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Hernias

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The authors presented modern methods for the research and treatment of hernias.

The textbook "Hernias" is developed on the discipline "Hospital surgery" in accordance with the requirements of the FSEI HPE, is intended for students of medical Universities and faculties, trained in the specialty 31.05.01 General Medicine.

The manual is developed in accordance with the requirements of the Federal state educational institution, is intended for senior students of medical Universities and faculties enrolled in the specialty 31.05.01 Medical business.

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Contests:

Internal hernias

Internal hernias are a rare but important cause of intestinal obstruction (0.2–0.9% of all cases) because they are often undiagnosed before emergency laparotomy; not uncommonly, they lead to infarction necessitating bowel resection (of varying extent), and this contributes to the high morbidity and mortality rates. Internal hernias are often classified as developmental (congenital) or acquired. In the congenital types, except in instances of gross mid-gut malrotation, the presentation occurs over a wide age range, but the majority of patients are in the fifth decade. By definition, developmental internal hernias cause obstructive symptoms in the absence of any previous surgical intervention.

Acquired internal hernias occur in patients who have undergone abdominal surgery, most commonly of the upper gastrointestinal tract, e.g. after gastric bypass surgery for morbid obesity or following Roux-en-Y diversion (especially if this is antecolic). They are well documented after right hemicolectomy (both open and laparoscopic), after laparoscopic extraperitoneal hernia repair (through unrecognized defects in the peritoneum), vascular operations, e.g. intraperitoneal femorofemoral bypass grafting, and after pelvic lymphadenectomy when loops of small intestinal become trapped beneath one or other iliac arteries. A particular group of acquired internal hernias occurs, albeit rarely, in relation to transplantation of the kidneys and liver. These are sometimes referred to as

paratransplantation internal hernias and can have serious consequences. Following renal transplantation the internal hernia is caused by entrapment of bowel or omentum through a defect in the peritoneum covering the transplanted kidney. Internal herniation with volvulus of the small intestine is a potentially fatal complication after liver transplantation. The herniation occurs around the Roux-en-Y loop used for the biliary reconstruction. The mortality of this condition (from graft or bowel necrosis) is 50%. In view of the high mortality of peritonitis in transplant patients, early surgical treatment is indicated in all these patients who develop intestinal obstruction after surgery.

Pathological anatomy

This provides a more useful classification and better understanding of the underlying pathology. Thus, internal hernias fall into two groups: true hernias and internal prolapses.

True hernias

These have a hernial sac. The orifice involved may be:

• normal, e.g. Winslow's foramen

• paranormal, i.e. peritoneal fossae – paraduodenal, ileocaecal, interand mesosigmoidal, paracolic, supravesical.

Internal prolapse

These do not have a sac. The prolapse may occur through:

• an abnormal orifice in a mesentery or an omentum (transmesenteric, transmesocolonic, transomental)

• an anomalous orifice – congenital defects in a ligament (falciform, gastrosplenic, broad ligaments) or a mesentery (mesentery of Meckel's diverticulum)

• surgical defects or entrapment by surgically altered internal anatomy, e.g. anastomoses, stomas.

Paraduodenal hernias (right and left in close relation to the fourth part) constitute the commonest true internal hernias and account for 30–53% of cases. They are caused by incomplete rotation of the mid-gut such that the small intestine

becomes entrapped behind the colon and mesocolon. The most valuable investigation for paraduodenal hernia is a small bowel enema, which usually shows clumping of the small intestine with incomplete rotation of the caecum and ascending colon. Other true internal hernias worthy of specific mention are hernia through the foramen of Winslow (epiploic foramen) and paracaecal hernia. Herniation through the epiploic foramen accounts for 8% of internal hernias. Most commonly the caecum and ascending colon are involved, and, in some cases, re-enter the main peritoneal cavity through an additional congenital defect of the lesser omentum. In patients with chronic symptoms, a barium enema may be diagnostic because it shows the caecum lying posterior and medial to the stomach. Paracaecal hernia presents with both subacute and acute low small bowel obstruction.

Internal hernia (prolapse) arises as a complication of gastrointestinal surgery in 0.3–1.0% of cases. The majority occur after upper gastrointestinal surgery (Billroth II gastrectomy with antecolic gastrojejunostomy and enteroanastomosis, Rouxen-Y reconstruction or diversion, etc.) and less commonly after colon surgery (right hemicolectomy, colostomy). Presentation with intestinal obstruction may occur early or several years after (up to 25) the intervention. Malrotation of the mid-gut usually presents acutely in the neonatal period but affected individuals may not develop symptoms until much later (2–23 years). The most common symptoms include vomiting (68%), colicky abdominal pain (55%) and diarrhoea (9%). The diagnosis is made by barium meal and follow-through, or, preferably, a small bowel enema. A significant number of these late presenting patients (40%) are found to have either a volvulus or internal hernia at operation.

Clinical features

The reported incidence of all internal hernias varies between 0.2% and 0.9% of autopsies, 0.3–2.0% of parietal hernias and 0.01% of laparotomies. Overall the condition is more common in males (male to female ratio 3:2). The age distribution varies widely but peak symptomatic incidence is in the fifth decade (mean age of 45–50 years). Some (10–15%) are discovered as an incidental finding during laparotomy for another condition. Most commonly, these are paraduodenal hernias. The symptoms of internal hernia irrespective of type are entirely non-specific and very few cases are diagnosed in the elective situation, with the vast majority (90%) presenting with acute intestinal obstruction, which is often strangulating with evidence of established peritonitis caused by infarcted

bowel (30–60%). In a minority of patients recurrent attacks of colicky pain and abdominal distension are followed by imaging tests (contrast radiology, CT scanning, abdominal ultrasound), and these may provide a preoperative diagnosis. More rarely still, a mass is found on physical examination of the abdomen in a patient with subacute obstructive symptoms. Acute intestinal obstruction with strangulation occurring in a patient without an external hernia or previous abdominal surgical intervention should suggest the possibility of a congenital internal hernia, especially if the patient gives a history of chronic intermittent abdominal pain and a palpable abdominal mass is found on examination. Treatment The essence of good management is early intervention (laparotomy) as this is the only means of preventing necrosis of the bowel. The surgical treatment consists of reduction of the hernial contents, resection of the necrosed bowel, usually with primary anastomosis, and correction of the anatomical defect that caused the herniation in the first instance. The operative reduction of the hernia and the surgical repair must be conducted with extreme care to avoid injury to the major mesenteric vessels juxtaposed to or surrounding the hernial orifice. The hospital stay, morbidity and mortality (up to 30% in large series) depend on the presence/absence of bowel infarction. In the rare instances when an internal hernia is discovered after investigation of chronic symptoms, elective surgery is needed because of the pathogenic potential of this condition.

Diaphragmatic hernias

Strictly speaking diaphragmatic hernias should include hiatal hernias but, by convention, these are included with gastrooesophageal reflux disease (see Chapter 22). Diaphragmatic hernias excluding this category fall into three groups:

1 congenital diaphragmatic hernia

2 traumatic diaphragmatic hernia – secondary to undiagnosed rupture of the diaphragm

3 herniations through congenital small defects – through the foramen of Morgagni (anterior) and foramen of Bochdalek (posterior).

Congenital diaphragmatic hernia

This is a serious congenital anomaly, which is always associated with pulmonary hypoplasia and other abnormalities (35%), particularly of the central nervous system and the skeleton. The condition is diagnosed in the majority (80%) by

prenatal ultrasound, when the question of termination arises. With emergency neonatal surgery (reconstruction of the diaphragm with prosthetic mesh) and extracorporeal membrane oxygenation for cases with severe pulmonary impairment, the survival of infants born alive with congenital diaphragmatic hernia averages only 60% and more than half (60%) of these have persistent disorders that include respiratory problems, developmental delay, poor growth and gastro-oesophageal reflux. Despite advances in neonatology there is still a high mortality and morbidity associated with congenital diaphragmatic hernia.

Rupture of the diaphragm and traumatic diaphragmatic hernia

The primary event is rupture of the diaphragm owing to severe blunt trauma, most commonly from motor vehicle accidents. The rupture, which is twice as common on the left side and is rarely bilateral (5%), may be diagnosed immediately or missed when a traumatic hernia is diagnosed because of symptoms or complications. Rupture of the diaphragm is more common in males (male to female ratio 4:1) and occurs over a wide age range. Associated injuries are present in the majority of patients (90%) with rupture of the diaphragm. These include rib fractures, splenic, hepatic, pulmonary and bowel injuries. Helical CT with sagittal and coronal reformatted images is the best imaging test for the diagnosis of diaphragmatic rupture after blunt trauma. Findings consistent with diaphragmatic injury include waist-like constriction of abdominal viscera (collar sign), intrathoracic herniation of abdominal contents and diaphragmatic discontinuity. Helical CT reformatted images detect 78% of left-sided and 50% of right-sided diaphragmatic injuries. The injury is always a major one with a reported mean injury severity score (ISS) of 30–35. The immediate mortality ranges from 15% to 20%. Predictors of death include old age, high ISS, severe hypovolaemic shock and bilateral injuries. Emergency repair of a ruptured diaphragm can be carried out through a laparotomy, thoracotomy or the thoracoabdominal approach, depending on the nature of the associated injuries.

Traumatic diaphragmatic hernia may be diagnosed months to several years (average 5 years) after the injury. The patient may have non-specific symptoms (vague chest pain, shortness of breath, palpitations) or presents acutely with clinical signs of intestinal obstruction/strangulation of a hollow organ. In line with its aetiology traumatic diaphragmatic hernia is more common on the left. The chest radiograph is often suggestive and diagnosis is usually confirmed by barium studies of the gastrointestinal tract. The most common herniated abdominal

organs in traumatic diaphragmatic hernias are the stomach and colon. The repair involves closure of the defect by a prosthetic mesh and this can be performed through a thoracotomy or laparotomy or laparoscopically.

Iatrogenic diaphragmatic hernia This is due to damage to the diaphragm during surgery, particularly laparoscopic antireflux surgery. The injury is often caused by high-frequency electrosurgery and the resulting defect, which is small, leads to herniation, usually of the stomach over the succeeding months. The most common complaint is pain in the left upper quadrant and left shoulder. The condition is diagnosed by a barium meal and is often missed by flexible endoscopy.

Morgagni and Bochdalek hernias

Hernias through the foramina of Morgagni (right and left) are rare congenital hernias that may present in infancy, childhood and adult life. They are situated anteriorly in the immediate retrosternal position. In children Morgagni hernias are usually asymptomatic but they may be associated with mild respiratory distress or cause gastrointestinal symptoms and rarely incarceration of bowel, which may be of the partial Richter type. In adults, they may present with vague symptoms or intestinal obstruction or gastric volvulus. The foramina of Bochdalek are congenital posterior diaphragmatic defects resulting from persistence of the pleuroperitoneal canal on one or both sides. Bochdalek hernias are rare and present in adult and elderly patients with digestive symptoms and less frequently with obstruction. Both hernias do not have a sac and are thus instances of internal prolapses.

Incisional hernias

Incisional hernias after abdominal surgery are common but with a varied reported incidence depending on case mix (2–20%). Strictly speaking, the term ventral hernia should be restricted to incisional hernia arising in abdominal midline operative wounds, but often the two names are used synonymously. There are several factors that contribute to the aetiology of incisional hernias, the most important being adequacy of abdominal wound closure in the first instance and the occurrence of wound infection and subclinical wound dehiscence in the postoperative period. There is no evidence that abdominal wound closure with synthetic monofilament biodegradable sutures carries a higher incidence of

incisional hernia than closure with nonabsorbable sutures. There are however a number of recognized risk factors, which include:

• wound infection: most important aetiological factor

• postoperative abdominal distension: pressure on wound

• obesity, especially morbid obesity: very strong risk factor

• chronic obstructive airways disease

• emergency surgery: independent risk factor

• reoperation for a postoperative complication: independent risk factor

• type of incision: more frequent after vertical than transverse/oblique incisions

• steroid dependence: less important than morbid obesity

• underlying disease: diabetes

• creation of a stoma (colostomy, ileostomy, urinary conduit): parastomal hernias

• age >70 years

• no prophylactic antibiotic cover during primary operation: increased incidence.

Wound infection is the most significant independent factor for incisional ventral hernia. In patients who develop postoperative wound infection, the reported risk of incisional hernia averages 25%. Many reports indicate that transverse/ oblique incisions are accompanied by a lower rate of incisional hernias than vertical midline incisions. There is some evidence that, apart from technical faults and risk factors, incisional hernia may arise in patients with an underlying collagen metabolic disorder, known to play an important role in the development of inguinal hernia. Studies have shown a decreased ratio of collagen I/III owing to a concomitant increase in collagen III in patients with incisional and recurrent incisional hernias. This appears to reduce the mechanical strength of connective tissues and may explain the high incidence of recurrence in patients undergoing fascial repair procedures.

Clinical features

Aside from the obvious disfigurement, they cause pain and discomfort and may strangulate, although the risk of this complication is low. The diagnosis is obvious

and is made on clinical examination, when tensing of the muscles of the anterior abdominal wall (elevation of head from pillow or lower limbs from bed) accentuates the bulge. The vast majority of incisional hernias are reducible when the patient lies down in the supine position.

Treatment

This has to be individualized. Thus, if the patient has minimal symptoms and especially if elderly or suffers from significant comorbid disease, conservative management with an abdominal support is advisable. Many patients, however, have symptoms and dislike the bulge, and for this reason insist on repair. There are many techniques of surgical repair of incisional hernias:

- primary repair
- primary repair with relaxing incisions
- primary repair with onlay mesh reinforcement
- onlay mesh only
- inlay mesh placement
- retrorectus mesh placement
- intraperitoneal mesh placement.

There is now sufficient reported evidence that primary fascial repair techniques have an unacceptably high incidence of recurrence (up to 50%) and these operations have largely been abandoned in most centres. By contrast, tension-free repair by a synthetic mesh is accompanied by a much lower recurrence rate (2–10%) and is the technique that is in general use.

Mesh materials

Absorbable meshes are only used in cases when mesh infection is a significant risk and primary closure is not possible. Polyester mesh appears in some studies to be associated with higher rates of mesh infection and enterocutaneous fistula formation. However, fluorinated polyester mesh that can be gel impregnated for antibiotic bonding immediately before use has been shown experimentally to induce minimal adherence to bowel and this material exhibits minimal contraction and hardening with time.

Polypropylene has greatest tissue ingrowth of all non-absorbable mesh materials. Polytetrafluoroethylene (PTFE) (Gore-Tex) has the lowest bowel adherence rate and related complications. The Gore Dualmesh Plus, which incorporates antimicrobial agents (silver and chlorhexidine), carries the lowest mesh infection rates in most reported studies but is expensive. One experimental study involving infection of graft materials with S. aureus and meticillin-resistant S. aureus (MRSA) organisms showed that Gore Dualmesh Plus biomaterial was the only mesh material used in the study able to kill both S. aureus and MRSA.

The most commonly used are polypropylene meshes, which may be monofilament (Marlex), double filament (Prolene) or multifilament (Surgipro, Atrium, etc.). The absorbable meshes available are polyglactin 910 (Vicryl) and polyglycolic acid (Dexon). Whatever material is used, it is important that the mesh overlaps the size of the defect by a significant margin, and it should lie loosely rather than be stretched over the defect. Tension-free mesh repair can be undertaken laparoscopically with good results.

The types of repair techniques for incisional ventral hernia are:

• Primary repair: this consists in freshening and approximating the two edges of the defect. It is no longer practised in view of high recurrence (>50%) owing to tension on the repair. Some procedures (Keel repair) use relaxing incisions to reduce tension but still incur an appreciable recurrence.

• Primary closure with mesh reinforcement: an onlay is sutured over the primary repair to the anterior rectus sheath as reinforcement. However, the hernia repair suture line remains under tension. In addition, the mesh increases the infection risk without any material benefit in terms of recurrence.

• Inlay mesh repair: after excision of the hernial sac, the fascial margins of the defect are sutured to a mesh [polypropylene or expanded PTFE (ePTFE)]. Polypropylene is used when omentum can be placed between intestine and mesh; otherwise, ePTFE is preferred. This method is difficult to perform laparoscopically and is usually carried out by the open approach.

• Retrorectus mesh repair (Rives–Stoppa technique): in this technique the hernia sac is used to separate the mesh from the intra-abdominal contents. Above the umbilicus, the dissection to create the necessary space for the mesh is performed above the posterior rectus fascia and under the rectus muscles; below the

umbilicus, dissection is in the preperitoneal space. A suitably sized mesh is placed in the dissected place and fixed to the muscle layer superficial to the mesh. This repair is safe and effective with a reported low recurrence and morbidity rates.

• Intraperitoneal underlay mesh repair: this technique can be performed by either the open or laparoscopic approach, which is increasingly favoured nowadays.

Complications of tension-free mesh repairs

The risks of tension-free repair of incisional hernias include:

• wound infection

• infection of the mesh

• seroma formation

• wound sinus

• enterocutaneous fistula formation

• recurrence.

Although wound infection is common (4–17%), actual incidence rates of mesh infection are not known but most such instances resolve with antibiotic treatment, although persistent serious infections necessitating removal of the mesh are well documented. This is a major problem. The management is staged with temporary skin cover until infection is eradicated, followed by abdominal wall reconstruction by muscle transfer flaps. Seroma formation is also common but its incidence varies (0–22%) with the size of the defect and hence the mesh. Most surgeons insert tunnelled Redivac suction drains to the site to prevent this complication. There is no evidence that these tunnelled small-calibre suction drains increase the incidence of postoperative wound/mesh infection. However, the efficacy of these suction drains in reducing the incidence of seroma formation remains unproven. Wound sinus is reported in 4–18% of cases. It usually heals with conservative management or minor intervention to remove the offending suture. Enterocutaneous fistula has been reported but appears to be a rare complication. Its exact aetiology is not known but adherence of the bowel to the mesh appears to initiate the process. In a large retrospective report on 136 cases, the patient-related factors considered important on statistical evaluation in

relation to recurrence following tension-free mesh repair with polypropylene were:

- age >70 years
- hernia >6 cm
- no prophylactic antibiotic cover
- recurrent hernia
- wound infection.

It is important to stress that the recurrent hernia is usually larger than the initial one and hernial defects >10 cm may require autogenous reconstruction of the abdominal wall by muscle flaps.

Massive midline wall defects

These include large central incisional hernias (usually recurrent) and pose major problems in management. In one reported series of 22 patients, the defects varied in size from 14 to 24 cm and the causes included:

- removal of infected synthetic mesh material (32%)
- recurrent incisional hernia (18%)
- removal of split-thickness skin graft and dense abdominal wall cicatrix (18%)
- parastomal hernia (9%)
- primary incisional hernia (9%)
- trauma/enteric/abdominal wall sepsis (9%)
- abdominal wall tumour resection (4.5%).

In view of the size of the defect, conservative management with an abdominal support is unsatisfactory, and, if the patient is fit, surgical treatment is indicated. Reconstruction of these large central abdominal wall defects is a major surgical undertaking that requires specialist plastic surgical expertise. Modern surgical treatment is based on autogenous tissue reconstruction introduced by Ramirez et al. The technique utilizes bilateral, innervated, bipedicle, rectus abdominis–transversus abdominis–internal oblique muscle flaps that are transposed medially

to reconstruct the central defect. The results of the Ramirez autogenous tissue reconstruction are good, with satisfactory healing and no recurrence in 90%. The morbidity considering the magnitude of the operation is reported to be minimal and confined to superficial infection and wound seroma formation. The postoperative mortality averages 4–5%. Although the Ramirez operation is usually used to treat complicated (trauma, surgical excision) or recurrent central abdominal wall defects, it is also used as a primary repair of large central incisional hernias.

Port site wound (incisional) hernias after laparoscopic surgery

The overall reported incidence of incisional hernias through port site wounds is 2–3%. The risk factors include:

- size of port >10mm
- obesity
- inadequate fascial closure.

The vast majority occur in port wounds >10mm but instances of herniation have been reported in smaller port wounds (5mm), especially in the lower abdomen. It has to be remembered that, below the arcuate line, there is no posterior rectus sheath and thus the abdominal wall is intrinsically weaker. The commonest reported site is the umbilical region, probably because this is usually a large port (used to insert the laparoscope and extract specimens). Patients can present with localized pain and a subcutaneous lump, which is tender and has a cough impulse; or acutely with acute intestinal obstruction. This usually involves the small bowel and is of the Richter type. In obese patients, the small hernia can be easily overlooked as a cause of the small bowel obstruction (see below).

Parastomal hernias

A parastomal hernia is an incisional hernia that occurs at the site of a surgically constructed intestinal stoma on the abdominal wall. The basic underlying cause for the development of a parastomal hernia is progressive enlargement of the trephine opening in the abdominal wall, owing to tangential abdominal forces working on the circumference of the opening through which the bowel emerges. This physical consideration accounts for the unsatisfactory results of surgical repair irrespective of its nature.

Parastomal hernias are common and their management is both difficult and controversial. They continue to pose management problems. In one large series of 316 patients with 322 stomas, an overall incidence of 67% stoma-related complications was reported. This included a 31% parastomal herniation rate, stenosis of the stoma in 10% and prolapse in 7% at 10 years after surgery.

Parastomal hernias include:

- paracolostomy hernia
- ileostomy hernia
- urinary conduit hernia.

After sigmoid colostomies the crude and actuarial risk of complications are 50% and 58%, respectively, at 13 years with paracolostomy hernia being the highest at 35–40% at 10 years. Paracolostomy hernias are more likely in the elderly and in patients with other abdominal wall hernias. From the published data, the extraperitoneal technique appears to reduce the incidence of paracolostomy hernia. Other technical factors, e.g. mesenteric fixation and siting the stoma through the belly of the rectus abdominis, do not appear to influence the rate of this complication, although there are strong proponents for both measures. In general, complications are detected much later in patients with a urological stoma than in those with a colostomy. The high incidence of stomal complications requires long-term follow-up of these patients. Paracolostomy hernia most commonly presents with a bulge, ill-fitting bag and leakage problems, but they may present acutely with intestinal obstruction (usually small bowel), and indeed strangulation. Instances of incarcerated stomach in the hernial sac have been reported. The presumed reduction in the risk of intestinal obstruction with closure of the lateral space has not been confirmed by long-term studies. However, there is a slight reduction in the risk of intestinal obstruction with the extraperitoneal technique. The stomal complications of ileostomy may occur many years after construction and at 20 years the incidence of stomal complications exceeds 70% in patients operated on for ulcerative colitis, but is lower – though still high (50–60%) – in patients following colectomy for Crohn' disease. The complications in order of frequency are:

- skin problems (34%)
- intestinal problems (23%)

• retraction (17%)

• parastomal herniation (16%)

• prolapse.

Thus, stomal herniation is distinctly less common after terminal ileostomy than after terminal colostomy. Again closure of the lateral space does not diminish the risk of intestinal obstruction and fixation of the mesentery does not reduce the probability of prolapse of the ileostomy. The incidence of parastomal herniation is unaffected by siting the ileostomy through the rectus abdominis as distinct from the oblique muscles. The incidence of parastomal hernia in patients with ileal conduit diversion is lower than ileostomy after proctocolectomy (4–5%). The most common presentation is with a poorly fitting appliance causing leakage of urine. However, acute presentation with obstruction, anuria and parastomal ileal conduit fistula are well documented.

Treatment of parastomal hernias

The surgical treatment of parastomal hernias presents a continuing challenge and there is no universally effective operation. There are four techniques used in the surgical treatment of parastomal hernias:

1 relocation of the ostomy with repair of the defect (fascial or with mesh)

2 mesh repair of the defect around the ostomy exit site; in this method, the hernia sac (laparocoele) is replaced without being opened and the mesh positioned in the preperitoneal space

3 reduction and mesh repair with two strips of polypropylene mesh through a midline incision

4 special prosthesis consisting of a polypropylene ring mounted in the centre of a polypropylene mesh.

Irrespective of technique, parastomal hernia repair is often unsuccessful (average recurrence rate of 30% at 5 years) and rarely without complication. The general consensus for firsttime repair is to relocate the stoma and repair the defect with a tension-free mesh. This, of course, may transfer the problem to the other side. For recurrent parastomal hernias, local repair with prosthetic material (without relocation) is advocated, as it appears to be the best of a bunch of poor

alternatives. In either case, fascial repair alone should not be performed owing to an unacceptably high recurrence rate. There have been other techniques reported but the data on their efficacy are limited. As the basic problem is progressive enlargement with time of the hole by the tangential abdominal forces, a ringed prosthesis technique has been reported, which appears to give good results in the short term. The prosthesis consists of a polypropylene ring of varying internal diameter (20, 25 or 30mm), mounted in the centre of a polypropylene mesh. Following mobilization the exteriorized bowel is inserted through the ring and the mesh sutured to the parieties. In a series of 14 patients treated with this technique there was only one recurrence during a follow-up period of 5–35 months. Another procedure uses the midline laparotomy approach and, after reduction, two strips of polypropylene are sutured on either side of the bowel to prevent enlargement of the orifice.

Non-incisional abdominal wall hernias

These hernias occupy a good deal of surgical time and account for 10–15% of all surgical operations. The majority of operations (80%) are performed for inguinal hernias, although this figure is even higher in the male population. The remainder are in the region of the umbilicus (8%), incisional (7%) and femoral hernias (5%). Rarer forms of hernias, although very interesting, form only a tiny proportion of the surgical problem.

Diagnosis of abdominal wall hernias

In the vast majority of patients, the diagnosis is made on history and physical examination (location of the bulge and cough impulse) and no other confirmatory tests are needed. However, diagnostic problems may be encountered especially in obese patients and those presenting with acute intestinal obstruction. Water-soluble contrast herniography is an accurate means of identifying inguinal and femoral hernias in cases presenting diagnostic problems. For other hernias, ultrasound and crosssectional imaging CT or MRI is preferred. These are especially useful in the detection of the rare, e.g. Spigelian or obturator (pelvic floor), hernias. Epigastric, umbilical and paraumbilical hernias These hernias are grouped together because herniation occurs through a defect in the linea alba between the xiphisternum and the umbilicus. The paraumbilical hernia is an epigastric hernia situated just above the umbilicus.

Epigastric hernia

This hernia is usually encountered in males above the age of 40 years. About one-quarter of cases are multiple. The defect in the linea alba allows a small pad of extraperitoneal fat to protrude, and, as a result of the increased intra-abdominal pressure, the defect enlarges and then permits a sac of peritoneum, and eventually the sac may admit omentum or even small bowel. Most epigastric hernias are symptomless and are diagnosed incidentally by the patient or doctor. A small nodule, which is more prominent on standing, is palpable in the midline but it is rare for a cough impulse to be elicited. A small number of patients present with vague upper abdominal symptoms that do not fit a dyspeptic pattern and in whom repair of the hernia gives relief. It may be that in these patients a degree of tension on the peritoneal sac has produced the symptoms. Small epigastric hernias do not require treatment. Those >2.0 cm have the potential of strangulation because of the narrow neck through the linea alba and are best treated surgically. The procedure consists of excision of the sac and repair of the defect by either a simple longitudinal fascial repair or a transverse overlapping of the Mayo type. The results except in the very obese are generally very good.

Adult paraumbilical hernia

These hernias are more common in females (female to male ratio 3:1) and are largely confined to obese patients. The defect lies just above the umbilicus, although deformity of the umbilical button is the earliest manifestation. In adults these are common with an overwhelming female preponderance. In one study of 2100 patients undergoing laparoscopy, paraumbilical fascial defects were found in 18% of patients and only 56% of these had symptomatic or overt umbilical hernias. The hernia may enlarge to the size of an orange but the neck of the sac remains dangerously small so that the risk of strangulation is ever present. The chronicity of the condition leads to firm adhesions forming between the peritoneal sac and its contents so that almost all large hernias are irreducible and should never be treated by the use of an abdominal support or truss. Surgical treatment is best carried out effectively in all patients. The majority of patients, however, present acutely with obstruction/strangulation. The procedure of choice for repair of paraumbilical hernia is that described by W.J. Mayo in 1893. After excision of the sac, the defect is closed by suture, the upper crescent being fixed over the front of the lower half of the defect. The Mayo operation has reported

recurrence rates of 2–3%. For large hernias in the elective situation, some now use a prosthetic mesh repair.

Infantile umbilical hernia

The worst defect is exomphalos, which fortunately is a rare condition, occurring in about one in 5000 births and is nowadays diagnosed prenatally. It is frequently associated with other congenital defects and not surprisingly about one-quarter of the babies have malrotation of the intestine. Simple umbilical hernia is common in infants and young children with the highest reported incidence in African Caribbean babies. In the vast majority of infantile umbilical hernias spontaneous closure occurs (reduction in size by approximately 18% each month) before the age of 4 years and thus management is conservative, especially as complications during this age period are rare. However, large infantile umbilical hernias (neck of the sac >2cm) are unlikely to close spontaneously and surgical repair is therefore advisable. Irrespective of size, an umbilical hernia that persists beyond 4 years requires surgical repair, as closure then becomes unlikely. It is generally considered important to preserve the umbilical cicatrix after excising the sac and repairing the defect so that the child will not appear different from its fellows. The most common complication in these children is incarceration with the development of small bowel obstruction. The reported risk of this complication is approximately one in 1500 umbilical hernias.Another very rare complication reported in Nigerian children is spontaneous rupture. This usually occurs in the first year of life and is probably precipitated by raised intra-abdominal pressure from excessive crying. The condition results in partial evisceration and needs urgent intervention.

Adult umbilical hernia

The umbilical hernia that develops in patients with refractory ascites due to chronic liver disease is often overlooked but can assume clinical significance. In the first instance incarceration is well documented as a complication of effective relief of the ascites following diuresis, paracentesis, peritoneovenous shunting and transjugular intrahepatic portosystemic shunt. Second, these patients have marked atrophy of the abdominal muscles and some have, in addition, large high-

pressure veins following recanalization of the umbilical vein (caput medusae). Thus repair can be difficult and should always be conducted using prosthetic mesh, preferably of the double-stranded, closely knitted variety. In addition, subcutaneous suction drains should be avoided because of the increased risk of infection of the ascitic fluid. The use of prophylactic antibiotics against Gram-negative bacteria is mandatory.

Groin hernias

Because of the erect posture, the inguinofemoral area is subjected to maximum strain from the intra-abdominal pressure, especially during exertion. This together with the intrinsic weakness that is caused by the inguinal canal in males accounts for the predominance of these hernias in males. The hernia starts as a small pressure-induced diverticulum (hernial sac) that emerges through the deep inguinal and less commonly the femoral ring to enter the respective canal and exits as a lump in the groin that has a cough impulse. The term groin hernia covers inguinal and femoral hernias, which are discussed separately.

Complications of groin hernia

The complications of groin hernias are:

• irreducibility

• obstruction

• strangulation.

The majority of patients who are admitted as emergencies with complicated groin hernias have not previously sought medical attention or been diagnosed with the condition in the outpatient department. This observation implies that most hernias that develop complications do so within a relatively short time in the natural history of the disease. Mortality of obstructed hernias is high in patients with coexisting cardiorespiratory disease, whereas the morbidity rate is influenced by the viability of contents of the hernial sac. In turn, this is directly related to the duration of irreducibility/incarceration or delay in presentation.

The risk factors for complications of groin hernias are:

• Adults:

– old age

– duration of hernia: short duration

– type of hernia: femoral more than inguinal

– coexisting medical illness: especially chronic obstructive airways disease.

• Children:

– very young (infants)

– gender (male)

– short duration of hernia

– side (right).

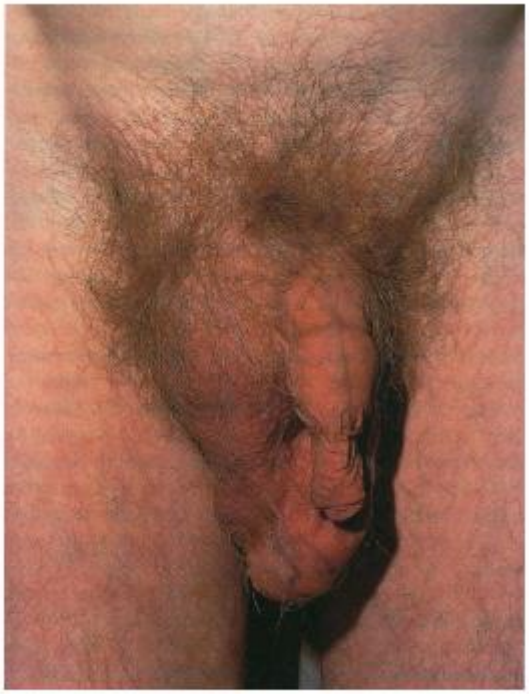
Inguinal hernia

By far and away, inguinal hernia is the most common external abdominal hernia, accounting for over 90%. Normally, two mechanisms act to prevent herniation through the inguinal canal. With increased intra-abdominal pressure, contraction of the internal oblique and transversus muscles acts upon the section of the transversus aponeurosis that arches convexly upwards over the medial half of the canal. The arch is pulled down and flattened and thus reinforces the posterior inguinal wall. The second mechanism, which may in fact be more important, depends upon the attachment of the strong fascial layer forming the deep inguinal ring. This fascial ring is normally firmly adherent to the posterior surface of the transversus muscle so that contraction of this muscle pulls the ring upwards and laterally. In essence, an inguinal hernia is the consequence of weakness of the posterior abdominal wall. In the past, stretching of the transversalis fascia was considered to be the most important factor and some fascial repair procedures (Shouldice operation) were based on suture plication of this layer. Some, however, consider the transversalis (endoabdominal) fascia to be the thinnest and least important layer in the prevention of inguinal hernia formation and consider that the strength of the posterior wall of the inguinal canal is due to the muscle fibres and aponeuroses of the internal oblique and transversus abdominis. There is evidence for an increased risk of right inguinal hernia after appendicectomy. This is related to the denervation of the right transversus abdominis muscle fibres. These fibres are responsible for the support of the deep inguinal ring of fascia. Weak fascial support due to an abnormal

accumulation of type III collagen has been demonstrated in some patients with direct but not indirect inguinal hernia.

Inguinal hernia exhibits a marked male predominance (male to female ratio 20:1) and from the anatomical standpoint is of two types – indirect (or lateral) and direct (or medial). The sac of an indirect hernia arises from the processus vaginalis. The hernia travels down the inguinal canal from the internal ring and exits as a subcutaneous lump, exhibiting a cough impulse at the external inguinal ring above and medial to the pubic tubercle. The herniation lies inside the spermatic cord (covered by all three spermatic fascial layers). In view of its indirect course, it does not often reduce itself spontaneously when the patient lies down and is more prone to irreducibility than the direct inguinal variety. Indirect inguinal hernia enters the scrotum as it enlarges, whence it qualifies as inguinoscrotal hernia (Figure 21.18). The same pathology occurs in the female. Persistence of the processus vaginalis forms a peritoneal diverticulum (canal of Nuck). This enters the inguinal canal to form the hernia, which, after exiting from the superficial inguinal ring, enters the labium majus as it enlarges. The direct hernia results from a weakness of the posterior wall of the inguinal canal medial to the internal ring and hence the inferior epigastric vessels; the sac is thus in close proximity to the external ring. Occasionally, the medial wall of the sac of a direct inguinal hernia is composed of the bladder wall. As the hernia enlarges it exits through the superficial inguinal ring behind or above the spermatic cord. Because of the direct path and wide neck, the vast majority of direct hernias are spontaneously reducible when the patient lies down and rarely strangulate. Moreover, even when large, direct hernias do not enter the scrotum; they tend to enlarge in the groin beneath Scarpa's fascia, which obstructs their entry into the scrotum. Patients with major weakness of the posterior inguinal wall may develop combined direct and indirect hernias with the two hernial sacs straddling the inferior epigastric vessels – this is sometimes referred to as a pantaloon hernia.

Clinical features



Inguinoscrotal hernia.

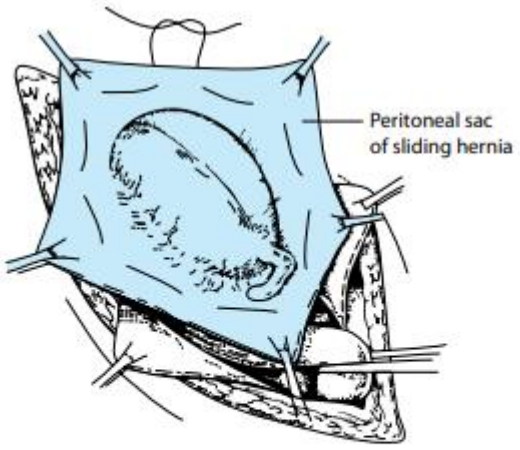
The complaint common to nearly all patients is the appearance of a lump in the groin. Some patients complain of a dragging sensation or pain in the groin, particularly during the early stages, but many hernias are asymptomatic. There may be a history of a major physical strain or of heavy physical work prior to the development of the hernia. Presumably, increased abdominal pressure can stretch the fascial margins of the deep inguinal ring and open up a preformed peritoneal sac. The hernia may be best shown with the patient standing or precipitated by coughing and straining. The bulge should be above and medial to the pubic tubercle. In patients with large inguinoscrotal hernias the diagnosis is obvious though a cough impulse may be difficult to elicit. The differential diagnosis of inguinal hernia includes femoral hernia, inguinal lymphadenopathy, ectopic testis, hydrocele of the cord, saphena varix and lipoma of the cord. Endometriosis in a hernial sac may be mistaken for an incarcerated hernia, as may malignant tumours in the groin. Patients with chronic groin pain constitute a difficult diagnostic problem. Most cases of chronic pain in athletes are due to soft-tissue injuries, but, in a small number, an undeclared hernia is the cause. In the vast majority of cases, the diagnosis of an inguinal hernia is made clinically and a good physical examination can distinguish between the two types of hernia. The old practice of inserting a finger into the inguinal canal to detect the exact position of the cough impulse (tip of the finger in indirect and volar aspect of the finger in direct hernia) is no longer practised because it causes considerable patient discomfort. The best technique is to reduce the hernia with the patient in the supine position, and then apply pressure over the internal ring. This should control the hernia only if it is of the indirect variety. When difficulty arises in establishing the diagnosis because the hernia is small, especially if the patient is obese, water-soluble contrast herniography (50– 80mL injected intraperitoneally) may be used.

Sliding inguinal hernia

Essentially, in a sliding inguinal hernia, part of the sac wall is formed by prolapsed viscus and, for this reason, these hernias are always large. The condition can be suspected but not confirmed preoperatively on clinical examination. Usually the diagnosis is established during surgery, although ultrasound and cross-sectional imaging may identify sliding components preoperatively. The most common organ associated with a sliding inguinal hernia is the sigmoid colon, but other organs can be involved. These include the vermiform appendix, urinary bladder, etc. In neonates, large sliding hernias containing Fallopian tubes, ovaries and uterus are well documented and such instances have been reported in middle-aged women. The more usual sliding hernia involving the colon forms a large inguinal mass and is often irreducible by the time of diagnosis. Sliding inguinal hernia may present acutely with strangulation involving omentum, small bowel, bladder or colon itself.

Inguinal hernias in children

In this age group, 90% of inguinal hernias occur in males, and these often present at about 1 year when the child starts to walk with the vast majority being of the indirect type (patent processus vaginalis). Between 10% and 20% of children will develop a hernia on the other side; in about 50%, this peritoneal sac will be present at the time of operation on the presenting side. Attempts to detect these occult hernias have included contrast herniography and laparoscopy. There is no indication for routine exploration of the contralateral side. Direct inguinal hernia is extremely rare in children. The history of a lump appearing in the groin is usually obtained from the mother, who notices the hernia after a period of straining or coughing by the child. Quite frequently the hernia cannot be demonstrated by the medical examiner and all that can be felt is a silky sensation on palpation of the spermatic cord as the layers of the processus vaginalis move under the examining fingers.



A sliding hernia develops when the contents, usually sigmoid colon, descend into the inguinal region. The colon does not lie within the sac but the sac is applied to its surface. The bowel is liable to damage if the sac is fully dissected from the surface and is best managed by a plicating suture after which the bowel can be returned to the abdominal cavity. [Derived from Nyhus LM, London RE (eds). *Hernia*, 2nd edn. Philadelphia, PA: Lippincott, 1978.]

Unfortunately, as many of the signs are ignored, there is a tendency for the hernia to become obstructed and strangulated by the time of presentation. This being the case, all children with a strong history should have elective exploration of the affected side. The operation consists of transection and high ligation of the processus vaginalis (herniotomy). Repair of the inguinal canal is not necessary. Differential diagnosis at this age includes undescended testis, hydrocele of the cord and torsion of the testis.

Repair of inguinal hernias

In general, if the patient is fit, an inguinal hernia should be repaired surgically. There are however situations when nonoperative management is sensible. This conservative management should only be considered if the hernia is easily reducible and the patient has significant comorbid disease. Small indirect inguinal hernias are controlled by a spring truss, but large indirect and direct hernias require a large pad and firm belt. In all other patients surgical repair should be recommended. The various repair procedures fall into two categories: fascial repairs (Bassini, Bassini with Tanner's slide, McVay, Ferguson, Shouldice) and tension-free prosthetic mesh repairs, and these may be performed by the anterior open approach or laparoscopically/endoscopically . The fascial repairs are the oldest. Their only advantage is the avoidance of prosthetic material, which may become infected, but they carry the highest incidence of recurrence, particularly the Bassini operation since the repair cannot be effected without tension. In practice, infection of the prosthetic mesh, requiring removal, has proved to be a rare occurrence, and this category of hernia repair operation is much more favoured nowadays in view of the uniformly reported good results and low recurrence rates. Open tension-free mesh repairs can be carried out under local anaesthesia as day cases and this reduces the costs considerably. The laparoscopic approach has a number of advantages that include less postoperative pain, earlier return to full activity and work, and reduced incidence of persistent groin pain at 1 year. The initial higher morbidity (including major vascular, bowel, bladder and nerve injuries) and high recurrence rates reflected inexperience with the technique as surgeons were not familiar with the anatomy of the posterior abdominal wall as visualized from the peritoneal side. The morbidity and recurrence rates of the laparoscopic versus open tension-free repairs are now equivalent. The residual disadvantages are increased hospital (but not total) costs and the need for general or epidural anaesthesia. There is

now good evidence that the laparoscopic TEP operation gives the best results in patients with large bilateral and recurrent hernias. The recurrence rate after primary laparoscopic TEP repairs at 3 years is under 1%. Uniformly excellent results have been reported consistently with the open Lichtenstein repair using polypropylene (Marlex) mesh under local anaesthesia. At 5 years, this procedure in hernia centres has a recurrence rate of 0.1%. Most of the recurrences occur at the pubic tubercle, usually because the mesh used was too small. The tension-free mesh plug repair was introduced in the late 1980s. A preformed mesh plug is used to fill and expand extraperitoneally occluding the defect. In large hernias, the plug is overlaid with an appropriately sized sheet of mesh. The technique is simple and entails minimal dissection, especially in direct hernias. The reported recurrence rates vary from 1% to 3%. In a prospective randomized study comparing open mesh plug repair with laparoscopic TEP, the overall recurrence rate was similar (2.5% for the TEP versus 3% for the mesh–plug hernioplasty). However, patients undergoing the laparoscopic repair required less narcotic analgesic medication and returned to full activity 1 week sooner than the open surgery group. There were no major postoperative complications in either arm in this study but minor morbidity was lower (13%) after laparoscopic TEP than after open mesh plug (23%). The complications of inguinal hernia repair are:

- urinary retention, especially in males
- wound infection and haematomas
- scrotal swelling
- orchitis and testicular atrophy
- recurrence
- iatrogenic bladder, bowel, nerve and vascular injuries
- chronic groin pain.

Recurrent inguinal hernias

The surgical treatment of recurrent inguinal hernias is less effective and the risk of further recurrence is higher than after first time repair. It is now generally agreed that all recurrent inguinal hernias require some form of tension-free prosthetic mesh repair (open or laparoscopic). It is essential that the size of the mesh used is large enough to overlap the defect by a significant margin. The risk

of further recurrence depends on the technique and the number of previous repairs. Thus, in a large reported series, patients with a first-time recurrence had recurrence rates of 2% as opposed to 9% in patients who had undergone two or more prior repairs. The morbidity of recurrent hernia repair is higher and includes wound haematoma, scrotal oedema, temporary pain at the wound site, paraesthesiae, injury of the ilioinguinal nerve and femoral hernia, although the overall morbidity can be low with good surgical technique.

Femoral hernias

The pathogenesis of femoral hernias is now thought to be related to the mode of insertion of the fibres of the transversus abdominis and its investing sheath into the superior pubic ramus and develops in two stages. If the insertion of the transversus abdominis fibres on the superior pubic ramus is through a narrow band, a cone-shaped defect overlying the femoral ring (the femoral cone) results. Initially, preperitoneal fat with or without a sac enters this femoral cone as a result of increased abdominal pressure. This is the asymptomatic stage I (internal) femoral hernia that can only be detected if the preperitoneal space is explored during inguinal herniorrhaphy. In time the fatty contents of the femoral cone exit from the narrow distal orifice when a stage II (external) symptomatic hernia results. As the hernia extends downwards, the sac is turned forwards through the cribriform fascia and may then turn upwards to overlie the inguinal ligament, when it may be mistaken for an inguinal hernia. The hernia may, however, remain quite small and be invisible or scarcely palpable in obese patients. Femoral hernia is particularly prone to incarceration and strangulation. By the time of diagnosis 16% of stage II femoral hernias are irreducible and 25–40% present with incarceration/ strangulation. Of the emergency group up to 40% will have strangulation of the hernial sac contents (omentum, small bowel, vermiform appendix) requiring excision. Femoral hernias can occur at any age with peak incidence in the fifth and sixth decades and are significantly commoner in females especially if multiparous (female to male ratio 4:1). The higher incidence on the right side is inexplicable unless the right leg being in use more often than the left in severe exercise is the reason. Femoral hernias are exceedingly rare in children. A small stage II femoral hernia may be difficult to diagnose especially in obese women. The lump may not be easily palpable and the cough impulse difficult to elicit. On other occasions, the nodule, typically below and lateral to the pubic tubercle, may be difficult to differentiate from a lymph node. In such cases,

contrast herniography or cross-sectional imaging with CT or MRI can be extremely useful.

Treatment of femoral hernias

All require surgical repair because of risk of obstruction/ strangulation. The surgical approach varies with the presentation. In the elective situation, the surgical approach may be from below the inguinal ligament or through the inguinal canal.

Infrainguinal operations

In the classic low approach, the hernial sac is isolated through an incision below the inguinal ligament. The sac is opened and emptied, with care taken to avoid injury to the bladder wall, which may be close to the medial side of the sac. The peritoneum is closed above the neck of the sac and the stump returned to the abdomen. The femoral canal is repaired by interrupted nonabsorbable sutures passing from the undersurface of the inguinal ligament to Cooper's ligament behind, or by the insertion of a rolled-up mesh plug. The repair with this cylindrical mesh prosthesis inserted into the femoral canal gives better results than the classic low fascial repair and is favoured nowadays. Alternatively a mesh repair can be effected laparoscopically using the total extraperitoneal approach.

Transinguinal approach

The inguinal canal is opened anteriorly and then the neck of the femoral hernia exposed by incising the posterior inguinal canal wall. The sac is open and the contents are reduced, after which the peritoneum is closed and a tension-free mesh repair is effected of the posterior wall of the inguinal canal, ensuring this is of adequate size and thus overlaps the pubic tubercle.

Obstructed/strangulated femoral hernia

Although both the above can be used in patients with obstructed femoral hernias, the preperitoneal approach of McEvedy is recommended, especially in the presence of strangulation of the contents of the hernial sac because this gives immediate access to the peritoneal cavity. The skin incision may be longitudinal or transverse over the lower abdomen but above the inguinal canal. The musculoaponeurotic layer is divided lateral to the rectus abdominis, and the extraperitoneal space of the lower abdomen is entered. The hernia is usually

easily reducible from above but it may not be. In this case the incision is enlarged and the peritoneal cavity entered above the sac.

Other hernias

Richter's or Richter–Littre hernia

In 1700, the French surgeon Alexandre de Littre described a hernia in which only the antimesenteric part of the bowel was inside the hernial sac. Subsequently, in 1777, Richter described 'the intestinal wall hernia', in which the antimesenteric border of the bowel was incarcerated within the hernial sac. For this reason Richter's hernia is sometimes referred as Richter–Littre hernia. Richter's hernia can complicate any small hernia but the most commonly involved is femoral hernia in which a knuckle of the small intestine becomes incarcerated. The patient presents acutely with symptoms and signs of intestinal obstruction. The diagnosis is often delayed as the obstruction may be incomplete or the small hernia may be overlooked particularly in obese patients. There are now well-documented cases of Richter's hernia complicating small unrecognized port site wound hernias after laparoscopic surgery. The diagnosis should be considered in all patients who develop acute intestinal obstruction after laparoscopic surgery and is established by cross-sectional CT imaging. All patients, irrespective of the nature of Richter's hernia, require urgent intervention after resuscitation; if the partial incarceration of the bowel is necrotic, the affected segment of the small intestine is resected.

Littre's hernia

This is defined as any hernial sac that contains a Meckel's diverticulum and may involve inguinal, umbilical, femoral, ventral and lumbar hernias. Littre's hernia is rare, particularly in children, in whom the umbilical variety is the commonest. It may present with evidence of gastrointestinal bleeding, as an incompletely reducible hernia, or acutely with intestinal obstruction and faecal–hernial fistulas. Obstructed/strangulated Littre's hernia usually presents in adult patients with intestinal obstruction. Preoperative diagnosis is rare with the vast majority being recognized during emergency surgery. The recommended treatment is resection of the Meckel's diverticulum from within the opened hernial sac but extension of the wound is needed when the adjacent loop of small intestine is infarcted, usually as the result of a volvulus.

Obturator (pelvic floor) hernia

Herniation through the obturator foramen is a rare clinical entity occurring most commonly in elderly thin (average body weight 35–40kg) multiparous women and presenting with acute small bowel obstruction. In one report of a large series one-third of the patients were admitted from homes for elderly people and were either bed-ridden or wheelchair-bound. The vast majority of patients with obstructed obturator hernia are high-risk patients and this together with the delayed diagnosis and intervention accounts for the high morbidity and mortality (15–25%) because of the frequent presence of infarcted bowel (60–75%). The preoperative diagnosis of obturator hernia is difficult since there are no specific clinical features although the Howship– Romberg sign may be positive, but a groin mass is rarely found on physical examination. Recently, pelvic CT has been shown to provide the diagnosis in suspect cases, and may be indicated in elderly patients with mechanical intestinal obstruction of uncertain origin. However, the correct preoperative diagnosis does not appear to influence the outcome, with survival being determined by early surgical intervention. Repair of the hernial defect is difficult because adjacent tissues are not easily mobilized and thus requires a polypropylene mesh placed in the preperitoneal space and sutured to Cooper's ligament. Recently there have been a few reports on the laparoscopic repair of obturator hernia but the experience is limited. This approach is inadvisable in the presence of infarcted bowel.

Spigelian hernia

This is an interesting hernia that is probably more common than the number of reported cases suggests. The herniation occurs close to the linea semilunaris (Spigelian line). This marks the transition between the muscular and aponeurotic part of the transversus abdominis muscle (Spigelian aponeurosis) at the edge of the rectus abdominis on either side, and extends from the costal margin to the pubic tubercle. The herniation occurs through a defect in the Spigelian aponeurosis between the linea semilunaris and the lateral edge of the rectus. As the hernia is covered by the external oblique aponeurosis, it is initially intramural and may not be palpable externally, i.e. the sac lies between the internal and external oblique muscles (85%) but may penetrate through the external oblique layer as it enlarges (15%). The hernial sac may be empty or contain small bowel,

omentum and, more rarely, caecum or sigmoid colon. Although very rare, congenital Spigelian hernia has been reported in children and these cases may be associated with an undescended testis or an ipsilateral mediastinal neuroblastoma in which muscle atrophy caused by the neuropathy of the ninth to twelfth intercostal nerves is thought to be responsible for the hernia. The mean age at diagnosis is 60 years and the hernia can occur on either side with equal frequency. The clinical presentation varies depending on the contents of the hernia sac and the size/type of herniation. Pain is the most common symptom but varies in intensity and nature. On physical examination, the commonest findings are a palpable hernia and a palpable hernial defect. Some patients (20–25%) present acutely with a tender irreducible mass or intestinal obstruction caused by incarceration of a loop of intestine. Although large easily palpable Spigelian hernias do not pose diagnostic problems, small hernias are often overlooked. Persistent point tenderness along the Spigelian aponeurosis with associated spasm of the abdominal wall should suggest the diagnosis in these cases. Ultrasound scanning or CT will identify these small impalpable hernias. The treatment of Spigelian hernia is surgical. A grid iron incision is favoured by many surgeons in patients with palpable hernias. In patients with non-palpable hernias the preperitoneal dissection is carried out through a vertical incision, which permits good exposure. The vertical approach is also recommended in patients requiring emergency surgery because of intestinal obstruction as it enables an exploratory laparotomy. Repair can be either fascial or by prosthetic mesh sheet or plug, although as with other hernias tension-free prosthetic repair is favoured nowadays. The repair of uncomplicated Spigelian hernias can be performed laparoscopically. Irrespective of approach, the reported recurrence rates after surgical repair are low.

Tests

1. What are the symptoms of strangulated hernia?

1. Sizes of hernial orifice can be defined

2. Sharp pains in the area of hernia protrusion

3. Incarceration of hernia

4. Consistent hernial protrusion

5. Positive cough impulse

Choose the correct combination of answers:

a) 1, 2, 3

b) 2, 3, 5

c) 2, 3, 4

d) 1, 4, 5

e) 1, 3

2. The patient with strangulated inguinal hernia during the transportation to the surgical department had spontaneous reduction of hernia contents.

What would be your following steps?

1. Emergency surgery

2. Do not hospitalize, perform elective surgery

3. Emergency laparoscopy

4. Case monitoring

5. There are no correct answers

3. What is sliding hernia?

1. When hernial sac contents goes through lacunar ligament

2. When Meckel's diverticulum comprises contents of hernia sac

3. When the urinary bladder serves as a part of the hernia sac.

4. When appendix comprises contents of hernia sac

5. There are no correct answers

4. Inguinal hernia strangulation surgery…

1. Is held under endotracheal anesthesia

2. Skin incision is made parallel to Poupart's ligament and a little bit higher than it

3. One of the first steps f the operation is hernial sac dissection, and then hernia sac is opened

4. One of the first steps of the operation is opening of the hernia sac, and then external abdominal ring is dissected

5. First of all median laparotomy is held

Choose the correct combinations of answers:

a) 1, 3

b) 2, 3

c) 1, 4

d) 2, 4

e) There are no correct answers

5. How is called the hernia with strangulation of only a part of colon wall?

1. Cloquet`s hernia

2. Richter`s hernia

3. Littre`s hernia

4. Hesselbach`s hernia 42

5. Laugier`s hernia

6. What is the main sign of sliding hernia?

1. Drags in the lumbar region

2. Drags between muscles

3. Retroperitoneal organ is wall of the hernia sac

4. Comes out from the lacunar ligament

5. Parietal peritoneum is a wall of hernia sac

7. Strangulated femoral hernia should be differentiated from:

1. Inguinal lymphadenitis

2. Femoral lymphadenitis

3. Tuberculous abscess cold sinter

4. Strangulated inguinal hernia

5. Thrombophlebitis of varicose node in the orifice of the great saphenous vein

Choose the correct combinations of answers:

a) 1, 2, 3

b) 2, 3, 4

c) 2, 4, 5

d) 1 2, 5

e) All answers are correct

8. During the strangulated hernia surgery after the opening of the hernail sac there were no contents in it. The wall of the sac is edematous, hyperemic. It has 40 ml of inflammatory exudate. What type of strangulation is it?

1. Parietal

2. Littré`s hernia

3. False incarceration

4. Retrograde strangulation

5. Richter`s hernia

9. During the examination of a patient with a strangulated inguinal hernia (prescription of strangulation - 2 hours) spontaneous reduction of hernial contents occured. Your actions?

1. Supervision of a patient in hospital

2. Emergency herniotomy

3. The patient may be let go home

4. Laparotomy with revision of the intestine and herniotomy

5. Emergency laparoscopy

10. What are the symptoms of external abdominal hernia strangulation?

1. Sharp pains in the area of protrusion

2. The protrusion is irreducible

3. The protrusion is painful and tensed

4. High tympanitis above the hernial protrusion

5. Positive cough impulse

Choose the correct combination of answers:

a) 1, 2, 3

b) 2, 3, 4

c) 1, 2, 5

d) 3, 4, 5

e) 1, 4, 5

Situational task 1

Patient M, 36 years old, was admitted to the hospital with complaints of a tumor-like formation in the epigastric region. A tumor formation arose 3 years ago, gradually increasing in size. Objectively: in the epigastric region, a tumor-like formation of 8x6 cm, an elastic consistency, painless, and settling into the abdominal cavity is determined. There is also a defect in the aponeurosis with a diameter of up to 3 cm. There is no other pathology.

1.Make a preliminary diagnosis.

2.What diseases should be used for differential diagnosis?

3. What operation is indicated for this patient?

Situational task 2

Patient P., 36 years old, was admitted to the clinic with complaints of a tumor formation in the left inguinal region. Sick 5 years, education gradually increases in diameter. Objectively: on the left, just below the pupartic ligament, there is a tumor-like

formation 5x3 cm in size, which sets in the abdominal cavity. No other pathology was found.

1.Make a preliminary diagnosis.

2.What diseases should be used for differential diagnosis?

3. What operation is indicated for this patient?

Situational task 3

Patient M, 46 years old, was admitted to the clinic with complaints of the presence of a tumor-like formation in the area of the surgical scar along the midline of the abdomen. 3 years ago she underwent surgery for destructive cholecystitis, peritonitis. The wound healed by secondary intention. Objectively: in the midline of the abdomen from the xiphoid process to the navel there is an operative scar, in the center of which there is a tumor-like formation with a diameter of up to 15 cm, the elastic consistency adjusts freely into the abdominal cavity. An objective examination of another pathology was not found.

1.Make a preliminary diagnosis.

2. Indicate the cause of the disease.

3. What is the treatment tactic?

Answers to Tests and Tasks

1. c
2. 4
3. 3
4. d
5. 2
6. 3
7. e
8. 3

9. 1

10. a

Situational task 1

1. A hernia of the white line of the abdomen.

2. Lipoma of the anterior abdominal wall.

3. Hernia repair with plastic surgery of the anterior abdominal wall according to Sapeshko.

Situational task 2

1. Left-sided femoral hernia.

2. Inguinal hernia, varicose veins of the great saphenous vein, inguinal lymphadenitis.

3. Hernia repair with plastic of the femoral canal.

Situational task 3

1. Incisional hernia.

2. The inflammatory process of the anterior abdominal wall.

3. Planned surgical intervention.

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