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Acute osteitis and septic arthritis

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Orthopaedic infections are common, often crippling and sometimes life threatening. They are a surgical emergency.

The majority develop from haematogenous spread of circulating organisms to the bone or joint, but a minority arise from direct contamination by penetrating wounds or surgery. Most haematogenous bone infections develop in bone with a good blood supply, usually the metaphyses of long bones in children (commonly the hip and knee), or the vertebrae in adults. The vascularity of joints allows septic arthritis to develop at any age.

Not only the virulence and circulating load of the infecting bacteria are important, but also the host factors that reduce the immune response to infection. In South Africa, the high incidence of HIV/AIDS has resulted in atypical infections, which must be considered in the diagnosis of any musculoskeletal pathology in adults. Diabetes mellitus, malnutrition and steroid medication are other important factors.

Bacteriology

Acute infections are most often caused by *Staphylococcus aureus,* less commonly group B streptococci. Osteitis in infants is often caused by *Escherichia coli* or other Gram-negative bacteria. *Haemophilus influenzae* infects children up to 5 years of age who are not immunised. Gonococcal arthritis may affect multiple joints and should be considered in adults.

Diagnosis

Acute osteitis and septic arthritis occur in or close to major joints, and may be difficult to distinguish from each other or from pyomyositis. *Cellulitis is rare in children.* The limb is swollen, inflamed and very painful. Movement and use of the limb are resisted. Septic arthritis typically causes an effusion in the knee and more severe loss of movement of the affected joint than osteitis. Osteitis may lead to secondary arthritis in the hip and knee. Patients have a fever and are ill. Infection is confirmed by a raised neutrophil count, and by determining the ESR and C-reactive protein. Radiographs are of no use for diagnosing osteitis in the first week, but will exclude a fracture in patients with a confusing history of minor trauma. Ultrasound is useful to confirm the presence of fluid in an inaccessible joint such as the hip.

All patients should be referred to an orthopaedic surgeon, as the majority will require emergency surgical drainage. If referral is impossible the diagnosis is confirmed by aspiration of the joint or bone under anaesthesia, and pus is sent for microbiological examination before antibiotics are started. Blood cultures may also be taken.

Neonatal osteitis may be undramatic and present with pseudoparalysis or failure to use a limb.

Treatment

Intravenous cloxacillin is the initial antibiotic of choice. It has to be started immediately after specimens are taken for microbiology, and changed later according to bacterial culture and sensitivity. The joint or subperiosteal abscess should be drained and washed out under general anaesthesia. In the case of osteitis, one or two drill holes should be made in the metaphysis to drain the medullary cavity. Wounds should be closed over suction drains, and the limb immobilised in a cast or by traction.

Septic arthritis of the hip should always be drained *on the grounds of a clinical diagnosis alone* as aspiration for confirmation of the diagnosis is unreliable.

It is preferable to perform drainage unnecessarily than to risk the possibility of even a few hours of continuing damage to the bone or joint.

Intravenous antibiotics are continued until the pyrexia subsides, after which they should be administered orally for a total of 6 weeks, or until infective markers have normalised. If clinical infection persists, re-exploration is required to drain recurrent collections of pus. Joints should be mobilised within the patient's pain tolerance after about a week, and weight bearing restricted for 4 - 6 weeks by using crutches.

Very early or subacute cases of osteitis may require an MRI scan to confirm the diagnosis. If only intraosseous oedema, but no pus, is demonstrated, such patients may be treated by intravenous antibiotics initially and, if they respond well, surgery may be avoided.

Long-term problems are joint stiffness, chronic osteitis with persistent drainage from sinuses, fracture because of weakened bone, and limb shortening. Long-term follow-up is necessary to manage these complications.

Sarcomas of the extremities

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Because malignant tumours of bone and soft tissue of the limbs are uncommon, diagnosis is often delayed and the tumour is inadequately treated. The result is a high morbidity and mortality, as these tumours are very aggressive.

Bone tumours

Primary bone sarcomas are tumours of the young, occurring mainly in the second and third decades of life. The commonest is osteosarcoma, followed by chondrosarcoma, but Ewing's sarcoma and similar sarcomas are not unusual. Malignant change in a previously benign tumour is largely restricted to conditions such as multiple exostoses (diaphyseal aclasis) and multiple enchondromatosis or Ollier's disease, where a relatively slow-growing chondrosarcoma develops in middle age.

Patients present with a mass arising from the bone, often ill defined, but growing rapidly. There may be little or no pain initially. In advanced cases the tumour may be large and warm with distension of overlying veins, and may mimic an infection. The commonest sites are around the knee and shoulder. Systemic symptoms occur late, except in Ewing's sarcoma, which often causes a fever and can easily be mistaken for osteitis – clinically and radiologically.

Radiographs show a mass arising from and destroying the metaphysis of a long bone. There is often a periosteal reaction, and osteosarcomas and chondrosarcomas typically show areas of ossification. The aggressive radiological picture is usually

very suggestive of a malignancy, except at an early stage, and can only be confused with an infection. A technetium bone scan is usually positive in cases where radiology is equivocal. An MRI scan is very sensitive in the case of tumours still restricted to bone and also shows spread beyond the bone, which indicates malignancy. A chest radiograph should always be performed to demonstrate whether metastases are present.

Soft-tissue sarcomas

Soft-tissue tumours occur at any age, peaking at middle age. They develop below the deep fascia, and are often only mildly symptomatic. By the time they become clinically evident, they are often large. They must be differentiated from bursae, especially around the knee, and from lipomas.

The commonest soft-tissue malignancies are synovial sarcoma, liposarcoma and malignant fibrous histiocytoma. Neuro-fibromatosis predisposes to secondary neurogenic malignancy. Only liposarcoma can be distinguished radiologically. In other cases the diagnosis is made by biopsy.

The abovementioned tumours need an astute clinician with a high index of suspicion to make a diagnosis.

The following are signs of probable malignancy:

- rapid growth
- pain or tenderness
- diameter >5 cm
- lies below the deep fascia
- regional lymphadenopathy
- neurovascular deficit.

Radiographs are valuable in the case of bone tumours, but are practically useless for soft-tissue malignancies. Results of haematological investigations are usually normal or nonspecific. Many patients will be subjected to negative special investigations (e.g. MRI) to detect the occasional malignancy, but this is justified if these patients can be diagnosed and treated at an early stage when there is still a reasonable prognosis.

Management

The first step is to stage the disease using MRI, isotope studies and CT to determine the extent of local infiltration and resectability of the tumour and the presence of metastases. All this information as well as a tissue diagnosis is essential to establish the treatment programme. All staging studies, such as MRI, must be completed *before* the biopsy, which should not be performed by inexperienced surgeons

because poor technique very frequently results in unnecessary amputation. *The rule is that the surgeon who ultimately treats the tumour is the surgeon who performs the biopsy.*

The mainstay of treatment is early surgical excision with a wide margin. This should provide local control of the tumour, but has little effect on metastatic disease, which must be treated by chemotherapy if possible. Sarcomas usually metastasise to the lung at an early stage, although some soft-tissue sarcomas also spread to regional lymph nodes. Recurrent tumours after inadequate excision have a very high rate of concomitant metastases, emphasising the critical importance of adequate primary surgery.

> **Recurrent tumours after inadequate excision have a very high rate of concomitant metastases.**

Chemotherapy is mainly of value in osteosarcoma, Ewing's and related sarcomas, and perhaps synovial sarcoma. Chondrosarcoma and the majority of soft-tissue sarcomas are resistant to chemotherapy, limiting effective treatment of metastases.

Radiotherapy is useful for surgically inaccessible tumours, such as those in the pelvis or spine, but this treatment is often palliative. Limb malignancies are usually radio-resistant, requiring high doses of irradiation, and there is a high morbidity because of soft-tissue fibrosis, ischaemia and neuropathy, resulting in painful, poorly functional limbs. These high doses of irradiation are usually reserved for control of residual tumour after inadequate excision.

Limb-sparing surgery can be performed where a tumour can be excised with a surrounding wide margin of tissue that contains microscopic 'satellite nodules', which would lead to tumour recurrence if not removed. The wider the margin, the smaller the risk of recurrence. During limb-sparing excision the margins are usually dictated by the need to spare vital structures such as arteries, which leads to a significantly higher recurrence rate than amputation.

Surgical management requires a change in thinking: from aiming to preserve a limb at all costs, to saving a patient's life by

sacrificing that limb if necessary. Tumour surgery requires special skills, and possible malignant tumours should be referred to tumour centres for evaluation and treatment *before* biopsy.

Osteoporotic fractures

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As the world's population ages, the incidence of osteoporotic fractures is increasing, even in Third-World countries. Management is problematic because non-operative treatment (especially of lower-limb fractures) has a high morbidity, while surgical reconstruction is made difficult by poor bone quality and slow healing. Fortunately some recent techniques have improved our ability to manage osteoporotic fractures, but the most significant problem remains – failing to recognise the fracture as a signal to treat the underlying cause, i.e. osteoporosis.

Definition

Osteoporosis is the reduction of bone mass per unit volume; the bone itself is normal, but there is not enough to maintain bone strength. Primary osteoporosis has no specific cause compared with secondary types caused by endocrine or metabolic disease. Risk factors for osteoporosis include smoking, excess alcohol consumption, blond hair, slim build, inactivity and premature menopause.

Radiographic diagnosis of osteoporosis is very subjective as technical factors can alter the apparent bone density, but the occurrence of a fragility fracture is strong evidence of underlying bone disease. Objective assessment of bone density requires DEXA or dual-photon absorptiometry.

General management of osteoporosis

Whenever a bone fragility fracture occurs causes of secondary osteoporosis must be excluded, after which treatment must be started. Fragility fractures are an indication to treat osteoporosis even if DEXA scans are only 'osteopenic', because bone strength is not directly linked to bone density, and the fracture is direct evidence of bone weakness. *Often this decision to treat must be made at GP level.* Treatment with calcium, vitamin D supplements and bisphosphonates is the basis of medical management, with oestrogen therapy if indicated. Smoking should be stopped.

The importance of other risk factors for fractures is seldom appreciated.

General weakness and poor balance, arthritis with poor gait, use of alcohol, and use of sedatives all increase the risk of falling and causing a fracture. Loose mats, slippery floors and small animals underfoot also take their toll. An active exercise programme will improve the patient's mobility, co-ordination and strength, and also strengthen the skeleton.

By combining medical and physical treatment with modification of the patient's environment the incidence of further fractures can be reduced substantially.

Bone fragility fractures

A bone fragility fracture is by definition caused by a minimal injury that would not normally break a bone. A fall from a standing position is a common example. Cancellous bone is affected by osteoporosis more severely than cortical bone; therefore osteoporotic fractures typically occur at the metaphyses of long bones and in the vertebral bodies. The classic fragility fractures are Colles', hip and vertebral body fractures.

Colles' fractures

These occur through the distal radial metaphysis, within 5 cm of the wrist joint. The term 'dinner fork deformity' describes the classic impaction, with dorsal displacement and tilt of the distal fragment. Early problems are swelling and possible median nerve compression in the carpal tunnel.

Closed reduction and plaster of Paris immobilisation often result in a degree of malunion, with poor aesthetic appearance but with quite acceptable function. Internal fixation with modern locking plates can restore normal anatomy. It is justified in displaced intra-articular fractures or fractures in younger patients, especially in a dominant hand.

Hip fractures

Despite their proximity to each other, femur neck and intertrochanteric fractures require different types of surgery. However, both these types of fractures result in high morbidity and mortality after attempts to treat them conservatively, which makes a convincing argument for surgical treatment in all but the moribund.

The principle is to stabilise the fracture and mobilise the patient as rapidly as possible. Patients should be medically assessed and prepared for operation within 48 hours of injury. Delay beyond 7 days causes a dramatic rise in mortality.

Intertrochanteric fractures are fixed by a variety of implants designed to allow the fragments to impact into each other during healing. The patient is encouraged to stand/walk using a walking aid– within limits of pain 48 hours after surgery. The fracture almost invariably unites, but hip movement seldom returns to normal, and there is often mild residual pain.

Femur neck fractures in the elderly are usually treated by partial or complete joint replacement fixed with bone cement to allow immediate, full weight bearing. If the patient's life expectancy is less than 5 years a hemi-arthroplasty is preferred as it is a less extensive procedure.

Mortality after hip fractures is high (25% at 1 year, 50% at 2 years), but this is a reflection of the co-morbidities in the population at risk rather than the fracture itself.

Vertebral fractures

Vertebral collapse may occur silently, presenting as an increasing thoracic kyphosis, but most patients experience an acute onset of severe back pain after a minor injury. Neurological deficit is rare. If a vertebral collapse is suspected it is wise to X-ray both the thoracic and lumbar spine as pain may not be accurately localised to the fracture, and multiple fractures may be present. The main problem is to distinguish osteoporotic collapse from a metastasis, and doubtful cases should be referred for investigation.

Treatment is conservative, with a minimum period of immobilisation (to prevent additional disuse osteoporosis). Analgesia, non-steroidal inflammatory drugs (NSAIDs), and a spinal brace are useful, with spine-extension exercises starting as pain subsides.

Pain persisting for more than 2 or 3 months may be effectively treated by injection of bone cement into the fractured body (vertebroplasty or kyphoplasty).

Single Suture

Non-allergic cat ownership determined by genes

A gene mutation that predisposes infants to eczema seems to pose a greater risk if they are also exposed to cats. In 2006, a mutation in gene for the protein filaggrin – which keeps foreign substances out of the skin – was shown to increase the risk of eczema. About 9% of people of European origin carry this gene mutation.

To find out whether an environmental trigger may also play a role, a team led by Hans Bisgaard of the Gentofte University Hospital in Copenhagen, Denmark, tracked 358 Danish and 460 British children from birth. About 25% of children without the mutation developed eczema, compared with 45% with the mutation. However, of the 16 children who had both the mutation and lived with a cat, 14 developed eczema, all between the ages of 1 month and 3 months. However, the authors say that it is too soon to advise parents not to have cats in the house. We need to look for other environmental factors that correlate with eczema.

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