Abscess and pus

What is an abscess?

An abscess is a localised tissue collection of pus. If pus forms in the pleural space or peritoneum it may be loculated and so considered to be an abscess (such as an appendix abscess or subdiaphragmatic abscess) or lie free and be an empyema or purulent generalised peritonitis.

What tissue is the wall of an abscess characteristically composed of?

Granulation tissue. This used to be called the "*pyogenic membrane*", but it is not a true membrane and is not itself pyogenic.

What is pus?

Pus is the product of acute inflammation composed of cellular and fluid, exudative phases. When the cause of pus formation is infective, the *solid* phase consists of:

- Live and dead polymorphs
- Live and dead macrophages
- Live and dead bacteria or other causative agent
- Dead human epithelial and connective tissue cells from the tissues involved in the acute inflammation
- A fibrin meshwork on which macrophages function much better

The *fluid* phase of pus is an exudate, which consists of water that permits migration of inflammatory cells and carries:

- Immunoglobulins for opsonisation
- Complement components for anaphylaxis, chemotaxis, opsonisation and membrane damage
- Clotting cascade factors which result in the fibrin meshwork above
- Inflammatory mediators other than the above such as arachidonic acid, kinins, cytokines

When the abscess is a sterile abscess micro-organisms are absent. Causes of sterile abscess include:

- Intramuscular injection of irritant pharmaceutical agents such as paraldehyde (historical only: no longer used therapeutically)
- Sterilisation by antimicrobials of a septic abscess

What is the natural history of an abscess?

To discharge itself through a line of least resistance.

What does the osmotic pressure of a solution depend on?

On the number of molecules present.

In pus, the number of these molecules increases constantly. Why?

Because of enzymes released from polymorphs and macrophages which split long-chain molecules such as proteins into smaller fragments. Then these fragments are further split, so the osmotic pressure increases until there is discharge of the pus into a hollow viscus, along fascial lines, into the peritoneal or other potential cavity, or out through the skin or mucous membranes.

Acromegaly

What is the definition of acromegaly?

The effects of excess growth hormone in an adult body (i.e. in a patient beyond the age at which bone and other normal growth has ceased).

What are the causes of acromegaly?

- Human growth hormone (hGH) secreted from an adenoma of the anterior pituitary (from chromophobe or acidophil cells called *somatotrophs*)
- Very rarely ectopic secretion of hGH from carcinoma of the pancreas, lung or small intestine

What surgically important diseases are associated with acromegaly?

- Osteoporosis and fractures
- Orthodontic procedures because of abnormality of bite
- Increased incidence of neoplastic large bowel polyps and adenocarcinoma of large bowel:
  - mediated by the actions of insulin-like growth factors from the liver
- Increased incidence of gall stones and gall bladder disease
- Increased incidence of hernia
- Increased incidence of the complications of diabetes mellitus
- Complications of reconstructive and related surgery

Actinomycosis

Why should a surgeon know about actinomycosis?

- Affects the neck (most commonly) and also the thorax, appendix, peritoneal cavity and central nervous system (CNS)
- Causes a local swelling with abscess formation, local fibrosis, and sinuses draining the area
- Can mimic a malignant neoplasm leading to overtreatment with consequent morbidity and mortality
- Relatively rare, usually responds to penicillin though a prolonged period of treatment is necessary
- Commoner in men than women, for no apparent reason
- Rare in children and people over 60 years

What pathogens characteristically cause actinomycosis?

- *Actinomyces israelii* is the commonest. The others (*Actinomyces naeslundii*, *Actinomyces odontolyticus*, *Actinomyces meyeri*) are rare
  - Gram-positive, anaerobic, filamentous bacteria
  - Commensal in the oral cavity, alimentary tract and female genital system
  - No risk of person-to-person spread of actinomycosis

What factors predispose to actimomycosis?

- Pathogenic only when there is tissue damage
  - Oral, facial and cervical involvement is characteristically only after dental operations, direct trauma or local sepsis from other organisms
  - Pulmonary involvement usually follows aspiration of oral, pharyngeal or upper gastrointestinal fluids

- Alimentary involvement is usually associated with breakdown of the mucosal barrier by appendicitis, diverticulitis, operative surgery and other trauma, or occasionally foreign bodies
- In the female genital system, infection has been linked with use of an intrauterine device, whether for contraception or hormone-replacement therapy

What is its characteristic course?

- Indolent
- Progressively forms fibrous tissue, multiple abscess, sinuses and fistulae
- Associated with pain, weight loss, fever, palpable mass, obstruction
- Often confused with malignancy

How may the diagnosis be suspected at the time of surgery?

- Yellow "sulphur granules"
  - Seen in pus in less than half of cases
  - Not pathognomonic
- Most cases are diagnosed post-operatively
- The organism takes a long time to grow: the patient's history and clinical findings should be discussed with a microbiologist

How may the diagnosis be made pre-operatively?

By a high index of suspicion and fine needle aspirate.

There are no serological or skin-sensitivity tests that will help in diagnosis. The main problem is to distinguish actinomyces infection from nocardia infection.

Adrenocortical insufficiency and Addison's disease

What is Addison's disease?

Adrenocortical insufficiency as a result of extensive bilateral destruction of the layers of the adrenal cortices. Thomas Addison (1793–1860) of Guy's Hospital, London described the disease in 1849 and 1855. His patients had bilateral adrenal tuberculosis.

How many anatomical layers does the adrenal have?

Three:

- Zona glomerulosa which secretes aldosterone
- Zona fasciculata–reticularis i.e. one zona which secretes cortisol and sex hormones
- Medulla

What are the causes of adrenocortical insufficiency?

- Infective with bilateral severe involvement of the adrenal glands
  - Tuberculosis
  - Fungal infections such as coccidioidomycosis, blastomycosis
- Infective with adrenal destruction as a secondary feature
  - Waterhouse–Friderichsen syndrome from meningococcal septicaemia
- Deposition
  - Extensive bilateral involvement by metastatic carcinoma

  - Haemochromatosis
  - Amyloidosis
- Autoimmune adrenalitis
- Iatrogenic
  - Bilateral adrenalectomy (as part of the treatment of breast carcinoma or Cushing's syndrome caused by ectopic adrenocorticotropic hormone (ACTH) secretion from an unidentified primary site) with inadequate replacement
  - Adrenolytic drugs such as *o*-*p*-dichlorodiphenyl-dichloroethane (*o*-*p*-DDD) and ketoconazole without replacement
  - Metyropone treatment without replacement
  - Sudden withdrawal of long-term steroid therapy

What are the clinical features of Addison's disease?

- Weight loss
- Ill-defined malaise
- Skin pigmentation especially in palmar creases, scars, genitalia and nipples, and on light exposed areas. The pigmentation occurs because of the reactive increase in pro-opiomelanocortin (POMC), from the anterior pituitary with increase in MSH (melanocyte-stimulating hormone) and ACTH as a consequence

What are the biochemical changes in the serum of patients with Addison's disease?

- Hyponatraemia
- Hyperkalaemia
- Increased serum ACTH
- Decreased serum aldosterone, cortisol

AIDS and neoplasia

What neoplasms characteristically occur in patients with AIDS?

- Lymphoma, of which the type is:
  - Commonly a B-cell non-Hodgkin's lymphoma (NHL)
  - Less commonly a T-cell NHL
  - Occasionally, an unusual aggressive form of Hodgkin's lymphoma that arises in sites that would be unusual for Hodgkin's disease in patients who do not have AIDS
- Skin neoplasms
  - Squamous cell papilloma, often with atypical appearances
  - Squamous cell carcinoma, especially of the skin of the anus and vulva
- Cervical neoplasms
  - Squamous cell carcinoma of cervix
- Laryngeal neoplasms
  - Squamous cell carcinoma of larynx

Toxoplasmosis can mimic a solitary brain neoplasm such as astrocytoma or a cerebral cyst. Kaposi's sarcoma, classically involving the skin, anus, large bowel and elsewhere is now considered to be a reactive process caused by human herpes simplex virus type 8.

What type of virus is HIV?

An RNA retrovirus that requires reverse transcriptase. It has core protein and RNA surrounded by a glycoprotein envelope and infects cells via CD4 receptors.

How may HIV be associated with a surgical "acute abdomen"?

- Bacterial enteritis
- Haemorrhage or other complications from Kaposi's sarcoma of gastrointestinal tract (GIT)
- Cytomegalovirus (CMV) infection of colon with megacolon
- Involvement of the GIT by lymphoma, classically NHL
- Infection of the GIT by mycobacteria, especially atypical mycobacteria, such as *Mycobacterium avium intracellulare* (MAI)
- By chance, such as appendicitis and diverticulitis

Alcohol-related disease

What are the physiological and pathological effects of ethyl alcohol on the body?

It affects principally the CNS, the stomach and pancreas, the larynx and the liver.

What are the hepatic changes as a consequence of excessive alcohol consumption?

- Fatty change, once considered innocuous and now considered to be damaging
- Alcoholic hepatitis with liver cell damage
- Cirrhosis, classically micronodular unless the person then gives up drinking, when it becomes mixed and then macronodular
- Hepatocellular carcinoma

How is alcohol metabolised by the liver?

- Microsomal ethanol oxidising system enzymes principally
- Alcohol dehydrogenase
- Catalase reaction

All of these reactions metabolise ethyl alcohol to acetic acid.

What CNS effects of alcohol would come to surgical notice?

- Head injury with the risk of intracranial haemorrhage
- Road traffic accidents, other physical trauma
- Cerebellar degeneration
- Korsakov's psychosis