دعمارنجم

ACUTE HAEMATOGENOUS OSTEOMYELITIS

Aetiology and pathogenesis

Acute haematogenous osteomyelitis is mainly a disease of children.

In children between 1 and 4 years of age the Gram negative *Haemophilus influenzae* used to be a fairly common pathogen for osteomyelitis and septic arthritis following upper respiratory infection, but the introduction of *H. influenzae* type B vaccination about 20 years ago has been followed by a much reduced incidence of this infection in many countries. *In children* the infection usually starts in the vascular metaphysis of a long bone, most often in the proximal tibia or in the distal or proximal ends of the femur.

In adults, haematogenous infection accounts for only about 20% of cases of osteomyelitis, mostly affecting the vertebrae. *Staphylococcus aureus* is the commonest organism but *Pseudomonas aeruginosa* often appears in patients using intravenous drugs.

Adults with diabetes, who are prone to soft-tissue infections of the foot, may develop contiguous bone infection involving a variety of organisms.

Clinical features

Children The patient, usually a child over 4 years, presents with severe pain, malaise and a fever; in neglected cases, toxaemia may be marked. The parents will have noticed that he or she refuses to use one limb or to allow it to be handled or even touched. There may be a recent history of infection: a septic toe, a boil, a sore throat or a discharge from the ear.

the gentlest manipulation is painful and joint movement is restricted (‘pseudoparalysis’). Local redness, swelling, warmth and oedema are later signs and signify that pus has escaped from the interior of the bone.

Infants In children under a year old simply fails to thrive and is drowsy but irritable. Suspicion should be aroused by a history of birth difficulties, umbilical artery catheterization or a site of infection Metaphyseal tenderness and resistance to joint movement can signify either osteomyelitis or septic arthritis; indeed, both may be present,

Adults The commonest site for haematogenous infection is the thoracolumbar spine. There may be a history of some urological procedure followed by a mild fever and backache. Local tenderness is not very marked and it may take weeks before x-ray signs appear; in the very elderly, and in those with immune deficiency, systemic features are mild and the diagnosis is easily missed.

Diagnostic imaging
PLAIN X-RAY
Faint extra-cortical outline due to periosteal new bone formation appear in second week
MRI It is extremely sensitive, even in the early phase of bone infection

Laboratory investigations
ESR CRP WBC ARE ELEVATED

In the very young and the very old these tests are less reliable and may show values within the range of normal.

Osteomyelitis in an unusual site sickle-cell disease (*Salmonella* may be cultured from the faeces) or deficient host defence mechanisms including HIV infection.

Differential diagnosis
Cellulitis This is often mistaken for osteomyelitis. There is widespread superficial redness and lymphangitis. The organism is usually staphylococcus or streptococcus. Mild cases will respond to high dosage oral antibiotics; severe cases need intravenous antibiotic treatment.

Acute suppurative arthritis **Tenderness** is diffuse, and movement at the joint is completely abolished by muscle spasm. A progressive rise in C-reactive protein values over 24–48 hours is said to be suggestive of concurrent septic arthritis

Streptococcal necrotizing myositis Group A betahaemolytic streptococci invade muscles and cause an acute myositis which, in its early stages, may be mistaken for cellulitis or osteomyelitis it is rare but serious lead to muscle necrosis, septicaemia and death

Sickle-cell crisis The patient may present with features indistinguishable from those of acute osteomyelitis. In areas where *Salmonella* is endemic it would be wise to treat such patients with suitable antibiotics until infection is definitely excluded.

Gaucher's disease 'Pseudo-osteitis' may occur with features closely resembling those of osteomyelitis. The diagnosis is made by finding other stigmata of the disease, especially enlargement of the spleen and liver.

Treatment

There are four important aspects to the management of the patient:
• Supportive treatment for pain and dehydration.
• Splintage of the affected part.
• Appropriate antimicrobial therapy.
• Surgical drainage.

GENERAL SUPPORTIVE TREATMENT

Analgesics for pain. Septicaemia and fever can cause severe dehydration and it may be necessary to give fluid intravenously.

SPLINTAGE

for comfort but also to prevent joint contractures. Simple skin traction may suffice and, if the hip is involved, this also helps to prevent dislocation.

ANTIBIOTICS
treatment should not await the result .IV AB should given

• *Neonates and infants up to 6 months of age*
against penicillin-resistant *Staphylococcus aureus*, Group B streptococcus and Gram-negative organisms. Drugs of choice are flucloxacillin plus a third-generation cephalosporin like cefotaxime.

• *Children 6 months to 6 years of age*
against *Haemophilus influenzae*, intravenous flucloxacillin and cefotaxime or cefuroxime.

• *Older children and previously fit adults*
a staphylococcal infection and can be started on intravenous flucloxacillin and fusidic acid.
• *Elderly and previously unfit patients*
usual risk of Gram-negative infections, due to respiratory, gastro-intestinal, or urinary disorders The antibiotic of choice would be a combination of flucloxacillin and a second- or third-generation cephalosporin.
• *Patients with sickle-cell disease*
cases is due to salmonella and/or other Gram-negative organisms Now adays the antibiotic of choice is a third-generation cephalosporin or a fluoroquinolone like ciprofloxacin.
• *immunocompromised patients*
Unusual infections (e.g. with *Pseudomonas aeruginosa*, *Proteus mirabilis* or anaerobic *Bacteroides* species) antibiotic such as one of the third-generation cephalosporins or a fluoroquinolone preparation, depending on the results of sensitivity tests.
• *Patients considered to be at risk of meticillin-resistant Staphylococcus aureus (MRSA) infection*
treated with intravenous vancomycin (or similar antibiotic) together with a third-generation cephalosporin.
The usual program is to administer the drugs intravenously usually takes 2–4 weeks then be administered orally for another 3–6 weeks CRP, ESR and WBC values are also checked at regular intervals and treatment can be discontinued when these are seen to remain normal.

DRAINAGE
If antibiotics are given early (within the first 48 hours after the onset of symptoms) drainage is often unnecessary. if there are signs of deep pus (swelling, edema, fluctuation), aspirated, the abscess should be drained by open operation under general anesthesia. Once the signs of infection subside, movements are encouraged and the child is allowed to walk with the aid of crutches. Full weight bearing is usually possible after 3–4 weeks.

Complications
1 Epiphyseal damage and altered bone growth

2 Suppurative arthritis This may occur:
(1) in very young infants, in whom the growth disc is not an impenetrable barrier;
(2) where the metaphysis is intracapsular, as in the upper femur; or
(3) from metastatic infection.
diagnosis is given by joint aspiration.

3 Metastatic infection This is sometimes seen – generally in infants – and may involve other bones, joints, serous cavities, the brain or lung.

4 Pathological fracture Fracture is uncommon

Chronic osteomyelitis

more frequently follows an open fracture or operation. The usual organisms (and with time there is always a mixed infection) are *Staphylococcus aureus*, *Escherichia coli*, *Streptococcus pyogenes*, *Proteus mirabilis* and *Pseudomonas aeruginosa*; in the presence of foreign implants *Staphylococcus epidermidis*, which is normally non-pathogenic, is the commonest of all.

Clinical features
The patient presents because pain, pyrexia, redness and tenderness have recurred (a ‘flare’), or with a discharging sinus. In longstanding cases the tissues are thickened and often puckered or folded inwards where a scar or sinus adheres to the underlying bone. There may be a seropurulent discharge and excoriation of the surrounding skin. In post-traumatic osteomyelitis the bone may be deformed or ununited.

Imaging

X-ray examination will usually show bone resorption, loss of trabeculation, area of osteoporosis or periosteal thickening

CT and *MRI* are invaluable in planning operative treatment: together they will show the extent of bone destruction and reactive oedema, hidden abscesses and sequestra.

Treatment

ANTIBIOTICS are important
(a) to suppress the infection and prevent its spread to healthy bone and
(b) to control acute flares.

Fusidic acid, clindamycin and the cephalosporins are good examples. Vancomycin and teicoplanin are effective in most cases of *meticillin-resistant infection (MRSA). Staphylococcus aureus,* Antibiotics are administered for 4–6 weeks

LOCAL TREATMENT

A sinus may be painless and need dressing simply to protect the clothing. An acute abscess may need urgent incision and drainage, but this is only a temporary measure.

Operation

1 Debridement

At operation all infected soft tissue and dead or devitalized bone, as well as any infected implant, must be excised. After three or four days the wound is inspected and if there are renewed signs of tissue death the debridement may have to be repeated– several times if necessary. Antibiotic cover is continued for at least 4 weeks after the last debridement.

2 Dealing with the 'dead space

1 Porous antibiotic- impregnated beads
2 cancellous bone grafts

3 Soft-tissue cover

For small defects split thickness skin grafts may suffice; for larger wounds local musculocutaneous flaps, or free vascularized flaps, are needed.

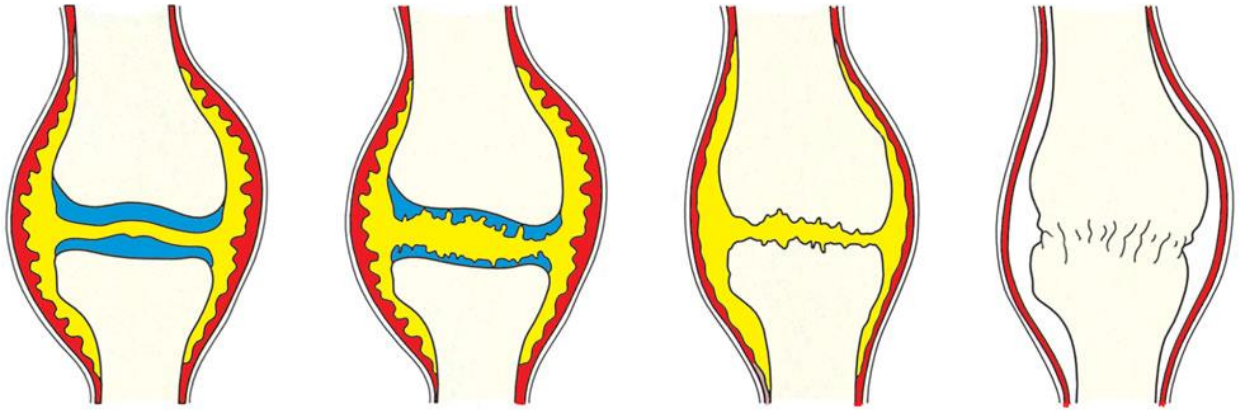
Aftercare Success is difficult to measure

ACUTE SUPPURATIVE ARTHRITIS

A joint can become infected by:
(1) direct invasion through a penetrating wound, intra-articular injection or arthroscopy; (2) direct spread from an adjacent bone abscess
(3) blood spread from a distant site.

The causal organism is usually *Staphylococcus aureus*; however, in children between 1 and 4 years old, *Haemophilus influenzae* is an important pathogen unless they have been vaccinated against this organism. Occasionally other microbes, such as *Streptococcus, Escherichia coli* and *Proteus*, are encountered. Predisposing conditions are rheumatoid arthritis, chronic debilitating disorders, intravenous drug abuse, immunosuppressive drug therapy and acquired immune deficiency syndrome (AIDS).

Pathology



Acute suppurative arthritis – pathology

In the early stage **(a)**, there is an acute synovitis with a purulent joint effusion. **(b)** Soon the articular cartilage is attacked by bacterial and cellular enzymes. **(c)**If the infection is not arrested, the cartilage may be completely destroyed. **(d)** Healing then leads to bony ankylosis.

With healing there may be:
(1) complete resolution and a return to normal;
(2) partial loss of articular cartilage and fibrosis of the joint;
(3) loss of articular cartilage and bony ankylosis
(4) bone destruction and permanent deformity of the joint.

Clinical features
In new-born infants the emphasis is on septicaemia rather than joint pain. The baby is irritable and refuses to feed; there is a rapid pulse and sometimes a fever.
In children the usual features are acute pain in a single large joint (commonly the hip or the knee) and reluctance to move the limb ('pseudoparesis'). The child is ill, with a rapid pulse and a swinging fever. There is local warmth and marked tenderness.
In adults it is often a superficial joint (knee, wrist, a finger, ankle or toe) that is painful, swollen and inflamed. There is warmth and marked local tenderness, and movements are restricted.

Imaging
Ultrasonography is the most reliable method widening of the space between capsule and bone of more than 2 mm is indicative of an effusion

X-ray examination is usually normal early on but signs to be watched for are soft-tissue swelling, loss of tissue planes, widening of the radiographic 'joint space' and slight subluxation

MRI and *radionuclide imaging* are helpful in diagnosing arthritis in obscure sites such as the sacroiliac and sternoclavicular joints.

Investigations

A white cell count and Gram stain should be carried out immediately: the normal synovial fluid leucocyte count is under 300 per mL; it may be over 10 000 per mL in non-infective inflammatory disorders, but counts of over 50 000 per mL are highly suggestive of sepsis.

Differential diagnosis

Acute osteomyelitis, Other types of infection, Trauma, Irritable joint, Haemophilic bleed, Rheumatic fever, Juvenile rheumatoid arthritis, Sickle-cell disease , Gaucher's disease, Gout and pseudogout In adults

Treatment

The first priority is to aspirate the joint and examine the fluid.

GENERAL SUPPORTIVE CARE
Analgesics are given for pain and intravenous fluids for dehydration.
SPLINTAGE
The joint should be rested, and for neonates and infants this may mean light splintage; with hip infection, the joint should be held abducted and 30 degrees flexed, on traction to prevent dislocation.

ANTIBIOTICS
Neonates and infants up to the age of 6 months protected against staphylococcus flucloxacillin plus a third-generation cephalosporin.
Children from 6 months to puberty can be treated similarly. Unless they had been immunized there is a risk of *Haemophilus* infection.
Older teenagers and adults can be started on flucloxacillin and fusidic acid.

Antibiotics should be given intravenously for 4–7 days and then orally for another 3 weeks.

DRAINAGE
Under anaesthesia the joint is opened through a small incision, drained and washed out with physiological saline. A small catheter is left in place and the wound is closed; suction–irrigation is continued for another 2 or 3 days.
This is the safest policy and is certainly advisable
(1) in very young infants, (2) when the hip is involved and (3) if the aspirated pus is very thick.

Complications

1 Subluxation and dislocation of the hip, or instability of the knee should be prevented by appropriate posturing or splintage.

2 Damage to the cartilaginous physis or the epiphysis in the growing child is the most serious complication.

3 Articular cartilage erosion (chondrolysis) may result in restricted movement or complete *ankylosis of the joint.*