MSSS
Malaysian Students' Surgical Society

1st Edition

All You Need to Know

LAPAROSCOPIC MANUAL

For Malaysian Undergraduate Medical Students

Written & designed by:

MSSS

MALAYSIAN STUDENTS' SURGICAL SOCIETY

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SELSMA
Society of Endoscopic and Laparoscopic Surgeons of Malaysia

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About Us

Introduction

SELSMA (Society of Endoscopic and Laparoscopic Surgeons of Malaysia) was formed to bring together surgeons from all over the world and Malaysia specifically. With a focus on Endoscopic-Laparoscopic techniques, SELSMA functions as a platform for surgeons with special interest in this field to congregate their ideas, learn new techniques and educate others.

Our History & Objectives

Formed in the year 2012, SELSMA is the brainchild of a group of esteemed surgeons with a common interest and goal. Thus far, SELSMA has successfully conducted 3 congresses with an array of various surgeons from across the globe as speakers.

SELSMA is also part of a bigger society, ELSA or also known as the Endoscopic and Laparoscopic Surgeons of Asia. SELSMA takes pride in its members who are the crème de la crème from various surgical subspecialties.

Besides being a platform for surgeons to come together, SELSMA also welcomes Medical officers, Medical students and Allied health to actively participate in their host of activities.

A Foreword From...

President, Society of Endoscopic and Laparoscopic Surgeons of Malaysia (SELSMA)

It is with great pleasure and pride that I extend my heartfelt congratulations to the Malaysian Students' Surgical Society (MSSS) for the successful development and publication of this Manual on Laparoscopy for Undergraduate Medical Students.

This initiative marks a significant step forward in nurturing surgical interest and skill development among future generations of doctors. By equipping students with a structured introduction to laparoscopic principles and techniques, MSSS is playing an important role in shaping the future of surgery in Malaysia.

SELSMA is proud to have contributed in a small way to this outstanding effort. Our collaboration with MSSS reflects a shared commitment to surgical education, innovation, and excellence. We believe that early exposure to minimally invasive surgery not only enhances technical competence but also inspires students to pursue careers that push the boundaries of modern surgical care.

With dynamic and forward-thinking societies like MSSS leading the way, the future of surgery in Malaysia is indeed bright. We look forward to seeing more initiatives that bridge the gap between student curiosity and surgical practice, and we are confident this manual will become a valuable resource in that journey.

Congratulations once again to the MSSS team for their dedication and vision.

Dr Vimal Kumar A/L Vasudeavan

President

Society of Endoscopic and Laparoscopic Surgeons of Malaysia (SELSMA)

Introduction

The **Malaysian Students' Surgical Society (MSSS)** is an esteemed student-led organization that is committed to surgical education and promoting the professional growth of medical students around Malaysia. Established in 2018, MSSS has grown and evolved into an active national student body where nationwide medical students who envision themselves in the field of surgery can boost their knowledge, sharpen their surgical skills and develop strong networking with like minded peers. We provide a vibrant avenue for our next generation surgeons to acquire the necessary skills and knowledge to thrive in this ever changing field as they graduate from medical school and progress to the next step of their career.

Our Goals

The goals of our society are as follows :

- To promote acquisition of basic surgical skills among medical students.
- To empower medical students to network with like minded peers who are interested in the surgical field.
- To create a platform where students can participate in peer to peer teaching of basic surgical skills and knowledge.
- To inspire medical students to step foot into the field of surgery with large scale surgical knowledge sharing events.

The Meaning of MSSS Logo

The logo of consists of two important components that highlight our mission as a society.

The main body of our logo consists of a diagram of the abdomen, the anatomy which is the main focus of attention in general surgery. This symbolizes our goal to promote quality surgical education.

The surgical knot in our logo signifies the unity that is seen among our members, like-minded medical students who are passionate in the field of surgery from all around Malaysia.

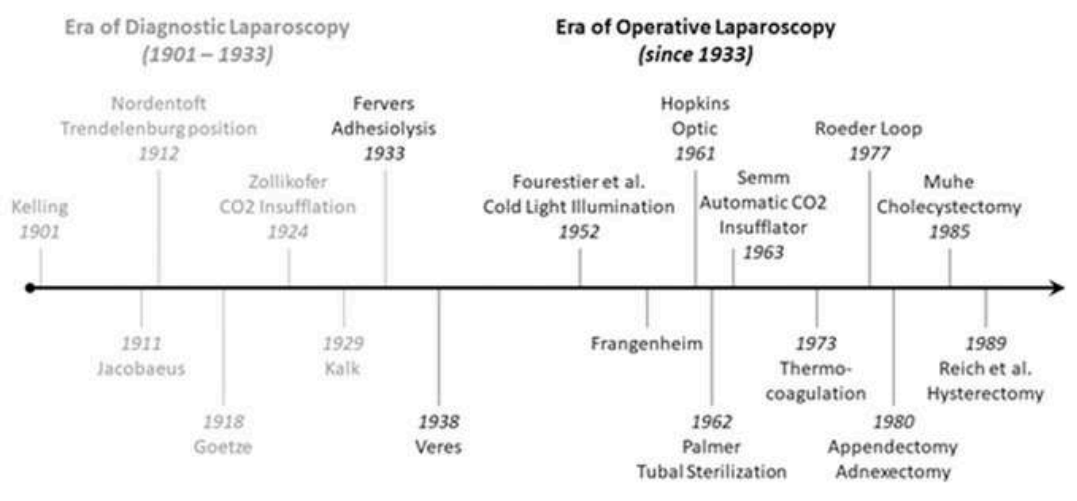
1. What is Laparoscopy?

1.1 Introduction to laparoscopy & the definition of laparoscopic surgery

A new era of surgical treatment has begun with the recent spike in the use of laparoscopic and other minimally invasive surgery techniques, which is having a significant impact on surgical management.

The procedure known as a laparoscopy involves creating a pneumoperitoneum and then inserting a telescope through the abdominal wall to examine the peritoneal cavity. This technique minimises access stress and speeds up the patient's recovery. Using video cameras and television screens, surgeons manipulate and dissect patients remotely within the enclosed abdominal cavity or extraperitoneal region while maintaining visual control.

1.2 The History of Laparoscopy



Modern laparoscopic surgery originated at the Kiel School in Germany, led by gynaecologist Semm. Most of the currently used laparoscopic gynaecological operations were established by this centre, which also developed and improved numerous devices. Laparoscopic techniques took some time to become popular in general surgery despite being used by gynaecologists for many years

1.3 Benefits of Laparoscopic Surgery

Laparoscopic surgery, also known as minimally invasive surgery, offers numerous advantages over traditional open procedures. Laparoscopic surgery has now become the preferred approach for many procedures in general surgery, gynecology, urology, and orthopedic specialties.

Patient benefits:

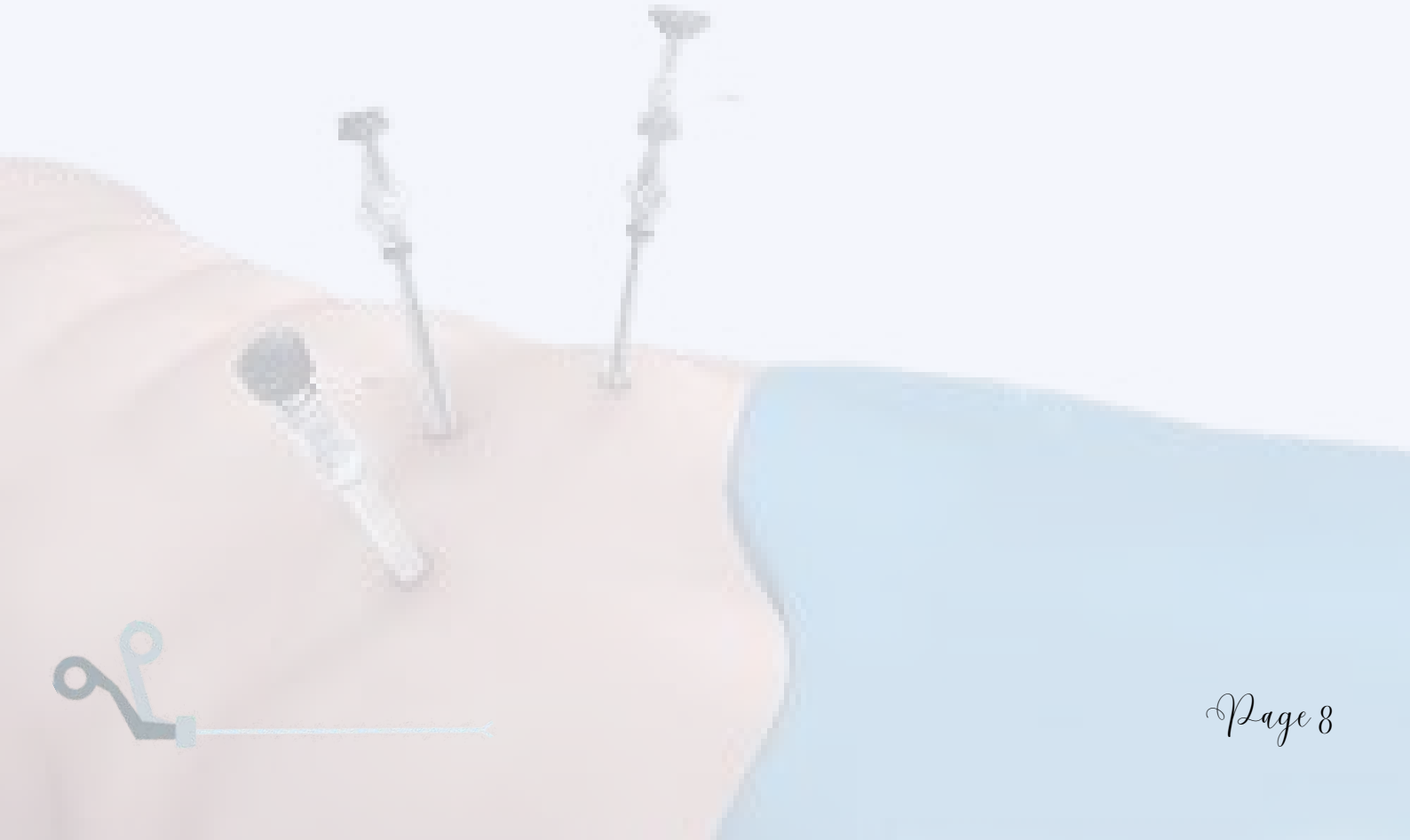
- Reduced postoperative pain compared to open surgery.
- Minimal blood loss during the procedure.
- Lower risk of wound infections.
- Faster recovery and shorter hospital stays.
- Quicker return to daily activities.
- Smaller incisions result in less scarring and better cosmetic outcomes.

Clinical advantages:

- High-definition visualization of internal organs enhances surgical precision.
- Allows for more controlled and accurate maneuvers by the surgeon.

Broader impact:

- Leads to higher patient satisfaction.
- Helps reduce overall healthcare costs.
- Contributes to improved surgical outcomes.



2. Laparoscopic Parts & Functions

2.1 Laparoscopic Trolley

Consist of video monitor units and electrical supply terminal strips

2.2 Fibre Optic Cables

Light source

2.3 Telescope

Telescopes can be tilted from 25-30 or 45-50 degrees. They can also be aimed directly at an angle of 0 degree. Compared to the 0-degree telescope, which only offers a field of vision of 76 degrees, the 30-degree telescope has a total field of view of 152 degrees.

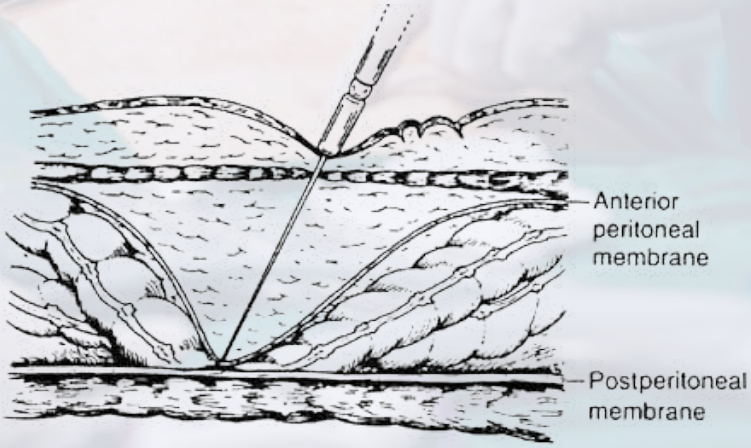
2.4 Insufflator

The availability of a secure pneumoperitoneum is the primary prerequisite for laparoscopy. For relatively basic procedures, including diagnostic laparoscopy, the mechanically monitored insufflator is suitable.

- It permits a constant flow of carbon dioxide (CO2). It automatically replenishes the abdomen, with the ability to quickly refill at a rate of three litres per minute with direct visual control.
- The gas volume and intra-abdominal pressure must be maintained within safe bounds.

2.5 Veress Needle

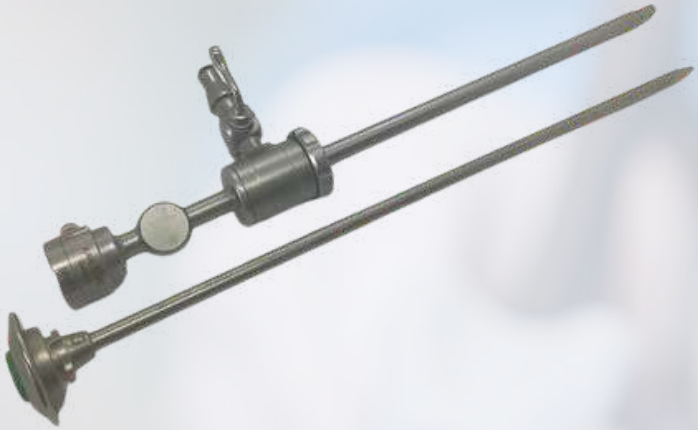
The Veress needle is used to create the initial pneumoperitoneum, which increases the gap between the abdominal wall and the abdominal viscera and allows the trocar to enter securely.



Source: Jack W. McAninch, Tom F. Lue
Smith & Tanagho's General Urology, Nineteenth Edition

2.6 Cannulae & trocars

- A trocar is a tool used to provide an entry point for a cannula or other devices, while a cannula is generally used for fluid transfer or as a channel for surgical equipment.
- Trocar and cannula will be explained more in the next chapter.

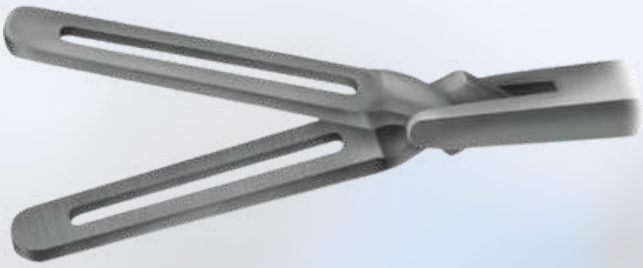


2.7 Hand instruments

A. Handle

B. Grasp forceps

- Atraumatic bowel grasp is the most commonly used grasp forcep



C. Dissector

D. Scissors

3. Types & Sizing Considerations of Trocars

3.1 What is a trocar?

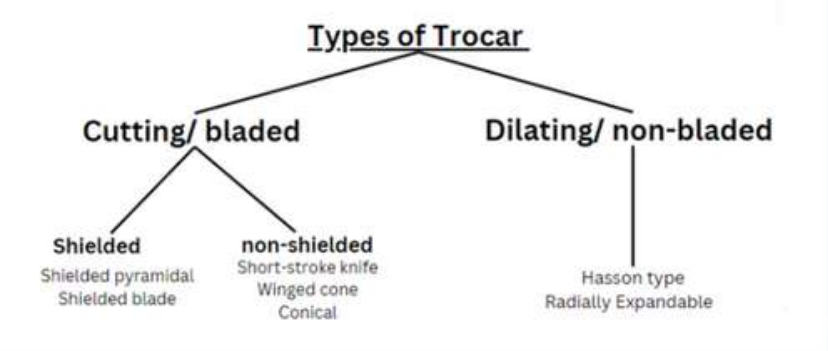
A trocar is a short, rigid device inserted into specific positions in the abdomen to facilitate the entry of laparoscopic surgery tools or a viewing device. It consists of an obturator (trocar tip), a cannula for instrument insertion, and a valve mechanism that prevents the leakage of air, gas, or fluid.

During use, the obturator pierces the body wall and is then withdrawn after securing the trocar, leaving the cannula as the access port for surgical procedures. The valve opens when an instrument is inserted or removed via the cannula, allowing the instrument to pass through and automatically sealing upon removal to minimize gas leakage and maintain abdominal pressure. Surgeons typically use multiple trocars to create various access points during surgery.

The field of laparoscopic surgery has advanced rapidly, supported by research demonstrating reduced post-operative complications and pain compared to open surgery. This progress has led to the introduction of a wide range of laparoscopic trocars, which will be further explored.

3.2 Types of Trocar

Minimally invasive surgery offers surgeons a wide array of laparoscopic trocars tailored to specific needs. Broadly categorised into bladed and non-bladed types, this article explores their distinct features, advantages, and disadvantages to aid surgical decision-making.



3.2.1 Bladed Trocars

Bladed trocars are the traditional instruments used to create an initial puncture point in laparoscopic surgery. They feature a sharp cutting tip that pierces the abdominal wall, allowing access for endoscopic instruments.

Shielded vs. Non-shielded
Bladed trocars come in two varieties: shielded and non-shielded. Shielded trocars have a retractable blade design that minimizes the risk of accidental injury to underlying structures during insertion. Non-shielded trocars offer faster entry but require greater precision due to the exposed blade.

Advantages and Disadvantages:
Bladed trocars offer a simple and efficient method for initial access. However, they carry a higher risk of vessel or bowel injury compared to non-bladed options. Additionally, they may cause tissue trauma and bleeding at the insertion site.

3.2.2 Non-bladed Trocars

Non-bladed trocars are a safer alternative to their bladed counterparts. They utilise various mechanisms to achieve access without a sharp cutting tip, minimising the risk of vascular or visceral injury.

Hasson Technique

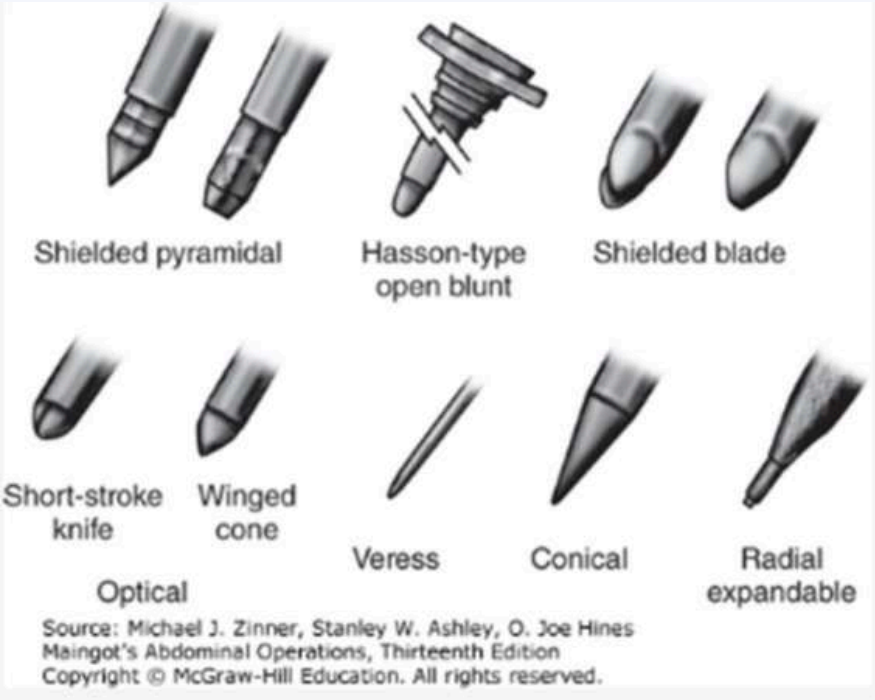
The Hasson technique, a non-bladed approach, uses a blunt trocar inserted under direct visualisation to create a small opening in the umbilicus. This initial access point is then used for subsequent insertion of bladed trocars under visual control.

Rapidly Expandable Trocars

Another type of non-bladed trocar employs a dilating mechanism to create a passage through the abdominal wall. This technique reduces tissue trauma and bleeding compared to bladed trocars.

Advantages vs. Disadvantages

Non-bladed trocars offer improved safety by minimising the risk of injury. However, they may be more time-consuming to insert and require additional technical expertise. Additionally, some non-bladed trocars may not be suitable for all types of laparoscopic procedures.



Source: Michael J. Zinner, Stanley W. Ashley, O. Joe Hines
Maingot's Abdominal Operations, Thirteenth Edition

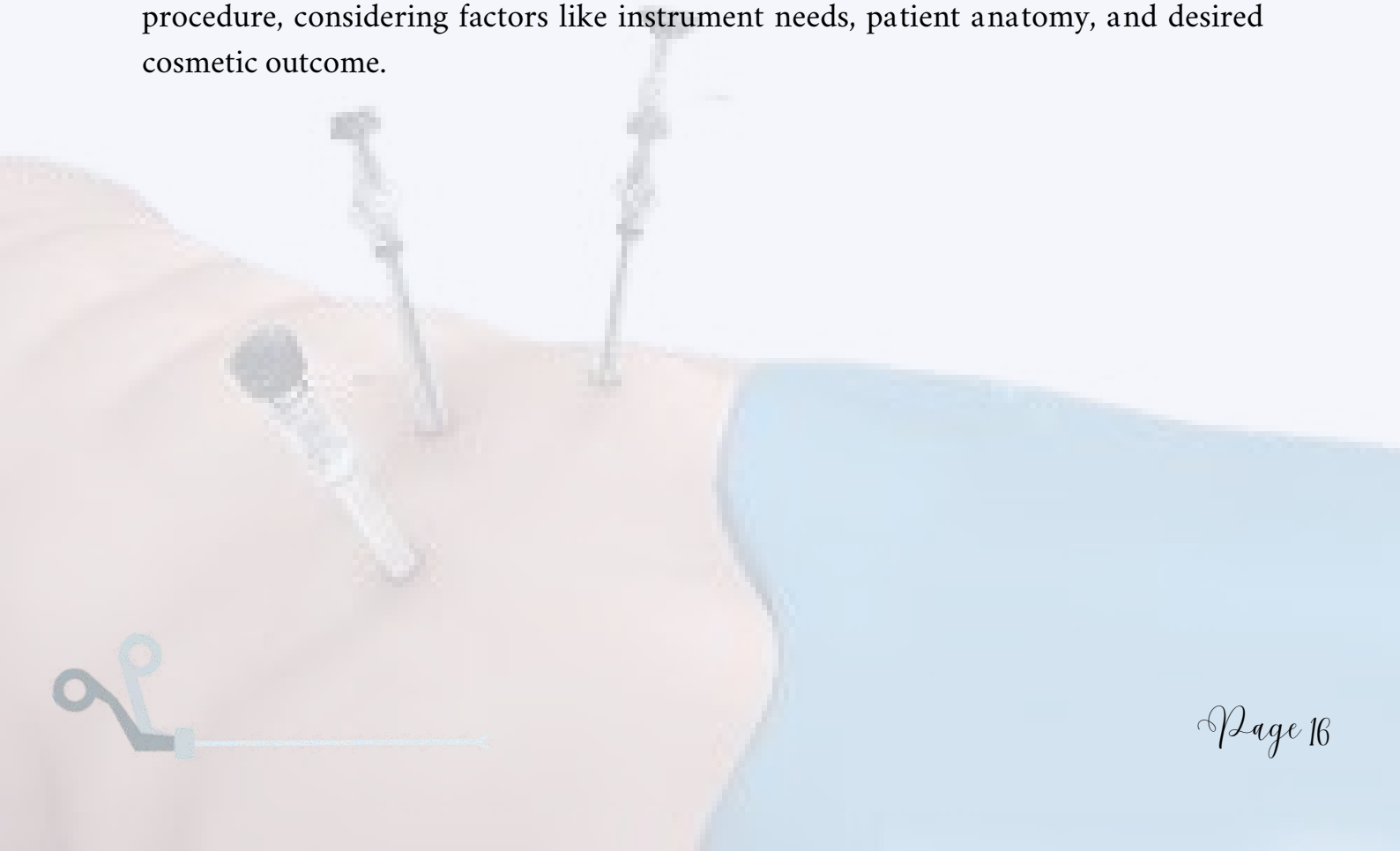
3.2.3 Optical Trocar

Optical trocars are specialized trocars that integrate a miniature camera within their design. This allows for direct visualization of the abdominal wall during insertion, further enhancing safety and reducing the risk of complications.

Optical trocars offer superior safety and visualization during trocar insertion. However, they are generally more expensive than traditional trocars and may require additional training for proper use.

3.3 Trocar sizes

Trocar size selection is crucial in laparoscopic surgery, balancing instrument access with minimal tissue disruption. They range in diameter from a mere 2mm to 15mm, with 5mm and 10-12mm being the most used sizes. Smaller trocars (5mm) are ideal for delicate procedures and offer improved cosmesis due to minimal incision size. However, they limit working space and instrument options. Conversely, larger trocars (10-12mm) allow for easier manipulation and accommodate bulkier instruments but come with a higher risk of incisional hernias if not meticulously closed. Ultimately, the surgeon chooses the optimal trocar size based on the specific procedure, considering factors like instrument needs, patient anatomy, and desired cosmetic outcome.



4. Disposable & Reusable Laparoscope

The choice between reusable and disposable laparoscopes hinges on several factors, impacting both cost and patient care.

4.1 Reusable Laparoscopes

Designed for multiple uses, these instruments are sterilized between procedures.

Advantages:

- **Cost-Effective in High Volume:** While the initial purchase price is higher, reusable laparoscopes become more economical over time, especially in hospitals performing a high volume of laparoscopic surgeries.
- **Durability:** Built with robust materials, they can withstand repeated sterilization cycles and extended use, ensuring reliable performance.
- **Reduced Environmental Impact:** By minimizing waste compared to disposables, reusable laparoscopes contribute to a greener healthcare system.

Disadvantages:

- **Sterilization Requirements:** Thorough cleaning and sterilization after each use are crucial to prevent infection transmission. This process can be time-consuming and requires meticulous execution to maintain sterility.
- **Higher Initial Cost:** The upfront investment for reusable laparoscopes is significantly higher compared to disposable options.

4.2 Disposable Laparoscopes

Intended for single use, these instruments are discarded after the procedure.

Advantages:

- **Convenience:** Eliminating the need for cleaning and sterilization allows for immediate use and faster turnover times in operating rooms.
- **Enhanced Infection Control:** Each device is used only once, minimizing the risk of cross-contamination between patients.
- **Predictable Costs:** Disposable laparoscopes offer a fixed cost per procedure, simplifying budget planning.

Disadvantages:

- **Higher Per-Use Cost:** While initially cheaper than reusables, the cumulative costs associated with disposables can outweigh those of reusables in high-volume settings.
- **Environmental Concerns:** Increased waste generation due to the disposal of plastic and other materials associated with disposable laparoscopes poses a significant environmental challenge.
- Ultimately, the optimal choice between reusable and disposable laparoscopes depends on a hospital's specific needs, surgical volume, and commitment to environmental sustainability.

5. Preparation for a Laparoscopic Surgery

5.1 Anaesthesia

General anaesthesia with intubation and controlled ventilation, is generally the preferred anaesthetic technique for the vast majority of laparoscopic procedures. Laparoscopy under epidural analgesia or local anaesthetic techniques, is unpopular because of patient discomfort associated with pneumoperitoneum and postural changes, the need to avoid respiratory embarrassment, hypercarbia, and aspiration, and the possible risks of bleeding, gas embolism and arrhythmia.

- The patient's age, size, pre-existing illnesses and contraindications to laparoscopy, should all be carefully assessed.
- The anaesthetist must be prepared to encounter complications
- such as major bleeding, gas embolism, and pneumothorax. Adequate monitoring will allow the early detection of compli- cations.
- Nasogastric aspiration via a tube improves access in the upper abdomen and minimises the risk of pulmonary aspiration.
- A bladder catheter improves access in the lower abdomen and allows monitoring of urinary output.
- Ensure adequate venous access and consideration should be given to the necessity for a central venous catheter and arterial line.
- Complete muscle relaxation is necessary to avoid any sudden movement by the patient which may be hazardous.
- Nitrous oxide may cause practical problems related to intestinal distension and has the theoretical disadvantages of increasing the size of a gas embolus and the chance of combustion by diffusion into the abdominal cavity.
- Maintain patient core temperature, particularly during laparoscopy in the elderly and children, and the more prolonged procedures.

5.2 Basic instruments required

Camera

- During laparoscopic surgery, precise visualisation of the operating field is crucial. The zoom lens, automatic colour calibration, high-speed shutter to prevent overexposure, and ease of sterilisation with glutaraldehyde and ethylene oxide gas characterise the current silicon chip lightweight camera.

Monitor

- While endoscopic surgery can be carried out with a single monitor, it is better to have two sets so that the assistant and the surgeon on either side of the operating table can see each other directly.

Light source

- Accurate colour and image transmission depends critically on the quality of the light. The phrase 'cold light' refers to the light that requires the least amount of heat conduction to the telescope in order to retain its sensitivity. However, if there is extended contact, the heat generated at the fibre optic or telescope's end could be enough to burn the patient, the drape, or internal organs.

Documentation device

- A video recorder that can capture with or without still images is essential for recording, education, and learning.

Imaging trolley

- The monitor, along with the camera control unit, light source, video recorder, printer, suction irrigation device, insufflator, and ultrasound screen, are all conveniently positioned on a specially constructed trolley. With the help of this trolley, there are fewer trailing wires and cables on the floor, and moving about the operating table and theatre is made simple.

Telescope

- The laparoscopic telescope has two channels, one channel being the optical 'viewing channel', and the second is the glass fibres that transmit light.

Insufflator

- Four readily apparent and adjustable gauges are required for a high flow automatic electronic insufflator: one for measuring the rate of CO2 flow into the abdomen (up to 10 ml/min); another for monitoring the pressure inside the CO2 cylinder; another for recording the total volume of gas delivered; and a fourth one for continuously monitoring the intra-abdominal pressure, which will trigger the gas flow automatically once the pre-selected abdominal pressure is reached.

Veress needle

- The Veress needle is a long needle with a hollow, blunt trocar that is spring-loaded in the middle. The blunt trocar retracts when it encounters resistance from the abdominal wall and then extends once more to shield the viscera from the needle when the abdominal cavity's resistance has vanished. Gas flows through the hollow trocar to create the initial pneumoperitoneum

Cannulae and trocars

- A tubular device called a cannula or "port" is used to get surgical access. With the exception of the blunt Hasson cannula, all cannulae feature a sharp trocar to aid in passing through the abdomen wall and a membrane or valve to stop gas leakage while the device is not in use. Additionally, the majority of cannulae feature a rubber seal at the top that allows tools and telescopes to pass through without compromising pneumoperitoneum. Not every cannula has an insufflation side port.

Anchoring device

- Cannula dislodgement could be avoided by using anchoring stitches or devices. These are especially useful for lengthy laparoscopic surgeries and for individuals who are skinny or young.

6. Common Surgeries

6.1 Urology

Laparoscopic urology uses minimally invasive keyhole techniques to treat conditions affecting the kidneys, ureters, bladder, and prostate. Laparoscopy is widely adopted in urology due to the retroperitoneal anatomy and deep pelvic structures that are well-suited for minimally invasive access. Laparoscopic approaches are associated with less pain, quicker recovery, minimal scarring, and shorter hospital stays compared to open procedures.

6.1.1 Laparoscopic Nephrectomy

Laparoscopic nephrectomy involves the removal of a kidney due to cancer, severe damage, or non-functioning kidneys. It is the gold standard treatment for kidney cancer and end-stage kidney disease. Depending on the patient's condition, it can be:

- Simple Nephrectomy: Removal of a kidney for non-cancerous disease, such as chronic infection, non-functioning renal units, or severe trauma.
- Partial Nephrectomy: Removal of a portion of the kidney, typically used for smaller tumors.
- Radical Nephrectomy: Removal of the entire kidney, often for large tumors or severe kidney disease. This includes removal of adjacent tissues, often including fat, lymph nodes, and the adrenal gland.

Indications:

- Chronic kidney infections or severe kidney damage.
- Large renal tumors (up to 10–12 cm) without local invasion.
- Renal trauma or symptomatic non-functioning kidneys.

Surgical Approach:

The patient is placed in a lateral decubitus position, and pneumoperitoneum is established. Three to four trocars are inserted to access the kidney. The colon is reflected medially, and the ureter and gonadal vessels are traced to the renal hilum. The renal artery and vein are individually clipped or stapled. The kidney is mobilized, placed in an extraction bag, and removed via an enlarged port site. Haemostasis is ensured, instruments withdrawn, and incisions closed.

6.1.2 Laparoscopic Adrenalectomy

Laparoscopic adrenalectomy is a minimally invasive surgical procedure to remove an adrenal gland, typically performed for adrenal tumors or hyperfunctioning conditions.

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Indications:

Functional Adrenal Tumors:

- Pheochromocytoma: Tumors producing excess catecholamines.
- Conn's Syndrome: Hyperaldosteronism.
- Cushing's Syndrome: Excess cortisol production

Incidentalomas: Asymptomatic adrenal tumors discovered incidentally on imaging.

Surgical Approach:

The patient is under general anesthesia, positioned with a slight lateral tilt. For right-sided adrenalectomy, 3–4 small incisions are made, and the liver is mobilized to access the gland. On the left, the splenic flexure of the colon is mobilized. The adrenal gland is carefully dissected, preserving nearby vessels (e.g., inferior vena cava, renal vein, splenic vessels). The gland is removed after ligating its blood supply and confirming hemostasis.

6.1.3 Laparoscopic Varicocelectomy

Laparoscopic varicocelectomy treats varicocele—enlarged veins in the scrotum, specifically in the pampiniform plexus.

Indications:

- Infertility.
- Pain relief.
- Testicular atrophy.
- Cosmetic concerns.

Surgical Approach:

Performed under general anesthesia using small abdominal incisions. A laparoscope is used to visualize the spermatic cord. The dilated veins are ligated while preserving the testicular artery and vital structures. Incisions are closed with sutures or surgical glue.

6.1.4 Laparoscopic Pyeloplasty

Laparoscopic pyeloplasty is a reconstructive surgery to correct ureteropelvic junction (UPJ) obstruction by removing the blockage and restoring urine flow from the renal pelvis to the ureter.

Indications:

- Symptomatic UPJ obstruction.
- Obstructive hydronephrosis with preserved renal function.
- Declining renal function due to UPJ obstruction.
- Recurrent urinary tract infections (UTIs).
- Urolithiasis associated with UPJ obstruction.

Surgical Approach:

The patient is placed in a modified lateral position, and three ports are introduced. After mobilizing the colon, the renal pelvis and upper ureter are exposed. The obstructed segment is excised. A dismembered pyeloplasty (Anderson-Hynes technique) is performed with spatulation and a double-J stent placement. Hemostasis is ensured and the port sites are closed. This approach provides durable outcomes, good cosmetic results, and faster recovery.

6.1.5 Laparoscopic Prostatectomy

Laparoscopic prostatectomy is used to remove the prostate gland in men with localized prostate cancer.

Indications:

- Organ-confined prostate cancer (T1–T2).
- Low to intermediate risk patients opting for surgery.

Surgical Approach:

Under general anesthesia, the patient is placed in the lithotomy position. 5 small incisions are made for the laparoscope and instruments. The prostate is exposed and surrounding structures (seminal vesicles, vas deferens, urethra) are dissected. The prostate is removed while preserving the neurovascular bundles. The urethra is anastomosed to the bladder neck. Hemostasis is secured, and incisions closed.

6.1.6 Laparoscopic Cystectomy

Laparoscopic cystectomy involves partial or complete removal of the urinary bladder and is most often indicated for muscle-invasive bladder cancer. This complex procedure also includes lymph node dissection and urinary diversion.

Types:

- Partial Cystectomy: Removal of a portion of the bladder.
- Radical Cystectomy: Complete removal of the bladder, often with removal of adjacent organs (e.g., prostate in men, uterus in women).

Indications:

- Muscle-invasive bladder cancer.
- High-risk non-muscle-invasive bladder cancer that doesn't respond to BCG or recurs frequently.
- Carcinoma in situ (CIS) not responding to treatment.
- Bladder tumors with aggressive or variant histology (e.g., micropapillary, squamous, adenocarcinoma).
- Locally advanced bladder cancer (T3/T4) that is still surgically resectable.
- Severe bladder dysfunction from radiation, chronic infection, or neurogenic bladder.

Surgical Approach:

Under general anesthesia, the patient is placed in a lithotomy or modified dorsal position. Four ports are inserted. The peritoneum is insufflated with CO_2, and the bladder or cyst is identified
and dissected from surrounding structures. After excision, hemostasis is ensured, peritoneum irrigated, and incisions closed. The patient is monitored for complications such as bleeding, infection, or bladder dysfunction.

6.2 Orthopedic

Arthroscopy is a minimally invasive surgical procedure in which a physical examination of the interior of a joint is performed using an arthroscope, a type of endoscope that is inserted through a small incision. The advantage of arthroscopy over traditional open procedures is that the joint does not need to be opened fully. Instead, surgery is performed with two small incisions—one for the arthroscope and one for the surgical instruments. This significantly reduces recovery time and increases surgical success rates due to reduced trauma to connective tissue.

6.2.1 Knee Arthroscopy for Meniscectomy

Knee arthroscopy is one of the most frequently performed orthopedic procedures. It allows direct, magnified visualization of intra-articular structures through small incisions, enabling both diagnosis and treatment of joint pathologies—particularly involving the meniscus—with minimal disruption to surrounding tissues.

Indications:

- Meniscal tears (especially traumatic or in young patients).
- Knee pain, locking, or swelling.
- Diagnostic confirmation of intra-articular pathology.

Surgical Approach:

Performed under spinal or general anesthesia with the patient in a supine position and knee in 90° flexion, using a tourniquet on the upper thigh. After sterile preparation, standard anterolateral and anteromedial portals are created for instrument access. The meniscus is examined, and repair is attempted if the tear is in a peripheral vascularized zone (inside-out or all-inside technique). Partial meniscectomy is performed for degenerative or avascular zone tears using punches and shavers. Joint is irrigated, hemostasis ensured, and portals closed.

6.2.2 Anterior Cruciate Ligament (ACL) Reconstruction

This procedure reconstructs a torn ACL using a graft—commonly hamstring or patellar tendon—to restore knee stability.

Indications:

- ACL tear resulting in knee instability.
- Failed conservative management or high-demand activity.
- Associated meniscal or cartilage injury.

Surgical Approach:
Under general or regional anaesthesia, the patient is placed supine with the leg secured. Diagnostic arthroscopy is performed first. A graft (e.g., semitendinosus-gracilis or bone-patellar tendon-bone) is harvested. Tibial and femoral tunnels are drilled under arthroscopic guidance. The graft is passed, tensioned, and fixed using screws or buttons. Graft stability is confirmed before portal closure.

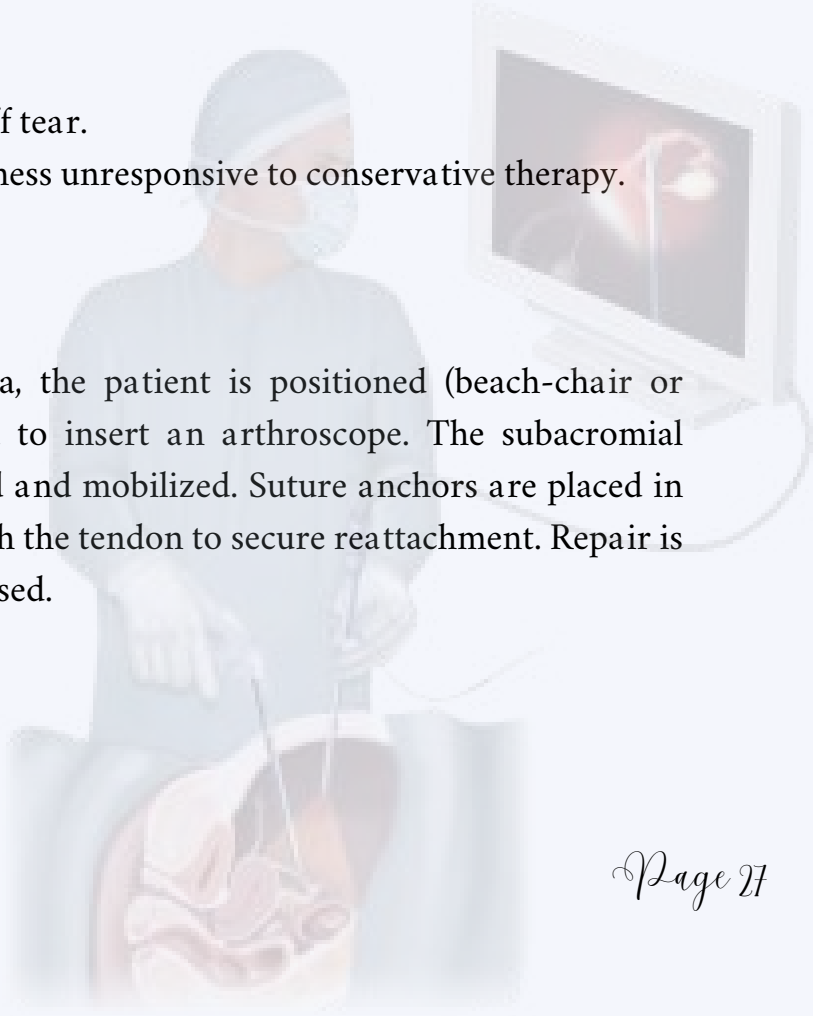
6.2.3 Arthroscopic Rotator Cuff Repair

A minimally invasive procedure used to repair tears in the rotator cuff—key tendons that stabilize the shoulder and facilitate elevation.

Indications:

- Partial or full-thickness rotator cuff tear.
- Persistent shoulder pain and weakness unresponsive to conservative therapy.
- Shoulder impingement syndrome.

Surgical Approach:
Under general or regional anaesthesia, the patient is positioned (beach-chair or lateral decubitus). Portals are created to insert an arthroscope. The subacromial space is cleared, the tendon is debrided and mobilized. Suture anchors are placed in the humerus and sutures passed through the tendon to secure reattachment. Repair is assessed, joint irrigated, and portals closed.



6.2.4 Shoulder Arthroscopy for Subacromial Decompression

A minimally invasive approach to visualize and treat intra-articular and subacromial shoulder disorders while preserving deltoid integrity. This improves shoulder motion and reduces pain.

Indications:

- Subacromial impingement syndrome
- Chronic bursitis
- Failure of conservative treatment (NSAIDs, physiotherapy, injections)

Surgical Approach:
Under general anesthesia, the patient is positioned (beach-chair or lateral decubitus). A posterior portal is created for initial arthroscopy, redirected into the subacromial space via a lateral portal. Inflamed bursa is removed. The coracoacromial ligament may be released, and the acromion undersurface shaved (acromioplasty) to relieve impingement. Portals are closed after decompression.

6.2.5 Hip Arthroscopy

A technically demanding but valuable procedure for diagnosing and treating intra-articular hip disorders with minimal disruption to the capsule and musculature
Indications:

- Femoroacetabular impingement (FAI)
- Labral tears
- Loose bodies or chondral damage

Surgical Approach:
Performed under general anesthesia with the patient in a supine or lateral position using a traction device for joint distraction. Standard anterolateral and mid-anterior portals are used. The arthroscope examines the labrum, cartilage, and ligamentum teres. Cam and pincer lesions are resected for FAI. Labral tears are repaired or debrided. Loose bodies and synovitis are addressed. Traction is released and portals closed.

6.2.6 Ankle Arthroscopy

Ankle arthroscopy is increasingly used to diagnose and manage intra-articular pathologies in a small, difficult-to-access joint while minimizing morbidity.

Indications:

- Ankle pain, catching, or stiffness
- Osteochondral defects of the talus
- Synovitis or anterior impingement

Surgical Approach:

Under spinal or general anesthesia, the patient is supine with the foot dorsiflexed or distracted. Anteromedial and anterolateral portals are created near the tibialis anterior tendon and lateral malleolus. A 2.7 mm arthroscope is introduced. Synovitis, loose bodies, and osteophytes are removed. Microfracture or debridement techniques may be used for osteochondral lesions. Joint is irrigated and incisions closed.

Laparoscopic Gynaecological Surgery

Laparoscopic gynaecological surgery is a cornerstone of modern minimally invasive therapy for women. Since its early application by Dr. Kurt Semm in the 1980s, this technique has evolved from diagnostic procedures to complex operative interventions. It offers faster recovery, reduced postoperative pain, and superior aesthetic outcomes compared to open surgery.
Today, laparoscopy is the standard of care for many benign and selected malignant conditions in gynaecology.

1. Indications for Gynaecological Laparoscopy

Diagnostic	Therapeutic
Evaluation of chronic pelvic pain	Ovarian cystectomy
Infertility workup (tubal patency, adhesions)	Salpingectomy/salpingostomy
Endometriosis staging	Myomectomy
Unexplained pelvic mass	Hysterectomy (TLH, LAVH)
Suspected ectopic pregnancy	Excision of endometriosis

2. Preoperative Preparation

- **Patient optimization:** FBC, UPT, coagulation screen, imaging (TVUS), bowel prep if needed.
- **Informed consent:** Include possibility of conversion to open surgery, risks (ureteric/bladder injury).
- **Anesthesia:** General anesthesia with endotracheal intubation.
- **Positioning:** Lithotomy with Trendelenburg; arms tucked.
- **Foley catheter & uterine manipulator** insertion (e.g., VCare).

3. Surgical Anatomy & Safety

Critical structures at risk in pelvic laparoscopy:

- **Ureter:** Courses medial to ovarian vessels, lateral to uterine artery.
- **Inferior epigastric vessels:** At risk during lateral trocar insertion.
- **Bladder reflection:** Dissected off the lower uterus in hysterectomy.

TIP: Always identify and trace the ureter when operating near infundibulopelvic ligament or uterosacral ligaments.

4. Port Placement (Standard 4-Port Setup)

Port	Location	Instrument
Primary (10 mm)	Umbilical	Laparoscope
Left lower (5 mm)	2–3 cm medial to ASIS	Grasper
Right lower (5 mm)	Mirror image	Energy device
Suprapubic (5 mm)	Midline above pubic symphysis	Accessory

5. Surgical Techniques in Laparoscopic Gynaecology

This chapter outlines the major laparoscopic surgical procedures commonly performed in gynaecology. Emphasis is placed on clear anatomical steps, instrument handling, and intraoperative judgment. Each procedure described supports skill development in safe tissue handling, energy application, and reconstructive techniques.

5.1 Laparoscopic Ovarian Cystectomy

Indications:

Benign ovarian cysts, including functional cysts, dermoid cysts (mature teratomas), endometriomas, and serous/mucinous cystadenomas. Cystectomy is particularly indicated in reproductive-age women where ovarian preservation is essential.

Surgical Steps:

1. **Pelvic Survey:** Conduct a thorough inspection of the uterus, both adnexa, and peritoneal surfaces. Gently mobilize the ovary with atraumatic graspers.
2. **Cyst Evaluation:** Assess the cyst's size, consistency, bilaterality, surface irregularity, and relationship with surrounding structures. If malignancy is suspected, avoid rupture and consider conversion to laparotomy.
3. **Mesovarian Dissection:** Coagulate and divide any adhesions using bipolar cautery or sharp dissection. Endometriomas may be firmly adherent to the uterine serosa or pelvic sidewall.
4. **Capsule Incision:** Create a linear incision over the antimesenteric surface of the ovary using a monopolar hook or cold scissors. Avoid damaging adjacent normal ovarian tissue.
5. **Hydrodissection (Optional):** Inject warmed saline between the cyst capsule and ovarian stroma to assist in creating a dissection plane.
6. **Cyst Enucleation:** Apply traction-countertraction using two graspers to peel the cyst from the ovary. Minimize use of electrosurgery to protect ovarian reserve.
7. **Hemostasis:** Achieve pinpoint hemostasis with bipolar forceps. Avoid over-coagulation, particularly near the hilum.
8. **Ovarian Reconstruction:** Reapproximate ovarian edges with 2-0 absorbable sutures (e.g., Vicryl). This step may aid in anatomical healing and hemostasis.
9. **Specimen Retrieval:** Place the cyst in an endobag prior to extraction. Avoid intra-abdominal spillage, especially with dermoid cysts.
10. **Final Inspection:** Irrigate and suction to remove debris. Confirm hemostasis and inspect for cyst wall remnants or bleeding points.

Tips:

- Endometriomas may require sharp dissection due to fibrotic planes.
- Send all excised specimens for histopathology. Consider intra-op frozen section if malignancy is suspected.

5.2 Laparoscopic Salpingectomy and Salpingostomy

5.2.1 Laparoscopic Salpingectomy

Indications:
Tubal ectopic pregnancy, hydrosalpinx (especially prior to IVF), irreparably damaged or diseased tubes, and risk-reducing salpingectomy in high-risk patients.

Surgical Steps:

1. **Identify the Tube and Mesosalpinx:** Visualize the course of the fallopian tube and its relation to the ovary and mesosalpinx.
2. **Coagulate and Transect the Mesosalpinx:** Progressively seal and divide the mesosalpinx toward the uterine end using bipolar cautery or an advanced energy device (e.g., LigaSure).
3. **Division at the Cornual End:** Transect the tube near its junction with the uterus, taking care to preserve the uterine wall.
4. **Specimen Retrieval:** Place the tube in an endobag for removal. In cases of ectopic pregnancy, verify the presence of gestational tissue.

5.2.2 Laparoscopic Salpingostomy

Indications:
Fertility-preserving management of ampullary ectopic pregnancy when tubal damage is minimal.

Surgical Steps:

- **Expose the Affected Segment:** Use atraumatic graspers to isolate and elevate the affected portion of the fallopian tube.
- **Linear Incision:** Make a 1–2 cm incision over the bulging segment using a monopolar hook or cold scissors.
- **Evacuate the Products of Conception:** Gently flush the tube using irrigation and suction. Avoid curettage or mechanical trauma.
- **Leave the Incision Open:** Allow the incision to heal by secondary intention. Suturing is not typically required.
- **Hemostasis:** Minor bleeding usually resolves spontaneously, though bipolar coagulation may be used as needed.

Important Considerations:

Post-op serial β-hCG is essential to exclude persistent trophoblast.

Salpingostomy carries a higher risk of recurrent ectopic pregnancy than salpingectomy.

5.3 Laparoscopic Myomectomy

Indications:

Symptomatic fibroids (e.g., menorrhagia, subfertility, recurrent miscarriage), especially in patients desiring uterine preservation.

Surgical Steps:

1. **Vasopressin Injection:** Infiltrate the myometrium with diluted vasopressin (e.g., 10 U in 100 mL NS) to reduce bleeding.
2. **Serosal Incision:** Use monopolar or ultrasonic energy to incise the uterine serosa directly over the fibroid bulge, down to the pseudocapsule.
3. **Fibroid Enucleation:** Employ a corkscrew myoma screw or tenaculum for traction. Dissect the fibroid from the myometrium with countertraction and blunt or sharp dissection.
4. **Cavity Check (If Deep):** Inspect the surgical bed for any entry into the endometrial cavity. If breached, repair in layers to prevent future rupture.
5. **Myometrial Closure:** Close the defect in 2–3 layers using barbed sutures or conventional 2-0 Vicryl. Achieve adequate hemostasis and anatomical alignment.
6. **Serosal Approximation:** Reapproximate serosal edges to maintain smooth contour and minimize adhesion risk.
7. **Specimen Retrieval:** Perform in-bag power morcellation if available. If morcellation is contraindicated, extract through a mini-laparotomy or colpotomy.
8. **Hemostasis and Lavage:** Irrigate the pelvis and apply anti-adhesion barriers such as Seprafilm or hyaluronic acid gel if indicated.

Tips:

- Multilayered closure reduces risk of uterine rupture in future pregnancy.
- Avoid morcellation if sarcoma is suspected; consider preoperative MRI or endometrial sampling when indicated.

5.4 Total Laparoscopic Hysterectomy (TLH)

Indications:
Heavy menstrual bleeding, symptomatic fibroids, adenomyosis, complex atypical hyperplasia, and early-stage malignancy of the endometrium or cervix.

Surgical Steps:

1. **Uterine Manipulator Placement:** Insert a uterine manipulator (e.g., VCare or RUMI) to facilitate exposure and delineation of tissue planes.
2. **Round Ligament Transection:** Coagulate and divide both round ligaments to enter the broad ligament.
3. **Infundibulopelvic or Utero-Ovarian Ligaments:** Depending on ovarian conservation or removal, transect the appropriate ligament with careful ureteric identification.
4. **Bladder Dissection:** Incise the vesicouterine peritoneum and push the bladder caudally to expose the lower uterine segment and cervicovaginal junction.
5. **Uterine Artery Control:** Identify and skeletonize the uterine arteries at their origin. Seal and divide using bipolar or vessel-sealing devices, maintaining awareness of ureter location.
6. **Cardinal and Uterosacral Ligament Division:** Transect the remaining ligamentous supports after appropriate coagulation.
7. **Colpotomy:** Create a circumferential incision around the cervix at the level of the vaginal fornices using monopolar hook or harmonic scalpel.
8. **Specimen Delivery:** Remove the uterus vaginally. If the uterus is enlarged, consider in-bag morcellation or extending the posterior colpotomy.
9. **Vault Closure:** Close the vaginal vault laparoscopically using interrupted or continuous sutures (e.g., 0-Vicryl). McCall culdoplasty may be added to reduce prolapse risk.
10. **Final Survey:** Irrigate thoroughly, inspect the vault and ureters, and confirm complete hemostasis at all pedicles and port sites.

Complications to Avoid:

- Ureteric injury, especially near the uterine artery.
- Vault hematoma or dehiscence.
- Bladder or bowel injury during dissection.

6. Postoperative Care

- Analgesia: Paracetamol + NSAIDs ± PCA
- Early mobilization within 6–8 hours
- Return to diet after 6 hours or when alert
- Wound care and port site inspection
- Advice on avoiding intercourse, heavy lifting for 4–6 weeks post-op

7. Complications

Intraoperative	Postoperative
Ureteric or bladder injury	Vault hematoma
Bowel injury (thermal)	Wound infection
Vascular injury (IEV, IP ligament)	Deep vein thrombosis (DVT)
CO_2 embolism	Chronic pelvic pain
Port site hernia	Uterine stump infection

8. Instruments Used in Gynae Laparoscopy

- **Uterine manipulator** (e.g., VCare, RUMI)
- **Laparoscope** (30° preferred)
- **Bipolar grasper** (e.g., Kleppinger)
- **Energy device** (e.g., Harmonic scalpel, LigaSure)
- **Needle holders**
- **Endobag**
- **Morcellator** (if TLH or myomectomy)

9. Training Recommendations

To achieve proficiency in laparoscopic gynaecology:

- Practice **dry lab simulations** (e.g., rubber band, intracorporeal suturing)
- Assist in ≥20 diagnostic procedures & scrub in ≥10 therapeutic cases
- Keep a personal logbook of procedures with reflections

Laparoscopic Abdominal and Thoracic Surgeries

This section covers core surgeries involving the gastrointestinal, hepatobiliary, and thoracic systems — all of which require precise port placement, careful dissection, and a clear understanding of intraperitoneal or intrathoracic anatomy.

1. Laparoscopic Cholecystectomy

Indications:

- Symptomatic cholelithiasis
- Acute/chronic cholecystitis
- Gallbladder polyps ≥1 cm
- Gallstone pancreatitis (post-resolution)

Surgical Technique:

1. **Port Placement**
    - Umbilical (10 mm): camera port
    - Epigastric (10 mm): dissecting instrument
    - Right subcostal midclavicular (5 mm): grasper
    - Right subcostal anterior axillary (5 mm): retractor or suction
2. **Retraction & Exposure:** Grasp the fundus and elevate it cranially. Grasp the infundibulum and retract laterally and inferiorly to expose Calot's triangle.
3. **Dissection of Calot's Triangle:** Identify cystic duct, cystic artery, and common hepatic duct. Dissect to obtain the **critical view of safety (CVS)**:
    - Clear hepatocystic triangle
    - Lower one-third of gallbladder separated from liver
    - Only two structures entering gallbladder
4. **Clipping and Division:** Apply metal clips (or Hem-o-lok) to cystic duct and artery: typically 2 proximal, 1 distal. Transect in between.
5. **Gallbladder Dissection:** Cauterize and dissect the gallbladder off the liver bed. Control minor bleeding from liver surface with bipolar or gauze.
6. **Specimen Retrieval:** Place gallbladder in an endobag and extract via umbilical or epigastric port.
7. **Final Inspection & Irrigation:** Check for bile leak or bleeding. Irrigate and suction before desufflation.

Tips:

- In acute cholecystitis, perform **subtotal cholecystectomy** if dissection is unsafe.

2. Laparoscopic Appendectomy

Indications:
Acute appendicitis, recurrent appendicitis, complicated appendicitis with abscess (in selected cases).

Surgical Technique:

1. **Port Placement**
   - Umbilical (10 mm): camera
   - Suprapubic (5 mm): dominant working hand
   - Left lower quadrant (5 mm): traction grasper
2. **Identification and Mobilization:** Locate the appendix at the base of the cecum. Follow the taenia coli if difficult to find. Elevate the appendix and divide adhesions.
3. **Mesoappendix Ligation:** Cauterize and divide mesoappendix using bipolar or energy device (e.g., LigaSure). Ensure proper hemostasis.
4. **Appendiceal Base Control:** Apply 2–3 endoloops or use clips/stapler to ligate the base. Cut distal to the ligature.
5. **Specimen Retrieval:** Place appendix in endobag and remove via 10 mm port.
6. **Peritoneal Toilet (if perforated):** Lavage pelvis and right paracolic gutter thoroughly. Leave drain if indicated.

Tips:

- For a retrocecal or subhepatic appendix, add a fourth port for better exposure.
- In suspected perforation, handle appendix minimally to avoid spillage.

3. Laparoscopic Inguinal Hernia Repair (TAPP)

Indications:
Elective repair of reducible direct, indirect, or bilateral inguinal hernias.
Preferred in: bilateral hernias, recurrent hernias after open repair.

Surgical Technique (TAPP):

1. **Port Placement**
   - Umbilical (10 mm): camera
   - Left/right midclavicular line (5 mm each): working ports
2. **Peritoneal Incision:** Create a horizontal incision 2 cm above the hernia defect. Extend from medial umbilical ligament to ASIS.
3. **Preperitoneal Dissection:** Gently dissect the areolar tissue to expose Cooper's ligament, inferior epigastric vessels, and hernia sac.
4. **Reduction of Hernia Sac:** Carefully reduce indirect sac from the cord structures. For large sacs, divide and leave distal portion.
5. **Mesh Placement:** Place a 10x15 cm polypropylene or composite mesh over Hesselbach's triangle, covering indirect, direct, and femoral spaces.
6. **Fixation:** Secure mesh using tacker or glue (optional). Avoid nerve zones: triangle of pain (lateral) and triangle of doom (medial).
7. **Peritoneal Closure:** Reapproximate peritoneum with continuous suture or tacking to prevent mesh exposure.

Tips:

- Never use electrocautery blindly near the cord structures.
- If unsure, convert to open repair — especially in recurrent cases.

4. Laparoscopic Thoracic Surgery (VATS)

Video-Assisted Thoracoscopic Surgery (VATS) enables access to the pleural cavity and lungs via 1–3 small ports. Performed in lateral decubitus with selective one-lung ventilation, it is used for both diagnostic and therapeutic indications.

4.1 VATS Pleural Biopsy

Indications:
Undiagnosed pleural effusion (e.g., TB, malignancy), pleural thickening.

Surgical Technique (VATS Pleural Biopsy):

1. **Port Placement:** Usually 2–3 ports at 5th–7th intercostal spaces in midaxillary and posterior axillary lines.
2. **Exploration:** Thoroughly inspect the pleural surfaces and diaphragm. Break down any adhesions with blunt dissection or cautery.
3. **Targeted Biopsy:** Use endoscopic scissors or forceps to take multiple pleural biopsies. Avoid intercostal vessels along the inferior rib margin.
4. **Hemostasis & Lavage:** Control bleeding with cautery or adrenaline-soaked swabs.
5. **Chest Tube Insertion:** Place a 24–28 Fr chest tube through the port site. Connect to underwater seal drainage.

4.2 VATS Bullectomy

Indications:
Spontaneous pneumothorax with visible apical bullae on imaging.

Surgical Technique (VATS Bullectomy):

1. **Locate Bullae:** Inspect lung apex using camera. Collapse lung fully for better visualization.
2. **Resection:** Grasp the bullae and resect using endoscopic stapler (e.g., Endo-GIA).
3. **Pleurodesis (Optional):** Perform mechanical abrasion or apply talc to induce pleural adhesion and reduce recurrence.
4. **Chest Tube Placement:** Insert tube in apex, confirm re-expansion postoperatively.

4.3 VATS Sympathectomy

Indications:
Primary hyperhidrosis of palms or axillae.

Surgical Technique (VATS Sympathectomy):

1. **Access Thoracic Cavity:** Usually via 5 mm port in the 3rd or 4th intercostal space in midaxillary line.
2. **Identify Sympathetic Chain:** Trace the chain along the rib heads. T2–T4 ganglia typically targeted.
3. **Transection:** Cauterize or divide the chain segmentally. Confirm cessation of conduction.
4. **Close & Reinflate Lung:** Insert chest tube, reinflate lung under direct vision, remove tube if lung remains expanded.

Warning:
Patients must be counselled about **compensatory hyperhidrosis**, a common long-term side effect.

7. MSSS Laparoscopic Simulation Models & Games

Overview

The Malaysian Students' Surgical Society offers a variety of laparoscopic skill-building games and simulation stations during its workshops. These activities mimic key elements of real laparoscopic surgery, focusing on depth perception, precision, ambidexterity, and hand-eye coordination. All tasks are performed using laparoscopic instruments within a box trainer or virtual model setup.

7.1 Peg Transfer

A foundational laparoscopic exercise involving the transfer of small objects from one side of a pegboard to the other using alternating hands.

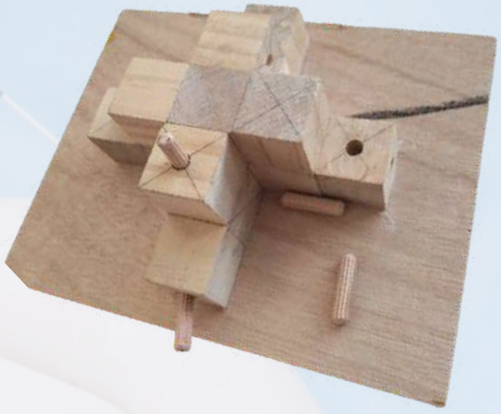
Steps:

- Pick up a peg with the dominant-hand grasper.
- Transfer the peg mid-air to the non-dominant hand.
- Place the peg onto the target peg on the opposite side using the non-dominant hand.
- Repeat the process for all pegs, then reverse the action.

Purpose and Benefits:

- Hand-eye coordination: Encourages precise movements and coordination between the visual field and the instruments
- Bimanual dexterity: Develops effective use of both hands.
- Speed and precision: Trains accuracy and efficiency under time constraints.

7.2 Wood Plugs



The wood plug game involves picking up small cylindrical wooden plugs and inserting them into matching holes using laparoscopic graspers.

Steps:

- Use the dominant-hand grasper to lift a wooden plug from the container or base.
- Stabilize the plug with the grasper while aligning it with the hole.
- Use the non-dominant hand to assist in orienting or rotating the plug if necessary.
- Slowly insert the plug into its matching hole — do not force or drop it.
- Repeat the process with all plugs, focusing on speed and accuracy.
- Ensure minimal plug wobble and smooth placement.

Purpose and Benefits:

- Hand-eye coordination: Trains spatial alignment with indirect visualization.
- Bimanual dexterity: Promotes balanced hand control and coordination.
- Tactile precision: Improves delicate handling and positioning.

7.3 Cutting Shapes

This task focuses on cutting along predefined shapes using laparoscopic scissors, designed to develop fine motor control and precision in dissection

Steps:

- Stabilize the cutting material using your non-dominant grasper.
- Using your dominant hand, begin cutting along the shape's outline with laparoscopic scissors.
- Apply light tension with the grasper to aid in smooth cutting.
- Continue along the entire shape, following the borders precisely.
- Retrieve the excised shape and assess accuracy.

Purpose and Benefits:

- Hand-eye coordination: Requires precision following visual guides.
- Bimanual dexterity: Encourages tension-control cooperation.
- Precision and control: Trains fine dissection and clean margin techniques.

7.4 Beads Transfer

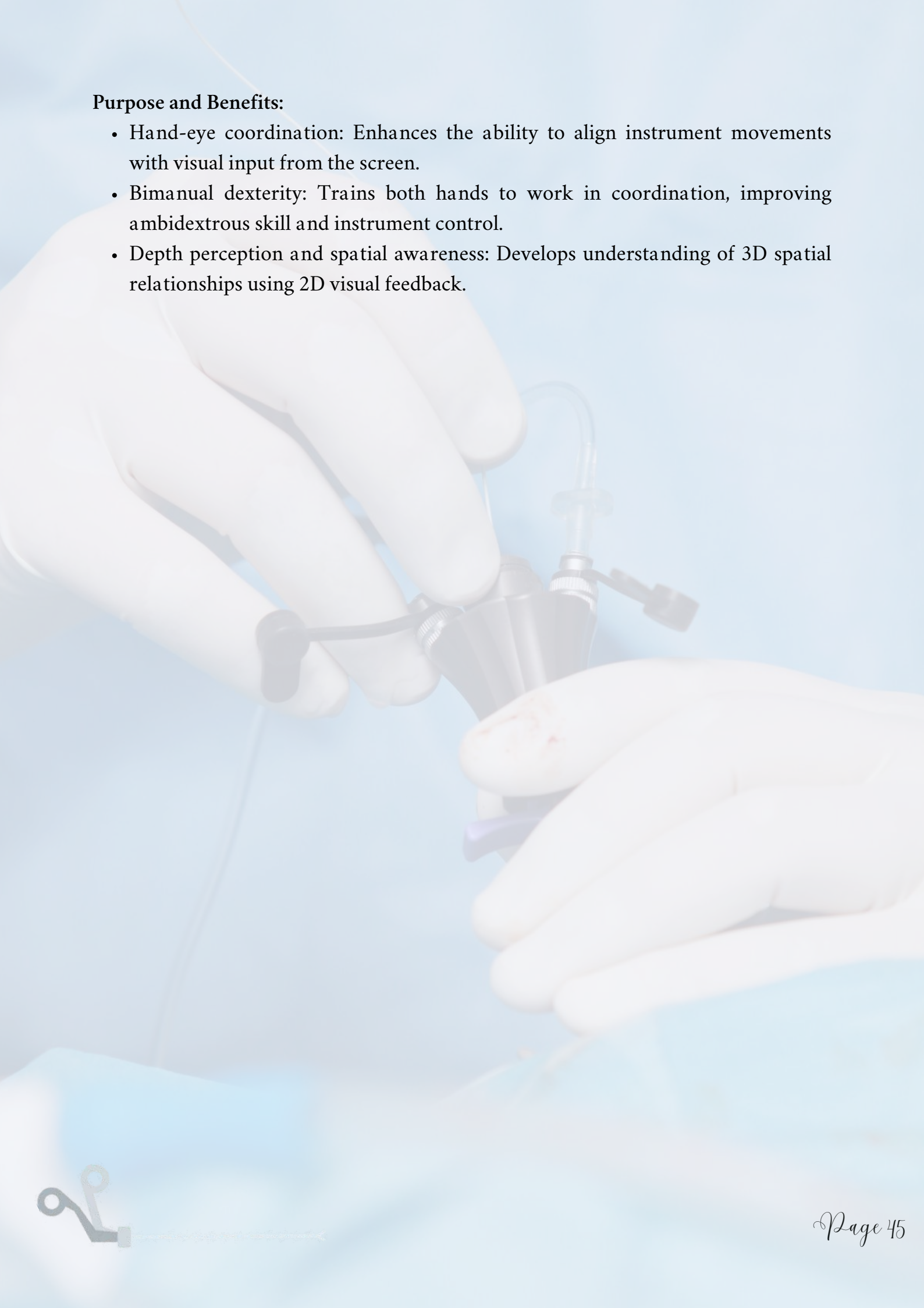
This exercise involving the placement of small beads onto a thin rod under laparoscopic view, enhancing precision and steady hand control.

Steps:

- Grasp a bead using your dominant hand.
- Align and rotate the bead midair with the help of the non-dominant hand.
- Guide the bead carefully over the rod and slide it into place.
- Repeat for all beads, maintaining smooth and controlled movements.

Purpose and Benefits:

- Hand-eye coordination: Enhances the ability to align instrument movements with visual input from the screen.
- Bimanual dexterity: Trains both hands to work in coordination, improving ambidextrous skill and instrument control.
- Depth perception and spatial awareness: Develops understanding of 3D spatial relationships using 2D visual feedback.



7.5 Rubber Band Stretch & Transfer

Objective:
To stretch rubber bands across a fixed series of pegs using laparoscopic graspers, simulating tension-controlled maneuvers.

Steps:

1. Use both graspers to grip either side of a rubber band.
2. Stretch the band carefully and loop it over a target peg.
3. Avoid snapping, twisting, or letting go abruptly.
4. Complete the full peg sequence (typically 5–10 pegs).
5. Reverse the process or switch roles between hands.

Skills Developed:

- Bimanual precision under tension
- Grip pressure control
- Spatial orientation in a 3D field
- Dynamic range of motion with limited visibility

Surgical Relevance:
Analogous to sling placements, vascular loop control, ureteric manipulation, and tissue retraction under tension.

7.6 Loop Navigation (Thread Through Rings)

Objective:
To pass a flexible thread or catheter through a sequence of loops/rings mimicking narrow anatomical passages.

Steps:

1. Grasp the thread with your dominant hand.
2. Insert through the first ring using calculated wrist movement.
3. Stabilize and adjust trajectory using your non-dominant hand.
4. Sequentially thread through all rings in a defined pattern.
5. Avoid touching ring edges or tangling the thread.

Skills Developed:

- Depth judgment in confined spaces
- Bimanual maneuvering with limited axis control
- Wrist articulation and force calibration

Surgical Relevance:
Replicates complex maneuvers such as catheter guidance, ureteral stenting, and threading under/around structures (e.g., in lymphadenectomy or adhesiolysis).

7.7 Roeder Knot and Extracorporeal Suture

Objective:
To tie and slide a secure extracorporeal knot using a knot pusher to simulate vessel ligation or pedicle control.

Steps:

1. Form a Roeder knot extracorporeally using 2-0 suture (Loop–Loop–Wrap×3–Pass).
2. Pass the suture into the box trainer through a trocar port.
3. Guide the knot to the target using a laparoscopic knot pusher.
4. Slide and seat the knot snugly against the target tissue.
5. Confirm knot security and cut the tail cleanly with laparoscopic scissors.

Skills Developed:

- Extracorporeal knot formation
- Tactile feedback awareness while advancing knots
- One-handed knot advancement

Surgical Relevance:
Used in ligating vascular pedicles in gynecologic, urologic, and bowel surgeries where intracorporeal suturing is not feasible.

7.8 Intracorporeal Suturing and Knot Tying

Objective:
To perform suture placement and tie secure intracorporeal square knots within the box trainer.

Steps:

1. Load a curved suture needle onto a needle holder.
2. Drive the needle through the simulated tissue pad (entry → exit).
3. Form a loop with one instrument, pass the tail through with the other.
4. Tighten squarely and repeat for 3–4 throws to complete a secure knot.
5. Trim the tail using laparoscopic scissors.

Skills Developed:

- Needle angle and tip control
- Intracorporeal knot integrity
- Hand switching and coordination
- Triangulation and tension modulation

Surgical Relevance:
Essential for laparoscopic bowel anastomosis, peritoneal flap closure, myometrial repair post-myomectomy, and pelvic reconstruction.

7.9 Origami Precision Fold (Rocket Model)

Objective:
To fold a square sheet of paper into a standard origami "rocket" using only laparoscopic graspers, without tearing or deforming the folds.

Steps:

1. Begin with a flat square origami sheet.
2. Fold diagonally into a triangle. Unfold and repeat in opposite direction.
3. Perform stepwise folds as per printed rocket diagram.
4. Complete with a pointed nose and folded base, maintaining crease sharpness.

Skills Developed:

- Fine grasp modulation
- Non-traumatic tissue handling simulation
- Pattern recognition and spatial sequencing
- High-fidelity dexterity

Surgical Relevance:
Simulates meticulous steps in procedures requiring extreme precision — e.g., nerve sparing, intracorporeal suturing of fragile tissues, and peritoneal fold reconstruction.

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All You Need to Know

LAPAROSCOPIC MANUAL

For Malaysian Undergraduate Medical Students

MSSS
Malaysian Students' Surgical Society

SELSMA
Society of Endoscopic and Laparoscopic Surgeons of Malaysia