Endoscopic Surgery
Scope vs Scapel

By L. Beeston, R.N.

"Endoscopic surgical principles and techniques are established methods of therapy in medical specialties, including gynecology, urology and gastroenterology." (White, 1991) Technological advances in fiberoptics, camera lenses, lasers, insufflation equipment, coagulation devices, and accessory instruments have extended the usefulness of endoscopic surgery. Endoscopic surgery has not been utilized to its fullest potential but with the rapid progression of medical and surgical technology, the era of endoscopic surgery is nearing. The prediction is that 90% of all cholecystectomies, prostate cancer stagings, and select lung procedures; 80% of kidney removals; 70% of hysterectomies, appendectomies, and hernia repairs; plus a potentially significant number of vagotomies and bowel resections will be done endoscopically within the next five years.(Burke, 1992)

In this article it is my intention to trace the history of the endoscope and to examine where endoscopic surgery is heading. I will explain some of the present surgical procedures highlighting the advantages and disadvantages for this new minimal access surgery.

History of Endoscopy

The remarkable advancement of endoscopic surgical technology began with man's innate curiosity of viewing the inside of body cavities and canals. This dates back to the time of Hippocrates II (460 - 375 B.C.) (White, 1991). This crude beginning involved the examination of the rectum using a rectal speculum. The vaginal speculum was first used in 65 B.C. to distinguish between vaginal and uterine bleeding and it was the first incidence of gynecological endoscopy. In 1012 - 1013 A.D. an Arab named Abulkasim used a glass mirror to reflect light into the vaginal cavity "he was thus the first to use reflected light for the purpose of illumination and observation of the interior of a body orifice,"(White, 1991). Tulio Caesare Aranzi is credited with using the first endoscopic light in 1585. His method involved using light rays entering through a hole in a window shutter then brought into focus by using a water filled round glass flask and being projected into the nasal cavity, (White, 1991). In 1805, a man named Bozzani is credited to be the first to visualize the interior of the urethra using candlelight and a tube as an endoscope. Segalis, in 1826, developed an obturator to aid in urethroscopy. 1935 saw the development of a simple cystoscope by Desormeaux and in 1869 Cornial Pantaleoni modified this cystoscope and was able to cauterize a hemorrhaging uterus with silver nitrate, thus hysteroscopy. In 1877 Nitze added a lens system. It is this lens system that is the forerunner to today's endoscopes. 1880 saw the invention, by Edison, of the incandescent lamp. In 1883 Newman utilized this lamp as a light source. 1889 saw the development of different parts on the endoscope.

Manipulation could be done via a sheath. Using this sheath, Poirex was able to successfully catheterize ureters.

By the end of the 19th century, medical practitioners were well established in the use of body orifice scopes, such as, cystoscopy, laryngoscopy, hysteroscopy and esophagoscopy.

It wasn't until 1902 that the first incisional endoscopy was performed. (The term for incisional endoscopy being laparoscopy.) In 1910 cases of visceral exploration were being performed abdominally and thoracically using a separate needle to produce a pneumoperitoneum with filtered air. By 1912 Jacobeus had described the liver changes in cirrhosis, metastic cancer, and tuberculosis peritonitis and predicted "a great future for laparoscopy." (White, 1991) The credit of utilizing reverse trendelenburg position goes to Nordentoft in 1912.

Up to this time period, endoscopic development was based in Europe. 1920 saw North America gain interest and become involved. Orndoff of Chicago introduced the sharp pyramid point on trocars. In 1924, Carbon dioxide was deemed the gas of choice, instead of air, because it is absorbed quickly and easily by the body and there is less chance for air emboli to occur. In 1929 a German man named Kalk devised a lense system that produced 135 degrees of viewing. He can be referred to as "the Father of Modern Laparoscopy" (White, 1991) and it was he who first utilized a second puncture.

By 1933, simple operative procedures were being combined with endoscopy. 1952 saw the development of an intense light attached to the distal end of the telescope. History slowly continued until 1968 when fiberoptics was developed. With the emergence of fiberoptic light, North America saw extensive and expanding horizons for endoscopy. The early 80's brought about the use of Carbon dioxide and Argon lasers being used in conjunction with endoscopic procedures. In 1983 the first appendectomy was performed through a laparoscope as was the cholecystectomy in 1989. Today, laparoscopic cholecystectomies are performed more routinely than the previous open method.

Current procedures being done as endoscopic (keyhole) surgery include: appendectomy, herniorrhaphy, bowel resection, hysterectomy, and hiatus hernia repair.

The advancement of endoscopic surgery started at a very crude and nonglamourous beginning a long time ago and has progressed steadily. What was once considered to be an invasive procedure is now routinely being done via the endoscope.

With all the technological advances new endoscopic surgeries are on the horizon. In the near future, procedures done will also include kidney removal, addrenalectomies, spleenectomy, and lung procedures. It is important for us as O.R. nurses to be familiar with these new instruments and their accessories. The development of surgical endoscopic instruments is still in its infancy. The cost and shortage of instruments has resulted in the use of various devices for functions for which they were not originally intended.

Endoscopic Appendectomy

The laparoscopic appendectomy procedure is basically the same as the laparoscopic cholecystectomy. The patient is given a general anesthetic and is also injected with local anesthetic. The patient is in trendelenburg position. This procedure involves three trocar puncture sites. (See Figure 1) When inserting a trocar the surgeon feels for three separate pops and then injects some saline into the trocar to ensure placement is in the abdominal cavity and not the peritoneum. The appendix is freed from the surrounding mesentery in the usual laparoscopic manner utilizing the ESU unit. Ligation of blood vessels and nerves is usually accomplished with a surgical clip applier. Titanium clips are placed distal and proximal on such structures before they are cut. The appendix pedicle is purse string tied or cauterized and the appendix specimen is delivered from the abdomen via one of the trocar ports. Endoscopic Allis, Babcocks, and Poole suction are utilized. Before closing, the abdomen is irrigated with copious amounts of saline to detect any missed bleeders. The small trocar sites are closed in two layers and opsite is used as the dressing of choice. This method of appendectomy takes just as long as the open version but causes less trauma, and a greatly decreased risk of infection for the patient. (White,1991)

Endoscopic Herniorrhaphy

Approximately 500,000 hernia repairs are performed each year. (Corbitt, 1991) By the year 1995, it is estimated that 70% will be done endoscopically. All types of hernias can be done with this method. The

Author

L. Beeston, R.N., is a staff nurse in the Operating Room at Ladysmith & District General Hospital, Ladysmith, B.C.

patient is given a general anesthetic and is injected with local anesthetic, such as Marcaine or Xylocaine. The patient is placed in trendelenburg position. This laparoscopic hernia repair involves three puncture sites. A 12 mm trocar is used with a 30 degree telescope and camera. Through complete dissection of the inguinal space, the deficit wall is brought into view. Groin anatomy is difficult so it is very important to identify landmarks, such as Coopers ligament, Iliac vessels and the Internal ring. The surgeon must be careful of the spermaticord. Prolene and Marlex mesh may be used as a reinforcement strip. It comes in different sizes depending on the size of the deficit. It is passed into the abdomen via the 12 mm port. The mesh is fixated over the deficit area with sutures or clips. It is attached to Coopers ligament to prevent it from drifting. The area is irrigated with antibiotic because of the implant. The trocar sites are closed in two layers. Unlike the standard hernia repair, laparoscopic hernia patients can resume their usual activity level the next day and have no lifting restrictions. The adverse part of this surgery is that the patient must have a general anesthetic. In an otherwise healthy individual however, this does not pose as a problem and the benefits are outweighed. (White, 1991)

Endoscopic Assisted Bowel Resection

Previously, the most limiting aspect of endoscopic intestinal surgery was the lack of appropriate instrumentation. Prior to 1989, manufacturers of laparoscopic equipment showed little interest in developing any instruments that were different from the existing devices. However, nowadays, there is such competition involved in this area of the market that they cannot come out with the equipment fast enough. I found the manufacturers very pleased and willing to help by providing information for this project.

Once endoscopic surgeons became experienced with the endoscopic appendectomy, they realized that the next step would be endoscopic bowel resection. It should really be termed endoscopic assisted bowel resection. The patient is under general anesthetic and also receives a local anesthetic injection for control of post-op pain. This injection is good for 12 - 16 hours. The abdomen is then distended with Carbon dioxide and a 10 mm trocar with sheath is inserted just above or below the umbilicus. The abdominal cavity is then observed via the telescope and camera. The patient is then put into trendelenburg position which moves the small bowel out of the way. Three or four more trocars are inserted. (See Figure 1) The position of these trocars is the surgeons preference. The colon is freed using dissecting scissors and atraumatic babcock forceps. Once free, the colon is mobilized to the midline. Now, either a 40 mm trocar or a small incision is utilized and the segment of bowel is delivered out of the abdomen. The bowel is then stapled and cut using a disposable GIA staple unit. The lesion has now been excised and the bowel is end-to-end anastomosed together. It is placed back in the abdominal cavity and the area is irrigated with copious amounts of saline. The wounds are closed in the usual manner.

This method of laparoscopically assisted bowel resection cannot be performed on the small bowel. Like any other laparoscopic surgery it cannot be performed on patients with ascites or previous abdominal surgeries (as they would have adhesions and scarring). A major problem with this surgery is that it is hard to accurately identify the exact site of the lesion and as a result, there have been cases of incorrect bowel resections. On the positive side however, 70% of patients are discharged within 96 hours on a regular diet and having regular bowel movements. Average length of hospital stay for an open bowel resection is 12 days and is only six days with laparoscopic surgery.

Endoscopic Hysterectomy

It is important to distinguish between laparoscopic assisted vaginal hysterectomy and laparoscopic hysterectomy. Presently, laparoscopic assisted vaginal hysterectomy is the most common approach. It involves the freeing of the higher abdominal structures by operating through the scope and then the procedure is finished through the vagina. The other method involves the procedure being carried out entirely via the scope. The patient receives a general anesthetic and is placed in a low lithotomy position. Four trocar ports are utilized, according to surgeons preference (See Fig.1). Surrounding the basic reproductive structures are many ligaments, arteries, and the ureters that make hysterectomy a complicated procedure. The ligaments function to suspend the uterus in the pelvis. These ligaments must be preserved in order to support the bladder once the uterus has been removed. As well, the bladder sits on top of the uterus and must be dissected down away from the uterus during the procedure. Scissors, ESU unit, dissecting forceps and irrigation is utilized. A 10 mm trocar is placed at the umbilicus. The ureters must be identified and preserved. The ligaments are identified and the tedious

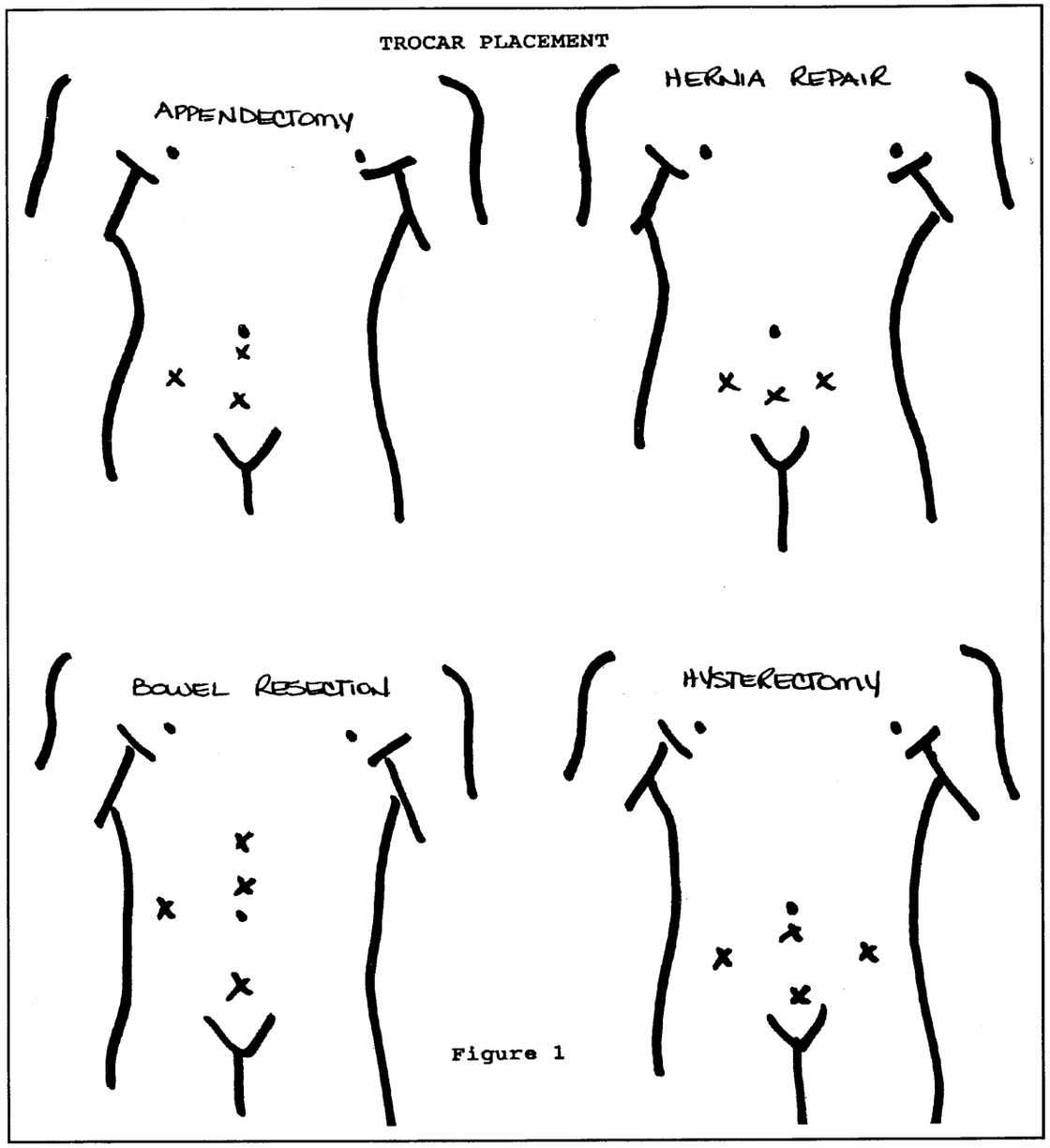

Figure 1

procedure of ligating vessels begins. Some of the ligaments are dissected and ligated (round and cardinal). Once the uterus is freed, it is removed through a vaginal incisions. The surgeon must suture the uterosacral and cardinal ligaments to the vaginal membrane to ensure good vaginal support for the bladder and other pelvic structures. The vaginal incisions is closed. The abdomen is reinsufflated and checked for bleeding.

Trocar incisions are closed and steristrips or opsite applied. There is a minimal blood loss. The laser can be utilized in this procedure. I could find very little information on this procedure.

The Pros and Cons

There are some general complications to endoscopic, minimal access, surgery. From an anesthetic viewpoint the patient will experience discomfort with a distended abdomen and may not breathe deeply if under a regional block. Because of this, general anesthetic is required for all endoscopic surgery.

Insertion of the verres needle has the potential of

causing some serious problems because it carries with it the 'risks of inserting a sharp object into the patients abdomen without the margin of relative safety provided by established pneumoperitoneum."(White, 1991) The instruments are potentially dangerous and the surgeon must have a feel for the two dimensional video monitor. In laparoscopic surgery there is no depth perception.

Laparoscopic instruments are, by necessity, extremely long and thin and, therefore, can easily penetrate most abdominal organs. As long as the tip of an instrument can be seen by the surgeon, it's position can be easily adjusted. Loss of depth perception is a part of the difficulty the surgeon must overcome when learning the skill of laparoscopic surgery. The difficulties of working without the benefit of depth perception become apparent even when performing such simple tasks as dividing vessels. Endoscopic surgery is contraindicated in those patients with ascites, who are obese, or who have abdominal scarring.

The advantages of endoscopic surgery are many. The patent experiences a rapid disappearance of pain, less chance of wound infections, no would dehiscence, no incisional hernias, and a quicker return to their daily activity level. There is less overall cost to the health care system as hospital stays are shortened. In an evermore budget conscious system, this new technology will pave the way for future surgeries. Endoscopic surgical instruments are expensive. Hospitals increase that expense by using disposable instruments (Trocars). By using reusable instruments, the cost is approximately 50% less per procedure.

Conclusion

There are many up-to-date articles regarding new endoscopic surgical techniques. In this paper, I have explored the baseline techniques and there are, I am sure, many variances. Endoscopic surgery is obviously where medical and surgical technology is heading. The treatment mode of the future is outpatient care as much as possible. Because these procedures are new, not every surgeon may be willing to try them, or, not all who try may be skilled in the procedures. When successfully performed endoscopic surgery provides the surgical team with the means to eliminate the discomfort and the disability patients encounter while shortening surgical, anesthetic, and recovery time, and reducing overall patient costs.

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The Joys of Initiating Laparoscopic Surgery in a Small Rural Hospital

By Dianna Havin & Patricia Frayne

It all started with a phone call from our surgical supply representative regarding an upcoming seminar on laparoscopic cholecystectomy.

Our hospital is a 71-bed acute care facility in Peace River, a town of 7,000 with a catchment area of 16,000, situated 500 km north of Edmonton, Alberta. There are two operating theatres in our hospital and we operate each morning, doing three to five cases per day. There are three nursing positions, one full-time, one three-quarter time, and one half-time, and we rotate between circulating, scrub and recovery room duties. There are four other nurses working in the hospital who share on call duty and do relief work in the O.R. when necessary.

We had discussed doing laparoscopic surgery for several months, and after the phone call regarding the seminar, we consulted with our two surgeons and our Director of Patient Care. It was decided that the four of us, the two G.P. surgeons and ourselves, would attend the upcoming course in Vancouver in February, 1992.

The seminar included lectures for the surgeons and nurses, some together and others separately, and several presentations by our surgical supply representatives. There were also workshops on camera techniques, instruments, capital equipment, setting up the nurses tables, etc. We also attended a one day workshop in the animal lab for the nurses and doctors. The doctors rotated positions - surgeon, assistant and camera man - to gain experience with the equipment. We nurses were able to examine the instruments and handle them as well.

When we returned to Peace River, the real work began. Our physicians arranged their preceptor program with colleagues in Edmonton who were already performing laparoscopic cholecystectomies. They each spent two weeks in Edmonton learning and doing laparoscopic surgery.

A cost comparison of six companies dealing in laparoscopic cholecystectomy systems was undertaken and three different companies were invited to attend our preceptorship weekends to demonstrate their equipment and services. The physicians were able to use two different systems while on their in-service in Edmonton, thus providing them with a wide choice of systems from which, ultimately, to choose.

We organized two preceptorship weekends. The doctors, in order to obtain privileges to perform laparoscopic cholecystectomy as approved by the College of Physicians and Surgeons, were required to perform at least six laparoscopic cholecystectomies as primary surgeon in their own hospital, supervised by a preceptor, meaning a surgeon from a teaching hospital with vast experience in performing laparoscopic cholecystectomy. This involved a lot of planning and preparation on our part and also involved most of the hospital departments.

A pre-admission program was set up, so that part of the admission process could be done ahead of time. The admitting department started the documentation and the charts the day before surgery, but the patients would sleep at home and return the following day, thus

Authors

Dianna Havin, R.N., is the Nurse Manager of the Emergency Department and Operating Room of the Peace River Health Care Complex. Patricia Frayne, R.N., is Charge Nurse, Operating Room, Peace River Health Care Complex in Peace River, Alberta.