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ABSTRACTS

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RÉSUMÉS

des communications présentées
aux congrès annuels de l'

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et de la

Société canadienne des chirurgiens du côlon et du rectum

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Canadian Society of Colon and Rectal Surgeons
Société canadienne des chirurgiens du colon et du rectum

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MRI FOR THE PREOPERATIVE ASSESSMENT OF SACRAL RESECTION FOR PELVIC TUMOURS.

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Surgical resection of pelvic tumours involving the sacrum has considerable morbidity, but complete resection offers the only chance of cure. We evaluated the accuracy of preoperative pelvic MRI to predict the highest sacral level of tumour involvement to plan the extent of sacral resection. A hospital database identified 28 patients who had a partial sacrectomy as part of a curative composite pelvic resection from 1989 to 1999. The present study evaluated the 18 patients whose preoperative MRI was available for review: 9 with primary sacral tumour, 9 with anorectal cancer (8 recurrent, 1 primary). An expert radiologist blinded to the operative and pathological findings rated the superior extent of sacral involvement on the preoperative MRI by 2 criteria: (i) tumour mass, (ii) abnormal signal, indicating disturbed tissue planes. Review of the operative and pathology reports identified the level of sacral resection and the specimen margin status (positive or negative), respectively. Data are mean ± SE mean. Mean sacral resection level was between S2 and S3 (S2.4 ± 0.2), similar in anorectal and sacral tumours. Bone invasion was seen in the specimen in 22% of anorectal cancers and in 100% of sacral tumours. The sacral resection margin was microscopically positive in 1 / 9 anorectal and in 2 / 9 sacral tumour patients. In the 12 patients who had previously received radiotherapy, the abnormal signal level was 2.5 ± 0.4 sacral segments higher than MRI tumour mass level, compared with 0.58 ± 0.3 segments higher in the 6 with no radiotherapy. The table shows margin status predicted by MRI versus actual pathological margin status. In patients with pelvic tumours requiring composite resection, the preoperative MRI tumour mass level should help guide the level of sacral resection.

MRI margin (predicted)	Pathological margin (actual)				*n* = 18	
(a) Tumour mass level	Positive	Negative	Sensitivity	Specificity	PPV	NPV
positive	1	3	0.33	0.8	0.25	0.86
negative	2	12	PPP = positive predictive value.			
(b) Abnormal signal level	Positive	Negative	Sensitivity	Specificity	PPV	NPV
positive	2	10	0.67	0.33	0.17	0.83
negative	1	5	NPV = negative predictive value.			

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EXTENDED RESECTIONS FOR PRIMARY RECTAL CANCERS INVOLVING ADJACENT ANTERIOR STRUCTURES.

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The purpose of this study was to evaluate clinical features of female primary rectal cancer patients and results of resection requiring partial vaginectomy.

Sixty-four primary rectal cancer patients treated by APR (n = 49), LAR (n = 6) or posterior pelvic exenteration (n = 9) with partial vaginectomy from 1986 to 1999 were identified from a prospective database. Survival was determined by the Kaplan–Meier method, and distributions were compared by the log rank test ($p < 0.05$ considered significant).

Clinical evaluation revealed 6 patients with malignant rectovaginal fistulae (RVF), 32 cancers that were bulky or adherent / tethered to the rectovaginal septum, 18 confined to the rectal wall and 8 without comment. Thirty-eight patients received radiation ± chemotherapy (30 preoperatively, 8 postoperatively). In the 49 patients undergoing APR, the vaginal defect was left open in 11, 7 had myocutaneous flap reconstruction, 6 had omental pedicle flaps rotated into the pelvis, and 25 had primary closure. Seventeen complications occurred in 16 (25%) patients and included 8 wound complications (2 perineal fistulae), 4 urinary retentions, and 1 each of peripheral neuropathy, metabolic encephalopathy, phlebitis, deep venous thrombosis and bowel obstruction. Long-term urinary dysfunction included inadequate bladder emptying in 6 patients and varying degrees of incontinence in 4. There were no perioperative deaths. Pathological assessment revealed: 2 stage 0 (complete response to preoperative radiation), 12 stage I, 18 stage II, 21 stage III, and 11 stage IV rectal cancers. At a median follow-up of 22 months, 27 (42%) patients have recurrent disease, 8 in the pelvis, 17 at distant sites, and 2 with both locoregional and distant failure. Thus, the overall local failure rate was 16% (10 / 64), but this occurred more commonly in patients with a positive microscopic margin (2 / 4 = 50%) than in those with a negative margin (8 / 59 = 14%). Five-year overall survival of this cohort was 46% with a median survival of 44 months. Positive nodal status had a significant impact on overall survival (p = 0.0003). Partial vaginectomy is indicated for locally advanced rectal cancers involving the vagina and may be accomplished with minimal morbidity and acceptable local recurrence and survival rates.

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A META-ANALYSIS OF RANDOMIZED CONTROLLED TRIALS (RCTS) COMPARING STRAIGHT COLOANAL (SCA) TO J-POUCH ANASTOMOSIS (JPA) FOR LOW RECTAL CANCER.

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Many patients having a coloanal anastomosis following low anterior resection for rectal cancer have suboptimal functional results. While there is evidence from RCTs that a JPA may lead to improved outcome, most RCTs have been small, and results are inconclusive. Thus, the objective of this study was to systematically review RCTs, evaluating the outcome of patients undergoing SCA versus JPA for low rectal cancer.

RCTs were identified by searching MEDLINE and key journals and consultation with experts. Data were extracted by 2 individuals and discrepancies were resolved by consensus. The Cochrane Collaboration Review Manager was used to calculate Peto odds ratios (OR) for dichotomous data and weighted mean differences (WMD) for continuous data with 95% confidence intervals (CI). RCTs were included if at least 80% of patients were followed for at least 1 year.

Of 6 RCTs identified, 4 were included. There were no significant differences in tumour location, stage, anastomotic level, postoperative complication or recurrence rates. Significantly more individuals had > 3 bowel movements per day with SCA (Peto OR = 0.22, 95% CI 0.1 to 0.47). Mean maximum tolerable rectal volume and anal squeeze pressure were not significantly lower after JPA (WMD = –15.7, 95% CI –30.4 to 1.0).

Initial results suggest that functional results may be better with JPA, but the impact on quality of life is unknown. Therefore, larger RCTs with patient outcomes are needed.

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CONFORMAL PREOPERATIVE ENDORECTAL BRACHYTHERAPY FOR PATIENTS WITH LOCALLY ADVANCED RESECTABLE RECTAL CANCER: PRELIMINARY RESULTS.

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This study was designed to determine feasibility, reproducibility and toxicity of the use of fractionated preoperative high-dose-rate endorectal brachytherapy and to evaluate pathological tumour response to this treatment.

Patients with newly diagnosed invasive rectal adenocarcinoma, locally advanced T2, T3, operable tumours were eligible. Colonoscopy, computed tomography scans, magnetic resonance imaging, endoscopic rectal ultrasound and chest x-ray were used as preoperative studies. A dose of 26 Gy was given over 4 consecutive daily treatments of 6.5 Gy prescribed at tumour depth with a multichannel endorectal applicator. CT simulation was used to contour tumour and to optimize dosimetry. Surgery was done 4 to 6 weeks later. There was no plan to change the type of surgery regardless of tumour response. Patients found to have nodal spread were to receive postoperative external beam (45 Gy / 25 fractions) and chemotherapy.

From October 1998 to March 2000, 25 patients entered the study. Tumours were in the lower one-third in 10 patients, middle one-third in 12, upper one-third in 3. There were 23 T3 and 2 T2 tumours by preoperative imaging studies. Toxicity was limited to grade 2 tenesmus and proctitis in all patients and controlled with steroid enemas, anti-inflammatory and mild narcotics in 84% of the patients. One patient with a very low lesion developed a perineal ulcer. No hospital admission was required because of toxicity. Ulceration of the tumour bed without fibrosis on dissection was observed, except in 1 with a perforated tumour. Two major introperative bleeds (1500 mL) occurred and another patient had an anastomotic leak, requiring a temporary colostomy. Complete response to treatment was found in 65% of patients. Operative specimen pathology showed 26% pT0N0 and 137% residual microfoci of carcinoma. Downstaging was thus observed in 78%. Postoperative chemotherapy and external beam treatment was required in 21% of patients.

High-dose-rate endorectal brachytherapy is well tolerated, with tenesmus being the only acute toxicity so far. Our tumour downstaging rate compared favourably to the best-published results obtained with preoperative chemotheray and external beam radiotherapy but with minimal toxicity and a shorter treatment time. Further accrual is planned and close follow-up is ongoing to assess local control, survival and long-term toxicity.

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STENTING FOR MECHANICAL LARGE-BOWEL OBSTRUCTION — A NEW TREATMENT OPTION.

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A prospective study of 16 patients over 2 years shows that decompression using a fluoroscopic-endoscopic technique for the placement of an expandable stainless steel intraluminal colonic stent in acute mechanical large-bowel obstruction is a safe and effective therapy.

Acute mechanical complete large-bowel obstruction is a common general surgical emergency requiring immediate attention. Traditionally, this has involved 1 of 4 options: tube cecostomy; loop colostomy; on-table lavage with resection and anastomosis; resection with stoma. Selection of any of the above 4 options depended upon the health status of the patient, the etiology of the obstruction and technical facility with which any option could be carried out. We describe a fifth option now available that can be applied to all patients, independent of their health status as well as whether or not their treatment will be curative or palliative.

Over a period of 24 months, 16 patients presented with acute mechanical large-bowel obstructions at a tertiary referral centre. Fluoroscopically assisted endoscopic stenting using a stainless steel expandable wall stent (Enteral Wallstent™, Boston Scientific) was carried out successfully in 14 patients (87.5%); 6 males, 8 females; age = 71 ± 21 years. Patients were then divided into 2 groups, palliative and curative. The palliative group (n = 5; 35.7%) were either short term (n = 3) or long term (n = 2). The short-term

patients died at 1, l8 and 16 weeks post-stenting from nonobstructive causes. The long-term patients were alive at 52 and 80 weeks post-stenting. In the curative group (n = 9; 64.2%), 1 patient died while undergoing neoadjuvant chemotherapy prior to resection. The remaining 8 patients were divided equally between those with diverticulitis (n = 4) and those with colon cancer (n = 4). All underwent an elective bowel resection, including a bowel preparation, within 3 weeks of stenting. Of these 8 patients, 6 (43%) had a primary anastomosis and 2 (14%) had a stoma.

The only complication of stent placement was migration, which occurred in the long-term palliative group of patients. This was rectified by stent replacement. There were no cases of bleeding, perforation or sepsis secondary to stent placement. Intraluminal colonic stenting provides both a temporzing measure to more definitive resection as well as a palliative option in patient with mechanical large-bowel obstruction, with minimal morbidity and mortality.

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WOULD THE IMMUNE ESCAPE MECHANISM OF FAS LIGAND BE A PROGNOSTIC MARKER FOR DUKES' STAGE B COLONIC CARCINOMA?

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Our objective is to determine whether tumours from patients with Dukes' stage B colonic carcinoma express FasL, a potential prognostic marker for aggressive behaviour and early spread.

Fifty patients with Dukes' stage B primary colon cancer histopathologically diagnosed during the period 1989 to 1995 were included in the study. Tumour differentiation, PCR evaluation and immunohistochemical expression of FasL in the primary tumours were performed in all patients. A staining score of 4+ (> 75%) was considered strongly positive.

Thirty-five patients aged 40 to 85 years were included in the study. Ten patients (22.7%) developed local recurrence or distant metastasis. Thirty-five percent of the tumours were well differentiated, 54% were moderately differentiated and the rest were poorly differentiated. FasL expression was strongly positive in 68%, focal in 15%, weak in 2% and negative in 15%. All lymph nodes in the studied specimens were negative for FasL. One hundred percent of the specimens from recurrent tumours stained strongly positive for FasL, compared with 31.6% from nonrecurrent tumours (OR = 3.17, $\chi^2 = 5.02$, $p = 0.025$).

Patients with Dukes' stage B colonic carcinoma and strong positivity for FasL are more prone to immune escape and earlier tumour spread. Clinical management should, therefore, include wider resection margins and closer surgical follow-up regardless of tumour differentiation. We recommend measurement of FasL expression in resected stage B tumours for early identification of patients at risk of recurrence.

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DISTAL ADENOMAS MANDATE TOTAL COLONOSCOPY.

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Purpose: Distal adenomas have been considered markers of proximal neoplasms. It has also been suggested that patients with small distal adenomas do not necessarily require proximal examination. This study was conducted to determine the validity of this concept. Methods: From a total of 3838 colonoscopies performed between 1986 and 1998, all patients from whom polyps were removed were included. Those with previous colon resection or incomplete cecal intubation were excluded. The patients were divided into 2 groups: I — asymptomatic, positive family history (1 or more first-degree relatives with colorectal cancer); II — asymptomatic average risk. Proximal polyps were defined as those proximal to the sigmoid colon. Polyps were considered advanced if they were ≥ 1 cm, were villotubular, villous or contained severe dysplasia. Results: In group I, there were 74 patients (mean age 61 ± 12 years, total polyps excised 153) and distal polyps were present in 22 (29.8%). Proximal adenomas were found in 17 of these 22 patients (77.3%). By comparison, of the 102 group II patients (mean age 68 ± 8.7 years, total polyps excised 94), distal polyps were found in 44 (43.1%) and proximal adenomas were found in 34 of these 44 patients (77.3%). Solitary, small (< 1 cm) distal adenomas were present in 14 group I patients, 11 of them (78.6%) also having proximal adenomas. Of group II patients, 21 patients had small distal adenomas with 17 (81.0%) of those having proximal adenomas. Advanced distal adenomas were found in 7 of 74 (9.5%) group I patients, and 6 of those patients had proximal adenomas (85.7%). In group II patients, advanced distal adenomas were found in 21 of 102 patients (20.6%), and 15 (71.4%) of those patients had proximal adenomas. Conclusion: These data confirm the necessity for total colonoscopy in all patients with distal adenoma regardless of size and histopathology.

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RISK OF SMALL-BOWEL OBSTRUCTION (SBO) FOLLOWING THE PELVIC POUCH PROCEDURE (PP).

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The aim of this study was to determine the incidence of SBO in patients having a PP, and to identify risk factors for its development.

All patients having a PP at the Mount Sinai Hospital (MSH) were included. Data were obtained from the MSH database, patient charts and a mailed-out questionnaire. Early SBO was defined as a hospital stay greater than 14 days because of delayed bowel function or need for reoperation or readmission for SBO within 30 days. All patients readmitted after 30 days with a discharge diagnosis of SBO were included as late SBO.

One thousand one hundred and thirty-seven patients had a PP between 1981 and 1999 (644 males and 493 females, mean age 40.7 years). A total of 330 episodes of SBO were documented in 281 patients over a mean follow-up of 8.7 years (mean 1.17 episodes / patient). Forty-two patients (15%) had more than 1 SBO. One hundred and sixty-two (49%) of the SBOs occurred in the first 30 days (early SBO), while 255 (77%) occurred in the first postoperative year. The cumulative risk of SBO was 14.2% (95% CI 12.2% to 16.2%) at 30 days, 22.4% (95% CI 20% to

24.8%) at year 1, 27.6% (95% CI 24.4% to 30.8%) at year 5, and 28.9% (95% CI 24.1% to 33.7%) at year 10. The cumulative need for surgery for SBO was 0.6% (95% CI 0.2% to 1%) at 30 days, 2.6% (95% CI 1.7% to 3.5%) at 1 year, 6% (95% CI 4.3% to 7.7%) at 5 years, and 6.4% (95% CI 3.8% to 9%) at 10 years. Seven of the 162 (4.3%) early SBOs required laparotomy for management, while 61 of 181 patients (34%) with late SBO required laparotomy. Of the 42 patients who had more than one SBO, 45% required laparotomy, compared with 20.5% (49 / 239) who had only 1 SBO. Thirty-one of 128 patients (24%) who had an IAA leak developed SBO, compared with 30% of those with no leak, while 21% of patients who had had a previous subtotal colectomy (STC) developed SBO, compared with 29% of those whose colectomy was done in conjunction with the PP. Of those with an ileostomy created during the PP procedure, 28% developed a SBO, versus 17% of those with no ileostomy.

The risk of SBO following the PP procedure is approximately 25%, with the risk being highest in the first postoperative year; however, most do not require surgical intervention. Construction of a defunctioning ileostomy is associated with an increased risk of SBO, whereas previous STC and IAA leak have no effect. The need for laparotomy and lysis of adhesions is much more likely for late SBO compared with early SBO.

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COMPARISON OF QUALITY OF LIFE 5 AND 10 YEARS AFTER THE PELVIC POUCH (PP) PROCEDURE.

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The aim of this study was to assess the quality of life (QL) and functional results of patients who underwent the PP, and to determine whether the results remain constant over prolonged follow-up.

All patients who had a PP performed prior to 1994 were sent a questionnaire in 1994 and again in 1999. The questions concerned bowel function, diet, well-being and daily activities.

Of the 624 patients who had a PP performed prior to 1994, 406 returned the questionnaire in 1994, and 307 of these patients (76%) returned it in 1999. Our cohort consists of 155 males and 152 females, mean age 44.9 years. One hundred and forty-six had a handsewn and 161 had a stapled ileoanal anastomosis. Two hundred and six had a J-pouch and 101 had an S-pouch. Two hundred and seventeen were performed with a diverting ileostomy. The diagnosis was ulcerative colitis in 289 (94%). Mean follow-up was 5.8 years in 1994 and 10.8 years in 1999. The functional results, measured by number of bowel movements, day and night-time continence, and significant incontinence, did not show a statistically significant change over the 5 years between the questionnaires. The QL questions showed that fewer patients felt that their bowel function never interfered with their activities of daily living. There was no difference in the percentage who usually or always feel well or in those who are unrestricted in pursuing their career and in participating in leisure activities (see Table I).

Table I	1994	1999	*p* value
< 6 bowel movements/d	55%	50%	NS
Fully continent — day	68%	67%	NS
Fully continent — night	51%	50%	NS
Usually/always feel well	93%	89%	NS
Bowel function interferes with activities	34%	64%	< 0.001
Unrestricted — career	77%	86%	NS
Unrestricted — leisure	79%	75%	NS

These results suggest that the functional results following the PP are excellent in most patients and are sustained over time. Despite this, however, more patients reported that their bowel function interferes with their daily activities.

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IS IT SAFE TO BEGIN DOING LAPAROSCOPIC COLON SURGERY (LAP) WITH ILEOCOLIC RESECTIONS FOR CROHN'S DISEASE (CD)?

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With concerns about port site recurrences, it is recommended that one begins LAP experience with benign, noninflammatory cases. There are very few such cases, making it difficult to accrue experience. The following is a review of one surgeon's initial LAP experience with ileocolic resection for CD. A retrospective review of all LAP ileocolectomies by a single surgeon without prior advanced laparoscopic experience was done. The patients were divided into 2 equal groups of 21 (1: 1 / 97 to 9 / 98, 2: 11 / 98 to 8 / 99), to compare early and late experience.

Group	1 (*n* = 21)	2 (*n* = 21)
Age, yr	33 ± 2.5	27 ± 1.6
Operating room time, min	174 ± 11*	133 ±7*
Length of stay, d	6 ± 0.43	6 ± 0.36
Incision, cm	5 ± 0.29	4 ± 0.36
Conversion, no. (%)	6 (28.6)	2 (9.5)

*$p < 0.05$.

There were no deaths. Complications occurred in 3 patients in each group (anastomotic bleeding, enterotomy, intra-abdominal seroma in group 1; and port-site hematoma, phlegmon, anastomotic bleeding in group 2). Complex cases included: phlegmon / abscess (7), enterointestinal fistula (10), enterovesical fistula (1), extensive adhesions (4), additional small-bowel disease (4), and repeat ileocolectomy (6). LAP ileocolic resection for CD, even with complex disease, is a safe way to begin LAP surgery, albeit with a high initial conversion rate. With experience, operating room time and conversion rate decreased.

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PREOPERATIVE TECHNETIUM-99M-SESTAMIBI (MIBI) SCANNING AND INTRAOPERATIVE GAMMA-PROBE LOCALIZATION FOR MINIMALLY-INVASIVE PARATHYROIDECTOMY (MIP). P.I. Haigh, F.R. Singer, E.C. Glass, A.E. Giuliano. John Wayne Cancer Institute, Santa Monica, Calif.

The goals of this study were to examine the accuracy of MIBI in localizing an abnormal parathyroid gland (APG) suitable for MIP and to assess biochemical cure rates after MIP.

Patients with sporadic primary hyperparathyroidism (PHPT) were enrolled in a prospective study between Aug. 1, 1998, and Dec. 1, 1999. Preoperative MIBI scans were obtained, and MIP with gamma-probe guidance was attempted if the MIBI scan revealed unifocal uptake, otherwise bilateral neck exploration (BNE) was performed. Calcium levels were obtained at 3-month intervals.

Fifty-seven patients were enrolled. Unifocal MIBI uptake was found in 46 patients, and 44 of these had an APG removed by MIP. Two patients required conversion to BNE, 1 due to an adenoma that rapidly lost MIBI, and 1 due to uptake in a contralateral thyroid nodule (a false-positive case). Five patients had multifocal MIBI scans, and BNE revealed hyperplasia in 4 patients and an adenoma in 1 patient. Six patients had negative MIBI scans, and all underwent BNE: 3 had hyperplasia, and 3 had an adenoma. Minimum follow-up was 3 months. Overall cure rate was 55/57 (97%). In those patients who had MIP only, 42 (95%) were normocalcemic and were assumed to have an adenoma, 1 has persistent hypercalcemia (a false-positive case), and 1 required BNE at reoperation for a single adenoma correctly identified but incompletely removed at MIP. Therefore, for a single APG removed after unifocal MIBI scan, the sensitivity was 92%, the positive predictive value was 96%, the false-negative rate was 8%, and the false-positive rate was 22%.

The uptake of MIBI in an APG usually represents an adenoma, which can be removed successfully by MIP to effectively cure patients with sporadic PHPT. MIP performed on the rare falsely positive unifocal MIBI scan will require a second operation for cure. Technical problems, even with correct unifocal MIBI scans, may also contribute to persistent PHPT after MIP. Multifocal or absent MIBI uptake usually represents hyperplasia, and MIP is not indicated; BNE in these cases will identify the occasional falsely negative adenoma.

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PROBE-GUIDED PARATHYROID ADENECTOMY PERFORMED WITH LOCAL ANESTHESIA. A. Hagr, D. Anderson, R.J. Tabah. Department of Surgery, McGill University, Montreal, Que.

Over a 10-month period, 48 patients were referred for parathyroid surgery. Of these, 26 underwent probe-guided parathyroid adenectomy under local anesthesia. In 24 patients, the procedure was successful in that a diseased gland was retrieved (92.3%). In 23, the procedure was curative in that PTH and ionized calcium normalized in the postoperative period. The overall success was therefore 88.5%. No patient experienced postoperative hemorrhage. Two patients experienced transient intraoperative recurrent laryngeal nerve dysfunction which resolved within minutes in both.

The technique as well as selection criteria are discussed.

The advent of probe-guided parathryoid adenectomy is a major advance in minimal access surgery.

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A DECADE OF LAPAROSCOPIC COLORECTAL SURGERY: REVIEW OF 554 PROCEDURES. C.M. Schlachta, J. Mamazza, R. Grégoire, P.A. Seshadri, M.O. Cadeddu, E.C. Poulin, The University of Toronto Centre for Minimally Invasive Surgery, St. Michael's Hospital, Toronto, Ont.

The objective of this study was to review the overall cumulative experience of 1 surgical group with laparoscopic colorectal surgery in the last decade.

This review was conducted from a prospectively accumulated, computerized, clinical database of laparoscopic colorectal procedures performed between April 1991 and February 2000.

A total of 554 laparoscopic colorectal procedures were performed in this series comprising 261 women and 293 men. Average patient age was 58 ± 19 (range 12 to 94) years. Surgery was performed for malignant disease in 266 cases (261 adenocarcinoma, 3 carcinoid, 1 squamous cell carcinoma and 1 lymphoma) and benign disease in 288 cases (118 diverticulitis, 59 Crohn's disease, 46 ulcerative colitis, 34 polyps and 31 others). Procedures performed were right hemicolectomy (153), sigmoid colectomy (139), anterior resection (95), abdominoperineal resection (38), total colectomy (42), left hemicolectomy (21), total proctocolectomy (16), stoma closures (16), colostomy (12), transverse colectomy (8), proctectomy with ileal J pouch (8), and 6 others. Intraoperative complications occurred in 41 cases (7.4%) and consisted of hemorrhage (17), bowel perforation (11), instrument malfunction (5), with 8 others. The overall rate of conversion to open surgery was 9.9%. The conversion rate was higher in patients with malignant disease (12.8%) compared with benign disease (7.3%, $p = 0.044$). In cases completed laparoscopically, average operating time was 164 ± 57 minutes for segmen-

tal resections. Postoperative complications occurred in 29% and were mostly ileus or bowel obstruction (8%, 3 reoperated), wound infection (6.2%) and urinary retention (4.2%). Pneumonia developed in only 5 cases (1.0%). Mortality was 2.2%. Median postoperative length of stay declined from 6.0 days to 5.0 days between the first and second halves of the experience ($p < 0.001$). Considering patients undergoing segmental resection, 36% were discharged home by the fourth postoperative day.

Laparoscopic resections are safe and feasible for a wide range of basic and complex colorectal procedures. Adherence to proper oncologic principles results in a higher conversion rate for patients with malignant disease. Postoperative hospital stay is short and declining further with experience. This series confirms the superior short-term outcomes associated with laparoscopic colorectal surgery.

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A SIMPLE CLINICAL MODEL FOR PREDICTING THE RISK OF CONVERSION TO OPEN SURGERY IN LAPAROSCOPIC COLORECTAL RESECTIONS.

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The objective of this study was to develop a simple model for clinical use in predicting the individual risk of conversion to open surgery in patients undergoing laparoscopic colorectal resections.

A multiple logistic regression analysis of 367 laparoscopic colorectal resections completed between 1991 and 1998 was performed. Thirteen patient-specific factors (age, gender, weight level: < 60 kg, 60 to 90 kg, 90 kg or more), disease-specific factors (Crohn's disease, diverticulitis, malignant disease, fistula) and procedure-specific factors (resection of the hepatic flexure, splenic flexure, sigmoid, rectum, perineum, experience < 50 cases) were considered.

The overall risk of conversion to open surgery was 9% in this series. Based on the 3 factors found to be predictive of the risk of conversion to open surgery on multiple regression analysis, the following scoring system was developed: diagnosis of malignant disease (odds ratio 3.23, $p = 0.0037$, 1 point), surgeon experience 50 cases or less (odds ratio 2.26, $p = 0.0363$, 1 point), and weight level (odds ratio 3.42, $p = 0.005$, 60 to 90 kg, 1 point, 90 kg or more, 2 points). The predicted conversion rates for cumulative scores of 0 to 4 points were 1.1%, 3.3%, 9.8%, 25.4% and 49.7%. There was no significant difference between predicted and actual conversion rates, indicating a good fit of the model ($\chi^2 = 1.774$, $p > 0.5$).

This novel scoring system is simple, accurate and readily applicable in an office setting. It represents the large experience of 1 surgical group and remains to be validated by other centres.

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EFFECT OF LAPAROSCOPIC FAILURE ON THE OUTCOME OF LAPAROSCOPIC NISSEN FUNDOPLICATION.

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This study was undertaken to determine whether conversion or early reoperation contributed significantly to the eventual outcome after laparoscopic Nissen fundoplication (LNF).

An independent surgeon, blinded to the operative events, administered 2 general (direct questioning of objectives and Noddingham short form-36 health survey) and 1 system-specific (gastrointestinal quality of life index) quality-of-life tools to the first 100 consecutive patients booked for LNF in a community hospital, where the conversion rate was 5 patients and early reoperation rate 1.5 patients / surgeon for the first 20 LNFs. Patients were also asked about need for medication, dysphagia, satisfaction by analogue scale and if, given it to do over, would they opt for surgery again.

Of the original 100 patients, 40 were studied completely an average of 4.8 years after surgery (range 2 to 8 years): 26 patients with successfully completed LNF and 14 with laparoscopic failure (13 conversions and 1 early reoperation). Patient characteristics (left side of table) for both groups were similar, except for more fixed intrathoracic hiatus hernias in the failure group. Among the parameters examined (right side of table), no statistically significant differences could be detected between laparoscopic and converted patients. Sixty patients, whose preoperative characteristics were similar to the studied patients, were lost to follow-up: unknown —— 32, language — 9, moved — 7, dead — 2, miscellaneous — 5.

	n	Age, yr	Sex	Sympt.	PPI, %	HH, %	GIQLI	Meds, %	Dysph, %	1–5 scale	Repeat, %
Lap	26	47	48% M	8 yr	76	8	116	19	8	4.4	81
Fail	14	58	58% M	8 yr	67	42	112	38	21	4.2	71
p: 0.05		>	>	>	>	<	>	>	>	>	>

General and system-specific quality of life, dysphagia, need for medication, patient satisfaction and willingness to have surgery over again are not altered by conversion or reoperation. Thus, surgeons who have adequate laparoscopic skills, have experience with open fundoplication, have obtained training in LNF and wish to add it to their repertoire, should feel free to do so, provided the likelihood of conversion and reoperation due to inexperience has been understood by the patient. Early in the learning, surgeons should unhesitatingly convert difficult situations to avoid potential problems. If problems are found, they should be corrected with reoperation. If patients are selected correctly and the required surgery is done properly, outcomes are not affected, whether operations were done laparoscopically or open.

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LAPAROSCOPIC VERTICAL BANDED GASTROPLASTY: EARLY RESULTS WITH THE JOVO PROCEDURE.

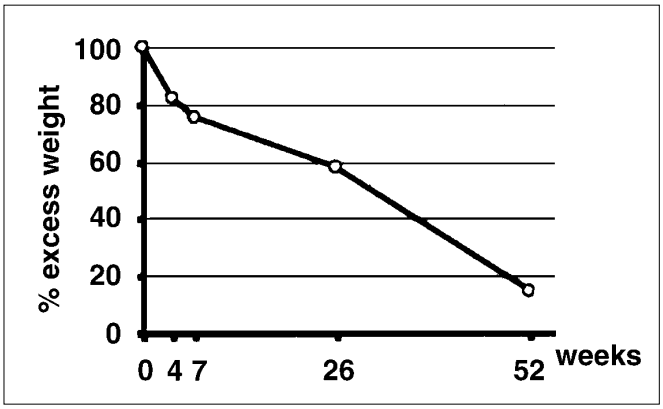
S. Rizoli, J. Joffe, A. Voitk, P. Yau. Department of Surgery, Scarborough Hospital, Grace Division, Scarborough, Ont.

Morbid obesity reduces life expectancy and worsens quality of life. Surgery is the only effective long-term treatment for this disease. Open vertica1 banded gastroplasty (VBG) is a widely accepted sur-

gica1 technique, but its laparoscopic versions still lack clinica1 validation. This study reports an independent assessment of early results with laparoscopic VBG using the JOVO procedure, recently described by the senior authors of this study (J.J., A.V.).

An independent surgeon (S.R.) interviewed all parients, who had had the JOVO prccedure at 1 institution, evaluating weight loss, comorbid conditions and quality of life (QOL) using a 36-item short form health survey (SF-36).

In 20-months 14 JOVO procedures were done by 2 surgeons (J.J., P.Y.). All patients were female, with a mean body mass index of 44 kg / m^2 (37–50 kg / m^2), mean age of 30 years (22–38 years) and at least 1 comorbid condition (5 gastroesophagea1 reflux, 4 arthritis, 3 hypertension, 3 s1eep apnea, 1 asthmna, 1 periphera1 edema). Surgery lasted a mean of 165 minutes (119–240 minutes). Only 1 patient had any complications, a suspected gastric leak requiring reoperation, later complicated by wound infection and incisional hernia. Excluding this patient, the mean hospital stay was less than 48 hours (1–4 days). A1l patients had a significant weight loss 4 weeks after surgery, mean 9 kg or 18% of their excess weight (see figure).



Of the 5 patients available for 1-year follow-up, mean excess weight loss was 42% at 6 and 85% at 12 months; on1y 1 did not continue to lose weight A1l preoperative comorbid conditions, except fcr 1 case of sleep apnea, improved markedly or resolved with the weight loss. Of the 14 patients, 13 were fu1ly satisfied with the results and had no regrets about the operation (the sole failure is awaiting reoperation). QOL improved significantly in the 13 who lost weight, especially in physica1 and social functioning areas.

Thus, the JOVO procedure is safe and reproduces laparoscopica1ly the weight loss of open VBG with much shorter hospital stay and very low complications and failure rates, which should improve with experience. Even though longer follow-up and larger numbers are necessary, early results are extremely encouraging.

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QUALITY OF LIFE AFTER THE PELVIC POUCH PROCEDURE. A.R. MacLean, R.S. McLeod, B. O'Connor, E.D. Kennedy, D. Mukraj, H. MacRae, Z. Cohen, Department of Surgery, Mount Sinai Hospital, University of Toronto, Toronto, Ont.

The aim of this study was to assess the quality of life (QL) and functional results of patients who underwent the pelvic pouch (PP) procedure, and to determine factors which influence outcome.

A total of 1178 patients have had a PP performed between 1981 and 1999. Ninety-six were lost to follow-up, 16 died and 168 were either defunctioned, had their pouch excised or their loop ileostomy had not yet been closed. Twenty-eight patients with Crohn's disease were also excluded. This left 870 patients to whom a questionnaire was sent. The questions concerned bowel function, diet, well-being and daily activities.

Seven hundred and twenty-one patients (83%) returned the questionnaire. There were 390 males and 334 females, mean age 41.7 years. Two hundred and sixteen had a handsewn and 505 had a stapled ileoanal anastomosis. Five hundred and eighty-four had a J-pouch and 136 had an S-pouch. Four hundred fifty-two were done with a diverting ileostomy. The diagnosis was ulcerative colitis in 670 (93%). Mean follow-up was 7.3 years. Forty-eight percent had 6 or fewer bowel movements per day. Sixty-nine percent were completely continent during the day and 54% were at night. Sixty percent rarely or never had urgency. Only 9% usually or always felt their bowel function interfered with their daily activities. Eighty-seven percent usually or always felt well, 93% usually or always had a good appetite, and 72% usually or always had a good energy level. Eighty-nine percent described their self-esteem as good to excellent, and 87% felt their physical health was good to excellent. Over 90% felt that they were either unrestricted or only mildly restricted doing hobbies, leisure activities and in pursuing their career.

These results suggest that the functional results and quality of life following the PP are excellent in most patients.

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ANTIBIOTIC PROPHYLAXIS IN ELECTIVE COLORECTAL SURGERY: THE COST OF IGNORING THE EVIDENCE. J. Baughan, N. Wassey, C.J. de Gara. Department of General Surgery, University of Alberta, Edmonton, Alta.

There is available Level I evidence to show that for a clean–contaminated case, there is no need for continued postoperative "prophylactic" intravenous antibiotics, yet typically, several more doses are ordered after elective colorectal resections.

At a single institution (519 beds), 104 elective colorectal resections were examined from an 8-month period carried out by 10 surgeons. Patients were compared for age, sex, ASA, operation performed, preoperative bowel preparation, preoperative intravenous antibiotics, spillage, irrigation and doses of postoperative antibiotics. Cost of antibiotics, materials and nursing time for administration of antibiotics were obtained. Appropriate antibiotic usage was defined as no further postoperative antibiotics when an adequate bowel preparation and preoperative intravenous antibiotics were given.

At this institution, surgeons and residents are giving postoperative intravenous antibiotics unnecessarily in 95% of elective colorectal surgery cases at a cost of $77 per patient or approxi-

	Appropriate antibiotics	Inappropriate antibiotics	*p* value
No. of patients	5	87	
Sex, M:F	1:4	47:40	NS
Age, yr (mean ± SD)	73.2 ± 14.3	61.2 ± 16.4	NS
Procedure (right hemi.:left hemi.:sig.:low ant.:sub/tot.)	2:0:3:0:0	31:6:30:14:6	NS
Cefazolin doses: metronidazole doses		508:389	< 0.05
Total cost, $		6693	< 0.05

mately $100 40 per hospital per year. Not included in this cost is the potential for drug reactions and bacterial resistance these patients are exposed to. If indeed this is a universal practice an aggressive educational program is required to encourage surgeons and trainees alike to adhere to the evidence for prophylactic antibiotics.

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REPLICATION OF HUMAN HEPATITIS C VIRUS IN MICE WITH CHIMERIC HUMAN LIVERS. D.F. Mercer, D.E. Schiller, T.A. Churchill, J.F. Elliott, B. Addison, D.L.J. Tyrrell, N.M. Kneteman. Surgical-Medical Research Institute, Department of Surgery, University of Alberta, Edmonton, Alta.

Human hepatitis C virus (HCV) is a dominant cause of liver-related morbidity and mortality worldwide, affecting over 300 million people, with neither a vaccination nor an adequate treatment. As it infects only humans and chimpanzees, a major impediment to developing antiviral therapies for HCV has been the lack of a small-animal model that supports viral replication. We hypothesized that a mouse model capable of sustaining high-level human chimerism within its liver after transplantation with human hepatocytes would be susceptible to infection with human HCV. Through a series of backcrosses, an immunodeficient SCID mouse carrying a plasminogen activator transgene under an albumin promoter (Alb-uPA) was produced. Mice hemizygous for the Alb-uPA transgene were crossed, and F1 progeny were used in transplantation experiments, with investigators blinded to genotype. 1×10^6 human hepatocytes freshly isolated and purified from surgically obtained liver biopsies were transplanted intrasplenically into 36 pups from 4 to 12 days of age. Serum samples were serially analysed for production of human albumin (HA) by immunoprecipitation and Western blotting, and randomly selected animals were sacrificed for immunohistochemical analysis of human MHC Class I expression. Nineteen recipients had strong HA signals at 4 weeks post-transplant; genotyping by PCR amplification of the Alb-uPA transgene from genomic DNA revealed that all animals with strong HA signals carried the transgene, and all with absent HA signals were wild-type. Immunohistochemical studies confirmed human chimerism within recipient livers at up to 40% in some sections; long-term studies have demonstrated persistent chimerism to beyond 300 days in certain animals. Based upon these findings, 25 transplant recipients were inoculated at 6 weeks post-transplant with 250 µL of HCV-infected human serum. 8 wild-type recipients had neither HA production nor HCV replication as assessed by RT-PCR for HCV RNA; a further 13 recipients hemizygous for the uPA transgene showed initially strong HA production, but no HCV RNA positivity at any time point. In sharp contrast, all 4 homozygous uPA recipients had strong HA signals over all measured time points and were positive for HCV RNA by 3 weeks after inoculation. HCV replication was demonstrated to beyond 18 weeks after infection, with quantitative RT-PCR analysis revealing viral levels of 10^3 to 10^6 copies per millilitre of serum, equivalent to actively-infected human controls. We conclude that homozygosity of the Alb-uPA transgene is critical to successful establishment of HCV infection. This represents the first murine model of human hepatitis C infection, a model that is robust, cost-effective and relatively easy to produce. It will allow investigators to directly explore strategies for inhibiting viral replication in vivo and will remove one of the major obstacles in the path toward development of effective HCV antiviral therapies.

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LOCAL RECURRENCE AFTER LAPAROSCOPIC MESORECTAL RESECTION FOR RECTAL ADENOCARCINOMA. E.C. Poulin, C.M. Schlachta, R. Grégoire, P.A. Seshadri, M.O. Cadeddu, J. Mamazza. Centre hospitalier de l'université Laval, Québec, Que., and the University of Toronto Centre for Minimally Invasive Surgery, St. Michael's Hospital, Toronto, Ont.

Laparoscopic resection for cure of rectal cancer is controversial, and local recurrence rates have not been determined. This study aims to determine the rate of local recurrence for laparoscopic resection of rectal adenocarcinoma.

A prospective database of 80 consecutive laparoscopic resections of rectal cancers performed between November 1991 and 1999 was reviewed. The TNM classification (stage 0, I, II, III and IV) for colorectal cancers and the Kaplan–Meier method (K–M) were used to determine staging and survival curves. The mesorectal excision technique was used at surgery.

Of the 80 patients, 52 had an anterior resection (AR) and 28 had an abdominoperineal resection (APR). Fifteen (18.7%) had conversion to open surgery; most of these patients (8/15) were obese males or males with large tumours where the surgeon felt that complete mesorectal excision could not be achieved laparoscopically. The median postoperative stay was 6.5 days after AR and 8 days after APR. Two patients (2.5%) died postoperatively of cardiovascular events. AIl patients had follow-up (13 stage I, 28 stage II, 29 stage III and 10 stage IV). Overall, 14 deaths occurred during the foIlow-up period, 11 of which were cancer related (0 stage I, 1 stage II, 5 stage III, 5 stage IV). The median foIlow-up was 30 months for stage I, II and III patients, and 15 months for stage IV patients. Observed survival at 4

years was 92.3% stage I, 85.7% stage II and 64.1% stage III. Overall 5-year survival for stage I, II and III was 79.2%. No trocar site recurrence was observed. Local recurrence rate was 3.75% (3/80).

Local recurrence rates of patients with a rectal cancer who underwent laparoscopic treatment with mesorectal excision do not differ negatively from historical controls seen after open mesorectal excision. Further validation is needed.

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FACTORS ASSOCIATED IN RECTAL CANCER RECURRENCE. P. Miles, C. de Gara, J. Hanson, J. Hatcher. Division of General Surgery, Department of Surgery University of Alberta, and Department of Epidemiology Cross Cancer Institute, Edmonton, Alta.

Local recurrence rates for rectal cancer as low as 5% have been reported. Yet, rates of 18% for T1 and 37% for T2 lesions completely excised locally have also been reported. Multiple factors such as selection bias, tumour biology, surgeon and adjuvant therapy are at play.

We have selected 180 rectal cancer cases (44% low anterior resection [LAR] and 56% abdominoperineal resection [APR]) resected for cure in northern Alberta between 1990 and 1995 and identified for local (LR), distant (DR), both (B) or no recurrence (NR) within 4 years of follow-up. A number of prognostic variables were coded and tested for association with the above recurrence groups using χ^2 test for contingency tables, analysis of variance for comparison of means and odds ratios.

There was no significant difference between mean tumour size (4 $\pm$ 1.8 cm) or distance from anal verge (6.7 $\pm$ 3.4 cm) among the groups. There was no significant association with sex or positive margins (3%). There was a significant difference in the mean number of positive nodes ($p < 0.001$). Tumour grade ($p = 0.003$) and vascular involvement ($p = 0.011$) were associated with recurrence overall, whereas neural invasion ($p = 0.02$) was associated with DR but not LR. Node status ($p = 0.001$) was associated with recurrence. Whether the surgeon did < 4, 4 to 10 or > 10 cases per year was significantly ($p = 0.001$) associated with recurrence. Intraoperative tumour perforation (8%) was significantly associated with recurrence ($p = 0.013$). Intraoperative rectal washout (5% of LAR), and postoperative leaks (6.8%) were not associated with LR or DR ($p = 0.213$, RR 2.11). Spillage (6.2%) was associated with recurrence (0.001). Preoperative chemotherapy ($p = 0.4$) and radiotherapy ($p = 0.06$) did not appear to influence recurrence rates, yet postoperative chemotherapy ($p = 0.009$, RR 2.31) and radiotherapy ($p = 0.002$ RR 2.72) did.

Our data confirm some aspects of rectal cancer recurrence and refute others. Despite a reasonable sample, when factors and events considered important occur with relative infrequency, data interpretation needs care.

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THE ROLE OF CHOLECYSTECTOMY IN THE CARE OF PATIENTS AFTER ENDOSCOPIC SPHINCTEROTOMY. J. Archibald, V. McAlister, J. Love. Queen Elizabeth II Health Sciences Centre, Dalhousie University, Halifax, NS

Cholecystectomy (CCY) is usually performed after endoscopic sphincterotomy (ES) and common bile duct clearance as an elective procedure. The need for CCY in frail patients after ES, who deferred CCY because of morbidity, is suprisingly low. In this retrospective study, we examined the role of CCY in the care of all patients after ES.

A retrospective study of 870 patients who had undergone endoscopic retrograde cholangiopancreaticography (ERCP) and ES at the Queen Elizabeth II hospital from July 1992 to June 1999 was undertaken. The gallbladder was found to be present in 404 patients at the time of ERCP, of whom 52 were excluded because of biliary-pancreatic cancer, chronic liver disease or cholecystitis. Review of hospital charts, radiology and ERCP databases, family doctor survey and patient interviews were conducted. Outcome for patients with elective CCY (E-CCY) is compared to that of patients who deferred CCY (D-CCY).

Of the 352 patients, complete information is presently available on 196, of whom 71 (36.2%) underwent E-CCY. E-CCY patients were found to be significantly younger with a lower ASA rating than D-CCY patients (E-CCY: males 21, females 50 of mean age 53.2 years (16 to 87 years), ASA of 1.63 ± 0.59; D-CCY: males 51, females 74 of mean age 67.8 years (8 to 95 years), ASA of 2.22 ± 0.67). Death was more common among D-CCY patients (26.4% versus 7.0%) due mainly to non-biliary causes. Gallbladder cancer was diagnosed in only 2 patients both of whom had E-CCY. Biliary symptoms recurred in 18.3% and 36.0 % of E-CCY and D-CCY respectively. CCY was eventually required in 26 (20.8%) of D-CCY patients at 0.17 to 36.4 (mean 5.9) months after ES. The rate of late post-ERCP pancreatitis was similar in both groups (E-CCY 2.8%, D-CCY 4.0%). Sixty-nine patients of mean age 65.6 at ERCP (8 to 95) currently have their gallbladder in situ, 10.2 to 70.7 (mean 25.1) months after ERCP.

Deferral of CCY is a clinical option in care of patients after ERCP and sphincterotomy, which should be investigated by a prospective randomized trial.

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THE LEARNING CURVE FOR LAPAROSCOPIC CHOLECYSTECTOMY. A. Voitk, S. Tsao, S. Ignatius. Department of Surgery, The Scarborough Hospital, Grace Division, Scarborough, Ont.

The steep part of the learning curve for laparoscopic cholecystectomy (number of cases to master the technique without failure [conversion]) has been studied and is estimated to be 20 operations. Subsequent learning (the tail of the learning curve) has not been studied; this study examines the tail — how much and how long improvement continues.

After the first 20 operations, prospective data from the next 500 consecutive elective laparoscopic cholecystectomies for a single operator with the same assistant were analysed for conversion, infection, number of short and long operations and op-

erative time by cohorts of 100. Performance with emergency cholecystectomy during the same time span was also analysed. Average patient age was 51, males 26%; 15% had acute cholecystitis, 13% were over age 70 and 14% were in ASA class 3 or 4. These parameters were similar for each 100.

Average operative time decreased by a further 40% over 200 operations, before levelling off with no further detectable improvement. Most of the gain occurred through decreasing duration and number of longer cases. Significant decrease in longer operations, increase in shorter cases and a decrease in wound infection rate also persisted for 200 operations (see table). Conversion rate remained constant. Parallel to this, the number of emergency cholecystectomies attempted laparoscopically rose from 53% to 100% between the first and last 100, and successful laparoscopic surgery for these rose from 27% to 50% ($p > 0.05$). There were no deaths or bile duct injuries.

			no. > 45	no. < 30		
Patients	Op. time	Range	min	min	Infection	Conversion
1–100	44	23–117	34	6	16	3
101–200	37	18–135	18	28	8	3
201–300	31	14–80	7	54	7	3
301–400	31	16–67	9	52	5	2
401–500	32	19–65	11	44	6	2

After the steep portion of the learning curve, measurable learning for laparoscopic cholecystectomy continues for about 200 operations, resulting in a 40% reduction in operative time. Increased proficiency does not shorten easy (quick) cases by much but does make difficult (longer) cases easier (shorter), contracting the range and making operative time more stable and predictable.

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GALLSTONE PANCREATITIS: IS DISCHARGE AND READMISSION FOR LAPAROSCOPIC CHOLECYSTECTOMY SAFE? L.K. McCullough, R. Preshaw, S. Kim, F.R. Sutherland. Department of Surgery, University of Calgary, Calgary, Alta.

Conventional surgical wisdom is that a patient with gallstone pancreatitis should have their gallbladder removed during their initial hospitalization. However, because of reduced operating room time, patients are now often discharged to await surgery. A retrospective review of all cases of gallstone pancreatitis at the Foothills Hospital between 1992 and 1996 was undertaken. Patients with a first attack of mild pancreatitis (Ranson's criteria < 3) were studied.One hundred and sixty-four patients were identified: 90 patients were discharged (discharge group) for readmission cholecystectomy and 74 patients had their cholecystectomy prior to discharge (in-hospital group). Over the 5-year time period, the proportion of patients discharged increased from 27% in 1992 to 67% in 1996 (χ^2 $p <$ 0.01). The mean waiting period for surgery was significantly increased in the discharged group versus the in-hospital group (40 ± 69 days versus 8 ± 10 days, $p < 0.0001$). There was a trend toward an increased total number of hospital days with the in-hospital group versus the discharged group (15.5 ± 17 days versus 10.7 ± 16 days, $p = 0.07$). In the discharged group 20% (18 of 90) patients experienced an adverse event requiring readmission while awaiting surgery. Three had recurrent pancreatitis, 10 experienced biliary colic and 5 developed acute cholecystitis. None of the patients in the in-hospital group experienced any adverse events (20% versus 0%, $p < 0.00001$). There were no deaths in either group. Discharging patients with gallstone pancreatitis to await operating room time for cholecystectomy resulted in an increased waiting time to surgery and a 20% readmission rate for adverse events.

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THE ASSOCIATION OF PERFORATION OF THE APPENDIX AND FEMALE TUBAL INFERTILITY. D.R. Urbach, L.D. Marrett, R. Kung, M.M. Cohen. Clinical Epidemiology and Health Care Research Program, University of Toronto, Toronto, Ont.

Although perforation of the appendix is considered to be a risk factor for female tubal infertility, the epidemiologic evidence supporting this relationship is inconsistent. We conducted a matched case-control study to determine whether perforation of the appendix is a risk factor for tubal infertility.

One hundred and twenty-one women with documented primary tubal infertility attending in vitro fertilization clinics from July to December 1998 were individually matched by age and annual household income to pregnant control women. Self-administered questionnaires and review of medical records were used to assess exposure to appendicitis, as well as other risk factors for infertility. The magnitude of the risk of developing primary tubal infertility was estimated by the odds ratio (OR) using conditional logistic regression modelling.

Neither a history of acute appendicitis nor perforation of the appendix was a statistically significant risk factor for tubal infertility. The crude OR for perforated appendicitis was 1.3 (95% confidence interval [CI] 0.3 to 5.9), and the adjusted OR (controlling for the effects of smoking status, endometriosis and pelvic inflammatory disease [PID]) was 2.4 (95% CI 0.4 to 14.0). Smoking (OR 2.6, 95% CI 1.3 to 4.9), history of endometriosis (OR 3.8, 95% CI 1.5 to 9.8) and history of PID (OR 5.7, 95% CI 1.9 to 17.6) were significantly associated with tubal infertility in multivariate analyses.

These data do not provide substantial evidence that perforation of the appendix is an important risk factor for female tubal infertility.

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TIMING OF OPERATIVE REPAIR OF TRAUMATIC RUPTURE OF THE THORACIC AORTA. R. Karmy-Jones, M. Meissner, Y. Carter, J. Borsa, A. Nathens, G. Jurkovich. Department of Surgery, Harborview Medical Center, Seattle, Wash.

The treatment of traumatic rupture of the thoracic aorta (TRA) has evolved from the concept that immediate repair is required to

the current understanding that some patients may be better managed by a period of nonoperative therapy to allow optimization.

We reviewed our experience with TRA over a 15-year period. Patients were classified as "unstable" if the presenting systolic blood presure was < 90 mm Hg or if it decreased to < 90 mm Hg after admission. The impact of closed head injury (CHI), cardiac risk factors, preoperative acute lung injury (ALI), age and need for other surgery on mortality, postoperative adult respiratory distress syndrome (ARDS) and paralysis was analysed. One hundred and thirty-six patients were admitted with TRA. Sixteen have been managed nonoperatively (2 with endovascular stent grafts, EVSG). Nine have died (8 from massive CHI) and the remainder are alive at up to 3 years' follow-up. One hundred and twenty underwent operative repair (11 after delays of 3 to 21 days, 1 with EVSG) with a mortality of 31%. Operative mortality was significantly higher in unstable patients (62%) versus stable patients (17%, $p = 0.001$), in patients with cardiac risk factors (71%) versus those without (24%, $p = 0.001$), and with preoperative free rupture (83% with versus 19% without, $p = 0.001$). Free rupture was the cause of hypotension in only 25% of unstable patients, the remainder being due to other causes. Mortality in patients requiring surgery prior to TRA repair was the same as those undergoing TRA repair alone (31% in both). Preoperative ALI was associated with a marked increase in postoperative ARDS (47% with versus 9% without, $p = 0.001$) but not operative mortality. CHI was not associated with an increased operative mortality, but none of the patients undergoing surgery had gross bleed or edema at the time of surgery. Mechanical circulatory support (MCS) was used in 59 cases, none of whom experienced paralysis while 8/61 operated on without MCS developed paralysis ($p = 0.001$). When logistic regression was applied, the use of MCS was not determined to be statistically significant. Only preoperative instability was found by logistic regression to be a significant predictor of postoperative paralysis (risk increased 5.5 times, confidence intervals 3.3 to 10). Age did not have an impact on mortality.

The predominant factor influencing mortality, postoperative ARDS and paralysis was preoperative instability and associated injuries. In patients who are unstable, other injuries should take precedence over repair of TRA. Patients with minor CHI can be operated on safely, while those with major CHI, cardiac and/or pulmonary risk factors may be better managed by a period of nonoperative management.

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THE IDEAL SURGICAL AIRWAY: A RETROSPECTIVE STUDY OF PERCUTANEOUS AND OPEN TRACHEOSTOMY PERFORMED IN THE INTENSIVE CARE UNIT.

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A retrospective study was undertaken comparing cost and safety of percutaneous tracheostomy and open tracheostomy, both performed at bedside in the intensive care unit (ICU).

Sixty-three patients requiring tracheostomy in the ICU between January 1996 and December 1997 were analysed. Demographics, APACHE II score, indications for tracheostomy, length of stay, condition at discharge and complications were reviewed. The complications were subdivided into major (e.g., conversion, infection requiring antibiotics and bleeding requiring transfusion), minor (e.g., difficult tracheostomy change, infection not requiring antibiotics and bleeding not requiring transfusion), delayed (e.g., stenosis and tracheomalacia). The costs between the 2 groups were also compared.

Thirty-six percutaneous and 27 open procedures were reviewed. Groups were similar in age, sex and APACHE II score. There was no statistical difference between the procedure performed and proportion of complications, major (4/36 percutaneous versus 2/27 open, $p = 0.693$), minor (14/36 percutaneous versus 6/27 open, $p = 0.183$) or delayed (2/36 percutaneous versus 2/27 open, $p = 1.00$). There was no relationship between APACHE II score and aggregate complications ($p = 0.078$). High-risk patients, such as obesity and previous radiation, did not have a higher risk of complications ($p = 1.00$). When fit into a logistic regression model to adjust for age, sex, PMH and APACHE II score, there was no difference in odds of developing a complication after either procedure (odds ratio 1.86, 95% confidence interval 0.62 to 5.58)

The initial capital cost is greater with the percutaneous tracheostomy. Percutaneous tracheostomy cost $50.00 to $100.00 more compared to each open procedure performed. Approximately $1000.00 annually is spent at our institution on disposable percutaneous tracheostomy equipment.

Both procedures are safe and effective. There is no statistical difference between major, minor and delayed complications. This finding is consistent with other studies. There is a cost disadvantage to performing the percutaneous tracheostomy if a centre is already performing the open procedure at bedside.

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STAT6 UPREGULATION BY FK506 IN THE PRESENCE OF IL4.

S.D. Moffatt, S.M. Metcalfe. Department of Surgery, Cambridge University, Cambridge, UK

T-cell activation requires intracellular signalling via Calcineurin, a protein phosphatase. T-cell activation then results in either a TH1 or TH2 response, which involves differential phosphorylation of STATS (signal transducers and activators of transcription). Interferon gamma (INFgamma) activates STAT1 and a TH1 response whereas IL-4 activates STAT6 and a TH2 response. The clinically important immunosuppressant, FK506, perturbs intracellular phosphorylation, namely the inhibition of Calcineurin. Here we ask if FK506 also perturbs the phosphorylation of STAT proteins and the resultant TH1 or TH2 response.

Using the mouse macrophage cell line, RAW 264.7, we treated cells with IL-4 (10 ng/mL) or IFNgamma (100 U) with or without FK506, at physiological doses. The effect on STAT1 and STAT6 protein level and DNA binding activity were measured using Western blotting and electrophoretic mobility shift assays.

We found that IL-4 specifically induced the synthesis and ac-

tivation of STAT6 and that FK506 enhanced this activity. This effect was specific for STAT6, in that IFNgamma-induced STAT1 activity was not affected by FK506.

In conclusion, in addition to its antiproliferative effect on T cells, FK506 may also enhance TH2 activity by upregulating STAT6 activity. This may directly translate into improved clinical outcomes in FK506-based immunosuppressive protocols.

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INTERCELLULAR AND VASCULAR CELL ADHESION MOLECULE LEVELS IN ENDOSCOPIC AND OPEN SAPHENOUS VEIN HARVESTING FOR CORONARY ARTERY BYPASS SURGERY. A. Abo-deeb, S.J. Alrawi, M. Samee, R. Raju, D. Shirazian, A.J. Acinapura, J.N. Cunningham. Maimonides Medical Center / Lutheran Medical Center Research Institute, Brooklyn, NY

Samples of human saphenous veins were harvested from 90 randomly selected patients undergoing coronary artery bypass surgery (CABG), utilizing 2 different techniques (the open and endoscopic). Endothelial cells were collected from the vein samples retrieved through both techniques were cultured for 72 hours. Pre- and postoperative sera, in addition to the supernatants from the cultures were analysed for ICAM-1 and VCAM-1 using ELISA.

Mean preoperative levels of ICAM-1 and VCAM-1 (0.95 ± 0.58 ng / mL and 1.81 ± 1.03 ng / mL, respectively) did not differ significantly from those for postoperative sera (0.98 ± 0.451 ng / mL and 1.74 ± 1.05 ng / mL, respectively) (p = 0.77 and 0.73, respectively). Mean ICAM-1 and VCAM-1 levels for endothelial cell culture supernatants did not differ significantly between the endoscopic (0.16 ± 0.05 ng / mL and 0.23 ± 0.10 ng / mL, respectively) and the open methods (0.18 ± 0.08 ng / mL and 0.30 ± 0.27 ng / mL, respectively) (p = 0.19 and 0.13, respectively).

Our findings indicate that endoscopic and open saphenectomies are technically comparable with respect to their effects on ICAM-1 and VCAM-1 synthesis during saphenous vein harvesting for CABG. We recommend the endoscopic method for its low morbidity and earlier hospital discharge.

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PLASMA-LYTE AND PAPAVERINE IN HUMAN SAPHENOUS VEIN HARVESTING: PRELIMINARY TRANSMISSION ELECTRON MICROSCOPIC REPORT. R. Balaya, A.J. Alrawi, G. Alshkaki, R. Raju, A. Ibrahim, L. Torrello, R.E. Gordon, A.J. Acinapura, J.N. Cunningham. Maimonides Medical Center / Lutheran Medical Center Research Institute, Brooklyn, NY

Transmission electron microscopy was performed on 90 samples of human saphenous veins from 45 patients prepared for coronary artery bypass grafting (CABG) utilizing both endoscopic and standard open incision techniques. These vein samples were collected and divided into 9 subgroups of 5 each including the control; incubated in plasma-lyte solution in combination with or without papaverine, at 2 distending pressures, 100 or 300 mm Hg, and at either 4 °C, or 28 °C respectively.

The pathological alterations in human saphenous veins were graded by a scoring system to assess the degree of the damage inflicted by these 2 different techniques. The χ^2 tests examining the rate of damage in endoscopic versus open technique was not statistically significant.

Scale of damage to endothelium	Endoscopic technique	Open technique
0	22%	20%
1	18.5%	23.3%
2	18.5%	16.6%
3	40.74%	40%

Our findings indicate that endoscopic and open techniques are technically comparable, as far as structural changes inflicted by these 2 different techniques of vein preparation for CABG.

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RESECTIVE LIVER SURGERY: A REVIEW OF INFLOW AND OUTFLOW OCCLUSION. E. Dixon, F.R. Sutherland, J.G. Mckinnon. Department of Surgery, University of Calgary, Calgary, Alta.

A review of all articles pertaining to portal triad clamping (PTC) and total vascular exclusion (TVE) was undertaken to compare the utility of these techniques and identify indications and contraindications to their use. A comprehensive MEDLINE search of English articles pertaining to these techniques was used to identify articles for review. Both PTC and TVE are useful techniques to decrease intraoperative blood loss and transfusion requirements and the morbidity associated with them. Inflow occlusion with or without outflow occlusion is generally indicated in major liver resections involving 3 or more segments as defined by Couinaud, or in nonanatomic liver resections involving a large raw liver surface area when operative time and blood loss may be great. PTC is superior to TVE except in cases where liver tumours are large and deep seated, hypervascular, abutting the hepatic veins or vena cava, and in patients with elevated right-sided heart pressures. In patients with chronic liver disease or lengthy operative times, intermittent PTC is likely superior to continuous PTC and associated with less morbidity and liver failure. Further prospective randomized studies are needed to determine the optimal interval used in intermittent PTC.

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EMPHYSEMATOUS PERITONITIS — A CLINICOPATHOLOGICAL PERSPECTIVE. R. Kanthan, J.M. Radhi, S.C. Kanthan. Department of Pathology and Department of Surgery, College of Medicine, University of Saskatchewan, Saskatoon, Sask.

Emphysematous peritonitis is a new concept that has not been described previously. This condition consists of a constellation

of clinicopathological findings. In this report we describe 2 cases that highlight the salient features of this unrecognized clinical entity.

The first case is a 48-year-old woman who had undergone multiple abdominal surgeries in the past for chronic idiopathic intestinal pseudo-obstruction. She had a gasrostomy placed for gastroparesis with a non-decompressing stomach. She continued to complain of severe abdominal pain. Small-bowel follow-through was normal except for some delayed transit. CAT scan of the abdomen revealed the presence of "free air" around the gastrostomy tube. Due to persistent abdominal pain, nausea and vomiting a laparotomy was undertaken. At laparotomy there were adhesions with small-bowel obstruction. Also present were multiple "aeromas" (pockets of air) diffusely infiltrating the mesentery and the serosa of the small bowel. The ileostomy was intact and there was no air around the surgical gastrostomy. There was no evidence of bowel leak or fluid or pus in the abdominal cavity. Postoperative period was uneventful.

The second case is a 14-year-old boy who had multiple abdominal surgeries for pneumoperitoneum with no definitive cause. He had a surgical gastrostomy for gastroparesis with recurrent vomiting and abdominal pain. CAT scan of the abdomen showed similar findings to the above case. At laparotomy similar aeromas were found with no evidence of a bowel perforation. Postoperative period was uneventful.

Pathological examination of the aeromas showed the presence of multiple empty air filled cysts lined by histiocytes and multinucleate giant cells. The morphological appearance bore a marked similarity to emphysematous vaginitis wherein gas filled cysts lined by histiocytes; multinucleated giant cells, fibroblasts and collagen are seen. These are often associated with *Trichomonas* or *Gardnerella* infections.

These 2 cases illustrate the clinical constellation of repeated abdominal surgeries, gastrostomy, abdominal pain and pneumoperitoneum presenting with aeromas and emphysematous peritonitis. We believe that emphysematous peritonitis is a non-infectious phenomenon occurring as a result of air entry through the gastrostomy. This sets up a foreign body "peritonitis" reaction accounting for the recurrent episodes of abdominal pain. This is an unrecognized complication of long-standing gastrostomy in a "neurodysfunctional" stomach not described previously.

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AN INVESTIGATION OF THE FEASIBILITY OF BOVINE ERYTHROCYTES FOR THE PURPOSE OF CROSS-SPECIES TRANSFUSION TO HUMAN RECIPIENTS.

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Use of animal blood could overcome concerns of supply and disease transmission with human blood donation if immunological, microbiological and ethical barriers are overcome. Here we investigated the feasibility of using bovine red blood cells (RBC) because of the relative ease of venous access in the cow.

A group of 12 tagged Holstein cows were randomly selected from the Nova Scotia Agricultural College herd for compatibility evaluation. Tests included hemagglutination, complement mediated lysis, osmotic fragility, conventional human crossmatch, and human IgM and IgG (including subtypes) antibody binding. Each of these tests included 2 human type O controls.

Hemagglutination by pooled human serum (PHS) occurred between 1/4 to 1/32 dilutions (median 1/8) in 11 of the 12 cows. Rabbit complement (25 μL, 1/1 dilution) lysed the RBC of the same 11 cows when incubated with PHS between dilutions of 1/4 and 1/16 (median 1/8). Cow 37 RBC were neither hemagglutinated nor lysed by any dilution of PHS. FACS analysis showed that RBC from all cows including cow 37 bound human IgM and IgG. No difference was seen in IgG subtype binding. Clinical human crossmatch tests showed negative reactivity between cow 37 RBC and 7 out of 9 random human sera representing all human blood groups. Osmotic fragility and storage characteristics were similar between bovine and human RBC.

Bovine RBC are stable in storage conditions. They elicit variable responses from human serum in the in vitro tests performed. Cow 37 RBC are unexpectedly resistant to normal hemagglutination and complement mediated lysis. Further investigation will focus on the membrane-associated proteins of cow 37 RBC compared to the rest of the study group.

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ACQUISITION OF LAPAROSCOPIC SKILLS: THE VALUE OF INANIMATE TRAINING SYSTEMS.

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Purpose: This study was designed to investigate whether practice of intracorporeal knot tying in an inanimate trainer box would translate into improved performance in the operating room.
Methods and materials: Fourteen surgical residents (PGYI–5) were asked to place 2 stitches between the stomach and small bowel in a pig and tie each with an intracorporeal knot (baseline study). Their performance was videotaped and scored for time and security of the knot (error). Residents were stratified into junior or senior resident level and randomized to practice or no practice in a mirror endo-trainer box. They were re-evaluated within a week in the pig (final study). Results were tested for significance using the Wilcoxon rank sum for paired data and the Mann–Whitney U test for unpaired data.
Results: There was significant improvement in time, error and total score (time-error) from baseline to final testing ($p < 0.02$) irrespective of practice. Furthermore, junior residents who had practised showed greater improvement in time to completion without incurring greater error ($p < 0.03$).
Conclusion: Practice in an inanimate endoscopic training box is useful to accelerate the acquisition of in vivo laparoscopic skills for junior residents.

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USE OF A PREOPERATIVE ACTH-STIMULATION TEXT TO PREDICT ADRENAL SUPPRESSION IN PATIENTS WITH INFLAMMATORY BOWEL DISEASE.

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The use of corticosteroids is common among patients with inflammatory bowel disease and is a cause of secondary adrenal insufficiency. In order to avoid complications of adrenal suppression, surgeons routinely give "stress" doses of steroids to patients who have a history of steroid use. Side effects of steroids are known and include delayed wound healing and increased risk of infection. Therefore, it would be useful to determine which patients actually require "stress" steroids. The ACTH stimulation test was used on 4 patients with inflammatory bowel disease preoperatively to determine whether there was sufficient adrenal suppression to warrant supplemental doses of steroids.

The subjects were 4 patients with inflammatory bowel disease who were to undergo surgery for a complication of their disease. They had all used steroids in the 6 months prior to assessment. Each patient was subjected to an endocrinology consult and an ACTH-stimulation test. Based on the test results none of the patients had adrenal suppression sufficient to warrant supplemental doses of "stress" steroids. None of the patients were given supplemental steroids. A retrospective chart review was done to determine any complications that occurred as a result of not administering "stress" steroids.

The results of the ACTH-stimulation test indicated that none of the patients tested displayed adrenal insufficiency. As a result, the patients did not receive supplemental "stress" doses of steroids at the time of surgery. None of the patients developed Addisonian shock in the perioperative period.

Routine use of "stress" steroids is not always necessary in patients with a history of exogenous glucocorticoid use. The ACTH stimulation test is a useful predictor of steroid-induced adrenal suppression and can be used preoperatively to determine whether a patient requires supplemental steroids at the time of the operation.

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DOES EXPERIENCE WITH ADVANCED LAPAROSCOPY IMPROVE OUTCOME IN THE TREATMENT OF ACUTE CHOLECYSTITIS?

L.S. Feldman, L.E. Medeiros, J.S. Barkun, H.H. Sigman, J. Garzon, G.M. Fried. Section of Video-endoscopic Surgery , McGill University, Montreal, Que.

We tested the hypothesis that surgeons with advanced laparoscopic training would be more successful in performing laparoscopic cholecystectomy (LC) for acute cholecystitis compared to surgeons with only basic laparoscopic experience.

Records of patients undergoing cholecystectomy from Jan. 1, 1996, to Dec. 31, 1998, were reviewed retrospectively. Patients were included if they had clinical findings (abdominal tenderness with fever or WBC >10) and radiologic signs consistent with acute cholecystitis. Of 217 patients meeting these criteria, 72 were cared for by 3 surgeons who perform advanced laparoscopic procedures routinely (group 1), while 145 were treated by 9 general surgeons who perform only laparoscopic cholecystectomy routinely (group 2). The proportion of cases begun laparoscopically, conversion to laparotomy, complications and length of stay were compared in the 2 groups. Multivariable regression was used to control for baseline differences in the 2 groups.

The 2 groups were similar with respect to age, gender and peak WBC count. Patients in group 2 were more likely to have an ASA > 2 (7% versus 19%, $p = 0.02$), fever (32% versus 46%, $p = 0.05$), and thick gallbladder wall (76% versus 86%, $p = 0.05$). Patients in group 1 were more often approached laparoscopically (87% versus 74%, $p = 0.02$), and fewer were then converted to laparotomy (22% versus 50%, $p < 0.01$). Thus, 49 patients in group 1 (68%) compared with 57 in group 2 (39%) had successful LC (95% CI for difference 15 to 42%, $p < 0.01$). The rates of intraoperative complications (23% versus 20%) and postoperative complications (28% versus 32%) were similar. The median postoperative length of stay (3 versus 5 days, $p < 0.01$) and total hospital stay (6 versus 8 days, $p = 0.03$) were shorter in group 1. On regression analysis, significant predictors of an initial laparoscopic approach included ASA ($p = 0.05$) and fever ($p = 0.04$). The most significant predictor of conversion was group 1 ($p = 0.05$).

While patient factors, including comorbidity score and severity of illness, are important in determining initial operative approach, the surgeon's experience with laparoscopy predicts the ability to successfully complete LC for acute cholecystitis. Associated benefits include shorter hospital stay, without an increase in complications.

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THE DOMINIC EXPERIENCE: EVOLUTION OF AN EFFICIENT AND ACCURATE COMPUTER DATABASE FOR STORAGE AND RETRIEVAL OF CLINICAL DATA IN MINIMALLY INVASIVE SURGERY.

C.M. Schlachta, J. Mamazza, P.A. Seshadri, M.O. Cadeddu, E.C. Poulin. The University of Toronto Centre for Minimally Invasive Surgery, St. Michael's Hospital, Toronto, Ont.

Current knowledge of patient outcomes and consumption of resources is part of a new standard of awareness to which surgeons are being increasingly held accountable. For minimally invasive surgery in particular, there is a need to justify changes in practice by maintaining accurate and readily accessible data. These requirements are seldom met by administrative databases, which are fraught with coding errors and limited information, or by time-consuming chart reviews. To meet these needs, a highly efficient clinical computer database of patients undergoing minimally invasive surgery was developed.

DoMinIC, the database of minimally invasive surgery (*chirurgie*), evolved in 3 phases. With the advent of advanced minimally invasive surgery, the goal of phase 1 was to collect accurate data on clinical outcomes for these new procedures. Initially, for all patients undergoing laparoscopic splenectomy, colorectal surgery or thoracoscopic procedures, clinical

data were recorded on standardized database sheets. Computerization began with the transcription of colorectal data into a text-based, coded field, computer database. The goal of the second phase of development was complete data acquisition. The database was expanded to capture all minimally invasive procedures using more comprehensive data records. Full computerization was achieved with a graphical interface that mimicked data collection sheets. Coded fields were replaced with intuitive plain language drop-down lists. Free format data entry was minimized to reduce errors and enhance efficiency in data retrieval. The third phase of this project is currently under way with the goal of facilitating long-term data capture and retrieval for a growing team of surgeons and procedures. The most significant development in this phase is the elimination of the paper record entirely with direct data entry into palm platform collectors and subsequent synchronization with a centralized data registry. The central database is housed in a stand-alone personal computer with a data assistant overseeing accurate follow-up and providing current outcomes reports.

DoMinIC has evolved as an efficient and accurate means of collecting and reporting outcomes for patients undergoing minimally invasive surgery. For surgeons in our centre, this provides current knowledge of quality benchmarks and permits timely access to patient outcomes measurements.

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LAPAROSCOPIC COLORECTAL RESECTIONS RESULT IN A 41% DECREASE IN HOSPITAL STAY WITH NO DIFFERENCE IN OPERATIVE TIME. M.O. Cadeddu, E.C. Poulin, C.M. Schlachta, P.A. Seshadri, J. Mamazza. The University of Toronto Centre for Minimally Invasive Surgery, St. Michael's Hospital, Toronto, Ont.

To demonstrate whether laparoscopic colorectal resections confer patient advantages, a retrospective cohort study comparing laparoscopic (LCR) and open (OCR) segmental colorectal resections was undertaken. Pertinent perioperative data from all open and laparoscopic procedures performed were collected in a prospectively defined computer database at a university teaching hospital between March 1998 and February 1999.

There were 49 LCR and 73 OCR performed. Age, weight and comorbid conditions were not significantly different. Rate of conversion to open surgery was 8% in the LCR group. There was no significant difference in median operating times between LCR and OCR (162.5 versus 150 minutes, $p = 0.106$). The rate of intraoperative complications was similar (15% LCR versus 6% OCR, $p = 0.26$). There was a nonsignificant trend toward a lower rate of postoperative complications in the laparoscopic group compared with open resections (33% versus 51%, $p = 0.075$), which was partly due to a decreased rate in postoperative ileus (8% versus 19%) and cardiopulmonary complications (4% versus 14%). Median postoperative return to normal diet was reduced by 43% in the LCR group (4 days LCR versus 7 days OCR, $p < 0.001$) compared with the OCR group. Similarly, patients were discharged significantly faster after LCR compared with OCR (5 days versus 8.5 days, $p < 0.001$) resulting in a 41% reduction in median length of stay.

We conclude that LCR can be performed with equivalent outcomes as compared to OCR, except that patients having LCR have the advantage of significantly faster return to normal diet and shorter length of hospital stay with no difference in operating time.

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MODIFICATION OF LAPAROSCOPIC MANAGEMENT OF PHEOCHROMOCYTOMA IN PREGNANT PATIENTS. M.O. Cadeddu, C.M. Schlachta, P.A. Seshadri, J. Mamazza, E.C. Poulin. The University of Toronto Centre for Minimally Invasive Surgery, St. Michael's Hospital, Toronto, Ont.

Surgical diseases in pregnancy are rare, but some, such as pheochromocytomas, can have a tremendous impact on maternal and fetal morbidity and mortality. Our aim was to describe the modifications necessary in the investigation, perioperative preparation and laparoscopic excision of a 6-cm left pheochromocytoma in a pregnant woman.

Ultrasonographic evidence of a left adrenal lesion was confirmed with magnetic resonance imaging to avoid exposing the fetus to radiation. Once biochemical confirmation of the pheochromocytoma was obtained, the patient was alpha-blocked with phenoxybenzamine, until she was in her second trimester of pregnancy, since this has not been associated with teratogenic effects.

At 13 weeks' gestational age, elective laparoscopic adrenalectomy was performed in 220 minutes with minimal blood loss. The systolic blood pressure was maintained between 110 and 160 mm Hg throughout the case using nitroglycerine and avoiding all direct contact with the gland. No intra- or postoperative complications occurred. The patient was observed in the intensive care unit for 24 hours postoperatively, for fetal monitoring. There were no episodes of fetal distress. Narcotic analgesia was required for 24 hours. The patient was discharged on the third postoperative day requiring only oral acetominophen for pain control.

Modifications in standard management of pheochomocytomas are necessary in pregnant patients due to concerns such as exposure of the fetus to ionizing radiation, teratogenic effects of medications and minimizing the risk of preterm labour. With appropriate preoperative preparation, laparoscopic adrenalectomy for pheochromocytoma can be performed safely in pregnant patients. Postoperatively, little narcotic analgesic is required and recovery is rapid.

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ACROMEGALY DUE TO CARCINOID CURED WITH THORACOSCOPIC LOBECTOMY. M.O. Cadeddu, C.M. Schlachta, P.A. Seshadri, J. Mamazza, E.C. Poulin. The University of Toronto Centre for Minimally Invasive Surgery, St. Michael's Hospital, Toronto, Ont.

The aim of this study was to describe the minimally invasive tho-

racoscopic treatment of a 6-cm pulmonary carcinoid in a patient with acromegaly (height = 1.85 m, weight = 150 kg).

The patient was placed in the left lateral decubitus position with the bed flexed. Four 1.5-cm port sites were used to complete the right lower lobectomy and lymphadenectomy. A 3.5-cm extraction incision was made, and a sterile plastic bag was placed in the chest cavity. The specimen was placed in this to protect the wound and then removed.

No intraoperative or postoperative complications occurred. The operation was completed in 300 minutes, with 120 cc blood loss. Chest drainage tube was removed on postoperative day 3. The patient was discharged on the fourth postoperative day, requiring only nonsteroidal anti-inflammatory medications for analgesia. Pathology revealed a carcinoid tumour with disease in 1 lymph node. Postoperative biochemical examinations have returned to normal.

Bronchial carcinoids are the second most common cause of acromegaly, after pituitary tumours. They can be resected safely thoracoscopically, even if they are larger than 5 cm. Posterative recovery is rapid, and for large acromegalic patients this is a definite advantage.

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THE UMBILICUS IN LAPAROSCOPIC SURGERY. A. Voitk, S. Tsao. Department of Surgery, The Scarborough Hospital, Grace Division, Scarborough, Ont.

The umbilicus seems to beget more infections and incisional hernias after use as a laparoscopic port site than remote sites. This study determines whether such infections are due to the umbilical site rather than other factors and whether preexisting fascial defects predispose to postoperative ventral herniation.

Hasson cannula sites from a total of 3462 port sites for 873 consecutive laparoscopic operations (cholecystectomy 561, inguinal herniorraphy 190, Nissen fundoplication 71, ventral hernia repair 51) done by 1 surgeon with the same assistant, routinely using a Hasson cannula, were analysed from a prospective database. All gallbladders were removed through the umbilical port. All patients were assessed by the surgeon 1 to 12 weeks postoperatively.

Of 873 Hasson cannulations, 748 were at the umbilicus and 125 remote. Overall wound infection rate was 6%, 7.4% at the umbilicus and 0% at remote sites ($p < 0.05$). Umbilical wound infection was 9% after cholecystectomy and 2% after hernia repair ($p < 0.05$). When cholecystectomy was excluded, Hasson cannula site infection was 2% at the umbilicus and 0% at remote sites ($p > 0.05$). Postoperative ventral herniation occurred at 0.8% of Hasson cannula sites, 0.8% at the umbilicus and 0.8% elsewhere. This rate did not differ statistically for gallbladder and non-gallbladder operations and did not seem to correlate with postoperative wound infection or preexisting fascial defect.

Wound infection at the umbilicus is uncommon in laparoscopic surgery, except after cholecystectomy, where it seems related to the gallbladder, not the umbilicus. If gallbladder surgery is excluded, difference in wound infection rates between umbilicus and remote sites is not significant statistically. Postoperative ventral hernia is very rare after laparoscopic surgery and occurs with similar frequency at the umbilicus and at remote sites. It does not seem to be related to preexisting umbilical fascial defects. Thus, the umbilical site, *per se*, does not seem to be prone to more infection or herniation than other sites and the laparoscopist should not hesitate to continue using this excellent central access site for laparoscopic procedures.

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OUTPATIENT LAPAROSCOPIC SPLENECTOMY. J. Joffe, A. Voitk, L. Grossman. Department of Surgery and Department of Medicine, The Scarborough Hospital, Grace Division, Scarborough, Ont.

Our first laparoscopic splenectomy patient was discharged stable and free of pain within 24 hours of surgery. This similarity to other ambulatory laparoscopic procedures stimulated us to investigate the feasibility of ambulatory care for laparoscopic splenectomy.

Data was gathered prospectively. Excluded from ambulatory care were splenectomies requiring conversion or abdominal incision to retrieve intact a laparoscopically removed spleen. Patients were discharged in accordance with an existing day surgery discharge protocol, to which were added postoperative hemoglobin and platelet counts and independent assessment by a hematologist.

Sixteen laparoscopic splenectomies were attempted between 1995 and 1999. Of these, 6 were excluded, 2 because of an abdominal incision to retrieve the spleen intact for pathology and 3 because of conversion, and our first patient, when outpatient surgery was not entertained. The remaining 10 patients form the study group. Patient characteristics: age 44 (18 to 71); 1 male; ASA 1 — 1, 2 — 7, 3 — 1, 4 — 1; diagnosis ITP — 8, miscellaneous — 2; operating time 128 minutes (101 to 185 minutes). 8 were taking steroids. 3 had accessory spleens. Average pre- and postoperative hemoglobin for ITP patients was 147 and 122; and 90 and 92 for non-ITP patients. Average pre- and postoperative platelet count for ITP patients was 70 and 81 and 155 and 150 for non-ITP patients. Platelet counts of ITP patients rose 246% by 4 months postoperatively, with no relapses and no patients requiring steroids. There were no platelet or blood transfusions. Eight of the 10 patients were discharged on the day of surgery and the remaining 2 within 24 hours of surgery (1 kept overnight for pain control and 1 for observation because of some oozing in the face of a low platelet count). There were no readmissions. One patient developed a splenic bed hematoma, treated symptomatically as an outpatient.

Thus, 100% of laparoscopic splenectomy patients were discharged within 24 hours of splenectomy, 80% the same day and 20% the following morning, without sequelae. Patients stable during perioperative observation did not destabilize later. Immediate postoperative hemoglobin and platelet changes were minimal and did not seem to contribute to decision to discharge.

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ATTENUATED FEBRILE RESPONSE TO ENDOTOXIN IN RATS WITH BILIARY OBSTRUCTION. L.K. McCullough, Y. Takahashi, Q. Pittmann, T. Le, M. Swain. Faculty of Medicine, University of Calgary, Calgary, Alta.

Withdrawn

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ETIOLOGY AND OUTCOME OF READMISSION FOR SMALL-BOWEL OBSTRUCTION IN THE EARLY POSTOPERATIVE PERIOD. G. Miller, J. Boman, I. Shrier, P.H. Gordon, Division of Colon and Rectal Surgery and Department of Epidemiology and Community Studies, The Sir Mortimer B. Davis-Jewish General Hospital, McGill University, Montreal, Que.

Objectives: Goals of the study were to determine the frequency for readmission for early postoperative small-bowel obstruction (SBO), highlight factors that may predispose to this entity and define the risks of strangulation. Finally, we compare the immediate as well as long-term risks and benefits of operative versus nonoperative treatment.
Methods: The medical records of all patients admitted between 1986 and 1996 with the diagnosis of SBO were reviewed retrospectively. Patients who presented within 50 days of a previous laparotomy were selected for this review. All patients whose symptoms began during the same admission as the initial laparotomy or in whom bowel function had not clearly returned were excluded.
Results: Of the 1001 admissions for SBO, 3% occurred within 50 days of a previous laparotomy. In the majority of cases adhesions were the cause of the obstruction (24 cases). Other etiologies were Crohn's disease (2), hernia (1), malignant neoplasm (1) and a combination of adhesions and malignancy (2), 43% of procedures preceding the obstruction were primary small-bowel operations. Overall, 23% of patients were treated operatively. There was only 1 episode of strangulated bowel. A comparison of individual signs and symptoms reveals no significant difference between the operatively and nonoperatively treated groups. Patients with more positive signs or symptoms had a greater tendency to be treated by operation. For patients treated operatively, the recurrence rate was 71% compared with a readmission rate of 48% for those treated nonoperatively. The median time to recurrence was 0.1 years (mean = 1.3 years) post surgical treatment compared with 0.7 years (mean = 1.2 years) post nonsurgical treatment. The median length of stay for operated patients was 12 days (mean = 11.1 days) compared with 6 days (mean = 8 days) for those not undergoing operation.
Conclusions: Readmission for SBO within 50 days of a previous laparotomy represents a small percentage of all cases of SBO. These often follow small-bowel operations. Cases of strangulation are no more common than in general cases of SBO. Patients treated nonoperatively had a lower recurrence rate, longer time interval to readmission and a shorter hospital stay.

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IS VIDEO-ASSISTED THORACOSCOPIC SURGERY SUPERIOR TO LIMITED AXILLARY THORACOTOMY IN THE MANAGEMENT OF SPONTANEOUS PNEUMOTHORAX? A.S. Ashrafi, M.J. Hyland, R.J. Mehran. Department of Thoracic Surgery, Ottawa Hospital, Ottawa, Ont.

The objective of this study was to evaluate bullectomy and pleurectomy in the treatment of spontaneous pneumothorax (PNO) performed by video-assisted thoracoscopic surgery (VATS) and to compare the outcome to the same procedure performed via axillary thoracotomy (AT).

We retrospectively studied all patients treated for PNO during the last 4 years at the Ottawa Hospital. Twenty-eight patients were treated by AT and 22 underwent VATS. We compared length of operation, duration of chest drainage after surgery, length of hospital stay, time off work, the amount of pain after operation and the recurrence rate of the pneumothorax.

The median length of follow up was 43 months (3.8, 81.5 months). No patient developed recurrent pneumothorax. We found no difference in the operating time, the amount of pain immediately after the surgery, and in time off work between the 2 groups. On the other hand, patients who underwent VATS had a shorter length of stay ($p = 0.002$) and a shorter requirement for analgesics postoperatively ($p = 0.05$). Overall the cost of VATS was no different than AT.

We conclude that VATS offers a cost-effective and a better tolerated procedure for the management of spontaneous pneumothorax compared with the time-honoured open technique.

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ENUCLEATION OF GIANT CYSTADENOMAS OF THE LIVER. E. Dixon, F. Sutherland, G. McKinnon, R. Preshaw. Department of Surgery, University of Calgary, Calgary, Alta.

Giant cystadenomas of the liver are rare premalignant tumours that are difficult diagnose and treat. We describe 3 cases of cystadenoma, 2 with mesenchymal stroma and 1 without. The first case was a 39-year-old woman who had a centrally placed cystadenoma. At surgery a communication with the left hepatic duct was found and enucleation included the entire tumour except an area around the duct. This tumour has recurred 3 years later. The second case was a 61-year-old Chinese woman who presented with early satiety and was found to have a large cystadenoma coming off segments II and III and displacing the porta hepatis to the right. Serum CEA and CA 19.9 were normal. Cyst fluid CEA was 870 ng/L and CA19.9 was 32 450 U/L. The tumour was completely enucleated and at 1 year there has been no recurrence. The third case was a 19-year-old woman who presented with acute abdominal pain and was found to have a large cyst in her right liver. Serum CEA and CA 19.9 were normal. Cyst fluid CEA was 96 ng/L and CA19.9 was 3000 U/L. This tumour was completely enucleated. Pathology revealed cystadenoma without mesenchymal stroma. All 3 of these giant cystade-

nomas were enucleated without the need for perioperative blood transfusions and without postoperative morbidity. Cyst fluid analysis was useful in distinguishing these tumours from simple or hydatid cysts. Complete enucleation is the treatment of choice for benign giant cystadenomas of the liver.

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HEPATOCELLULAR CARCINOMA IN ALBERTA: A POPULATION BASED REVIEW. E. Dixon, P.M.A. Brasher, F.R. Sutherland, J.G. McKinnon. University of Calgary, Calgary, Alta.

The Alberta Cancer registry was used to identify all cases of hepatocellular carcinoma (HCC) in Alberta from 1986 to 1996. All charts from patients seen at the Tom Baker Cancer Centre (TBCC) in Calgary from 1986 to 1996 were revlewed.

Results: The total number of cases in Alberta in the 11-year period was 516. There were 150 cases seen at TBCC, 109 male and 41 female. Seventy percent were identified as Caucasian and 25% as Oriental. Mean age at diagnosis was 63.9. Twenty-six percent were identified as having hepatitis B or C, and 56% had cirrhosis. Overall median survivaI was 3.45 months. Median cause-specific survival was 3.78 months. The majority of patients presented with advanced stage IV disease. Only 14 patients had a potentially curative treatment, either surgery or ablation. The presence or absence of cirrhosis or active hepatitis had no significant effect on survival.

The incidence of HCC in Canada is likely to increase. We conclude that HCC in Alberta usually presents at an advanced stage and outcome is poor. Newer strategies such as aggressive screening and innovative treatments are needed to improve outcome.

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AN ESTIMATE OF THE APPROPRIATE RATE OF BREAST-CONSERVING THERAPY IN A POPULATION. S. Tyldesley, H. Walker, C. Boyd, K. Schultz, W. Mackillop. Radiation Oncology Research Unit, Department of Oncology, Community Health and Epidemiology, and the School for Policy Studies, Queen's University, Kingston Regional Cancer Centre, and Kingston General Hospital, Kingston, Ont.

The objective of this study was to estimate the appropriate rate of breast-conserving surgery and radiotherapy (BCT) in a North American population using an evidence-based approach.

Eligibility criteria for BCT were identified from published guidelines. Various sources, ranging from tumour registries to retrospective series, were used to determine the proportions of patients with each eligibility criterion (i.e., the case mix). The eligibility criteria for BCT were combined with the information about the cases mix to estimate the need for BCT. Plausible error rates on the estimates of the need for BCT were calculated.

The estimated appropriate BCT rates (EABR) for all breast cancer patients was 45.1% ± 5.5%. For invasive cases only, the EABR for all stages, stage I, II and III were 46.9% ± 6.3%, 57.8% ± 10.4%, 53.5% ± 10.4% and 27.0% ± 4.8% respectively. For ductal carcinoma in-situ, the EABR was 43% ± 7.8%. Sensitivity analyses using minimizing and maximizing assumptions resulted in an EABR for all breast cancer patients of 41.7% ± 2.8% and 57.5% ±3.7% respectively.

Our evidence-based model suggests that BCT is appropriate in approximately 45.1% of all incident cases of breast cancer. Current BCT practices in British Columbia and Ontario will be compared to the EABR estimate.

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ENDOTHELIAL ACTIVATION RESULTS IN UPREGULATION OF INTERLEUKIN-1α AND ENDOTHELIN-1 MRNA IN PIG-TO-HUMAN LIVER XENOTRANSPLANTATION. A. Di Carlo, A.J. Tector, M. Tan, J.A. Fridell, S. Liu, C. Soderland, J.S. Barkun, P. Metrakos, J.I. Tchervenkov. McGill University Health Centre, Montreal, Que.

An in vitro model of pig-to-human liver xenotransplantation was used to identify the early mediators of acute vascular rejection in pig liver xenotransplantation. The aim of this study is to identify therapeutic targets to abrogate acute vascular rejection.

Porcine hepatic microvascular sinusoidal endothelial cells (PHEC) were isolated by elutriation (Cell Systems) and cultured to confluence. The cells were then incubated with 10% normal human serum for 1, 2, 4, 8 and 14 hours. The generation of soluble membrane attack complex (sC5b-9) was measured by fluorescent enzyme immunoassay. Total RNA was isolated from the PHEC at each incubation time point and gene upregulation was assayed by semiquantitative rt-PCR.

Human serum contained xenoreactive IgM and IgG that reacted with PHEC. Baseline sC5b-9 levels were 0 and increased to 1.63 μg/mL (± 0.15 μg/mL) by 12 hours of incubation. Interleukin-1a (IL-1α) mRNA was first detected at 1 hour of incubation. This expression peaked at 2 hours and then decreased to 12 hours. Endothelin-1 (ET-1) and endothelin-converting enzyme 1 (ECE-1) were also detected at 1 hour of incubation, peaked at 2 hours and decreased to 12 hours. Xenoreactive antibody and complement mediated injury of PHEC induces the expression of IL-1α, a critical mediator of acute vascular rejection. In addition, ET-1 is also upregulated, suggesting that ET-1 released by pig livers perfused with human blood results from newly synthesized ET-1 rather than stored protein. These findings corroborate that IL-1α is a mediator of acute vascular rejection in pig-to-human liver xenotransplantation and identify ET-1 as a novel mediator of acute vascular rejection in pig-to-human liver xenotransplantation.

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EXPRESSION OF POLO-LIKE KINASES IN HUMAN COLORECTAL CANCER LINES EXHIBITING GENOMIC INSTABILITY. J. Macmillan, J. Hudson, C. Swallow, M. Redston, J. Dennis. Samuel Lunenfeld Research Institute, Mount Sinai Hospital, Toronto, Ont.

Background: The majority of human tumours display genomic

instability, which can be classified as either chromosomal or microsatellite instability (CIN or MIN, respectively). CIN is related to loss or gain of chromosomes, resulting in aneuploidy and is observed in over 80% of sporadic colorectal cancers. Cell cycle checkpoint genes are essential for the maintenance of mitotic integrity and chromosomal stability. Sak and polo-like kinase (PLK) are human polo gene family members which have been implicated in cell cycle regulation.

Objective: To compare levels of expression of Sak and PLK in human colorectal cancer (CRC) cell lines known to exhibit either chromosomal instability (CIN) or microsatellite instability (MIN).

Methods: Total RNA was extracted from 14 established human CRC lines for which the pattern of genomic instability is known. Reverse-transcription PCR was performed using primers specific for either Sak or PLK. Following polyacrylamide gel electrophoresis of PCR products, band density was quantitated and gene expression was calculated relative to the level of a constitutively expressed gene, porphobilinogen deaminase (PBGD). Data are means ± SEM. The correlation of gene expression level with pattern of genomic instability was assessed by contingency table analysis.

Results: Both Sak and PLK were expressed in all 14 CRC lines studied. The mean levels of Sak and PLK expression, relative to PBGD, were 0.9054 ± 0.060 and 1.5062 ± 0.107 respectively. PLK expression was equivalent in CRC lines with CIN compared to those with MIN. By contrast, Sak expression was reduced in CIN versus MIN lines.

Type of instability	Sak*	PLK*
CIN	0.794 ± 0.096	1.415 ± 0.156
MIN	1.017 ± 0.046†	1.597 ± 0.150

*mean ± SEM, $n = 7$.
†$p < 0.05$ v. CIN

Conclusions: Reduced Sak expression in human CRC lines was correlated with chromosomal instability. This suggests that loss of Sak could contribute to CRC progression.

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HEPARIN PROPHYLAXIS IN COLORECTAL SURGERY: THE COST OF IGNORING THE EVIDENCE.

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Colorectal surgery is associated with a high risk of developing deep vein thrombosis (DVT) and pulmonary embolus (PE). Level I evidence studies have shown that heparin 5000 IU subcutaneously 2 hours preoperatively and *bid* or *tid* every 5 to 7 days or until ambulating can prevent 85% to 90% of postoperative DVT and PE.

This study assessed the adherence to this evidence-based prophylactic regime in a university-affiliated teaching hospital (519 beds) and the monetary cost of inappropriate heparin dosing.

We conducted a retrospective chart audit of 103 patients who had major elective colorectal surgery between April and December 1999. Appropriate was defined as postoperative heparin for the duration of hospital stay when a preoperative dose had been given.

	Appropriate heparin	Inappropriate heparin	*p* value
No.	62	35	< 0.05
Age ± SD	61.8 ± 16.7	61.6 ± 15.8	NS
Sex M:F	33:29	18:17	NS
Procedure (right hemi.:left hemi.:sig.:low ant.:sub./ tot.)	23:3:23:10:3	12:4:10:6:3	NS
Cost @ 70¢/dose	$43.40	$196.00 – $1029.00	< 0.05

A total of 35% of patients did not receive any preoperative heparin. Postoperatively, 31% of patients were ordered heparin without having received a preoperative dose. During the time period, there was no clinical or radiologic evidence of postoperative DVT, PE or heparin-induced thrombocytopenia. For those patients who received postoperative heparin no preoperative dose, the cost per patient ranged between $5.60 and $29.40.

We conclude that there are a significant number of patients in our institution who are not receiving appropriate prophylaxis and in addition significant numbers of patients are receiving heparin inappropriately. Further education for staff, residents and students regarding the recommendations for perioperative heparin is required.

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WAITING LIST MANAGEMENT IN GENERAL SURGERY.

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Waiting lists for medical services are common in Canada. Currently, lists are often managed by individual surgeons, and patients are prioritized on the basis of the surgeon's impression of urgency. The Western Canada Waiting List Project was established to develop objective methods of prioritizing patients for cataract surgery, hip and knee replacement, MRI services, child mental health services and general surgery. Panels of academic and private specialists, family physicians and other relevant providers from all 4 western provinces were established. Criteria were identified that the relevant physicians used to rank patients in order of priority; questionnaires were developed on the basis of these criteria and these questionnaires were used to evaluate patients in the offices of the specialists. For the general surgery panel, initial work done in New Zealand was used to develop questions on intensity of pain, other forms of suffering, frequency of pain, impairment

of role function, impairment of social activities and history of complications. For cancer patients, further questions on life expectancy without the procedure and degree of improvement of life expectancy with surgery were added. Each of these areas was scored on a 5-point scale, and scores were predicted for 3 to 6 months following the procedures. Surgeons were also asked to rate the urgency or relative priority of the patient on a linear scale, and to rate the patient in terms of urgency in relation to the average patient seen. Univariate correlations were calculated for each of the questions versus the overall urgency. After a total of 200 patients had been analysed, 3 of the questions correlated highly with the impression of overall urgency for cancer patients. These were (1) life expectancy without the procedure (R = 0.75), (2) expected degree of improvement (R = 0.50), and (3) other forms of suffering (R = 0.59). For non-cancer patients, the important variables appear to be, (1) impairment of role function (R = 0.54), (2) impairment in social activities (R = 0.52), and (3) history of complications (R = 0.50). A questionnaire developed using these results may be useful for prioritizing patients for general surgical procedures.

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OUTCOME OF RESEARCH TRAINING IN A GENERAL SURGERY RESIDENT TRAINING PROGRAM.

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Introduction and objectives: Surgical residency programs often incorporate research training, but there is very little data examining the value of this activity. The objective of this study was to describe the success, using both objective and subjective measures, of mandatory research training incorporated into a general surgery residency, as well as to identify any factors associated with research success.

Methods: Questionnaires were sent to 97 current and past (1978 to 2000) graduates of a general surgery residency program. Over several years (1978 to 1996) a mandatory research year was included in the residency, usually during the third year. The questionnaire obtained data regarding the type of each research project during residency, objective (publications) and subjective (by Likert scale 1 to 5) measures of research success, and eventual career path of the resident. Likert scores for the perceived usefulness of research were defined as: 1 = not at all, 3 = somewhat, 5 = definitely.

Results: The response rate to the questionnaire was 74%. A total of 161 projects were described; 108 clinical (67%) and 53 basic science (33%). Objectively, 66 (41%) of all research projects were published. Basic science projects were more likely to be published than clinical projects (60% versus 31%, respectively; $p < 0.001$), as were projects done by PGY 4–5 residents compared with PGY 1–2 residents (48% versus 20%, respectively; $p < 0.05$). Residents who trained with a mandatory full research year had more publications at the end of their residency than those without a full research year (2.4 versus 1.2, respectively; $p < 0.05$). Subjectively, (Likert scale ≥ 3 as a positive response) most respondents perceived that research training influenced their career (69%), improved communication skills at meetings (71%), helped prepare talks (79%) and abstracts (68%), and facilitated literature reviews (74%). However, fewer respondents perceived research training to improve quality of care (44%). Of the respondents who have graduated, 41% are university-affiliated, 38% are community surgeons and 21% are geographical full-time. Neither specific research project type nor the presence of a mandatory research year, were associated with eventual career path.

Conclusions: We conclude that research during residency confers subjective and objective benefits to residents, and contributions to surgical science. Basic science projects and a dedicated research year yield greater publication output, although this does not appear to influence an eventual career path.

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LAPAROSCOPIC VERSUS OPEN SPLENECTOMY: A SURVEY OF GENERAL SURGEONS IN ONTARIO.

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The objective of this study was to determine the practice patterns and views of general surgeons in Ontario regarding the use of laparoscopic splenectomy (LS) versus open splenectomy (OS). A critical literature review of controlled series shows that there is insufficient evidence to suggest that LS is superior to OS; numerous uncontrolled series suggests that LS has several potential benefits. Given the controversy in the literature, we hypothesize that there is equipoise in the surgical community as to the optimal approach to splenectomy.

Two hundred and seventy-one surgeons registered with the Ontario Association of General Surgeons in 1999 were surveyed during that year. A response rate of 68% was achieved. Seventy-one percent of academic surgeons and 66% of community surgeons participated. When asked whether they viewed LS as an accepted standard of practice, 63% agreed and 37% disagreed (3% did not respond). When asked what approach they would recommend for patients suitable for either LS or OS, for any spleen type, support for LS declined, with 58% citing LS, 36% citing OS and 6% did not choose (undecided or did not respond). In patients with normal-sized spleens with no systemic disease, 58% said they would recommend LS to their patients, 23% said OS and 19% were either undecided or did not respond. In patients with splenomegaly or systemic disease, recommendations for use of LS further declined;15% cited LS, 58% cited OS, and a significant number, 27%, were undecided or did not respond. Interestingly, when asked if LS was currently being performed at their institution, only 38% reported "yes" and 60% reported "no," even though 93% of surgeons claimed that there were either no restrictions on its use or issues of restriction did not apply to their institution.

Our survey results show that although a small majority of surgeons theoretically support the use of LS, little more than

one-third of institutions offer LS. As the complexity of cases increases, support for the use of LS declines and uncertainty about its applicability rises. The results also show that LS has not yet been accepted as the gold standard in Ontario. Most surgeons still use the open approach for splenectomy in their practices. There is no consensus on the issue of LS versus OS. To date, there are no methodologically sound evaluations of LS versus OS in terms of cost or quality of life. In order to prove the benefits of LS over OS, a randomized controlled trial that can evaluate quality of life and cost-utility outcomes is necessary.

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SURGICAL MANAGEMENT OF POTENTIALLY CURABLE COLON CANCER IN ONTARIO. A.M. Easson, M. Cotterchio, G. Buchan, H. Sutherland, D. Dale, M. Aronson, E. Holowaty, S. Gallinger. Princess Margaret Hospital, Mount Sinai Hospital, Cancer Care Ontario and Ontario Familial Colorectal Cancer Registry, Toronto, Ont.

Subtotal colectomy may be considered as the initial curative surgical procedure for young patients or those with a strong family history although clear guidelines are not available. The population-based Ontario Familial Colon Cancer Registry, which includes all eligible colorectal cancer patients diagnosed in Ontario since July 1, 1997, has collected family history data to study genetic factors associated with colorectal cancer. The present study is a population-based cross-sectional survey of recent surgical practice with respect to the extent of curative resection for colon cancer. All patients diagnosed with colon cancer in Ontario between July 1, 1997, and June 30, 1998, were staged by TNM stage at time of surgical intervention using the pathology, discharge summaries and operative reports. Rectal cancer patients were excluded. Extent of initial curative colon resection (subtotal versus segmental or hemicolectomy) was compared with familial risk status, defined using the Registry's family history questionnaire that classified patients as to high, intermediate or low familial risk. Analysis was done using χ^2 statistics and multivariate logistic regression. There were 3394 cases of colorectal cancer in the first year of the registry; of these, 86% (1727/ 2010) of colon cancer cases could be staged. Exclusion of 433 (25%) with metastatic disease, 57 with previous colectomy and 14 who had a subtotal colectomy for left-sided obstruction left 1223 patients who had a potentially curative colon resection: 206 (17%), 569 (46%) and 448 (36%) stage 1, 2 and 3, respectively. Patients were more likely to receive a subtotal colectomy if they were ≤ 50 years of age (OR = 3.4, CI 95% 1.8 to 6.6), if they had a synchronous colon cancer or polyp (OR = 28.37, CI 95% 12.2 to 61.2) or if they had a metachronous or synchronous other cancer (OR = 2.5, CI 95% 1.07 to 6.1). Tumour stage, gender and familial cancer risk were not associated with the extent of colon resection. While young age and multiple cancers are significant factors toward performing a subtotal colectomy for curable colon cancer by surgeons in Ontario, a family history of colon cancer surprisingly does not appear to be included in surgical decision-making.

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KELOID SCARS, USE OF ANIMAL MODELS TO ASSESS EFFICACY OF PREVENTATIVE THERAPY. M. Hillmer, S. Salama, S.M. MacLeod. Father Sean O'Sullivan Research Centre, St. Joseph's Hospital, Hamilton, Ont.

Keloids arise from exuberant tissue growth resulting because of an aberrant wound healing process; increased extracellular matrix (ECM) production and fibrous tissue combined with decreased ECM degradation. Darker-skinned people are predisposed to keloid scar formation (between 5:1 and 15:1 compared to Caucasians). The efficacy of the most widely used glucocorticoid (GC), triamcinolone (40 mg/mL) (T), compared to methylprednisolone (40 mg/mL) (M) and dexamethasone (8 mg/mL) (D) was evaluated. In the first model using male Wistar rats, carrageenan (2.0%) was delivered by osmotic minipump to induce a hyperinflammatory state analogous to keloid scars in humans. A second model made use of nude athymic mice and human keloid scar tissue implanted subcutaneously. The GCs were injected into the keloid scar tissue. Histologic scales were used to determine the efficacies of both models. A hydroxyproline (OH-P) assay was done to determine the levels of collagen synthesis in the keloid tissue (see table below). No GC treatment showed consistent advantage in prevention or amelioration of KSCs in either animal model. The models employed are imperfect and ideally, study of novel KSC therapies should be conducted in patients.

OH-P (mg/g dry weight) in keloid tissue treated with GCs

Day	Biopsy*	Control*	T*	M*	D*
0	7.1 ± 2.6	—	—	—	—
14	—	31.4 ± 12.4	12.3 ± 2.9	19.1 ± 8.3	12.5 ± 3.7
30	—	23.9 ± 12.6	8.3 ± 1.0	18.1 ± 6.1	29.4 ± 7.3

*All values are means of at least 3 determinations and are listed as ± standard error of the mean.

2000 Royal College Medallist in Surgery

PREVENTION AND DIAGNOSIS OF ISLET TRANSPLANT REJECTION —FROM BENCH TO BEDSIDE. A.M.J. Shapiro, J.R.T. Lakey, E.A. Ryan, G.S. Korbutt, E. Toth, J.F. Elliott, G.L. Warnock. R.V. Rajotte, N.M. Kneteman. Clinical Islet and Pancreas Transplant Programs, University of Alberta Hospitals, Edmonton, Alta.

Of 267 clinical islet allografts performed in type I diabetics over the past decade, only 12.4% became insulin-independent for longer than 1 week, and only 8.2% were insulin-independent beyond 1 year. Major barriers to success include immunologic graft loss through acute rejection or recurrent autoimmune destruction, the use of steroid-based diabetogenic immunosuppression, the lack of a diagnostic marker to detect early islet rejection, and limited β-cell reserve within the engrafted cellular transplant mass.

A series of laboratory and clinical studies were undertaken to develop (a) steroid-free immunosuppression for islet transplantation, (b) to monitor portal vein immunosuppressant drug levels in a large animal model to determine potential local islet toxicity to islets embolized to an intrahepatic site, (c) new approaches for early diagnosis for islet allograft rejection and (d) to translate these findings to a new pilot series of "solitary islet" transplants in patients with brittle control or severe hypoglycemic unawareness.

A canine islet autograft model was developed using total pancreatectomy and intrasplenic islet reflux. The frequently sampled glucose tolerance test was used in the modified Bergman Minimal Model to determine the metabolic impact of a panel of immunosuppressants, given alone or in combination for 1 month. There was no significant impairment in K_G with treatment with low- or high-dose steroid monotherapy, but the combination of cyclosporine and low-dose steroid induced an irreversible 25% decline in K_G on therapy ($p < 0.05$), due to a decrease in peripheral insulin sensitivity (S_1 7.1 ± 1.1 pre-drug to 3.1 ± 0.5 on drug, $p = 0.005$). Analysis of portal vein drug levels for all immunosuppressants tested demonstrated peak drug concentrations that could be locally toxic to an intrahepatic islet allograft, confirming the "portal immunosuppressive storm." Three strategies for early diagnosis of islet rejection showed superiority of an abbreviated glucose tolerance test with decline in K_G as the most effective early marker of islet rejection.

A clinical series of 8 consecutive patients had immediate and sustained independence from insulin using a steroid-free immunosuppressant regime based on sirolimus, low-dose tacrolimus and IL2-receptor antibody induction. All patients had complete normalization in HbA_1C, and the mean amplitude of glycemic excursion corrected from 10.42 ± 2.8 pretransplant to 3.66 ± 1.2 post transplant ($p = 0.003$). The mean islet transplant mass required to sustain insulin independence was 11 392 islet equivalents per kg recipient body weight.■