remain at population norms after surgery. At 3 months after H-D, dysphagia scores were useful in predicting 2-year patient-centred outcomes, while LESP measurements were not.

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**HEPATIC VEIN INJURY DURING LAPAROSCOPIC CHOLECYSTECTOMY: THE UNDERAPPRECIATED PROXIMITY OF THE MIDDLE HEPATIC VEIN TO THE GALLBLADDER BED.** *C.G. Ball, A.R. MacLean, A.W. Kirkpatrick, O.F. Bathe, F. Sutherland, E. Debru, E. Dixon.* Department of Surgery, Foothills and Peter Lougheed Hospitals, Calgary, Alta.

The primary objective of this study was to define the anatomic proximity between the middle hepatic vein and the gallbladder bed, and hence to the plane of dissection during a laparoscopic cholecystectomy. The secondary objective was to identify any patient or anatomic factors that may predict significant intraoperative bleeding during these laparoscopic procedures.

CT scans of 20 random patients from a busy hepatobiliary practice were prospectively reviewed to identify the closest distance between branches of the middle hepatic vein and the gallbladder bed. The hepatic vein diameters were also recorded. Potential anatomic and patient risk factors for intraoperative bleeding during laparoscopic cholecystectomies performed over a 12-month period were also retrospectively reviewed.

Large branches (mean diameter 2.1 mm) of the middle hepatic vein are directly adjacent to the gallbladder bed in 10% of patients. The median separating distance was 6.1 mm (range 0–47 mm). An additional 10% of cases also possess major branches within 1 mm of the gallbladder bed. Among the patients who required emergent conversion to an open procedure for major hemorrhage, chronically scarred and contracted gallbladder disease appeared to increase the risk of bleeding.

Twenty percent of all patients will possess a large branch of the middle hepatic vein adherent, or immediately adjacent, to the gallbladder fossa. These patients are at increased risk for intraoperative bleeding during the dissection of the gallblad-

der off of the liver. Furthermore, contracted gallbladders with evidence of chronic disease may be at increased risk for significant hemorrhage.

## 25

**GLOBAL OPERATIVE ASSESSMENT OF LAPAROSCOPIC SKILLS (GOALS): EXTERNAL VALIDATION.** *M.C. Vassiliou, D.L. Fowler, N.J. Hogle, C.G. Andrew, A. Vergis, D.R. Klassen, L.S. Feldman, G.M. Fried.* Departments of Surgery, McGill University, Montréal, Que.; Columbia University, New York, NY; University of Manitoba, Winnipeg, Man.; Dalhousie University, Halifax, NS.

GOALS has been shown in a pilot study (21 participants) to meet high standards of reliability and validity in the host institution (H). The aim of this study was to evaluate the external validity of GOALS by exporting it to 3 other North American centres, and to compare these results to additional data accrued in the host site since initial publication.

GOALS, a 5-item Likert scale developed and tested for intraoperative assessment in laparoscopy, was used by attending surgeons in 3 external institutions (X) to evaluate 16 novice (Nov., PGY1–3) and 12 experienced (Exp., PGY4–attending) participants performing laparoscopic cholecystectomy. These data were compared with 50 assessments completed by attending surgeons in the host site (31 Nov. and 19 Exp.). Construct and external validity were assessed by comparing mean total GOALS scores for novice and experienced subjects in host and external sites using 2-way ANOVA with Fischer post hoc analysis.

GOALS scores		
Study site; participant group	Mean	95% CI
<b>Host institution</b>		
Novice	12.6	(11.3–13.9)
Experienced	21.0	(19.2–22.8)
<b>External institutions</b>		
Novice	14.3	(12.5–16.2)
Experienced	21.4	(19.6–23.2)
CI = confidence interval; GOALS = Global Operative Assessment of Laparoscopic Skills.		

Novice and experienced groups respectively scored similarly in host and external sites. Significant differences between novice and experienced operators were demonstrated, irrespective of the testing location.

These data suggest that GOALS is valid outside of the institution where it was developed and support its widespread use as an intraoperative assessment of laparoscopic skills. Results of future research employing GOALS as an outcome measure of different training strategies can be generalized to many North American programs.

## 26

**COMPARATIVE REVIEW OF INITIAL LAPAROSCOPIC COLON RESECTIONS.** *M. Sawatzky, H.J. Bonjer, C. Jamieson, B. McIntyre, P. Johnson.* Department of Surgery, Queen Elizabeth II Health Sciences Centre, Halifax, NS.

A comparative retrospective review of the initial 50 laparoscopic colon procedures performed by a colorectal surgeon with a laparoscopic preceptor and a matched cohort of 45 open colon procedures. The matched cohort was determined by identifying patients on the same surgeon's past operating room list in chronological order. Patients were selected who underwent colonic procedures that might be done laparoscopically; exclusion criteria included relative contraindications to laparoscopic resections. Relevant demographic, perioperative and pathologic data were recorded for each group to evaluate similarity between cohorts and significant differences that may be attributed to surgical technique.

The cohorts had similar demographics, but the laparoscopic group had a higher portion of patients with significant comorbidities. The most common procedures were anterior resections and right hemicolectomies for adenocarcinoma and adenomatous polyps. A preceptor was involved in 30 of the 50 procedures and decreased in frequency with the number of cases. Operating room times were significantly longer in the laparoscopic group by 44 minutes. There were 5 conversions to open technique. Opiate use, time requiring IV fluid maintenance and length of stay in hospital were significantly improved by 1.4, 2.1 and 2.6 days, respectively, for the laparoscopic group. There were no significant differences in surgical margins or total lymph nodes counted for adenocarcinoma. Postoperative complications, wound infections and readmissions were similar.

Learning a laparoscopic technique for common colorectal procedures is safe in properly selected patients in a preceptor-based format. An improvement in several perioperative measures were observed in these initial cases, however, operative time was increased.

## 27

**VALIDATION OF THE ProMIS HYBRID SIMULATOR USING STANDARD LAPAROSCOPIC TASKS.** *A.L. McCluney, L.S. Feldman, D. Stanbridge, G.M. Fried.* Steinberg-Bernstein Centre for Minimally Invasive Surgery, Department of Surgery, McGill University Health Centre, Montréal, Que.

SAGES Fundamentals of Laparoscopic Surgery (FLS) tasks are validated measures of technical skills, but testing in the standard FLS simulator requires trained personnel. The ProMIS "hybrid" simulator offers automated scoring for both physical and virtual reality tasks. Any physical task can be scored in ProMIS using motion analysis metrics which are reported as instrument path length (PL) and instrument smoothness (IS). This study was designed to evaluate the construct and concurrent validity of the ProMIS simulator using the standard FLS tasks.

Twenty-three subjects (10 students, 8 residents and 5 laparoscopic surgeons) performed FLS tasks in the standard FLS simulator and in ProMIS. Assessments were based on FLS metrics, as well as PL and IS. ANOVA was used to compare mean scores across experience levels. Pearson's correlation coefficients were calculated for ProMIS FLS scores, total PL and total IS relative to standard FLS scores. Significance was defined as  $p < 0.05$ .

Mean ProMIS FLS scores differed significantly across all groups: students  $17 \pm 11$  versus residents  $50 \pm 16$ ,  $p \leq 0.01$ ;

students versus surgeons  $76 \pm 11$ ,  $p \leq 0.01$ ; residents versus surgeons,  $p \leq 0.01$ . Mean PL for surgeons ( $3093 \pm 857$ ) was significantly lower than for students ( $7613 \pm 2433$ ,  $p \leq 0.01$ ) but not residents ( $5929 \pm 2707$ , NS). Students' mean PL was not significantly different from residents'. Mean IS for residents ( $6788 \pm 2380$ ,  $p \leq 0.01$ ) and surgeons ( $3093 \pm 857$ ,  $p \leq 0.01$ ) were significantly lower than for students ( $10759 \pm 2629$ ) but did not differ from each other (NS). ProMIS FLS scores ( $r = 0.83$ ,  $p \leq 0.01$ ), total PL ( $r = -0.67$ ,  $p \leq 0.01$ ) and total IS ( $r = -0.74$ ,  $p \leq 0.01$ ) all correlated significantly with standard FLS scores.

FLS tasks performed in ProMIS, whether scored by traditional FLS metrics or ProMIS motion analysis metrics, discriminate easily between students and surgeons. However, motion analysis metrics do not consistently distinguish residents from other groups. The observed correlations show ProMIS FLS scores, total PL and total IS to be excellent predictors of standard FLS performance.

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**LAPAROSCOPIC COLORECTAL RESECTION: A CRITICAL REVIEW OF 104 CASES.** *A. Hummadi, W. Mohammed, A. Rostom, S. Tadros.* Department of Surgery and Gastroenterology, University of Ottawa, Ottawa, Ont.

As laparoscopic colon resection (LCR) gains wider acceptance among surgeons, questions are raised about the efficacy and safety of these procedures. We undertook a critical review of a single surgeon's experience of 104 LCRs carried out at The Ottawa Hospital between 2002 and 2005. The average age was 68 years, 47% were female, 71.7% of patients had an ASA score of 1 or 2 and 28.3% had an ASA score of 3 or 4. The LCRs included 29 right hemicolectomies, 33 sigmoid resection, 26 anterior resections, 7 left hemicolectomies and 8 abdominal-peritoneal resections. Seventy-six percent of cases were for malignant pathology (stage I, 12%; stage II, 14%; stage III, 39%; and stage IV, 7%). The mean operative time was 173 minutes (range 82–429 min). Right hemicolectomies took significantly less time than the other procedures (mean 135 min,  $p < 0.03$ ). No difference was noted in operative time between malignant and benign pathologies. The conversion rate was 7%. The 30-day operative mortality was 0.96%. Complications included: anastomotic leak in 1 patient, wound infection in 3, cardiopulmonary in 5 and bleeding in 1. There were no reoperations. For malignant lesions, the average number of lymph nodes retrieved was 14. The overall average length of stay was 5.8 days. In multiple logistic regression analysis, only female gender and ASA score were independently associated with the occurrence of complications ( $p < 0.011$ ). In conclusion, LCR is safe and is associated with a low complication rate and a short hospital stay.

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**WHAT A DIFFERENCE A YEAR MAKES: THE IMPACT OF FORMAL MENTORING IN ADVANCED MINIMALLY INVASIVE SURGERY (MIS) ON SURGEON PRACTICE AND PATIENT OUTCOMES.** *A. Asiri, C. de Gava, D.W. Birch.* Department of Surgery, University of Alberta, Centre for the Advancement of Minimally Invasive Surgery (CAMIS), Royal Alexandra Hospital, Edmonton, Alta.

Canadian surgeons are in desperate need of a mechanism for safely and appropriately introducing new surgical techniques into practice. The effectiveness and adoption of advanced MIS depend on how these techniques are introduced. Typically, surgeons complete courses with limited hands-on training. Inevitably, this has led to a highly varied adoption of advanced MIS. Emerging evidence would suggest a more effective strategy is the implementation of a mentorship program. This study analyzed the effect of mentoring on a single institution's advanced MIS practice.

We completed a retrospective review of patient charts 1 year before and after the recruitment of a fellowship-trained advanced MIS surgeon whose job description included facilitating the introduction of advanced MIS. All advanced MIS of the gastrointestinal tract (excluding bariatric surgery) were examined. Outcomes include the adoption rate, conversion rate, operative time, immediate surgical complications and length of stay in hospital.

A total of 7 surgeons were mentored at one site. None withdrew or refused mentoring. The outcomes of formal mentoring are included in the following table.

Practice and patient outcomes following formal mentoring in minimally invasive surgery (MIS); no. (and %)			
Outcome measures	Pre-mentoring	Mentoring	p value
MIS surgeons			
Total	3	9	
> 12 cases/yr	2	4	
Advanced MIS cases			
Total	35	155	
Excluding mentor	—	102	
Mentored MIS cases	0	53 (52)	
Conversions	5 (14.3)	10 (6.4)	0.12
LOS, d	5	5	
Intraoperative complications	6 (17.1)	11 (7.1)	0.06
All colorectal cases			
Resections	11 (55)	92 (88)	0.0027
OR time, min	172	170	

LOS = length of hospital stay; OR = operating room.

For many gastrointestinal disorders, advanced MIS is becoming the standard of care. Surgeons and the institutions in which they work have a duty to adopt these techniques in a safe and appropriate manner. We believe these data clearly demonstrate that a mentorship program is an effective strategy with a sustainability not provided by courses.

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**ROUX-EN-O GASTRIC BYPASS: DON'T LET THIS HAPPEN TO YOU.** *V. Sherman, J. Lord, A.G. Dan, B. Chand, P.R. Schauer.* Department of General Surgery, Cleveland Clinic, Cleveland, Ohio.

We reviewed issues related to causation and patient outcomes associated with incorrect intestinal connection during gastric bypass (roux-en-O). This complication results from improper anastomosis of the bilio-pancreatic limb to the gastric pouch, with a misplaced jejunum-jejunostomy.

Four cases involving roux-en-O configuration that occurred at institutions not affiliated with the authors were evaluated. Contributory factors and outcomes were assessed.

Patients' preoperative BMIs ranged from 36.5 to 47. Two patients had an open gastric bypass and one had a laparoscopic gastric bypass. The fourth patient underwent a laparoscopic to open conversion in which the jejunum-jejunostomy was created laparoscopically. Operative reports did not indicate any adverse events during the creation of the jejunum-jejunostomy. The site of jejunal division varied from 20 cm distal to the ligament of Treitz to 250 cm from the ileo-cecal valve. Surgeon experience ranged from novice (< 10 laparoscopic gastric bypasses) to experienced (> 5 years bariatric experience). One case was diagnosed intraoperatively (patient #1). The time of diagnosis in the remaining 3 patients was postoperative days 2, 52 and 230 (patients #2, #3 and #4, respectively). Patients who experienced a delayed diagnosis underwent 2 abdominal CT scans, 2 endoscopies and 4 contrast studies each. These patients presented with protracted biliary emesis and a clinical picture of bowel obstruction. Regardless of the time to diagnosis, all patients required subsequent surgeries ( $n = 10, 3, 1$  and  $3$ , respectively) and had multiple major complications ( $n = 7, 4, 4$  and  $3$ , respectively) with total length of stay equal to 97, 86, 49 and 125 days, respectively.

To our knowledge, this is the first reported series of incorrect anastomosis of bowel limbs during gastric bypass, an extremely serious complication. Technical manoeuvres such as standardized roux limb lengths, marking of the roux limb and tracing bowel to the ligament of Treitz are recommended to prevent this unusual, debilitating complication.

### 31

**TUMOUR GROWTH VELOCITY IS PREDICTIVE OF MALIGNANCY IN SOFT TISSUE MASSES: A MULTIVARIATE ANALYSIS.** *K. Jones, T. McAllister, R. George, P. Isotalo, W. Hopman.* Department of Surgery, Department of Pathology and Molecular Biology, Department of Community Health and Epidemiology, Queen's University, Kingston, Ont.

Soft tissue masses are common and are often benign. Malignant neoplasms involving soft tissue often present at an advanced stage with poor prognosis. The purpose of this study is to define clinical features that help differentiate soft tissue masses as benign or malignant.

Consecutive adult patients referred for assessment of a soft tissue mass were organized in a prospective database. Patient demographics and tumour characteristics (including size, anatomic location, relation to fascia, associated symptoms and patient's perception of tumour growth velocity) were all recorded. Diagnoses were confirmed histologically by excision or biopsy. Parametric data were analyzed using Student's  $t$  test and odds ratios and 95% confidence intervals were calculated for categorical data.  $\chi^2$  testing was used to assign  $p$  values to the nonparametric data. Significant variables were subjected to multivariate logistic regression.

Eighty-six of 194 patients had a malignant diagnosis. The most common benign diagnosis was lipoma (55%). The most common malignant diagnoses were liposarcoma (22%) and leiomyosarcoma (22%). The most significant predictors for malignancy were perceived tumour growth velocity ( $p = 0.0001$ ),

size greater than 5 cm ( $p = 0.0001$ ), presentation deep to fascia ( $p = 0.0002$ ), age ( $p = 0.001$ ) and retroperitoneal location ( $p = 0.001$ ). Pain was not significant ( $p = 0.26$ ). In multivariate analysis, the independent predictors were age ( $p = 0.0001$ ), growth velocity ( $p = 0.0001$ ) and mass size greater than 5 cm ( $p = 0.0047$ ). Tumour relation to fascia and anatomic location lost their significance in multivariate analysis.

Soft tissue masses are more likely to be malignant in older individuals. Independent characteristics that predict malignancy in soft tissue tumours are size greater than 5 cm (odds ratio [OR] 5.14, 95% confidence interval [CI] 2.63–10.1), and tumour growth velocity, regardless of size (OR 34, 95% CI 9–144).

### 32

**DELAYED CLINICAL PRESENTATION PREDICTS ADVANCED DISEASE IN SOFT TISSUE MALIGNANCY: THE CASE FOR EARLY DIAGNOSIS.** *T. McAllister, K. Jones, R. George, P. Isotalo, W. Hopman.* Department of Surgery, Department of Pathology and Molecular Biology, Department of Community Health and Epidemiology, Queen's University, Kingston, Ont.

The American Joint Committee on Cancer (AJCC) staging system for soft tissue sarcomas uses tumour size, grade and depth to help designate patients as stages I through IV. Increasing stage predicts for worse outcome. Many patients present with stage III disease that is associated with a 52% 5-year survival. This study examines the relationship between initial stage and delay in diagnosis, hypothesizing that delay is a modifiable indicator of stage.

One-hundred and ninety-four consecutive adults presenting with a soft tissue mass were identified prospectively. Patients were excluded from the study if the presenting mass was an obvious nodal tumour, clinically arose from bone, or was uterine or ovarian in origin. Demographics, tumour characteristics and time to presentation were recorded. Diagnosis was histologically confirmed, and malignancies were staged as per AJCC guidelines. Data were analyzed using Microsoft Excel and Palisade StatTools 1.1.

Eighty-six of 194 patients were found to have a malignant mass. Mean age was 64 years, 55% of the malignant cases were male, and 60% presented as stage III or IV. Common malignancies were liposarcoma (22%), leiomyosarcoma (21%) and malignant fibrous histiocytoma (15%). Extremity location was most frequent (42%), followed by retroperitoneal location (21%). Times to presentation were correlated to initial stage, with increasing delay predicting higher stage ( $p < 0.05$ , Mann-Whitney rank sum test). Over 60% of advanced stage patients reported more than a 6-month delay, compared with just 27% of stage I or II patients ( $p = 0.003$ ,  $\chi^2$ ).

The majority of patients presented with stage III or IV disease. Late presentation was significantly associated with advanced disease. Earlier recognition of malignant soft tissue masses could improve prognosis by favourably impacting on presenting stage.

### 33

**APPROPRIATENESS OF BLOOD TRANSFUSION IN COLORECTAL CANCER.** *T. Cheang, J.L. Callum, A. Kiss, C.H.L. Law.* De-

partment of Surgery, Division of General Surgery, University of Toronto, Sunnybrook Health Sciences Centre, Women's College Hospital, Toronto, Ont.

We hypothesize that clinical factors can be identified to predict inappropriate transfusion in the perioperative care of colorectal cancer (CRC) patients. The objectives of this study were: 1) to describe the appropriateness of red blood cell (RBC) transfusion practice in the perioperative care of CRC patients; and 2) to determine factors independently associated with inappropriate transfusions.

All patients who had curative resections for CRC between September 1999 and December 2002 at a tertiary hospital were evaluated. The appropriateness of each transfusion event was assessed using hospital transfusion guidelines. Multivariable analysis was used to determine factors independently associated with inappropriate transfusions.

Among 308 patients there were 267 transfusion events and 30.7% were deemed inappropriate by hospital transfusion guidelines. Inappropriate transfusions occurred most often during the pre- and postoperative periods (43.5% preoperative v. 11.8% intraoperative v. 38.2% postoperative,  $p < 0.0001$ ). There were no differences in appropriateness on univariate analysis with respect to age, gender, anemic or emergent presentations. Significant differences were observed in age-adjusted Charlson comorbidity scores, timing of transfusion and presence of acute bleeding. However, timing of transfusion was the only factor independently associated with inappropriate transfusion on multivariate analysis.

An unacceptably high proportion of RBC transfusions given in the perioperative care of CRC patients are not endorsed by evidence-based guidelines. Further study is warranted to evaluate and improve the safety of transfusion medicine in this population.

### 34

**MICROSATELLITE INSTABILITY IN THYROID NEOPLASMS.** *E.J. Mitmaker, C.H. Alvarado, L.R. Bégin, M. Trifiro.* Department of Surgery, Lady Davis Institute—Jewish General Hospital and Department of Pathology, Sacré-Coeur Hospital, McGill University, Montréal, Que.

Microsatellite instability (MSI) is a form of genomic instability that has recently been implicated in the pathogenesis of thyroid cancer. The purpose of this study is to further define the distribution of microsatellite instability in both normal and neoplastic thyroid follicular epithelium. Similarly, by testing for different microsatellite markers, an attempt will be made to demonstrate a defective mismatch repair enzyme system in the tissue examined.

Paraffin blocks of benign and malignant thyroid tissue were obtained. Using laser capture microdissection (LCM), the cells from both normal and tumour tissue were individually collected. The DNA was then isolated from the laser microdissected tissues using the QIAamp DNA purification kit. PCR amplification of the DNA was then performed using 5 dinucleotide microsatellite markers: TSHR, THRA-1, D2S115, D2S399 and D2S123. A sequencing gel was performed on the PCR products. Gels were dried and used for autoradiography.

Eighteen benign and malignant thyroid tumours were com-

pared with their adjacent normal thyroid follicular tissue and were analyzed for MSI at 5 different loci. Seven of 7 (100%) papillary thyroid carcinomas demonstrated MSI at 2 or more loci; 6 of 7 (86%) of follicular thyroid carcinomas demonstrated MSI at 2 or more loci; while 1 of 7 (14%) was positive at 1 locus. Finally, in benign follicular adenomas, 3 of 4 (75%) were positive at 2 or more loci, while 1 of 4 (25%) demonstrated microsatellite stability at all 5 loci tested.

Microsatellite instability (MSI) appears to play a role in thyroid carcinogenesis as evidenced by the high frequency of MSI in both benign and malignant thyroid neoplasms. More importantly, the technique of laser capture microdissection allows for more accurate selection of benign, malignant and normal DNA. Further studies are needed to define the significance of MSI in the pathogenesis of thyroid follicular neoplasms.

### 35

**OPERATIVE REPORTS IN BREAST SURGICAL ONCOLOGY: TIME FOR A CHANGE.** *V. Khokhotva, R. George.* Department of Surgery, Queen's University, Kingston, Ont.

Oncologists, pathologists and regional tumour boards review cancer patient operative reports. Cancer agencies may begin to access these reports as a means of auditing compliance with guidelines. Reports can facilitate decisions about the adequacy of surgery, influence responses to equivocal pathological findings and facilitate radiation therapy planning. This study examines narrative breast cancer operative reports at a teaching centre against 10 items identified through literature review as pertinent for breast oncology cases. The items are included in Cancer Surgery Alberta's synoptic breast template.

Fifty recent breast cancer surgeries were identified from a prospective database and the reports audited for reference to each item. Five clinical (preoperative work-up, affected side, location in breast, clinical size and relation to structures such as skin, fascia or nipple) and 5 technical aspects (incision, gross margin assessment, relationship of posterior margin to pectoral fascia, tumour bed marking and specimen orientation) were assessed. Tumour bed, incision and orientation applied only to breast conserving procedures.  $\chi^2$  testing was used to look for differences between fields.

Consistently reported details were side (96%), preoperative investigations (64%), gross assessment of margins (58%) and specimen orientation (58%). All remaining items were reported with frequencies of less than 50%. Breast conserving operations fared slightly better than mastectomies (46% v. 36% of items reported), but both were poorly recorded, and the differences did not reach statistical significance. Attending staff were modestly better than resident staff, but not significantly ( $p = 0.209$ ), and both groups had low scores, 49 versus 42%, for compliance.

Pertinent details of oncologic breast surgery are inconsistently recorded. This review provides support for the concept of adopting a more standardized operative reporting system.

### 36

**MITOTIC COUNT AS A PREDICTIVE FACTOR IN MELANOMA: AN ADJUNCT TO THE SENTINEL NODE.** *H. Roldan, R. George.* Department of Surgery, Queen's University, Kingston, Ont.

The TNM staging system for melanoma defines N-stage disease as nodal involvement detected by sentinel biopsy, or gross nodal or in-transit spread. N disease (stage III) predicts systemic failure and is used to select patients for adjuvant therapy. However, up to 30% of stage II patients, without nodal or in-transit disease at presentation, experience systemic failure over 10 years. This study examines other variables as indicators of distant disease in melanoma.

Two-hundred and thirty-two patients were followed for a mean period of 29 months. Sex, age, site, Clark level, Breslow depth, ulceration, nodal status, TNM stage and mitotic count were recorded at presentation. Microsoft Excel and Palisade StatTools 1.1 were used for statistical analysis. The mean age at presentation was 59 (13–88) years; mean Breslow depth was 2.75 (0.2–14) mm; 26% of 156 patients had a positive sentinel node; and 35 patients presented with gross N-stage disease.

At analysis, 65 individuals had died from melanoma or were alive with recurrence. Multivariate regression confirmed Breslow depth and ulceration as the only independent predictors of N-stage disease ( $p = 0.021$  and  $0.023$ ). When applied to systemic failure, N-stage disease ( $p = 0.0001$ ) and mitotic count ( $p = 0.003$ ) were the most significant independent predictors of distant spread. Breslow depth just retained its significance ( $p = 0.050$ ) and ulceration lost significance when tested against mitotic rate and N-stage disease. High mitotic counts ( $\geq 10/\text{mm}^2$ ) were associated with a systemic failure rate of 62% ( $p = 0.0002$ ), and 24% of individuals with high counts failed distantly without initial N-stage disease.

High mitotic counts are an independent predictor of systemic failure for melanoma and should be considered prognostic, even in the setting of a negative sentinel node biopsy.

### 37

**PREDICTORS OF LATE BREAST CANCER RECURRENCE 5 OR MORE YEARS AFTER DEFINITIVE TREATMENT.** *M.E. Goecke, S. Narod, P. Sun, E. Rawlinson, F.C. Wright, M.L. Quan.* Department of Surgery, University of Calgary, Calgary, Alta.; Centre for Research in Women's Health, Department of Surgery, Sunnybrook & Women's College Health Sciences Centre, University of Toronto, Toronto, Ont.

It is well established that the greatest risk of breast cancer recurrence is within 5 years after definitive treatment. However, little is known about those patients who recur 5 or more years after definitive therapy. The objective of this study was to identify predictors of late recurrence of breast cancer (local, regional and distant).

A retrospective cohort study of all women who had breast cancer surgery between January 1, 1987, and December 31, 1997, at a single institution was performed. Patient demographics, tumour characteristics and treatment data were abstracted from a prospectively maintained database. Women with any breast cancer recurrence between 5 and 15 years after treatment were compared with women who remained disease-free, and variables predictive of recurrence were identified. Adjusted analysis was performed using Cox proportional hazards.

Twelve-hundred and forty-two women with invasive breast cancer were identified with a median follow-up of 8.8 years. A total of 165 (13%) of women sustained a recurrence between

5 and 15 years after definitive treatment. Thirty-nine percent of first recurrences were local, 12% were regional and 48% were distant. The median time to any recurrence was 8 years. Mean age was 57 years, and mean tumour size was 1.9 cm. Seventy percent of patients had invasive ductal carcinoma as their primary diagnosis, 37% were node positive and 75% were estrogen-receptor (ER) positive. Eighty-five percent were treated with breast conserving surgery (BCS); 25% underwent chemotherapy. On multivariate analysis after adjusting for patient and tumour characteristics, positive nodal status (hazard ratio [HR] 1.81, 95% confidence interval [CI] 1.19–2.75,  $p = 0.006$ ) and presence of lymphovascular invasion (HR 1.56, 95% CI 1.09–2.24,  $p = 0.02$ ) were significant independent predictors of recurrence.

Women are still at risk of recurrence after being disease free for 5 years after definitive treatment. Predictors of late recurrence are similar to known predictors of early recurrence.

### 38

**MALIGNANT BLUE NEVUS — EXPERIENCE OF 21 PATIENTS FROM A SINGLE INSTITUTION.** *H. Wang, R.C.W. Martin, R.A. Scolyer, M. Colman, J.F. Thompson.* Sydney Melanoma Unit, Sydney Cancer Centre, Royal Prince Alfred Hospital, Sydney, Australia.

The objective of this study was to provide a detailed analysis of the clinical features, treatment outcomes and prognoses of malignant blue nevus (MBN), a rare cutaneous tumour that is poorly described in the literature.

Information was obtained from the records of 21 patients diagnosed with MBN at the Sydney Melanoma Unit (SMU) from 1978 to 2003. Their clinical and pathological features were reviewed and compared in a matched-pair analysis to other subtypes of melanoma.

Contrary to most reports describing such lesions as occurring predominantly on the scalp, we found that 33% of them were on an extremity, 33% on the trunk, only 24% on the scalp and 9.5% in the head and neck area other than scalp. The SMU pathology reports indicated that the tumours had an average Breslow thickness of 5.2 mm, were mostly Clark levels 4 or 5 (95%), were ulcerated in only 14.5% and had a mean mitotic rate of 3.9/mm<sup>2</sup>. The recurrence pattern after initial definitive treatment was: 38% to regional nodes (median time to recurrence 11 mo), 29% to liver (4.5 mo), 24% to lung (22 mo), 19% in transit (42 mo), 19% to other sites (39.5 mo), 14% local recurrence (7 mo), 9.5% to bone (32 mo) and 5% to brain (1 mo). The median follow-up time was 30 months, the mortality rate was 38%, and survival was 82% at 1 year and 50% at 5 years.

From this, the largest series of MBN reported by a single institution to date, we conclude that MBN occurs not only on the scalp, but also quite frequently on the extremities and trunk. It tends to present at a later stage than other histological subtypes of melanoma but has a similar prognosis and comparable metastatic pattern.

### 39

**HEREDITARY NONPOLYPOSIS COLON CANCER IN A REMOTE CANADIAN SETTING: EXPERIENCE OF A SCREENING PROGRAM 1996–2004.** *R.R. Suri, W.A. Harris, J. Cox, G. Fitzgerald,*

**F. Farrokhyar.** Charles S. Curtis Memorial Hospital, St. Anthony, NL; McMaster University Hospital, Hamilton, Ont.

We conducted a prospective cohort study to examine the results of a colonoscopic surveillance program in rural Newfoundland and Labrador where there is a high prevalence of hereditary nonpolyposis colorectal cancer (HNPCC). Between 1996 and 2004, 340 subjects from 27 families meeting either Amsterdam I or Amsterdam II criteria for HNPCC underwent at least 1 screening colonoscopy. Multiple colonoscopies were performed in 265 patients, resulting in 1179 person-years of observation.

The mean age of our cohort was 48.1 years (range 22–88). Females comprised 53.8% of the cohort. Adenomas were found in 62 subjects (18%) on their first colonoscopy. In those who had subsequent colonoscopies, 45 (17%) had polyps. Two subjects developed colorectal cancer despite active surveillance. Subjects older than 50 years of age were more than twice as likely to develop polyps than patients less than or equal to 50 years of age (incidence rate ratio [IRR] 2.88, 95% confidence interval [CI] 1.70–4.98,  $p < 0.001$ ). The presence of polyps on initial colonoscopy significantly increased the risk of developing future polyps (IRR 6.10, 95% CI 3.64–10.28,  $p < 0.001$ ).

Our results confirm the importance of regular screening of patients with HNPCC to detect adenomatous polyps. Further research is needed to confirm that this effort has translated into improved patient outcomes and quality of life.

#### 40

**DOES EARLY DETECTION ACCOUNT FOR THE APPARENT INCREASING INCIDENCE OF THYROID CARCINOMA IN WOMEN?** *W.D.T. Kent, S.F. Hall, P. Isotalo, R. Houlden, R. George.* Departments of Surgery, Otolaryngology, Medicine and Pathology, Queen's University, Kingston, Ont.

Recent reports from both North America and Europe have documented an increase in the incidence of well-differentiated thyroid carcinoma (WDTC). It has been suggested that this may be a result of exposure to environmental carcinogens. An alternative explanation is that these findings represent a perceived increase resulting from the enhanced sensitivity of modern diagnostic imaging techniques.

From the Ontario Cancer Registry, 8100 cases of well-differentiated thyroid cancer in Ontario were identified from January 1990 to December 31, 2001. Incidence of WDTC was compared across this time period. Pathology reports were then obtained for a random 10% from each year across all Cancer Care Ontario regions. These reports were analyzed to determine changes in mean tumour size across the time period. Age and sex differences were also assessed.

A 230% increase in cases of WDTC was found over the 12 years. Mean tumour size was found to decrease across time with significantly more small tumours (< 2 cm) resected in 2001 than in 1990 ( $p < 0.01$ ). Interestingly, when male and female populations were compared, this effect was only found in the female population.

The overall increase in incidence of WDTC in Ontario seems to be accounted for by the increase in small tumours in

female patients. This phenomenon may be explained by the identification and resection of clinically occult microcarcinomas incidentally found in women, who are more likely to see their primary care physician and undergo radiological investigations. Alternatively, it may be that females have selectively been exposed to an environmental carcinogen or hormonal factor that has resulted in thyroid cancer.

#### 41

**THE ROLE OF FDG-PET/CT AND THYROGEN® IN RADIOIODINE SCAN NEGATIVE PATIENTS WITH RECURRENT/METASTATIC DIFFERENTIATED CARCINOMA OF THE THYROID.** *M.S. Al-Qabhtani, R.J. Tabah, V.A. Derbekyan, J.S. How.* Departments of Surgery, Radiology and Medicine, McGill University Health Centre, Montréal, Que.

Patients with recurrent or metastatic differentiated thyroid cancer (DCT) as detected by rising thyroglobulin (Tg) alone, with or without abnormal findings on either physical or diagnostic imaging, will often have a positive radio-iodine whole body scan (WBS). Fluorine-18-fluorodeoxyglucose positron emission/CT scan has been shown to be helpful in documenting recurrent DCT in a sub-group of WBS-negative patients. The purpose of the present study is to review our experience with FDG-PET/CT in 16 previously treated patients with suspected recurrent DCT who are WBS negative.

Sixteen patients treated for DCT (9 male, 7 female) between the ages of 30 and 81 and who were Tg positive and WBS negative underwent a total of 17 FDG-PET/CT scans. In 7 instances, examinations were performed under Thyrogen® stimulation, the maximum stimulated Tg (Tg<sup>max</sup>) was measured, and the ratios between Tg<sup>max</sup> and baseline Tg (Tg<sup>baseline</sup>) were calculated.

Two patients were found to have unsuspected second primary cancers on the basis of FDG-PET/CT alone. Overall, 13 of 17 FDG-PET/CT scans were positive for DCT (76%). Eight of 10 unstimulated scans were considered positive (80%) while 5 of 7 Thyrogen® stimulated scans (71%) were positive. Furthermore, the incidence of a positive FDG-PET/CT scans in these 7 instances appeared to be unrelated to the ratio of Tg<sup>max</sup> to Tg<sup>baseline</sup>.

FDG-PET/CT is helpful in identifying foci of disease in patients with recurrent/metastatic DCT who are WBS negative. The use of Thyrogen® stimulation is not associated with an increased incidence of positive scan.

#### 42

**FACTORS AFFECTING AXILLARY LYMPH NODE RETRIEVAL AND ASSESSMENT IN BREAST CANCER PATIENTS.** *T. Cil, H. Kahn, S. Gardner, W. Melnick, C. Holloway.* Departments of Surgery, Pathology, Clinical Trials and Epidemiology, Sunnybrook Health Sciences Centre, Toronto, Ont.

Axillary lymph node dissection (ALND) has been the standard of care in managing patients with invasive breast cancer. The goals of this procedure are to provide accurate disease staging and locoregional control. It is important that an adequate number of nodes are retrieved surgically and identified pathologically. This number affects the future role of adjuvant therapy for these patients (e.g., if < 10 nodes are retrieved, some

have advocated axillary radiation). The purpose of this study is to determine the factors that affect the number of nodes retrieved and pathologically examined in ALND samples for breast cancer.

All patients who had an ALND for breast cancer at Sunnybrook and Women's College Health Sciences Centre between July 1999 and July 2004 were identified. For these 829 patients, the number of nodes retrieved and the number of positive nodes were identified from pathology reports. We also extracted patient variables, institutional and treatment factors and various tumour and nodal characteristics.

Patients who had  $\geq 10$  nodes retrieved were compared with those with  $< 10$  using a  $\chi^2$  test. The mean number of nodes retrieved was 14, with 77% of patients having  $\geq 10$  nodes removed. Forty percent of these patients were node positive. In a univariate analysis, factors that had a significant impact on the number of nodes retrieved included patient age ( $p = 0.015$ ), surgeon ( $p < 0.0001$ ), pathology assistant ( $p = 0.04$ ) and concurrent breast procedure ( $p = 0.0003$ ). Only 6.4% of our sample had received preoperative chemotherapy; this did not affect the node count. Other tumour and nodal characteristics had no impact on the number of nodes retrieved.

This study identifies institutional factors that may be targeted for improving the frequency of complete axillary clearance. The contribution of patient and treatment factors to lymph node yield should be considered in making treatment decisions based on the number of nodes retrieved.

#### 43

**INHIBITION OF PLATELET GLYCOPROTEIN IB AND IIb/IIIa IN CONJUNCTION WITH LOW DOSE HUMOURAL IMMUNOSUPPRESSION DELAYS ACUTE VASCULAR REJECTION IN RODENT CARDIAC XENOGRAPTS.** D. Kubelik, H. Wang, Y. Wise, H. Sun, W. Liu, W. Wang, Y. Xiong, B. Garcia, R. Zhong. Departments of Surgery and Pathology, University of Western Ontario, London, Ont.; Animal Toxinological Laboratory, Kunming Institute of Zoology, Kunming, China.

Acute vascular rejection (AVR) of xenografts is characterized by endothelial activation, platelet aggregation and thrombosis within the graft. As the interplay between these factors is not fully understood, the importance of platelet binding was examined using inhibitors of platelet glycoprotein Ib and IIb/IIIa.

A concordant xenograft model was used in which Golden Syrian Hamster hearts were heterotopically transplanted into Lewis rats. The animals were subsequently treated with LF15-0195 (LF), an analog of 15-deoxyspergualin at 1 mg/kg, *trimeresurus mucrosquamatus* snake venom (TMVA) at 80  $\mu$ g/kg (Gp Ib inhibitor) or abciximab at 3 mg/kg (Gp IIb/IIIa inhibitor). These agents were given both as monotherapy and in combination. Survival data were collected, and the grafts were examined for platelet and antibody deposition using immunohistochemistry. Fluorescence activated cell sorting (FACS) analysis was performed on harvested sera to determine IgM and IgG antibody levels.

Graft survival without treatment was  $3.9 \pm 0.4$  days. No single agent was found to increase survival beyond that of the control group. The combination of abciximab with LF15-

0195 prolonged graft viability to  $4.5 \pm 0.6$  days ( $p = 0.01$ ). The addition of TMVA further increased this to  $6.2 \pm 0.2$  days ( $p = 0.03$ ). All grafts succumbed to acute vascular rejection. When compared with the LF monotherapy group, immunohistochemistry of the grafts revealed a decrease in platelet deposition and a reduction in platelet microthrombi when the 2 antiplatelet drugs were added to the LF treatment. Furthermore, there was a decrease in IgM levels in the triple therapy treated group.

The addition of TMVA and abciximab to low-dose anti-humoural immunosuppression with LF15-0195 had a synergistic effect in delaying AVR of concordant xenografts. This effect appears to be mainly mediated by a decrease in platelet deposition and platelet microthrombi formation, although a mild attenuation of the humoral response may play a contributory role.

#### 44

**THE NATIONWIDE IMPACT OF CLOSTRIDIUM DIFFICILE COLITIS IN SURGICAL PATIENTS.** M. Zerey, A.E. Lincourt, B.L. Paton, K.W. Kercher, B.T. Heniford. Division of Gastrointestinal and Minimally Invasive Surgery, Carolinas Medical Center, Charlotte, NC.

*Clostridium difficile* is the major hospital-acquired gastrointestinal infection in the United States, but its nationwide implication on surgical patients has yet to be defined.

We performed a retrospective analysis of the 2003 edition of the Agency for Healthcare Research and Quality's National Inpatient Sample Database, which represents a stratified 20% sample of hospitals in the United States. All inpatient discharge data from 669 hospitals in 37 states, representing approximately 8 million inpatient stays, were analyzed to determine the association of *C. difficile* infections with length of stay (LOS), total charges and in-hospital mortality. Multivariate analysis was used to determine if the presence of *C. difficile* infection was an independent predictor of LOS, total charges and in-hospital mortality.

*Clostridium difficile* infection was reported as a discharge diagnosis for 0.58% of all 336 400 inpatients having undergone a general surgical procedure. Inpatients with *C. difficile* infection had, on average, 4.5 times the LOS (18.0 v. 4.0 d,  $p = 0.0001$ ), 3.7 times the total charges (\$77 981 v. \$21 186,  $p = 0.0001$ ) and significantly higher rates of in-hospital death (odds ratio 4.18, confidence interval 3.64-4.79) than inpatients without this infection. Procedures that had the highest prevalence rate of *C. difficile* included small bowel resection (1.39%), colectomy (1.22%) and gastrectomy (1.14%), while the lowest prevalence rates were seen with Heller myotomy (0%), splenectomy (0.01%) and appendectomy (0.18%). Patients having undergone colectomy or appendectomy had among the highest increase in mortality rate if infected with *C. difficile* when compared with those who were not (colectomy: 3.36% v. 0.13%,  $p = 0.0001$ ; appendectomy: 3.36% v. 0.13%,  $p = 0.0001$ ).

*Clostridium difficile* infections represent a considerable burden to surgical patients and hospitals in the United States. The potential benefits to patients in improving outcome and to hospitals in reducing costs and resource expenditures by preventing *C. difficile* infections is significant.

45

**PERIOPERATIVE VASOPRESSOR USE IS ASSOCIATED WITH INCREASED RATES OF GASTROINTESTINAL ANASTOMOTIC LEAKAGE.** *T.L. Zakrison, B. Nascimento, L. Tremblay, M. Silva, S. Rizoli.* Department of Surgery, University of Toronto, Sunnybrook & Women's College Health Sciences Centre, Toronto, Ont.

Multiple factors associated with anastomotic leakage following gastrointestinal surgery were analyzed in 223 patients with postoperative stays in the critical care unit.

Multiple pre-, peri- and postoperative factors previously associated with gastrointestinal (GI) anastomotic leakage were measured, as was exposure to vasopressor medication. Variables associated with leakage were analyzed using univariate analysis, followed by multivariable logistic regression modeling. Clinical status (APACHE II) and operative morbidity scores (POSSUM) were calculated and compared among the subgroup of patients who leaked. Postoperative blood pressures at the time of vasopressor administration were also measured and compared in patients that leaked. Rationale for vasopressor use was analyzed.

A total of 259 GI anastomoses were created in 223 patients, principally for cancer or trauma, of which 22 patients leaked (9.9%). Pre- and perioperative variables were similar between the 2 groups. Of the postoperative variables, only vasopressor administration was found to be significantly associated with leakage ( $p < 0.029$ , odds ratio 3.2). Similarly, multiple vasopressor use and increased length of vasopressor exposure were also highly significantly associated with anastomotic leakage. There was no difference in APACHE II or POSSUM scores between leaking patients exposed, or not, to vasopressors. Postoperative blood pressures, before vasopressor administration, were also found to be similar between both groups. The rationale for appropriate vasopressor administration was also found to be lacking or unjustified. Reoperation rates were significantly increased in patients that leaked (41% v. 1%,  $p < 0.0001$ ), as was overall mortality (21% v. 4%,  $p = 0.002$ ).

Vasopressor use in high-risk patients with GI anastomoses is associated with more than a 3-fold increased rate of leakage, leading to further reoperation and death. This is independent of overall clinical and surgical status of patients or postoperative hypotension. The appropriate use of vasopressor therapy must be clearly defined in high-risk postoperative patients.

46

**TACROLIMUS VERSUS CYCLOSPORINE AS PRIMARY IMMUNOSUPPRESSANT AFTER LIVER TRANSPLANTATION.** *E. Haddad, E. Renouf, R.A. Malthaner, M.S. Kjaer, L.L. Gluud, V.C. McAlister.* Departments of Surgery and Statistics, University of Western Ontario, London, Ont.; Copenhagen Trial Unit, The Cochrane Hepato-Biliary Group, Denmark.

Randomized clinical trials (RCT) of tacrolimus versus cyclosporine have not been sufficiently powered to show differences in major outcomes including graft and patient survival after liver transplantation.

A systematic review of RCTs was undertaken to evaluate the beneficial and harmful effects of immunosuppression with

cyclosporine versus tacrolimus for liver transplanted patients.

MEDLINE, EMBASE, Cochrane Central and Hepato-Biliary Group Controlled Trials Registers were searched. Using fixed effects model, relative risk (RR), values  $< 1$  favouring tacrolimus, with 95% confidence intervals (CI) were calculated.

Of 717 potentially relevant references, 16 RCTs were eligible for inclusion. Mortality and graft loss at 1 year were significantly reduced in tacrolimus-treated recipients (death: RR 0.85, 95% CI 0.73–0.99; graft loss: RR 0.73, 95% CI 0.61–0.86). Tacrolimus reduced the number of recipients with acute rejection (RR 0.81, 95% CI 0.75–0.88) and steroid-resistant rejection (RR 0.54, 95% CI 0.47–0.74) in the first year. Lymphoproliferative disorder or dialysis rates were not different, but more de-novo diabetes (RR 1.38, 95% CI 1.01–1.86) occurred with tacrolimus. More patients stopped cyclosporine than tacrolimus (RR 0.57, 95% CI 0.49–0.66).

Treating 100 recipients with tacrolimus instead of cyclosporine would avoid rejection and steroid-resistant rejection in 9 and 7 patients, respectively, graft loss and death in 5 and 2 patients, respectively, but 4 additional patients would develop diabetes after liver transplantation.

47

**INFLUENCE OF LOCAL PROVISION OF LIVER TRANSPLANTATION SERVICES ON UTILIZATION RATES.** *V.C. McAlister.* Department of Surgery, University of Western Ontario, London, Ont.

The impact of local provision of specialty service on patient access to care was studied in Canada's 13 health care jurisdictions where distance may be a barrier to access to care.

A cross-sectional study was performed of routinely collected registry data in the setting of populations of Canada, Ontario and Nova Scotia. Liver transplantation was chosen as an indicator service. Disease severity, urgency, utilization and outcome were studied in adult recipients of first liver transplants from 1993 to 2002 comparing provider provinces to non-provider provinces, provider districts in Ontario to non-provider districts, provider period in Nova Scotia to non-provider period.

Utilization varied widely between jurisdictions but was consistently higher in provider provinces, 10.9 per million population (pmp) compared with 8.9 pmp in non-provider provinces ( $p < 0.005$ ). Utilization was higher in district health councils of Ontario that provided transplantation (14.1 v. 10.6 pmp,  $p < 0.05$ ). A larger proportion of patients in provider regions had viral or alcoholic etiologies of disease than those from non-provider regions who tended to have superior survival after transplantation. Interruption of service in Nova Scotia did not change utilization rates (12.7 pmp), which remained above average at 12.0 pmp.

Differences in utilization between provider and non-provider regions may reflect local provision of service as well as local patterns of disease and patient referral.

48

**GENERAL SURGERY CONSULTATION IN THE EMERGENCY DEPARTMENT: WAITING TIMES AND DISPOSITION.** *T. Bardell, K.L. Boadway, B. Paun, H. Hristov.* Department of Surgery, Queen's University, Kingston, Ont.

To assess the relationship between emergency department (ED) waiting time and diagnosis for all general surgery consultations in the ED. To assess factors that influence the accuracy and concordance of emergency physician and general surgery diagnoses in the ED.

Retrospective review of a prospectively gathered cohort consisting of all patients seen in the ED and referred to general surgery in July 2005 at a single tertiary care centre. Waiting times from ED registration to assessment by an emergency physician, from consultation request until assessment by general surgery, and from assessment by general surgery to admission or discharge were recorded. Emergency physician diagnosis and admitting diagnosis were compared with the discharge diagnosis for patients admitted to hospital. Diagnoses were grouped as follows: abdominal pain not yet diagnosed, biliary, appendicitis, diverticulitis, other bowel disorders, hernia and 'other.' Data were analyzed using Student's *t* test, ANOVA and  $\chi^2$  as appropriate.

Seventy-seven cases were identified. Forty-four were admitted to general surgery, 4 were referred to another service, 26 were discharged and 2 were referred back to the ED. Patients spent  $11.5 \pm 6.8$  hours in the ED on average. Accuracy of the ED and general surgery diagnoses had no impact on waiting times. The most common reasons for referral to general surgery were diseases of the biliary tract and disorders of the large and small bowel. Waiting times appeared to vary widely by pathology, although we could not demonstrate statistical significance given the small sample size and large variation in waiting times. Patients with abdominal pain not yet diagnosed spent an average of 23.7 hours waiting for admission, compared with 6.6 hours for patients with diseases of the skin/soft tissues.

Patients referred to general surgery spend a considerable amount of time in the ED. Further study is warranted.

#### 49

**SIGNIFICANT FIREARM INJURIES: THE CANADIAN NATIONAL EXPERIENCE.** *C. Finley, R. Simons, D. Hemenway, M. Hameed.* Department of Surgery, Vancouver General Hospital, Vancouver, BC; Harvard School of Public Health, Boston, Mass.

Firearms are a leading cause of death in Canada. The primary objective of this study was to evaluate all the firearm injuries (Injury Severity Score [ISS] > 12) in Canada between fiscal years 1999 and 2003 for demographic, geographic and causal factors as they relate to presentation, treatment and outcome.

Firearm injuries with ISS > 12 in Canada submitted to the Canadian Institute for Health Information (CIHI) were obtained from fiscal years 1999 to 2003. The patients: age, ISS, province of injury, sex, date of injury, length of stay, first recorded blood pressure (BP), first recorded Glasgow Coma Scale (GCS) score, blood alcohol, rural place of residence, if any operations were performed, site of disposition, ICD 9 and 10 codes for intention of injury, weapon type, shot by police and location of incident as they related to death in hospital were investigated. Univariate, bivariate adjusting for ISS, and multivariate logistic regression were performed.

Seven-hundred and eighty-four people were injured in the timeframe of this study, 736 men (94.1%) with an average ISS

of 26.1 (standard deviation [SD] 11.9). The average length of stay for these patients in 17.7 days (SD 35.0) and blood alcohol was positive in 35% of patients. The overall fatality rate was 39.8%, and 83% happened on the first day. Sixty-six percent of patients were discharged to home. Univariate and adjusted analysis found ISS, first systolic BP, first systolic BP < 100 but not 0, first GCS, age, self inflicted, accidental shooting, shot by police and injured at home to have significantly increased odds of death. Patients greater than 45 years old have an adjusted odds ratio of 1.99 ( $p < 0.0001$ ) of death, self-inflicted wounds 3.10 ( $p < 0.0001$ ) and systolic BP < 100 but not 0 was 4.17 ( $p < 0.0001$ ). The multivariate model showed that ISS, BP < 100 but not 0, age > 45 and self inflicted injuries were all still significant.

Firearm injuries remain a significant concern in Canada. The lethality of these injuries, largely in the first day, highlights the importance of preventative strategies and the need for rapid transport of these patients to trauma centres for definitive care.

#### 50

**ANAPLASTIC THYROID CANCER EXHIBITS INTRATUMORAL MOLECULAR HETEROGENEITY: POTENTIAL IMPLICATIONS FOR DISEASE TREATMENT.** *S.M. Wiseman, H. Masoudi, D. Turbin, A. Rajput, J. Hay, D. Filipenko, D. Huntsman, B. Gilks.* Department of Surgery, St. Paul's Hospital, University of British Columbia, Genetic Pathology Evaluation Centre at the Prostate Centre at Vancouver General Hospital, British Columbia Cancer Agency, Vancouver, BC.

Anaplastic thyroid cancer is a rare endocrine malignancy whose rapidly lethal disease course has made it difficult to study. Little is known regarding the intratumoral molecular heterogeneity of these tumours and potential implications for disease treatment. The objective of this work was, through assessment of the expression profile of discrete intratumoral adjacent histologic subtypes of anaplastic carcinoma, to evaluate the molecular heterogeneity of this fatal cancer.

Of 94 cases of anaplastic thyroid cancer diagnosed and treated in British Columbia, Canada, over a 20-year period (1984–2004), 32 cases had adequate archival tissue available for evaluation, and 6 of these cases each contained 2 discrete anaplastic carcinoma subtype foci. A tissue microarray was constructed from these anaplastic thyroid tumours, and immunohistochemistry was used to evaluate expression of 17 molecular markers. The markers evaluated were: EGFR, HER3, uPA-R, clusterin, AMF-R, c-kit, VEGF, aurora B, CA-IX, p53, MDM2, p21, Bcl-2, cyclin D1, calcitonin, TTF-1 and thyroglobulin.

A single tumour with strong calcitonin expression was identified as a poorly differentiated medullary carcinoma and excluded from the study cohort. The mean age of the anaplastic cohort was 72 years, 4 patients (67%) were male, and the median patient survival was 46 weeks. A wide range in alteration of molecular marker expression was observed by the adjacent anaplastic thyroid cancer foci (0%–50%). The molecular markers most frequently altered when comparing the intratumoral anaplastic foci were: Bcl-2 (33%), CA-IX (50%), uPA-R (50%) and aurora B (66%).

Anaplastic thyroid cancer exhibits considerable intratumoral molecular heterogeneity that reflects a derangement of the cell

cycle and multiple signal transduction pathways. These findings support the development of clinical trials with multi-targeted anti-cancer drugs, or combinations of targeted drugs, that may offer new hope for individuals diagnosed with this fatal thyroid cancer.

51

**PHEOCHROMOCYTOMA AND ITS PERIOPERATIVE MANAGEMENT: THE TORONTO EXPERIENCE.** *S. Kassirian, A. Sawka, J. Gaugin, S. Ezzat, A. Logan, D. Urbach.* Department of Surgery, University of Toronto, Toronto, Ont.

The objective was to study perioperative management and the intraoperative and postoperative course of surgery for pheochromocytoma and abdominal paraganglioma at our institution in the last 5 years.

The University Hospital Network and Mount Sinai Hospital health record databases were searched for patients with a diagnosis of pheochromocytoma or paraganglioma who had surgery between 2000 and 2006.

Thirty-one cases were identified, including 5 paragangliomas, 2 bilateral adrenal pheochromocytomas and 24 unilateral pheochromocytomas. Of these, 3 (9%) were asymptomatic at the time of diagnosis. Six cases (19%) were identified incidentally on imaging. The rest were diagnosed based on clinical suspicion and subsequent radiological testing (81%). The preferred mode of  $\alpha$ -adrenergic blockade by endocrinologists was *phenoxybenzamine* for at least 2 weeks in 29 patients (94%), *doxazosin* in 1 (3%) and no  $\alpha$ -blocker for a non-functioning tumour. Most patients were also  $\beta$ -blocked: 13 (42%) received *labetalol*, 7 (23%) received other  $\beta$ -blockers, and 11 patients either received a calcium channel blocker, an ACE inhibitor or no other medications in 5 cases. Fifteen patients had perioperative salt and intravenous hydration. Adequate  $\alpha$ -blockade (defined as orthostatic hypotension the morning of surgery) was present in 12 patients. Five patients were still hypertensive preoperatively. There were 7 (23%) open, 20 (64%) laparoscopic and 4 (13%) converted cases. Intraoperatively, 10 (32%) patients exhibited sustained hypertension, 4 (40%) of whom were not adequately  $\alpha$ -blocked perioperatively. No arrhythmias were noted. All patients required either phentolamine, sodium nitroprusside or a  $\beta$ -blocker for intraoperative blood pressure control. No deaths occurred. Postoperatively, in the first 24 hours 2 remained hypertensive, 1 hypotensive and 2 experienced hypoglycemia. In the first postoperative month, there were 2 myocardial infarctions (both were hypertensive intraoperatively), 1 atrial fibrillation and 2 pulmonary emboli.

There is room for improvement of preoperative management of pheochromocytoma at our institution.

52

**ATTITUDES AND KNOWLEDGE OF HEALTH CARE PROFESSIONALS REGARDING OBESITY AND ITS MANAGEMENT AND TREATMENT WITHIN CAPITAL HEALTH.** *C. Johnson Stoklossa, D.W. Birch, S. Kock-Martin.* Royal Alexandra Hospital, Department of Surgery, University of Alberta, Edmonton, Alta.

The objective of this survey was to assess health care profes-

sionals' attitudes and knowledge regarding obesity and its management and treatment. A cross-sectional Web-based survey was conducted with staff of the local health region. There were 246 respondents (93% female). Eleven professions identified with 38% nursing, 14% registered dietitians and 14% occupational or physical therapists. Most staff (63%) worked at 2 of the larger hospitals. Areas of work included 35% in acute care, 19% in community and 14% in outpatient clinics. Most respondents were either at the start of their career (41%, less than 10 years experience) or very experienced (34%, 20 years or more).

Sixty-four percent of respondents estimate 25%–50% of their clients are obese. Only 24% discuss weight management issues regularly as part of their work. Professions identified as best suited to advise people with obesity include registered dietitians (81%), multidisciplinary teams (65%) and physicians (49%). With respect to training, 33% identified they had never received training for weight management and 45% wanted more training.

Most respondents (94%) indicated obesity has serious health consequences and 76% agreed it is a chronic disease that requires medical management. One-third (32%) view weight loss surgery as “a quick fix,” but the majority either disagreed (48%) or were neutral (20%). However, 50% of respondents agreed that long-term health benefits can be achieved after weight loss surgery. In response to the statement “people are responsible for their own health — if they are obese, it is their own fault,” 20% agreed, 47% disagreed and 33% were neutral.

The top factors viewed as contributory to obesity were activity and nutrition. Time/stress factors and personality/mood ranked as less significant. Activity, nutrition and behaviour change were identified as the most effective strategies for weight management, with medication and weight loss surgery ranked as the least effective.

The survey results indicated staff view obesity as a significant health issue and treatment as important. Some responses indicate a need for further education and the presence of bias. The information gathered will be used to formulate education strategies for staff, identify barriers to care and target areas to strengthen health care services for people with obesity.

53

**FAMILY HISTORY AND MOLECULAR FEATURES OF CHILDREN, ADOLESCENTS AND YOUNG ADULTS WITH COLORECTAL CARCINOMA.** *C. Durno, M. Aronson, B. Bapat, Z. Cohen, S. Gallinger.* Familial Gastrointestinal Cancer Registry and Department of Surgery, Mount Sinai Hospital, Division of Gastroenterology/Hepatology and Clinical Nutrition, Department of Paediatrics, Hospital for Sick Children, University of Toronto, Toronto, Ont.

Colorectal cancer is extremely rare in childhood. Published case series reporting children and adolescents with colorectal cancer have not focused on the underlying genetic aspects of the tumour or genetic susceptibility of the families.

We examined a cohort of patients with early-onset colorectal cancer to determine whether a specific genetic predisposition could be elucidated. In particular we focused on whether DNA mismatch repair gene deficiency, which causes hereditary non-polyposis colorectal cancer (HNPCC), could be elucidated.

Patients with colorectal cancer  $\leq 24$  years of age were identified from a database at the Familial Gastrointestinal Cancer Registry at Mount Sinai Hospital, Toronto. Detailed pedigrees were ascertained from the proband or parents. Tumours were tested for microsatellite instability (MSI). Germline mismatch repair gene mutations (MMR) were sought in some cases.

Among 1382 probands, 16 (1%) colorectal cancer patients were  $\leq 24$  years at the time of diagnosis. MSI was identified in tumours from 8 (73%) of 11 evaluated patients. Germline mutations in mismatch-repair genes were identified in 6 of 12 patients including *MSH2* ( $n = 3$ ), *MLH1* ( $n = 2$ ) and *PMS2* ( $n = 1$ ). Ten (63%) of the 16 families met the Amsterdam criteria for HNPCC. Among these, 6 were screened for MMR gene mutations and 3 were found to carry *MSH2* or *MLH1* germline mutations. Location of the colorectal cancers included rectum/sigmoid ( $n = 9$ ), splenic flexure ( $n = 2$ ), hepatic flexure ( $n = 3$ ) and cecum ( $n = 2$ ). Forty-four percent (7/16) of these young cases developed additional malignancies (gastrointestinal,  $n = 8$ ; extra-intestinal,  $n = 4$ ) during follow-up (mean 12.8, standard deviation 12.4, range 0.08–30 yr).

Patients with early-onset colorectal carcinoma often have an inherited predisposition to the disease. Tumours with high frequency microsatellite instability and germline mutations of mismatch repair genes are sufficiently common in this patient population even though family histories may not satisfy the stringent Amsterdam criteria for HNPCC. Young colorectal cancer patients are at increased risk of developing second gastrointestinal and extra-intestinal malignancies.

#### 54

**THE ROLE OF MILKY SPOTS AND MCP1 IN THE DEVELOPMENT OF ADHESIONS: A POSSIBLE NEW INSIGHT TO POSTOPERATIVE ADHESION TREATMENT.** *A.O.E. Obayan, R. Kanthan, A.O. Obayan, S. Kanthan. Departments of Surgery, Pathology and Pediatrics, University of Saskatchewan, Saskatoon, Sask.*

An animal model aimed at understanding normal peritoneal regeneration using tissue culture and at identifying and establishing the role and frequency of milky spots and microphage chemotactic protein1 (MCP1) in adhesion formation. We performed cecal perforation with pulstring closure on 50 Wistar rats  $> 300$  g with saline washing in 25 rats and no wash in the remaining. We compared post-laparotomy with virgin abdomen using hematoxylin and eosin (H&E), Masson histology and MCP1 stains on peritoneal and abdominal tissue between days 1 and 42 to determine the number of fibroblasts, milky spots and inflammatory cells. Zuhlke adhesion scores were used to determine severity, and tissue culture of peritoneal explants was also done to understand the normal peritoneal regeneration process. We observed 1 per 7 high power field (HPF) milky spots in the virgin abdomen as compared with 7 per HPF in the none-Saline washed and 5 per HPF in the Saline washed ( $p = 0.002$ ). There was a correlation between the number of milky spots and the severity of adhesion. A none significant increase was observed in the number of MCP1 after surgery as compared with virgin abdomen. Culture also demonstrated that peritoneum and omentum had the capacity to regenerate independent of macrophage contrary to previous hypothesis. Fibroblast and mesothelial cells

regenerated at the same time in the peritoneum. We conclude that the greatest determinant of adhesion formation is the number of milky spots.

#### 55

**AN EVALUATION OF ADMINISTRATIVE DATA FOR ITS DIAGNOSTIC ACCURACY OF UPPER GASTROINTESTINAL DISEASES.** *S.R. Lopushinsky, K. Risnyj, L. Rabeneck, P. Austin, D.R. Urbach. Departments of Surgery and Health Policy, Management and Evaluation, University of Toronto, Toronto, Ont.*

The primary objective of this study was to assess the validity of administrative diagnostic codes for the study of benign upper gastrointestinal disorders.

We abstracted charts on 590 adult patients who had upper gastrointestinal endoscopy between Jan. 1, 2000, and June 30, 2001, in Toronto, Ontario, Canada. Clinical diagnoses were compared with *International Classification of Diseases* version 9 (ICD-9) codes within hospital discharge abstracts maintained by the Canadian Institute of Health Information (CIHI). The primary analysis was to determine the sensitivity, specificity and positive predictive value (PPV) of an "esophagitis" diagnosis code for the prediction of clinical esophagitis. Secondary analyses included performance characteristics of the diagnostic codes for esophageal ulcer, esophageal stricture, gastroesophageal reflux disease (GERD), gastritis, gastric ulcer and duodenal ulcer. Analyses were repeated for each of the codes to assess their diagnostic properties when listed in CIHI as 1 of up to 16 allowed diagnoses.

Successful linkage was achieved on 500 patient records. When coded as the most responsible diagnosis for admission, the sensitivity, specificity and PPV for esophagitis was 46.79%, 98.83% and 94.81%, respectively. As a secondary diagnosis, the sensitivity, specificity and PPV were 70.51%, 97.67% and 93.22%. The diagnostic properties of predicting GERD (most responsible, secondary) were: sensitivity (56.10%, 78.66%), specificity (98.51%, 96.73%) and PPV (94.84%, 92.14%). Of the remaining "most responsible" codes, sensitivity varied from 14.29% to 51.30%, and specificity ranged from 90.75% to 99.79%. Using secondary diagnoses, sensitivities ranged from 42.86% to 85.71% and specificities from 86.42% to 99.38%.

ICD-9 diagnosis codes for benign upper gastrointestinal diseases are highly specific and associated with strong PPVs but have poor sensitivity.

#### 56

**CAGS BASIC SCIENCE AWARD: OXIDATIVE STRESS IN RAW 264.7 MURINE MACROPHAGES IN VITRO AND SHOCK/RESUSCITATION IN RAT ALVEOLAR MACROPHAGES IN VIVO LEAD TO GENERATION OF THE LIPID SIGNALLING MOLECULE CERAMIDE.** *P.S. Tawadros, F. Wang, K. Szaszi, A. Kapus, O.D. Rotstein. St. Michael's Hospital, University of Toronto, Toronto, Ont.*

Multi-organ failure is a major cause of late mortality following trauma. Oxidative stress generated during shock/resuscitation contributes to tissue injury directly and by priming the immune system for an exaggerated response to subse-

quent inflammatory stimuli such as lipopolysaccharides, the so-called "two-hit hypothesis." The mechanisms of oxidant-induced cell priming, however, remain poorly elucidated. Recent studies have suggested that the membrane sphingolipid product ceramide is an important molecule in inflammatory cell signalling. We hypothesized that oxidative stress may lead to macrophage priming by inducing generation of ceramide.

RAW 264.7 murine macrophage cells were grown in vitro and exposed to 100  $\mu\text{M}$  hydrogen peroxide ( $\text{H}_2\text{O}_2$ ) for 0, 5, 10 and 30 minutes. In vivo, alveolar macrophages were recovered by bronchioalveolar lavage from Sprague-Dawley rats that were bled to a mean arterial pressure of 40 mm Hg for 1 hour and resuscitated over the following 2 hours. Resultant ceramide generation was measured by diglyceride kinase assay and thin layer chromatography (TLC). Western blot analysis of downstream signalling molecules was conducted using antibodies against activated phosphatidylinositol 3-kinase (PI3k) and Akt.

In vitro,  $\text{H}_2\text{O}_2$  was able to stimulate ceramide generation in RAW cells in a dose-dependent manner as seen by TLC. In vivo, shock/resuscitation also led to increased ceramide generation compared with sham. Together, these findings suggest that oxidative stress induces ceramide generation. Furthermore,  $\text{H}_2\text{O}_2$  was shown to activate PI3k and its downstream effector Akt in a dose-dependent manner in RAW cells, indicating a role for this signalling pathway in macrophage priming.

Oxidant-induced macrophage priming in vitro and shock/resuscitation in vivo both cause generation of ceramide. In RAW cells, oxidant-induced macrophage priming also involves activation of the PI3k/Akt signalling pathway. These findings may direct future therapies in modulating the critical process of oxidant-induced cellular priming.

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**DAYCARE CHOLECYSTECTOMY: FEASIBILITY IN A PUBLIC HEALTH SERVICES HOSPITAL IN A DEVELOPING COUNTRY.**  
*A. Chaubhan, M. Mehrotra, P.K. Bhatia. Department of Surgery and Department of Anaesthesia, Base Hospital, Delhi Cantt, Delhi, India.*

A prospective analytical study of the feasibility of day-care laparoscopic cholecystectomy (DCLC) in a public health service hospital in a less developed nation without a free-standing facility or department for day-care surgery. This study aims to set certain minimal norms and parameters wherein DCLC can be accepted into practice even in centres that do not have dedicated ambulatory surgery units.

One-year period between January 2005 and January 2006. DCLC was offered to all patients with symptomatic, ultrasound-proved gallstone disease that met inclusion criteria: < 60 years, ASA grade I and II, lived within half an hour of the hospital, had a post-primary surgery caregiver at home in form of a relative/next-of-kin who understood the responsibility and agreed to it, and had own means of transport.

Patients were admitted at 0700 hours, prepared and premedicated. They were induced with propofol and maintained with isoflurane +  $\text{N}_2\text{O}$ . A standard French system of laparoscopic cholecystectomy followed. GB fossa and port sites were

infiltrated with 0.5% bupivacaine. Patients were observed for 8–10 hours. The operating surgeon and anesthesiologist evaluated the patient for pain, nausea, vomiting, consciousness level and vital parameters. An awakening assessment score chart was maintained, based on accepted criteria. Patients with a score of 12 or more out of maximum 14 were discharged with oral antiemetic and analgesic and were reviewed the next day morning in OPD.

Two-hundred and ninety-one cases (78%) out of a total 373 laparoscopic cholecystectomies were found suitable for DCLC. The most common cause for omitting from DCLC was that the patient lived out of the defined area (57%), followed by poor domestic support (13.4%). Four of 291 (1.3%) cases were cancelled due to medical condition; 256 of 287 (89%) were discharged the same evening as surgery. Six patients were converted to open surgery, 25 did not meet the necessary discharge criteria, 8 of 256 (3.1%) required readmission of whom 3 (1.1%) required intervention.

This study demonstrates that DCLC is a viable concept even in surgical centres not specifically designed for ambulatory surgery. Certain selection guidelines, as demonstrated, need to be observed in this respect. It has large potential in public health system hospitals in terms of reduced hospitalization and greater turnover of in-patient beds.

58

**IS RIGHT LAPAROSCOPIC DONOR NEPHRECTOMY RIGHT?**  
*D. Klassen, H.J. Bonjer, M.J. Walsh, M. Molinari, B. Kiberd, L. Storsley, B. Nashan. Multi Organ Transplant Program, Capital Health and Dalhousie University, Halifax, NS.*

A prospective study of laparoscopic and open donor nephrectomies from February 2005 until March 2006 was done. The safety and efficacy of laparoscopic right donor nephrectomy were assessed.

Choice of operative technique (open v. laparoscopic) and side was based on CT angiography and renal scintigraphy. Laparoscopic donor nephrectomy was done transperitoneally with the patient in semilateral decubitus position while open donor nephrectomy was done extraperitoneally through a vertical pararectal incision.

Twenty-four laparoscopic and 11 open donor nephrectomies were performed. Abnormal distribution of renal function (difference > 5%) was present in 4 of 24 laparoscopic cases and 5 of 11 open cases. Abnormal vascular anatomy was recorded in 10 of 24 laparoscopic cases (7 on the left side and 3 on the right side) and in all open cases. Twelve (50%) of all laparoscopic cases were right donor nephrectomies. One laparoscopic right donor nephrectomy was converted to a right pararectal laparotomy for extensive intraperitoneal adhesions. There was 1 early graft loss after laparoscopic left donor nephrectomy. No donors required reoperations.

Laparoscopic right donor nephrectomy appears safe and associated with good early graft function.

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**A RANDOMIZED CONTROLLED TRIAL COMPARING COMBINATION THERAPY OF ACETAMINOPHEN PLUS IBUPROFEN VERSUS ACETAMINOPHEN PLUS CODEINE FOR THE TREATMENT OF PAIN AFTER OUTPATIENT SURGERY.**  
*A.D. Mitchell, G.A. Porter,*

*K.M. Inglis, S. VanZanten, J.M. Murdoch, W. Shih, L. Nuth, L. Waselewski, G. Beck.* Departments of Surgery, Dartmouth General Hospital, Dartmouth, and Dalhousie University, Halifax, NS.

Narcotic analgesia after outpatient day surgery is commonly used but not always well tolerated. We hypothesized that acetaminophen combined with ibuprofen may be a good alternative.

This double-blind, randomized study included patients undergoing outpatient hernia repair (inguinal, umbilical or ventral) or laparoscopic cholecystectomy. Patients were randomized (stratified by procedure) and received either acetaminophen 300 mg + codeine 30 mg (T3) or acetaminophen 325 mg + ibuprofen 400 mg (AcIBU) QID until pain-free. Pain intensity, the primary outcome, was measured with 100-mm visual analogue scales (VAS) QID for 1 week or until pain-free. Secondary outcomes were patient satisfaction, medication-related side-effects and discontinuation due to side-effects. With  $\alpha = 0.05$  and  $1-\beta = 0.80$ , a sample size of 128 was required to show equivalence of mean daily VAS between the 2 groups ( $< 5$ -mm difference in VAS).

Seventy-four patients were randomized to T3 and 72 to AcIBU ( $n = 146$ ); complete follow-up was obtained in 139 (97%). No significant differences were found in mean or maximum VAS except on day 2 where lower VAS was found among AcIBU compared with T3 patients (35.6 v. 44.4 mm,  $p = 0.025$ ). Satisfaction was higher in the AcIBU group (83% v. 64%;  $p = 0.02$ ). Significantly more T3 patients reported medication-related side-effects (57% v. 41%,  $p = 0.04$ ) and discontinued therapy due to side-effects (11% v. 3%,  $p = 0.04$ ).

Although analgesia was similar between groups, higher patient satisfaction, fewer side effects and better compliance with AcIBU suggest it to be a good alternative to narcotic analgesia in outpatient surgery.

## 60

**CHOLECYSTECTOMY DEFERRAL IN PATIENTS WITH GALLBLADDER-IN-SITU AFTER ENDOSCOPIC SPHINCTEROTOMY: A META-ANALYSIS OF RANDOMIZED CLINICAL TRIALS.** *E. Davenport, V.C. McAlister.* Department of Surgery, University of Western Ontario, London, Ont.

Case series have suggested that cholecystectomy deferral after endoscopic sphincterotomy (ES) is safe in elderly patients. Retrospective cohort studies have shown a higher mortality in patients who defer cholecystectomy, due possibly to an inferior premorbid state in that group compared with those who undergo cholecystectomy. Randomized clinical trials (RCT) of patients fit for surgery have not been sufficiently powered to show differences in survival.

A systematic review of RCTs was undertaken to determine the beneficial and harmful effects of leaving the gallbladder in situ after ES to clear choledocholithiasis compared with surgical treatment.

MEDLINE, EMBASE, Cochrane Central and Hepato-Biliary Group Controlled Trials Registers were searched. Using random effects model, relative risk (RR), values  $< 1$  favouring cholecystectomy deferral, with 95% confidence intervals (CI), were calculated.

Of 103 potentially relevant references, only 4 RCTs, with a total of 476 participants, were eligible for inclusion. Follow-up varied between 18 and  $> 60$  months. No heterogeneity was detected between the studies ( $I^2 = 0$ ). Mortality was significantly higher in the cholecystectomy deferral group (RR 1.79, 95% CI 1.13–2.84); 21.9% of those who deferred surgery eventually required cholecystectomy. Recurrent biliary symptoms (RR 4.79, 95% CI 1.76–13.07) and subsequent cholangitis (RR 2.10, 95% CI 0.87–5.05) were more common in patients whose gallbladders remained in situ.

Elective cholecystectomy is superior to observation after endoscopic sphincterotomy in patients fit for randomization to surgery. The number needed to treat is 12.5 patients to save a life, 4 to avoid recurrent biliary symptoms and 33 to prevent subsequent cholangitis.

## 61

**CAGS CLINICAL RESEARCH AWARD: THE ASSOCIATION BETWEEN CENTRAL VENOUS PRESSURE, PNEUMOPERITONEUM AND VENOUS AIR EMBOLISM IN LAPAROSCOPIC HEPATECTOMY.** *S. Jayaraman, A. Khakhar, H. Yang, D. Bainbridge, D. Quan.* Departments of Surgery and Anesthesia, The University of Western Ontario, London, Ont.

Laparoscopic hepatectomy (LH) is increasingly used, however, the safety and outcomes following LH have yet to be elucidated. The risk of venous gas embolism is increased during liver parenchymal transection. This risk may be increased with positive pressure carbon dioxide (CO<sub>2</sub>) pneumoperitoneum (PP). This may be further exacerbated when using low central venous pressure (CVP) anesthesia used to minimize hemorrhage during liver resection. To determine the risk of CO<sub>2</sub> venous embolism, we performed hand-assisted laparoscopic left hepatic lobectomy in 20 domestic pigs. They were divided into 3 groups: Positive Gradient, normal pressure PP (12–14 mm Hg) and low CVP (5–7 mm Hg), Negative Gradient, low pressure PP (7–8 mm Hg) and normal CVP (10–12 mm Hg), and Neutral Gradient (normal pressure PP and normal CVP or low pressure PP and low CVP). Transesophageal echocardiography (TEE) was used intraoperatively to assess the presence of emboli in the suprahepatic vena cava and the right side of the heart. The TEE was recorded and analyzed by blinded observers. CO<sub>2</sub> embolism was also monitored using end-tidal CO<sub>2</sub> and compared with TEE. CO<sub>2</sub> embolism was demonstrated in 14 of the 20 cases. The majority of gas emboli were small gas bubbles associated with dissection of the major hepatic veins. There was no statistically significant difference in the occurrence of gas emboli between the groups. Thirteen of the 14 animals experienced no significant hemodynamic changes. One pig in the Positive Gradient group experienced hypotension in relation to gas embolism; the effects were only transient and did not preclude safe completion of the operation. In conclusion, we demonstrate that CO<sub>2</sub> embolism during LH does frequently occur. The clinical significance of this finding appears to be nominal; however, care must be taken when dissecting around large veins and awareness of potential venous air embolism by the surgical and anesthesiology teams is essential. Further evaluation of this phenomenon is required.

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**TIMING OF TOTAL ABDOMINAL COLECTOMY AND RISK FACTORS PREDICTIVE OF MORTALITY FOR FULMINANT *CLOSTRIDIUM DIFFICILE* COLITIS.** *M. Boutros, M. Ladouceur, E. Rahme, E. Lamoureux, C.A. Vasilevsky.* Division of Colorectal Surgery, Department of Pathology, Sir Mortimer B. Davis Jewish General Hospital, McGill University; Department of Epidemiology and Biostatistics, McGill University, Montréal, Que.

An epidemic of *Clostridium difficile* colitis (CDC), with increased case fatality, has had important consequences on the population of our region. Previous studies report a high mortality due to fulminant pseudomembranous colitis (FPC) regardless of surgical intervention. The aims of this study were to determine the impact of time to total abdominal colectomy (TAC) for FPC on survival and to identify risk factors predictive of mortality.

All cases of FPC necessitating TAC between 1995 and 2004 at one hospital were identified. Data were compiled from patient charts, operative and pathology reports. Patient variables and predictors of poor outcome were analyzed by multivariate logistic regression. Multivariate survival analysis and the Kaplan–Meier method were used to construct survival curves. Statistical significance was designated as  $p < 0.05$ .

Forty-two patients with FPC underwent TAC. Indication for TAC was failure of medical treatment and progression to FPC. The median age was 76 years (26–90) and 52% were male. Forty percent had an admitting diagnosis of CDC. Prior to TAC, 71% developed hypotension, 64% acute renal failure and 33% respiratory failure. Cytotoxin assays were positive in 89%, and CT scans showed colitis in 81%.

The 30-day overall survival after TAC was 40% (Fig. 1), while the mean time to discharge was 56 days. With increasing experience, we altered our management toward earlier operative intervention: 5.5 days from diagnosis (2000–2004) versus

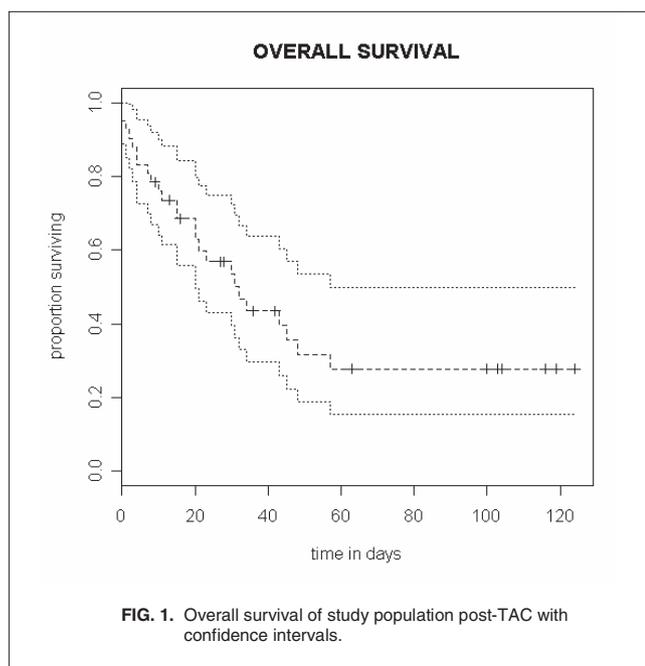


FIG. 1. Overall survival of study population post-TAC with confidence intervals.

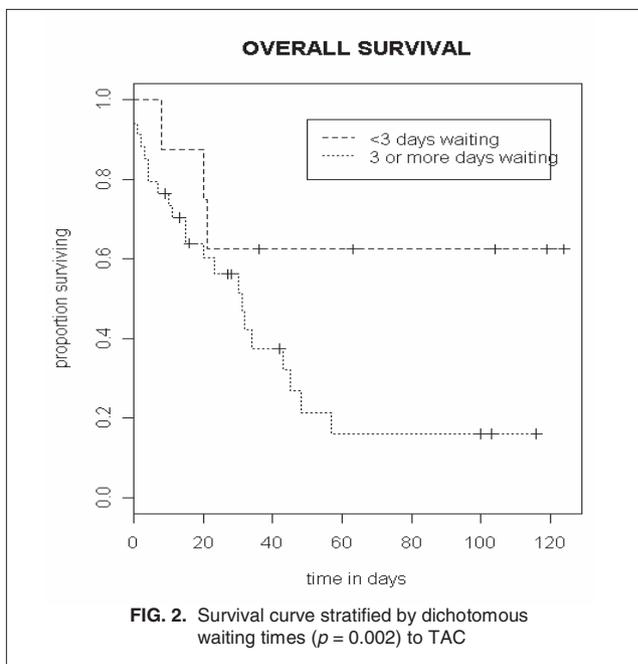


FIG. 2. Survival curve stratified by dichotomous waiting times ( $p = 0.002$ ) to TAC

17.7 (1994–1999). After adjusting for confounders, we found that patients with FPC who underwent TAC within 72 hours of diagnosis had a 3.5-fold increased chance for survival (confidence interval 1.08–13.07) (Fig. 2). Clinical predictors of mortality post-TAC were preoperative pressor requirement ( $p < 0.02$ ) and acute renal failure ( $p < 0.01$ ), while laboratory predictors of mortality included elevated white blood-cell count (WBC) ( $p < 0.05$ ), thrombocytopenia ( $p < 0.03$ ) and elevated international normalized ratio (INR) ( $p < 0.03$ ).

In conclusion, early surgical intervention for FPC improves survival. Patients with increased fluid requirements, renal insufficiency, rising WBC or laboratory evidence of coagulopathy should be considered for TAC within 72 hours of presentation.

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**PRELIMINARY RESULTS FROM THE QUALITY INITIATIVE IN RECTAL CANCER (QIRC) TRIAL.** *M. Simunovic, A. Coates, A. Smith, L. Thabane, C. Goldsmith, F. Denardi, R. Riddell, G. Browman, R. McLeod, H. Stern, T. Whelan, M. Levine.* Departments of Surgery and of Clinical Epidemiology and Biostatistics, Hamilton Health Sciences, McMaster University, Hamilton, Ont.

To test if the surgeon-directed QIRC strategy can improve hospital-level rates of permanent colostomy and local recurrence for patients undergoing rectal cancer surgery.

Following trial initiation in May 2001, 114 surgeons at 16 hospitals across Ontario were cluster-randomized to the experimental (QIRC strategy) or control arms. The intent of the strategy was to optimize the delivery of total mesorectal excision (TME) surgery. Strategy interventions included workshops, audit and feedback, opinion leaders, postoperative questionnaires and intraoperative demonstrations. For this last intervention, operative demonstrators were invited by participating surgeons to demonstrate TME.

We enrolled 1031 patients. With 12 months of follow-up data, preliminary descriptive statistics in the experimental and control arms show similar rates of permanent colostomy at 30% and 33%, respectively, and of local recurrence at 3.4% and 2.6%, respectively. These latter rates will rise with time, though they are likely to remain similar, since the rate of a positive mesorectal margin was 4.5% and 4.7%, respectively. In the experimental arm, for the 69 demonstrator and 491 non-demonstrator cases, the rate of permanent colostomy was 22% and 31%, respectively, and the rate of a positive mesorectal margin was 2.9% and 5.9%, respectively, despite demonstrator cases being closer to the anal verge (6 cm v. 10 cm) and closer to the radial mesorectal margin (1.1 cm v. 1.9 cm).

Ontario surgeons participated with enthusiasm in the QIRC interventions, suggesting that surgeons are primed for quality improvement activities. But the sub-optimal delivery of TME-type surgery in the experimental arm suggests the need for more effective strategies to achieve improved surgical performance.

## 64

**THE LONG-TERM RISK OF MORTALITY FOLLOWING ANTIREFLUX SURGERY: A POPULATION-LEVEL STUDY.** *S.R. Lopushinsky, L. Rabeneck, P. Austin, D.R. Urbach.* Departments of Surgery and Health Policy, Management and Evaluation, University of Toronto, Toronto, Ont.

The primary objective of this study was to examine long-term mortality of patients with complicated gastroesophageal reflux disease (GERD) undergoing anti-reflux surgery. A randomized controlled trial conducted in Veterans Affairs hospitals suggested that patients having antireflux surgery are at greater risk of death as compared with patients treated medically.

In Ontario, Canada, administrative health databases contain information on all residents receiving health services. We developed a population-based inception cohort of 43 992 adult patients newly diagnosed with GERD between fiscal years 1991 and 1994, using administrative data. The follow-up study period ended Dec. 31, 2004. Cox-proportional hazard models were created to compare mortality rates between patients that underwent surgery and those that did not. Hazard ratios (HR) and 95% confidence intervals (CI) are reported.

Of the 43 992 patients with GERD newly diagnosed between 1991 and 1994, 1875 patients went on to have an anti-reflux procedure. At the time of index diagnosis, patients who eventually had surgery tended to be younger (46.6 v. 55.1 yr;  $p < 0.0001$ ), female (53.48%;  $p = 0.0267$ ) and had fewer comorbid conditions (Charlson comorbidity score, 0.086 v. 0.21;  $p < 0.0001$ ). Overall, 12 622 patients died during the study period. The unadjusted HR of death associated with surgery was 0.32 (95% CI 0.28–0.37). After adjustment for confounding variables, the HR was 0.63 (95% CI 0.55–0.72). Age, gender, Charlson comorbidity score, income status, acuity of index hospital admission and GERD severity were all independent predictors of mortality.

In a population-based cohort study, we found no evidence that anti-reflux surgery is associated with higher rates of mortality as compared with medical therapy.

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**BOWEL PREPARATION IN GENERAL SURGERY: SURVEY OF QUEBEC SURGEONS.** *M. L'Espérance, C.S. Richard.* CHUM, Department of General Surgery, Université de Montréal, Montréal, Que.

Bowel preparation is considered a standard in colonic resections. The benefits attributed to this practice are a reduction in fecal contamination, anastomotic leaks and wound infections, as well as facilitating manipulation of the bowel. Recent studies call into question the clinical benefit of bowel preparation and some even claim it has adverse effects. This study sought to determine the current practices of Quebec general surgeons in order to evaluate whether they are consistent with the literature.

A 5-question survey was mailed to 448 Quebec general surgeons. The questions dealt with the use of oral preparation in left and right, open or laparoscopic colonic surgeries, the timing of patient admission and the use of saline solution on admission.

With a 48% response rate, the data indicated that the majority (87%) use an oral preparation in right colonic resections and virtually all (97%) in left resections. The pattern was essentially the same for laparoscopic procedures. Fifty-two percent of the patients prepared were admitted the day before and the majority (67%) with administration of a saline solution. Some surgeons report that they adjust these requirements depending on the patient's comorbidities.

This survey highlighted the fact that, despite the current economic environment and the fact that the literature supports home bowel preparation, the majority of surgeons admit their patients the day before the surgery. Moreover, the use of bowel preparation is consistent with the recommendations, although these are based on inconsistent evidence. It was therefore found that the use of bowel preparation remains well established in the surgical community, with very gradual signs of change.

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**INCREASED INCIDENCE OF SECOND PRIMARY MALIGNANCIES IN PATIENTS WITH MICRO-PAPILLARY CARCINOMA OF THE THYROID.** *A. Al-Ashweez, R.J. Tabah, J.S. How.* Department of Surgery and Department of Medicine, McGill University Health Centre and McGill University, Montréal, Que.

Data concerning the incidence of second primary malignancies (SPM) following the diagnosis of differentiated carcinoma of the thyroid (DCT) have suggested that patients with DCT are at higher risk of developing a second cancer. Incidental and micropapillary cancers of the thyroid less than 10 mm are generally of little or no clinical significance. The purpose of the present study is to determine if patients diagnosed with such lesions share the same risks for developing SPM as do patients with more advanced, clinically significant DCT.

This review consists of a retrospective analysis of 984 patients who were diagnosed with DCT between January 1992 and May 2004 and in whom we had a minimum follow up of 1 year. Of these patients, 42 (4.3%) developed SPM. Their mean age of 58 years was somewhat greater than that of the entire cohort (46.7 yr). DCT tumours less than 10 mm were

diagnosed in 106 patients (10.8%). Twelve (11.3%) SPM developed in this cohort. Of the 878 patients with primary tumours > 10 mm, 30 developed SPM (3.4%). The mean interval between the diagnosis of DCT and the subsequent SPM was 7.6 years for the group as a whole and 8.9 years for those with DCT 10 mm or less. The variety of SPM includes a wide variety of neoplasms including breast, lung, colon, prostate and cancers of the upper aerodigestive tract.

Although our data are preliminary and retrospective in nature, the observation is nonetheless intriguing in that it would suggest that incidental DCT, although relatively benign in regards to their own clinical course, may in fact represent an indicator of a relatively unstable genome in general. Clearly, further study is required to confirm the validity of this study and to explore the responsible molecular pathways.

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**PARATHYROIDECTOMY DECREASES FRACTURES IN PRIMARY HYPERPARATHYROIDISM.** *P.I. Haigh, L.H. VanderWalde, I.A. Liu, T.X. O'Connell.* Department of Surgery, Kaiser Permanente Los Angeles Medical Center, Los Angeles, Calif.

The objective of this study was to determine if the risk of fracture is reduced in patients with primary hyperparathyroidism who undergo parathyroidectomy compared with those who are observed.

A retrospective cohort study with median follow-up of 6.5 years was performed using linked data from 2 regional databases. The main outcome measure was fracture-free survival (FFS), and the difference in FFS between patients who had parathyroidectomy or observation was analyzed using Cox proportional hazards regression modelling.

There were 1569 patients identified. The majority were  $\geq$  50 years old (84%) and female (78%). Mean initial calcium, parathormone and creatinine levels were 11.1 mg/dL, 123 pg/mL and 0.9 mg/dL, respectively. Parathyroidectomy was performed in 452 (29%) patients, and 1117 (71%) were observed. The 10-year FFS after primary hyperparathyroidism (PHPT) diagnosis was 73% in patients treated with parathyroidectomy compared with 59% in those observed ( $p < 0.001$ ). Parathyroidectomy decreased the 10-year fracture rate in the hip by 8% ( $p = 0.001$ ) and in the upper extremity by 3% ( $p = 0.02$ ); spine, pelvis or lower extremity fractures were not decreased. On multivariate analysis, parathyroidectomy was independently associated with a decreased fracture risk (hazard ratio [HR] = 0.53; 95% confidence interval [CI] 0.38–0.73), whereas females (HR = 1.82; 95% CI 1.19–2.80) and creatinine level (HR per 1 mg/dL increment = 2.05; 95% CI 1.22–3.46) remained independently associated with an increased fracture risk. Age  $\geq$  50 (HR = 1.62; 95% CI 0.99–2.66), initial parathormone level (HR = 1.00; 95% CI 0.99–1.02) and calcium level (HR = 1.02; 95% CI 0.75–1.37) were not independently associated with fracture risk after adjusting for all other variables.

In conclusion, parathyroidectomy decreases the risk of fracture. The largest decrease was in hip fractures. Parathyroidectomy should be offered to all patients with PHPT to reduce fracture risk, regardless of age, calcium or parathormone levels.

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**The Alberta WebSMR — dynamic outcomes in cancer surgery.** *W.J. Temple, O.F. Bathe, W.D. Buie, T. Gomes, K. Dabbs, E.A. Plewes, W.S. Brzezinski, T. Fields.* Cancer Surgery Alberta, Alberta Cancer Board, Edmonton, Alta.

A digitized Web-based synoptic medical report (WebSMR) was created to replace the narrative operating room (OR) report and implemented in Alberta to measure short- and long-term outcomes.

Using consensus and educational forums, templates for 8 cancers were developed by university, urban and rural surgeons. Waiting times, resource utilization, staging, decision-making, guidelines and functional information were incorporated in the SMR as well as the technical details of surgery. The WebSMR was documented to capture 98% of critical information in breast and colon cancer as compared with 45% for a narrative OR report.

The WebSMR has been implemented by 21 surgeons in 3 of 9 health regions in Alberta. In 6 months, 20 hepatic cancers, 50 rectal cancers and 80 breast cancers have been accrued.

A real-time prospective analysis of short-term outcomes was conducted to demonstrate its utility. Following is a sample of types of data that can be extracted. The median waiting time for breast cancer was 19 days. Forty-nine had invasive cancers. Of these, 34 were candidates for breast conservation surgery (BCS) of whom 90% had BCS. Ninety percent had lymph node surgery with 66% having sentinel lymph node dissection only. In BCS patients, intraoperative margins were done in 76%.

The Alberta WebSMR creates the opportunity for studying the science of surgery. The short-term data generated in these 3 tumour sites already have significant implications for the surgeon. Long-term data will further enhance the value of the WebSMR. The adoption of the Alberta WebSMR provides surgeons the opportunity to be seamlessly involved in quality assurance and outcomes for the cancer patient.

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**THE ROLE OF SENTINEL LYMPH NODE BIOPSY IN DUCTAL CARCINOMA IN SITU TREATED BY MASTECTOMY.** *J.C.C. Tan, D.R. McCready, A.E. Easson, W.L. Leong.* Department of Surgical Oncology, University Health Network, University of Toronto, Toronto, Ont.

Sentinel lymph node biopsy (SLNB) is a widely accepted alternative to axillary lymph node dissection in invasive breast cancer. Its role in ductal carcinoma in situ (DCIS) is still unclear. The purpose of this study was to determine the factors associated with the diagnosis of invasive disease and the role of SLNB when performing a mastectomy for DCIS.

A retrospective study was conducted of all mastectomy cases performed with a preoperative diagnosis of DCIS between 2000 and 2005 at a single tertiary care institution. Ninety mastectomies for DCIS were included.

Fifty-four mastectomies were performed with concurrent SLNB. Thirty-four (63%) patients with concurrent SLNB had diagnosis of DCIS by core biopsy only, compared with 10 (28%) patients treated with mastectomy only ( $p < 0.01$ ). Overall, 30 patients (33%) had invasive disease, of whom 22 re-

ceived concurrent SLNB. Seven SLNB patients (14%) had positive SLNs, 3 had isolated tumour cells, 2 had micrometastasis and 2 had metastatic disease. On univariate analysis, multifocality ( $p = 0.03$ ), multicentricity ( $p = 0.01$ ), comedonecrosis ( $p = 0.01$ ) and diagnosis by core biopsy ( $p < 0.001$ ) were associated with invasive disease. On multivariate analysis, comedonecrosis ( $p = 0.04$ ) and diagnosis by core biopsy ( $p < 0.01$ ) were independent predictors for invasion. There was no significant predictor for SLN metastasis. Eighteen of 22 patients (82%) with invasive disease received an SLNB with negative nodes.

About one third of patients with a preoperative diagnosis of DCIS treated with mastectomy at our institution have invasive disease, and factors associated with invasion have been identified. Concurrent SLNB reduced the need for an additional procedure in the majority of these cases. These data should be helpful in deciding whether to offer concurrent SLNB when performing a mastectomy for DCIS.

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**SURGICAL SKILLS TRAINING: WHAT KIND OF PRACTICE MAKES PERFECT?** *C. Moulton, A. Dubrowski, H. MacRae, B. Graham, E. Grober, R. Reznick.* Departments of Surgery, University Health Network, Mount Sinai Hospital, Toronto Western Hospital, University of Toronto, Toronto, Ont.

Surgical skills laboratories have become an important venue for early skill acquisition. The principles that govern training in this novel educational environment remain largely unknown; the most common method of training, especially for

continuing medical education (CME), is a single multi-hour event. This study addresses the impact of an alternative method, where learning is distributed over a number of training sessions. The acquisition and transfer of a new skill to a life-like model is assessed.

Thirty-eight junior surgical residents, randomly assigned to either massed (1 day) or distributed (weekly) practice regimens, were taught a new skill (microvascular anastomosis). Each group spent the same amount of time in practice. Performance was assessed pre-training, immediately post-training and 1-month post-training. The ultimate test of anastomotic skill was assessed with a transfer test to a live, anesthetized rat. Previously validated computer-based and expert-based outcome measures were used. In addition, clinically relevant outcomes were assessed.

Both groups showed immediate improvement in performance, but the distributed group performed significantly better on the retention test in most outcome measures (time, number of hand movements, path length, expert global ratings; all  $p$  values  $< 0.05$ ). Importantly, the distributed group also outperformed the massed group on the live rat anastomosis in all expert-based measures (global ratings, checklist score, final product analysis, competency for operating room; all  $p$  values  $< 0.05$ ).

Our current model of training surgical skills at CME courses and structured residency curricula may be suboptimal. Residents retain and transfer skills better if taught in a distributed manner, rather than the prevailing approach of teaching during a single, multi-hour session. Despite the greater logistical challenge, we need to re-structure training schedules to allow for distributed practice.

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**STERNAL TUBERCULOSIS: REVIEW OF THREE CASES.** *I. Alloubi, S. Boubia, M. Ridai, N.O. Zerouali.* P35 Casablanca University Hospital, Casablanca, Morocco.

Tuberculosis of the sternum is rare, and primary sternal tuberculosis is rarer still. The authors report 3 cases of sternal tuberculosis.

The clinical examination can be summarized as a presternal mass with lysis of the sternum evidenced by imaging. The diagnostic problem is to rule out neoplasm, hence the value of anatomic pathology. Chest wall tuberculosis is rare. Its frequency ranges from 0.4 to 9.2 of osteoarticular tuberculosis cases. It is characterized by predominately costal involvement, followed by involvement of the sternum and then of the clavicle. Sternal tuberculosis is frequently associated with other bone or visceral lesions. Clinically, sternal tuberculosis is mentioned in the differential diagnosis only in cases of a sternal mass with or without general signs.

An appearance suggestive of a cold abscess is a late development. Like the clinical examination, the radiological findings are not specific and frequently suggest a malignant pathology. CT scanning and MRI make it possible to demonstrate local extension, especially mediastinal.

Ultrasound-guided or surgical biopsy with anatomic pathology study can confirm the diagnosis. The treatment is primarily medical, based on a long course of antibacterial polychemotherapy and frequently leads to a cure. However, surgery may be necessary and involves resection with muscle flap coverage.

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**PERFORMANCE EVALUATION OF THORACOSCOPIC 3D ULTRASOUND IMAGING IN AN IN VIVO PORCINE MODEL.** *V. Hornblower, E. Yu, A. Fenster, J.J. Battista, R.A. Malthaner.* Imaging Research Laboratories, Robarts Research Institute; Canadian Surgical Technologies and Advanced Robotics, Division of Thoracic Surgery, London Health Sciences Centre, The University of Western Ontario, London, Ont.

To test the imaging performance of thoracoscopic 3-dimensional (3D) ultrasound (US) imaging of lung lesions in vivo.

An in vivo surgical porcine model was developed using agar to simulate small lung tumours. Spherical phantom tumours were made from agar, ranging in diameter from 9.5 mm to 25.4 mm. Five phantoms, all of different sizes, were inserted through incisions in all 3 lobes of the right lung via an open

thoracotomy. Single lung ventilation was provided using a Univent endotracheal tube. The Lap L9-5 thoracoscopic ultrasound probe was coupled to a rotational mover for 3D image acquisition and inserted into the chest through the incision. After insertion, the transducer was rotated and multiple 2D US images of the tumours were acquired and reconstructed into 3D images. During data acquisition, the ventilation was suspended, and the surgeon stabilized the probe but allowed it to rotate freely. One observer measured the tumour volumes by outlining the tumour boundaries in triplicate in the US images.

Each 3D scan took approximately 5-6 seconds to perform. There was sufficient contrast between the agar tumour and surrounding lung tissue for reliable tumour boundary detection. Despite minor movement due to cardiac pulsation, there were minimal motion artifacts in the images. The coefficient of variation (COV = standard deviation / mean) and tumour volume error decreased as the tumour size increased and averaged 1.75% and 8.18%, respectively.

3D thoracoscopic ultrasound can be used to accurately and reproducibly measure tumour volumes in vivo. This porcine lung tumour model can be used as a teaching and training tool for intraoperative lung ultrasound techniques in applications such as brachytherapy for minimally invasive lung cancer therapy.

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**THORACOSCOPIC SURGERY: A SURVEY OF THE EDUCATION NEEDS OF CANADIAN THORACIC SURGEONS.** *S.R. Ong, J. Clifton, R. Sidhu, J. Yee, K. Evans, R.J. Finley.* Department of Surgery, University of British Columbia, Vancouver, BC.

The purpose of this study was to assess the need for education programs to assist thoracic surgeons in acquiring the skills and knowledge necessary for thoracoscopic surgery (TS).

After a literature search and expert panel discussion, an on-line survey was developed, using multiple choice, Likert-type scales (not important = 1, very important = 5) and single-response questions. The survey was sent to all members of Canadian Association of Thoracic Surgery.

Forty members responded (response rate 48%). Respondents included tertiary care (27) and community (9) surgeons in addition to 4 trainees.

Basic TS (pleuroscopy, bullectomy, sympathectomy) was routinely performed by 60%. Limited operating room time (mean Likert score 3.51/5) and lack of formal training in TS (3.89) were factors identified as most important in influencing

surgeons in performing TS. Training in TS was obtained during residency (59%), additional courses (57%) and video demonstrations (56%).

All respondents thought basic TS was important during training. Factors affecting residents' training in TS were the attending surgeons' interest (4.55), residents' own interest (4.03) and program directors' involvement (3.97). Many would like to perform more advanced TS like video assisted thoracoscopic surgery (VATS) lobectomy (61%), esophageal mobilization (55%) and esophagectomy (50%). A self-directed course was acknowledged by 64% as an appropriate format to acquire basic or advanced thoracoscopic surgical skills. For more advanced procedures, the majority identified workshop (57.8%) and proctorship (59.8%) as best formats.

Currently, most surgeons perform basic thoracoscopic surgical procedures. They identify both resource and training limitations as barriers to pursuing more advanced procedures. They would like more formal training and feel that advanced skills are best learned through a combination of self-directed courses, workshops and proctorship. The findings of this study must be considered in the design of possible educational interventions for TS.

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**VIDEO ASSISTED THORACIC SURGERY LOBECTOMY — TOTAL ENDOSCOPIC/CLOSED CHEST DISSECTION: TECHNIQUE AND INITIAL RESULTS. THE LONDON ONTARIO EXPERIENCE. A.L. Lee, R.I. Incullet, D. Fortin, R.A. Malthaner. Division of Thoracic Surgery, London Health Sciences Centre, University of Western Ontario, London, Ont.**

Video assisted thoracoscopic surgery (VATS) lobectomy has not become the standard of care. These operations have previously been performed using a 5-cm utility incision, with thoracoscopic assistance. Most of the dissection is carried out by hand through the utility incision.

We have developed a total endoscopic/closed chest technique, with thoracoscopic dissection, using CO<sub>2</sub> insufflation. This technique may be superior due to better visualization, less manipulation of the lung and tumour, and a more precise dissection.

From January 1, 2004, to March 31, 2006, 2 surgeons performed 254 major anatomic pulmonary resections. There were 196 (77%) isolated lobectomies. We attempted 50 (26%) total endoscopic/closed chest VATS lobectomies.

The procedure involves 4 self-sealing ports, a 30° thoracoscope and CO<sub>2</sub> insufflation to 12 mm of H<sub>2</sub>O. The entire dissection is done with conventional thoracoscopic equipment, with the chest closed. Vessels are stapled or clipped, and the bronchus is stapled. The specimen is removed via a thoracoscopic specimen bag, using a 4-cm utility incision, at the end of the procedure. This is a "no-touch" technique with respect to the tumour.

Of the 50 minimally invasive resections, 32 (64%) were successfully performed using this technique. In the first 12 months of the study 18 (21%) were attempted VATS, and 8 (44%) were successfully completed. In the last 3 months, 15 (71%) were attempted VATS. In only 1 of these did we have to convert to a mini-thoracotomy.

Median length of stay for VATS lobectomy was 5 days com-

pared with 8 days for open lobectomy. Hospital mortality was 0% for the VATS group and 2.6% for the open group. The median length of stay for the VATS-to-open group was 6 days, with 1 death in this group (5.6%).

Total endoscopic/closed chest VATS lobectomy is feasible, safe and reproducible. The proportion of VATS lobectomies attempted and the success rate of completed VATS operations had dramatically increased over the study period. Total endoscopic/closed chest VATS lobectomy is an alternate technique for minimally invasive pulmonary surgery.

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**MEDIASTINAL HYDATID CYSTS: REVIEW OF THREE CASES. I. Alloubi, S. Boubia, M. Ridai, N.O. Zerouali. P35 Casablanca University Hospital, Casablanca, Morocco.**

Hydatid cyst of the mediastinum (HCM) is very rare. We review 3 cases of mediastinal hydatid cysts, one of which was complicated by pericardial rupture. We present a bibliographic study of the imaging and treatment methods of mediastinal hydatid cyst.

Mediastinal localization is one of the rarest; its incidence is low, accounting for less than 4% of all visceral localizations. Young adults are the most frequently affected, with no gender predilection. In most published cases, the mediastinal hydatid involvement is isolated. Clinical expression of this localization is nonspecific, dominated by indirect signs of compression of the mediastinal organs. Hydatid cysts tend to develop primarily in the posterior mediastinum, causing pain and neurologic signs, with possibility of erosion of the ribs and vertebrae. In the case of localization in the middle mediastinum, rupture of the cyst in the heart and/or aortic arch can cause a fatal hemorrhage.

The paraclinical examinations suggest but do not confirm the diagnosis. The posterior-anterior chest x-ray usually shows a mediastinal enlargement. The chest CT scan shows a well-defined, fine-walled, non-enhancing mass of fluid density, sometimes calcified. Mediastinal hydatid cysts are often solitary unilocular, but rarely multiple multilocular. MRI is less useful than CT except in cases of posterior costovertebral mediastinal involvement or cardiac involvement.

The diagnosis of HCM will include discussion of a number of other cystic lesions of the mediastinum: bronchogenic cyst, enteric cyst, cystic lymphangioma and pleuropericardial cyst. In these cases, hydatid serology is extremely useful for both diagnosis and follow-up. The treatment is essentially surgical, aimed at eliminating the parasite and repairing the pleuropulmonary sequelae.

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**COMMUNITY HOSPITAL VIRTUAL LUNG CLINIC REDUCES LUNG CANCER WAIT TIMES. R. Zeldin, I. Fraser, C. Simone, R. Skrastins, A. Monavvari, J. Meharchand, Y. Ung. Divisions of Thoracic Surgery, Oncology & Respiriology, Department of Family and Community Medicine, Toronto East General Hospital, Toronto Sunnybrook Regional Cancer Centre, Toronto, Ont.**

Delay in diagnosis of lung cancer can lead to "upstaging" of lung cancer and reduced potential for treatment. Based on

previously successful reports of reduced wait times using flow redesign, a clerical navigator, queue optimization with pooling of diagnostic testing and multidisciplinary tumour board, a virtual lung clinic was set up involving referring primary care physicians, community hospital specialists and a regional cancer centre.

A 6-month cohort-control trial was designed to assess the change in wait time from abnormal chest x-ray to diagnosis (CXR-Dx) between historical controls (Group A), intervention group (Group B) and concurrent controls (Group C, treated as intervention group after specialist consultation). Times from abnormal CXR to Referral (CXR-Referral), referral to specialist (Respirology or Thoracic Surgery) consultation (Referral-Consult), consultation to CT scan (Consult-CT) and CT scan to diagnosis (CT-Dx) were measured:

A community hospital-based virtual lung clinic using a clerical

Lung cancer wait times			
Wait-time interval	Mean days (and standard deviation)		
	Group A (n = 52)	Group B (n = 61)	Group C (n = 39)
CXR-Referral	19.9 (24.7)	11.7 (18.7)*	13.9 (15.9)
Referral-Consult	16.8 (11.9)	4.7 (4.4)†	11.2 (17.1)‡
Consult-CT	52.1 (42.2)	2.3 (3.9)†	11.5 (3.4)‡
CT-Dx	39.0 (52.5)	12.0 (14.3)†	12.7 (12.7)
CXR-Dx	107.3 (70.8)	30.8 (25.8)†	42.6 (28.1)‡

\*p < 0.02 v. A  
 †p < 0.001 v. A  
 ‡p < 0.02 v. B  
 CXR = chest x-ray; Dx = diagnosis.

patient navigator substantially reduces diagnostic wait times for lung cancer. The impact on disease staging at time of diagnosis and subsequent treatment will be determined in a larger study.

Funded by Cancer Care Ontario and the Ontario Ministry of Health and long-term Care.

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**COMPARISON OF INTRAOPERATIVE HEMODYNAMICS AND POSTOPERATIVE OUTCOMES IN PATIENTS UNDERGOING TRANSHIATAL VERSUS TRANSTHORACIC ESOPHAGECTOMY. C.D. Felisky, D.E. Low. Section of Thoracic Surgery, Virginia Mason Medical Center, Seattle, Wash.**

Over a 10-year period (1995–2004), 20 patients who underwent transhiatal (TH) esophagectomy were matched with 20 patients who underwent a transthoracic (TT) esophagectomy on the basis of sex, age, comorbidities, ASA status and operative date. Information regarding patient demographics, intraoperative hemodynamics and outcomes had been gathered prospectively on an IRB-approved database.

Forty patients were included in the study: 20 TH (15 cancer, 4 high grade dysplasia, 1 benign) and 20 TT (17 cancer, 2 high grade dysplasia, 1 benign). In the TH:TT groups, mean age was 64.5:65.4, male/female ratio was 11/9:12/8 and mean ASA was 2.6:2.6, respectively.

No significant advantages were noted in perioperative outcomes, particularly pulmonary complications. Significantly more lymph nodes were removed following TT procedures.

**Operative outcomes according to procedure\***

	No. pts.	Nodes excised†	Op. time, min	Blood loss, mL	LOS, d		Complications, %		
					ICU	Hosp.	Cardiac	Resp.	Leak
TH	20	7.7	392	211	1.5	11.7	5	25	10
TT	20	13.7	416	211	1.0	12.0	10	20	0

\*There were no deaths in either group.  
 †p = 0.024  
 Hosp. = hospital; ICU = intensive care unit; LOS = length of stay; Op. = operative; pts. = patients; Resp. = respiratory; TH = transhiatal; TT = transthoracic.

**Intraoperative hemodynamics according to procedure**

	Dysrhythmia, no. (%)	Intraoperative hypotension, % of op. time		Phenylephrine infusion			
		Required treatment	SBP ≤ 90	SBP ≤ 80	No. (%)	% of op. time	Total dose, µg
TH	15 (75)	4 (20)	11.3	1.7	3 (15)	52.7	15 750
TT	12 (60)	1(5)	11.5	2.2	4 (20)	33.6	5593

op. = operative; SBP = systolic blood pressure; TH = transhiatal; TT = transthoracic.

Trends toward more intraoperative dysrhythmias and greater amounts of phenylephrine infusions were seen with TH resections, although none of these differences were statistically significant. Operative approach should be individualized on the basis of patient and pathologic variables, and not on a preconceived notion of advantages of one approach over another.

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**THE TECHNIQUE OF ESOPHAGOGASTRIC ANASTOMOSIS FOLLOWING ESOPHAGECTOMY: A CANADIAN SURVEY. A. Al-Sulaimani, J. Clifton, R.J. Finley, K.G. Evans, J. Yee. Department of Surgery, University of British Columbia, Vancouver, BC.**

Quality of life (QOL) following esophagectomy is mostly determined by perioperative morbidity. The main postoperative complication that will affect QOL is anastomotic leak. Previous studies showed no significant difference in leak rate between hand-sewn (HS) anastomosis when compared with stapled end-to-end (S-EEA) anastomosis. A combined HS and stapled technique is a new technique that is getting more popular over the last few years with claims of a much lower anastomotic leak rate. No randomized controlled trial (RCT) has been done to support this result so far. Our goal was to discover the practice pattern in Canada in order to determine if an RCT is needed.

A survey was emailed to all 79 members of the Canadian Association of Thoracic Surgeons (CATS). The questionnaire instructed members to indicate the techniques they use for anastomosis and the percentage of time they perform each technique. Summary statistics include means, standard deviations and medians.

Thirty-six members (45.6%) returned the questionnaire. Responders perform anastomosis 73% of the time in the neck and 27% of the time in the chest. Four responders perform anastomosis in the neck 100% of the time. HS anastomosis is per-

formed 64.6% of the time; stapled 3.7% and combination hand/stapled 31.7%. Of those who indicate the type of staple used, all but one use a S-EEA stapler for a completely stapled anastomosis (one uses endo-GIA and TX stapler) and 100% use an endo-GIA stapler for a combined anastomosis.

There remains variation in esophageal anastomosis technique among Canadian thoracic surgeons. A national esophageal database should be established to continue to record these data. A randomized controlled trial would be useful in determining the best surgical technique providing the lowest operative morbidity and mortality and the highest quality of life to patients after esophageal surgery.

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**CONSTRUCTIVE PERICARDITIS: A CLINICO-PATHOLOGICAL STUDY AND SURGICAL OUTCOME IN INDIA.** *S.K. Agarwal, S. Pande, G. Majumdar, N. Kale, A. Kundu.* Department of Cardiovascular and Thoracic Surgery, Sanjay Gandhi Post-graduate Institute of Medical Sciences, Lucknow, India.

Constrictive pericarditis (CP) is common in India. In the past, the most common etiology was tubercular. This study was conducted to find out the etiological spectrum and surgical outcome of these patients in the current era.

One-hundred and two patients (76 men, age 6–65 yr) undergoing pericardiectomy for CP at our institution since January 1998 were included. Most patients were in New York Heart Association (NYHA) class III (48) or IV (18). Past history of pericarditis (20), tuberculosis (6), cardiac surgery (2), radiation (2) or chronic renal failure (8) was present in 38 (37.25%) cases. Other clinical features included edema (79), ascites (74), pleural effusion (68) and superior vena cava syndrome (1). Calcification of pericardium on x-ray was present in 6. The diagnosis was made by echocardiography in all. Catheterization was done in 15 cases.

All patients underwent subtotal pericardiectomy via mid sternotomy. One patient undergoing concomitant mitral valve replacement was operated under cardio-pulmonary bypass. Pericardial thickness was 2–15 ( $6.4 \pm 2.6$ ) mm. The CVP reduced by 2–24 ( $9.45 \pm 4.2$ ) mm Hg following surgery. Low cardiac output requiring inotropes for 2–5 days occurred in 56 (54.9%) patients. Four patients (3.92%) died (intractable bleeding 2, low cardiac output 2). The follow-up ranged from 1 month to 8 years. All survivors are in class I. Echocardiography revealed no evidence of constriction with improvement in left ventricular dimensions and ejection fraction. On histopathology, fibrosing pericarditis without granuloma (77, 75.49%), non-tubercular granuloma (11, 10.78%) and tuberculosis (10, 9.8%) were the common findings.

The most common cause of CP in India is idiopathic. Tuberculosis is becoming uncommon. Surgery is curative and can be performed with low mortality.

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**DEFINING THE OPTIMAL TREATMENT OF LOCALLY ADVANCED ESOPHAGEAL CANCER: A SYSTEMATIC REVIEW AND DECISION ANALYSIS.** *A.J. Graham, F.M. Shrive, W. Ghali, B.J. Manns, S.C. Grondin, R.J. Finley, J. Clifton.* University of Calgary, Calgary, Alta., and the University of British Columbia, Vancouver, BC.

The objective of this study was to combine systematic review and decision analytic techniques to determine the optimal treatment strategy for patients with locally advanced esophageal cancer.

We performed a systematic review of all randomized intervention trials of patients with locally advanced esophageal cancer which included at least 1 of the following strategies compared with surgery alone (Sx): chemoradiotherapy followed by surgery (CRS), chemotherapy followed by surgery (CS) or surgery with adjuvant chemoradiotherapy (SCR). Using the estimates of relative risk (RR) for mortality for each approach, we constructed a decision model using Markov analysis. Overall quality of life (i.e., utility scores) was taken from the published literature and a study to develop a health-related quality of life instrument for esophageal cancer. The outcome of interest was expected Quality Adjusted Life Years (QALY) gained with each of the strategies.

The systematic review identified 14 randomized controlled trials. The meta-analysis showed the cumulative mortality risk (and 95% confidence interval [CI]) for surgery alone at 6, 12, 24 and 36 months was 17.5% (15.5–19.5), 34.3% (31.9–36.7), 56.1% (53.6–58.6) and 67.4% (65.1–69.8). For the first year, the RR (and 95% CI) of death for treatments compared with surgery were 0.87 (0.75–1.02) for CRS, 0.94 (0.82–1.08) for CS and 1.33 (0.93–1.93) for SCR. Using decision analysis, QALYs gained for the Sx, CRS, CS and SCR strategies were 2.07, 2.18, 2.14 and 1.99. If the reduction in utility for multi-modality treatment was increased to 21%, the expected QALYs gained for Sx, CRS, CS and SCR strategies were 2.07, 2.03, 1.99 and 1.85, respectively.

For patients with locally advanced esophageal cancer, CRS appears to be associated with the best survival and the largest expected gain in QALYs. However, the improvement in quality adjusted life expectancy on average is modest at 40 days, and surgery alone becomes the preferred strategy if the utility associated with multi-modality treatment is lower by 21%.

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**A COST ANALYSIS OF MANAGEMENT STRATEGIES FOR ACHALASIA: LAPAROSCOPIC MYOTOMY VERSUS PNEUMATIC DILATATION.** *P.J. Karanicolas, SE Smith, R.I. Incelet, R.A. Malthaner, R.P. Reynolds, R. Goeree, A. Gafni.* Department of Surgery, of Medicine and of Clinical Epidemiology and Biostatistics, The University of Western Ontario, London; Department of Clinical Epidemiology and Biostatistics, McMaster University, Hamilton, Ont.

The objective of this study was to compare the costs of 2 alternative management strategies for patients with esophageal achalasia.

We constructed a decision model consisting of 2 treatment strategies for otherwise healthy patients diagnosed with achalasia: (1) laparoscopic distal esophageal myotomy without an antireflux procedure (LM) and (2) pneumatic dilatation (PD). Probabilities of short-term efficacy, complications, disease recurrence and symptomatic reflux were systematically derived from a comprehensive literature review, supplemented by expert opinion when necessary. Costs were estimated from the perspective of society, including both direct and indirect costs. All costs were expressed in 2005 Canadian dollars, with future

costs discounted at a rate of 5.5% over a time horizon of 5 and 10 years. Uncertainty in the probability estimates was incorporated into the model using one- and multi-way sensitivity analyses and Monte Carlo simulation probabilistic analyses.

In the base analysis, the expected cost per patient was \$10 701 (LM) compared with \$5265 (PD) 5 years following diagnosis, and \$11 789 (LM) compared with \$7916 (PD) after 10 years. The results were not sensitive to the probabilities of short-term efficacy, long-term recurrence or complications of either modality in the one-way or multi-way sensitivity analyses. When these variables were all fixed at the extremes of the ranges in favour of LM, PD was \$1434 less expensive after 5 years, and \$16 less expensive after 10 years. From the Monte Carlo simulations, the 95% confidence interval of the incremental cost per patient treated with LM was \$5472–\$5550 after 5 years, and \$3879–\$3961 after 10 years.

In conclusion, initial LM is a more costly management strategy under all clinically plausible scenarios tested in this model. Further research is needed to determine patients' preferences for the 2 treatment modalities, and society's willingness to bear the incremental cost of LM if chosen by patients.

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**REVIEW OF PNEUMONECTOMY MORBIDITY AND MORTALITY IN A REGIONAL ACADEMIC CENTRE FOR THORACIC SURGERY.**  
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Demographic, operative and postoperative information was examined using a retrospective chart review to identify factors

that contribute to the mortality and morbidity rates of patients who have undergone an elective pneumonectomy at a regional academic centre.

One-hundred and twenty-eight patients (68 male, 60 female) with a mean age of 61 years (standard deviation [SD] 10.9) underwent an elective pneumonectomy (67 left, 61 right) at Vancouver General Hospital (VGH) between April 2001 and February 2006. Hospital mortality for uncomplicated pneumonectomies was 0%. All deaths occurred among patients who underwent complex or extended resections. Specifically, 1 death occurred after pneumonectomy with tracheal sleeve, 1 death occurred among 16 patients who underwent completion pneumonectomy, and 2 deaths occurred among 21 patients who underwent intrapericardial pneumonectomy. There were no deaths among the remaining 89 uncomplicated pneumonectomies. The overall mortality for all complicated and uncomplicated pneumonectomies was 3.1%. One-hundred and twenty of the pneumonectomies (93.8%) were carried out on patients diagnosed with lung cancer. Pre-operative therapy was completed in 3 patients (2.3%, 3 chemotherapy, 2 radiotherapy). Pneumonectomy patients stayed an average of 12 days (SD 10.4) in hospital with a complication rate of 32%. Complications included atrial fibrillation (21, 16.4%), supraventricular tachycardia (6, 4.7%), pneumonia (9, 7%), pleural effusions (1, 0.8%), pulmonary edema (2, 1.6%), atelectasis (1, 0.8%), pulmonary embolus (1, 0.8%) and recurrent nerve paralysis (7, 5.5%).

Elective pneumonectomies, in a regional academic centre for thoracic surgery, carry a low mortality rate and low length of stay, however, the data suggest that more complicated pneumonectomies may carry a greater risk of death or complication.

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