

4) Minimally Invasive Surgery - Dr. Hiwa

1. Laparoscopy

Perceived Benefits

- Reduced post-operative pain and analgesic requirement
- Reduced operative trauma
- Reduced bleeding
- Faster recovery, discharge and return to work
- Reduced wound infection, seroma and hematoma
- Reduced chronic wound pain
- Less cardiorespiratory complications
- Less ileus from reduced handling
- Improved cosmesis
- Reduced contamination of theatre staff (Hepatitis and HIV)
- Interesting for surgeons
- Reduced outpatient/social costs
- Reduced risk of DVT/PE
- Reduced incisional hernia rate
- Fewer adhesions and less likely to develop obstruction
- Immunological benefits
- Better visualization for the surgeon

Perceived Risks

- High risk of co-lateral injury (e.g. common bile duct in lap chole)
- Bowel/bladder/vascular injury in hernia surgery
- Veress needle injury
- Diathermy may lead to organ damage (e.g. late CBD stricture)
- Increased operating time
- Increased costs due to theatre time and equipment
- Tumor seeding
- Poor quality surgery (e.g. cancer resection)
- Loss of tactile sensation
- Long learning curve
- Loss of training opportunity (e.g. appendicitis and inguinal hernia)
- Some surgeons not able to develop skills

Operations (now fully accepted)

- Cholecystectomy? CBD exploration
- Fundoplication
- Splenectomy
- Nephrectomy
- Adrenalectomy
- Diagnostic (e.g. Ca staging, abdominal pain)
- ? Appendicectomy
- ? Inguinal, Femoral, Incisional, para-umbilical Hernia repair
- ? Colectomy
- ? Gastrectomy? Other gastric surgery (e.g. obesity surgery)

High risk patients likely to benefit most

- Elderly
- Obese
- Cardiorespiratory
- AIDS
- Thoracic

Gaseous insufflation and Pressures

- Keep pressure as low as possible to reduce CVS and respiratory effects
- Also reduces post-operative pain
- 14 mm mercury intraperitoneal
- 10 mm mercury extra peritoneal to avoid surgical emphysema
- CO₂ most commonly used.
- May cause acidosis with respiratory depression and hypercapnia
- Cardiac output may fall as much as 30% due to reduced venous return
- Bradycardia most common arrhythmia,
- Respiratory depression due to splinting of diaphragm
- Other complications may include Pneumothorax, Emphysema, Air embolus

Insufflation technique

- Carbon dioxide (CO₂) is put into the abdomen through a special needle (Veress) that is inserted just below the navel.

What can you expect?

- Laparoscopy is direct visualization of the peritoneal cavity
- The laparoscope is an instrument somewhat like a miniature telescope with a fiber optic system which brings light into the abdomen. It is about as big around as a fountain pen and twice as long.

Prior to Surgery

- Not to eat or drink anything after 12:00 midnight the night before surgery.
- Not to smoke or chew gum after 12:00 midnight.
- Currently taking medication, some should be stopped.
- Bowel preparation is usually recommended for patients with endometriosis, pelvic adhesions, pelvic pain.
- Patient must take a shower or bathe the night prior to surgery.
- Nail polish, make-up and jewelry should be removed the night before surgery.
- Wearing loose-fitting clothes to prevent any unnecessary pressure on the abdomen on the day of surgery.

Immediately Before Surgery

- Immediately prior to surgery to empty your bladder
- Glasses, contact lenses, dentures and jewelry should be removed.
- Valuables should be left in the safekeeping of the person who accompanies the patient or should be left at home.

After Surgery

- Early mobilization
- Checking vital signs: blood pressure, pulse and temperature frequently.
- Checking the dressing and intravenous.
- If the patient is cold, an extra blanket given
- The nurse or physician will tell the patient when he will be allowed to drink something
- Discuss the findings with your patient and his family immediately after the surgical procedure is complete.
- Kept in Surgery Center for approximately three or four hours after the procedure.
- Medication will be available for pain or nausea.

Diet

- Consume only clear liquids (juices, Jello, or both) until the patient pass flatus or have a bowel movement. At this time, may begin to advance the diet. To eat light, easily digested food for a few days.

Activity

- To get up and move about, even though may not want to.
- Increase the activity gradually during this time.
- For a week or two after surgery expect to tire easily even after the slightest effort of work or exercise.
- Not to engage in strenuous activity until after the first post-op visit at office.

2. Single Incision Laparoscopic Surgery (SILS)

The TriPort has multiple advantages

1. Multiple instruments can pass through different access points without loss of pneumoperitoneum. Moreover, the different ports allow instruments of variable sizes.
2. The TriPort is fairly simple to introduce into the abdomen and can even be replaced if it is removed, for example, for organ extirpation.
3. It can accommodate variable thicknesses of the abdominal wall.
4. Each of the ports affords significant angles of distraction, allowing instruments to be located at wider distances away from one another inside the abdomen.

The disadvantages of the TriPort include

- The relative need for umbilical placement. It may be difficult to pass the introducer through a fascial defect not located at the umbilicus because cephalad distraction of umbilical stalk allows a 45 angle of approach.
- This also can be limiting because the target tissue may be too far away for roticulating instruments.
- It easy to cause dislodgment of the device, causing loss of pneumoperitoneum.
- The sheath can easily be torn, which may result in a need to replace the device.

The first reported cases of single-incision laparoscopic cholecystectomy

- Were published in 1997, when Navarra et al. described a series of 30 cases performed with two 10-mm trocars placed via a single umbilical incision.
- The gallbladder was retracted using three traction sutures through the abdominal wall.
- Even cholangiography was achieved successfully in eight cases.
- Piskun and Rajpal used the same concept of multiple trocars deployed via a single umbilical incision in 1999 but used two 5-mm ports.

- The port used is a SILS one.
 - The incision is strictly intra-umbilical in order to avoid any operative pain.
 - A 2 cm incision is carried out under direct visual control.
 - The SILS port is introduced into the abdomen.
 - It has three operating channels and another channel for insufflation.
-
- The position of the port is controlled after introduction of a sheath.
 - The optical system is a 5mm one with a 30 degree angulation.
 - The good positioning of the port into the abdominal cavity is checked.
 - Then insufflation is performed using the insufflation cannula.
-
- Three 5mm cannulas are placed.
 - One cannula is used for the introduction of a 5mm camera.
 - The two other cannulas are used for the introduction of instruments.
 - The procedure is started conventionally by the placement of two straight instruments: one grasper to expose the gallbladder, and one hook to progressively dissect the Calot's triangle

3. Da Vinci

- The incorporation of such "wrist like" joints in tele manipulator systems contributed to increasing the four degrees of freedom available with laparoscopic instruments to seven degrees of freedom
- The "endowrist" available in the da Vinci system is such an example.
- As most general surgical operations can be done using conventional laparoscopy, perhaps advanced robotics will be reserved for only the most complex operations.
- Robotic assistance allows more efficient completion of a complex minimally invasive surgical task over laparoscopy in this ex vivo bench model.
- This advantage is more pronounced in the hands of surgeons with less experience in complex laparoscopy.
- Conversely, robotics may allow less experienced surgeons to perform more complex operations without first developing advanced laparoscopic skills; however, there may be benefit to first obtaining fundamental skills.
- The addition of three-dimensional visualization has provided depth perception and increased dexterity
- The wrist-like articulations of the instruments also have been shown to improve surgeons' dexterity
- The coordinated hand–instrument movements have reduced the training time for the use of robotic systems versus manual laparoscopy
- In addition, tremor abolition and motion scaling have been shown to enhance dexterity with the use of robotic systems compared with manual techniques.

4. N.O.T.E.S.

Introduction:

- NOTES was developed after a meeting between an expert laparoscopic surgeons from the SAGES& a group of expert endoscopists from the ASGE, in New York city, on July 22&23, 2005 .

Definition:

- NOTES; is a new procedure, less invasive methods to treat conditions in both the gut lumen & in the peritoneal cavity, through natural orifices like; transgastric, transcolonic, transvaginal w/o skin incisions
- It needs laparoscopic skills, as well as advanced flexible endoscopic skills.
- It can be performed for many complex surgical procedures including; tubal ligation, cholecystectomy, gastrojejunostomy, splenectomy, oophorectomy with tubectomy, appendectomy

Advantages:

- Less pain.
- Faster recovery.
- Better cosmetics than current laparoscopic techniques.

Complication:

- Intraoperative haemorrhage.
 - Bowel perforation.
 - Splenic injury.
- ❖ When Antony Kalloo presented his experience in transgastric surgery in 2004, he could not imagine that he and NOTES would be at the epicentre of a revolution in laparoscopic surgery.
- ❖ Research has to focus on finding the best way of accessing the peritoneal cavity, on the development of leak-proof closure methods and on minimizing the potential risks related to contamination.
- ❖ Infection rate is 0.001%, rectal injury is 0.002%, localized bleeding is 0.2%^{1,2}. This compares favourably with the risks related to the use of trocars in laparoscopic surgery: 0.03-0.3% of visceral and vascular injuries, 0.7-1.8% of incisional hernia³⁻⁶.
- ❖ The initial idea behind NOTES was that of an incisionless surgery, which would de facto eliminate scars accessing the peritoneal cavity via natural orifices. This implies the use of controlled procedures that breach the lumen of a healthy hollow viscus such as the stomach, the colon, the vagina or the urinary bladder.

This first human incisionless operation

- On April 2nd 2007, at the University Hospital of Strasbourg, Professor Jacques Marescaux and his team, B. Dallemagne, MD, S. Perretta, MD, D. Mutter, MD, PhD, FACS, A. Wattiez, MD, D. Coumaros, MD, successfully performed the first no scar surgery. This first human incisionless operation was carried out using a flexible endoscope for transvaginal cholecystectomy in a 30 yo woman w/ symptomatic gallstones.
- Natural Orifice Transluminal Endoscopic Surgery (NOTES) is the extension of the flexible endoscope's capabilities to reach organs outside the lumen of the bowel for the purposes of diagnosis, and treatment including resective therapies, such as appendectomy, cholecystectomy, or splenectomy
- Operation Anubis performed without incision, save from using a 2mm needle allowing for insufflation and control of intra-abdominal pressure, represents an extremely important step towards totally non-invasive surgery.
- The justification of this technique are
 - the reduction or absence of postoperative pain
 - ease of access to some organs
 - the absence of trauma to the abdominal wall
 - ideal cosmetic results and the psychological advantages of eliminating the bodily
 - trauma represented by surgery
 - Lastly and as pointed out by P. Swain, this provides proof that there are no limits to how human ingenuity and technology can reduce the physical and emotional trauma related to the surgical act.