

Positioning and Accesses

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Positioning

Correct and stable positioning of the patient is the first step for a successful operation. Safe positioning of the arm and leg are crucial in preventing pressure lesions, such as ulnar or peroneal neuropathy and neurologic “stretch” injuries to the upper extremities.

Supine Position

The supine position is used for most abdominal procedures. The arms can be left out (■ Fig. 2.1a) or kept close to the body (■ Fig. 2.1b), depending on the type of operation to be performed.

- Anchor the patient's legs and/or ankles with a strap in case tilt is required
- Protect arms with a pillowcase, gauze sponge, or silicone pad
- Avoid traction on the brachial plexus (abduction of the shoulder should be $<90^\circ$)



a



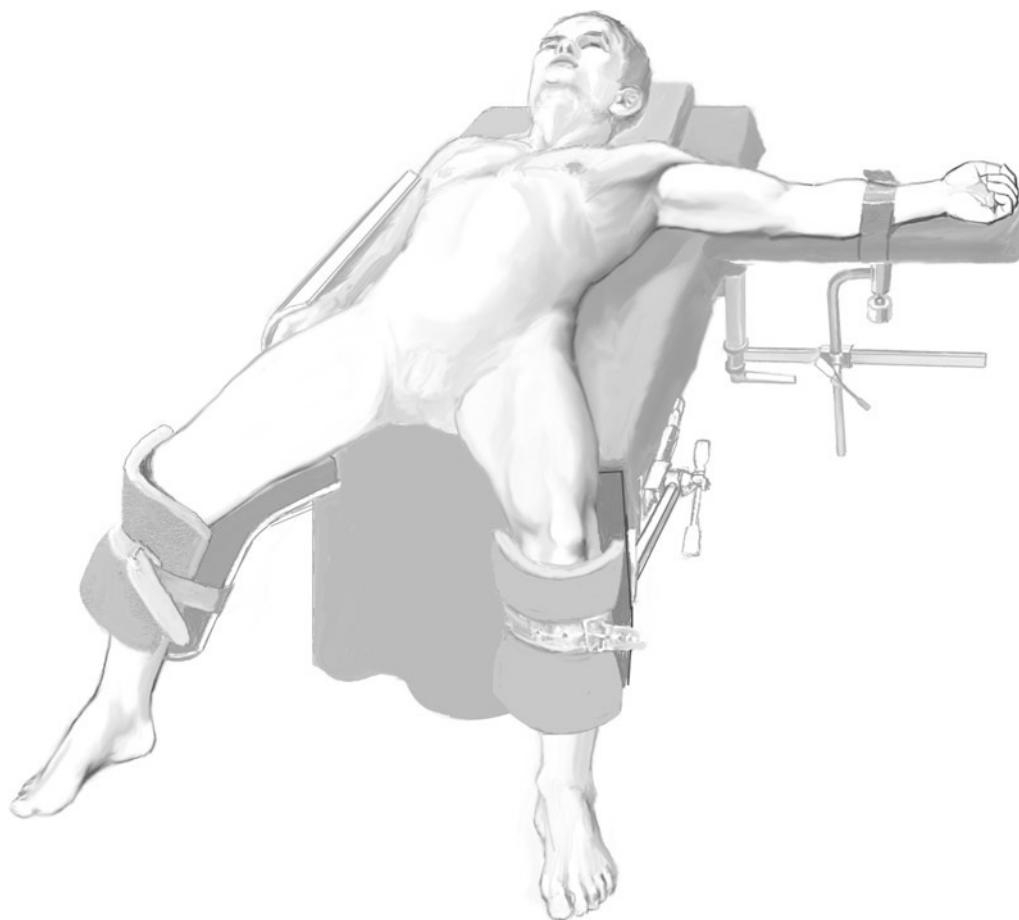
b

■ Fig. 2.1

French Position

The French position (■ Fig. 2.2) is one possible patient position for a laparoscopic cholecystectomy (the “American” supine position with both arms tucked alongside the body being the other). This position can also be used for upper abdominal operations such as laparoscopic fundoplication or gastric surgery.

- The patient’s legs are placed in stirrups or supported under the knee
- Legs need to be placed horizontally or slightly bent to allow free movements with laparoscopic tools
- Avoid any pressure on the peroneal (lateral popliteal) nerve



■ Fig. 2.2

Beach Chair Position

The beach chair position (■ Fig. 2.3) is used for most laparoscopic obesity surgery procedures

- Requires a special weight-bearing table
- The patient is almost “sitting” on the table
- Avoid any pressure on arms, the brachial plexus, and the peroneal (lateral popliteal) nerve



■ Fig. 2.3

Positioning for Esophageal Surgery

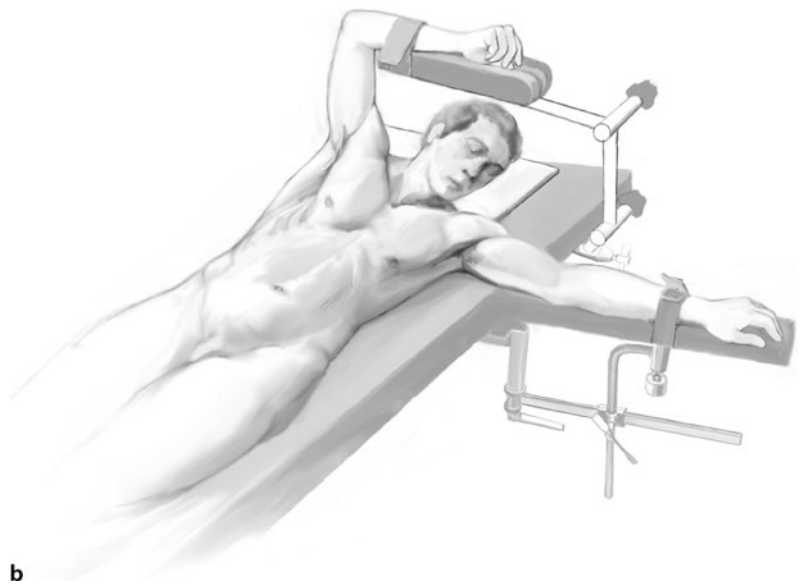
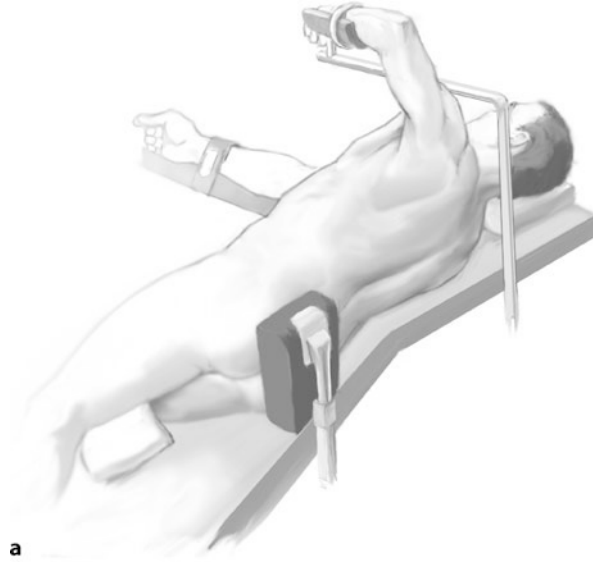
For esophageal resection and reconstruction, several approaches can be used. Depending on the location of the disease and the surgical approach, the positioning is adapted accordingly.

The positions used are:

- a) *Supine* position with overextended thoracic spine, the head rotated to the right and extended. The right arm is left out and the left arm is tucked alongside the body (■ Fig. 2.4). This position is commonly used for transhiatal esophagectomies enabling
 - Good exposure of the upper abdomen
 - Good exposure for the cervical anastomosis
- b) *Right or left lateral decubitus* (■ Fig. 2.5a)
 - Good for the intrathoracic anastomosis distal to azygous vein; left decubitus is good for higher intrathoracic anastomoses
 - Procedures on the upper thoracic esophagus are approached via a right posterolateral thoracotomy, and similar procedures on the lower esophagus are best approached through the same incision on the left side
 - The table is bent slightly at the thoracic level, allowing further opening of the thoracic cavity after thoracotomy
- c) *45° lateral decubitus or screw position* (■ Fig. 2.5b)
 - An advantage is that the abdominal, thoracic, and/or cervical phase of the procedure can be performed without changing the position
 - For optimal access, the operating table can be tilted side-to-side
 - The main disadvantage is a more limited exposure



■ Fig. 2.4



■ Fig. 2.5

Incisions

Abdomen

Choice of approach for entering the abdominal cavity depends upon:

- The accuracy of the preoperative diagnosis
- The location and extent of the disease
- Previous scars
- The requirement of a possible extension of the incision
- Anatomic structures, such as skin, fascia, muscles, nerves, and blood vessels. The abdominal wall should stay functional. Whenever possible, incisions are placed along the lines of Langer, and muscles and fascia are divided along their fibers; all attempts to avoid transection of muscles of the abdominal wall should be entertained

Mark the incision prior to cutting to prevent malpositioning.

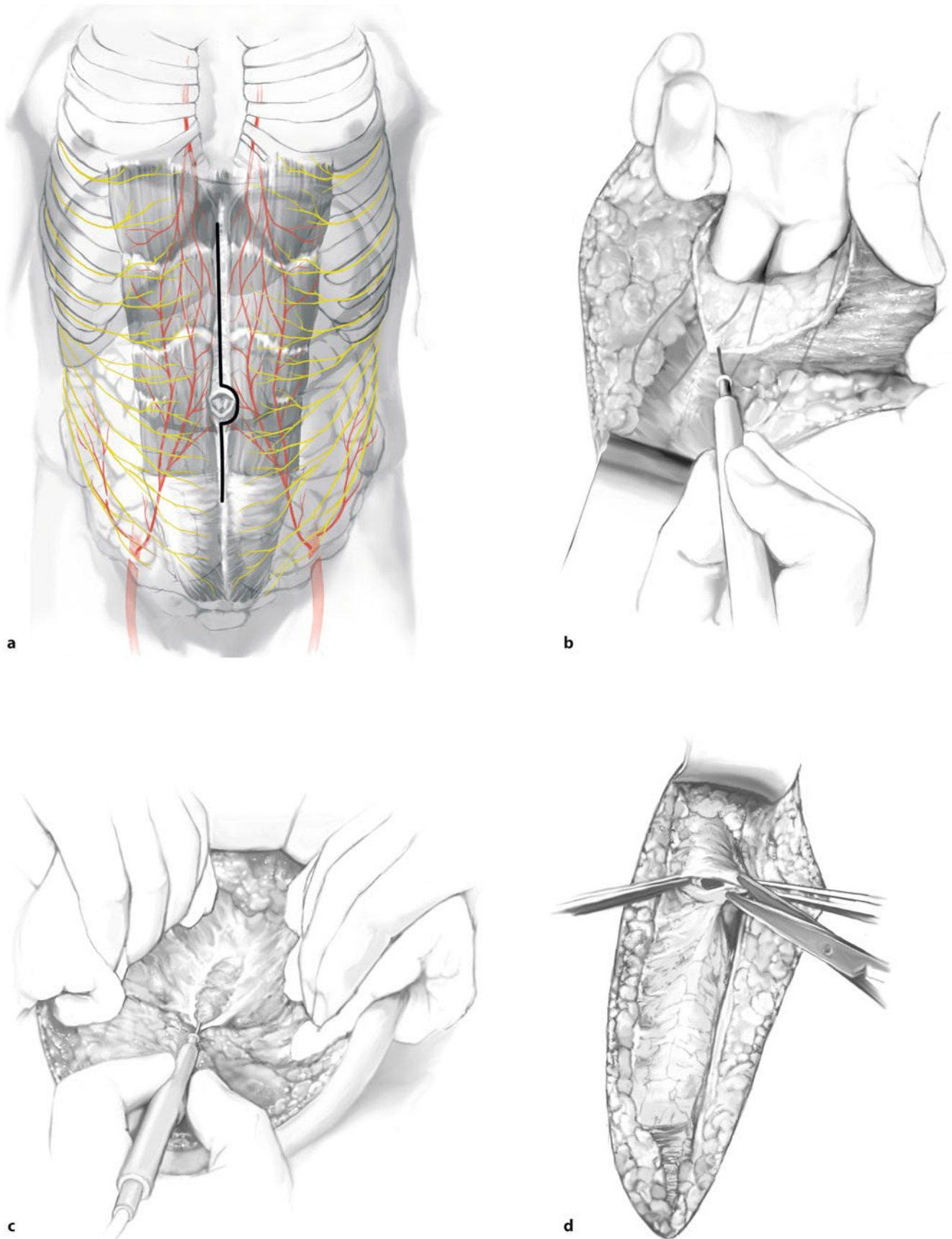
Midline Incision

The midline incision is the most expedient choice for opening the abdomen and provides unrestricted access, regardless of the patient's size or shape (including exposure of the pelvis). The advantages of a midline incision are:

- Can be extended into a median sternotomy
- Minimal blood loss
- No muscle fibers are divided
- No nerves are injured
- Is suitable for repeated celiotomies
- Offers best exposure to all areas of the peritoneal cavity in an emergency situation with unclear diagnosis

The Steps

- Place skin incision exactly in the midline, above and below the umbilicus from the tip of the xiphoid to the pubis (extension as needed) (■ Fig. 2.6a); avoid transecting midline fascia all the way up to the xiphoid
- Deflect the incision around the umbilicus to the left or the right. The evasion of the umbilicus on the left side is preferred, because of possible rudimentary umbilical vessels. In general, use the opposite side of the umbilicus if an ostomy is planned
- The scalpel or the cautery can be used all the way
- By pulling the wound edges laterally, the fat spreads and the plane separates down to the midline fascia (■ Fig. 2.6b and 2.6c)
- Apply digital pressure to minimize bleeding
- Incise the fascia with the scalpel or cautery just above or below the umbilicus, as the linea alba is widest around the umbilicus
- Gently lift up the peritoneum with pickups before opening to avoid small bowel lesions (■ Fig. 2.6d)
- Care to incise the linea alba without any lateral exposure of the rectus muscles markedly facilitates the closure



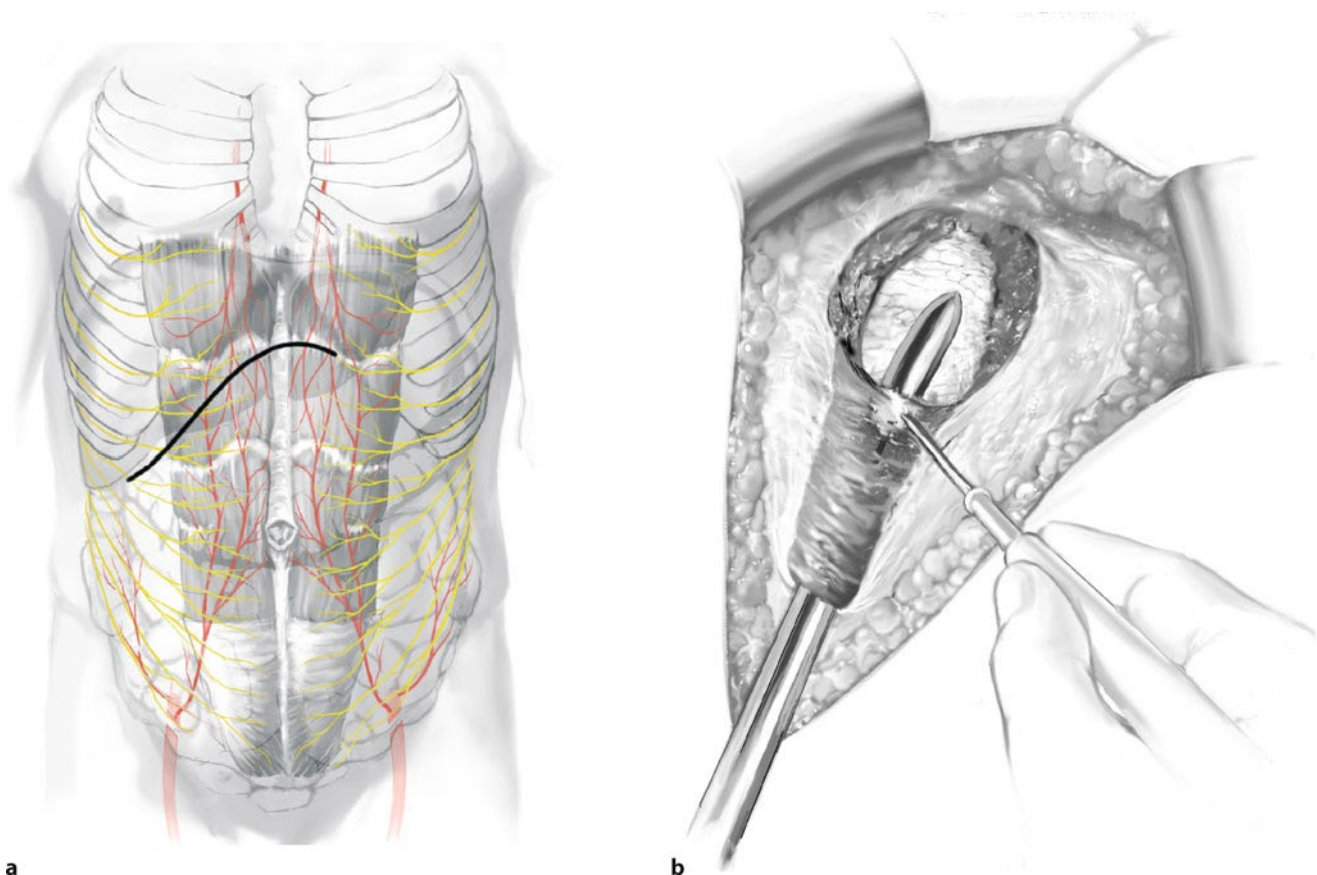
■ Fig. 2.6

Subcostal Incision (■ Fig. 2.7a)

The subcostal incision is usually made for cholecystectomy or common bile duct exploration (right subcostal incision) and for elective splenectomy (left subcostal incision) (■ Fig. 2.7a). The major advantages of the subcostal incision over the upper midline incision are greater lateral exposure and possibly less pain. The disadvantage is that the operation takes longer, because there are more layers to close. The subcostal incision generally heals well with less risk of hernia formation.

The Steps

- Place skin incision two finger breadths caudal to the costal margin. This facilitates closure so that the incision line is not on or over the costal margin
- Incise the anterior and posterior sheet of the rectus muscle. The muscle is cut slowly with the cautery (■ Fig. 2.7b); care should be taken to ligate or cauterize the inferior epigastric vessels
- Laterally, the fascia of the transverse muscle may need to be cut
- Try not to incise the fascia in the midline, but if necessary, extend the incision medially



■ Fig. 2.7

Bilateral Subcostal Incision

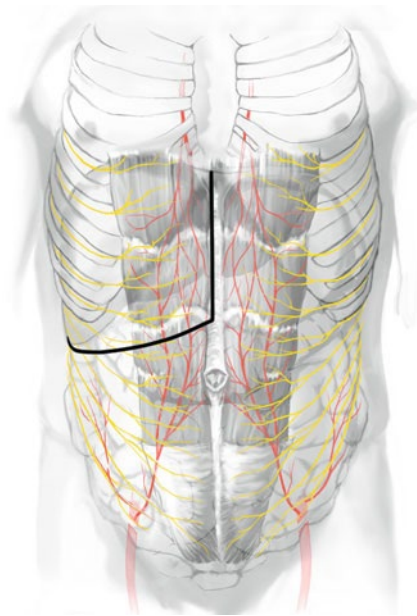
The bilateral subcostal incision is used to access the liver for transplant and major liver resections. Also, most pancreas resections are performed with this incision. The exposure is often helped with a vertical extension to the xiphoid (the so-called “Mercedes star” incision).

The Steps

- Incision of skin and fascia as described above
- For pancreas resections, the incision is generally placed three to four finger breadths below the costal margin
- Mobilization of the liver begins with the division of the falciform ligament as well as the liver's reflection of peritoneum with the anterior wall
- Division of the round ligament (a fibrous cord resulting from the obliteration of the umbilical vein), which should be ligated to avoid bleeding, particularly in the presence of portal hypertension
- It is preferable to mobilize the liver prior to the use of stationary retractors to reduce the necessity of frequent repositioning

J-shaped Incision

The J-shaped incision (Makuuchi incision) is used most frequently for surgery on the right liver. This incision provides a particularly good access to the area between the inferior vena cava and the right hepatic vein. The J-shaped incision can be extended laterally to a thoracotomy for better exposure.



■ Fig. 2.8

Esophageal Surgery

Like the various positions used in esophageal surgery, there are different incisions used depending on the location of the disease, the level of the anastomosis, and the surgeon's preference. Most of the time, a combination of two or more of the following incisions are used:

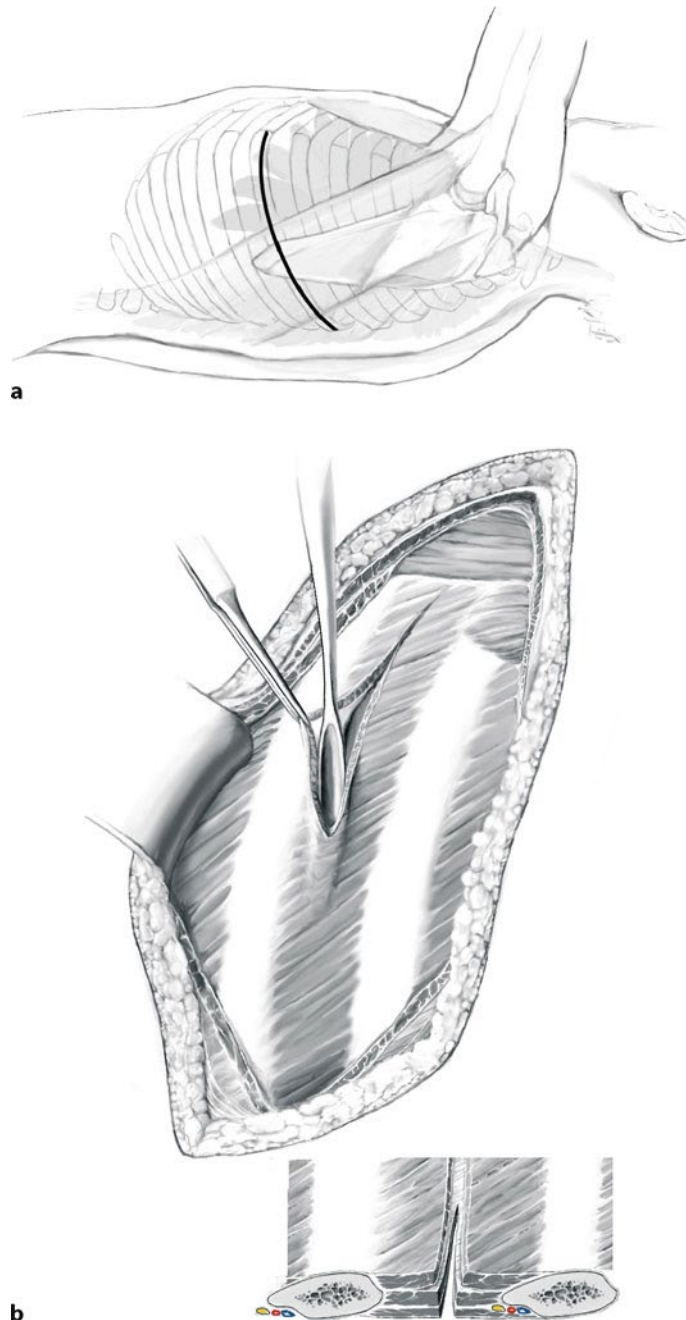
a) Upper midline laparotomy

- As described in the previous section on the abdomen
- Can be combined with a transverse laparotomy for better exposure

b) Thoracotomy

- Anterolateral: skin incision usually in the fourth or fifth intercostal space
- Posterolateral: skin incision in the seventh intercostal space at the angle of the scapula (■ Fig. 2.9a). A paravertebral or anterior extension is possible

- The intercostal muscle is freed from the upper border of the rib (avoids damaging the intercostal nerve and blood vessels, which lie just posterior to the inferior border of the rib) (■ Fig. 2.9b)
- The parietal pleura is opened with scissors, and the ribs are separated with a retractor

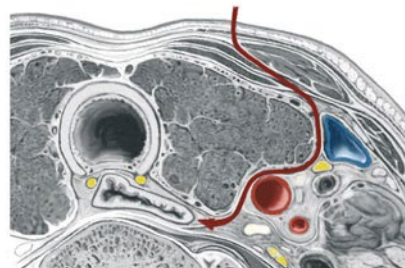
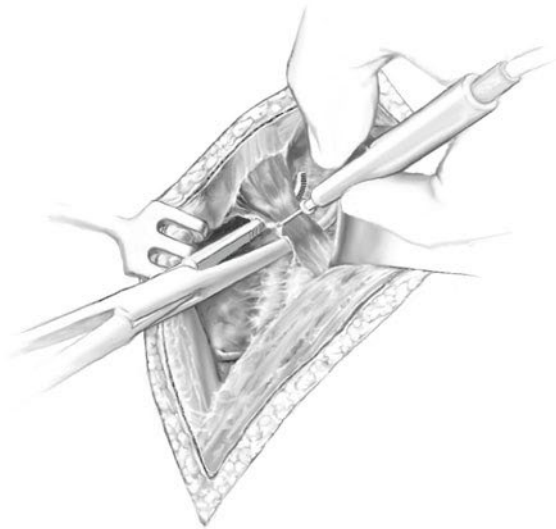
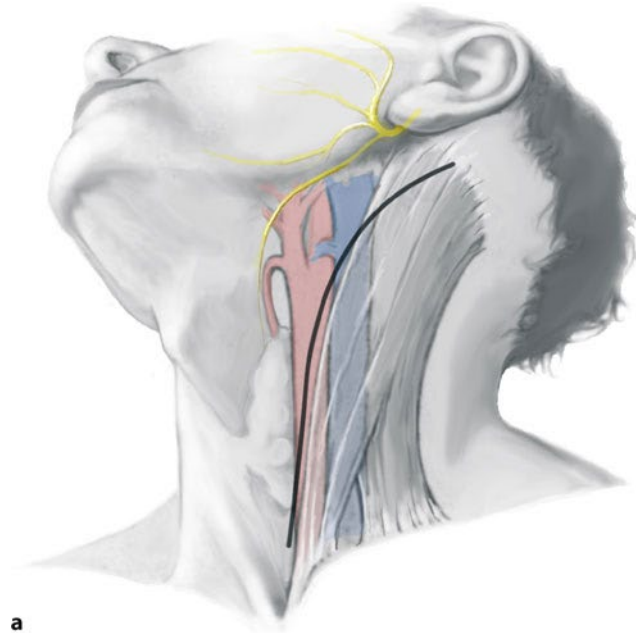


■ Fig. 2.9

c) *Cervical incision*

- Incision along the anterior border of the sternocleidomastoid muscle (■ Fig. 2.10a)
- Division of the platysma in the direction of the incision
- The omohyoid muscle (■ Fig. 2.10b) and, if necessary, the inferior thyroid artery and/or middle thyroid vein are divided to provide clear exposure
- The sternocleidomastoid muscle and carotid sheath and its contents are retracted laterally (■ Fig. 2.10c), and the trachea, larynx, and thyroid lobe are retracted medially (■ Fig. 2.10a)

- No retractor should be placed against the recurrent laryngeal nerve in the tracheoesophageal groove during the entire cervical phase of the procedure
- For better exposure, the medial part of the sternocleidomastoid muscle can be cut inferiorly close to the clavicle bone if necessary
- Identification of the flat, decompressed esophagus can be helped by inserting a large tube into the esophagus by the anesthesiologist
- In patients with a “bull neck” habitus or with osteoarthritis preventing extension of the neck, a partial upper sternal split can provide the prerequisite access to the high retrosternal esophagus



■ Fig. 2.10

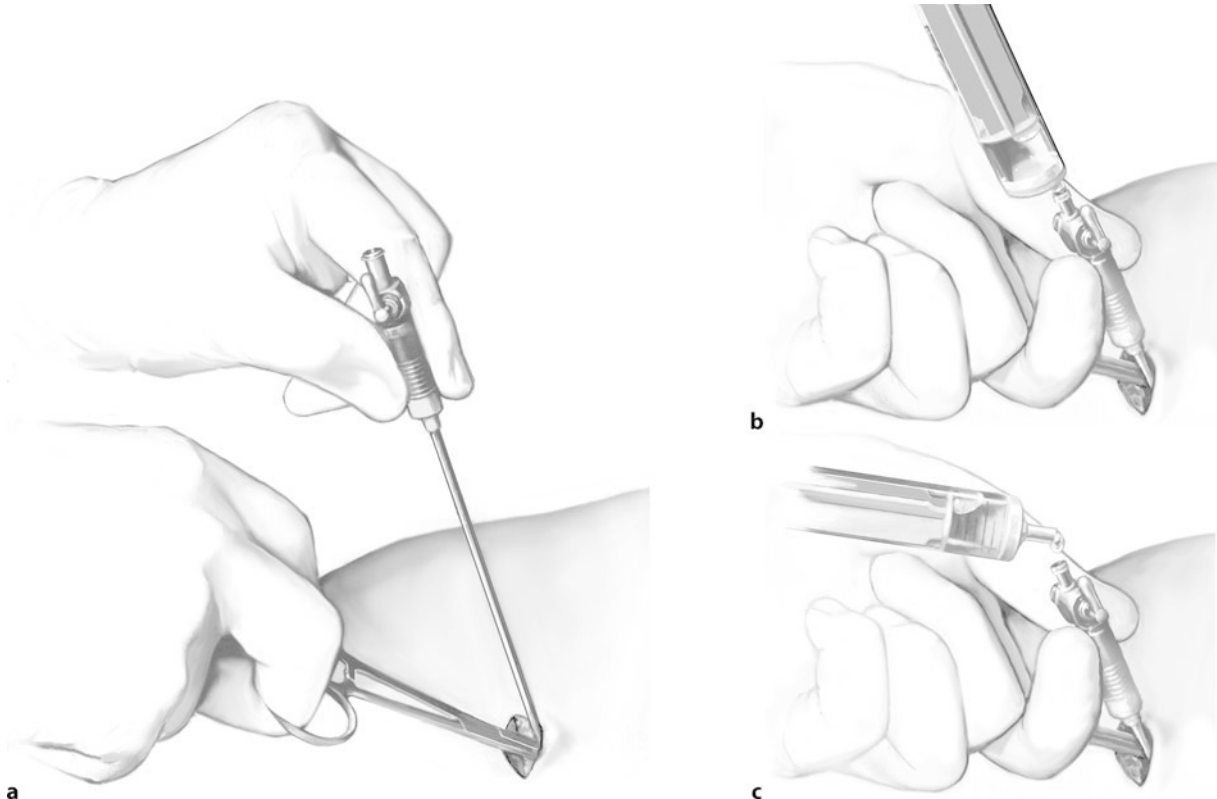
Laparoscopic Surgery

Establishing Pneumoperitoneum

Pneumoperitoneum can be established using a Veress needle, by an open approach using any modified Hassan trocars, or with EndoPath OptView trocar (Ethicon; Cincinnati, OH, USA). The open technique is generally preferred, as it minimizes the risks of inherent lesions to the bowel. However, in obese patients, the Veress needle is used, as the thick subcutaneous tissue does not allow visualization of the fascia through a 1–2 cm incision.

Gaining Access with a Veress Needle

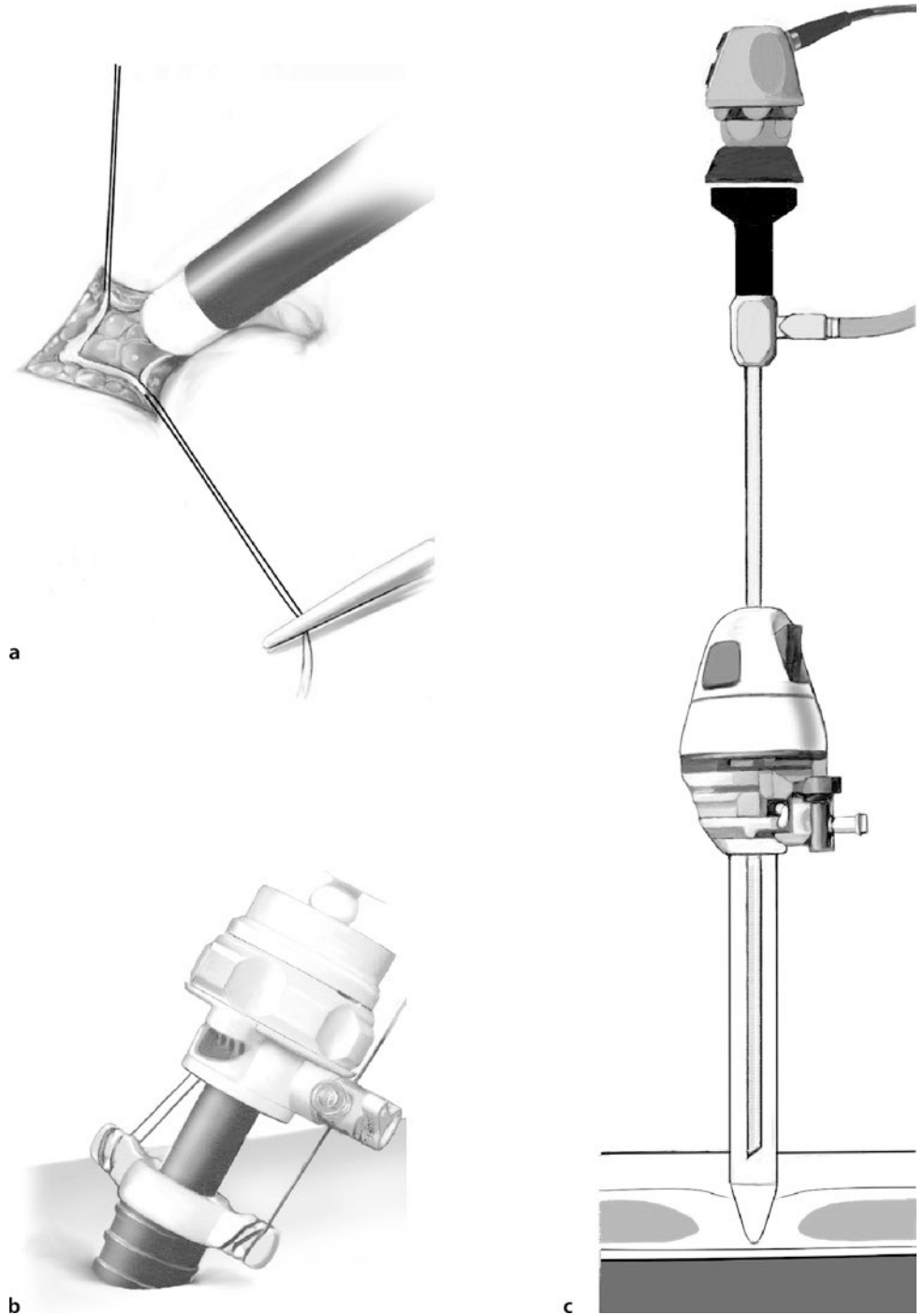
- Incision of the skin (generally infraumbilical in the midline or just caudal to the left subcostal region) and blunt dissection of the subcutaneous tissue
- The fascia is grasped with a hook retractor or a Kocher clamp and is pulled anteriorly (■ Fig. 2.11a)
- Before inserting the Veress needle, its correct functioning must be checked
- Insertion of the needle at a 90° angle to the abdominal wall. As the needle's spring-loaded safety mechanism crosses the abdominal fascia and then the peritoneum, two clicks are heard and are usually felt
- Verification of the needle's intraperitoneal location by injecting 3 ml of saline with no resistance (■ Fig. 2.11b) followed by the “hanging drop” test (■ Fig. 2.11c) (i.e., a drop of saline is placed on the top of the needle, which is sucked into the needle when the abdominal fascia is lifted up anteriorly)
- Pneumoperitoneum. When a pressure of 13–15 mmHg is reached, the Veress needle is withdrawn, and a sharp-tipped camera trocar is blindly inserted through the same incision



■ Fig. 2.11

Gaining Access with the Open Technique

- Incision of the skin (generally infraumbilical in the midline) and blunt dissection of the subcutaneous tissue
 - Incision of the fascia (1–2 cm) and opening of the peritoneum with scissors (two sutures can be placed to lift up the abdominal wall and to later secure the port)
 - Entry into the abdominal cavity is confirmed easily by inserting a finger
 - A blunt-tipped camera trocar is inserted and fixed with the two sutures if needed
- (■ Fig. 2.12a–b)



■ Fig. 2.12

Gaining Access with the EndoPath OptiView Trocar

This trocar provides visualization of the transparent tip of the trocar as it traverses the anterior abdominal wall.

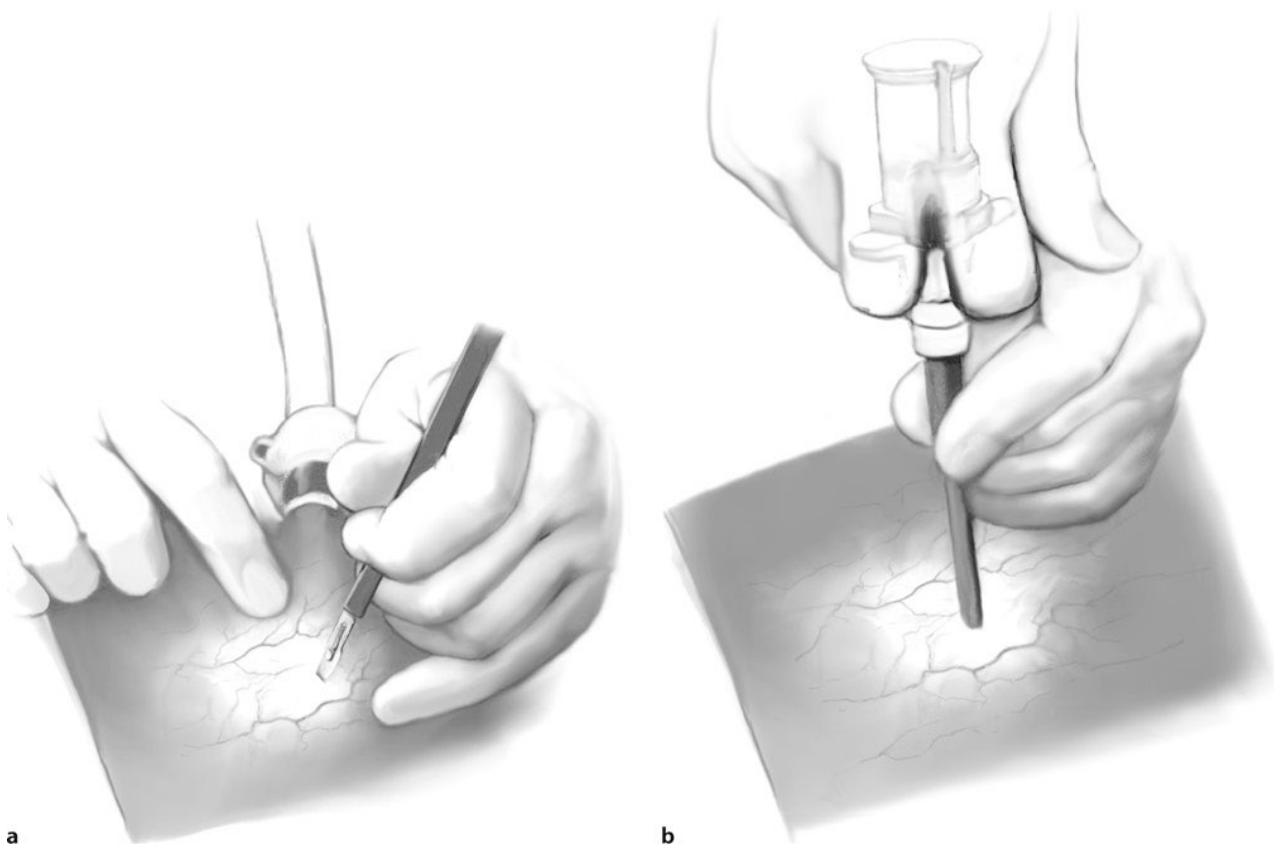
- Incision in the skin (generally in the left upper quadrant in midclavicular line 1 cm caudal to the left subcostal margin where the abdominal wall is less mobile)
- The camera is placed inside the trocar and the layers of the abdominal wall (fat, fascia, muscle, preperitoneal fat, and thin veil of peritoneum) are visualized as the trocar is advanced carefully (■ Fig. 2.12c)

Placement of Accessory Ports

Selecting the insertion sites of working trocars is dependent on the procedure to be performed and also depends on the surgeon's preference, the patient's body habitus, and the presence or absence of previous scars or intra-abdominal adhesions.

The Steps

- The size of the skin incision must be planned carefully. If the incision is too small, friction will develop between the skin and the port, and greater force will be required for insertion, which will increase the risk of uncontrolled insertion. If the incision is too large, gas may leak and the port may dislocate more easily
- Transillumination of the skin can help to avoid insertion of the trocar through major blood vessels (■ Fig. 2.13a)
- The trocar is inserted optimally by holding it between the index and the middle fingers. The shaft of the trocar should also be supported by the opposite hand as the body wall is traversed to avoid an uncontrolled, too rapid of an insertion (■ Fig. 2.13b)



■ Fig. 2.13

Closures

General

- The length of the suture material should be 4:1 to the length of the wound
- Avoid excessive tension on the suture closure of the fascial edges because it may compromise vascularization of the wound edges
- Caudal to the umbilicus, the posterior fascia (rostral to the semi-circular line caudal to which there is no posterior rectus fascia) and then the anterior fascia of the rectus abdominis muscle can be closed as separate layers
- Grasp the needle with the tip of the instrument

Midline Laparotomy

- The fascia is closed with a running loop of monofilament, absorbable suture material (e.g., PDS II-1 loop or Maxon-1 loop) with or without inclusion of the peritoneum
- The subcutaneous fatty layer is not closed and subcutaneous drains are rarely needed
- The skin is closed preferably with a running intracutaneous absorbable monofilament suture (e.g., Maxon 5-0 or 4-0 Monocryl) or with staples

Subcostal Incision

- In contrast to the midline laparotomy, the fascia should be closed in two layers

Trocar Wound Closure

- Ports are removed under direct vision with the camera; port sites should be watched routinely for 10 s to exclude port site bleeding
- All fascial defects of trocars greater than 5 mm are closed with absorbable sutures (e.g., Vicryl 0); this is also probably warranted with the 10-mm “blunt-tipped” “non-traumatic” trocars
- The skin is closed with interrupted mattress sutures (e.g., Dermalon 4-0) or with staples

Tricks of the Senior Surgeon

- The surgeon should personally check the correct positioning of the patient and the adequate protection of the extremities before draping.
- Marking the incision site before the beginning of the procedure is useful for teaching and prevents malpositioning.
- The incision should always be large enough to guarantee good visualization of the operative fields and to guarantee a safe and efficient operation.
- Avoid extending the midline incision all the way to the xiphoid-stay 1–2 cm caudal; this avoids a more difficult closure and potential ectopic bone formation from disruption of xiphoid cartilage. These last 2 cm do not provide increased exposure.
- Avoid extensive traction on the wound edges, as it may compromise healing.
- Place trocars carefully according to the operative need and according to the body habitus of the patient (e.g., obesity).
- Do not hesitate to place another trocar if better exposure is needed.
- Visualize the port site for at least 10 s after removal of the trocar to check for bleeding.

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