64 T_h e abdominal wall, hernia and umbilicus

- Neoplasms of the abdominal wall
- Parastomal hernia
- Rare external hernias
- SPECIFIC HERNIA TYPES
- Spigelian hernia
- Sportsman’s groin
- Surgical approaches to hernia
- Synergistic gangrene
- THE ABDOMINAL WALL Basic anatomy and function rela
- Traumatic hernia
- UMBILICAL CONDITIONS IN THE ADUL T
- Umbilical hernia
- VENTRAL HERNIA

ABDOMINAL HERNIA

ABDOMINAL HERNIA

e A hernia is an abnormal protrusion of an organ or tissue through an opening in the layer that normally conï¬nes it. There are many varieties of hernia arising through areas of weakness in the abdominal wall. Because they â€˜pushâ€™ from the inside to the outside, an abdominal hernia takes with it all the coverings of the abdominal wall, although they may be - thinned and attenuated. However, not all abdominal hernias have a peritoneal sac: many epigastric hernias, for example, arise in the interstitial layers and only draw peritoneum into the protrusion as a secondary phenomenon when they become) and larger.

Figure 64.2 Divarication of the recti. Note a coexisting small umbilical hernia.

ABDOMINAL WALL

ABDOMINAL WALL

The skin of the abdominal wall, similar to all skin, is prone to develop superficial infection that may be spontaneous, due to minor trauma or infection of skin lesions such as an epider moid cyst. Although antibiotics will su ffi ce in most patients, if an abscess develops then surgical drainage may be required. The close proximity of bowel and bowel organisms opens the abdominal wall to attack fr om a wide range of highly virulent bacteria. Most commonly , these are released during abdominal surgery such as appendicectomy and hence the need for appropria te antibiotic prophylactic cover.

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Abdominal compartment syndrome

Abdominal compartment syndrome

- Surgeons are increasingly aware of the harmful e ff ect of high - intra-abdominal pressures that can occur in severe intra- abdominal sepsis, such as pancreatitis and also following aortic aneurysm rupture. High pressure leads to reduced blood flow and tissue ischaemia, which contributes to multiorgan failure. Although the abdominal wall has elasticity , if intra-abdominal volume increases as a result of fluid, gas, pus, tissue oedema, etc., the maximal capacity may be reached and pressure rises to a critical level. Intra-abdominal pressure >20 /uni00A0 mmHg, as measured via a catheter in the urinary bladder, is diagnostic and requires intervention to avoid organ failure. Occasionally , such as after surgery for severe intraperito - neal sepsis, there is so much retroperitoneal swelling and/or - oedema of the bowel that the surgeon cannot close the abdo - men. In such cases it is often wise to leave the incision open, cover the abdominal contents with mesh or a saline-soaked dressing and plan to return at a future date to close the defect. This is called a lapar ostomy . Vacuum-assisted dressings assist in managing the large amounts of wound exudate. The patient may require repeated trips to the operating theatre, gaining a little more fascial apposition each time, before the wound can - be finally closed.

Anatomical causes of abdominal wall herniation

Anatomical causes of abdominal wall herniation

These may be classified as areas of natural weakness due to absence of muscle, natural defects that allow structures to enter or leave the abdomen, developmental abnormalities and disruptions of the abdominal wall as a result of injury . The only natural weaknesses caused by inadequate muscular strength are the lumbar triangles (see Lumbar hernia the posterior wall of the inguinal canal (Figure 64.3). Many structures enter and leave the abdominal cavity , cre ating weakness that can lead to hernia formation. The most common example is the inguinal canal, along which, in males, the testis and its associated vessels descend from the abdomen to scrotum a t the time of birth. In females the round ligament traverses the inguinal canal. The resultant weakness may lead to an indirect inguinal hernia. The risk of inguinal hernia is related to the anatomical shape of the pelvis and is greater in Giovanni Battista Morgagni , 1682–1771, Professor of Anatomy , Padua, Italy . Vincent Alexander Bochdalek , 1801–1883, Professor of Anatomy , Prague, Czech Republic. inherent areas of weakness include the oesophageal hiatus, the femoral canal and the umbilical cicatrix. Failure of normal development may lead to congenital her - nias. The most common is an indirect inguinal hernia arising through failure of the processus vaginalis to close. As the testis (or round ligament) descends, it pulls a tube of peritoneum along with it. This tube should naturally fibrose and become obliterated, but, if it fails to do so , a hernia may develop. Recent studies have shown that calcitonin gene-related pep - tide and hepatocyte growth factor influence the closure of the processus, raising the possibility of a hormonal cause of hernia development. Other examples of congenital herniation include Morgagni and Bochdalek hernias of the diaphragm and some umbilical her nias. In neonates these are often seen in association with other congenital abnormalities. Weak areas of the abdominal wall may also arise from direct injury . A surgical scar, even with perfect wound heal - ing, has only 70% of the initial muscle strength, resulting in incisional herniation in at least 10% of laparotomy incisions. Smaller laparoscopic port-site incisions have a hernia rate of 1%. Increasing use of the laparoscopic surgical appr oach should lead to a fall in the incidence of incisional hernia. Muscle damage by blunt trauma or tearing of the abdom -) and inal muscles is rare but is seen after exceptional force, such as high-speed motor vehicle accidents (Figure 64.4). - Summary box 64.1 Causes of hernia /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF

Figure 64.3 A right direct inguinal hernia defect (yellow arrows) is above the inguinal ligament (arrowheads). The round ligament (green arrow) enters the deep inguinal ring just lateral to the inferior epigastric vessels (black arrow). Anatomical weakness Developmental failures Genetic weakness of collagen Sharp and blunt trauma Weakness due to ageing and pregnancy Primary neurological and muscle diseases Figure 64.4 Traumatic hernia in the right iliac fossa (arrow) following a motor vehicle accident in which the lateral muscles, along with a tiny sliver of bone,

were torn off the iliac crest.

A normal abdominal wall has su ffi cient strength to resist high abdominal pressure and prevent herniation of content. Many patients will first notice a hernia after excessive straining, the strain bringing the hernia to the attention of the patient, rather than being the cause. There is good evidence that hernia is a ‘collagen disease’ and is due to an inherited imbalance in the types of collagen. This is supported by histological evidence and relationships between hernia and other diseases related to collagen, suc as aortic aneurysm. In extreme collagen disorders, such as Ehlers–Danlos syndrome, successful long-term repair of a her nia can be very di ffi cult. Hernia is more common in smokers as smoking is linked to impaired collagen maturation. Hernias are more common in elderly people owing to degenerative weakness of muscles and fibrous tissue. Inci sional hernias ar e more common after wound complications and in patients with a high body mass index; how ever, a major risk factor is the surgeon and the way the abdominal wall was closed.

Clinical history and diagnosis in hernia cases

Clinical history and diagnosis in hernia cases

Patients are usually aware of a lump on the abdominal wall under the skin. Self-diagnosis is common. The hernia is usually painless but patients may complain of an aching or heavy feeling. Sharp, intermittent pains suggest pinching of tissue at the hernia neck. Severe pain should alert the surgeon to a high risk of strangulation. One should determine whether the hernia reduces spontaneously or needs to be helped. The patient should be asked about symptoms that might suggest bowel obstruction. Once the clinician is satisfied that a swelling is indeed a hernia, it is important to know if this is a primary hernia, a recurrent hernia or an incisional hernia after previous surgery . Recurr ent and incisional hernias are more di ffi cult to treat and may require a di ff erent surgical approach. General questions about the cardiac and respiratory sys tems are necessary to assess a patient’s anaesthetic risk. Intake of anticoagulants such as warfarin and apixaban or antiplatelet medication such as aspirin or clopidogrel is important because this impacts on future surgery . Many hernia operations can be perfor med as a day case or single overnight stay , so that suitability for such treatment needs to be assessed, including home support, distance from the hospital, mobility levels, etc. (see Chapter 22).

Common principles in abdominal hernia

Common principles in abdominal hernia

An abdominal wall hernia has two essential components: a defect in the wall and the content, i.e. tissue that has been forced outwards through the defect. The weakness may be through fascia and muscle, or through fascia alone, such as an epigastric hernia. It may have a bony component, such as a femoral hernia. The weakness in the wall is usually the narrow est part of the hernia, which expands into the subcutaneous fat outside the muscle. The defect varies in size and may be very small or indeed very large. The nature of the defect is important to under standing the risk of hernia complications. A small defect with rigid walls traps the content and prevents it from freely moving in and out of the defect, increasing the risk of complications. The content of the hernia may be tissue from the extra peritoneal space alone, such as fat within an epigastric hernia or urinary bladder in a direct inguinal hernia. However, if a hernia enlar ges then peritoneum may also be pulled into the hernia secondarily along with intraperitoneal structures such as bowel or omentum; a good example is a ‘ sliding type inguinal hernia. More commonly , when peritoneum is lying immediately deep to the abdominal wall weakness, pressure forces the peritoneum through the defect and into the subcu taneous tissues. This ‘ sac ’ of peritoneum allows bowel and omentum to pass through the defect. In most cases, the intra peritoneal organs can move freely in and out of the hernia, a ‘ reducible ’ hernia; however, if adhesions form or the defect is small, bowel can become trapped and unable to return to the main peritoneal cavity , an ‘ irreducible ’ hernia, with higher risk of further complications. The narrowest part of the sac, at the abdominal wall defect, is called the ‘ neck ’ of the sac. Edvard Ehlers , 1863–1937, dermatologist, Frederiks Hospital, Copenhagen, Denmark. Henri-Alexandre Danlos , 1844–1912, dermatologist, Hôpital Saint Louis, Paris, France. August Gottlieb Richter , 1742–1812, surgeon, Göttingen, Germany . space. The narrow neck acts as a constriction ring imped - ing venous return and incr easing pressure within the hernia. Resulting tension leads to pain and tenderness. If the hernia obstructed ’, partially contains bowel then it may become ‘ or totally . If the pressure rises su ffi ciently , arterial blood is not able to enter the hernia and the contents become ischaemic and may infarct. The hernia is then said to have ‘ strangu - lated ’. The wall of the bowel perforates, releasing infected, toxic bowel content into the tissues and ultimately back into the h peritoneal cavity . The risk of strangulation is highest in hernias that have a small neck of rigid tissue, leading first to irreduc - - ibility and on to strangulation. The term ‘ incarcerated ’, literally ‘in prison’, means that a hernia is not only irreducible but also potentially developing strangulation. - Summary box 64.2 Types of hernia by complexity /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF - - ’ of - In a special circumstance (Richter’s hernia) only part of the - bowel wall enters the hernia (Figure 64.5). It may be small and di ffi cult or even impossible to detect clinically . Bowel obstruc - tion may or may not be present but the bowel wall may still become necrotic and perforate with life-threatening conse - quences. Femoral hernia may present in this wa y , often with diagnostic delay and high

risk to the patient.

Occult – not detectable clinically Reducible – a swelling that appears and disappears Irreducible – a swelling that cannot be replaced in the abdomen, at risk of complications Incarcerated – irreducible, trapped, risk of strangulation Strangulated – acutely painful swelling with tissue ischaemia: requires emergency surgery Infarcted – when contents of the hernia have become gangrenous: high mortality Figure 64.5 A gangrenous Richter’s hernia from a case of strangulated femoral hernia.

between the musculofascial layers of the abdominal wall mus cle and does not contain a peritoneal sac. This is commonly seen with small Spigelian hernias (see Spigelian hernia An internal hernia describes bowel entrapment within the peritoneal cavity . This can occur in naturally existing spaces such as the foramen of Winslow or the paraduodenal and paracaecal fossae, around adhesive bands or through iatro genic defects in the mesentery .

Cutaneous fistula

Cutaneous fistula

Because of the thickness of the abdominal wall, it is rare for abdominal inflammatory conditions to discharge sponta neously through the wall to the skin. Chronic intraperitoneal abscesses arising after occult bowel perforation, appendicitis, diverticulitis and cholecystitis are the most likely sources. CT will locate the internal abscess and suggest the likely origin. Treatment is usually by CT - or ultrasonography-guided drainage but the surgeon may be called on to remove the Jean Alfred Fournier , 1832–1915, French syphilologist and founder of the V enereal and Dermatological Clinic, Hôpital St Louis, Paris, France. Burrill Bernard Crohn , 1884–1983, gastroenterologist, Mount Sinai Hospital, New Y ork, NY , USA, along with Leon Ginzburg and Gordon Oppenheimer described regional ileitis in 1932. - source organ (source control). Malignancy in its later stages can occasionally erode through the abdominal wall. Crohn’s disease also has a tendency to fistulate into adjacent organs and - may develop an enterocutaneous fistula. -

Figure 64.29 Bacterial synergistic gangrene of the chest and abdom

inal wall. The area has become gangrenous and looks like suede leather.

Epigastric hernia

Epigastric hernia

These hernias arise through the midline raphe (linea alba) anywhere between the xiphoid process and the umbilicus. They begin with a transverse split in the midline raphe so the defect is elliptical and usually less than 1 /uni00A0 cm in diameter. The hernia commonly contains only extraperitoneal fat, which gradually - enlarges, spreading in the subcutaneous plane to resemble the shape of a mushroom (Figure 64.21). When very large they may contain a peritoneal sac but rarely any bowel. More than - one hernia may be present. Indeed, the most common cause of ‘recurrence’ is failure to identify a second defect at the time of original repair. Clinical features The patients are often fit, healthy men, but they are also seen in older, overweight men and women especially after multiple pregnancies. The hernia can be very painful even when the swelling is small owing to the fatty contents becoming nipped su ffi ciently to produce partial strangulation. It may be locally tender. It is unlikely to be reducible because of the narrow neck and may resemble a lipoma. A cough impulse may or may not be felt. Treatment V ery small epigastric hernias have been known to disappear spontaneously , probably because of infarction of the fat. Small- to moderate-sized hernias without a peritoneal sac are not inherently dangerous and surgery should be o ff ered only if the hernia is su ffi ciently symptomatic. Hernias containing bowel should always be repaired. Surgery This may be open or laparoscopic. At open surgery , a vertical or transverse incision is made over the swelling and down to the linea alba. Protruding extraperitoneal fat can simply be pushed back through the defect or excised. Often a small vessel is present in the hernia content that can cause troublesome bleeding. Small defects in the linea alba may be closed with non-absorbable sutures in adults and absorbable sutures in children; however, in larger hernias and when a peritoneal sac is present, the surgical approach is similar to that described for an umbilical mesh repair. Laparoscopic repair is also very similar to that for umbilical hernia except that the defect is hidden behind the falciform ligament, which must first be taken down from the undersur face of the abdominal wall to allow the mar gins of the defect to be exposed. It is very important to fully reduce the fatty contents, as simply placing a mesh under the linea alba may leave the patient with a palpable lump if the hernia contents are extraperitoneal fat.

Figure 64.21 Epigastric hernia.

Examination for hernia

Examination for hernia

The patient should be examined lying down initially and then standing, as this will usually increase hernia size. Some hernias will only be apparent with the patient standing. The patient may be asked to cough or to perform the Valsalva manoeuvre to make the hernia appear. Divarication is best seen by asking a supine patient to simply lift his/her head o ff the pillow . Finally , it should be remembered that if a patient describes an intermittent swelling but the surgeon finds no hernia on examination, there still may be a hernia present. The overlying skin is usually of normal colour. If there is overlying cellulitis then the hernia content is strangulating and the case should be treated as an emergency . In most cases an expansile cough impulse is felt if gen tle pressure is applied to the lump and the patient is asked to cough; however, there may be no cough impulse when the neck is tight and the hernia irreducible. This is typical of a femoral Adriaan van den Spiegel , 1578–1625, Flemish anatomist who practised in Padua, Italy . Jacob Benignus Winslow , 1669–1764, Danish-born anatomist, Jardin du Roi, Paris, France Antonio Maria Valsalva , 1666–1723, Professor of Anatomy , Bologna, Italy . - agnose a lymph node. A cough impulse can also be appreciated in a saphena varix (see Chapter 62).). If a groin hernia is found on one side, the other side must also be examined as occult contralateral hernias are present in up to 20% of patients . If a hernia does not reduce spontaneously , the surgeon - should ask the patient to attempt reduction because he/she may be w ell practised in this task, and the surgeon might cause unnecessary discomfort. If neither the patient nor the surgeon can reduce the hernia, the trea tment is more urgent. Summary box 64.3 Checks /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF Summary box 64.4 - Examination /uni25CF /uni25CF

Reducibility Cough impulse Tenderness Overlying skin colour changes Multiple defects/contralateral side Signs of previous repair Scrotal content for groin hernia Associated pathology A swelling with a cough impulse is not necessarily a hernia A swelling with no cough impulse may still be a hernia but consider other diagnoses

Femoral hernia

Femoral hernia

Basic anatomy The external iliac artery and vein pass below the inguinal ligament to become the common femoral vessels in the leg. The vein lies medially and the artery is lateral to the vein, with the femoral nerve lateral to the artery . They are enclosed in a fibrous sheath. Just medial to the vein is a small space containing fat and some lymphatic tissue (node of Cloquet). It is this space, Jules Germain Cloquet , 1790–1883, Professor of Anatomy and Surgery , Paris, France. Manoel Louise Antonio don Gimbernat , 1734–1816, Professor of Anatomy , Barcelona, Spain. boundaries of the femoral canal are the femoral vein laterally , the inguinal ligament anteriorly , the pelvic bone covered by the iliopectineal ligament (Astley Cooper's) posteriorly and the lacunar ligament (Gimbernat's) medially . This is a strong curved ligament with a sharp unyielding edge that impedes reduction of a femoral hernia (Figure 64.17). - The female pelvis has a di ff erent shape from the male, increasing the size of the femoral canal and the risk of hernia. In old age, the femoral defect enlarges further and femoral hernia is commonly seen in thin, elderly w omen. Summary box 64.11 Femoral hernia /uni25CF /uni25CF /uni25CF /uni25CF Diagnosis of femoral hernia Diagnostic error is common and often leads to delay in diag - nosis and treatment. The hernia appears below and lateral to the pubic tubercle and lies in the upper leg rather than in the lower abdomen. Inadequate exposure of this area during routine examination leads to failure to detect the hernia. The hernia often rapidly becomes ir reducible and loses any cough impulse owing to the tightness of the neck. It may only be 1–2 /uni00A0 cm in size and can easily be mistaken for a lymph node. As it increases in size, it is reflected superiorly and becomes di ffi cult to distinguish from a medial direct hernia, which arises only a few centimetres above the femoral canal. Summary box 64.12 Differential diagnosis /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF Investigations In routine cases, no specific investigations are required. However, if there is uncertainty then ultrasonography or CT should be requested. In the emergency patient, bowel obstruc - tion is often present and a plain radiograph is likely to show this. All patients with unexplained small bowel obstruction should undergo careful examination for a femoral hernia.

A B C Figure 64.17 Right femoral hernia: laparoscopic view. The slightly oblique inguinal ligament can be seen superolaterally above the defect. The external iliac vein is not seen. A, inguinal ligament; B, lacunar ligament; C, arch of pubic bone; D, fatty tissue overlying iliac vessels. Less common than inguinal hernia More common in women than in men Easily missed on examination 50% present as an emergency with very high risk of strangulation D Inguinal hernia Lymph node Saphena varix Femoral artery aneurysm Psoas abscess Rupture of adductor longus with haematoma

obstruction primarily to exclude malignancy , but it can identify an obstructing femoral hernia missed by clinicians. Surgery for femoral hernia There is no alternative to surgery for femoral hernia and it is wise to treat such cases with some urgency . There are three open approaches and appropriate cases can be managed laparoscopically . Low approach (Lockwood) This is the simplest

operation for a femoral hernia but suitable only when there is no risk of bowel resection. It can easily be performed under local anaesthesia. A transverse incision is made over the hernia. The sac of the hernia is opened and its contents reduced. The sac is also reduced and non-absorbable sutures are placed between the inguinal ligament above and the pectineal ligament overlying the pubic bone below . A small incision can be made in the medial lacunar ligament to aid reduction but there may be an abnormal branch of the obturator artery just deep to it, which can bleed. The femo ral vein, lateral to the hernia, needs to be protected. Some surgeons place a mesh plug into the hernia defect for further reinforcement. The inguinal approach (Lotheissen) The initial incision is identical to that of Bassini's or Lichten stein's operation into the inguinal canal. The spermatic cord (or round ligament) is mobilised and the transversalis fascia opened from the deep inguinal ring to the pubic tubercle, av oiding injury to the inferior epigastric vessels. This gains entry into the extraperitoneal space. A femoral hernia lies immediately below this incision and can be reduced by a combination of pulling from above and pushing from below . If necessary , the peritoneum can be opened to deal with the contents. Once reduced, the neck of the hernia is closed with sutures or a mesh plug, protecting the external iliac vein throughout; alternatively , a sheet of flat mesh may be laid over the defect in the extraperitoneal plane. The layers are closed as for inguinal hernia and the surgeon may place a mesh into the inguinal canal to protect against development of an inguinal hernia. High approach (McEvedy) This more complex operation is ideal in the emergency situa tion where the risk of bowel strangulation is high. It requires regional or general anaesthesia. Although McEvedy described a paramedian incision, most surgeons nowadays use the Nyhus modification, which is a transverse incision just above the inguinal canal, centr ed on the lateral border of the rectus muscle. The anterior rectus sheath is incised and the rectus muscle retracted. The surgeon proceeds deep to the muscle in the preperitoneal space. The femoral hernia is reduced and the Charles Barrett Lockwood , 1856–1914, surgeon, St Bartholomew's Hospital, London, UK. George Lotheissen , 1868–1941, surgeon, the Kaiser Franz Joseph Hospital, Vienna, Austria. Peter George McEvedy , 1890–1951, surgeon, Ancoats Hospital, Manchester, UK. Lloyd Milton Nyhus , 1923–2008, Chief of Surgery , University of Illinois, Chicago, IL, USA. Arnold K Henry , 1886–1962, Professor of Surgery , Cairo, later Anatomy Professor, Royal College of Surgeons in Ireland, Dublin, Ireland. In dubious cases, the bowel is replaced into the peritoneal cavity for 5 minutes and then re-examined. The femoral defect is then closed with sutures or mesh. This approach allows a gener ous incision to be made in the peritoneum, which aids inspection of the bowel and facil - itates bowel resection. Bowel resection is not possible via the low (Lockwood) appr oach because the completed anastomosis will not be able to be returned to the abdominal cavity through the narrow femoral canal. The preperitoneal appr oach may be extended to gain access to repair bilateral femoral hernias through a single incision (Henry). Laparoscopic approach Both the TEP and TAPP approaches can be used for a femoral hernia and a standard mesh inserted in the extraperitoneal plane. This is ideal for reducible femoral hernias presenting electively , but there are increasing reports of the laparoscopic approach in the emergency setting, mainly with the TAPP approach. In women, the laparoscopic approach is recommended - because of the increased early recurrence observed in women, thought to relate more to misdiagnosis of the hernia (ingui - nal versus femoral) than true r ecurrence. The laparoscopic approach allows good visualisation of all the hernia orifices, removing any diagnostic uncertainty . -

Incisional hernia

Incisional hernia

These arise through a defect in the musculofascial layers of the abdominal wall at the site of a postoperative scar. Thus, they may appear anywhere where a laparotomy has been made. Incidence and aetiology Incisional hernias have been reported in 10–50% of laparot omy incisions and 1–5% of laparoscopic port-site incisions. Factors predisposing to their development include patient factors (genetic collagen disorders, obesity , general poor healing due to maln utrition, immunosuppression or steroid therapy , chronic cough, cancer), wound factors (poor quality tissues, wound tension, wound infection) and surgical factors (inappropriate suture material, poor closure technique). An incisional hernia usually starts as disruption of the mus culofascial layers of a wound in the early postoperative period. This may progress rapidly to full thickness wound dehiscence, usually heralded by a serosanguineous discharge around the sixth postoperative day , but mor e commonly the event passes unnoticed if the overlying skin wound has healed securely . A visible swelling may take weeks, months or years to appear. Many incisional hernias may be preventable by ensuring healthy wound edges, minimal wound tension and good sur gical technique as described by the European Hernia Society abdominal wall closure guidelines. The small-stitch, small-bite technique is recommended, and the role of prophylactic mesh in high-risk patients is also a current area of researc h. Clinical features Incisional hernias commonly appear as a localised swelling involving part of a surgical scar but may present as a di ff use bulging of the whole length of the incision (Figure 64.25 Alternatively there may be several discrete hernias along the length of the incision, but even with apparently singular hernias unsuspected defects are frequently found at operation (Figure 64.26). Incisional hernias tend to increase steadily in - - - Summary box 64.16 - Incisional hernia /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF). size with time, and the overlying skin may become thin and atrophic. Local trauma and microvascular damage to skin may lead to ulceration. Episodes of intestinal obstruction are common because there are usually coexisting internal

Figure 64.25 A large incisional hernia involving the full length of the incision. Figure 64.26 Multiple defects along the line of the scar, seen at laparoscopy. Incidence 10–50% after surgery Aetiology includes patient, wound and surgeon factors Wide variation in size Multiple defects within the same scar are very common Obstruction is common but strangulation is rare Open and laparoscopic repairs possible

incisional hernias are shallow and wide-necked. As with any hernia type, strangulation is most likely when the fibrous defect is small and the sac is large. Treatment Asymptomatic incisional hernias may not require treatment. The wearing of an abdominal binder or belt often provides symptomatic relief and may prevent the hernia from increas ing in size. Many patients with an incisional hernia have other comorbidities and discussion around the balance of benefits and risks of surgery is important. The decision to operate and choice of technique should always be agreed between the patient and the surgeon and patients’ preferences need to be respected. Repair of

large and/or complex incisional hernias can be extremely challenging; in such cases advice from, or referral to, a colleague with a special interest in abdominal wall reconstruction should be considered. Each patient undergoing an elective incisional hernia repair should be optimised for surgery . In many centres, patients undergo formal multidisciplinary team assessment and this is likely to become the standard of care in the coming year So-called ‘prehabilitation’ includes weight loss if the patient is obese, smoking cessation, fitness improvement and core strength exercising. Loss of 7% of total bodyweight achieves a significant improvement in metabolic state, and 5 /uni00A0 kg of body weight is said to create about one extra litre of space inside the adult male abdomen (0.5 litres in women). Prevention of incisional hernia The risk of incisional hernia may be reduced by improving the patient’s general condition preoperatively where possible, e.g. smoking cessation, weight loss for obesity or improving nutritional status in undernourished individuals. Closing the fascial layers with good technique and materials is important. For years it has been advised that sutures should be 1 /uni00A0 cm back from the wound edge and 1 /uni00A0 cm apart, but recent work has shown that lower incisional hernia rates and reduced infection rates are gained when smaller and closer bites are used: 5 /uni00A0 mm apart and 5–8 /uni00A0 mm back from the wound edge, with care taken to incorporate fascia only in the suture bites (no muscle) and to minimise excessive suture tension. A 2/0 slowly resorbable suture is also recommended rather than traditional heavier and/or non-absorbable materials (see Chapter 7). There is no evidence that interrupted sutures are better or worse than continuous. However, if continuous suturing used, the tissue bites must not be too near the fascial edge or pulled too tight because they may cut out. The optimal ratio of suture length to wound length is 4:1. If a ratio of less than this is achieved, the suture bites are likely to be too far apart and/ or too tight (and vice versa). Drains should be brought out through separate incisions and not through the wound itself because this prevents fascial apposition and increases the risk of hernia formation. Studies in obese patients undergoing bariatric surgery have suggested that placement of a prophylactic mesh in patients Alcino Lazaro da Silva , contemporary , surgeon, Vitoria, Brazil. reduce that risk. Use of prophylactic mesh ma y reduce the risk of parastomal herniation, which occurs in up to 50% of patients. Principles of surgical repair For repair of most incisional hernias, both open and laparoscopic options are available. A number of principles apply , irrespective of the technique used. First, the repair - should cover the whole length of the previous incision. Second, approximation of the musculofascial layers should be done with minimal tension; third, prosthetic mesh should be used to reduce the risk of recurrence. Mesh may be contraindicated in a contaminated field, e.g. in the event of perforation of strangulated bowel, but mesh may still be used in a clean-contaminated field, such as after an elective bowel resection, if strict hygiene measures are observed and appropriate prophylactic antibiotics are given. Open repair The previous incision is opened along its full length to reveal any clinically unsuspected defects. The hernial sac, its neck s. and the margins of the defect are fully exposed. The sac can be opened, contents reduced, local adhesions divided and any redundant sac excised to allow safe fascial closure. Simple suture techniques without the use of prosthetic mesh for reinforcement, even with the overlapping re pair of Mayo or the layered closure of da Silva, are not recommended because of the unacceptable risk of recurrence. However, they may be the only option in the presence of gross contamination, where mesh is contraindicated. Mesh should ideally be used in a tension-free manner to augment primary fascial closure and not used to ‘bridge’ a gap between fascial edges as the unsupported mesh centrally will inevitably bulge outwards postoperatively , giving the appearance of recurrence. However, if the mesh-to-defect area ratio is su ffi ciently large, i.e. there is su ffi cient circumferential overlap of mesh in relation to the size of the defect, then a bridging repair is generally secure. Mesh can be

placed in one of several planes, as for primary ventral hernia repair. The simplest approach is an onlay mesh but this carries the risk of mesh exposure and contamination in the event of wound infection or wound breakdown. Furthermore, placement of a large onlay mesh requires elevation of large skin flaps, which increases the risk of wound seroma and overlying skin ischaemia. Intraperitoneal mesh placement is di ffi cult at open surgery and mesh in direct contact with the intra-abdominal organs is prone to complications such is as adhesive bowel obstruction, erosion into adjacent organs and bowel fistulation. The retromuscular plane is preferred by many surgeons. Laparoscopic repair Great advances have been made in applying laparoscopic tech - niques to incisional hernia repair. Laparoscopy and division of adhesions is initially performed, hernia contents are reduced and the fibrous margins of the hernia defect(s) are exposed. Often the falcif orm ligament and median umbilical fold need defect(s) with sutures before reinforcing with mesh, while others simply ‘bridge’ the defect with no attempt at closure. Larger defects are more di ffi cult to close, but bridging large defects is associated with bulging of the mesh postoperatively , often referred to as ‘pseudo-recurrence’ (Figure 64.27 small hernias can be safely fixed without closing the defect, as the large mesh to defect area ratio will help to minimise mesh bulging and recurrence. The mesh is placed directly onto the peritoneum deep to the abdominal wall muscles, fixed in place with tissue glue, sutures or staple/tacks and is known as an IPOM repair. Special meshes with anti-adhesion coatings must be used, so-called ‘tissue separating’ meshes, and these are generally expensive. In the presence of dense peritoneal adhesions, the laparo scopic surgeon needs to take great care because injury to the bowel is possible and may not be recognised. If occult bowel injury does occur it can lead to postoperative peritonitis.

Inguinal hernia

Inguinal hernia

Inguinal hernia, often referred to as a ‘rupture’ by patients, is the most common hernia in men and is around 10 times more common in men than in women. There are two basic types that are fundamentally di ff erent in anatomy , causation and complications. However, they are anatomically very close to each other, the surgical repair techniques are very similar and ultimate reinforcement of the weakened anatomy is identical, so they are often referred to together as inguinal hernia. Inguinal hernia /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF - Congenital inguinal hernias are of the indirect type, whereas the acquired hernias may be either indirect or direct. - Anatomy of the inguinal canal As the testis descends from the abdominal cavity to the scrotum it passes through a defect in the transversalis fascia called the deep inguinal ring, just deep to the abdominal muscles. This ring lies midway between the anterior superior iliac spine and the pubic tubercle, approximately 2–3 /uni00A0 cm above and marginally lateral to the femoral artery pulse in the groin. The inferior epigastric vessels lie just medial to the deep inguinal ring, passing from the iliac vessels to rectus abdominis. Muscle fibres from the innermost two layers of the lateral abdominal wall, the transversus muscle and the internal oblique muscle, arch over the deep inguinal ring from lateral to medial before descending to become attached to the pubic tubercle. These two muscles fuse and become tendinous, forming the conjoint tendon. Below this arch there is no muscle but only transversalis fascia and external oblique aponeurosis, resulting in an area of weakness (Figure 64.10). The testis proceeds medially and downwards along the inguinal canal. Anterior to the canal is the aponeurosis of the external oblique muscle, the fibres of which run downwards and medially . T he testis finally emerges through an inverted V-shaped defect in the aponeurosis, the superficial inguinal ring, and descends into the scrotum.

Epigastric Umbilical Spigelian Inguinal Femoral Obturator Figure 64.9 Diagram to show the sites of abdominal wall hernias: common in red and rare in black. Incisional and parastomal hernias can be found at various sites. Types – indirect (lateral, or oblique) or direct (medial) Origin – congenital or acquired Anatomy – inguinal canal Diagnosis – usually clinical but radiological in special circumstances Surgery – open or minimally invasive (laparoscopic/robot assisted) Superior lumbar Inferior lumbar Gluteal Sciatic

The inguinal canal is roofed by the conjoint tendon; its pos terior wall is transversalis fascia, the anterior wall is the exter nal oblique aponeurosis and the floor is the free inferior edge of the external oblique aponeurosis, rolled inwards thickened to become the inguinal (Poupart’s) ligament. The inguinal canal in males contains the testicular artery , veins, lymphatics and the vas deferens all covered in cremasteric muscle. In females, the round ligament descends through the canal to end in the labia majora. Three important nerves, the ilioinguinal, the ilio hypogastric and the genital branch of the genitofemoral nerve, also pass through the canal. As the testis descends, a tube of peritoneum is pulled with the testis and wraps around it ultimately to form the tunica vag inalis. This peritoneal tube should obliterate, possibly under hormonal control, b ut it commonly

fails to do so completely . As a result, bo wel within the peritoneal cavity can pass inside the tube towards the scrotum. Inguinal hernias in neonates and Francois Poupart , 1661–1709, physician and anatomist, Hôtel Dieu, Reims, France 1561 by Gabrielle Fallopius , 1523–1563, Professor of Anatomy , Padua, Italy . Franz Kaspar Hesselbach , 1759–1816, surgeon and anatomist, Würzbur patients, the muscles around the deep inguinal ring can prevent a hernia from developing until later in life, when, under the constant positive abdominal pressure, the deep inguinal ring and muscles are stretched and a hernia becomes apparent. As the hernia increases in size, the contents are directed down into the scrotum. These hernias can become massive and may be referred to as a scrotal hernia. An indirect hernia is lateral because its origin is lateral to the inferior epigastric vessels. It is also oblique as the hernia passes obliquely from lateral to medial through the abdominal muscle layers. An indirect hernia can pass all the way down to the scrotum, following the line of the processus vaginalis, while this is not possible with a direct hernia. The second type of inguinal hernia, referred to as direct or medial, is always acquired. It is a result of stretching and weakening of the abdominal wall just medial to the inferior epigastric vessels, an area known as Hesselbach’s triangle, the - three sides of which are the inferior epigastric vessels laterally , - the lateral edge of rectus abdominis muscle medially and the inguinal ligament below (the iliopubic tract) (Figure 64.11). This area is weak because the abdominal wall at this point con - sists of only transversalis fascia covered by the external oblique aponeurosis. A direct medial hernia is more likely in elderly patients. It is broadly based and therefore unlikely to strangulate. The - bladder can be pulled into a direct her nia (Figure 64.12). Inguinal hernias are sometimes referred to as ‘sliding’ in type. These are acquired indirect hernias arising at the deep inguinal ring lateral to the inferior epigastric vessels. Retro - - peritoneal fatty tissue is pushed downwards along the inguinal canal. As more tissue enters the hernia, peritoneum is pulled with it, thus creating a sac. However, the sac has formed sec - ondarily , distinguishing it from a classic indirect hernia. On the left side, sigmoid colon may descend into a sliding hernia and , described the inguinal ligament in 1705 although it had been described in g, Germany.

ring Iliacus Inferior epigastric vessels Femoral nerve External inguinal Femoral artery ring Femoral vein Sac of femoral Pubic tubercle hernia Sac of indirect inguinal hernia Sac of direct

inguinal hernia Figure 64.10 The close relationships of direct inguinal, indirect ingui nal and femoral hernias. (a) Figure 64.11 (a) Laparoscopic view of the left inguinal region with hernia defects highlighted: yellow, Hesselbach’s triangle (medial or direct inguinal); blue, lateral or indirect inguinal; green, femoral. (b) Diagrammatic representation of

(b) Inferior epigastric vessels Laparoscopic instrument Testicular Line of the vessels inguinal ligament Arch of the pubic bone Vas deferens (a) .

the caecum may do so on the left. Surgeons need extra caution during repair because the bowel may form part of the sac itself and can be damaged during the dissection. Occasionally , both lateral and medial hernias are present in the same patient (pantaloon hernia). Classification Many ways to classify inguinal (and femoral) hernias have been described. The European Hernia Society has recently suggested a simplified system of: /uni25CF primary or recurrent (P or R); /uni25CF lateral, medial or femoral (L, M or F); /uni25CF defect size in fingerbreadths (assumed to be 1.5 /uni00A0 cm), with three sizes of one fingerbreadth or less, between one and three fingerbreadths and three or more fingerbreadths. A primary indirect inguinal hernia with a 3-cm defect size would be PL2. Diagnosis of an inguinal hernia In most cases, the diagnosis of an inguinal hernia is simple. Often the hernia will reduce on lying and reappear on stand ing. With the patient lying down, the patient is asked to reduce the hernia if it has not spontaneously reduced. If the patient cannot then

the surgeon gently attempts to reduce the hernia. Once reduced, the surgeon identifies the bony landmarks of the anter osuperior iliac spine and pubic tubercle, from which the location of the deep inguinal ring can be found just above the midpoint of the inguinal ligament. Gentle pressure is applied at this point and the patient asked to cough. If the hernia is controlled with pressure on the deep inguinal ring then it is likely to be indirect/lateral; if the hernia appears medial to this point despite local pressure, then it is direct/ medial. Other examination techniques have been suggested but even experienced surgeons find it di ffi cult to distinguish lateral and medial hernias with certainty (Figure 64.13 Diagnostic difficulties Confirmation of the diagnosis may not be possible when the patient describes an intermittent swelling but nothing is found history alone but re-examination at a later date or investigation by ultrasound scan may be requested. If an inguinal hernia becomes ir reducible and tense there may be no cough impulse. Di ff erential diagnosis would include a groin lymph node mass, psoas abscess, subcutaneous soft tis - sue mass (e.g. lipoma) or an abdominal mass. Such cases may r equire investigation by either ultrasonography or CT . Large scrotal hernias may be misdiagnosed as a hydrocele or other testicular swelling. The surgeon should be able to iden - tify the upper limit of a swelling that arises from within the scrotum, but a large scrotal hernia has no upper limit because it extends back along the inguinal canal to the peritoneal cavity . In cases of doubt, ultrasonography or CT should establish the diagnosis. As inguinal hernia is so common, less experienced clini - cians might suggest this diagnosis w hen referring cases of fem - oral hernia or Spigelian hernia. A saphena varix may present as a groin swelling that increases in size on standing and with a definite cough impulse and be misdiagnosed as a hernia, par - ticularly in pregnant women. It is essential in men to e xamine the scrotal contents to exclude other pathologies and to check that the patient has both testes. It is also important to examine the opposite side because contralateral her nia is common. A patient with a single hernia has a 50% lifetime risk of developing a hernia on the other side. Some surgeons have suggested that patients should be o ff ered bilateral repair, especially if laparoscopic surgery is planned, but this is not widespread practice at present. -).

Figure 64.12 A cystogram showing that part of the urinary bladder has descended into a left direct inguinal hernia (arrows). Figure 64.13 Oblique left inguinal hernia that became apparent when the patient coughed and persisted until it was reduced when he lay down.

Most cases require no diagnostic tests but ultrasonography , CT and MRI are occasionally used and show excellent anatomical detail but may miss groin hernias because they tend to reduce spontaneously in supine patients. Management of inguinal hernia It is safe to recommend no active treatment in cases of early asymptomatic direct hernia, particularly in elderly patients who do not wish for surgical intervention. These patients should be warned to seek early advice if the hernia increases in size or becomes symptomatic. Surgical trusses are not recommended. Elective surgery for inguinal hernia can be undertaken under local, regional or general anaesthesia with minimal risk, even in high-risk patients. Herniotomy In children who have lateral hernias with a persistent processus vaginalis, it is su ffi cient just to excise and close the sac. This is called a herniotomy (see Chapter 18). In adult surgery , herniotomy alone has a high recurrence rate and some form of muscle-strengthening repair (herniorrhaphy) is recommended. Open suture repair In 1890, Edoardo Bassini described a suture repair for inguinal hernia that remained the basis of open repair for over 100 years (Figure 64.14). The surgeon enters the inguinal canal by opening its anterior wall, the external oblique aponeurosis. The spermatic cord is dissected free and the presence of a lateral or

a medial hernia is confirmed. The sac of a lateral hernia is separated from the cord, opened and any contents reduced. The sac is then sutured closed at its neck and excess sac removed. If there is a medial hernia then the sac is inverted and the transversalis fascia is suture plicated. Sutures are now placed between the conjoint tendon above and the inguinal ligament below , extending from the pubic tubercle to the deep inguinal ring. The posterior wall of the inguinal canal is thus strengthened. Over 150 modifications to Bassini's operation have been described with little or no benefit except for the Shouldice modification. In this operation, the transversalis fascia is opened by a central incision fr om the deep inguinal ring to the pubic tubercle and then closed to create a two-layered pos terior wall (double breasting). The external oblique is closed in a similar fashion. Expert centres have reported lifetime failure rates of less than 2% after Shouldice repair but it is a techni cally demanding operation that, in most hands, gives r similar to those of a Bassini repair. Today , when a Bassini-type operation is done, most sur geons use a continuous, non-absorbable nylon or polypropyl ene sutur e that is darned between the conjoint tendon and inguinal ligament (Maloney). This operation gives excellent Edoardo Bassini , 1844–1924, Professor of Surgery , Padua, Italy . Edward Earle Shouldice , 1890–1965, surgeon, Thornhill, Ont, Canada, established the Shouldice Hernia Hospital in 1945. Sir Astley Paston Cooper , 1768–1841, surgeon, Guy's Hospital, London, UK. George Edward Maloney , 1912–1997, born Dunedin, New Zealand, surgeon, the Radcli ff e Infirmary , Oxford, UK. Mohan P Desarda , contemporary , Poona, India. Irving Lichtenstein , 1920–2000, surgeon, Beverley Hills, CA, USA. results and is the most common operation performed in coun - tries where mesh is too expensive. Desarda has described an operation where a 1- to 2-cm strip of external oblique aponeurosis lying over the inguinal canal is isolated from the main muscle, but left attached both medially and laterally . It is then sutured to the conjoint tendon and inguinal lig ament, reinforcing the posterior wall of the inguinal canal. As the abdominal muscles contract, this strip of aponeurosis tightens to add further physiological support to the posterior wall. This operation is currently seen as equivalent to Shouldice repair. Open flat mesh repair Synthetic mesh has been used since the 1950s to reinforce hernia repair, and in the 1980s Lichtenstein described a tension-free, simple, flat, polypropylene mesh repair for inguinal hernia (Figure 64.15). The initial part of the operation is identical to Bassini's. Once the hernia sac has been removed and any medial defect closed, a piece of mesh measuring 8 /uni00A0×/uni00A0 15 /uni00A0 cm is - placed over the posterior wall, behind the spermatic cord, and is slit to wrap around the spermatic cord at the deep inguinal ring. Loose sutures hold the mesh to the inguinal ligament and - conjoint tendon. Two major advantages are claimed: lower esults hernia recurrence rates and accelerated postoperative recov - ery . Randomised trials show that hernia recurrence within the - first 2 years is lower but acute pain scores are similar. Recent - research comparing Lichtenstein's re pair with laparoscopic surgery has identified chronic pain as the most common complication of open flat mesh repair with rates reported as

B F A D G E C A Figure 64.14 Inguinal canal anatomy as shown in Bassini's original diagram

(1890). A, subcutaneous fat; B, external oblique aponeurosis (opened); C, inferior epigastric vessels; D, Poupart’s (inguinal) liga

ment; E, spermatic cord retracted; F , the conjoint tendon (triple layer of lesser oblique, transversus abdominis and Cooper’s (cremasteric) fascia); G, transversalis fascia.

high as 20%. Nevertheless, today , Lichtenstein’s repair is the most common operation for inguinal hernia in resource-rich countries. Open plug/device/complex mesh repair Shaped mesh plugs have been developed in an attempt to improve on simple flat mesh repair. They are simple to insert and require little if any fixation. However, they can become solid (meshoma) and migrate/erode into adjacent structures such as the urinary bladder. Other meshes have been designed to be placed beneath the transversalis fascia. There is little evidence that any of these techniques are superior to Lichten stein’s operation and use is not recommended in the 2018 European Hernia Society groin hernia guidelines. Open preperitoneal repair The preperitoneal approach was first described by Annandale in 1880, but was largely discarded until the 1950s when Stoppa described it with mesh reconstruction through a midline incision. It is useful when multiple attempts at open standard surgery have failed and the hernia(s) keeps recurring. It has been largely superseded by the totally extraperitoneal laparo scopic approach, which is modelled on Stoppa’s operation. Laparoscopic inguinal hernia repair Two techniques are described and have been extensively stud ied: the totally extraperitoneal (TEP) and the transabdominal preperitoneal (TAPP) approach. In both, the aim of surgery is to reduce the hernia and hernia sac from within the abdomen and place a 10 /uni00A0×/uni00A0 15 /uni00A0 cm mesh (or larger) in the pr eperitoneal plane, just deep to the abdominal wall extending medially Thomas Annandale , 1838–1907, Regius Professor of Surgery , Edinburgh, UK. Rene Stoppa , 1921–2006, surgeon, Amiens, France. into the retropubic space and at least 5 /uni00A0 cm lateral to the deep inguinal ring (Figure 64.16). The mesh covers Hesselbach’s triangle, the deep inguinal ring and the femoral canal. In TEP , the surgeon develops the extraperitoneal plane just deep to the abdominal muscles, taking care not to enter the peritoneal cavity . In TAPP , the surgeon enters the peritoneal cavity first and incises the peritoneum above the hernia defect to open up the extraperitoneal space as in TEP . Compared with an open approach, the laparoscopic approach is associated with reduced pain both immediately s later, more rapid return to full after surgery and up to 5 year - activity and a reduced incidence of wound complications such as infection, bleeding and seroma. Laparoscopic surgery is of particular benefit in bilateral hernias and in patients with hernia recurrence after open surgery . The proportion of cases performed laparoscopically is slowly rising, but there is a long learning curve. The increasing use of robot-assisted laparoscopic inguinal hernia surgery is evident. To date, little additional patient ben - efit has been noted, although the enhanced surgical view of the gonomic comfort for the surgeon are compel - robot and the er - ling reasons to utilise this

platform. The cost of using a robot for simple inguinal repair r emains hard to justify . Tailored approach - A number of surgical approaches and operations are available, as noted in Summary box 64.9. No one operation suits all hernias. Taking into account the surgeon’s skills, equipment available, patient type and hernia characteristics will aid a preoperative discussion as to which repair is best, or indeed whether no operation at all is the best management plan.

Figure 64.15 Lichtenstein’s repair. Figure 64.16 Right medial/direct inguinal hernia: laparoscopic view. Note the inferior epigastric vessels (red arrow) and contents of the spermatic cord passing through the deep ring (yellow arrow).

Operations for inguinal hernia /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF Emergency inguinal hernia surgery Approximately 5% of inguinal hernias present as an irre ducible, painful lump that may progress to strangulation and possible bowel infarction. Time is critical in the presence of ischaemic bowel. The principles of surgery are the same as in an elective setting. Open or laparoscopic surgery is possib depending on the local facilities, the surgeon’s skills and the patient’s characteristics. Approximately 20% of patients who present as an emergency require bowel resection. This may require conversion to a midline laparotomy , which adds signifi cantly to postoperative morbidity and mortality . Surgical site infection may complicate emergency cases but, unless there is significant infection/contamination, use of synthetic mesh is acceptable as long as the operation is covered by appropriate antibiotics. Complications of inguinal hernia surgery Despite inguinal hernia repair being a common procedure, postoperative complications are common. Immediate complications include bleeding or haematoma (usually from subcutaneous vessels but occasionally from accidental damage to the inferior epigastric or iliac vessels). Urinary retention may require catheterisation. Infusion of local anaesthetic may lead to femoral nerve blockade that will resolve over some hours. Within the first week, pain, bruising and swelling are com mon while seroma formation and wound infection are less frequent. Seroma is due to an inflammatory response to dissec tion, sutures or mesh and is more common if the peritoneal sac is left in situ . In most cases the fluid resolves spontaneously but may require aspiration. After laparoscopic surgery , a seroma may be misdiagnosed as an early recurrence. Despite the potential of bacterial contamination of a groin incision and use of mesh, routine use of antibiotics is not recommended in recent guidelines. In the longer term, hernia recurrence and chronic pain are the main concerns. No operation can be guaranteed to be recurrence free and good centres aim for a 5-year recurrence than suture repairs, but there is no di ff erence between the var - ious mesh repairs and no di ff erence between open and lapa - roscopic sur gery . There is very strong evidence that specialist hernia surgeons have lower recurrence rates and chronic pain rates whatever technique the y use. Chronic pain, defined as pain persisting for more than 3 /uni00A0 months after surgery , is common after all forms of surgery and possibly a ff ects as many as 20% of patients after groin her - nia repair. It is less common and less se vere after laparoscopic surgery . Di ff erent types of pain have been described but the most severe is neuralgic pain due to nerv e irritation. This may be the result of nerve injury at the time of operation or chronic irritation of nerves by suture material or mesh. Chronic pain has become one of the main areas of focus when comparing inguinal hernia outcomes. Patients at higher risk of chronic pain include females, the young, those with a painful hernia, those with a chronic pain syndrome, those with an exaggerated response to a heat stimulus and those with certain psychologi - cal tendencies. In addition, the handling of the nerves at open surgery is thought to be important. The variation of anatomy of the

three nerves should be considered during the dissec - tion, keeping nerves contained within their connective tissue surroundings w hen possible. In laparoscopic surgery , placing - sutures or staples/tacks into the retroperitoneal area should be avoided for fear of causing nerve injury . If a nerve requires to be sacrificed, this should be done as proximally as practicable and the nerve end buried within the muscle belly . le Rarely , damage to the testicular artery can lead to testicu - lar infarction, perhaps the most serious complication of ingui - nal hernia surgery in a young man. There is no evidence that hernia surgery has an e ff ect on male fertility despite extensive - study in this area. Summary box 64.10 Complications /uni25CF /uni25CF /uni25CF

Herniotomy Open suture repair Bassini Shouldice Desarda Maloney darn Open /f_l at mesh repair Lichtenstein (Open complex mesh repair – not recommended Mesh plugs Hernia systems) Open preperitoneal repair Transinguinal, Stoppa repair Laparoscopic/robot-assisted repair TEP TAPP Early: pain, bleeding/haematoma, urinary retention Medium: seroma, wound infection Late: chronic pain, testicular atrophy

Introduction

Introduction

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Investigations for hernia

Investigations for hernia

For most hernias, the diagnosis is made on clinical examina - tion. However, the patient may have symptoms suggesting a hernia but no hernia is found, or the patient may have a swelling suggestive of hernia but with clinical uncertainty . It is important to be certain that any symptoms described are due to a hernia and not to coexisting pathology , particularly when the major symptom is pain. Soft, reducible hernias are rarely painful. There may also be a requirement for more detailed information than can be found by examination alone. An ultra - sound scan may be helpful in cases of irreducible hernia when the di ff erential diagnosis includes a mass or fluid collection, enlarged lymph node or saphena varix or when the nature of the hernia content is in doubt. It is non-invasive, dynamic and low cost but highly operator dependent. Ultrasonog raphy may be useful in the early postoperative period to distinguish a haematoma or seroma from an early recurrence. - Computed tomography (CT) is helpful in complex ventral and incisional hernias, determining the number and size of muscle defects, identifying the content, giving some indication pathology such as ascites, occult malignancy and portal hyper tension. By showing the surrounding muscle layers CT helps planning abdominal wall reconstruction. Magnetic resonance imaging (MRI) can help in the diag nosis of sportsman’s (Gilmore’s) groin, w here pain is the pre senting feature and the surgeon needs to distinguish an occult hernia from an orthopaedic injury . Laparoscopy itself may be used. In incisional hernia, initial laparoscopy may determine w hether a laparoscopic approach is feasible or not. In inguinal hernia r epair by the transabdom inal route, initial laparoscopy can determine the presence of an occult contralateral hernia. However, laparoscopy will not identify intraparietal hernias such as lipomas of the spermatic cord and some epig astric and Spigelian hernias. Summary box 64.5 Investigations /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF

Plain radiograph – of little value Ultrasound scan – low cost, operator dependent CT scan – ventral and incisional hernia MRI – good in sportsman’s groin with pain Laparoscopy – useful to identify occult defects but not interstitial hernias

Learning objectives

Learning objectives

To know and understand: Basic anatomy of the abdominal wall and its weaknesses • Causes of abdominal hernia • Types of hernia and classi /f_i cations • Clinical history and examination /f_i ndings in hernia • Complications of abdominal hernia •

Lumbar hernia

Lumbar hernia

Most primary lumbar hernias occur through the inferior lumbar triangle of Petit, bounded below by the crest of the ilium, laterally by the external oblique muscle and medially by latissimus dorsi (Figure 64.23). Less commonly , the sac comes through the superior lumbar triangle, which is bounded by the twelfth rib above, medially by sacrospinalis and laterally by the posterior border of the internal oblique muscle (Figure 64.24). Primary lumbar hernias are rare, but may be Jean Louis Petit , 1674–1750, Director of the Academie de Chirurgie, Paris, France. - mimicked by incisional hernias arising through flank incision operations. Differential diagnosis A lumbar hernia must be distinguished from: /uni25CF a lipoma; /uni25CF an incisional hernia, such as from a renal operation; /uni25CF a cold (tuberculous) abscess pointing to this position; /uni25CF a pseudohernia due to local muscular paralysis. Lumbar pseudohernia can result from any interference with the nerve supply of the a ff ected muscles, the most common cause being injury to the subcostal nerve during a kidney operation. Treatment The natural history is for these hernias to increase in size and surgery is recommended. Lumbar hernias can be approached by open or laparoscopic surgery . The defects can be di ffi cult to close with sutures alone and mesh is recommended. The TAPP laparoscopic approach is gaining popularity for small hernias. With the patient in a semilateral position ports are inserted well away from the defect. The peritoneum is incised above the hernia and dissected back to expose the mus - cle defect. The content, often extraperitoneal fat, is reduced and a mesh fixed with ample overlap. The peritoneum can then be resutured or tacked back to cover the mesh. Lumbar incisional hernias can be approached in the same way; howev er, large ones can be very di ffi cult, especially if there is a component of neuropathic muscle atrophy causing a di ff use b ulge (pseudohernia).

Figure 64.23 Inferior lumbar hernia, which contained caecum, appendix and small bowel. Note the /f_i larial skin rash on the buttocks (courtesy of VJ Hart /f_i

eld, formerly of south-east Nigeria). Figure 64.24 (a) Left superior lumbar hernia, containing only extraper

itoneal fat. (b) Computed tomography scan of a similar but right-sided superior lumbar hernia. Emerging just below the twelfth rib, it is level with the right kidney and the right lobe of the liver.

Management principles

Management principles

An abdominal wall hernia does not necessarily require repair. A patient may request surgery for relief of symptoms or for cosmesis. The surgeon should recommend repair when compli cations are likely , the most worrying being bowel obstruction and strangulation. These are most likely in narrow-necked hernias; for this reason all femoral hernias should be repaired, as should symptomatic or irreducible hernias unless coexisting medical factors place the patient at very high risk. Increasing di ffi culty in reduction and increasing size are also indications for surgery . Surgery should be o ff ered to younger adult patients as symptoms and complications are likely over time. Summary box 64.6 Management /uni25CF /uni25CF /uni25CF /uni25CF In elderly patients a policy of ‘watchful waiting’ in asymp tomatic inguinal hernia appears generally safe, with an annual crossover to surgery because of symptoms developing of around 10%. A truss can be used to control a hernia but now adays few surgeons r ecommend this approach. Small umbilical Jerry Gilmore , 1942–2019, surgeon, London, UK, gave his name to a syndrome of chronic groin pain in professional footballers. - they cause few symptoms and usually contain fat or omentum with a very low risk of complications. Large incisional hernias, particularly recurrent, present a - major pr oblem. Surgical repair is a complex procedure with - significant risk of complications and later recurrence. When the neck is wide, the risk of strangulation is low . In obese and elderly patients, these risks may outweigh the benefits of sur - gery and it is common for surgeons to adopt a conservative approach. - A patient who presents with acute pain in a hernia, partic - ularly if it is irreducible, should be o ff ered urgent surger y . It may be reducible by taxis (gentle forceful reduction, perhaps requiring analgesia and/or sedation) and sometimes, after admission to hospital and adequate analgesia, the hernia will reduce as a result of muscle r elaxation. In either case, the like - lihood of similar episodes is very high and surgery should be recommended at the next available opportunity .

Not all hernias require surgical repair Small hernias can be more dangerous than large Pain, tenderness, skin changes and dif /f_i culty reducing imply high risk of strangulation Femoral hernia should always be repaired

Mesh in hernia repair

Mesh in hernia repair

The term ‘mesh’ refers to prosthetic material, either a net or a flat sheet, that is used to strengthen a hernia repair. Mesh can be used to: /uni25CF bridge a defect: the mesh is simply fixed over the defect as a tension-free patch; /uni25CF plug a defect: a plug of mesh is pushed into the defect; /uni25CF augment a repair: the defect is closed with sutures and the mesh added for reinforcement. Simple bridging of a hernia defect relies on a generous overlap of the mesh onto strong tissues around the defect in order to reduce the risk of recurrence. Mesh plug repairs hav been used in small defects, especially where tissue overlap is hard to achieve, but have been largely abandoned because col lagen deposition often produces a fibrous mass, a ‘meshoma’, that may cause chronic pain. Other complications include mesh migration, erosion into adjacent organs and fistula for mation. Primary closure of the hernia defect with the addition of mesh for reinforcement placed in a tension-free manner is currently reg arded as optimal. Suturing a mesh edge to edge into the defect (inlay), with no overlap, is not recommended. Mesh types Gross structure Net meshes are woven or knitted. Sheet meshes are not porous but may be perforated with multiple holes. Net meshes allow native tissue ingrowth between the strands so that the mesh becomes integrated into host tissues within a few months. Initial fixation of such mesh is by glue, sutures or tacks/staples, which may or may not be absorbable; in some cases, such as extraperitoneal repair of inguinal hernias, no mesh fixation may be required at all. ‘Sheet’ meshes do not allow host tissue ingrowth but eventually become encapsulated by host fibrous tissue. They always require strong, non-absorbable fixation to prevent mesh migration. Synthetic mesh Most meshes used today are synthetic polymers of polypropyl ene, polyester or polytetrafluoroethylene (PTFE), but there may be other chemical additives and meshes may have a composite structure such as those with anti-adhesive barriers. Meshes for hernia repair are generally non-absorbable and designed to pr ovoke tissue ingrowth that leads to the formation of a tissue barrier. Polypropylene is an inert, hydrophobic, monofilament material so does not generate an immune response and tends to resist bacterial ingrowth. Polyester mesh is similar but hydro philic, and is said to encourage microvascular ingrowth. PTFE meshes are flat sheets, quite inert and resistant to both tissue ingrowth and adhesion formation (Figure 64.6). - - e - - Weight and porosity Synthetic meshes are very strong; early meshes were much stronger than a human abdominal wall, so they are considered to be ‘over-engineered’. All meshes provoke a fibrous reaction. More dense or heavyweight meshes provoke a greater reaction, leading to collagen contraction and mesh sti ff ening, which is associated with impaired elasticity/mobility of the abdominal - wall, foreign body sensation and pain. The term ‘mesh shrinkage’ is often used to describe this the mesh itself progressive decrease in mesh size over time, but does not shrink; instead, it is simply the natural progressive contraction of the fibrous tissue that has grown into the mesh. Thus ‘mesh contracture’ is a more accurate term. This process can lead to hernia recurrence if the mesh no longer covers the defect. Meshes can contract in area by more than 50%. - Meshes with thinner strands and larger spaces (pores) between them are preferred because they have better tissue integration, less contracture, less foreign body reaction, more flexibility and improved comfort.

(b) Figure 64.6 (a) Polypropylene mesh in totally extraperitoneal inguinal hernia repair. The blue lines are added purely to help the surgeon orientate the mesh. (b) Polyester mesh in an epigastric hernia repair.

and favours a pore size of at least 1 /uni00A0 mm in all directions in order to promote collagen ingrowth that is not only strong but also elastic. Biological mesh So-called ‘biological meshes’ are sheets of sterilised, decellu larised, connective tissue derived from a variety of sources, including human or animal dermis, bovine pericardium or porcine intestinal submucosa. They provide a ‘sca ff old’ to encourage neovascular ingrowth, fibroblast infiltra tion and new collagen deposition. In theory host enzymes eventually break down the biological implant and replace it with normal host fibrous tissue. The rates of enzymatic degradation and collagen deposition vary between products and also depend on the local environment of the mesh. In the presence of infection, for example, some biological meshes break down more rapidly and weaken before remodelling can occur, leading to early hernia recurrence. Others are more resistant to breakdown, particularly those with chemical cross-linking between the fibrous strands. The choice of biological mesh depends on the clinical situation for which it is to be used. They are expensive, and their precise role in abdominal wall hernia repair has yet to be fully established. Absorbable meshes Synthetic absorbable meshes such as those made from poly glycolic acid, collagen or polyhydroxybutyrate may be used in temporary abdominal wall closure and for short-term buttress ing suture lines but are not recommended in hernia repair as they are absorbed too quickly and induce only minimal colla gen deposition. In recent years a number of synthetic, slowly absorbable meshes have been developed. These are designed to be g radually degraded by the body and replaced with strong native collagenous fibrosis in or der to create a lasting repair. The long-term outcomes of repairs using these meshes are as yet unknown. Most standard meshes induce fibrosis and, if placed within the peritoneal cavity , promote unwanted adhesions. A number of meshes have been designed for intraperitoneal use. Most of these have two very di ff erent surfaces, one being sticky and one slippery . Good adherence and host-tissue ingrowth is required - on the parietal (fascia/muscle/peritoneum) side of the mesh, but the opposite (bowel) side needs to prevent adhesions to the abdominal contents. Usually , one side of the mesh is coated by material that prevents adhesions, such as polycellulose, collagen or PTFE. However, none of these materials is 100% e ff ective at preventing adhesions and consequently intraperito - neal placement of mesh is associated with bowel obstruction, mesh erosion and fistulation (Figure 64.7). Surgeons now try to avoid intraperitoneal mesh placement whenever possible. Summary box 64.7 Mesh characteristics /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF - - Positioning the mesh The strength of a mesh repair depends on host-tissue - ingrowth. Meshes should be laid in a tension-free manner on a firm, well-vascularised tissue bed with generous overlap of the hernia zone. The mesh can be placed: /uni25CF on top of the muscle/fascia in the subcutaneous space (onlay); /uni25CF within the defect (inlay); /uni25CF immediately deep to the muscle layers in the abdominal wall (sublay); /uni25CF extraperitoneally; /uni25CF intraperitoneally . Each of these planes may be used with both open and lapa - roscopic techniques (Figure 64.8). Onlay meshes may become

Figure 64.7 Adhesions to intraperitoneal mesh causing bowel obstruction. Net (woven or knitted) or sheet Synthetic or biological – mainly synthetic Large pore, small pore – large pore causes less /f_i brosis and pain If for intraperitoneal use – non-adhesive surface on one side Non-absorbable or absorbable – mainly non-absorbable Anterior rectus sheath Subcutaneous space Linea alba Onlay space Rectus abdominis muscles Posterior Sublay spaces re ctus sheath Retromuscular

Extraperitoneal space space Figure 64.8 Diagrammatic representation of the various layers into which meshes are placed in ventral hernia repair.

of skin flaps to allow wide overlap can lead to skin ischaemia and/or seroma formation. Inlay meshes are not recommended as they are e ff ectively no more than a suture repair at each mesh–tissue interface. Meshes placed deep to the abdominal wall muscle layers have a mechanical advantage over onlay positioning as the abdominal pressure helps to keep the mesh in place; both sublay and extraperitoneal mesh placement techniques are generally preferred. Intraperitoneal mesh is associated with complications described earlier and many sur geons now try to avoid this. Limitations to the use of mesh The presence of infection limits the use of mesh. If a mesh becomes infected then it usually needs to be removed, although some infected situations can be salvaged using a combina tion of debridement, appropriate antibiotics and modern vacuum-assisted dressings. Meshes are expensive, especially biological, biodegradable or those for intraperitoneal use. Price or novelty is not always an indicator of quality or safety and a simple, non-absorbable, large-pore synthetic mesh is nowadays seen as the safest implant.

Neoplasms of the abdominal wall

Neoplasms of the abdominal wall

As the abdominal wall is composed of muscle, fascia and bone, benign and malignant tumours can arise from each, although these are rare. This is usually considered by pathologists to be a hamartoma and is more common in women. Some, however, believe it to be a fibroma and possibly the result of repeated trauma. Desmoids also occur in familial adenomatous polyposis. Histologically , they contain plasmodial cell masses resembling giant cells. They undergo central myxomatous change. Surgical excision with a wide margin is required to prevent local recurrence, which is a frequent problem.

Parastomal hernia

Parastomal hernia

When surgeons create a stoma, such as a colostomy or ileostomy , they are e ff ectively creating a hernia by bringing bowel out through the abdominal wall. The muscle defect created tends to increase in size over time and can ultimately lead to massive herniation around the stoma. The rate of parastomal hernia is over 50%. For patients, it is very di ffi cult to manage a stoma that is lying adjacent to or atop a large hernia. The stoma may intermittently obstruct and appliance bags fit poorly leading to leakage. The ideal surgical solution for the patient is to rejoin the bowel and remove the stoma altogether, but this is not always possible. The stoma may be re-sited but parastomal hernia will occur at the same ra te at the new location, so it is no longer recommended. Numerous techniques have been described to repair parastomal hernia but failure rates remain high. Mesh repairs are associated with a lower recurrence rate but also with occasional bowel erosion and infection. Meshes are best placed in the retromuscular space but intraperitoneal mesh placement is also popular (Sugarbaker). Laparoscopic repair is also possible, using a modified Sugarbaker technique or by using a large mesh with a central hole (‘keyhole’ technique). Recent reports have described the use of prophylactic mesh insertion at the time of formation of the stoma. A large-pore polypropylene mesh is inserted in the retromuscular space so that the bowel passes through a hole in the centre of the mesh. Using this technique, parastomal hernia rates may be reduced significantly .

Rare external hernias

Rare external hernias

Perineal hernia Primary perineal hernias are very rare. The majority of perineal hernias encountered are some form of incisional hernia arising after previous pelvic floor surgery or trauma. This type of hernia includes: Paul H Sugarbaker , contemporary , surgeon, Washington Cancer Institute, Washington, DC, USA.). Only - /uni25CF postoperative hernia through a perineal scar, typically after excision of the rectum; /uni25CF median sliding perineal hernia, which is a complete pro - lapse of the rectum; /uni25CF anterolateral perineal hernia, which occurs in women and presents as a swelling of the labium majus; /uni25CF posterolateral perineal hernia, which passes through the levator ani to enter the ischiorectal fossa. A combined abdominoperineal operation is generally employed. The hernia is exposed by an incision directly over it. The sac is opened and its contents ar e reduced. The sac is cleared from surrounding structures and the wound closed. With the patient in semi-Trendelenburg position, either lap - aroscopically or at open surgery , the abdomen is opened and the mouth of the sac exposed. The sac is inverted, ligated and excised, and the pelvic floor repaired by muscle apposition and, if indicated, buttr essing of the repair with prosthetic mesh or tissue flap with the involvement of plastic surgeons. Obturator hernia Obturator hernia, which passes through the obturator canal, occurs six times more frequently in women than in men. Most patients are older than 60 years. Any swelling is liable to be overlooked because it is covered by pectineus. It seldom causes a palpable lump but, if the limb is flexed, abducted and rotated outwards, the hernia sometimes becomes apparent. The leg is usually kept in a semiflexed position and movement increases the pain. In more than 50% of cases of strangulated obturator hernia, pain is referred along the obturator nerve by its genic - ulate branch to the knee. On vaginal or rectal examination the hernia can sometimes be felt as a tender swelling in the region of the obturator foramen. These hernias are most frequently diagnosed on a CT scan, usually requested to investigate pelvic pain or bowel

Figure 64.27 Abdominal computed tomography scan showing mesh bulge (pseudo-recurrence) 2 years after a laparoscopic repair of inci

sional hernia. The two white dots are metal tacks still in place, /f_i xing the mesh to the underside of the abdominal wall.

presentation. Occasionally , asymptomatic obturator hernia defects are noted at laparoscopy on the lateral pelvic wall, under the pubic arch. Surgery is indicated. The diagnosis is rarely made preoperatively and so it is often approached through a laparotomy incision. The full Trendelenburg position is adopted. The constricting agent is the obturator fascia, which can be stretched by inserting the operator’s index finger, or suitable forceps, through the gap in the fascia. The content is reduced. If incision of the fascia is required, it is made parallel to the obturator vessels and nerve. The contents of the sac are dealt with in a standard manner. The defect cannot simply be closed because one margin is bone and the obturator nerve and vessels run through it. It is best repaired using a flat mesh laid over the defect in the extraperitoneal plane. In the absence of mesh or in an infected field, the broad ligament can be sutured over the defect or used as a plug. Laparoscopic TAPP repair may also be performed again using a mesh. As with other extraperitoneal mesh repairs, mesh fixation is often not required. Alternatively , to avoid nerve injury , tissue g lue can be used to fix a mesh over the defect. Note that it can be very di ffi cult to reduce an incarcerated hernia lap aroscopically and it is easy to damage the bowel with traction. Gluteal and sciatic hernias Both of these hernias are very rare. A gluteal hernia passes through the greater sciatic foramen, either above or below piriformis. A sciatic hernia passes through the lesser sciatic foramen. Di ff erential diagnosis must be made between these conditions and: /uni25CF a lipoma or other soft-tissue tumour beneath gluteus max imus; /uni25CF a tuberculous abscess; /uni25CF a gluteal aneurysm. All doubtful swellings in this situation can be characterised with CT scanning but, if in doubt, they should be explored by operation. After reduction of the hernia contents, complete closure of the defect may not be possible because of the unyielding bony and ligamentous margins of the hernia orifices. Bridging mesh may be useful but should not be placed directly on top of major nerves or vessels in the vicinity for fear of causing local irritation and neuralgic pain.

SPECIFIC HERNIA TYPES

SPECIFIC HERNIA TYPES

Hernia sites are shown in Figure 64.9 .

Spigelian hernia

Spigelian hernia

These hernias are uncommon although probably underdiagnosed. They a ff ect men and women equally and are most common in elderly people. They have also been described in infants, reflecting incomplete di ff erentiation of through a defect in the aponeurosis of transversus abdominis (Spigelian fascia) and may advance through the internal oblique to spread out deep to the external oblique aponeurosis. Most Spigelian her nias appear below the level of the umbilicus near the edge of the rectus sheath, but they can be found anywhere along the Spigelian line (Figure 64.22). There is a common misconception that they protrude below the arcuate line as a result of deficiency of the posterior rectus sheath at that level, but in fact the defect is almost always above the arcuate line. In young patients they usually contain extraperitoneal fat only , but in older patients there is often a peritoneal sac and they can become very large. Clinical features Y oung patients usually present with intermittent pain, due to pinching of the fat, similar to an epigastric hernia. A lump may or may not be palpable because the fatty hernia is small and the overlying external oblique is intact. Older patients generally present with a reducible swelling at the edge of the rectus sheath and may have symptoms of intermittent obstruction. The diagnosis should be suspected because of the location of the symptoms and is confirmed by CT . Ultrasonography has the advantage that it can be performed in the upright patient because no defect may be visible with the patient lying down. Treatment Surgery is recommended because the narrow and fibrous neck predisposes to strangulation. Surgery can be open or laparo - scopic. At open surgery a skin crease is made over the hernia, but no abnormality will be seen until the external oblique is opened. The sac and contents are dealt with and the small defect in the Spigelian fascia is repaired by suture or mesh laid deep to the external oblique aponeurosis . The plane of the mesh can be extended medially into the posterior rectus sheath if required. The external oblique aponeurosis is closed over the mesh. -

Figure 64.22 Spigelian hernia in the left iliac fossa. Note the scar from a previous left inguinal hernia repair.

patients with a hernia containing only extraperitoneal fat, no hernia will be seen from within the peritoneum. In such cases, the peritoneum can be incised and the extraperitoneal plane explored for the small defect, which can then be closed by either suture or mesh. When an intraperitoneal sac is present, laparo scopic repair can be performed using either the intraperitoneal onlay of mesh (IPOM) or, more commonly now because of the risks of intraperitoneal mesh, the TAPP technique. Summary box 64.15 Spigelian hernia /uni25CF /uni25CF /uni25CF

Rare Often misdiagnosed High risk of complications

Sportsman’s groin

Sportsman’s groin

This specific entity is well described and presents with severe - pain in the groin area, often extending into the upper thigh and the scrotum in men. It is seen in both men and women - who play contact sports such as football and rugby . The pain can be debilitating and prevent the patient from exercising. On examination there may be some tenderness in the region of the inguinal canal, over the pubic tubercle and over the insertion of the thigh adductor muscles. Tightening the hip flexor or thigh adductor muscles against resistance may reproduce the pain. Usually no hernia is present. In most cases, the pain is due to adductor strain or pubic symphysis diastasis. However, some believe that it can be due to muscle tearing (Gilmore’s groin) or stretc hing of the should be excluded, such as hip, pelvic or lumbar spinal disease and bladder/prostate problems. MRI is most likely to detect a musculoligamentous problem but ultrasonography or laparoscopy may be used to exclude an underlying hernia. Hernia surgery should be a last resort and the patient should be warned of a significant risk of failure to relieve the pain. The same is true for patients with groin pain and no obvi ous hernia, even if a small hernia is noted on groin ultrasound.

Surgical approaches to hernia

Surgical approaches to hernia

In general, modern surgical repairs follow these principles: /uni25CF Reduction of the hernia contents into the abdominal cav - ity with excision of any non-viable tissue and bowel repair if necessary . /uni25CF Excision and closure of the peritoneal sac if present (though small sacs may be reduced intact). /uni25CF Closure of the hernia defect if possible. /uni25CF Reinforcement of the abdominal wall with mesh (though non-mesh repairs are an option). /uni25CF If necessary , excise redundant skin to improve cosmetic - outcome. Reduction of hernia content is essential for a successful repair. Excision and closure of the peritoneal sac is ideal but not essential. During intraperitoneal onlay mesh laparoscopic re pair of incisional hernia, for example, surgeons will often leave the sac in situ after reducing the hernia contents, and simply fix a mesh over the defect. Leaving the peritoneal sac in situ risks the accumulation of serous fluid formation within the sac (seroma). This can arise after all forms of hernia repair. In open repair of lateral (indirect) inguinal hernia, most sur - geons excise the peritoneal sac but small sacs can be simply pushed back through the deep inguinal ring, which is said to reduce postoperative pain. Similarly , in laparoscopic repair of inguinal hernias, surgeons simply pull the sac back into the abdominal ca vity from within and do not excise it. Closure of the hernial defect is ideal but may not be possible when the defect is large, the surrounding tissues are rigid (suc h as the femoral canal) or structures traversing the defect must be retained (such as the spermatic cord traversing the deep inguinal ring). Plastic surgical techniques have been developed to ‘borrow’ tissue from elsewhere in order to cover large muscle - defects, but usually at the cost of leaving a weak area elsewhere. The repair of large and complex hernias using a variety of such specialised techniques has led to some surgeons declaring - a specialist hernia interest. recurrence rate. Additional reinforcement of the repair with a non-absorbable mesh reduces but does not prevent recur rence. With improved techniques and new meshes it is hoped that recurrence after surgery will fall further. Mesh repair has become so important in hernia sur gery that some understand ing of mesh technology is essential for the modern surgeon.

Synergistic gangrene

Synergistic gangrene

This rare condition is due to the synergistic action of non-haemolytic streptococci and staphylococci causing rapid tissue necrosis and overwhelming systemic infection (Figure 64.29). It requires immediate administration of high- dose, broad-spectrum antibiotics in combination with early debridement of any non-viable tissue. Hyperbaric oxygen therapy has been advocated. Other forms of severe abdominal wall infections occur, gen erally known as necrotising fasciitis (also known as Fournier’s gangrene). All of these conditions have a high associated mor bidity and mortality . They occur more frequently in diabetic, debilitated or immunocompromised patients but can occa sionally occur in healthy patients. The necrosis spreads rap idly through the subcutaneous layer s of the abdominal wall and may extend into the chest, axilla, thigh and perineum. Necrotising fasciitis is characterised by systemic features of septic shock, a high temperature, a foul smell and occasionally crepitus in the skin, indicating gas-pr oducing bacteria. Prompt diagnosis and aggressive surgical debridement within hours of onset are the keys to success, with repeated debridements under anaesthesia over several days until all of the necrotic and infected tissues have been cleared. If the patient survives, extensive skin grafting is usually required. Patients with lymphatic oedema of the abdominal wall may present with redness and tenderness, suspicious for necro tising fasciitis. This important diagnosis needs to be excluded, but cellulitis secondary to lymphatic stasis is more likely to be the cause.

THE ABDOMINAL WALL Basic anatomy and function rela

THE ABDOMINAL WALL Basic anatomy and function related to pathology

The abdominal wall is a complex structure composed primar ily of muscle, bone and fascia. Its major function is to protect the enclosed organs but it must also enable mobility and be able to flex, extend, rotate and vary its capacity . Flexibility requires elasticity and str etch, which compromise abdominal wall strength. The roof of the abdomen is formed by the diaphragm separating the thoracic cavity above, with negative pressure, from the abdomen below , with positive pressur e. Weakness of the diaphragm can lead to much of the bowel being drawn into the chest down this pressure gradient. The bony pelvis forms the floor of the cavity but a muscular central portion, the perineum, may also weaken and allow rectum, bladder and gynaecological organs to bulge downwards, a condition called prolapse. The overall design of the abdominal muscles is best seen on transverse section through the mid-abdomen (Figure 64.1 Posteriorly the muscles are strong, further supported by the ver tebral column, ribs and pelvis. Two regions called the posterior triangles represent areas of weakness, which can lead to rar lumbar hernias. Laterally there are three thin muscle layers, the fibres of which criss-cross for strength and flexibility . Anteriorly the two powerful rectus abdominis muscles extend vertically from ribs to pelvis. Herniation through these strong muscles does not occur naturally but their central join, the linea alba, is an area of weakness that may r esult in epi gastric or umbilical herniation. Divarication of the recti is the condition where the linea alba stretches laterally as the two rectus muscles separate. It occurs predominantly in the upper abdomen in middle-aged, overweight men (Figur e 64.2 also as a result of pregnancy in women, where it is primarily - below the umbilicus. Divarication is not a hernia and does not require treatment, although some surgeons do o ff er repair for). purely cosmetic reasons. -

Non-surgical and surgical management of hernia, • including mesh Complications of hernia surgery • Other abdominal wall

conditions • Rectus abdomini s L inea alba Transversalis fascia External oblique Extraperitoneal fascia Internal oblique Parietal peritoneum Transversus abdominis Psoas Latissimus major dorsi Erector Quadratus spinae Abdominal lumborum aorta Figure 64.1 A cross-section of the mid-abdomen showing the mus

cular anatomy.

Traumatic hernia

Traumatic hernia

These hernias arise through non-anatomical defects caused by injury . They can be classified into three types: 1 Hernias through abdominal stab wound sites. These are e ff ectively incisional hernias. 2 Hernias protruding through splits or tears in the abdomi - nal muscles after blunt trauma (Figure 64.4). 3 Abdominal bulging secondary to muscle atrophy that vation. Akin to the lumbar pseudohernia seen after open nephrectomy , these can also arise after rib fractures with damage to the intercostal nerves. Clinical features Traumatic hernias present as any other hernia. The key to the aetiology is in the history and the non-anatomical location of the hernia. Treatment Surgery may be justified if the hernia is su ffi ciently symptom atic or if investigations suggest a narrow neck and hence a risk of obstruction or strangulation. CT scanning is useful to define the tissue layers that have been damaged in order to plan repair. Stab wound traumatic hernias are straightforwar d to repair. Di ff use abdominal bulges are more di ffi cult to correct and require some form of plication of the stretched musculofascial layer with mesh reinforcement to prevent further bulging in the future. Some bulging may persist, however.

UMBILICAL CONDITIONS IN THE ADUL T

UMBILICAL CONDITIONS IN THE ADUL T

Chronic infection in the umbilical area is common, particularly in patients with poor hygiene due to a plug of keratin causing chronic irritation. It is often encountered during elective Friedrich Trendelenburg , 1844–1924, Professor of Surgery , successively at Rostock (1875–1882), Bonn (1882–1895) and Leipzig (1895–1911), Germany . The Trendelenburg position was first described in 1885. Johann Frederick Meckel (the younger), 1781–1833, Professor of Anatomy and Surgery , Halle, Germany , described his diverticulum in 1809 although Littre , 1658–1726, surgeon and lecturer in anatomy , Paris, France, described Meckel's diverticulum in a hernial sac in 1700, 81 years before Meckel was born. Sister Mary Joseph (nee Julia Dempsey) , Nursing Superintendent, St Mary's Hospital, Rochester, MN, USA, observed that patients with terminal cancer sometimes developed a red papular lesion in the umbilicus. She and William Mayo published this observation in 1928; however, it was Hamilton Bailey who coined the term ' Sister Mary Joseph's nodule ' in 1949. surgery and may complicate the insertion of a laparoscope port at the umbilicus. Occasionally , a rapid-onset, superficial cellulitis occurs even after minor surgery in this region. It is - normally due to a streptococcal infection and is treated with appropriate antibiotics. Pre-existing infection should be treated before surgery where possible. A chronic sinus may arise following umbilical hernia repair owing to infection of a mesh or non-absorbable suture material used. Antibiotics may help but usually the mesh or suture will need to be removed with a risk of recurrence of the her nia. In utero the umbilicus is connected to the gut by the vitellointestinal duct. In most patients the duct becomes totally - obliterated. The bowel end of the duct may persist as Meckel's diverticulum. More rarely , the umbilical end persists, leading to chronic faeculent discharge. Rarely endometriosis can present with cyclical bleeding from the umbilicus. The urachus is a connection between the urinary bladder and umbilicus. It usually involutes but may present in later life as a r esult of increased pressure in the bladder usually due to prostatic hypertrophy . The cause of obstruction should be dealt with initially , but if the problem persists then surgical excision of the patent urachus might be considered. If tumour presents at the umbilicus it is most probably due to spread from the internal organs along internal ligaments, e.g. from the liver along the falciform ligament. A malignant mass at the umbilicus is called a Sister J oseph's nodule. It usually indicates very advanced malignant disease and surgery probably has little to o ff er (Figure 64.28). Malignancy at the umbilicus is rar e; however, primary squamous carcinoma may occur and malignancy may develop in a urachal remnant. Local excision is required. Alexis

Figure 64.28 Secondary nodule at the umbilicus: Sister Joseph's nodule.

Umbilical hernia

Umbilical hernia

The umbilical defect is present at birth but closes as the stump of the umbilical cord heals, usually within a week of birth. This process may be delayed, leading to the development of herniation in the neonatal period. The umbilical ring may also stretch and reopen in adult life. This common condition occurs in up to 10% of infants, with a higher incidence in premature babies. The hernia appears within a few weeks of birth and is often symptomless, but increases in size on crying and assumes a classic conical shape. Sexes are equally a ff ected but the incidence in black infants is up to eight times higher than in white. Obstruction and/or strangulation is extremely uncommon below the age of 3 years. Treatment Conservative treatment is indicated under the age of 2 years when the hernia is symptomless. Parental reassurance is all that is necessary as 95% will resolve spontaneously . If the hernia persists beyond the age of 2 years surgical repair is indicated. Surgery A small, curved incision is made immediately below the umbi licus. The neck of the sac is defined, opened and any contents are returned to the peritoneal cavity . The sac is closed and redundant sac excised. The defect in the linea alba is closed with interrupted sutures of slowly absorbable material. Summary box 64.14 Umbilical hernia in children /uni25CF /uni25CF Umbilical hernia in adults Conditions that cause stretching and thinning of the midline raphe (linea alba), such as pregnancy , obesity and liver disease with cirrhosis and ascites, predispose to reopening of the umbilical defect. In adults, the defect can be not only through the umbilicus but also in the median raphe (linea alba) imme diately adjacent to (most often above) the true umbilicus. The latter are commonly called ‘paraumbilical’ hernias; however, under current guidelines, any hernia in the immediate vicinity of the umbilicus can now be called ‘umbilical’. Small umbilical hernias often contain e xtraperitoneal fat or omentum. Larger hernias can contain small or large bowel. Because the hernia neck is relatively narrow in relation to the size of the sac, they are prone to become irreducible, obstructed and strangulated. Clinical features Umbilical hernias are commonly seen in overweight men with a thinned and attenuated midline raphe or in postpartum women with a weakened abdominal wall. The bulge is typi cally slightly to one side of the umbilical depression, creating a crescent-shaped appearance to the umbilicus (Figure 64.18 Women are a ff ected more than men. Most patients complain of pain due to tissue tension or symptoms of intermittent bow obstruction. In large hernias, the overlying skin may become William James Mayo , 1861–1939, surgeon, the Mayo Clinic, Rochester, MN, USA, described this operation in 1901. He and his brother Mayo (1865–1939) joined their father’s (William Worrall Mayo) private practice in Rochester. This practice became the Mayo Clinic. - very thin; while overlying skin irritation and ulceration may be seen, spontaneous rupture is extremely rare. Treatment As a result of the high risk of strangulation, surgery should be advised in cases where the hernia contains bowel. Small hernias may be left alone if they are asymptomatic, but they may enlarge and require surgery at a later date. Surgery may be performed open or laparoscopically . Open umbilical hernia repair V ery small defects less than 1 /uni00A0 cm in size may be closed with a simple suture repair as long as the fascia is not closed under tension. An alternative technique utilises a darn suture where a non-absorbable, monofilament suture is criss-crossed across the defect and anchored firmly to the

fascia all around. For defects up to 2 /uni00A0 cm in diameter a transverse incision is made and the hernia sac dissected, opened and its contents reduced. The peritoneum is closed. The defect in the linea alba is extended in a transverse direction and the fascial edges are closed in an overlapping style with the superior flap on top (‘waistcoat - over trousers’) (Mayo). Non-absorbable sutures are used and the skin is closed in a routine manner, but redundant skin may need to be excised to achieve a better cosmetic result. The Mayo repair remains popular for defects up to 2 /uni00A0 cm, but the larger the defect the more tissue tension. Current evidence advises the use of mesh even in small defects, and certainly for all defects larger than 2 /uni00A0 cm, owing to the high likelihood of recurrence (Figure 64.19). Special circumstances Women often develop umbilical hernias during pregnancy and may present in the early postpartum period. There is often a degree of rectus divarication. They should be advised to exer - - cise specifically for this condition, lose weight and increase their abdominal muscle tone before operation should be considered). as these may resolve completely within a few months. It is strongly recommended to avoid surgery for umbilical hernia el repair before or during pregnancy . Charles Horace

Common in infants and most resolve spontaneously Rarely strangulate Figure 64.18 A small adult umbilical hernia.

Patients with liver cirrhosis have extremely high mortality and morbidity after primary ventral hernia repair, especially with Child’s B and C disease. Patient selection is very import ant, with appropriate hepatology support if surgery is contem plated. Fascial repair is best done with fine continuous sutures to minimise the risk of post-operative ascites leakage. Laparoscopic umbilical hernia repair A camera port and two working ports are placed laterally on the abdominal wall, well away from the defect. The contents of the hernia are reduced by traction and external pressure. The falciform ligament above and the median umbilical fold below may need to be taken down to create a smooth, firm surface for mesh placement (Figure 64.20). A disc of non-adherent mesh, designed for intraperitoneal use, is introduced and positioned on the undersurface of the abdominal wall, centred on the defect. It is then fixed to the peritoneum and posterior rectus sheaths using staples, tacks or sutures. This is a simple and secure repair, which achieves generous overlap without surgi cal damage to umbilicus and surrounding fascia. However, it requires specialised equipment and expensive tissue-separating mesh and brings with it all the potential problems of intraperi toneal mesh, including bowel adhesion, erosion and fistulation. Intraperitoneal meshes can cause severe pain lasting f or 24–48 hours after surgery , which can mimic peritonitis. The tacks or sutures used to fix the mesh can be a source of chronic or long-lasting pain. Ho wever, this approach is associated with fewer wound complications than open repair and allows large pieces of mesh to be used, so should be considered for obese patients, those with concomitant rectus divarication and those with multiple ventral hernia defects. Emergency repair of umbilical hernia Incarceration, bowel obstruction and strangulation are frequent because of the narrow neck and the fibrous edge of the defect Charles Gardner Child , 1908–1991, Chair of the Departments of Surgery at Cornell University , Ithaca, NY (1947–1953), Tufts University , Boston, MA (1953–1974), and the University of Michigan, Ann Arbor, MI (1978–1983), USA. in the midline raphe. Delay to surgery can lead to gangrene of the omentum or bowel. Large hernias are often multiloculated - and there may be strangulated bowel in one component when - other areas are clinically soft and a non-tender hernia. Multi - loculated hernias are however more common as incisional then primary ventral. Most emergency repairs are performed by open surgery . In the presence of established strangula tion mesh should be avoided

as the risk of infection is too high; the focus of the operation should be to deal with the strangulated tissue, so a suture repair is advised with a more definite repair to be performed at a later date if necessary .

Figure 64.19 A massive umbilical hernia, intraoperative view. Figure 64.20 Umbilical defect: laparoscopic view, before the bulky falciform ligament has been taken down to create a smoother surface for mesh placement.

VENTRAL HERNIA

VENTRAL HERNIA

This term refers to hernias of the anterior abdominal wall. Inguinal and femoral hernias are not included, however lumbar hernia is included despite being dorsolateral. The European Hernia Society classification (2009) distinguished primary ventral from incisional hernia but did not include parastomal hernia, which is included in this section. Summary box 64.13 Primary ventral hernias ‘Secondary’ ventral /uni25CF hernias /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF -

Umbilical Epigastric Incisional Spigelian Parastomal Lumbar Traumatic