

Minimally Invasive Surgery

Minimally Invasive Surgery (MIS) – Study Notes

1. Definition

- **Minimally Invasive Surgery (MIS):** A set of surgical techniques that achieve the same therapeutic goals as open surgery but use smaller incisions, specialized instruments, and visualisation technologies to reduce tissue trauma.
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2. Historical Milestones

Year	Milestone	Significance
1901	First endoscopic examination of the abdominal cavity (Kelling)	Pioneered “laparoscopy” concept
1985	First laparoscopic cholecystectomy (Mouret)	Demonstrated feasibility of complex intra?abdominal MIS
1990s	Introduction of video?assisted thoracoscopic surgery (VATS)	Expanded MIS to thoracic procedures
2000s	Development of robotic platforms (e.g., da Vinci)	Enhanced dexterity, 3?D vision, tremor filtration
2010s	Single?port and natural orifice transluminal endoscopic surgery (NOTES)	Pushed the limits of incision?free approaches

3. Core Principles

1. **Small Access Ports** – Typically 5–12?mm incisions; sometimes a single port or natural orifice.
2. **Enhanced Visualisation** – High?definition, often 3?D, video imaging (laparoscope, thoracoscope, endoscope).
3. **Specialised Instruments** – Long, slender, articulated tools; energy devices (ultrasonic, bipolar) for cutting/coagulation.
4. **Tissue?Preserving Technique** – Minimal disruption of surrounding structures, reduced blood loss.

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5. **Goal?Oriented** – Same oncologic, functional, or reconstructive outcomes as open surgery.

4. Common MIS Modalities

Modality	Typical Access	Primary Uses	Key Equipment
Laparoscopy	3–5 abdominal ports (5–12?mm)	Gallbladder, appendectomy, hernia repair, colorectal, gynecologic, bariatric surgery	30°/0° laparoscope, insufflator, trocars
Thoracoscopy (VATS)	2–4 thoracic ports (5–12?mm)	Lung lobectomy, pleural biopsy, esophageal mobilization	Rigid thoracoscope, double?lung ventilation
Robotic Surgery	3–4 robotic arms + camera port	Prostatectomy, hysterectomy, cardiac valve repair, complex colorectal	Surgeon console, robotic arms, EndoWrist instruments
Endoscopic Submucosal Dissection (ESD)	Natural lumen (GI tract)	Early GI cancers, large polyps	Endoscope with electrosurgical knife
Single?Port / Laparo? endoscopic Single? Site (LESS)	One incision (often umbilical)	Cholecystectomy, nephrectomy, gynecologic procedures	Flexible/curved instruments, multi? channel port
Natural Orifice Transluminal Endoscopic Surgery (NOTES)	No skin incisions; access via mouth, vagina, rectum	Transgastric appendectomy, peritoneoscopy	Flexible endoscope, specialized suturing devices

5. Advantages Over Open Surgery

Category	Benefits
Patient? Centric	Smaller scars, less postoperative pain, reduced opioid use, quicker return to daily activities
Clinical	Lower blood loss, decreased infection rates, shorter hospital stay, reduced pulmonary complications

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Category

Benefits

Economic

Shorter LOS ? lower