

MINIMAL ACCESS SURGERY

Minimal access surgery or called *minimally invasive surgery* (MIS) is a mixture of modern technology and surgical innovation that aims to accomplish surgical therapeutic goals with minimal somatic and psychological trauma.

It is a means of performing major operations through small incisions, often using miniaturized, high-tech imaging systems, to minimize the trauma of surgical exposure.

Extent of minimal access surgery

It crosses all traditional disciplines, from general surgery to neurosurgery.

Broadly speaking, minimal access techniques can be categorised as follows:

Laparoscopy

A rigid endoscope (**laparoscope**) is introduced through a port into the peritoneal cavity. This is insufflated with **CO₂** to produce a pneumoperitoneum. Further ports are inserted to enable instrument access and their use for dissection e.g. laparoscopic cholecystectomy.

Robotic Surgery

A robot is a mechanical device that performs automated physical tasks according to direct human supervision, a predefined program or a set of general guidelines using artificial intelligence techniques (**human-machine interface**) .

The advantages are two-fold: first for the *patient* (as for laparoscopic surgery) and second for the *surgeon* including better visualisation (higher magnification) with stereoscopic views; elimination of hand tremor allowing greater precision (e.g. the da Vinci system).



Operating arms of da Vinci system for robotic surgery

Disadvantages of robotic surgery:

- increased cost;
- increased set up of the system and operating time;
- socioeconomic implications;
- significant risk of conversion to conventional (open) techniques;
- prolonged learning curve;
- multiple repositioning of the arms can cause trauma;
- haemostasis;
- collision of the robotic arms in extreme positions.

Thoracoscopy

A rigid endoscope is introduced through an incision in the chest to gain access to the thoracic contents.

Endoluminal endoscopy

Flexible or rigid endoscopes are introduced into hollow organs or systems, such as the urinary tract, & GIT.

Perivisceral endoscopy

Body planes can be accessed even in the absence of a natural cavity. Examples are mediastinoscopy, retroperitoneoscopy and retroperitoneal approaches to the kidney, aorta and lumbar sympathetic chain.

Arthroscopy and intra-articular joint surgery

Give access to the knee and now, even to other joints, including the shoulder, wrist, elbow and hip.

Combined approach

The diseased organ is visualised and treated by an assortment of endoluminal and extraluminal endoscopes and other imaging devices.

Advantages of minimal access surgery

- _ Decrease in wound size
- _ Reduction in wound infection, dehiscence, bleeding, herniation and nerve entrapment
- _ Decrease in wound pain
- _ Improved mobility
- _ Decreased wound trauma
- _ Decreased heat loss
- _ Improved vision

Limitations of minimal access surgery

- _ Reliance on remote vision and operating
- _ Loss of tactile feedback
- _ Dependence on hand–eye coordination
- _ Difficulty with haemostasis
- _ Reliance on new techniques
- _ Extraction of large specimens

Preparation for laparoscopic or robotic surgery

- _ Overall fitness: cardiac arrhythmia, emphysema, medications, allergies
- _ Previous surgery: scars, adhesions
- _ Body habitus: obesity, skeletal deformity
- _ Normal coagulation
- _ Thromboprophylaxis
- _ Informed consent

Preparation is **very similar** to that for open surgery and aims to ensure that:

- _ The patient is fit for the procedure.
- _ The patient is fully informed and has consented.
- _ Operative difficulty is predicted when possible.
- _ Appropriate theatre time and facilities are available (especially important for robotic cases).

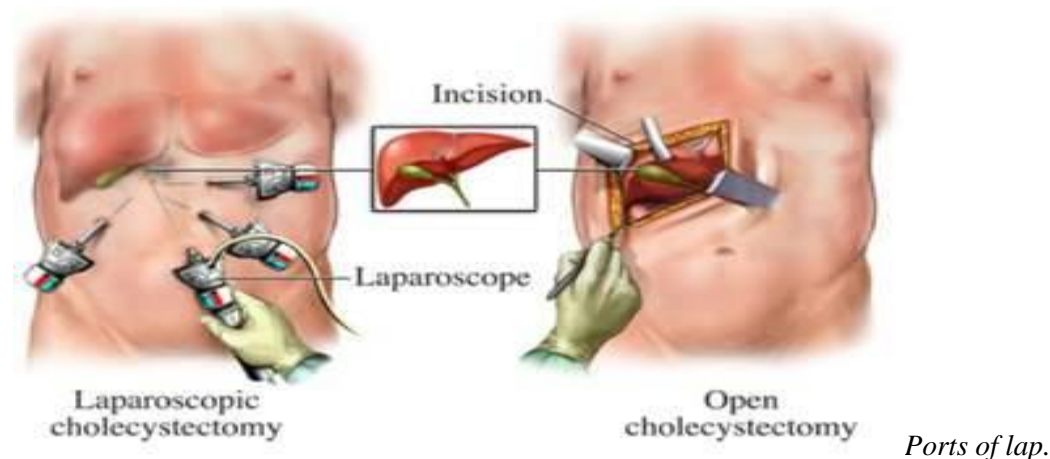
Laparoscopic cholecystectomy

It is the **commonest** laparoscopic procedure & it's now the '**gold standard**' for operative treatment of symptomatic gallstone disease. Though nowadays, **most** of the elective (& **some** emergency) general surgical procedures can be performed laparoscopically.

Creating a pneumoperitoneum :There are **two** methods for creation of a pneumoperitoneum:

open and closed. The **closed** method involves blind puncture using a **Verres needle**. Although this method is **fast**, there is a small potential for intestinal or vascular **injury**.

The routine use of the **open** technique for creating a pneumoperitoneum avoids the morbidity related to a blind puncture. To achieve this, a 1-cm vertical or transverse incision is made at the level of the umbilicus. Then, a **Hasson trocar** (or other blunt-tip trocar) is inserted, followed by CO₂ insufflation then introduction of the other 3 trocars.



Chole.



Extraction of the gallbladder in laparoscopic cholecystectomy.

Preoperative problems

Previous abdominal surgery

This is **no longer a contraindication** to laparoscopic surgery, but preoperative evaluation is necessary to assess the type and location of surgical scars (intra-abdominal **adhesions** expected) . As mentioned earlier, the **open technique** for insertion of the first trocar is safer.

Obesity

Laparoscopic and robotic surgery have proved to be **safe and effective** procedures in the obese population. In fact, some procedures are less difficult than their open

counterparts for the morbidly obese patient, e.g. in bariatric surgery. **Technical difficulties** occur, however, in obtaining pneumoperitoneum.

Postoperative care

This is with a **low** incidence of pain or other problems.

Nausea

About **half** of patients experience some degree of nausea after laparoscopic surgery and rarely this is severe. It usually responds to an antiemetic & is made worse by opiate analgesics.

Shoulder tip pain

The **most common** routine postoperative symptoms are a dull upper abdominal pain, nausea and pain around the shoulders (referred **from the diaphragm**) mostly due to diaphragmatic irritation by CO₂. It can be at its worst 24 hours after the operation. It usually settles within **2–3 days** and is relieved by simple analgesics.

Abdominal pain

Pain in one or other of the port site wounds is not uncommon and is worse if there is haematoma formation. It usually **settles** very rapidly. Increasing pain after 2–3 days may be a sign of infection and, with concomitant signs, antibiotic therapy is occasionally required. Occasionally, herniation through a port may account for localised pain.

Analgesia

A 100-mg diclofenac suppository may be given at the time of the operation.

Suppositories may be administered a further two or three times postoperatively for relief of more severe pain. Otherwise, 500–1000 mg of paracetamol 4-hourly. Opiate analgesics cause nausea and should be avoided unless the pain is very severe.

Orogastric tube

An orogastric tube may be placed during the operation if the stomach is distended and obscuring the view (**not routine**).

Oral fluids

There is no significant ileus after laparoscopic surgery, except in resectional procedures. Patients can start taking oral fluids **as soon as** they are conscious; they usually do so **4–6 hours** after the end of the operation.

Oral feeding

Provided that the patient has an appetite & not nauseated, a light meal can be taken **4–6 hours** after the operation.

Urinary catheter

If a urinary catheter has been placed in the bladder during the operation, it should be removed before the patient regains consciousness.

Drains

Some surgeons drain the abdomen at the end of laparoscopic cholecystectomy, although this is controversial (**not routine**). If it has been placed it should be removed after **12–24 hours**. Continued blood loss from a drain is an indication for re exploration of the abdomen.

Surgical principles

- _ Meticulous care in the creation of a pneumoperitoneum
- _ Controlled dissection of adhesions
- _ Adequate exposure of operative field
- _ Avoidance and control of bleeding
- _ Avoidance of organ injury
- _ Avoidance of diathermy damage
- _ Vigilance in the postoperative period

Discharge From Hospital

Most surgeons discharge a significant proportion of their laparoscopic cholecystectomy patients **on the day** of surgery, but some are discharged the **following morning**. Patients should not be discharged until they are seen to be comfortable, passed urine and eating and drinking satisfactorily.

Developments That Have Made Minimally Invasive Surgery Even Less Invasive

There is continued work on how to **reduce the trauma and scarring** from the incisions used in laparoscopic surgery as multiple port sites are needed for most procedures.

Natural orifice transluminal endoscopic surgery (**NOTES**) : here surgeons enter the peritoneal cavity via **endoscopic puncture** of a hollow viscus e.g. the stomach, rectum or vagina (**transvaginal NOTES** cholecystectomies have been performed).

Single incision laparoscopic surgery (**SILS**) is a technique adopted by some surgeons to insert all the instrumentation via a single incision, through a multiple channel port via the umbilicus to carry out the procedure.

laparoendoscopic single site surgery (**LESS**) and single port access (**SPA**) surgery.

GOOD LUCK