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KERATINOCYTE GROWTH FACTOR-2 DOES NOT ENHANCE ESOPHAGOGASTRIC ANASTOMOTIC WOUND HEALING IN RATS. Y. Cui, J.D. Urschel, N.J. Petrelli. Thoracic Surgical Oncology, Roswell Park Cancer Institute, Buffalo, NY

Esophagogastric anastomotic leaks complicate 5% to 20% of esophagectomies for esophageal cancer. Keratinocyte growth factor-2 (KGF-2) is a newly identified growth factor that accelerates skin incisional healing. An animal experiment was done to test the hypothesis that KGF-2 would enhance esophagogastric anastomotic wound healing.

Forty rats had single-layer esophagogastric anastomoses constructed using interrupted 7-0 polypropylene sutures. In the experimental group (20 rats) 1 mg of KGF-2 was administered by intraperitoneal injection on the day of surgery and for 3 consecutive days thereafter. Placebo (buffer solution only) was given to the control rats (20 rats). Rats were sacrificed on the fourth postoperative day and their anastomoses were excised, mounted in a tensiometer, and distracted at 10 mm/min to measure breaking strength. After that, anastomotic tissue was subjected to hydroxyproline analysis (an indicator of wound collagen). Skin and fascial wounds were also tested in a tensiometer.

There were 2 anastomotic leaks in the KGF-2-treated rats and none in the control rats ($p = 0.26$, not significant). Esophagogastric anastomotic breaking strength was 1.00 ± 0.61 N in the KGF-2 treated rats and 1.58 ± 0.62 N in the control rats ($p = 0.017$). Esophagogastric anastomotic tissue hydroxyproline concentration was 95.9 ± 19.9 nmol/mg in the KGF-2 treated rats and 114.1 ± 38.0 nmol/mg in the control rats ($p = 0.10$, not significant). Skin and fascia breaking strengths were also lower in the KGF-2 rats, but the difference was not significantly different (KGF-2 skin — 0.97 ± 0.48 N, control skin — 1.46 ± 0.89 N, $p = 0.064$; KGF-2 fascia — 3.60 ± 2.06 N, control fascia — 4.67 ± 1.88 N, $p = 0.14$). KGF-2 did not enhance esophagogastric anastomotic wound healing in this model. Similarly, intraperitoneal KGF-2 did not have a beneficial effect on skin or fascial wound healing.

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CARDIOPULMONARY CHANGES IN LIVER TRANSPLANTATION CANDIDATES WITH HEPATITIS C CIRRHOSIS. A. Al-Abdulkareem, M. Al-Moamary, T.

Gorka, M. AL-Sebayel, I. Al-Traif, A. Al-Shimemeri. King Fahad National Guard Hospital, Riyadh, Saudi Arabia

Introduction: Echocardiography (TEE) can reliably detect intrapulmonary shunt (IPS) and portopulmonary hypertension (PPH) in orthotopic liver transplantation candidates (OLT). Knowing that hepatitis C virus (HCV) is associated with multi-system involvement, we conducted a study that evaluated echocardiographic and pulmonary vascular changes in a unique cohort of OLT candidates with HCV cirrhosis. **Methods:** TEE changes of 81 patients, evaluated for OLT over 4 years (1994 to 1997), were studied. All patients had biopsy-proven end-stage cirrhosis due to HCV. Forty matched normal subjects were used as a control group. **Results:** The mean age was 53 (± 19) years. When compared with the control group, OLT candidates had higher cardiac output (5.4 L/min [± 1.7 L/min] versus 4.6 L/min [± 0.5 L/min], $p = 0.002$) and wider LVEDD (49.8 mm [± 4.7] versus 48.0 mm [± 3.9], $p = 0.002$). Whereas, ejection fractions were not significantly different (74% [$\pm 4.1\%$] versus 72% [± 5.3], $p = 0.25$). The prevalence of PPH was 8.6% with a peak pulmonary artery pressure of 40 mm Hg. Of 62 patients who had micro-bubbles study, 4 (6.6%) had IPS and 1 (1.6%) had patent foramen ovale. Three patients had hepatopulmonary syndrome as they showed arterial oxygen abnormalities. One of these patients was successfully transplanted. **Conclusions:** Cardiac and pulmonary vascular abnormalities are frequent in OLT candidates with HCV cirrhosis. The prevalence of PPH was higher than what is reported in the literature; this may be due to HCV being the etiology of cirrhosis.

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LAPAROSCOPIC SPLENECTOMY. A. Pomp, G. Breton, M. Dagenais, M. Gagner. Department of Surgery, Centre hospitalier de l'Université de Montréal, Montreal, Que.

In order to receive the safety and efficacy of laparoscopic splenectomy, we reviewed the charts of 53 patients operated between December 1992 and February 1999. Twenty-one men and 32 women with a mean age of 46 years (6 to 73 years), weight of 62 kg (20 to 100 kg) were operated in the right lateral decubitus position. Pathologies included idiopathic thrombotic purpura (23), thrombotic thrombocytopenic purpura (8), lymphoma (7) and 15 others. Thirty percent of the patients had undergone prior abdominal surgery. Spleen size varied, with 14

normal spleens (< 11 cm), 36 moderate splenomegaly (11 to 20 cm) and 3 severe splenomegalies. Patients were prepared with preoperative vaccinations for *Pneumococcus*, *Haemophilus* and *Meningococcus*. Operating room time averaged 150 minutes. Accessory spleens were discovered in only 6 (12%) patients. Thirteen patients underwent concomitant surgery, primarily hepatic biopsies (7). Two patients required conversion, both these patients had portal hypertension. Mean blood loss for the entire cohort was less than 250 mL. No patients underwent preoperative arterial embolization. Seventeen patients had drains inserted during the operations, mostly early in our experience. Five patients required transfusions. Mean postoperative stay was about 5.5 days. Ten patients had important complications, including pneumonia, subphrenic hematoma, pancreatitis and deep vein thrombosis. There was no postoperative mortality. Laparoscopic splenectomy permits an appropriate intra-abdominal exploration, decreased postoperative pain and early return to oral intake with a low incidence of wound complications. Patients rapidly resume normal activities with comparable or lower morbidity when compared with open procedures. For selected patients (and surgeons) it may be the procedure of choice.

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ABNORMALITIES IN THERMOREGULATION IN CHOLESTATIC RATS. L.K. McCullough, Y. Takahashi, Q. Pittman, T. Le, M. Swain. Liver Unit and Neurosciences Research Group, University of Calgary, Calgary, Alta.

Fever is a highly conserved response to injury, inflammation or infection. Patients with biliary tract obstruction have unexplained, inordinately high rates of perioperative morbidity and mortality, while cholestatic rats are known to have abnormal hypothalamic responses in response to pyrogenic stimuli. The following study was therefore undertaken to determine whether cholestasis is associated with an abnormal febrile response. Male Sprague-Dawley rats (250 g) were surgically implanted with temperature telemetry devices and either bile duct resected (BDR) or sham resected (sham). On postoperative day 5, the rats were placed individually into cages and temperatures were recorded for 1 hour pre injection and 8 hours post injection. Rats were injected intraperitoneally with either PBS (vehicle; 200 μ L), IL-1 β (1 μ g/kg; *E. coli* serotype 026:B6). Baseline (pre injection) temperatures were similar for both groups. Febrile responses after IL-1 β injection in BDR and sham groups were not significantly different (peak fever above baseline: BDR 0.9 ± 0.2 °C versus sham 0.7 ± 0.2 °C, $p > 0.05$). However, in response to LPS injection, BDR rats showed an initial hypothermic response with an attenuated febrile response, when compared with sham-operated animals ($p < 0.05$). Sham rats did not develop any evidence of a hypothermic response to LPS injection. Between 1.5 and 2.5 hours post LPS injection, BDR rats' temperature was significantly lower at all time points, when compared with sham-operated animals ($p < 0.05$). By 2 hours post injection, BDR animals generated a febrile response which was significantly less than that observed in sham rats. IL-1 β or LPS injection did not cause mortality in any group. In conclusion, cholestatic rats have an

initial hypothermic response to LPS injection followed by a diminished ability to generate as great a magnitude of a fever as do sham rats. This inadequate febrile response may contribute to, at least in part, the increased mortality rates observed postoperatively in cholestatic patients, as hypothermia occurring in response to sepsis is known to be associated with a poor outcome.

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THE CANCER CARE ONTARIO SURGICAL ONCOLOGY NETWORK: PROMOTING TIMELY AND EQUITABLE ACCESS TO APPROPRIATE SURGICAL ONCOLOGY CARE. A.D. DePetrillo, A. Gagliardi. Cancer Care Ontario, Toronto, Ont.

The Surgical Oncology Network (SON) was established by Cancer Care Ontario (CCO) to ensure that patients receive the necessary information, support and surgical cancer services as close to their home as possible. Phase 1 of the program involved recruiting specialty surgeons trained in surgical oncology to join multidisciplinary teams in 8 regional cancer centres. The second stage of the program will focus on improving communication. Knowledge-sharing between regional cancer centres, hospitals, general and specialty surgeons, and family physicians will be promoted by implementing a Web site, email discussion group and newsletter and by facilitating regional workshops. A database of surgical oncologists will be developed so that practitioners can identify colleagues for consultation when making treatment decisions and arranging referrals for their patients. Links with research groups have already been formed: SON will liaise with the Program in Evidence-Based Care to develop surgical oncology treatment guidelines and with the Institute for Clinical Evaluative Sciences to examine outcomes in cancer surgery. We have developed and distributed a 2-page needs assessment survey to all surgical specialists in the province of Ontario. Designed to assess their clinical and information needs, the questionnaire consisted of 3 sections. The first section, featuring check boxes next to each option, established basic information about the respondent, including type of institution, surgical and oncology specialty, and proportion of oncology cases within their practice. The second section offered a Yes/No, Agree/Disagree scale in association with several statements regarding collegial consultation, standards of care, medical literature, clinical practice guidelines, the Internet, patient information resources and workshops of interest. The final section allowed the respondent to describe any desired information resources that would assist their surgical practice. The results of this survey are being used to further define Surgical Oncology Network activities.

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GOBLET CELL CARCINOIDS OF THE APPENDIX — IMMUNOHISTOGENETIC AND ULTRASTRUCTURAL STUDY. R. Kanthan, S.C. Kanthan. Department of Pathology and Department of Surgery, Royal University Hospital, University of Saskatchewan, Saskatoon, Sask.

Goblet cell carcinoids are uncommon neoplasms. The exact biological behaviour of this neoplasm is uncertain, although most studies favour an aggressive behaviour. The aim of our study was to evaluate the immunophenotype with cell cycle and proliferation markers and their histogenesis with ultrastructural analysis using the conventional carcinoids as a frame of reference.

Clinical data and archival material of all goblet cell carcinoids of the appendix between 1970 and 1998 were reviewed. A detailed hematoxylin–eosin analysis complemented by periodic acid-Schiff (PAS), Alcian blue, mucicarmine, Fontana–Masson (FM), Churkian–Schenk (CS), chromogranin A (CGA), synaptophysin (SYP), cytokeratins (CK), carcinoembryonic antigen (CEA), Ki67, PCNA, p16, p21, p53, cyclin D, bcl-2, c-erbB2 and electron microscopic (EM) evaluation were performed in all cases.

A total of 7 cases of goblet cell carcinoids were identified among 110 cases of conventional carcinoids of the appendix. The clinical presentation in all 7 cases was acute abdomen with florid perforated appendicitis. All cases had a right hemicolectomy as a primary or interval procedure. Four cases died with carcinoma of the lung, which was confirmed to be metastatic in 2 cases with a mean survival of 8 years. The mean follow-up of the remaining 3 cases show no evidence of disease at 18 months. Histopathology revealed widespread infiltration of the neoplasm in all cases to the periappendiceal fat with extensive perineural invasion. The cells were strongly positive to mucicarmine, PAS, Alcian blue, CK and CEA. No staining was observed with FM, CS, bcl-2 and c-erbB2. Most of the cases were CGA negative and SYP positive. Increased expression of Ki67 and PCNA were observed. Overexpression of cyclin D1 and p21 with negative staining to p16 were seen. p53 was strongly expressed in 1 case. EM demonstrated the presence of mucinous vacuoles of varying sizes and occasional membrane-bound neuroendocrine granules.

Goblet cell carcinoids of the appendix arise from a pluripotent cell with divergent neuroendocrine and mucinous differentiation. These neoplasms have a high cellular proliferation rate and dysregulation of the cell cycle with upregulation of cyclin D1 and p21 and down-regulation of p16. An aggressive surgical approach is recommended with emphasis on complete removal of the tumour with microscopic tumour-free margins.

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IS LATENT ADENOVIRUS INFECTION ASSOCIATED WITH INFLAMMATORY BOWEL DISEASE? J.E. Baird, S. Hayashi, J.C. Hogg, P.T. Phang. MacDonald Research Laboratory and Department of Surgery, St. Paul's Hospital, University of British Columbia, Vancouver, BC

Adenovirus is a common pediatric enteric infection and is capable of producing a chronic, subclinical, latent infection. We asked whether latent adenovirus infection is associated with inflammatory bowel disease (IBD).

Immunocytochemistry was used to detect adenovirus proteins hexon and E1A in gut specimens from 10 IBD patients and 6 controls. Thirty slides were assessed by 2 independent, blinded observers.

Hexon positivity is similar between IBD patients and controls

and may be due to cross-reactivity with another antigen or to presence of adenovirus in malignant control specimens. E1A protein, indicative of latent infection, may be present more commonly in IBD patients than in controls, although the majority of patients are negative. While the data do not show a cause and effect relationship of adenovirus with IBD, adenovirus may be a contributing factor to chronic inflammation in patients who are adenovirus positive.

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PRELIMINARY RESULTS OF PHARMACOLOGICAL STUDIES AND TOXICITY PROFILE OF RALTITREXED AFTER INTRAPERITONEAL ADMINISTRATION IN NORMOTHERMY IN PIGS. D. Nguyen,* P. Dubé,* Y.E. Leclerc,* C. Emond,* A.A. Abugaber.† *Department of Surgery, Maisonneuve-Rosemont Hospital, CAU, Montreal, Que., and †Zeneca Pharma Inc., Mississauga, Ont.

This study was conducted to evaluate pharmacokinetics and toxicity profile of raltitrexed after intraperitoneal administration in normothermy in pigs.

We proceeded by surgery on 12 pigs (female of 20 kg) under general anesthesia to the following procedures: 1 short-bowel resection, 1 hepatic resection, 1 major vascular ligation (mesenteric) and portal vein cannulation. At the end of surgery, we infused into the peritoneal cavity 1 mg of raltitrexed in 500 mL of dialysate in 6 pigs and 2 mg of raltitrexed in 500 mL of dialysate in 6 pigs. Serial samples were taken from portal vein, ear vein and peritoneal fluid during 6 hours. Ten days later, pigs were sacrificed, and an autopsy was performed. Raltitrexed concentrations were measured by high-pressure liquid chromatography.

We obtained a peritoneoplasmatic gradient of 3081:35.89 ng/mL in the 2-mg group and of 1571:16.06 ng/mL in the 1-mg group. There was a nonsignificant first-pass effect. T_{max} in the venous blood was between 100 and 120 minutes and reached a maximum of 35.89 ng/mL in the 2-mg group and 16.06 ng/mL in the 1-mg group. AUC, bioavailability and K_{el} were not calculated. One death occurred on postoperative day 2 from wound dehiscence; a technical problem was identified. At autopsy, 1 hematoma in 1 pig was reported, all bowel anastomoses were healed but 5 pigs had unsuspected small abscesses in the abdominal wall.

Intraperitoneal administration of raltitrexed by intraperitoneal route in pigs is safe and nontoxic. We obtained high local (peritoneum) concentration of raltitrexed without major alteration to the healing process. Series will be continued to 20 pigs, sampling prolonged to 15 hours and intravenous administration will be necessary to calculate K_{el} , bioavailability and AUC. A phase I study is the next logical step.

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LAPAROSCOPIC END-TO-END AORTOBIFEMORAL BYPASS WITH REIMPLANTATION OF THE INFERIOR MESENTERIC ARTERY — AN EXPERIMENTAL STUDY. H. Ben El Kadi, O. Hartung, C.R. Gracia, C.J.

Doillon, Y.-M. Dion, Département de chirurgie, Pavillon St-François d'Assise, Centre Hospitalier Universitaire de Québec, Québec, Que.

Colic ischemia is a serious complication which can occur after abdominal aortic surgery. It has been described in 2 patients following laparoscopic aortic surgery. The goal of the present experiment is to determine the feasibility of inferior mesenteric artery (IMA) reimplantation during laparoscopic aortobifemoral bypass (LAFB).

Six piglets were submitted to the laparoscopic approach according to the apron technique we previously described. The infrarenal aorta was clamped and a LAFB was performed using a Dacron graft. The IMA was reimplanted in the body of the graft with a running 5-0 polypropylene suture.

Mean operative and dissection times were 282.5 (270 to 310) minutes and 123 (110 to 140) minutes with a mean blood loss of 108 (80 to 150) mL. Aortic clamping and anastomotic times were 123 (110 to 135) and 33 (24 to 45) minutes respectively. IMA reimplantation took 55 (45 to 70) minutes. At autopsy, all anastomoses were patent with no stenosis or leak.

Laparoscopic IMA reimplantation during laparoscopic aorto-bifemoral bypass is feasible.

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LAPAROSCOPIC END-TO-SIDE AORTOBIFEMORAL BYPASS: AN EXPERIMENTAL STUDY. H. Ben El Kadi, O. Hartung, C.R. Gracia, C.J. Doillon, Y.-M. Dion. Département de chirurgie, Pavillon St-François d'Assise, Centre Hospitalier Universitaire de Québec, Québec, Que.

The goal of the present animal experiment is to demonstrate the feasibility of the laparoscopic end-to-side aortic anastomosis.

Six piglets weighing between 70 and 77 kg were anesthetized. The approach to the aorta was performed according to the apron technique we previously described. Seven ports were used. After systemic heparinization (100 IU/kg), the infrarenal aorta was clamped with a laparoscopic Satinsky. A 3-cm end-to-side laparoscopic anastomosis was constructed with a 12 × 6-mm knitted Dacron graft. Two 15-cm 4-0 monofilament running sutures were used. Performance of the right side of the anastomosis was followed by the left side. Then the femoral anastomoses were made in an end-to-side manner. Blood was drawn for hematocrit before and at the end of the intervention.

The procedures were completed in an average of 198 minutes (170 to 240) with a mean blood loss of 86 mL (50 to 120). Mean preoperative and postoperative hematocrits were 38 (34 to 48) and 38 (34 to 46) respectively. Mean time for femoral artery dissection, trocar insertion, creation of the peritoneal apron, aortic dissection and graft insertion was 92 minutes (75 to 105). Aortic crossclamp and anastomotic times were 51 (40 to 65) and 44 (35 to 60) minutes respectively. No extra sutures were needed to secure the anastomoses. No pigs died before sacrifice. At autopsy, all the anastomoses were patent, without stenoses. In each case, the limbs of the graft were found correctly placed under the ureters.

Our results indicate that laparoscopic ABF can be done with an end-to-side proximal anastomosis. This type of anastomosis is mandatory in certain cases of occlusive aortoiliac disease and also allows for a shorter procedure.

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RECHERCHE PAR RT-PCR DE MICRO-METASTASES DANS LES GANGLIONS SENTINELLES DE 53 PATIENTS ATTEINTS DE MÉLANOMES MALINS. S. Nolet*, C. Pétorin*, I. Gorska-Flipot*, L. Lamarre*, M. Cadotte*, J. Cantin†, N. Provost‡ et L. Gaboury*. Département de pathologie*, Département de chirurgie† et Département de médecine‡, Hôtel-Dieu, Centre hospitalier de l'Université de Montréal, Montréal, Qué.

Le mélanome malin est un cancer à fort potentiel métastatique et son pronostic est directement lié à la présence de métastases. Nous avons utilisé les techniques de biologie moléculaire pour rechercher la présence de micro-métastases dans les ganglions sentinelles de patients atteints de mélanomes malins.

Les ganglions sentinelles de mélanome stade I et II sont analysés à double insu, la moitié en biologie moléculaire, l'autre moitié en immunohistochimie. La présence de tyrosinase est révélée par RT-PCR, couplée à un Southern Blot. Le résultat est corrélé aux données immunohistochimiques et comparé à d'autres facteurs pronostiques.

Cent quinze ganglions sentinelles provenant de 53 patients ont été analysés. Par immunohistochimie, on retrouve 8 ganglions positifs pour un total de 7 patients. La RT-PCR révèle 27 ganglions positifs chez 18 patients, soit 11 patients supplémentaires. Tous les ganglions positifs par immunohistochimie le sont aussi par RT-PCR.

La technique de RT-PCR permet de détecter de façon sensible et spécifique le transcrite de la tyrosinase dans les ganglions sentinelles. Le suivi de ces patients permettra de déterminer la signification clinique de cette constatation.

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REQUIREMENTS FOR RESIDENCY TRAINING IN GENERAL SURGERY: A SURVEY OF THE PRACTISING COMMUNITY. E.M. Webber, S. Chan, A.D. Forward. Department of Surgery, University of British Columbia, Vancouver, BC

In an effort to improve the education we provide the next generation of general surgery residents we sought the input of all practising general surgeons in British Columbia through a written survey. A questionnaire was sent to all 191 general, vascular and thoracic surgeons in the province for their perspectives on the appropriate locations for training, the type of experience and elements that they considered important, areas that had been deficient in their own residencies and new components that should be added. The surgeons were grouped by type and location of their practices into (1) large teaching hospitals (48 surgeons, 25%), (2) major urban hospitals (67 surgeons, 35%), (3) regional centre hospitals (44 surgeons, 23%) and (4) smaller

community hospitals (32 surgeons, 17%). Of the 191 surgeons surveyed, the overall response rate was 60%. The responses demonstrated a high concordance among the groups with several notable exceptions. All groups felt that the majority of training should be in the major teaching hospitals, but about 25% should be undertaken in regional and community hospitals. There was strong agreement that all elements of general surgery should be incorporated but less consensus about subspecialty rotations. Endoscopy and some laparoscopic skills were deemed essential. Most elements of the CanMeds2000 were considered important. Computer skills and linkages to other surgeons and academic sources were considered important skills for surgeons to obtain. The majority of surgeons use email and almost all have access to the Internet. There was strong support for streaming residents toward academic and clinical practices early in residency in order that subsequent training could be tailored toward the specific goals of each resident. The broadly based and enthusiastic responses to this questionnaire have provided valuable guidance and clear direction to us as we develop our program for training general surgeons for the new millennium.

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HOW MUCH DO PATIENTS WAIT FOR ELECTIVE GENERAL SURGERY? D. Olson, C.J. de Gara. University of Alberta, Edmonton, Alta.

Waiting times have become the expected (but possibly unacceptable) part of Canadian Health Care. Sound data are few, with the majority of published information based on questionnaire-type surveys.

This study aims to determine the extent and variance of waiting times amongst 3 designated elective general surgical procedures: (1) colon/rectal resection for colorectal carcinoma, (2) segmental resection or modified radical mastectomy for breast carcinoma and (3) cholecystectomy-open or laparoscopic for biliary colic/cholelithiasis.

The study was prospective and carried out at a single institution (Royal Alexandra Hospital — 519 beds). All elective cases for the 6-week period of Feb. 1 to Mar. 15, 1999, were included. The following data were obtained through surgeon's offices (11 surgeons): (T_1 = days from initial referral from GP to specialist, T_{2A} = days from initial visit with specialist to operation for patients requiring no further work-up, T_{2B} = days from initial visit with specialist to operation for patients requiring further work-up). Statistical method: one-way ANOVA was employed.

Ninety patients were identified, however 16 were excluded due to incomplete records. Data are presented for $n = 74$ patients.

	T_1 (days \pm SE)	T_{2A} (days \pm SE)	T_{2B} (days \pm SE)
No.	74	59	15
Cholecystectomy	28.4 \pm 5.3	55.2 \pm 10.5	78 \pm 0
Breast	10.9 \pm 1.9	13.1 \pm 1.6	54.9 \pm 19.5
Colorectal	16.7 \pm 3.4	15.0 \pm 2.6	34.0 \pm 12.4
<i>p</i> value	0.004	0.0001	0.5

We conclude that for standard general surgical procedures there is a significant waiting time. Further, there are significant differences between the waiting times for surgeries for different disease processes. Studies involving multiple sites, longer duration, and additional procedures are necessary to better evaluate these measures and to reduce confounding variables.

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SMALL-BOWEL OBSTRUCTION RESULTING FROM MALIGNANCY — AN 11-YEAR AUDIT. G. Miller, J. Boman, I. Shrier, P.H. Gordon. Division of Colorectal Surgery and Department of Epidemiology, Sir Mortimer B. Davis-Jewish General Hospital, McGill University, Montreal, Que.

Goals of the study were to determine the efficacy and long-term prognosis for operative versus nonoperative treatment of small-bowel obstruction (SBO) secondary to malignancy.

The medical records of all patients who presented to the Sir Mortimer B. Davis-Jewish General Hospital (Montreal, Canada) with SBO between 1986 and 1996 were reviewed. Patients with malignancy as the established etiology of their obstruction were selected for this review. This included 32 patients, accounting for 74 admissions. The number of patients in the series was too small for statistical analysis.

Colorectal and ovarian neoplasms were the leading primary malignancies that led to SBO. The median time between diagnosis of malignancy and SBO was 1.1 years. At their initial presentation, 80% of patients were treated by operation, but 47% of these patients had an initial trial of nonoperative treatment. Re-obstruction eventually occurred in 57% of operated cases compared with 72% of nonoperated cases. The median time to re-obstruction was 17 months for operated patients compared with 2.5 months for nonoperated patients. Also, 71% of patients were alive and symptom-free 30 days post-discharge from operative treatment compared with 52% post nonoperative treatment. Postoperative morbidity rate was 67%. Mortality rate was 13% with 94% of patients eventually dying from complications of their primary disease.

SBO secondary to malignancy usually indicates a grim prognosis. Operative treatment has better outcome than nonoperative management in terms of symptom-free interval and reobstruction rates. However, it is marked by high postoperative morbidity. We recommend that, after a short trial of N-G decompression, patients with obstruction secondary to malignancy be operated on if clinical factors indicate likelihood of surviving the operation.

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LUNG GROWTH AND STRUCTURAL DEVELOPMENT AFTER REVERSIBLE FETAL TRACHEAL OCCLUSION IN DIAPHRAGMATIC HERNIA. I. Bratu,* H. Flageole,* J.-M. Laberge,* S. Kay,* B. Piedboeuf.† *Department of Surgery, Montreal Children's Hospital, McGill University and †Department of Pediatrics, Centre hospitalier universitaire de Québec, Université Laval, Québec, Que.

Our objective is to analyse the effect of in-utero endoscopic fetal tracheal occlusion (TO) with or without release of tracheal occlusion (TR) before birth on the growth and structural maturity of the hypoplastic lung model in fetal lambs with a surgically created diaphragmatic hernia (DH). At 80 days' gestation, a left-sided DH is created in the fetal lamb. Endoscopic TO using a detachable balloon system is performed by fetal tracheoscopy at 108 days. TR is done either by ultrasound-guided percutaneous or endoscopic deflation of the fetal intratracheal balloon at 129 days. The ewe receives betamethasone at 135 days. At 136 days (term = 145 days), the fetus is delivered by cesarean section. Four groups are compared: DH ($n = 6$), DH + TO ($n = 6$), DH + TO + TR ($n = 6$), and controls that are normal unoperated twins ($n = 14$). The degree of lung structural maturity is determined at 100 \times magnification by the mean terminal bronchiole density (MTBD), which is inversely related to the number of alveoli supplied by each bronchiole. Results are compared using ANOVA with Duncan post-hoc testing.

	LW/BW, %		RLW/BW, %		LLW/BW, %		RLW/LLW		% increase RLG, LLG from DH	MTBD	
	Mean	(\pm SEM)	Mean	(\pm SEM)	Mean	(\pm SEM)	Mean	(\pm SEM)		Mean	(\pm SEM)
DH	1.23	(0.12)#	0.80	(0.11)#	0.43	(0.05)#	1.93	(0.26)	na	6.20	(0.49)#
DH + TO + TR	2.02	(0.26)#*	1.32	(0.15)#*	0.70	(0.12)#*	1.96	(0.15)	66, 63	2.79	(0.14)*
DH + TO	2.28	(0.39)#*	1.54	(0.24)*	0.74	(0.15)#*	2.18	(0.14)#	92, 71	2.50	(0.49)*
Control	2.97	(0.13)*	1.83	(0.08)*	1.14	(0.06)*	1.60	(0.02)	na	2.84	(0.16)*

= different from control ($p < 0.05$), * = different from DH ($p < 0.05$), LW = total lung weight, RLW = right lung weight, LLW = left lung weight, BW = body weight, RLG = right lung growth, LLG = left lung growth.

Both right and left lungs are severely affected, as evidenced by lung hypoplasia, in this animal model of DH. TO \pm TR partially normalizes the hypoplastic lungs of DH: it results in an accelerated and harmonious growth of both lungs despite the persistence of the DH at autopsy.

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TRANSDUCTION OF NEONATAL PORCINE ISLETS USING LIPOSOMAL, ADENOVIRAL AND RETROVIRAL VECTORS. K. Alibhai, G.S. Korbitt, A. Ghahary, J.F. Elliott, R.V. Rajotte, G.L. Warnock. Surgical-Medical Research Institute, University of Alberta, Edmonton, Alta.

Neonatal porcine islets have been advocated as a solution to the shortage of human islets as therapy for diabetes. However, islet transplantation will require strategies to prevent their rejection. Transforming Growth Factor beta (TGF- β_1) has been shown to suppress the host xenograft response and prolong graft survival. We used a liposomal, adenoviral and retroviral construct to introduce a gene encoding either green fluorescent protein (GFP) or TGF- β_1 into these islets. Neonatal pancreata were digested, purified into endocrine aggregates and dissociated into single cells. The liposomal group had controls treated with either GFP DNA, liposome, or both. The adenoviral group was treated with Hams F10 or 2.5xMOI adeno TGF- β_1 construct. The retroviral group was treated with Hams-F10, an empty vector, or the TGF- β_1 retroviral vector. All groups were then incubated for 24 hours except for the adenoviral group (1 hour), then washed with Hams-F10 and cultured for another 72 hours. Aliquots from the adenoviral and retroviral groups were analysed for TGF- β protein using ELISA and for bioactivity using the Mink Lung Assay. Im-

munochemical localization was sought using a specific antibody to TGF- β_1 . Cells in the liposomal group were assessed for fluorescence. Viability in all groups was tested by trypan blue exclusion and was approximately 65% to 72% for all.

	Adenoviral group		Retroviral group			Liposomal group		
	Hams-F10 ($n = 9$)	Adeno-TGF- β ($n = 9$)	Hams-F10 ($n = 7$)	Empty vector ($n = 2$)	TGF- β retrovirus ($n = 7$)	DNA ($n = 6$)	Liposome ($n = 6$)	GFP liposome ($n = 6$)
TGF- β conc (ng/mL)	8.5 \pm 2.5	407.5 \pm 17.2	0.07 \pm 0.05	0.33 \pm 0.03	1.31 \pm 0.78	—	—	—
TGF- β bioactivity (cpm)	3115 \pm 51.2	225 \pm 32.6	3825 \pm 65.5	2895 \pm 364	331.8 \pm 47.8	—	—	—
% cells positive for TGF- β	2.3	69.8	< 1	< 1	11.9	—	—	—
% cells fluorescent	—	—	—	—	—	n/a	n/a	n/a

We conclude that the adenoviral vector is 6 times more efficient at transducing neonatal porcine islets than a retroviral vector. However, both viral vectors are superior to a liposomal-based system.

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INDICATIONS FOR LIVER TRANSPLANTATION IN BRITISH COLUMBIA'S ABORIGINAL POPULATION. N.R. Caron, A.K. Buczkowski, C.H. Scudamore, S.W. Chung, E.M. Yoshida. Department of Medicine and Department of Surgery, University of British Columbia and BC Transplant Society, Vancouver, BC

Objectives: To study the indications for liver transplantation (LTx) among British Columbia's First Nations population to determine if any differences exist compared to the non-aboriginal population. **Methods:** A retrospective analysis (χ^2 and Fisher's exact tests) of the BC Transplant Society's database of aboriginal and non-aboriginal LTx recipients from 1989 to 1998. For primary biliary cirrhosis (PBC), the transplant assessment database (includes both transplanted and nontransplanted patients referred for assessment) was analysed using a binomial distribution and compared to published census data regarding British Columbia's proportion of aboriginals.

Results: Between 1989 and 1998, 203 transplants were performed in 189 recipients. Fifteen recipients were aboriginal ($n = 15$, 13.3%). Among all recipients, the 4 most frequent indications for LTx were: hepatitis C (HCV) ($n = 57$, 30.2%), PBC ($n = 34$, 18%), alcohol ($n = 22$, 11.2%) and autoimmune hepatitis ($n = 14$, 7.41%). Indications for LTx among aboriginals were: PBC ($n = 8$, 53.3%; $p > 0.001$ versus non-aboriginals), autoimmune hepatitis ($n = 4$, 26.67%; $p = 0.017$), acute failure ($n = 2$, 13.3%) and HCV ($n = 1$). Among all patients referred for LTx with PBC ($n = 43$), 29 (67.44%) were Caucasian, 11 were aboriginal (25.6%), 2 were Asian Indian and 1 was Chinese. Analysing the proportion of aboriginals referred for LTx to the proportion of aboriginals in British Columbia (139 655 or 3.8% of 3 698 755; 1996 census; Statistics Canada), a significant difference was found ($p < 0.001$).

Conclusions: Aboriginals in British Columbia are more likely to be referred for LTx with a diagnosis of PBC, which may suggest an increased risk. Aboriginals are less likely to be transplanted for HCV or alcohol compared to the non-aboriginal population.

(supported by a grant from Fujisawa-Canada Inc.)

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A RATIONALLY DESIGNED IMMUNOMODULATORY PEPTIDE ATTENUATES CHRONIC REJECTION IN A RAT RENAL ALLOGRAFT MODEL. N. Parry, R. Buelow,* J. Jiang, B. Garcia, S. Chakrabarti, R. Zhong. Multi-Organ Transplant Program, University of Western Ontario, London Health Sciences Center and J.P. Robarts Research Institute, London, Ont., and *SangStat Medical Corporation, Menlo Park, Calif.

Upregulation of hemeoxygenase-1 (HO-1) has been shown to be associated with long-term graft survival in various transplant models. Recently, a novel rationally designed immunomodulatory peptide (RDP1258) was shown to induce HO-1 expression in vivo. The present study was undertaken to determine whether peptide RDP1258 would attenuate the pathological changes seen in chronic renal allograft rejection. Orthotopic renal transplantations were performed using F344 (RT1^{lvi}) rats as donors and Lewis (RT1^l) rats as recipients. Recipients were treated briefly (10 days) with low dose cyclosporine (CsA, 0.75 mg/kg subcutaneously) to reverse the initial acute rejection. Animals that survived longer than 140 days demonstrated histologic evidence of chronic rejection characterized by vascular obliteration, tubular atrophy, glomerulosclerosis as well as interstitial and cortical fibrosis. Recipients were randomly allocated into 1 of 4 groups: (1) CsA alone ($n = 11$); (2) CsA + RDP1258, day 0 to 20 ($n = 10$); (3) CsA + RDP1258, day 50 to 70 ($n = 8$); and (4) CsA + RDP1258 day 100 to 120 ($n = 9$). Renal function was assessed by serum creatinine levels at day 140 and pathology was graded by 2 blinded pathologists. Survival rate longer than 140 days was 58.3%, 50%, 87.5% and 62.5% for groups 1 to 4 respectively. Mean serum creatinine levels were all within normal range (66.4 to 130.1 $\mu\text{mol/L}$). Grafts treated with CsA and RDP1258 from day 50 to 70 had a marked reduction in both intimal thickening as well as interstitial and cortical scarring compared with grafts treated with CsA alone.

Treatment (F344 → Lew)	Intimal thickening, %	Scarring, %
1. CsA alone	100	71.4
2. CsA + RDP1258* (POD 0–20)	60	80
3. CsA + RDP1258* (POD 50–70)	28.6†	28.6
4. CsA + RDP1258* (POD 100–120)	60	80

*RDP1258 2 mg/kg qod sc; † $p < 0.05$ v. group 1 (Fisher's exact)

Lew-Lew controls had 100% survival rate and had no histological evidence of chronic rejection. We conclude that peptide RDP1258 can inhibit transplant vasculopathy in rat renal allografts.

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ATTITUDE OF SURGEONS TOWARD BLOOD-BORNE PATHOGENS IN THE OPERATING ROOM. K.A. Harris, G.M. McCarthy, M.A. John, J.K. MacDonald. University of Western Ontario, London, Ont.

Introduction: Universal precautions (UP) have been recommended to reduce the transmission of blood-borne pathogens (BBP) to health care workers. The attitudes of surgeons and compliance with the use of UP in the high-risk environment of the operating room were investigated in a pilot survey.

Methods: A questionnaire that included items on UP, occupational health and attitudes related to BBP was developed, tested and mailed to all surgeons affiliated with a university centre. Two additional mailings were sent to nonrespondents.

Results: The response rate was 74% (54 of 73). The majority of respondents reported willingness to perform elective surgery on those with HBV or HCV (96%), HIV (90%) or AIDS (86%) and felt they had an ethical responsibility to care for patients with HIV (88%). Most surgeons reported immunization against HBV (86%); 4% reported natural immunity to HBV. Despite the fact that 56% of surgeons stated that they treat all patients as though they had HBV, HCV or HIV, 72% of surgeons reported they would take additional precautions for patients with known HIV positivity: These included the use of eye or face protection, double gloving and improved sharps technique. Although 90% of surgeons recalled injury(ies) in the last year, only 11% of these had reported these exposures to occupational health. Awareness of post-exposure protocols was low (57%) and knowledge of the infectivity of different BBPs following a needlestick injury varied (HIV, 71%; HBV, 60%; HCV 34% of respondents).

Discussion: Although the surgeons at the institution reported an obligation to care for patients regardless of the potential risk of exposure to BBP, more education related to UP and occupational health is required to reduce the potential for cross-infection. Better compliance with UP, knowledge of post-exposure protocols and appropriate follow-up after occupational exposures may increase the safety of patients, surgeons and their families.

Conclusions: Further investigation is required; however, these results indicate the need to institute additional simple, noninvasive precautions and teaching about BBP and UP for surgeons.

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VALIDATION OF NEW CRITERIA FOR PREDICTING MSH2 AND MLH1 MUTATIONS IN HIGH-RISK COLORECTAL CANCER (CRC) FAMILIES. L. Temple, R.S. McLeod, M. Aaronsen, L. Madlensky, B. Bapat, A. Millar, M. Rodriguez-Bigas, T. Pal, S. Narod, Z. Cohen. Mount Sinai Hospital, University of Toronto, Center for Research in Women's Health, Toronto, Ont., and Roswell Park Cancer Institute, Buffalo, New York, USA

Identification of families with a strong family history of CRC who would benefit from germline mismatch repair (MMR) gene mutations is an important aspect of genetic counselling. Recently, Wijen and colleagues (*N Engl J Med* 1998) proposed a 3-variable logistic model to calculate the likelihood that a high risk CRC family has an MSH2 or MLH1 mutation (MMR+).

The objective of this study was to determine whether the model could discriminate between MMR+ and MMR- in another cohort of patients.

Ninety-one families met the Mount Sinai Hospital Registry criteria (3 individuals with an extracolonic hereditary nonpolyposis

colorectal cancer related cancer, at least 1 with CRC within 2 successive generations, or any individual less than 35 years of age with CRC, or any individual with multiple HNPCC-related primaries). For each family, the predicted probability of being MMR+, the sensitivity and specificity of the model were calculated.

Overall 29% of the families (26 of 91) were MMR+. Thirty-nine (43%) of the families met the AC (33% [13 of 91] MMR+) and 58 (60%) had 1 or more endometrial cancers (26% [15 of 58] MMR+). The overall mean probability of having mutation within a family was 0.17 (SD 0.37) with no statistical significant difference between MMR+ (0.31, SD 0.31) and MMR- families (0.11, SD 0.47). Using predicted probabilities between 0.1 and 0.3 to test families, the sensitivity and specificity of the model varied from 77% to 54% and 43% to 71% respectively.

The proposed model by Wijen and colleagues was not able to discriminate between MMR+ and MMR- families in our cohort. In addition, given its sensitivity and specificity, the model may not be useful in identifying families who should undergo genetic testing.

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LIMITATIONS OF FAMILY CANCER ASSESSMENT AT INITIAL SURGICAL CONSULTATION. L. Ruo, J.G. Guillem, C. Cellini, J. Puig La-Calle, S. Quan, A. Cohen. Memorial Sloan-Kettering Cancer Center, New York, NY

Although important for the diagnosis of HNPCC, the accuracy of familial cancer assessment in the office setting has been questioned. The purpose of this study was to compare family cancer history assessment at initial surgical consultation to phone interviews and questionnaires in potential HNPCC patients. Office records on 125 patients diagnosed with CRC ≤ 40 years old were reviewed for documentation of family cancer history at the time of initial surgical consultation. Surviving patients or next of kin were interviewed by telephone in conjunction with detailed family history questionnaires. The K statistic was used to compare familial cancer ascertainment using these 2 distinct approaches.

In the office setting, a family cancer history was obtained in 78.4% of patients. Routine family history assessment failed to identify 7 of 11 individuals meeting Amsterdam criteria for HNPCC and 10 of 16 individuals meeting modified clinical criteria for HNPCC. At initial surgical consultation, 31.2% of the study population were identified as having no family cancer history. However, this decreased to 13.5% following phone interviews and questionnaires (K statistic 0.5). Although family cancer history is obtained in the majority of patients, there is a tendency to underestimate the extent of familial cancer risk. This is an important observation, which underscores the need for improved familial cancer risk assessment because individuals identified as high-risk for HNPCC require special consideration in terms of screening, surveillance and surgical options.

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MALIGNANT GASTROINTESTINAL STROMAL TUMOURS (M-GISTS): 52 CASES FROM A PROSPECTIVE DATABASE. J. Crosby, C. Catton, A. Davis, B. O'Sullivan, J. Couture, C. Swallow. University of Toronto Sarcoma Group, Toronto, Ont.

We reviewed the recent experience of a single tertiary care cancer centre to determine outcome and prognostic factors for M-GIST of stomach (ST), small intestine (SI) and large intestine (LI).

All patients (pts) with M-GIST referred from 1987 to 1995 (*n* = 52) were analysed for clinical and pathological data, treatment and outcome. Follow-up (F/U) visits to our sarcoma clinic continued regularly until death (*n* = 39). For pts alive at last F/U or dead of other causes (*n* = 15), median F/U was 66 months. Overall median F/U was 33 months. Time to recurrence and death are measured from date of original resection.

Thirty-one of 52 pts were male; all were symptomatic. Mean age at diagnosis was 56 years (range 36 to 76 years). Stage at diagnosis was: localized in 27%, locally advanced (invasion into adjacent organs or peritoneum) in 48%, perforated in 7.7%, diffuse (multiple primary lesions) in 7.7% and metastatic in 9.6%. All pts were resected; 39 had complete gross resection (CR). Local recurrence (LR) occurred in 22 of 39 pts at risk (median 17.5 months). Metastases occurred in 28 of 47 pts at risk (median 20.5 months). At last F/U, 13 pts were alive (4 disease-free, 9 with disease). Of 37 pts dead of M-GIST, 11 had LR only, 15 had metastases only, 11 had both.

Overall and disease-free 5-year survival (OS, DFS) were 37% and 17% (*n* = 52). There were no significant differences in OS and DFS by site, but ST and LI groups (gps) had limited numbers. There was a trend to increased survival for LI and decreased survival for ST gps (Table). In a univariate analysis for SI cases (*n* = 33), stage (*p* = 0.04) and CR (*p* = 0.0014) predicted for greater OS and DFS. Age, gender, tumour size, grade, and tumour spill were not prognostically significant overall or for any group.

Site	<i>n</i>	OS (mo)		DFS (mo)		SI group	<i>n</i>	OS (mo)		DFS (mo)	
		Mean	Med	Mean	Med			Mean	Med	Mean	Med
ST	10	41.9	35	18.5	4	Loc/loc adv	23	64	49	35.6	25
SI	33	56.1	35	29.3	18	Perforated	4	37	26	21	9
LI	9	64.1	63	40.3	21	Diff/mets	6	22.3	22	8.7	0

Although the majority of pts with M-GIST present with grossly resectable disease, about 90% relapse. Despite this, survival may be prolonged. M-GISTs in all sites do poorly, but STs appear to have shorter OS and DFS; LIs have longer OS. For SI, stage and CR were prognostically significant. Given the prolonged survival in pts with early-stage disease and CR, early identification of pts with M-GIST is important, and complete resection in the absence of metastases or sarcomatosis should be performed.

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DISSEMINATION OF MELANOMA CELLS WITHIN ELECTROCAUTERY PLUME. J.N. Fletcher, J.G. Des-Côteaux, D. Mew. Heritage Medical Research Building, University of Calgary, Calgary, Alta.

The purpose of this basic science study was to determine if viable melanoma cells are present in suspension within electrocautery plume. Electrocautery smoke may convey viable cells to the port site in laparoscopic cancer surgery.

Pellets of B16-FO melanoma cells were cauterized and the plume was collected into culture medium. In the first part of this study, the trypan blue assay was used to assess cell viability immediately after collection and 7 days later. A cautery current of 30 W was applied for 5 minutes. In part 2, the MTT (tetrazolium) viability assay was used to assess cell viability after cauterization of tumour pellets containing 2.5×10^7 cells/mL at 10, 20 and 30 W for 5 seconds. The MTT assay was selected for its high degree of precision in detection and quantification of living cells.

Although intact melanoma cells were identified with the trypan blue assay immediately after plume collection, no viable cells were seen at 7 days using this assay. In part 2, viable melanoma cells were present in the culture wells at 7 days post-cauterization. Lower fulguration currents exhibited a trend for higher yields: 2250 cells/well at 10 W, 2100 cells/well at 20 W and 1800 cells/well at 30 W.

Results of this study confirm that application of electrocautery to a pellet of melanoma cells releases these cells into the plume. These tumour cells are viable and can be grown in culture. This release of malignant cells may explain the appearance of port metastases at sites that are remote from the surgical dissection or that were never in direct contact with the tumour.

111 THE OPTIMAL DISTAL RESECTION MARGIN FOR ESOPHAGEAL CARCINOMA. A.G. Casson, S. Subramanian, S.J. Darnton, L. Hiller. Dalhousie University, Halifax, NS, and the Birmingham Heartlands Hospital and the University of Birmingham, Birmingham, UK

The aim of this study was to determine the optimal distal resection margin to achieve complete resection for esophageal cancer, particularly for esophageal adenocarcinoma. We examined microscopic tumour involvement at the distal resection margin of a consecutive 8-year series of esophageal carcinomas (squamous cell carcinoma [SCC], $n = 50$; primary esophageal adenocarcinoma [ADC], $n = 100$; and adenocarcinoma of the cardia, $n = 39$), judged to be completely resected. No patient received induction chemotherapy, and strict clinicopathologic criteria were used to define ADCs of primary esophageal origin.

The extent of distal resection (measured in fresh specimens) varied significantly ($p = 0.0001$, Kruskal-Wallis) between groups, with median values of 6.8 cm (range, 1.0 to 17.5 cm), 4.0 cm (range, 0.5 to 12.5 cm) and 1.5 cm (range, 0.5 to 8.5 cm) for SCC, ADC and cardia tumours, respectively. Microscopic tumour at a 3-cm distal resection margin was seen for 1 multifocal esophageal SCC. Positive distal margins were seen in 12% (12 of 100) ADCs (median 2 cm, range 0.5 to 4.5 cm; $p = 0.002$, Wilcoxon) and 28% (11 of 39) cardia tumours (median 1 cm, range 0.5 to 4.0 cm; $p = 0.02$, Wilcoxon). Although pathologic stage was shown to be the only significant predictor of overall survival (hazard ratio 1.8, 95% CI 1.2 to 2.6; $p = 0.007$), there was a trend toward reduced postoperative survival for patients with histologically positive distal resection margins (median 10.5 months versus 13.6 months if negative; $p = 0.17$).

We conclude (1) the extent of distal resection should be at least 5 cm for all esophageal tumours, including adenocarcinomas of the esophagus and cardia, to ensure microscopically negative resection margins; and (2) histologically negative distal resection margins were associated with a trend toward improved postoperative survival.

112 LONG-TERM MORBIDITY ASSOCIATED WITH LAPAROTOMY FOR ACUTE PANCREATITIS. J. Walker, W. Stephen. Dalhousie University, Halifax, NS

The objective of this study was to determine the long-term morbidity associated with complicated acute pancreatitis (AP). A retrospective chart review was performed from 1990 to 1998. The etiology of the AP was determined as was the indication for surgery and the number of laparotomies. The outcomes examined were (1) the development of diabetes mellitus (DM), (2) further hospitalizations related to their AP, (3) the use of narcotics, (4) the use of octreotide for pain control, (5) the use of enzyme supplements and (6) return to work.

Follow-up time ranged from 2 months to 4 years.

Four hundred and sixteen patients were admitted with AP. Twenty-one patients had laparotomies for complicated AP. Six patients died.

Of the 15 who survived, 10 of 15 (66%) developed DM, 4 of 15 (26%) used narcotics daily, 6 of 15 (40%) used octreotide, 3 of 15 (20%) required enzyme supplements, 8 of 15 (53%) had further hospitalizations and 1 of 4 who worked before their AP returned to work.

Morbidity related to laparotomy for complicated AP is high, particularly the development of DM and the lack of return to work.

113 USING OUTCOMES FOR PROACTIVE DECISIONS ABOUT "WHIPPLE TYPE" PANCREATECTOMY. A.J. Voitk. The Salvation Army Scarborough Grace Hospital, Toronto, Ont.

This paper describes proactive decision-making about "Whipple type" pancreatic resection, based on outcomes, in a 200 to 300-bed community hospital. Operative mortality was defined as death from any cause, either during the same hospitalization (including referral hospitals), regardless of duration, or within 30 days of surgery.

A surgical mishap caused a new chief of surgery to a review previous "Whipple type" pancreatetectomies at the hospital (Group 1). A high mortality rate was found. The main cause of death was sepsis from pancreatic anastomotic leak. Also, a second surgeon was not always present or was called without preparation. A proactive decision was made to establish a corrective protocol for future operations: the pancreatic anastomosis was to be eliminated by closing the resection margin and all operations were to be done with 2 prepared surgeons. Subsequent pancreatetectomies were monitored prospectively.

Over 10 years, 1988 to 1997 inclusive, 4 surgeons did 16 pancreatectomies with a 44% mortality rate. Individual surgeons did 2 to 6 operations with a 17% to 100% mortality. Average patient age was 67 years (47 to 78 years), 50% were males and average ASA classification was 2.4. Group 1 had 8 operations with 50% mortality. Introduction of the new protocol produced 5 resections without death (Group 2), followed by 3 operations with 100% mortality (Group 3).

	No.	Mortality, %	Reop, %	Operative time	ICU, d	LOS	% Transf	% node pos	5-yr survival
Group 1	8	50	43	388	8	30	25	86	0
Group 2	5	0	20	193	5	11	0	60	20
Group 3	3	100	33	238	na	na	67	100	na

A second active decision was now made to abandon these operations at this hospital. Patients requiring pancreatectomy were to be referred to centres with large volumes.

Surgeons, department heads and hospital administrators should make proactive, rather than reactive, treatment decisions. Accurate knowledge of outcomes is absolutely essential for such decisions. Our small numbers suggest that for best outcomes, "Whipple type" pancreatectomy should be concentrated to provide high volumes for a few surgeons and that the occasional pancreatectomist may risk a high mortality rate.

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EFFECT OF RECONSTRUCTIVE TECHNIQUE ON OUTCOME AFTER PANCREATICODUODENECTOMY. T.J. Butler, J.J. Doucet, D.B. Vair, V.C. McAlister. Department of Surgery, Dalhousie University, Halifax, NS

Despite improved survival, morbidity remains common after pancreaticoduodenectomy. To monitor this, we set up a registry for all patients undergoing this surgery from January 1998. Here we examine the effect of different surgical options on outcome.

The Whipple's Registry was reviewed for the first hospital stay, with respect to reconstructive technique and outcome measures which included: survival, length of stay, duration of nasogastric (NG) drainage and complications. Missing data were collected by chart review. Data were entered into a computerized database, given here as median and range, and analysed using χ^2 and Student's *t*-tests.

Thirty of 31 (97%) patients were discharged alive 17 (7 to 74) days after surgery. Complications were seen in 15 (48%). Pylorus preservation (18) did not alter outcome. Of the 20 patients who did not have prior cholecystectomy, 13 had their gallbladder removed. Cholecystectomy was not associated with a lower incidence of complications but with a longer hospital stay (18 versus 15 days; *p* = NS). The incidence of complications was greater (56% versus 38%; *p* = NS), NG drainage longer (10 versus 5 days; *p* < 0.002) and hospital stay longer (18 versus 12 days; *p* < 0.02) if the route of the biliary-pancreatic limb was retromesenteric as opposed to antemesenteric-retrocolic. Gastric reconstruction used the Billroth I (3); Billroth II (20) or Roux-en-Y (8) method. Billroth I patients had a short period of

NG drainage (4 days) and a short hospital stay (12 days). A retromesenteric route for the gastric limb was associated with a longer period of NG drainage (10 versus 6 days; *p* < 0.02) and a longer hospital stay (19 versus 13 days; *p* < 0.03) compared with the antecolic or retrocolic limb routes combined.

Early data from the registry suggest that the retromesenteric route for the reconstructive limb may be associated with slower recovery after pancreaticoduodenectomy. This needs to be verified by multivariate analysis, which will require greater patient numbers, and possibly by prospective comparative study.

115
IS CONVENTIONAL SURGICAL MANAGEMENT OF PRIMARY HYPERPARATHYROIDISM UNDULY MORBID? R. Cheifetz, L. Rotstein. Ontario Cancer Institute/Princess Margaret Hospital, University of Toronto, Toronto, Ont., and Vancouver General Hospital, University of British Columbia, Vancouver, BC

This study was designed to review the experience of a single surgeon in the conventional management of primary hyperparathyroidism. The intent was to assess the outcomes of surgery and the complication rate in a specialty practice.

A review of hospital and office records from January 1986 to August 1997 identified a total of 320 parathyroidectomies performed, of which 172 were first operations for primary hyperparathyroidism. The mean age was 57.6 years and 76.2% of patients were female. The standard procedure performed (97% of patients) was a bilateral neck exploration with removal of the abnormal gland(s) and biopsy of the others. All 4 glands were identified in only 56.4% of patients. The final pathology was consistent with a single adenoma in 91.3% of patients, hyperplasia in 4.4% and carcinomas in 1.9%. Postoperative hypocalcemia occurred in 70% of patients and was permanent in 2.9%. Recurrent laryngeal nerve injury was seen in 4.1% of patients with a permanent deficit in 1.2%. Wound infections and hematomas occurred in 7.6% and 1.7% respectively. The overall cure rate was 97%, with persistent hypercalcemia in 1.5% and cure after second surgery in 98.5%. The mean follow-up is 4 years and there has been a 2% recurrence rate.

In this series, primary hyperparathyroidism was highly curable with conventional bilateral exploration. The high incidence of hypocalcemia was, however, unacceptable, and that, in keeping with a 91.3% incidence of solitary adenoma, would argue for a less extensive operation, either bilateral exploration without multi-gland biopsy or, ideally, unilateral exploration based on accurate preoperative localization studies.

116
THE USE OF DIFFERENT SURGICAL STRATEGIES FOR EARLY BREAST CANCER IN ONTARIO AND THEIR INFLUENCE ON BREAST CONSERVATION. D.W. Petrik, D.R. McCready, V. Goel, S.P. Pinfold, C. Sawka. University of Toronto, Toronto, Ont.

The surgical strategy used for the treatment of early breast can-

cer can be either a 1-step procedure whereby the biopsy and definitive operation are done at the same time or a 2-step procedure in which the definitive operation is performed only after tissue diagnosis has been obtained from a biopsy done on a separate visit. The purpose of this study is to examine the patient, tumour, surgeon and hospital factors associated with these 2 different surgical strategies, as well as the effect this has on the operation performed (breast-conserving surgery [BCS] versus mastectomy).

A random sample of 938 node-negative breast cancer patients was drawn from the Ontario Cancer Registry and matched confidentially to 2 population registries (Canadian Institute of Health Information and Ontario Health Insurance Plan). The data on the final cohort of 643 patients included patient information, surgical procedures performed, tumour characteristics, and surgeon and hospital characteristics. The axillary lymph-node dissection (ALND) defined the definitive procedure, allowing identification of the 1-step group (ALND plus BCS or mastectomy in 1 operation) and the 2-step group (surgical biopsy followed at a later date by ALND plus BCS or mastectomy). Associations between the patient, tumour, surgeon and hospital factors and both surgical strategy and operation performed were studied.

A 1-step strategy was employed in 57% of patients. Those with palpable lesions were more likely to be treated in a 1-step manner (65% 1-step), while significantly more patients with nonpalpable lesions were treated in a 2-step manner (69% 2-step, $p < 0.001$). Factors associated with a 1-step procedure in patients with a palpable mass ($n = 504$) were: patient age > 50 , previous fine-needle aspiration (FNA) biopsy, tumour size > 1 cm, absence of extensive ductal carcinoma in situ (DCIS) and surgery in an academic setting. BCS was the planned treatment in 70% of patients and this did not differ between the 1-step and 2-step groups (69% versus 70% respectively, $p = 0.870$). However, palpable lesions, larger tumour size, extensive DCIS and centrally located or multifocal tumours, were associated with lower rates of breast conservation.

Surgical strategy differed between patients with palpable and nonpalpable lesions, consistent with current guidelines. The rate of BCS was independent of the surgical strategy employed and was associated with several accepted patient and tumour factors. This study shows that despite differences in the timing of the surgical decision, surgical treatment of early breast cancer appears to be based upon important patient and tumour factors.

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SENTINEL LYMPH-NODE BIOPSY IN BREAST CANCER: A PROSPECTIVE TRIAL. S.K. D'Amours, G.I. McGregor, N.L. Davis, U. Kuusk, D. Worsley, E. Germann. Department of Surgery and Department of Nuclear Medicine, University of British Columbia, Vancouver Hospital and Health Sciences Centre, Vancouver, BC

Axillary lymph-node dissection is an integral part of staging breast cancer but is associated with complications, including lymphedema, neuralgia and increased risk of infection. Sentinel lymph-node mapping and biopsy will theoretically reduce these

complications but may not provide adequate axillary staging. We conducted a validation study of sentinel lymph-node biopsy at a major Canadian university hospital. Our goals were to identify sentinel lymph nodes using 2 techniques and to document the accuracy of the procedure as compared to level I/II axillary lymph-node dissection.

Seventy women with breast cancer requiring axillary dissection were prospectively enrolled. Technetium-99m antimony trisulfide colloid and isosulfan blue dye injections were used to identify sentinel lymph nodes. Scintigraphy was completed on all patients. Sentinel lymph-node biopsy was performed using a hand-held gamma probe followed by complete level I/II axillary lymphadenectomy.

The overall sentinel lymph-node identification rate was 90.5%. Radiocolloid identified 85.5% of sentinel nodes and isosulfan blue dye identified only 46.6% of sentinel nodes. The sentinel lymph node was predictive of axillary status in 93.0% of patients. In 6 of 18 patients (33%) with metastatic nodal disease the sentinel lymph node was the only positive node.

In patients with breast cancer the sentinel lymph node can be predictive of axillary nodal metastases. The technique of localization can be difficult. Isosulfan blue dye does not appear to be an adequate stand-alone technique for sentinel lymph-node identification. A number of cases should be completed by each surgeon to adequately assess accuracy, false-negative rate and sensitivity. Further work should only be done within ongoing study protocols.

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THE RESULTS OF SENTINEL LYMPH-NODE BIOPSY IN BREAST CANCER. D.R. McCready, B. Youngson, N. Miller, K. Bukhanov, W. Hanna, B. Patterson, M. Ichise, M. Hershkop, G. Coady, I. Boxen. University of Toronto, Toronto, Ont.

Evaluation of the axilla is important for optimal management of the breast cancer patient, but the standard level I, II axillary dissection (AD), is associated with significant morbidity. Sentinel lymph-node biopsy (SLNB) is an important advance. This report documents the experience for our first 100 patients.

Eligible patients provided informed consent. Prior to definitive breast surgery, 1 mCi (37 mBq) per 6 to 8 mL of unfiltered Tc-99m sulfur colloid was infiltrated in 4 aliquots beside the breast cancer in 90 patients and 8 mL of patent blue dye was used in 18 (8 had both). Ultrasound guidance was used for nonpalpable lesions. The SLNB was performed 1 to 4 hours after Tc-99m injection in 93 patients; in 7 no hot spot or blue node could be found. Eighty patients had SLNB followed by level I, II AD, 13 refused AD. The sentinel nodes were evaluated by multiple sections using hematoxylin-eosin and immunohistochemical stains for low-molecular-weight keratin.

Of the 80 patients who had both SLNB and AD, 32 patients had at least 1 node positive for breast cancer metastasis on SLNB. No patient had a negative SLNB and a positive non-sentinel node. Thus, there were no false negatives in the cohort. The sensitivity, specificity, negative predictive value and accuracy were 100%. In 15 of 32 patients with positive nodes, only the sentinel

lymph node showed metastatic disease. One of 10 (10%) T1a cancers and 3 of 12 (25%) T1b cancers had positive nodes.

SLNB is an important advance that will impact the management of breast cancer. It should next be evaluated by randomized clinical trial.

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LAPAROSCOPIC VERSUS OPEN SPLENECTOMY: THE PATIENT'S PERSPECTIVE ONE YEAR LATER — A WILLINGNESS TO PAY STUDY. V.R. Tandan. Department of Surgery, St. Joseph's Hospital, Hamilton Health Sciences Centre, Hamilton, Ont.

The objective of this study was to determine the value and importance attributed to cosmetic results by patients undergoing splenectomy, laparoscopic versus open. This information is useful to ascertain whether a cosmetic outcome should be evaluated in studies that compare new minimally invasive approaches in major surgery to conventional "open" surgical approach.

A total of 36 patients who underwent an elective, open or laparoscopic splenectomy as a primary procedure, at least 1 year ago, participated in a telephone interview. The patients' indications for surgery included: immune thrombocytopenia (ITP), autoimmune hemolytic anemia, myeloproliferative disorders, lymphoproliferative disorders and hypersplenism with refractory cytopenias. The cases were matched for age and gender. Using a computer generated "willingness to pay" algorithm as a tool to generate monetary bids and random start points, information on the importance of the scar itself as well as the entire surgical experience was elicited from patients. The following questions were asked of patients: (1) Would you be willing to pay \$X to have the scar from your spleen surgery removed using a painless and risk-free procedure? (2) Based on the experience you had with having your spleen removed, if you were to require the same procedure again, would you be willing to pay \$X for a pill which would have the same effect with no pain or discomfort, no risk and no scar? \$X represents the current bid in the WTP bidding algorithm. The incomes of patients were recorded from Canadian census figures. Survey responses were calculated and examined for both questions to determine if there were differences between the open splenectomy (OS) group and the laparoscopic splenectomy (LS) group. Age, gender and income variables were also analysed.

The results indicate no correlation between willingness to pay and the variables of age, gender or income. In regard to the scar, 25% of LS group were willing to pay an average amount of \$11 000.00; no OS patients were willing to pay. In terms of the entire surgical experience, 75% of OS patients would pay an average of \$4966.66; 75% of OS patients were willing to pay an average of \$8940.00. In conclusion, patients seemed to fulfil their own preconceived expectations of the surgical scar as well as the entire surgical experience.

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THE ROLE OF COMPLETION THYROIDECTOMY IN CANCER CONTROL. D. Mozeq, I.B. Rosen. Department of Surgery, Mount Sinai Hospital, University of Toronto,

Toronto, Ont.

Two hundred and seventy-four patients underwent thyroidectomy (THX) for cancer from 1995 to 1998, and 50 (18%) required completion THX after benign rapid section diagnosis — 13 in 1996, 25 in 1997, 12 in 1998. In the 1995 to 1997 group, there were 30 females and 8 males under 40 in 14, over 40 in 24. Age ranged from 25 to 78 years with a mean of 45. Pathology showed papillary 30 (multicentricity 11), Hurthle cell 5, anaplastic 1, follicular 2, medullary 1. Completion delay was less than 2 months 24, 3 months 8, more than 1 year 3. FNAB was cellular 17, atypical 4, colloid 2, thyroiditis 1, inadequate 8, benign 1, cancer 4, Hurthle 1. Sensitivity was 70%, specificity 76%. Rapid section showed follicular lesion 21, thyroiditis 2, colloid 5, cancer 4, cyst 1, adenoma 3, benign 2. Paraffin change was due to "paraffin" histology 28, immunohistochemistry 17, clinical recurrence 3, surgeon referral 3, + calcitonin stain 1. Contralateral lesions showed cancer 13 (36%), normal 7 (9%), thyroiditis 5, colloid 11, adenoma 2, for gland lesions in 31 (82%). Four jugular and 5 central positive nodes were also recovered. There was no morbidity or mortality. Postoperative RAI was given in 31. Tumour size varied from less than 1 cm to 8 cm, with less than 3 cm in 40% (60% developed contralateral cancer) and more than 3 cm in 60 (19% developed contralateral cancer). Contralateral cancer had no special relation to multicentricity.

Completion thyroidectomy is safe, effective, but should be best avoided by liberal indication of near-total thyroidectomy for cellular lesions.

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NEOINTIMAL CELL ORIGIN IN ALLOGRAFT ARTERIOSCLEROSIS. P. Johnson, M. Carpenter, G. Hirsch, T. Lee. Department of Surgery, Dalhousie University, Halifax, NS

Chronic rejection of heart transplants (liver, kidney, heart and lung) is characterized by progressive arterial occlusion by an atherosclerotic lesion (allograft arteriosclerosis — AAS). Controversy surrounds the origin (donor versus recipient) of the cells that form this intimal lesion. To determine neointimal cell origin, we have developed an in situ pcr differentiation scheme based on a variable region of the rat MHC 1 RT1.A allele.

Transplantation of aortic interposition grafts from Brown Norway (BN) to Lewis (Lew) rats results in rapid and extensive AAS. DNA isolated from splenic lymphocytes of each rat strain was used to examine the RT1.A allele of the MHC gene, using pcr and direct amplicon sequencing.

Sequence analysis has revealed a means of differentiating donor versus recipient cells through a genetic variable region. A 600 bp amplicon, coding for amino acids of the rat MHC class one molecule, contains a 10-bp segment with 7 mismatches between strains. The variable regions have been successfully amplified with pcr using archival DNA isolated from splenocytes and formalin-fixed, paraffin-embedded aortic tissue from both strains. We have generated fluorescein-labelled oligonucleotide probes for the BN and Lew variable regions, and established their specificity through Southern blotting and hybridization.

We have developed an in situ pcr technique and have demonstrated nonspecific amplification of RT1.A allele sequences.

Sequence differences at the RT1.A allele of the MHC gene allow for in vitro differentiation of donor and recipient cells, in situ differentiation is currently being tested. Identification of unique DNA sequences through in situ pcr will allow us to determine neointimal cell origin in this rat model and is a methodology easily transferrable to human archival tissue.

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COLOVESICAL FISTULA: A RETROSPECTIVE REVIEW AT A CANADIAN REGIONAL HOSPITAL. S. Dutta, W. Stephen. Dalhousie University, Halifax, NS

We analysed our experience with colovesical fistula (CVF) with regard to investigative approach, preoperative diagnostic accuracy, surgical management and mortality. Comparison to the previous literature has revealed some interesting trends.

A 7-year retrospective chart review of all patients at Saint John Regional Hospital in Saint John, New Brunswick, with a chart diagnosis of CVF was carried out. Parameters analysed included presentation, past medical history, investigations, management, etiology and mortality. A total of 37 patients were identified who met the criteria for review.

Patients most commonly presented with pneumaturia, fecaluria and hematuria. Cystoscopy was performed in 27 patients, barium enema in 19, flexible sigmoidoscopy (FS) in 16, intravenous pyelography (IVP) in 8, and cystogram in 5. Abnormalities were seen in 86% of cystoscopies, 84% of barium enemas, 44% of FSs, 75% of IVPs and 40% of cystograms. A resection + primary anastomosis was performed on 16 (44%) patients, resection + anastomosis + proximal diversion in 1 (3%), a Hartmann's procedure in 10 (27%) and a colostomy alone in 2 (8%). Eight (22%) patients were managed nonoperatively. Etiologic diagnosis at presentation was diverticulitis in 15 patients — 14 went to operation of whom 13 were confirmed to have diverticulitis and 1 was found to have colon cancer. Colon cancer was suspected in 7 patients — 6 went to operation of whom 5 were confirmed to have colon cancer and 1 was found to have non-Hodgkin's lymphoma. Crohn's disease was suspected in 5 patients and all were confirmed at operation. Of the 10 patients in whom no etiologic diagnosis was given at presentation, 4 were operated on of whom 3 turned out to have diverticulitis and 1 Crohn's disease. Four of the 37 patients died while on the surgery service. Two of these patients had not been operated on.

Colovesical fistula continues to be a diagnostic and therapeutic challenge. It most commonly manifests with pneumaturia, fecaluria and hematuria. An effective investigative strategy involves the concurrent use of barium enema, cystoscopy and flexible sigmoidoscopy, which can accurately distinguish benign from malignant disease in the majority of cases. If the underlying pathology is uncertain preoperatively, it is generally safe to plan an operation for benign disease. An operative approach utilizing resection plus primary anastomosis is safe and justifiable in most cases.

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RE-ESTABLISHING THE ROLE OF DIRECTED ULTRASOUND IN THE DIAGNOSIS AND MANAGEMENT OF ACUTE APPENDICITIS. C. Simone, D. Torbiak. Department of Medical Imaging, St. Joseph's Hospital, McMaster University, Hamilton, Ont.

Acute appendicitis (AA) is frequently a difficult diagnosis to make. Clinicians will often rely on diagnostic imaging to support their clinical assessment. We studied the diagnostic accuracy and clinical impact of directed ultrasound (DUS) retrospectively in 100 consecutive patients who underwent appendectomy and prospectively in 50 patients who underwent DUS for possible AA. The first group of patients were collected via a chart review of 100 consecutive patients who underwent appendectomy in our centre from July 1997 and December 1997. Sixty-one patients (61%) underwent preoperative DUS with the rest proceeding directly to the operating room (OR). Of the 61 patients who had DUS, 54 (89%) had findings consistent with AA, all of which were confirmed with surgical pathology. The remaining 7 patients had no signs suggestive of AA on DUS but still proceeded to the operating room. One of the 7 had pathology showing AA yet the remaining 6 were normal appendixes. The second group of patients were collected prospectively starting January 1998. All patients who came to radiology for DUS for possible AA were followed. Of the 50 patients, 28 (56%) had DUS findings suggestive of AA. Twenty-four (86%) proceeded to the operating room with all 24 having positive pathology. The remaining 4 patients improved clinically and were discharged home. They were assumed not to have AA. Of the 22 patients with negative ultrasound, 6 proceeded to the operating room, and 4 of the 6 (67%) had pathology suggestive of AA. The sensitivity of DUS for possible AA at our centre is 86% and the specificity is 91%. Therefore, DUS is a useful and accurate diagnostic tool to aid in the diagnosis of AA. We feel this is important data to emphasize given the growing amount of literature in support of CT imaging for the diagnosis of AA. Further work is required in comparing ultrasound to CT in the management of AA in an academic centre.

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INTRAOPERATIVE PROPHYLAXIS AGAINST POST-PNEUMONECTOMY EMPYEMA. C. Simone J.D. Miller. Division of Thoracic Surgery, St. Joseph's Hospital, McMaster University, Hamilton, Ont.

Empyema is a dreaded complication following pneumonectomy which carries with it a high mortality and significant long-term morbidity. Approximately 25% of empyemas are iatrogenic and post-surgical in etiology. There have been no studies to investigate the effectiveness of various intraoperative practices used to reduce the incidence of post-pneumonectomy infection. This retrospective chart review was carried out to assess the effectiveness of intraoperative prophylaxis against postsurgical empyema in patients undergoing pneumonectomy. Intraoperative prophylaxis included the instillation of 1 L of saline solution containing 5 000 000 units of penicillin G, 50 000 units of baci-

tracin and 60 mg of gentamicin into the hemithorax prior to the approximation of the intercostal space. The solution remained in situ and the chest was closed without draining the antibiotic solution. We identified a total of 93 patients who underwent pneumonectomy between January 1992 and January 1996. Patients who underwent thoracotomy with known preoperative infection were excluded. All patients received 1 dose of preoperative systemic antibiotics as well as postoperative systemic antibiotics as per protocol for routine perioperative antibiotic prophylaxis against surgical infection. Patients in Group A ($n = 42$) received no further intraoperative prophylaxis against postsurgical infection. The patients in Group B ($n = 51$) received the intraoperative irrigation with the antiseptic solution. The incidences of postsurgical empyema between the 2 groups were compared (Yates' corrected χ^2). Group A had no postoperative infections, while 6 (14.3%) of the patients in Group B suffered postsurgical empyema thoracis ($p = 0.018$). There is strong suggestive evidence from this retrospective analysis that intraoperative irrigation of the hemithorax with antiseptic solution in pneumonectomy patients will decrease the incidence of postoperative empyema. Further investigation into intraoperative prophylaxis against postsurgical infection is therefore warranted.

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AIRWAY STENTING FOR THE TREATMENT OF MASSIVE HEMOPTYSIS. C. Simone, E. Spratt, M. Yaman. Division of Thoracic Surgery, St. Joseph's Health Centre, Toronto, Ont.

The treatment of massive hemoptysis has always been a difficult clinical problem. We report here a very difficult clinical situation and a novel approach to its management.

A 63-year-old female smoker presents with blood-streaked sputum and weight loss. Imaging reveals a right lung upper lobe lesion suggestive of a bronchogenic carcinoma. Preoperative pulmonary function testing showed the patient to suffer from severe obstructive pulmonary disease with an FEV₁ of 0.56 L (32% of predicted) which increased to 0.69 L (40% of predicted) with bronchodilators. The patient underwent a right thoracotomy for a sleeve resection of the right upper lobe with postoperative pathology confirming moderately differentiated squamous cell carcinoma. The patient was discharged home after an uneventful postoperative course. One month postoperatively the patient presented to the Emergency Room with a single episode of massive hemoptysis. No focus was identified. The patient had 5 more episodes, all of which resulted in significant changes in hemoglobin, all over the course of 1 month. All investigations failed to provide a focus. The patient underwent emergency right bronchial arteriography but failed to show convincingly a source of bleeding. The last episode of hemoptysis was associated with syncope and the patient was therefore brought to the operating room. Flexible bronchoscopy revealed bleeding at the old anastomotic site. Using rigid bronchoscopy a 10-mm diameter \times 20-mm long endobronchial stent was inserted and, with the intent to tamponade the site of bleeding,

was deployed across the anastomosis. The patient tolerated the procedure well and at 10 months follow-up had no further episodes of hemoptysis and continues not to require home oxygen. This case presents a novel and successful approach to massive hemoptysis and therefore warrants further study.

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A SIMPLIFIED LAPAROSCOPIC APPROACH TO SECOND-LOOK LAPAROTOMY. J. Mamazza, P.A. Seshadri, E.C. Poulin, C.M. Schlachta. University of Toronto Centre for Minimally Invasive Surgery, St. Michael's Hospital, Toronto, Ont.

This poster describes the laparoscopic surgical technique for second-look surgery. Its objective is to present our minimally invasive approach for the diagnosis and treatment of ongoing postoperative mesenteric ischemia.

We present our technique and illustrate it with a case report. An 84-year old woman presented with diffuse abdominal pain and at laparotomy was found to have multiple patches of necrotic bowel located between the last 10 cm of ileum and the mid-ascending colon. She had a right hemicolectomy with a primary anastomosis. Thirty-six hours later she was returned to the operating room for laparoscopic re-examination under general anesthesia. The abdominal contents and anastomosis were intact.

Our laparoscopic technique involves the placement of a plastic laparoscopic cannula sleeve at the superior aspect of the wound. The rectus fascia is closed around the port while the skin may be left open or closed depending on the degree of abdominal contamination. A sterile gauze abdominal dressing is secured over the trocar sleeve for protection. At a later time the abdomen is quickly reinsufflated, and a 15 mm Hg CO₂ pneumoperitoneum is created using the cannula insufflation port. A 30° laparoscope is placed into the abdomen and the abdominal contents are examined with or without the assistance of other 5-mm ports, placed under direct vision. The anastomosis, small and large bowels are examined sequentially using the ileocecal valve as a reference point. Care is taken not to perforate the intestine by using atraumatic graspers and by taking full-thickness grabs on the antimesenteric border. If there is any question regarding intestinal viability or sepsis, the previous laparotomy incision can be reopened.

A review of the literature reveals that to date, 19 laparoscopic second-look procedures have been reported, preventing 13 (68%) unnecessary laparotomies. Advantages to this procedure include reduced operative times and the elimination of first trocar injuries.

Second-look laparoscopy has been shown repeatedly to be a safe alternative to laparotomy. Where second-look laparotomy has an established role, we believe that management can be simplified by the use of laparoscopy. It is simple and reduces negative second-look laparotomy in critically ill patients.

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TECHNIQUE FOR LAPAROSCOPIC PARTIAL SPLENECTOMY. E.C. Poulin, P.A. Seshadri, J. Mamazza,

C.M. Schlachta. University of Toronto Centre for Minimally Invasive Surgery, St. Michael's Hospital, Toronto, Ont.

This poster describes the laparoscopic surgical technique for partial splenectomy. Its objective is to develop a minimally invasive technique facilitating splenic conservation whenever possible. A significant trend has emerged in favour of preserving splenic tissue and function to decrease the risk of postsplenectomy sepsis. Strategies for splenic preservation have included nonoperative management in splenic trauma, cyst decapsulation in non-neoplastic cysts, partial splenic embolization, autologous splenic transplant and partial splenectomy.

A case report describing the technique of laparoscopic partial splenectomy for an undiagnosed splenic lesion is presented. Under general anesthesia, the patient was placed in the right lateral decubitus position, with the kidney bolster up and the table flexed. Three 12-mm trocars and a single 5-mm cannula were used. Initially, the splenicocolic and phrenosplenic ligaments were partially incised using electrocautery, and then branches of the gastroepiploic vessels to the lower pole were clipped and subsequently divided. The splenic hilum was carefully dissected, revealing a magistral type of blood supply. A penultimate branch of the inferior polar splenic artery was taken, creating a clear line of demarcation, involving the lower 40% of the spleen. Standard monopolar electrocautery then was used to transect the spleen, ensuring that a 5-mm rim of devascularized splenic tissue remained in situ. The specimen was removed in one piece through a wound protector after a 12-mm port site was enlarged to 2 cm and used as the extraction incision. Estimated blood loss and total operative time were 200 mL and 200 minutes, respectively. The patient was discharged on the second postoperative day using only nonsteroidal anti-inflammatory drugs for pain relief. Pathology confirmed the removal of a benign $2 \times 2 \times 1$ cm lesion, demonstrating reactive hyperplasia with focal fibrous exudate and fibrosis consistent with an organizing infarct.

A thorough understanding of splenic anatomy permits laparoscopic partial splenectomy by ligating penultimate vessels close to the spleen. Partial splenectomy can be carried out safely, easily and laparoscopically. It is superior to its open counterpart because of a short hospital stay, minimal pain, excellent cosmesis, and most importantly a decreased risk of postsplenectomy sepsis.

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RETROVIRAL-MEDIATED TRANSDUCTION OF HUMAN MELANOMA CELLS WITH CD154. E. Solano, A.L. Gainer, I.F. Parney, J.F. Elliott, K.C. Petruk. The University of Alberta, Edmonton, Alta.

The interaction between CD40, found on antigen presenting cells, and its ligand CD154, normally found on T-helper cells, is believed to be one of the key interactions in potentiating a cell-mediated immune response. A vaccine consisting of CD154-bearing human melanoma cells may upregulate the immune response against in situ melanoma.

The gene for CD154 was cloned from Jurkat cell mRNA using standard RT-PCR techniques and then subcloned into a

mammalian expression vector under the human CMV intermediate/early promoter and a replication incompetent retroviral vector under the LTR promoter. CD154 was introduced into COS cells using chemical transfection methods. Standard retroviral techniques were used to transfer CD154 into 2 human melanoma cell lines and 2 human melanoma early passage explants. Expression was confirmed by immunohistochemistry, immunofluorescence and/or flow cytometry.

Constitutive expression of CD154 was not detected on either COS or melanoma cells. Expression of CD154 on transfected COS cells was low (less than 10%) by all detection methods. In contrast, the established melanoma cell lines transduced with CD154 expressed high levels of CD154 (more than 50%), while the early passage explants expressed lower levels (less than 20%).

We conclude that while constitutive expression of CD154 in the melanoma cells tested was non-detectable, it is possible to generate expression in human melanoma cells. Not surprisingly, the transduced established lines expressed higher levels than the transduced patient explant cultures. The introduction of CD154 to melanoma cells by retroviral transduction appears promising for use as a cancer vaccine.

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PROLONGED SURVIVAL OF HUMAN HEPATOCYTES XENOGRAFTED INTO IMMUNODEFICIENT MICE: A NEW MODEL FOR HUMAN VIRAL STUDIES. D.F. Mercer, T.A. Churchill, M.A. Craig, J.F. Elliott, N.M. Kneteman. Surgical Medical Research Institute, University of Alberta, Edmonton, Alta.

Direct study of human viral hepatitis is restricted by lack of an accepted model of functioning human hepatocytes. Replication in culture systems is inconsistent, and as viruses are largely species-specific investigators are limited to surrogate animal models. Our objective was to develop a small animal model of functioning human hepatocytes for study of human hepatotropic viruses.

Human liver samples obtained at laparotomy were processed by 2-step collagenase perfusion with purification by density-gradient centrifugation. Recipient mice were anesthetized, and approximately 5×10^6 human hepatocytes were transplanted into the inferior pole of the spleen. To explore effects of partial hepatectomy on graft longevity, a 50% partial hepatectomy was performed immediately prior to transplantation on a second group of mice ($n = 8$). Graft survival was assessed initially by detection of fluorescently-labelled human cells in sections of recipient mouse liver. Additionally, a novel technique for immunodetection of human albumin production was developed, to allow for serial monitoring of differentiated graft function.

Mean yield of human hepatocytes was $2.1 \times 10^8 \pm 0.36 \times 10^8$ with a final viability of $87.3 \pm 1.2\%$ as assessed by trypan blue exclusion. Compared with standard transplantation, partial hepatectomy doubled graft survival to 6 weeks ($p < 0.05$), with survival up to 12 weeks in some cases. Transplanted human hepatocytes were seen to translocate to the liver, and reform cords of human hepatocytes within murine liver parenchyma. Immun-

odetection was shown to be a sensitive and reproducible method for the monitoring of human hepatocyte graft function.

By isolating and transplanting normal human hepatocytes into immunodeficient mice along with partial hepatectomy, survival of human cells up to 12 weeks was demonstrated. This model may be employed to allow direct study of human hepatitis viruses, hastening the time to development of effective cures.

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L'ÉCHOGRAPHIE ABDOMINALE EST-ELLE UTILE DANS L'APPENDICITE AIGUE? J.R. Houle, S. Dubé, Y. Leclerc, N. Gougeon, F. Heyen. *Service de chirurgie générale, Hôpital Maisonneuve-Rosemont, Université de Montréal, Montréal, Qué.*

Un faible taux d'appendice blanc est associé à un plus grand nombre de perforations, selon un paradigme chirurgical. L'échographie s'établit comme un moyen pour aider le chirurgien à poser correctement un diagnostic plus précoce et précis.

Les objectifs sont : 1) mesurer nos taux d'appendice blanc et de perforation appendiculaire et 2) évaluer l'impact de l'utilisation accrue de l'échographie.

Une étude rétrospective de 317 patients : Groupe A, 160 patients (1990 à 1991) Groupe B, 157 patients (1994 à 1995) est présentée. On note un taux d'appendice blanc de 3 % et de perforation de 48 % dans le Gr A et des taux respectifs de 2 % et de 32 % dans le Gr B ($p < 0,003$). Entre ces périodes, il y a eu augmentation du nombre d'échographies préopératoires 19 % Gr A à 46 % Gr B ($p < 0,0001$) avec un nombre de diagnostics positifs à la hausse Gr A 48, % Gr B 69 % ($p = 0,05$). On note que le délai entre le début des symptômes et la présentation à l'urgence était de 21,8 (appendicite aiguë) contre 39,0 (péritonite) ($p < 0,0001$) mais ce délai est demeuré stable entre le Gr A (31,1 h) et le Gr B (31,4 h). Le délai entre l'arrivée à l'urgence et la salle d'opération n'est pas différent entre les groupes (0,674 contre 0,636). Une différence significative a pu être démontrée entre le diagnostic et la durée d'hospitalisation (3,64 contre 8,93) et les complications associées (0,03 contre 0,28 complications/cas) ($p < 0,0001$). Deux facteurs favorisent le diagnostic d'appendicite aiguë simple : un délai plus court pré-admission ($p = 0,01$) et une échographie ($p = 0,01$).

L'échographie est un ajout utile dans la conduite thérapeutique.

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OPEN OR CLOSED DIAGNOSTIC PERITONEAL LAVAGE FOR ABDOMINAL TRAUMA? A META-ANALYSIS. N.F. Hodgson, T.C. Stewart, M.J. Girotti. *Department of Surgery and the Trauma Program, London Health Sciences Centre, University of Western Ontario, London, Ont.*

The objective of this study was to perform a meta-analysis of prospective, randomized controlled trials (RCT) comparing the closed and open techniques of diagnostic peritoneal lavage (DPL) in trauma patients to determine if there are any differ-

ences in outcomes.

Data for meta-analysis were identified through the MEDLINE database, Cochrane Library, as well as a manual search for RCT of DPLs in trauma patients. Seven RCTs, including a total of 1126 patients were identified that compared closed versus open technique. Two reviewers assessed the trials independently. Trial quality was critically appraised using the Jadad instrument, a validated published quality scale. Data extraction of major and minor complications, technical failures and difficulties, false-negative and false-positive rates was carried out. Mean procedure time was also analysed. Major complications, the primary outcome measured, was defined as any vascular, viscus or solid organ injury. Homogeneity was confirmed using the χ^2 test for heterogeneity. The Mantel-Haenszel fixed effects method was used in combining dichotomous outcomes. The Peto Odds Ratio (OR), weighted mean differences and 95% confidence intervals (CI) were calculated.

The overall quality of studies was poor. Major complications did not differ significantly between closed versus open technique (OR 0.65, 95% CI 0.15 to 2.92). Technical difficulties and failures were significantly higher in the closed group, OR 4.60, 95% CI 3.03 to 6.99 and OR 4.33, 95% CI 1.96 to 9.56, respectively. Accuracy of the closed and open DPL was comparable with no difference in false-negative or false-positive rates between the 2 techniques. Procedure time was lower in the closed technique.

The advantage of reduced time to perform the closed DPL is offset by the increased technical difficulties and failures of this group. Therefore, any significant benefit of routine closed DPL in improving outcomes can be excluded with more confidence based on pooled data than by the individual trials alone. A large, well-designed, randomized, controlled trial would help lead to a definitive conclusion of this debate.

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POSTMORTEM EXAMINATIONS AND DEATH CERTIFICATION IN BLUNT TRAUMA FATALITIES: WHAT ARE WE MISSING? N.F. Hodgson, T.C. Stewart, M.J. Girotti. *Department of Surgery and the Trauma Program, London Health Sciences Centre, University of Western Ontario, London, Ont.*

Postmortem reports and death certificates are valuable sources of information for patient care initiatives, designing health care promotion and injury prevention programs, as well as guiding the allocation of resources for clinical, research and trauma system development. Their accuracy is essential. The objectives of this study were: (1) to determine the frequency, body region, and severity of injuries missed by the clinical team; and (2) to examine the accuracy of the cause of death as recorded on death certificates.

A retrospective review was undertaken to assess blunt traumatic deaths at the London Health Sciences Centre from Apr. 1, 1991, to Mar. 31, 1997. Clinically significant missed injuries were identified manually by comparing the injury list of patients in the "Chart Alone" group with more detailed injury lists from

the autopsies of the patients in the "Chart + PostMortem" group. The cause of death was determined based on the chart and autopsy.

Of 108 nonpenetrating traumatic deaths, 72% were male with a median age of 39 years (range 2 to 90 years). The most common cause of death was neurologic (27%), followed by sepsis (17%) and hemorrhage (15%). There was disagreement with the treating physicians in 40% of cases and with the coroner in 7% of cases with respect to the causes of death listed on the death certificate. Seventy-seven clinically significant injuries were missed in 51 of the 108 patient deaths studied (47%). The proportion of patients with missed injuries was 29% for the in-hospital deaths and 100% in the ER deaths subgroup. Abdominal and head injuries accounted for 46% and 48% of missed injuries, respectively.

This study confirms the fact that the information contained on the death certificate can be misleading. Health care planners utilizing this data may draw inaccurate conclusions regarding causes of death, which may impact decisions on trauma system development. Our results also indicate that missed injuries continue to be a concern in the management of the major blunt trauma patient. This study reaffirms the role of the general surgeon and highlights the need for additional, more broadly trained surgeons in the management of the multiply injured patient.

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PATIENT-CENTRED OUTCOMES OF LAPAROSCOPIC NISSEN FUNDOPLICATION FOR GASTROESOPHAGEAL REFLUX DISEASE. L.S. Feldman, S. Mayrand, M. Antoniuk, G.M. Fried. Section of Videoendoscopic Surgery and Division of Gastroenterology, McGill University, Montreal, Que.

As gastroesophageal reflux disease (GERD) is a quality-of-life problem, the goal of laparoscopic Nissen fundoplication (LNF) should be to enhance patient-based outcomes while minimizing morbidity. We prospectively evaluated 39 consecutive patients undergoing LNF for GERD to assess patient-centred outcomes of the procedure.

Between Jan. 9, 1995, and Mar. 8, 1999, 39 patients underwent LNF for GERD and were entered into a computerized database. All patients underwent preoperative endoscopy, manometry and 24-hour pH testing. Thirty-six patients were further evaluated with a disease-specific quality-of-life (qol) scale, scored from 0 (no symptoms) to 45 (incapacitating symptoms). Patient satisfaction was also assessed. Postoperatively, qol and satisfaction were reassessed at 3 and 6 months. After 3 months, patients were asked to undergo repeat manometry and pH testing.

LNF was completed laparoscopically in all 39 patients. The mean \pm SD operating time was 131 ± 37 minutes. The postoperative stay was 2.7 ± 1 days. Five intraoperative complications were treated laparoscopically. Serious postoperative complications included pneumonia (2), asthma exacerbation (1), incisional hernia (1) and acute paraesophageal hernia (1). At 3 months, 26 of 34 patients (77%) completed the qol scale, while 21 of 29 (72%) completed the scale at 6 months. Nineteen pa-

tients underwent postoperative manometry and/or pH study (56%). The qol score improved from 21.3 ± 8.6 preop to 1.7 ± 4.6 at 6 months ($p < 0.0001$). The LES pressure rose from 7.7 ± 4 preop to 17.4 ± 7 mm Hg postop ($p < 0.0001$). The % pH less than 4 in 24 hours declined from 14.7 ± 11.7 preop to 2 ± 2.5 postop ($p < 0.0001$). Heartburn symptoms have recurred in 2 patients (5%). While only 2.8% of patients were satisfied with the treatment of their GERD preop, 92.3% were satisfied at 3 months postop, and 90.5% at 6 months postop ($p < 0.0001$). In conclusion, LNF for GERD is safe and effective, and results in striking improvement in quality of life and patient satisfaction.

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OUTCOME OF LAPAROSCOPIC COLORECTAL RESECTION IN OCTOGENARIANS. P.A. Seshadri, J. Mazza, E.C. Poulin, R. Grégoire, C.M. Schlachta. University of Toronto Centre for Minimally Invasive Surgery, St. Michael's Hospital, Toronto, Ont., and Centre hospitalier universitaire de Québec, Université Laval, Québec, Que.

To evaluate the surgical outcomes of elderly patients who underwent laparoscopic colorectal surgery. Sixty (60) cases involving octogenarians were analysed from a large prospective database consisting of 480 consecutive laparoscopic colorectal resections performed between 1991 and 1999, by 3 surgeons.

Thirty-three patients (48%) over 80 years of age had comorbid conditions including hypertension (14), ischemic heart disease (9), diabetes mellitus (9), chronic obstructive pulmonary disease (5), and others such as stroke, cirrhosis, portal hypertension and chronic renal failure (13). There were 29 males and 31 females with a mean age and weight of 84.7 years and 63.2 kg respectively. Indications for surgery included malignancy (46), adenoma (5), diverticulitis (2), rectal prolapse (2) and angiodysplasia (1). Procedures performed were right hemicolectomy (22), left hemicolectomy (8), sigmoid resection (13), total abdominal colectomy (3), anterior resection (7), abdominoperineal resection (4), Hartmann's procedure (2) and sigmoid loop colostomy (1).

Of the 60 attempted resections, 7 (12%) were converted to an open technique. Intraoperatively there were 4 complications (7%) in 4 patients (1 colon perforation, 1 small-bowel perforation, 1 burned gallbladder serosa, and 1 missed lesion), necessitating 2 conversions. There were 24 postoperative complications in 19 patients (32%) (6 ileus 10%, 5 wound infections 8%, 5 cardiac 8%, 2 urinary retention 3%, 2 hemorrhage 3%, 1 abscess 2%, 1 pneumonia 2%, and 2 other 3%). Intraoperative complications had no direct effect on postoperative complications. Three people died (5%) within 30 days of surgery. Of those completed laparoscopically the overall mean length of stay was 10.8 days; however, those having a postoperative complication had their length of stay increased to 15.6 days.

These results are superior to published, historical controls involving open colorectal resection on octogenarians. Overall mortality, lung and urinary tract complications are decreased and there were no reoperations for small-bowel obstruction. Laparoscopic colorectal resection is technically feasible and can be

done safely in elderly patients. Results require randomization against those for open surgery to elucidate the real advantages of this technique.

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LAPAROSCOPIC HELLER MYOTOMY FOR ACHALASIA: A CLINICAL AND SCINTIGRAPHIC SWALLOWING FOLLOW-UP. R.J. Finley, J.C. Clifton, K.C. Stewart, A.J. Graham, D. Worsley. Department of Surgery and Department of Nuclear Medicine, Vancouver Hospital and Health Science Centre, University of British Columbia, Vancouver, BC

The ideal treatment for achalasia eliminates the dysfunctional lower esophageal sphincter, relieving dysphagia and regurgitation, prevents gastroesophageal reflux and has minimal morbidity. The purpose of this study is to examine the postoperative clinical and scintigraphic swallowing studies on 69 patients who underwent a laparoscopic Heller esophageal myotomy (LHM) for achalasia between 1993 and 1998.

Sixty-nine consecutive patients with achalasia were followed. Presenting symptoms were dysphagia (94%), regurgitation (88%), heartburn (59%), aspiration (13%) and weight loss (67%). Preoperative treatment included pneumatic dilatation (57%) and botulinum injection (9%). All patients underwent LHM by one surgeon without conversion to laparotomy.

The mean operative was 2.8 hours. Operative complications included mucosal perforation closed laparoscopically without sequelae (1), pneumothorax (3) and pneumonia (1). The median length of hospitalization was 3 days. Of the 64 patients for whom follow-up was available (mean 12.3 mo), 96% were satisfied with their surgery. More than weekly symptoms were reported for dysphagia (6%), regurgitation (5%) and heartburn (9%). Liquid phase esophageal transit studies ($n = 38$) revealed a significant improvement in 10-minute esophageal clearance in the supine position from 28.5% before the operation to 49% after the operation ($p = 0.001$), and in the upright position 55.4% to 81.0% ($p < 0.001$). One patient has subsequently required a laparoscopic take down of her fundoplication for recurrent dysphagia.

Laparoscopic Heller esophageal myotomy and anterior fundoplication improves esophageal clearance and relieves symptoms of achalasia with minimal morbidity.

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LAPAROSCOPIC REPAIR OF INGUINAL HERNIAS WITH HIGHER RISK FOR RECURRENCE — INDEPENDENT ASSESSMENT OF RESULTS FROM 121 REPAIRS. J. Szymanski, A. Voitk. Department of Surgery, The Salvation Army Scarborough Grace Hospital, Toronto, Ont.

This study describes the results, determined by independent review, of laparoscopic transabdominal preperitoneal (TAPP) inguinal hernia repair for hernias with increased risk for recurrence.

From 1 surgeon's (A.V.) 236 patient laparoscopic inguinal hernia database from 1992 to 1998, inclusive, office and hospital records were reviewed of all who had undergone TAPP re-

pair of simultaneous bilateral or recurrent inguinal hernias. All were called for assessment by an independent surgeon (J.S.) at least 4 months postoperatively. Those unable to come in person were interviewed by telephone.

Follow-up 4 to 75 months postoperatively (average 34 months) yielded 74 patients of whom 3 had died, leaving 71: average age 58 (35 to 90); 1 female; ASA classification 1 — 23, 2 — 25, 3 — 20, 4 — 3. The 71 patients had 121 higher risk hernias: 50 bilateral and 34 recurrent (5th — 1, 3rd — 1, 2nd — 7, 1st — 25). For 13 patients with bilateral hernias, one or both was also recurrent. Independent follow-up was possible for 66 patients (93%), 39 (55%) by physical assessment and 27 (38%) by telephone. Thus, of the 121 high-risk hernias, 113 (93%) were followed, 60% by examination and 40% by interview. Out-patient rate was 94%. Four hernias recurred (overall higher risk hernia recurrence rate 3.3%), 3 hernias after bilateral repair (3%) and 1 after recurrent hernia repair (2.9%). All recurrences were diagnosed within 3 months of surgery. There were 2 conversions to open surgery (1 for bleeding and 1 for massive adhesions). A bladder perforation, repaired laparoscopically, was the only other operative complication noted. Apart from the recurrences, 1 patient was admitted 6 days after surgery for hematoma evacuation. There were no other late complications: no mesh infection, adhesion-related bowel obstruction or wound pain.

Laparoscopic transabdominal preperitoneal inguinal hernia repair, often quoted as the procedure of choice for bilateral and recurrent hernia repairs, is indeed a safe and effective operation with a low recurrence rate in these higher risk situations.

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NEEDLESCOPIC SURGERY: A LOGICAL EVOLUTIONARY STEP FROM CONVENTIONAL LAPAROSCOPIC SURGERY. J. Mamazza, E.C. Poulin, P. Seshadri, C.M. Schlachta. University of Toronto Centre for Minimally Invasive Surgery, St. Michael's Hospital, Toronto, Ont.

The term minimally invasive surgery (MIS) refers to all forms of minimally invasive techniques and does not draw a distinction between needlescopic and standard laparoscopic surgery. Needlescopic surgery is a refinement in conventional laparoscopic surgery which utilizes instruments ≤ 3 mm in diameter.

We have attempted 32 needlescopic procedures (cholecystectomy [10], splenectomy [7], Nissen fundoplication [5], bilateral sympathectomy [4], Heller myotomy [2], colon resection [1], ileostomy closure [1], splenic and adrenal cysts [2]). Of these, 1 (colon resection) was converted to open surgery. The mean length of stay for all these procedures combined was 1.4 days. Patients who underwent needlescopic splenectomy, fundoplication and sympathectomy were compared to those who had conventional laparoscopic surgery from the same prospective database. These groups were matched for age, gender distribution and weight. Splenectomy cases were also matched for splenic size and diagnosis and fundoplications were matched for DeMeester scores. Statistical significances were evaluated with the

Mann–Whitney rank sum test and Student’s *t*-test. There were no statistically significant differences between the needlescopic and conventional laparoscopic groups with respect to operative time, length of hospital stay or morbidity. There were no deaths in either group. However, 42% (3 of 7) of the needlescopic splenectomy patients were done as outpatients, whereas no conventional laparoscopic splenectomy cases were in hospital less than 2 days. Our operative times were identical in both groups and we have not seen the 20% to 30% rise reported elsewhere. The most striking difference has been with cosmesis. Needle-scopic scars once healed are almost undetectable when compared with conventional laparoscopic scars of 5 and 10 mm.

Needlescopic surgery seems to reduce surgical trauma and minimize scarring with no increase in operative time. Whether this translates into reduced hospital stays and postoperative complications, as well as quicker recovery times, remains to be seen. Randomized prospective trials comparing needlescopic to conventional laparoscopic surgery are needed with a special emphasis on evaluative tools for patient satisfaction.

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SCORING OF LAPAROSCOPIC CHOLECYSTECTOMY: A PILOT STUDY. E.J. Keyser, L.S. Feldman, H.H. Sigman, D.C. Evans, A.M. Derossis, G.M. Fried. Section of Videoendoscopic Surgery, McGill University, Montreal, Que.

Evaluation of technical skill of surgical residents has traditionally been by subjective evaluation. We developed an objective evaluation tool to assess surgical skills. A panel of surgeons developed a structured scoring system (SSS) of the “critical steps” (12 total) involved in performing a laparoscopic cholecystectomy (LC). Scoring was based on weighted visual analogue scales (VAS) measuring safety and efficiency. Penalties were subtracted for technical errors.

Ten senior residents were videotaped performing a LC. Each resident and supervising surgeon then filled out a brief global

Correlations	<i>r</i> coefficient	<i>p</i> value
Judge 1 SSS v. Judge 2 SSS	0.70	0.004
Judge 1 GPS v. Judge 2 GPS	0.69	0.004
Judges SSS v. GPS	0.72	0.005
Judges GPS v. Resident GPS	0.40	ns
Judges GPS v. Surgeon GPS	0.17	ns
Surgeon GPS v. Resident GPS	0.39	ns

ns = not significant.

performance score (GPS) evaluation. Videotapes were assessed by 2 blinded judges using the SSS and the GPS. Scores were normalized, and regression analysis was used to compare surgeon, resident and judges.

There was good correlation between judges and between GPS and SSS. There was no correlation between the supervising surgeon or the resident (at the time of OR) and the judges

(blinded). Traditional subjective evaluation methods may not reflect performance when measured by objective tools. Considerable operator bias may exist with respect to self-assessment of technical skills and performance.

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WHAT IS THE LEARNING CURVE FOR LAPAROSCOPIC COLORECTAL RESECTIONS? C.M. Schlachta, E.C. Poulin, J. Mamazza, P.A. Seshadri. The University of Toronto Centre for Minimally Invasive Surgery, St. Michael’s Hospital, Toronto, Ont.

The objective of this study was to determine the learning curve for laparoscopic colorectal resections.

A prospectively accumulated, computerized database of all laparoscopic colorectal resections performed by 3 surgeons between April 1991 and March 1999 was reviewed.

A total of 461 resections were evenly distributed between 3 surgeons (141, 155 and 165 procedures). Initially, operating experience was divided into 5 groups based on each surgeon’s case sequence number. Median operating time was 180 minutes for cases 1 to 30 in each surgeon’s experience, declined to 150 minutes for cases 31 to 60 and remained at a steady state (158 to 167.5 minutes) for cases 61 to 90, 91 to 120, and greater than 120. Subsequently, cases 1 to 30 were considered “early experience,” while cases 31 and higher were combined as “late experience” for statistical analysis. There were no significant differences between patients undergoing resections in the early experience compared to late experience with respect to age and weight. Additionally, there was no difference in the proportion of patients with a diagnosis of malignancy (44% versus 50%), Crohn’s disease (10% versus 11%) and diverticulitis (26% versus 21%). There was a greater proportion of males in the late experience (54% versus 42%, $p = 0.046$). There were no differences in procedures performed between early and late experience, including proportion of total abdominal and total proctocolectomies. However, a greater proportion of rectal resections were performed in the late experience (39% versus 22%, $p = 0.005$). This was exclusively accounted for by a greater proportion of anterior resections (21% versus 6%, $p = 0.001$). There were nonsignificant trends toward declining rates of intraoperative complications (9.0% versus 7.0%) and conversion to open surgery (13.5% versus 9.7%) in the late experience. Median operating time diminished significantly with experience (180 versus 160 minutes, $p < 0.001$). There was a trend toward a higher rate of postoperative complications with experience (32% versus 23%) that was associated with urinary retention occurring in the greater proportion of patients undergoing rectal excision. Overall median length of postoperative hospital stay was 6 days and decreased with experience ($p < 0.001$).

In this study, the learning curve for performing colorectal resections was approximately 30 procedures based on a decline in operating time, intraoperative complications and conversion rate. Learning also was extended to clinical care as it was appreciated that patients could be discharged home more quickly.

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COMPLICATIONS OF LAPAROSCOPIC CHOLECYSTECTOMY FOR ACUTE CHOLECYSTITIS: A PROSPECTIVE STUDY. L.S. Feldman, H.H. Sigman, J.S. Barkun, J. Garzon, M. Antoniuk, G.M. Fried. Section of Video-endoscopic Surgery, McGill University, Montreal, Que.

We undertook this study to compare outcomes of successfully performed laparoscopic cholecystectomy (LC) for acute and nonacute cholecystitis. Between May 15, 1990, and Nov. 10, 1998, 2999 patients in whom LC was attempted were prospectively entered into a computerized database. Patient characteristics, intraoperative findings and technique, and postoperative complications were recorded. Postoperative complications were graded in severity from 1 (minor) to 4 (mortality). Continuous variables were compared with the 2-tailed Student's *t*-test, while dichotomous variables were analysed using the χ^2 test.

Of the 2999 database patients, 468 patients were identified as having acute cholecystitis by clinical, laboratory, radiologic and/or operative findings. Three hundred and eighty-eight of 468 patients with acute cholecystitis (82.9%) and 2441 of 2531 patients without acute cholecystitis (96.4%) underwent successful LC and formed the comparison groups. Median age was 50 years in both groups. The average \pm SD operative time was 75.1 \pm 40.4 minutes in the acute group compared with 63.7 \pm 30.3 minutes in the nonacute group ($p < 0.01$). Postoperative length of stay was longer in the acute group (2.6 \pm 5 versus 1.6 \pm 1.6 days, $p < 0.01$). Intraoperatively, spilled stones, spilled bile and bleeding were more frequent in the acute group. With the exception of wound infections, which were more common in the acute group (2% versus 0.7%, $p < 0.01$), the frequency of nonbiliary postoperative complications was not different between the 2 groups. However, patients with acute cholecystitis were more likely to have a retained stone (1% versus 0.33%, $p < 0.05$) or cystic duct leak (1.3% versus 0.2%, $p < 0.001$) postoperatively. The postoperative mortality was 0.52% in the acute group and 0.08% in the nonacute group ($p < 0.05$). The incidence of common or right hepatic bile duct injury was not increased in the acute group (0.26% versus 0.21%). In conclusion, the presence of acute cholecystitis influenced the operative time, hospital stay and overall risk of complications associated with LC, but did not increase the risk of major bile duct injury.

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THE SEPTIC COMPLICATIONS OF ELECTIVE LAPAROSCOPIC COLORECTAL RESECTION. E.C. Poulin, J. Mamazza, C.M. Schlachta, P.A. Seshadri. University of Toronto Centre for Minimally Invasive Surgery, St. Michael's Hospital, Toronto, Ont.

The rate and pattern of all postoperative septic complications of laparoscopic colorectal resection are not determined. This study determines the rate and pattern of septic complications of the wound, abdominal cavity, urinary and respiratory tract following elective laparoscopic colorectal resection.

These outcomes were reviewed from a longitudinal database of 474 consecutive cases of laparoscopic colorectal resections performed between November 1991 and July 1999 in a univer-

sity setting.

The abdominal wound infection rate was 6.4% (27 of 419), and the rate of perineal wound infection was 7.2% (4 of 55) for a total 6.7% of wound sepsis. The size of infected abdominal wounds varied from trocar size (12 mm) to extraction incision size (mean, 52 mm). The anastomotic leak rate in 418 patients who underwent resection with primary anastomosis was 3.3% (14 of 418). It varied between 1.5% (2 of 127) for sigmoid resection to 5.2% (2 of 35) for total abdominal colectomy. Two of 3 of the patients with wound infections and anastomotic leaks had cancer. Intra-abdominal abscesses were diagnosed in 1% (5 of 478) of patients. All patients with abscesses had other postoperative complications. Urinary tract infections were rare (3 of 478, 0.6%) as was postoperative pneumonia (5 of 478, 1%).

Intra-abdominal abscesses, urinary tract infections and postoperative pneumonias are considerably less frequent after elective laparoscopic colorectal resection than in reported historical controls for open surgery. This study confirms the low rate of postoperative pneumonia observed in all other minimally invasive procedures. The rate of abdominal wound infection and anastomotic leak rate in laparoscopic colorectal resection appears to be equivalent to traditional surgery, whereas the rate of perineal wound sepsis appears less.

Comparative studies between the laparoscopic and open approaches are required to assess if a lesser septic burden follows elective laparoscopic colorectal resection. The differential costs of septic episodes between the 2 approaches need to be determined.

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THE ROAD TO OUTPATIENT LAPAROSCOPIC MANAGEMENT OF PERFORATED APPENDICITIS. C. Alvarez, A.J. Voitk. Department of Surgery, The Salvation Army Scarborough Grace Hospital, Toronto, Ont.

This study examines the contribution of increased laparoscopic skills to outpatient management of perforated appendicitis in one surgeon's practice.

All 38 perforated appendicitides from 151 appendectomies done by 1 surgeon, 1995 to 1998, were studied. Experience with the 18 perforations in 1998, when outpatient management became the preferred treatment, is reported.

In the 4 years, rate of attempted laparoscopic appendectomy rose from 67% to 100% for perforations. Conversion rate fell from 100% to 22%. ALOS was 6.3 days for converted perforations and 2.6 for non-converted. Ileus and pain control were not a problem for most laparoscopic perforations, so by the end of 1997, experience suggested they might be discharged within 24 hours, with visiting nursing care at home. In 1998 there were the 18 patients with gross perforation. Average age of this group was 31 years (4 to 69 years) and 10 were male. Average duration of symptoms before presentation was 2.5 days, time from presentation to surgery 11 hours and from surgical consult to operation 3.3 hours. Average presenting temperature was 37.2° (36.5° to 38.4°) and WBC 14 800 mm⁻³ (10 300 to 23 000 mm⁻³). Average operative time was 52 minutes (27 to 98 minutes).

Outpatient rate was 57% if the 4 conversions are excluded (44% gross outpatient rate). Parenteral antibiotics were given by a visiting nurse and wounds closed secondarily in 5 days. There was no difference in age, presenting temperature or WBC between converted and non-converted patients or inpatients and outpatients. There were no wound infections and no postoperative abdominal abscesses. No patient required readmission to hospital after discharge and all were satisfied with the care. The biggest impediment to same-day discharge was the late hour of surgery — 72% of operations began after 7:00 pm. The major difficulty to discharge within 24 hours was the ability to ensure home care nursing services.

Increasing laparoscopic skills allow laparoscopic treatment of complicated appendicitis with a low conversion rate and no infectious complications. The benign course of these patients allows outpatient management without apparent jeopardy to outcome for over one half.

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LAPAROSCOPIC GASTRIC SURGERY: PRELIMINARY RESULTS. P.A. Seshadri, J. Mamazza, E.C. Poulin, C.M. Schlachta. University of Toronto Centre for Minimally Invasive Surgery, St. Michael's Hospital, Toronto, Ont.

The objective of this paper is to present our preliminary results with a minimally invasive approach to laparoscopic gastric surgery for both benign and malignant lesions.

The data were retrieved and analysed from a prospectively collected computer database of laparoscopic gastric surgical procedures.

There were 9 laparoscopic gastric resections performed between August 1996 and September 1998. These included 3 gas-

tric wedge resections and 6 subtotal or hemigastrectomies. All wedge resections were done for leiomyomas and were performed with no deaths, complications or conversions. Of the patients undergoing gastrectomy, 5 were done for adenocarcinoma and 1 for chronic peptic ulcer disease. The median age and weight were 63.5 (range, 42 to 83) years and 70.5 (range, 53 to 98) kg respectively. There were 3 men and 3 women. Median operative time was 334 (range, 165 to 465) minutes; for those completed laparoscopically, the extraction incision averaged 4 (range, 3 to 5) cm. The greater omentum, attached to the specimen, is totally removed, conforming to the oncologic principles of an R2 resection. There was 1 conversion to open surgery in a patient with cirrhosis, large left liver lobe and bleeding that was not well controlled laparoscopically. In vivo resection margins were ≥ 10 cm and the average lymph-node harvest for cancer resections was 10.8 (range, 4 to 21). In those with cancer, 4 were stage IA and 1 was stage IB. Median time to discharge was 5.5 (range, 3 to 10) days. Complications included 1 wound infection and 1 death that resulted from portal vein thrombosis in a patient with hepatitis B complicated by cirrhosis, ascites, portal hypertension and esophageal varices. To date, the remaining 4 patients operated on for malignancy are alive and well, with a median follow-up of 21.5 (range, 19 to 30) months. There has been no recurrent disease or port-site metastases.

Wedge and formal gastric resections can be performed safely laparoscopically, with low complication rates and adherence to oncologic principles. Advantages over open gastrectomy seem to include a short hospital stay, improved cosmesis and a reduction in postoperative pain. Randomized trials with long-term follow-up, comparing laparoscopic gastric resection with its open counterpart are needed.