Pathology

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- Obstruction of the appendiceal lumen seems to be essential for appendiceal perforation. However, in many cases of early appendicitis, the appendix lumen is patent despite the presence - of mucosal inflammation and lymphoid hyperplasia. Occa - sional clustering of cases among children and young adults suggests an infective agent, possibly viral, which initiates an inflammatory response. Seasonal variation in the incidence is also observ ed, with more cases occurring between May and August in northern Europe than at other times of the year. Lymphoid hyperplasia narrows the lumen of the appen - - dix. Once obstruction occurs, continued mucus secretion and inflammatory exudation increase intraluminal pressure, obstructing lymphatic drainage. Oedema and mucosal cosa. Resolution may occur at this point either spontaneously or in response to antibiotic therapy . If the condition progresses, further distension of the appendix may cause venous obstruc tion and ischaemia of the appendix wall. With ischaemia, bacterial invasion occurs through the muscularis propria and submucosa, producing acute appendicitis (Figure 76.6 Finally , ischaemic necrosis of the appendix wall produces gangrenous appendicitis, with free bacterial contamination of the peritoneal cavity . Alternatively , the greater omentum and loops of small bowel become adherent to the inflamed appen dix, walling o ff the spread of peritoneal contamination and resulting in a phlegmonous mass or paracaecal abscess. Rarely , appendiceal inflammation resolves, leaving a distended mucus filled organ termed a mucocele of the appendix. Peritonitis occur s as a result of free migration of bacteria through an ischaemic appendicular wall, frank perforation of a gangrenous appendix or delayed perforation of an appendix abscess. Factors that promote this process include extremes of age, immunosuppression, diabetes mellitus, faecolith obstruc tion of the appendix lumen, a free-lying pelvic appendix and previous abdominal surgery that limits the ability of the greater omentum to wall o ff the spread of peritoneal contamination. In these situations, a rapidly deteriorating clinical course is accompanied by signs of di ff use peritonitis and systemic sepsis syndrome. Summary box 76.1 Risk factors for perforation of the appendix /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF /uni25CF John Benjamin Murphy , 1857–1916, Professor of Surgery , Northwestern University , Chicago, IL, USA. History - Appendicitis is relatively rare in infants under 36 months of age and, for obvious reasons, the patient is unable to give a history . Because of this, diagnosis is often delayed, and thus). the incidence of perforation and postoperative morbidity is considerably higher than in older children. In older age groups the classical features of acute appendi - citis begin with poorly localised colicky abdominal pain. This - is due to midgut visceral discomfort in response to appendi - ceal inflammation and obstruction. The pain is frequently first noticed in the periumbilical region and is similar to, but less - intense than, the colic of small bowel obstruction. Central abdominal pain is associated with anorexia, nausea and usually one or two e pisodes of vomiting that follow the onset of pain (Murphy). Anorexia is a useful

and constant clinical feature, particularly in children, who invariably also have vomiting. The patient often gives a history of similar discomfort that - settled spontaneously . A family history is also useful as up to one-third of children with appendicitis have a first-degree rela - tive with a similar history . In women of childbearing age pelvic disease can mimic acute appendicitis and a careful gynaecolog - ical history should be taken, concentrating on menstrual cycle, vaginal discharge and possible pregnancy . Summary box 76.2 Symptoms of appendicitis /uni25CF /uni25CF /uni25CF /uni25CF

Extremes of age Faecolith obstruction Immunosuppression Pelvic appendix Diabetes mellitus Previous abdominal surgery (a) Figure 76.6 Acutely in /f_l amed appendix with purulent exudate extending to the mesoappendix in a 28-year-old man as seen at laparoscopy and a photomicrograph (original magni /f_i cation × 20) (b) from the same patient showing the appendix with pus- /f_i lled lumen (L) and in /f_l ammation extending to in /f_l amed serosa (S) (courtesy of Professor C O’Keane, FFPath, FRCPI, Dublin, Ireland). Periumbilical colic Anorexia Pain shifting to the right iliac Nausea fossa (b) S L (a)

etal peritoneum in the right iliac fossa becomes irritated, pro ducing more intense, constant and localised somatic pain that begins to predominate. Patients often report this as an abdom inal pain that has shifted and changed in character. Typically , coughing or sudden movement exacerba tes the right iliac fossa pain. The classic visceral–somatic sequence of pain is present in only about half of those pa tients subsequently proven to have acute appendicitis. A typical presentation includes pain that is predominantly somatic or visceral and poorly localised. Atyp ical pain is more common in the elder ly , in whom localisation to the right iliac fossa is unusual. An inflamed appendix in the pelvis may not produce somatic pain involving the anterior abdominal wall, but instead cause suprapubic discomfort and tenesmus. In this circumstance, tenderness may be elicited only on rectal e xamination and is the basis for the recommendation that a rectal examination should be performed on every patient who presents with acute lower abdominal pain. During the first 6 hours, there is rarely any alteration in temperature or pulse rate. After that time, slight pyrexia (37.2–37.7°C) with a corresponding increase in the pulse rate to 80–90 beats per minute is usual. However, in 20% of patients there is no pyrexia or tachycardia in the early stages. In children, a temperature greater than 38.5°C suggests other causes (e.g. mesenteric adenitis; see Di ff erential diagnosis, Children). Typically , two clinical syndromes of acute appendicitis can be discerned: acute catarrhal (non-obstructive) appendicitis and acute obstructive appendicitis, the latter characterised by a more acute course. The onset of symptoms is abrupt and there may be generalised abdominal pain from the start. The temperature may be normal and vomiting is common, so the clinical picture may mimic acute intestinal obstruction. Signs The diagnosis of appendicitis rests more on thorough clinical examination of the abdomen than on any aspect of the history or laboratory investigation. The cardinal features are those of an unwell patient with low-grade pyrexia, localised abdom inal tenderness, muscle guarding and rebound tenderness. Inspection of the abdomen may show limitation of respiratory movement in the lower abdomen. The patient is then asked to point to where the pain began and w here it moved (pointing sign). Gentle superficial palpation of the abdomen, beginning in the left iliac fossa and moving anticlockwise to the right iliac Summary box 76.3 Clinical signs in appendicitis /uni25CF /uni25CF /uni25CF /uni25CF Neils Thorkild Rovsing , 1862–1937, Professor of Surgery , Copenhagen, Denmark. Sir Vincent Zachary Cope , 1881–1975, surgeon, St Mary’s Hospital, London, UK James Douglas , 1715–1742, anatomist and midwife who practised in London, UK, described this pouch in

1730. tenderness, classically McBurney’s point. Asking the patient to - cough or gentle percussion over the site of maximum tender - ness will elicit rebound tenderness (see Chapter 63). - Deep palpation of the left iliac fossa may cause pain in the right iliac fossa, Rovsing’s sign, which is helpful in supporting a clinical diagnosis of appendicitis. Occasionally , an inflamed appendix lies on the psoas muscle, and the patient, often a young adult, will lie with the right hip flexed for pain relief (the psoas sign). Spasm of the obturator internus is sometimes - demonstrable when the hip is flexed and internally rotated. If an inflamed appendix is in contact with the obturator internus, this manoeuvre will cause pain in the hypogastrium (the obtu - rator test; Zachary Cope). Cutaneous hyperaesthesia may be demonstrable in the right iliac fossa, but is rarely of diagnostic value. Summary box 76.4 Signs to elicit in appendicitis /uni25CF /uni25CF /uni25CF /uni25CF Special features, according to position of the appendix Retrocaecal Rigidity is often absent, and even application of deep pressure may fail to elicit tenderness (silent appendix), the reason being that the caecum, distended with gas, prevents the pressure exerted by the hand from reaching the inflamed structure. However, deep tenderness is often present in the loin, and rigidity of the quadratus lumborum may be in evidence. Psoas spasm, due to the inflamed appendix being in contact with that muscle, may be su ffi cient to cause flexion of the hip joint. Hyperextension of the hip joint may induce abdominal pain when the degree of psoas spasm is insu ffi cient to cause flexion - of the hip. Pelvic Occasionally , early diarrhoea results from an inflamed appen - dix being in contact with the rectum. When the appendix lies entirely within the pelvis, there is usually complete absence of abdominal rigidity , and often tenderness over McBurney’s point is also lacking. In some instances, deep tenderness can be made out just above and to the right of the symphysis pubis. In either event, a rectal examination reveals tenderness in the rectovesical pouch or the pouch of Douglas, especially on the right side. Spasm of the psoas and obturator internus muscles may be present when the appendix is in this position. An inflamed appendix in contact with the bladder may cause frequency of micturition. This is more common in children.

Pyrexia Localised tenderness in the right iliac fossa Muscle guarding Rebound tenderness Pointing sign Psoas sign Rovsing’s sign Obturator sign

Postileal In this case, the inflamed appendix lies behind the terminal ileum. It presents the greatest di ffi culty in diagnosis because the pain may not shift, diarrhoea is a feature and marked retching may occur. Tenderness, if any , is ill defined, although it may be present immediately to the right of the umbilicus.

Children Adult Gastroenteritis Regional enteritis Mesenteric adenitis Ureteric colic Meckel’s diverticulitis Perforated peptic ulcer Intussusception Torsion of testis Henoch–Schönlein purpura Pancreatitis Lobar pneumonia Rectus sheath haematoma

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