Postgraduate Course: Common Laparoscopic Procedures from Revolution to Standard of Care

Abstracts

7th World Congress of Endoscopic
Surgery
June 1–4, 2000, Singapore

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What Is the Penetration of Endoscopic Techniques into Surgical Practice?

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Summary: Laparoscopy has changed the face of general surgery forever. Until another technology replaces it, laparoscopic surgery will continue to be a strong force in the everyday practice of the general surgeon. The penetration of it into surgical practice will vary according to geographical area. A major factor involved in this transition is cost of equipment. Developing countries are at a disadvantage here. However, even in the remotest of areas, laparoscopic surgery has had an impact. **Introduction:** Since its introduction into mainstream clinical surgery in 1990, laparoscopic surgery has had an increasing role in the way we take care of patients. These 10 short years have seen an explosion in the techniques to do general surgery. If cardiac, gynecology, vascular, urology, and plastic surgery are thrown into the melieu, the numbers of procedures performed with this technology is truly remarkable. **Materials and Methods:** I have tried to canvass both industry and hospitals to get some idea of the exact penetration of endoscopic surgery into the clinical practice of surgeons. Obviously, different skill levels will determine utilization of this technology. The other factor, and a major factor, is cost of technology. In this era of cost constraints, new and expensive technology is often met by resistance from health care providers and administration alike. Individual institutions credential laparoscopic procedures differently. Surgeons are still learning advanced techniques. Out-come data is just coming to light. All these inputs will have an effect on penetration of this technology. **Results:** Our hospital (Mount Sinai, New York) has had a 10% per annum growth in laparoscopic surgery, mainly secondary to general surgery procedures. Gynecology, urology, cardiac, and plastics have been much slower in their development. However, over the last two years, small percentage increases have been seen. At our institution, the prediction is for continued growth in the specialties, but general surgery will likely be flat. This is because the penetration is already near maximum. At a major university in our same city (University X), the penetration of laparoscopic techniques has been minimal. Since the big push for laparoscopic cholecystectomy in the early 1990s, little or no advanced procedures have been done at this university. The contrast between University X and our institution is striking. This 'gap' in penetration can be found in most cities throughout the USA, and I am sure, throughout the world. At our institution, endovascular treatment of abdominal aortic aneurysms is the procedure of choice with penetration close to 90%. At other institutions in our city, this is just beginning to be performed. Industry predictions of penetration

are interesting, as they have access to data on a national level. There is no question that some procedures are increasing at a more rapid clip than others are. It has to do with perceptions of the surgeon in terms of difficulty and costs. For example, several companies show 40% penetration for all of general surgery, 47% for all of gynecology, but only 16% for cardio-thoracic. Laparoscopic cholecystectomy is near 93% penetration, but laparoscopic hernia repair is only 9% nationwide. However, predictions for growth are higher for cardio-thoracic than general surgery. Within the category of each specialty, the growth patterns are different (as expected). For example, diagnostic laparoscopy is already at 100% in gyn, but predicted growth of bladder neck suspension and oophorectomy is at 2–3% per annum. **Conclusions:** The exact penetration of endoscopic techniques into the clinical practice of surgery is unknown. However, different procedures will have different penetration rates according to institution, city, state and country. Unless a new technology replaces laparoscopic surgery, the growth and penetration of this technology into the surgical armamentarium will continue. The exact percentages will be procedure and site specific.

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Common Bile Duct Stones – Acceptable Options

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Aim: Currently the standard treatment modality for patients with common bile duct stone is the preoperative endoscopic stone extraction (ESE) by ERC (endoscopic retrograde cholangiography) followed by laparoscopic cholecystectomy. From July 1991 to November 1999, I have performed 125 cases of laparoscopic CBD exploration, results of which are retrospectively reviewed and presented herein. **Methods:** 125 patients with CBD stone underwent single-stage laparoscopic treatment. The reasons for undergoing single-stage operation were (1) failure to remove ductal stone with ERC (31 patients), (2) ESE not indicated (huge stones, multiple stones, 45 patients), (3) presence of duodenal diverticulum (9 patients), and (4) patients' refusal to undergo ERC with ESE, etc. (40 patients). There were 54 men and 71 women 24–89 years old (average 51 years). Seven patients had history of previous upper abdominal surgery (4 cholecystectomies and 3 gastrectomies). The laparoscopic procedures were performed under conventional pneumoperitoneum technique in 64 cases and gasless technique with wall lifter in 61 cases. Percutaneous

transhepatic biliary drainage (PTBD) had been performed in 2 patients and endoscopic nasobiliary drainage (ENBD) in 8 patients showing symptoms of acute toxic cholangitis. In addition, 27 patients underwent ENBD prior to surgery for postoperative temporary biliary decompression, and 21 patients, spontaneously eliminating biliary stent (SEBS) placed intraoperatively. The anterior choledochotomy with primary closure was performed, keeping the preoperatively placed biliary drainage devices (PTBD, ENBD, SEBS) for postoperative biliary decompression. In the remaining 67 patients, T-tube was inserted. Choledochotomy was closed by means of continuous sutures in the first 9 patients and interrupted sutures in the rest. Currently, in the last 22 patients, we used 3-0 suture Laploop (SJM, Korea). **Results:** Of 125 patients, stones were not found in 5 patients, in whom the preoperative evaluation showed single stones measuring less than 8 mm. The conversion rate was 4.8%, mainly owing to stone extraction failure. Four patients underwent second operation due to remnant stones (3 patients) and bile duct cancer recurrence (1 patient). Complications following surgery were pleural effusion (5 patients) and prolonged bile leakage (3 patients), which were managed conservatively and clinically improved. One patient died from bile leakage leading to septic bile peritonitis. It occurred in the early learning curve period using the continuous suture for CBD closure. The mean operative time was 161 min (85–220 min) and, taking into account the last 22 patients, 120 min. **Conclusions:** In patients with CBD stone, laparoscopic cholecystectomy with ductal stone clearance is now not only technically feasible, but also better in terms of postoperative results. Thus, with the availability of temporary biliary decompression methods and newer laparoscopic suture devices, laparoscopic cholecystectomy with ductal stone clearance in a single stage is now a good alternative to conventional procedures.

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Laparoscopic Inguinal Hernia Repair – A Dispassionate View

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Groin hernia repair is one of the commonest operations performed around the world, hence improvements that genuinely result in improved recovery times, cost-savings and reduced complications and recurrence rates have the potential for substantial impact on this patient group and health budgets. For large bilateral or recurrent hernias, the laparoscopic approach appears to have a sound evidence base in support over the open approach. For unilateral non-recurrent hernias, there are now a number of published randomised trials of laparoscopic versus open inguinal hernia repair, a meta-analysis of 16 of them with 2,471 patients [1], and a critical appraisal underway by the Cochrane Collaboration. At least two types of laparoscopic repair (TAPP and TPP) and 3 types of open repair have been compared (mesh onlay, sutured Shouldice or Lichtenstein and others), which complicates meaningful analysis: individual group comparisons have reduced numbers and statistical power. Also, quantification of post-operative pain, return to normal activity and overall satisfaction is notoriously difficult to quantify: what may be obvious to attending nurses and clinicians in relation to these variables can be

difficult to put into numbers in a meaningful way. Nonetheless, the results are consistent enough to show a modest advantage (in the short-term, at least) for the laparoscopic approach, but at a financial cost. They also indicate that further large randomised trials will not add much to this conclusion. Focus therefore needs to be on the bottom line: over time what will the recurrence rates be and how will the cost ratio change because of this? Laparoscopic inguinal hernia repair will continue into the foreseeable future and surgeons need to grapple with the issues of adequate training and general dispersment of laparoscopic skills in order to keep the complications of the operation to a minimum, and to work toward reducing the costs of the procedure. These latter two issues will otherwise determine the future of laparoscopic inguinal hernia repair.

Reference

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Laparoscopic Appendicectomy – A Procedure for All?

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Among the currently performed endoscopic operations, laparoscopic appendicectomy has the most thrilling history and a highly controversial reputation. Originally performed and implemented by the German gynecologist Semm in the 60ies of last century, surgeons adopted the operation in order to prevent adhesions and consecutive ileus after the open operation. The German surgeon Götz was almost looked upon as a maniac, when he promoted the operation. In 1989 during his opening address of the annual conference, the president of the German Surgical Association warned the surgeons to remove an acutely inflamed appendix by laparoscopy. A few years later, catastrophic complications of the operation were reported in the literature or during congresses. Surgeons lively discussed whether laparoscopic appendectomy was an operation for beginners or for experts only and whether the technological life cycle of the operation had already reached its end. A consensus conference in 1994 summarized the actual state of the art at that time, before multiple randomized trials and metaanalyses completed the confusion. Today laparoscopic appendicectomy still is a controversial operation which is both adopted and favoured but also vigorously rejected by a number of surgeons. The appearingly bad reputation of the operation is due to 2 facts: the important and dangerous complications of the procedure and the marginal benefit in terms postoperative pain, well-being and early recovery. The dangerous complications, however, helped to shape out a rather safe pathway of how to perform the operation with the optimal currently available safety standard in the year 2000 – a painful trial and error process. A valuable tool to analyse complications is the technique of failure analysis derived from aviation where critical incidents, disasters and failures are analysed individually and step by step. In aviation, every details can cost lives and statistical analysis of a numbers or series of accidents are almost meaningless – they all dropped down. Failure analysis in surgery has been promoted by Troidl who transformed the process of analysis from

aviation to daily surgical practice in the operating room. The critical, necessary and consecutive steps and questions of this process are the analysis of:

1. Situation	What was the situation?
2. Incident	What has happened?
3. Cause	Why did it happen?
4. Treatment	How can it be treated?
5. Prevention	How can it be prevented?

Murphy's law that even rarest and catastrophic accidents will happen accompanied by Hanley's 'rule of 3' threat or even proof that an accident will happen and thus single incidents – case reports – can help to improve the operative technique considerably. In fact, a typical 'complication career' can be described for laparoscopic appendectomy leading to a currently practical and relatively safe way of the operation. Every technical step of the operation has its typical 'Murphy-trap' which can be avoided by appropriate precautions.

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Laparoscopic Splenectomy – The Gold Standard in 2000

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With advanced laparoscopic techniques, new instrumentation and imaging systems, laparoscopic splenectomy has become the standard approach. The indications are the same as in conventional surgery. Laparoscopic surgery has engendered important understanding of the anatomy and special relationships of the spleen which must be elucidated in order to accomplish safe surgery of the spleen by laparoscopy. The concept of splenic salvage as in conventional approach is also being often utilised in laparoscopic splenectomy. A part from hemolytic anaemias, purpuras, multiple cases of secondary hypersplenism, in unusual conditions such as splenic infarcts, cystic lesions, incidental tumours, abscesses and splenic artery aneurysms, laparoscopic splenectomy has been performed. Trauma remains contraindication for laparoscopic surgery. Structural friability and high vascularity possess tendency for increased haemorrhage in anterior gastric approach division of the splenic artery as the first step not only minimises the incidence of bleeding but also makes the spleen to shrink considerably, and this is favoured in place of preoperative intraarterial embolisation. Understanding of the various ligamentous attachments enables easy mobilisation. Epigastric and/or left anterior axillary port enables effective retraction. With proper lateral tilt and careful dissection, spleen can be mobilised with limited risk from the adjoining structures and vessels. The pattern of the splenic artery to the hilum, magistral or distributed type should be realised in hilar dissection. The spleen can be placed in endobags and removed in pieces by fragmentation using e.g. the Kelly clamp fracture technique. With harmonic scalpel and ligasure and magnified system, laparoscopic splenectomy has become the standard technique. Not only the patients are offered the advantage of minimally invasive surgery but the postoperative morbidity and event mortality has reduced. Laparoscopic splenectomy is the most preferred standard technique in this new millennium.

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Laparoscopic Adrenalectomy: Approaches and Indications

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Since the first laparoscopic adrenalectomy was performed in 1992 by M. Gagner, various surgical procedures have been described through anterior, lateral and posterior approaches. Laparoscopy has demonstrated its safety and advantages, but demands a careful and meticulous technique by a surgical team trained and skilled in laparoscopic procedures. The choice between a retroperitoneal and a transabdominal approach, which we prefer and is chosen by most experts, depends on the experience of the team and the correct indications for this technique. The transabdominal lateral approach of the gland is the most commonly performed technique. The pneumoperitoneum is achieved and four ports are placed along the coastal margin. The intraabdominal organs play the role of landmarks. On the right side, the most anterior port is used to retract the liver. Four defined steps allow an easy and precise dissection of the gland. The first is the section of the hepatic triangular ligament allowing an upper mobilisation of the liver. This step is essential. The 2nd step consists in the dissection on the left side of the gland towards the vena cava, used as a landmark to find the main adrenal vein that is dissected and clipped. The third step is the control of the three main adrenal arteries, the medial originating from the aorta, the superior originating from the diaphragmatic artery and the inferior originating from the renal artery. The last step of dissection consists in a meticulous dissection of the inferior, renal-side, right and posterior aspects of the gland with progressive haemostasis in the perinephric fat. The gland is placed in a bag and extracted through a port site. On the left side, the dissection is also performed with a patient in a strict lateral position. The key to the success is to start the procedure by dissecting the splenoparietal ligament close to the diaphragm, until visualisation of the left crus and the greater curvature of the stomach. It permits the mobilisation and displacement of the spleen with the tail of the pancreas to the right of the operative field. The second step is the dissection of the splenic and the renal vein, used as landmarks to identify and control the main adrenal vein. An accessory adrenal vein is constantly present and divided. The right side of the gland is dissected and allows the identification of the medial artery originating from the aorta, and the superior one originating from the diaphragmatic artery. The dissection is continued on the inferior aspect of the gland to look for the main inferior artery, originating from the renal artery. The left adrenal dissection is achieved as on the right side. Limitations to this technique can be caused by previous surgery responsible for severe adhesions. Age, cardiac or respiratory failures or obesity are not contraindications. Bilateral adrenalectomy and/or small pheochromocytomas, despite reservation by some surgeons, are no longer considered as questionable indications. The best laparoscopic indications are the small secreting tumors, such as Conn's and Cushing's adenomas. Most of the time these are small and easily dissected. Most authors set the size limit between 7 and 9 cm for an easy and safe dissection. The laparoscopic treatment of cancer is questioned, as the benefits of the laparoscopic technique must be considered against the risk of cancer dissemination.

Will Laparoscopic Liver Resection Catch On?

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Laparoscopic liver resection is a tremendous challenge and still is an evolving discipline. Currently with the fast developing of new technologies and improvements in surgical skills more and more centres are increasing its experiences in this field. In this update the author is doing an extensive review that includes Laparoscopic Liver Resection as well other laparoscopic approaches to the liver. Firstly, a review of the history of Laparoscopic Liver Surgery was done followed by a description of the equipment necessary to perform these operations and then a detailed analysis of indications, type of resections, risks and complications, advantages and clinical results. At the end during the conclusion some remarks arise:

- Laparoscopic Liver Resection is a safe and feasible procedure in hands of experienced liver and advanced laparoscopic surgeons.
- Sophisticated equipment is required to perform these operations.
- Lesions located in segments II to VI, smaller than 4 cm lying in healthy liver and preferable benign are the best options for this approach.
- Bleeding, gas embolism and liver failure are the most serious risks and complications.
- Preservation of immunological status, less surgical trauma, quickly recovery are some of the clear advantages.
- The laparoscopic approach is useful for a myriad of procedures when the surgeon is leading with liver tumours.
- Clinical results from 1991 until now are promising.
- In the near future Laparoscopic Liver Surgery (resective or not resective) will be more and more popular but prospective randomized trials are needed to probe the safety, feasibility and efficacy of this method.

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The Evidence for Laparoscopic Surgery in the Colon Cancer

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Background/Aims: Some concern exists about the accuracy of the laparoscopic surgery in performing appropriate oncologic treatment and staging of the colonic malignancies. The role of laparoscopic techniques in the treatment of colon carcinomas is questionable. Previous studies have suggested technical feasibility of surgical resections of these cancers by laparoscopic means and they have implied a benefit to laparoscopic technique for patients undergoing colorectal resections. The controversy has been fueled by well-publicized anecdotal reports of port-site metastasis in patients undergoing surgery for the treatment of colorectal cancer by laparoscopic approach. The criteria for standards in medicine and surgery should be thoughtful and rigorous: benefit should be obvious and it should be established by scientific studies (evidence-based medicine). Up to now no study

has been published demonstrating better or equal long-term results in laparoscopic vs open colorectal resection for malignancy. The author examined the impact of the laparoscopic approach to the outcome of resected colorectal carcinomas. Moreover, we discuss the different papers recently published in the literature about laparoscopic resection for colorectal cancer. We divided in two types of study: prospective and randomized studies. We present a randomized study comparing laparoscopic assisted colectomy (LAC) versus open colectomy (OC) for colon cancer. We present the preliminary results in relation to: 1) the short-term outcome and the feasibility of the laparoscopic procedure to perform accurate oncologic resection and staging; 2) tumor implantation during laparoscopic surgery; 3) recurrence rate after colon resection and, 4) the cost of the laparoscopic procedures. **Results:** Out of 256 colorectal resections performed (126 LAC and 130 OC). Patient's data were similar in both groups. Benefit has been demonstrated by the use of LAC in this setting. Passing flatus and oral intake occurred earlier in LAC than OC treated patients. The mean operative time was similar in both groups. The overall morbidity was higher in the open group. Hospital length stay was significantly shorter in the LAC. We describe our Kaplan-Meier curves in survival and recurrence in both groups. **Conclusions:** The laparoscopic approach improves the short-term outcome of segmental colectomies for colon cancer. However, the further follow-up of these patients (inside a controlled trial such as COST Trial or COLOR Trial) will allow us to answer in the near future whether or not the laparoscopic approach may influence the long-term outcome.

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Laparoscopic Approaches in Gastric Cancer Shifting the Point of Intervention

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With the technology available today, there is no justification to persist with a nihilistic view regarding cancer of the stomach. The overall strategy required to conquer this deadly disease is simple and the technology is available. What is lacking is commitment and organization. Early gastric cancer is almost always curable. 5-year survival ranges from 95 to 97% and recurrence after 5 years is uncommon. Where screening programs are well developed about 70% of cases are detected early. Assuming a salvage rate of 50% of the remaining group we will in the best circumstances be able to cure 80–85% of all stomach cancer patients. Early detection allows the implementation of many new and high-tech minimally invasive options. Small pedunculated EGCs (JCA Typ1) can be treated endoluminally via a flexible gastroscope. The options are endoscopic mucosal resection or ablation with the NdYAG laser. Both give excellent results provided staging is accurate with near certainty of cure. JCA Type 2a and 2b lesions are ideal for laparoscopic resection by either the wall-lifting method or by transgastric resection. Japanese workers in Keio University and the University of Kanazawa have achieved excellent results with both these techniques. Where the tumor has been understaged there is the option of conversion to a more conventional resection for cure. Type 2C and Type 3 lesions will require at least a D1 gastrectomy with clearance of level 1 nodes. There has been tremendous progress in the technique of laparoscopic D1 gastrectomy which

has a low morbidity and allows quick recovery without compromising long-term recurrence rates. For tumors stage T2N0 and above the standard operation is a D2 gastrectomy. This is usually done by open surgery but laparoscopic options exist and are practiced in some centers. There is some controversy however as to the long-term recurrence rates for curative surgery by laparoscopy and the follow up is being watched closely. Thus far there does not appear to be any significant difference. These techniques were originally pioneered in Belgium and Italy and there was considerable enthusiasm in the mid nineties. Considerable reservations were expressed by a large body of opinion in Europe which led to the pioneers becoming less enthusiastic towards the close of the decade. Our small series of 4 cases of D2 gastrectomy performed with curative intent have all done well with no recurrence to date. They include one total and 3 subtotal gastrectomies. Follow up is from 2.5 to 5 years and stage of disease included up to T3N1. Nevertheless, laparoscopic curative resections remain a technically difficult and expensive option and we have yet to prove advantage in terms of post-operative morbidity. Larger trials are needed. Recent developments in instrumentation such as ultrasonic dissecting devices and ligasure (Valleylab) will simplify the procedure as will advances in robotic surgery which will make sutured anastomosis a more palatable undertaking. Other advances in the field include virtual endoscopy and serum pepsinogen which are both promising new screening modalities. The priority however is still to achieve early detection from aggressive screening at least of high-risk groups. This allows a truly minimally invasive and yet curative approach to the problem.

16**New Technology for Routine Practice***D.L. Fowler*

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Minimally invasive surgery is impossible without the use of technology. Each year, numerous new technologies are introduced and marketed as a major advance in surgical care, despite the lack of data to support their use. The surgeon must make difficult decisions about which new technologies offer actual improvements in patient care.

This presentation reviews some of the more recently developed technologies that seem to provide either a better or more cost-effective way to treat the patient. Technologies for three different purposes are reviewed. Hand-assist devices for laparoscopic procedures, energy sources, and computer based equipment such as robots and integrated operating rooms are some of the newer technologies which can be effectively utilized in routine practice at this time. In addition to these technologies which are utilized during the surgical procedure, the personal computer has become an invaluable tool for the management of information, and should be considered a necessity for routine practice. Hand-assist devices are used to maintain a closed abdomen with laparoscopic visualization, yet allow the surgeon to use a hand inside the abdomen for palpation, retraction, or dissection. Devices which are on the market have been effectively used for hand-assisted laparoscopic colon resection, hand-assisted laparoscopic splenectomy for massive splenomegaly, and hand-assisted laparoscopic donor nephrectomy. Meticulous hemostasis is even more important during laparoscopic surgery than during open surgery. Therefore, the energy sources used for dissection laparoscopically must meet strict requirements for safety and efficacy. Ultrasonically activated shears have become the technology of choice for soft tissue dissection during most advanced laparoscopic procedures. Bipolar electrocautery devices (including hook dissectors, scissors, and a new device which will seal large arteries) have the advantage of costing less, but are not generally considered to be as useful as the ultrasonically activated devices. New technologies for applying bipolar electrocautery or traditional cautery laparoscopically are in development and one of these may prove to be the energy source of choice in the future. The use of the voice-activated robotic arm by the surgeon to control the position of the laparoscope is a significant advance. It enables solo surgery for many cases, and greatly facilitates teaching laparoscopic surgery by allowing the surgeon and student to focus on the procedure at hand. Likewise, the use of the integrated operating room allows control of potentially all of the equipment in the operating room by either the surgeon or a designated nurse or technician. Currently available systems allow this control with the use of voice recognition systems or touch screen panels. Uses for the personal computer in routine practice include (1) generation of records, (2) scheduling, (3) billing, (4) database for following outcomes, and (5) access to the internet for references, research, and on-line continuing education.