BONE AND JOINT

MAIN CATALOGUE

CASE 45
No clinical history is available.
Describe the specimen. The specimen consists of a portion of the tibia sectioned longitudinally. A large pale brown generally well-circumscribed fleshy tumour surrounds the shaft of the bone and invades surrounding muscles.
What is the diagnosis? Osteosarcoma

CASE 163
No clinical history is available.
Describe the specimen. The specimen consists of the humerus that has been sectioned longitudinally. Throughout the bone there are numerous deposits of dark brown fleshy tumour, some of which extend from the marrow cavity to invade through the cortex.
What is the diagnosis? Metastatic deposits of malignant melanoma

CASE 173
The patient had a history of painful swollen right knee for 8 years with recent stiffness. The specimen is a surgical specimen.
Describe the specimen. The specimen is a knee joint opened from the front, with superior structures turned upwards. The patella has been removed. The articular cartilage has been eroded to varying extents. The surfaces of the joint space are covered by irregular light brown material and exudate. A paler area of possible necrosis in the synovium is seen in the upper right aspect of the specimen. On the back of the specimen an ill-defined pale lesion can be seen in the tibia.
What is the diagnosis? Tuberculosis of the knee joint
Comment: The thickened brown lining could potentially resemble the pannus of rheumatoid arthritis (RA) but caseous exudate is present also (not seen in RA) and these features would not be seen in osteoarthritis. The brown material lining the joint may well be a combination of necrotic debris, granulomatous inflammation, granulation tissue and scar tissue.
What histological features would you expect to see in an H&E stained section of a biopsy of the synovium? Caseous necrosis, epithelioid and multinucleate macrophages, lymphocytes, fibrosis and granulation tissue. Mycobacteria are not seen on H&E staining.

CASE 233
No clinical history is available.
Describe the specimen. The specimen consists of a portion of a fibula, part of which is surrounded by a pale, fleshy tumour, which is causing bone destruction in some areas, with extension of tumour into the medullary cavity and also subperiosteally.
What is the diagnosis? Osteosarcoma

CASE 944
The patient had a one year history of pain above the knee. Nine weeks ago he fractured his leg and was treated in extension for 6.5 weeks but gross shortening of the leg occurred within a few days of removing the splint.
Describe the specimen. The specimen consists of the upper half of the femur. Just below the lesser trochanter the shaft is focally completely destroyed by a large, irregular shaggy brown mass. There is obvious and extensive destruction of bone and there is a pathological fracture through the tumour.
What is the diagnosis? Osteosarcoma

CASE 946
No clinical history is available.
Describe the specimen. The specimen consists of the lower end of a femur, with one condyle almost entirely replaced by a cavitated tumour. The articular cartilage has remained intact but the bony tissue of the condyle has almost completely disappeared. The lining of the cavity is very ragged and comprises grey/brown tumour and old blood clot.
What is the diagnosis? Giant cell tumour of lower end of femur
Comment: This diagnosis was made on histological examination but the diagnosis can be suggested from the macroscopic appearance in the specimen as it is in a typical location and shows typical features.

CASE 948
No clinical history is available.
Describe the specimen. The specimen consists of the tibia of a child with the epiphyseal plates easily visible. There is swelling in the mid portion of the bone with extensive subperiosteal new bone formation in the form of trabeculae arising at 90 degrees to the long axis of the bone. There is also new bone formation in the medullary cavity causing a loss of the normal trabeculation pattern**.**
What is the diagnosis? Osteosarcoma

CASE 949
No clinical history is available.
Describe the specimen. The specimen consists of the tibia and fibula that have been macerated (all soft tissue has been removed) and dried. The whole of the shaft of the tibia is abnormal with extensive new bone formation in the medullary cavity and subperiosteally, the latter forming thin plates up to 1cm long projecting perpendicular to the surface.
What is the diagnosis? Osteosarcoma

CASE 957
No clinical history is available.
Describe the specimen. The specimen consists of the upper end of the tibia which has been sectioned longitudinally. The epiphyseal plate is visible. Within the metaphysis is a pale brown-grey, fleshy tumour which invades both into the medullary cavity, subperiosteally, raising the periosteum and through the skin anteriorly. The cortical bone in the region of the tumour has been almost completely destroyed but the epiphyseal plate remains intact above.
What is the diagnosis? Osteosarcoma

CASE 975
No clinical history is available. At post-mortem there was a large thoracic aortic aneurysm pressing on the vertebral bodies.
Describe the specimen. The specimen consists of a portion of the thoracic spine with parts of the ribs attached. The anterior aspects of the vertebral bodies show extensive erosion, whilst the intervertebral discs are very much less affected.
What is the diagnosis? Erosion of vertebrae by an aortic aneurysm

CASE 985
The patient presented with a painful pulsating swelling in the upper arm that was thought to be an aneurysm.
Describe the specimen. The specimen consists of the elbow joint. Occupying the antecubital region is a large tumour 11cm in diameter apparently arising from the periosteum of the front of the humerus and which is also attached to the ulna. The tumour is pale brown, focally haemorrhagic, has a ragged appearance and contains a number of loculated cavities.
What is the diagnosis? Osteosarcoma

CASE 1303
No clinical history is available.
Describe the specimen. The specimen consists of the macerated cervical spine. There is marked osteophytic lipping of many parts of the vertebrae with bony fusion anteriorly between the bodies of C6 and C7 and C7 and T1 and between the arches of C7 and T1 posteriorly.
What is the diagnosis? Osteoarthritis of the cervical spine

CASE 1396
No clinical history is available.
Describe the specimen. The specimen consists of a finger. Over the proximal interphalangeal joint there is an ulcerated lesion with extensive granulation tissue, in continuity with the underlying joint space.
What is the diagnosis? Septic arthritis of the finger
Comment: Definitive diagnosis would require a good clinical history and histological and microbiological findings indicating bacterial infection of the joint space.

CASE 1774
No clinical history is available.
Describe the specimen. The specimen consists of a wrist joint that has been opened up to show erosion of cartilage.
What is the diagnosis? Osteoarthritis of the wrist
Comment: This case was said to be due to “Charcot’s disease” or “Charcot’s joint”.
What is Charcot’s disease? Charcot’s disease refers to secondary osteoarthritic changes developing in a joint with impaired joint position sense due to tabes dorsalis, a manifestation of tertiary syphilis where the sensory nerves of the dorsal roots are damaged by the spirochetes. Who was Charcot?

CASE 3911
No clinical history is available.
Describe the specimen. The specimen consists of the lower femur. There is a pale fleshy tumour mass in the metaphyseal region involving the marrow space and extending into the surrounding tissues. Moderate bone destruction is present.
What is the diagnosis? Osteosarcoma

CASE 3932
No clinical history is available.
Describe the specimen. The specimen consists of a portion of the distal femur, the lower end of which has almost been completely destroyed by an irregular brown tumour 9cm in length with focal haemorrhage and necrosis. The cortex on the front and back of the femur has been destroyed and the tumour is growing out into the soft tissues posteriorly, but the joint cartilage is still intact.
What is the diagnosis? Osteosarcoma

CASE 4242
The patient was a woman with a long history of diabetes mellitus who presented with pain in her left hip and a high temperature. Blood cultures taken at the time of admission grew *Staphylococcus albus*. She was treated with sulphadiazine (penicillin was not available at that time) and had several blood transfusions. She eventually died 2 months later.
Describe the specimen. The specimen consists of the acetabulum of the hip joint. The articular surface appears hyperaemic and the articular cartilage has been completely destroyed and replaced by granulation tissue and small areas of slough.
What is the diagnosis? Septic arthritis

CASE 4246
The patient was an old man who presented with a fracture of his femur.
Describe the specimen. The specimen consists of distal femur that has been sectioned longitudinally. Within the distal marrow cavity there is a haemorrhagic and necrotic tumour mass that invades and destroys cortex and extends into the diaphysis.
What is the diagnosis? Osteosarcoma
What risk factors may this patient have had for this disease? Osteogenic sarcomas around the knee normally occur in children and adolescents. This patient may thus have had some specific risk factor. There is some suggestion that the cortex is focally thickened suggesting Paget disease of bone. This would require histological confirmation. Local radiotherapy is another risk factor.

CASE 4325
No clinical history is available.
Describe the specimen. The specimen consists of a portion of femur. Arising from the shaft on the external surface and extending into muscle is a well-circumscribed pale tumour mass that contains areas of cystic degeneration. Foci of tumour are also noted on the opposite side of the shaft and in the medullary cavity.
What is the diagnosis? Osteosarcoma

CASE 4329
The patient was a male infant who died at the age of 3 months. During his life swellings were noticed at the ends of the long bones and there was some kyphosis and scoliosis of the spine, with associated chest deformity.
Describe the specimen. The specimens of the long bones show shafts that are shorter than normal for an infant of this age, causing the bone ends to appear enlarged. Bone formation can be seen in the cartilaginous epiphyses at the ends of the femora and tibiae and in the vertebrae at the back of the pot.
Diagnosis: Achondroplasia in an infant
Comment: Achondroplasia is a genetically determined disease in which there is impaired endochondral ossification at the epiphyseal growth plates resulting in a failure of growth in the length of long bones. It is the most common cause of dwarfism. It is transmitted in an autosomal dominant pattern. Most cases are new mutations. Patients typically have a point mutation in the gene that codes for FGF receptor 3, resulting in constant activation of the receptor and reduction in the proliferation of chondrocytes at the growth plate. The epiphyses themselves grow relatively normally and hence appear relatively enlarged. There is also lack of development of the bones at the skull base that are formed in cartilage. Intra-membraneous ossification is unaffected so the cortices of the long bones and the bones of the skull vault grow normally. Affected persons have a trunk of relatively normal length and short limbs. They are usually intellectually and sexually normal with a normal life span though a female achondroplastic can rarely deliver a baby per vaginam because of the deformity of the pelvis. Some patients develop severe kyphoscoliosis.
This case may in fact represent a related condition known as thanatophoric dwarfism, also caused by a mutation in FGFR3, either a missense or a point mutation different to that in achondroplasia. Additional

features include a small chest cavity and a bell shaped abdomen, with resultant respiratory insufficiency. Death occurs either at birth or soon after.

CASE 6058
No clinical history is available.
Describe the specimen. The specimen consists of most of the thoracic spine that has been sectioned to show the vertebral bodies and the spinal cord. Two vertebral bodies have collapsed anteriorly, causing kyphosis. On closer inspection, within these vertebral bodies there are pale yellow areas of necrosis within the cancellous bone. A similar area is present in the vertebra above. Anterior to these vertebrae is a thick-walled cavity 1cm in diameter, which is continuous with the yellow caseous material in the vertebral bodies through a defect in the periosteum. There is also necrosis of the anterior end of the intervertebral disc adjacent to the prevertebral cavity. The spinal cord and the meninges appear normal.
What is the diagnosis? Tuberculous osteomyelitis of the spine (Pott disease)

CASE 6207
No clinical history is available.
Describe the specimen. The specimen is of a knee joint which has been opened from the front with the patella reflected superiorly. There is marked osteophytic lipping of the patella and the femoral condyles. The lateral condyles of the femur and the tibia show bare eburnated bone with little residual articular cartilage.
What is the diagnosis? Osteoarthritis of the knee joint

CASE 6957
No clinical history is available.
Describe the specimen. The specimen consists of a femur that has been sectioned longitudinally. About halfway down the shaft there is a grey necrotic lesion, 10cm in length, with ill-defined margins that has expanded and eroded the bone, lifting the periosteum. The adjacent bone also appears slightly abnormal, with thickening of the cortex, blurring of the corticomedullary junction and coarsening of the trabecular pattern.
What is the diagnosis? Osteosarcoma complicating Paget's disease of the femur

CASE 8082
The patient fractured a femur whilst in hospital undergoing treatment for carcinoma of the lung.
Describe the specimen. The specimen consists of the upper end of a femur. At the junction of the femoral head and neck, the normal bone has been replaced by an ill-defined area of grey necrotic tissue, which has focally eroded the cortex.
What is the diagnosis? Metastatic tumour in upper femur

CASE 8091
The patient was a man aged 26 who had had lumps on his right arm and right hand since he was a baby. Similar lumps were present attached to a rib on the left side and in the 4th toe of his right foot. The 3rd and 4th fingers of his right hand were amputated because they were so deformed that they were useless and impeded the use of his other fingers and thumb.
Describe the specimen. The specimen consists of these fingers that are grossly distended and nodular. Through one side of the pot the cut surface of one lesion can be seen. It is well-circumscribed and composed of pale grey glassy cartilaginous material with white flecks. There is no haemorrhage or necrosis and no evidence of direct local invasion into surrounding structures.
What is the diagnosis? Enchondromas in 3rd and 4th phalanges.
Comment: Chondroma or enchondroma is a benign cartilaginous tumour that occurs most frequently in the small bones of the hands and feet in patients 20-50 years of age. About 30% are multiple. Sarcomatous

transformation may occur rarely, but is more likely in persons with Ollier disease, a syndrome of multiple enchondromas.

CASE 9250

No clinical history is available.

Describe the specimen. The specimen consists of 5 macerated thoracic vertebrae. Osteophytes have formed anterolaterally on the superior and inferior margins of the vertebral bodies. Some of the osteophytes have fused.

What is the diagnosis? Osteoarthritis of thoracic vertebrae

CASE 9517

No clinical history is available.

Describe the specimen. The specimen consists of the skull that has on its external aspect a very abnormal worm-eaten appearance with areas of marked thinning. The process has involved almost the whole of the skull. Part of the outer table is partially separated as a sequestrum. The dural lining of the skull appears relatively normal. **What is the diagnosis?** Syphilitic osteomyelitis of the skull

Comment: This appearance is said to be characteristic, but modern medical students would not be expected to recognise this pathology. Although syphilis is currently increasing in incidence, bone involvement is still rare, since the disease is usually diagnosed and treated before this stage.

CASE 10198

The patient presented with increasing weakness, breathlessness, loss of weight, epistaxis and pallor. On admission he was very anaemic. His serum protein was raised but his urine did not contain any Bence-Jones protein. X-rays of the skull and long bones showed numerous well-defined osteolytic areas. A marrow biopsy showed numerous atypical plasma cells.

What is epistaxis? A bleed from the nose.

What tumour is characterised by the presence of malignant plasma cells? Multiple Myeloma

Describe the specimen. The specimen shows the sternum, lower end of the femur and a piece of the skull. There are several fairly well-defined, greyish and yellow nodules scattered throughout the specimens, with associated destruction of bone.

What is the diagnosis? Multiple myeloma

Comment: In the absence of any clinical history, metastatic carcinoma would be a reasonable differential diagnosis, but the presence of multiple osteolytic lesions in the absence of any primary malignancy should always raise the possibility of myeloma.

CASE 10248

No clinical information is available.

Describe the specimen. The specimen consists of a fragment of the shaft of a long bone measuring 9cm in length. The front of the specimen shows the irregular eroded inner surface of the bone while the reverse shows the smooth cortical surface.

What is the diagnosis? Bone sequestrum from osteomyelitis

CASE 10309

No clinical history is available.

Describe the specimen. The specimen consists of a portion of a markedly thickened skull in which the cortico-medullary border is completely lost, and the bone has an abnormally dense pattern of growth.

What is the diagnosis? Paget's disease of skull

CASE 10779
The patient was a deaf mute who had numerous manifestations of tertiary syphilis. He also developed septic arthritis of multiple joints and urinary infection. He became paraplegic several weeks before his death.
Describe the specimen. The specimen shows disorganisation of the lumbosacral joint and vertebral collapse and cord compression from osteomyelitis of T10.
What is the diagnosis? Vertebral collapse and cord compression from osteomyelitis

CASE 11326
The patient was a male aged 67 with a history of rheumatoid arthritis and hypertension. He died of chronic renal failure related to hypertension.
Describe the specimen. The specimen consists of the left knee joint opened by dividing the patellar ligament and reflecting the patella. The synovial membrane forms numerous villus projections into the joint space. The articular surfaces of the femoral condyles are irregularly eroded and at the margins osteophytes have formed.
What is the diagnosis? Osteoarthritis superimposed on rheumatoid arthritis
What is the pathogenesis of rheumatoid arthritis?
Rheumatoid arthritis is believed to be an autoimmune disease. There is a genetic predisposition, particularly with certain MHC class II antigens (HLA-DR4 +/- DR1 +ve). The disease may be initiated in genetically susceptible hosts by arthritogenic antigens (possibly microbial) that stimulate the immunological response. CD4 T lymphocytes release cytokines such as interferon gamma and TNF-alpha, which attract macrophages (interferon-gamma also activates macrophages) and B lymphocytes to the joint. B cells on exposure to antigen differentiate into plasma cells that produce antibody. Antigen-antibody complexes form with activation of complement within the joint that can also mediate damage. Macrophages release mediators that attract neutrophils. Release of inflammatory mediators, proteases etc by these cells result in erosion of cartilage, resorption of bone and stimulation of fibroblast proliferation.
One of the antibodies formed is known as rheumatoid factor – present in 80% of patients. This is mostly an IgM antibody that forms against the Fc portion of IgG.
Circulating immune complexes are thought to be responsible for many of the extra-articular manifestations (via type III hypersensitivity).

CASE 11356
The specimen was taken from a 57 year old male patient with severe chest deformity, apparently developing since an episode of trauma at the age of six.
Describe the specimen. The specimen consists of 6 thoracic vertebrae. There is wedging of the intervertebral discs with some protrusion beneath the periosteum anteriorly. Despite the angulation of the laminae in the middle of the spine, the cord shows a relatively smooth rounded curvature.
What is the diagnosis? Thoracic spinal deformity

CASE 11814
No clinical information is available.
Describe the specimen. The specimen consists of the skull, dura and falcine reflections. Arising in the calvarium and displacing the dura medially are several smooth homogeneous masses of varying sizes. They are pale and fleshy with well-defined margins and no evidence of haemorrhage or necrosis.
What is the diagnosis? Multiple extradural metastases

CASE 11846
No clinical history is available.
Describe the specimen. The specimen consists of the wall of the right hemithorax showing marked broadening of the costochondral junctions.
What is the diagnosis? Rachitic rosary

What is rickets and how does it develop? Rickets results from inadequate mineralization of newly formed bone matrix in children due to vitamin D deficiency, abnormalities in vitamin D metabolism or phosphate deficiency states. There is subsequent abnormal cartilage proliferation with hypertrophy and thickening of epiphyseal growth plates. Endochondral ossification proceeds very slowly. Affected children are often apathetic and short, with characteristic changes in teeth and bones (e.g. thickening of costochondral junctions, shortening and bowing of long bones) and fractures are frequent. Vitamin D deficiency may arise from e.g. inadequate sun exposure, dietary deficiency and defective intestinal absorption. Rickets is now rare in developed countries.
What is osteomalacia? Osteomalacia is the equivalent condition (inadequate mineralization of newly formed bone matrix) that develops from similar deficiencies in adults following closure of the growth plates. Osteoid is slow to mineralise. Patients may experience bone pain and pathological fractures.
Comment. This specimen was provided by Dr. Malcom Fowler of the Adelaide Children's Hospital. Dr Fowler was one of the leading pathologists in Adelaide in the 20th century. His research into the causes of amoebic meningitis is recognised by the name of the causative organism *Naegleri fowleri.*

CASE 11943
No clinical history is available. This is a surgical specimen.
Describe the specimen. The specimen consists of a finger. The base of the proximal phalanx is expanded by a grey, non-haemorrhagic, partly fleshy, partly cystic neoplasm. The overlying cortical bone is intact but thinner than normal and is expanded over the tumour.
What is the diagnosis? Giant cell tumour of bone
Comment: This diagnosis was made on histological examination of the lesion but the diagnosis can be suggested from its location at the end of a long bone, its being well circumscribed and expanding rather than invading the cortex. Cystic degeneration is also consistent.

CASE 12803
The patient was a man aged 64 who was a known chronic alcoholic and who developed an infected right shoulder joint after an arthrodesis. A discharging sinus was present on the tip of the shoulder. He died a few hours after admission from bronchopneumonia and pulmonary infarction.
Describe the specimen. The specimen consists of an opened shoulder joint. A ragged cavity originally filled with pus is present. It has shaggy necrotic walls. The joint is completely disorganised and the bone ends are eroded.
What is the diagnosis? Septic arthritis of the shoulder

CASE 13169
Three weeks of age.
Describe the specimen. The specimen consists of the clavicle with an unreduced fracture at its midpoint. Old haemorrhage can be seen and surrounding the fracture is ill-defined osseofibrous tissue.
Diagnosis: Fractured clavicle with surrounding callus
What happens following a fracture of bone and what stages are involved in its healing? How long do these processes take?
Immediately following a fracture, there is a variable amount of bleeding from torn vessels. The extravasated blood coagulates into a clot. In a fracture of bone there is often also some tearing of the periosteum and the fragments can be displaced relative to each other such that 'reduction' of the fracture is required. To maintain the appropriate position for proper healing the bone is often either stabilized externally, usually by a plaster cast, or internally, using metal rods (placed at operation).
Interrupted blood supply will result in death of bone cells either side of the fracture line. Dead bone can be recognised histologically by empty lacunae. Tissue damage excites an acute inflammatory response that is maximal at 2-3 days. Fibrin in the blood clot and acute inflammatory exudate acts as a framework for the influx of inflammatory cells, vessels and osteoprogenitor cells. Macrophages invade and begin to remove blood clot and necrotic tissue. Large blood clots may organise. Osteoclasts and macrophages begin removing dead

bone. Degranulated platelets and inflammatory cells release interleukins and growth factors including PDGF, TGF-beta and FGF that stimulate osteoclasts and osteoblasts and activate osteoprogenitor cells in the periosteum which differentiate into osteoblasts and chondroblasts and start forming osteoid and cartilage respectively. Vessels also grow into the fracture site. Some new bone forms from the cartilage by the process of endochondral ossification. More mobile fractures develop more cartilage. Osteoid, with its irregularly arranged collagen, calcifies to become immature woven bone. This fracture repair tissue (equivalent to granulation tissue in a healing wound) is termed callus. The callus forms both around (external callus) and within (internal callus) the fracture site. Callus continues to form over several weeks. Callus helps stabilize the fracture site but it is still not very strong e.g. for weight bearing. Callus can be seen on x-ray.
After several weeks the woven bone is replaced by mature lamellar bone, with more regularly arranged collagen. External callus is gradually removed and the cortex is reformed across the fracture gap. Medullary callus is removed and the trabecular bone and marrow cavity is restored. New bone is organised along stress lines and mechanical forces. Remodelling and strengthening can continue for months.
The latter describes the healing of a simple fracture of a long bone. There may be slight variations in the healing of other types of fracture.

CASE 14007
The patient was a woman aged 75 who had been bedridden with hemiplegia and aphasia for 3 years. She died of pulmonary embolism.
Describe the specimen. The specimen consists of the left knee joint opened from the anterior aspect. Much of the articular cartilage has been completely denuded from the lateral femoral condyle. The remainder of the articular cartilage is opaque and roughened and marginal osteophytes are visible. There is marked eburnation of the articular cartilage of the patella. Numerous lipoma arborescens are also present.
What is the diagnosis? Osteoarthritis of the knee joint
Comment: Lipoma arborescens are yellow villous projections of synovial tissue containing fat that are seen in a variety of degenerative joint conditions.

CASE 14163
The patient was a man aged 74 who had chronic tophaceous gout for 20 years. He contracted a septic infection in the terminal pulp of one of his fingers, which was amputated.
Describe the specimen. The specimen consists of a finger. A large rounded mass 4cm in diameter is present on the dorsal aspect of the proximal phalanx. A smaller mass lies on the medial side of the middle phalanx. There is patchy ulceration at the finger-tip.
What is the diagnosis? Chronic tophaceous gout of the finger

CASE 14242B
The patient was a woman aged 79 who died of congestive cardiac failure. Gangrene of the toes was present at post-mortem.
Describe the specimen. The specimen consists of the right great toe. On the lateral aspect of the toe is a discoloured dark swollen necrotic area.
What is the diagnosis? Gangrene of the toe

CASE 14282
The patient was a woman aged 64 who had noticed watery blood dribbling from the right side of her nose for 3 months. There had been some associated obstruction. She underwent a partial resection of her right maxilla.
Describe the specimen. The specimen consists of a portion of the right maxilla with the inferior aspect at the front of the pot. The inferior aspect of the specimen shows elevation of the buccal mucosa by tumour tissue. Adjacent to the teeth is a 1cm defect through into the tumour and adjacent to this is a further small defect, these representing non-healed tooth sockets. From the superior aspect the floor of the nose

medially appears normal, but the floor of the maxillary sinus is grossly irregular with one 2cm mass protruding upwards.
What is the diagnosis? Tumour in the maxilla
Comment: This was reportedly an adamantinoma (ameloblastoma). These arise from odontogenic epithelium and are rare.

CASE 14526
No clinical information is available.
Describe the specimen. The specimen is a left knee joint opened from the front. There white deposits urates on articular and synovial surfaces.
What is the diagnosis? Gout
Comment: The specimen generally appears white in colour because of the use of alcohol as a fixative. Absolute alcohol is used as a fixative in cases of gout as the water in formalin dissolves the urate crystals.

CASE 15641
The patient was a man aged 45 who had back pain for 8 months and sciatic pain for 6 months. There was cough and severe night sweats. Examination showed a leucoerythroblastic anaemia and multiple osteolytic areas in the ribs and lumbar vertebrae. He died after an illness lasting 4 months.
Describe the specimen. The specimen consists of six lumbar and lower thoracic vertebrae sectioned longitudinally. Well-demarcated, focally necrotic, pale fleshy lesions are present in the bodies of the vertebrae and have destroyed the bony trabeculae. One mass erodes through the cortical bone into the surrounding tissues.
What is the diagnosis? Metastatic cancer in the spine
Comment: At post mortem the primary site was identified as the lung.

CASE 15706
The patient was a woman aged 53. Eighteen years previously she had a nephrectomy for tuberculosis of the left kidney. Recently she developed congestive cardiac failure and uraemia. On her last admission she had markedly elevated serum urea and creatinine. At post-mortem the remaining right kidney was small, granular and contracted and weighed 70gm.
Describe the specimen. The specimen consists of a longitudinal section of the lumbar spine showing very dense uniform osteosclerosis of the vertebral bodies and processes.
What is the diagnosis? Osteosclerosis associated with renal failure
Comment: Osteosclerosis is a component of renal osteodystrophy, a term for the changes that may be seen in the skeleton in patients with chronic renal disease:
- increased osteoclastic bone resorption
- osteomalacia (delayed mineralisation of osteoid)
- osteosclerosis
- growth retardation
- osteoporosis

The pathogenesis of these complications involves:
- phosphate retention and thus hyperphosphataemia which in turn induces secondary hyperparathyroidism
- impaired conversion of vitamin D to its active form (1,25 diOH D3)
- metabolic acidosis

CASE 16053
The patient was a man aged 68 with a 2 year history of carcinoma of the prostate. He was treated with oestrogens. On his last admission he suffered a right hemiplegia with extensor plantar response and died 6 days later.
Describe the specimen. The specimen consists of a longitudinal section of 5 lumbar vertebrae. The cut surfaces of the vertebral bodies appear solid and heterogenous with areas of pallor and pale grey haemorrhage, with no normal trabecular architecture remaining.
What is the diagnosis? Sclerotic metastases from carcinoma of the prostate

CASE 16054
The patient was a 14-year old boy who became quadriplegic following a trampoline accident.
Describe the specimen. The specimen consists of the cervical spinal column in which the body of C3 has been replaced by a bone dowel but this has failed to prevent cord compression resulting from anterior dislocation of the upper portion. There is associated haemorrhage.
What is the diagnosis? Fracture dislocation C3-4

CASE 16218
The patient was man aged 70 who sustained a fracture of the right femoral neck. It was plated and at the same time a nodule was excised from the left 4th rib. Radiotherapy was given to the femoral neck but the patient slowly deteriorated and died.
Describe the specimen. The specimen consists of the head and upper femur sectioned longitudinally. An irregular necrotic swelling is present externally in the region of the neck and greater trochanter, around the metal plate. The tip of a surgical pin is visible protruding from the posterior aspect of the head of the bone.
What is the diagnosis? Pathological fracture (plated) of neck of femur
Comment: Histology showed osteosarcoma.

CASE 16760
The patient was a woman aged 63 who had had rheumatoid arthritis for 30 years, now said to be burnt out. She died from cardiac failure.
Describe the specimen. The specimen consists of a slice through the left knee joint. The joint capsule is completely obliterated by dense fibrous adhesions that bind all three bones together. The cortical bone and the bony trabeculae show thinning from disuse atrophy.
What is the diagnosis? Fibrous ankylosis in rheumatoid arthritis

CASE 16763
One month following fall onto outstretched hand. Deformity returned after initial reduction.
Describe the specimen. The specimen shows internal callus formation around a fracture site at the distal end of the radius. Callus does not appear to cross the fracture line.
What is the diagnosis? Delayed healing of a Colles' fracture of the wrist
What happens following a fracture of bone and what stages are involved in its healing? How long do these processes take?
Immediately following a fracture, there is a variable amount of bleeding from torn vessels. The extravasated blood coagulates into a clot. In a fracture of bone there is often also some tearing of the periosteum and the fragments can be displaced relative to each other such that 'reduction' of the fracture is required. To maintain the appropriate position for proper healing the bone is often either stabilized externally, usually by a plaster cast, or internally, using metal rods (placed at operation).
Interrupted blood supply will result in death of bone cells either side of the fracture line. Dead bone can be recognised histologically by empty lacunae. Tissue damage excites an acute inflammatory response that is maximal at 2-3 days. Fibrin in the blood clot and acute inflammatory exudate acts as a framework for the influx of inflammatory cells, vessels and osteoprogenitor cells. Macrophages invade and begin to remove blood clot and necrotic tissue. Large blood clots may organise. Osteoclasts and macrophages begin removing dead

bone. Degranulated platelets and inflammatory cells release interleukins and growth factors including PDGF, TGF-beta and FGF that stimulate osteoclasts and osteoblasts and activate osteoprogenitor cells in the periosteum which differentiate into osteoblasts and chondroblasts and start forming osteoid and cartilage respectively. Vessels also grow into the fracture site. Some new bone forms from the cartilage by the process of endochondral ossification. More mobile fractures develop more cartilage. Osteoid, with its irregularly arranged collagen, calcifies to become immature woven bone. This fracture repair tissue (equivalent to granulation tissue in a healing wound) is termed callus. The callus forms both around (external callus) and within (internal callus) the fracture site. Callus continues to form over several weeks. Callus helps stabilize the fracture site but it is still not very strong e.g. for weight bearing. Callus can be seen on x-ray.
After several weeks the woven bone is replaced by mature lamellar bone, with more regularly arranged collagen. External callus is gradually removed and the cortex is reformed across the fracture gap. Medullary callus is removed and the trabecular bone and marrow cavity is restored. New bone is organised along stress lines and mechanical forces. Remodelling and strengthening can continue for months.
The latter describes the healing of a simple fracture of a long bone. There may be slight variations in the healing of other types of fracture.

CASE 17063
No clinical history is available.
Describe the specimen. The specimen consists of a sagittal section through the cervical spine with a fracture-dislocation at the level of C5-6. There is gross distortion of the spinal canal with haemorrhage and softening of the cord at this level. The left had portion of the specimen shows a rounded piece of bone dowel has been inserted between the vertebrae to produce fixation.
What is the diagnosis? Fracture dislocation of spine

CASE 17087
The patient was a woman aged 65 who was involved in a vehicular accident. Initially there were no signs of spinal cord involvement and she was treated by extension. Shortly thereafter motor and sensory signs developed along with evidence of brain stem ischaemia thought to be due to nipping of vertebral arteries. Operative repair of the dislocation was therefore carried out with wiring of the laminae. She died 3 weeks after the accident. At post-mortem there was no evidence of brain stem softening.
Describe the specimen. The specimen consists of a sagittal cut through the cervical vertebrae to show a fracture dislocation at C5-6 level. Protrusion of intervertebral disc substance into the spinal canal is evident at this level with compression of the spinal cord. The wires holding together the laminae of C5 and C6 are evident.
What is the diagnosis? Fracture dislocation of cervical spine

CASE 17441
The patient was an elderly man who had numerous fractures, old and recent in ribs, clavicles, and collapse of several vertebral bodies.
Describe the specimen. The specimen is a sagittal section through a portion of the spinal column. The cortex of the vertebrae is thinned and there are large spaces between the trabeculae in the spongy bone. Several Schmorl's nodes are seen herniating into vertebral bodies.
What is the diagnosis? Osteoporosis
Comment: Schmorl's nodes represent herniations of intervertebral disc material through breaks in the subchondral bone plate into the vertebral body. They are seen in association with a variety of diseases including degenerative disc disease, osteoporosis and with general wear and tear.

CASE 17595
The patient was a man aged 80 who was mentally confused and fell out of bed. He died some weeks later of bronchopneumonia.
Describe the specimen. The specimen consists of the right knee joint opened from the front. There is extensive fibrillation and destruction of articular cartilage of the femoral condyles and patella. Surviving cartilage is opaque. Marginal osteophyte formation is prominent along the medial border of the medial condyle and around the patella. Lipoma arborescens are also focally noted arising from the synovium.
What is the diagnosis? Osteoarthritis of knee
Comment: Lipoma arborescens are yellow villous projections of synovial tissue containing fat that are seen in a variety of degenerative joint conditions.

CASE 18069
History of diving into shallow water.
Describe the specimen. The specimen consists of a sagittal slice through the cervical spine and shows an inserted piece of bone dowel replacing part of the body of C5 which is pushed backwards. The spinal cord is pulped from C2 to C6 and there is surrounding haemorrhage.
What is the diagnosis? Fracture dislocation of cervical spine with complete disruption of spinal cord

CASE 19314
The patient was a man aged 20. A large 'osteoma' had been noted in the left iliac bone for 18 months.
Describe the specimen. The specimen consists of half an irregular bony and cartilaginous mass that measures 7cm in maximum dimension. The cut surface shows irregular cancellous bone covered by a thick irregular cartilaginous cap except at the base where it has been chiselled from the underlying bone.
What is the diagnosis? Osteochondroma of the left iliac bone.
Comment: Osteochondromas, also known as exostoses, are relatively common cartilage capped outgrowths that are attached to the underlying skeleton by a bony stalk. They may be single or multiple, the latter being associated with an autosomal dominant hereditary disease – *multiple hereditary exostoses*. These lesions present as slow growing masses and may cause symptoms related to nerve compression. In less than 1% of cases they give rise to chondrosarcoma or some other form of sarcoma, a complication that is more likely in patients with the hereditary syndrome.

CASE 20058
The patient was a boy aged 19 who dived into shallow water, broke his neck and became immediately quadriplegic. Operation was performed but tracheostomy was necessary to maintain respiration. He died from pulmonary haemorrhage and respiratory infection 7 weeks after the accident.
Describe the specimen. The specimen consists of half the cervical spine divided by a vertical sagittal cut. There is forward dislocation of C4 (in which bone dowel has been inserted) on C5. The posterior protrusion of C5 has caused considerable compression of the spinal cord at this level and yellowish central necrosis is visible for a considerable distance above and below the point of compression. The laminae posteriorly seem in normal position and appear stable.
What is the diagnosis? Forward dislocation of C4

CASE 20339
The patient was a woman aged 54 in whom multiple myeloma was treated by chemotherapy. The haemoglobin and white cell count fell, she began to vomit blood and died 4 days later. At post-mortem there was marked congestion and petechial haemorrhages of the gastric mucosa.
Describe the specimen. The specimen consists of the skull that shows multiple rounded haemorrhagic osteolytic lesions. These are much more numerous on the internal than on the external aspect.
What is the diagnosis? Multiple myeloma in the skull

CASE 20451

The patient was a man aged 49 whose illness began with pain in the right hip radiating to the foot, aggravated by standing and by abduction of the thigh. X-ray of the hip at this stage was said to be normal. Two and a half years later the disability was still present and x-ray showed abnormality. A biopsy was performed and treatment commenced with radiotherapy and two attempts at surgical removal. He died 3.5 years after the onset of the illness.
Describe the specimen. The specimen consists of a portion of the right hip and joint with the upper half of the right femur divided by a coronal cut. Fleshy lobulated and partly necrotic tumour involves the hip-bone and has invaded the joint capsule and joint space. It extends posteriorly as a large fleshy mass into the gluteal region. Patchy pale tumour appears also to be involving the femur.
What is the diagnosis? Sarcoma of the right hip.
Comment: Histologically this was said to be chondrosarcoma. Chondrosarcoma is a malignant neoplasm where the cells demonstrate cartilaginous differentiation. It is the second most common primary malignant bone tumour. There are a variety of different types that are subdivided according to their location and histological pattern. Most cases occur in middle-aged or elderly persons. Some arise from pre-existing benign cartilaginous lesions.

CASE 20577
The patient was a man aged 78 who died from rupture of the bile duct after obstruction by a gallstone. A dorsal kyphosis was noted during his hospital admission but no information about it was recorded.
Describe the specimen. The specimen consists of a sagittal slice through five thoracic vertebrae. The body of 1 is collapsed in a wedged fashion. Remnants of an intervertebral disc are visible within the bony mass.
Diagnosis: Old crush fracture

CASE 21287
This 23-year old man had a left mid-thigh amputation for a giant cell tumour of the femur. One year earlier the tumour was unsuccessfully treated with curettage and bone implantation.
Describe the specimen. The specimen consists of the lower 22cm of the left femur. A haemorrhagic, cystic, necrotic tumour extends from the articular cartilage for a distance of 7cm. The cortical bone of the shaft is destroyed anteriorly and posteriorly above the margins of the articular cartilage.
What is the diagnosis? Giant cell tumour of the femur

CASE 21479
The patient was a 21 year old man who was involved in a vehicular accident in the country. On admission to the RAH he was paraplegic with sensory loss below the umbilicus. X-ray showed a comminuted and markedly depressed fracture of the body of T11 with dislocation of the spine. Harrington compression rods were inserted in T10 to T12 with considerable improvement of the fracture alignment. He subsequently developed respiratory distress and died on the 12th day from massive pulmonary embolism.
Describe the specimen. The specimen consists of a length of lower thoracic and lumbar spine together with the lower portion of the spinal cord (both are mounted upside down). There is an oblique comminuted fracture of the body of T11 with transection of the pedicles and dislocation of the laminar synovial joints. There is gross disruption of the lower end of the spinal cord in the region of the conus medullaris.
What is the diagnosis? Traumatic paraplegia

CASE 22201
The patient was a man aged 21 who developed pain in the left leg. Biopsy was performed and treatment commenced. Some months later he represented with pain in the chest and profuse haemoptysis. X-ray showed pleural effusion and bilateral pulmonary metastases. He died 3 months later.
Describe the specimen. The specimen is of a sagittal section of the lower femur and upper tibia showing a large poorly defined subperiosteal tumour surrounding the knee joint and lower femur. The tumour is necrotic and focally cystic and also involves the femoral diaphysis.
What is the diagnosis? Osteosarcoma

CASE 22694
This 55-year old man had gross kyphosis since childhood. He was admitted with an acute respiratory illness with complicating staphylococcal septicaemia and he died soon after admission.
Describe the specimen. The specimen is a longitudinal sagittal section of the thoracic spine showing gross distortion of the body of one of the vertebrae to produce a gross gibbus. There is slight spinal cord compression at the level of the intervertebral disc below this vertebra.
What is the diagnosis? Idiopathic angular kyphosis

CASE 22705
This 43-year old man was a schizophrenic who suffered quadriplegia during a suicide attempt seven years before admission. The injury occurred at the C7 level. He also had had a total laryngectomy for carcinoma of the larynx in the past. He died from a respiratory infection.
Describe the specimen. The specimen is a sagittal section of the lower cervical and upper thoracic spine showing wedging and considerable posterior protrusion of the body of C7. The spinal cord is compressed at the level of the injury.
What is the diagnosis? Traumatic quadriplegia

CASE 22770
This 62-year old woman was admitted with a 7-month history of neck pain with later pain in the right shoulder, lumbo-sacral spine and both hips. Investigation showed an ESR of 103 mm and a sharp band in the gamma globulin region on serum electrophoresis. She died from a Gram negative septicaemia.
Describe the specimen. The specimen is a longitudinal section of humerus showing complete replacement of the medullary cavity by an ill-defined haemorrhagic tumour that in several areas has eroded the cortex of the bone.
What is the diagnosis? Multiple myeloma

CASE 23663
This 75-year old man had a tractor accident 3 years before admission in which he suffered paraplegia at the level of the T12 vertebra. He later developed recurrent urinary tract infections and pressure sores and died in renal failure with a raised potassium level.
Describe the specimen. The specimen is a sagittal section of the lower thoracic and lumbar vertebrae showing compression and some posterior protrusion of the body of T12. A Schmorl's node is visible in the body of this vertebra. Opposite the protrusion there is narrowing and angulation of the spinal canal. There is wasting of the cord above the lesion.
What is the diagnosis? Traumatic paraplegia

CASE 23973
The patient was a 19-year old girl with macrodactyly affecting the medial 3 toes of the left foot and all toes of the right foot. The medial fingers of the left hand were also involved. Removal and plastic repair were performed in 1972.
Describe the specimens.
The first specimen shows the three medial fingers of the left hand with gross deformity and some enlargement.
The second specimen shows the amputated toes of the right and left feet. The toes are grossly enlarged, the great toe of the right foot measuring 8 x 4 x 4 cm and on the left measuring 9 x 4.5 x 6 cm. The 2nd left toe is almost as large.
What is the diagnosis? Macrodactyly affecting the toes and fingers

CASE 24797
The patient was an 82 year old man who was admitted to hospital with a painful right hip following a fall at home. X-rays revealed a lytic lesion above the right acetabulum and in the left inferior pubic ramus. Other lytic areas were present within the right clavicle, within several ribs and T8. He then suddenly developed shortness of breath, right sided pleuritic chest pain and haemoptysis and died 24 hours later.
Describe the specimen. The specimen consists of a coronal section of the spine. There are numerous round, well-defined haemorrhagic lesions that have destroyed the cancellous bone. One of the vertebrae is extensively replaced by tumour and has collapsed.
What is the diagnosis? Multiple myeloma

CASE 25359
The patient was a woman aged 60 who died from an intracerebral haemorrhage.
Describe the specimen. The specimen is in two parts. The larger specimen shows the complete femur sectioned longitudinally in the coronal plane. The bone is bowed and there is marked thickening of the cortex with blurring of the margin between cortical and medullary bone. Patchy vascular congestion is noted.
The smaller specimen is the upper end of the femur. It shows the same irregular thickening and congestion of the cortex with encroachment upon the marrow cavity.
What is the diagnosis? Paget's disease of the femur
Comment: Histology showed the typical thick bony lamellae with a mosaic pattern of cement lines. The intervening marrow was fibrous and non-haemopoietic.

CASE 25376
The patient was a man aged 71 who had a carcinoma of the prostate for 2 years. Bone scan showed many secondary deposits and there were repeated episodes of aplastic anaemia requiring transfusions. At post-mortem the prostate was small, fibrous and nodular, and there were many secondary deposits in the vertebrae and ribs.
Describe the specimen. The specimen consists of portions of five lower thoracic and upper lumbar vertebrae that contain numerous haemorrhagic lesions. The surrounding bone appears unusually dense.
What is the diagnosis? Secondary carcinomatous deposits (primary in prostate)

CASE 25411
The patient was a woman aged 75 who was admitted to the Alice Springs Hospital in a debilitated condition in August 1975. There was ulceration below the left knee with a copious thin discharge which contained acid-fast bacilli. X-rays showed widespread pulmonary tuberculosis and marked destruction in the knee joint, particularly of the head of the tibia. There was a severe hypochromic anaemia and the ESR was raised. She died after a month in hospital, despite treatment.
Describe the specimen. The specimen consists of the left knee joint opened from the front. On the lateral aspect of the knee is a rounded defect in the skin measuring 4 x 3 cm with undermined edges and a ragged

sloughing floor. There is another defect measuring 2 x 1.5 cm, 6cm below the joint that lies over the tibia, which is exposed in its base. The joint shows marked inflammatory thickening and brown discolouration of the synovial membrane with patchy exudate adherent to its inner surface. The cartilage of the femoral condyles is eroded, particularly the medial condyle. There is marked erosion of the medial condyle of the tibia, exposing irregularly eroded bone. A small fragment of the articular surface of this condyle remains as a ridge anteriorly. The cartilage of the patella is also eroded.
What is the diagnosis? Tuberculosis of the knee joint with secondary osteoarthritis

CASE 25555
The patient was a woman aged 67 who was admitted with a fractured shaft of the left femur after a fall at home. She was known to have Paget's disease. The left leg was shortened and externally rotated, and the femur was obviously broken. A tibial Denham pin was inserted and the leg was placed in traction for 6 weeks. Chest x-ray showed multiple lesions in the lung. She was fitted with a walking calliper and discharged. She died a month later.
Describe the specimen. The specimen consists of 27cm of the lower left femur. Ill-defined white tumour fills the marrow cavity at the lower end and in many areas it invades and destroys cortex. A pathological fracture runs obliquely downwards and laterally through the superior aspect of the tumour. A patch of similar tumour is also noted in the cortex 17cm above the lower border of the bone. The cortex generally appears thickened. Some osteoarthritic changes are visible in the cartilage of the lateral condyle.
What is the diagnosis? Sarcoma of the femur arising in Paget's disease
Comment: This tumour was histologically reported to be a fibrosarcoma.

CASE 25586
The patient was a blacksmith aged 69 who smoked 2 packets of pipe tobacco and 20 cigarettes each week. There was clubbing of the fingers and hypertrophic pulmonary osteoarthropathy. Chest x-ray showed an opacity in the posterior segment of the left lower lobe, and at thoracotomy extensive hilar and mediastinal deposits were found. A palliative left pneumonectomy was performed. He died 18 months after the onset of the illness, and at post-mortem multiple metastases were present in bone, kidney, adrenal, liver and other soft tissues.
Describe the specimen. The specimen consists of portions of 6 vertebrae sectioned in the vertical plane. Numerous scattered rounded pale neoplastic deposits are evident in the trabecular bone.
What is the diagnosis? Metastatic carcinoma in the spine

CASE 25617
The patient was a man aged 28 who had low back pain for 3 years. At first this was episodic, but during the 6 months before admission it had become continuous. For the last 3 months he had lost 13kg in weight and pain in the left leg, radiating into the calf, had been present for 2 months. On examination there was weakness of flexion in the left hip, several lumps were present in the skull and there was a large mass in the bed of the right tonsil. On x-ray of the spine, there was a soft tissue mass at the level of C7 on the left side. A myelogram showed a spinal block at L1 and L2 and at laminectomy obvious cartilaginous tumour was removed from the extra-dural space Chemotherapy was given after the operation. He later developed thrombocytopaenia with bleeding and died. At post-mortem there was a tumour 5 x 6 x 3 cm on the inner aspect of the right ramus of the mandible beneath the tonsil with many metastatic deposits.
Describe the specimen. The specimen consists of 7 vertebrae divided in the median sagittal plane. Numerous cartilaginous deposits are present in the vertebral bodies and spinous processes. Some are rounded, but elsewhere the tumour infiltrates the vertebral bodies more diffusely. One vertebra has partially collapsed.
What is the diagnosis? Metastatic chondrosarcoma

CASE 25634
The patient was a man aged 65 who was admitted to hospital in March 1978. He had presented with anaemia in 1975. Bone marrow studies suggested lymphoma, and he was treated initially with the chlorambucil, vincristine and Prednisolone regime, but he subsequently relapsed and was then shown to have multiple myeloma with circulating light chains and Bence-Jones proteinuria. Intermittent transfusions were required. X-ray in August 1977 showed collapse of the body of T8 vertebra. During the illness severe congestive cardiac failure developed, which was thought to be ischaemic. No gross valvular lesions were found. Renal function also deteriorated. At his final admission the BP was 110/40, pulse 80 and collapsing, and a systolic murmur was present at the apex. The liver was enlarged and pulsating. Lymph nodes were not enlarged. He became anuric with rising blood urea and creatinine and died after one week in hospital.
Describe the specimen. The specimen consists of the lower portion of a femur divided in the coronal plane. Much of the marrow is red in colour apart from distally where it is yellow. At the lower end, the haemorrhagic areas of marrow are more patchy.
What is the diagnosis? Multiple myeloma
Comment: Alternative macroscopic diagnoses (in the absence of a clinical history) are leukaemia or marrow hyperplasia, such as in an anaemia. However there is a vague suggestion of rounded defects as seen in myeloma.
What single complication of multiple myeloma could be responsible for the patient's cardiac failure, liver enlargement and renal failure? Systemic amyloidosis
What complications of myeloma may be responsible for the patient's renal failure?

- Hypercalcemia (from osteolytic bone lesions) -> renal stones
- Hypercalcemia (from osteolytic bone lesions) -> calcium deposition in tubules with resultant chronic inflammation and scarring (nephrocalcinosis)
- Renal amyloid from light chain deposition
- Cast (Bence Jones protein) nephropathy
- Neoplastic infiltration
- Chronic pyelonephritis from recurrent infections to which patents with myeloma are susceptible

CASE 19160/81
The patient was a man aged 29 with a past history of renal transplantation for which he was taking Prednisolone.
Describe the specimen. The specimen consists of the head of the femur which has collapsed and its articular cartilage is irregularly eroded.
What is the diagnosis? Osteoarthritis following avascular necrosis of head of femur
Comment: Collapse of the head has occurred because the bone has undergone necrosis and become weak. Necrosis of bone results from ischaemia of which there are a variety of causes including nitrogen embolism ('the bends'), thrombosis in sickle cell anaemia and vasculitis, and damage to blood vessels as a result of trauma or radiation. However, a number of cases are idiopathic (e.g. Legg –Calve-Perthes Disease in the femoral head in children) and others follow steroid therapy (as may be the cause in this case). Subchondral infarcts often collapse and predispose to secondary osteoarthritis.

CASE 19293/81
No clinical history is available.
Describe the specimen. The specimen consists of the lower end of the femur cut longitudinally to reveal a large ovoid tumour 11cm in maximum dimension involving the lower and posterior external aspects of the bone. The tumour is generally well-circumscribed and has a white, whorled cut-surface. It involves the periosteal surface but can also be seen infiltrating the cortex and extending into the medulla beneath the articular cartilage.
What is the diagnosis? Osteosarcoma

Comment: This is an example of a parosteal osteosarcoma. These are generally slow growing osteosarcomas. The large, lobulated mass present in this case is typical. The extension into the medullary cavity is associated with decreased survival. Histologically these tumours show a disorderly pattern of osteoid-bone formation in a highly fibrous spindle-cell stroma.

CASE 50562/81
The patient was a woman aged 59 with a history of breast carcinoma.
Describe the specimen. The specimen consists of a length of vertebral column. Numerous irregular pale areas of tumour are replacing much of the bone. Some of the tumour deposits show white areas of necrosis.
What is the diagnosis? Metastatic carcinoma

CASE 50301/82
The patient was a woman aged 56 who had a long history of severe progressive rheumatoid arthritis with the hip finally becoming fixed. Systemic amyloidosis also complicated the later stages of the disease.
Describe the specimen. The specimen consists of the hip joint. No residual articular cartilage is apparent on the surface of the head of the femur that is eroded. The surrounding capsule is thickened and fibrous tissue fills the joint space. The adjacent bone is osteoporotic (difficult to appreciate) and the cortex of the femur is thinned.
What is the diagnosis? Severe advanced rheumatoid arthritis of hip joint
Comment: Rheumatoid arthritis is a systemic disease. Its effects on the joint include a progressive destruction of the articular surfaces by an advancing zone of granulation tissue pannus resulting in cartilage erosion and fibrosis.

CASE 50551/82
The patient was a man aged 75.
Describe the specimen. There are 2 specimens.
One is of femur that has been sliced coronally. It shows bowing deformity, great cortical thickening and loss of fine trabecular structure.
The other specimen of skull shows gross cortical thickening and loss of medullary spaces.
What is the diagnosis? Paget's disease of bone
Comment: Paget's disease is a metabolic disorder in which there is disturbance of bone formation and resorption resulting finally in thickened but weakened bones. On histology the increased remodelling is reflected by a mosaic pattern of cement lines. The medullary cavity may contain increased vessels and show fibrosis. Clinically the disease becomes manifest through deformity of the weight-bearing affected portions of the skeleton. The tibia and femora become bowed, the pelvis deformed, the vertebral column is shortened and the skull may show basilar impression and, in addition, the remodelling also may lead to narrowing of the foramina at the base of the skull, so interfering with cranial nerves. Affected bones may sometimes give rise to pathological fractures and osteosarcoma and the increased vascularity may lead to significant arterio-venous shunting and high output heart failure.

CASE 50595/82
The patient was a man aged 67.
Describe the specimen. The specimen consists of part of the elbow joint with ulna and radius. The most striking abnormality is the villous proliferation of the synovium. The articular cartilage of the ulna has been destroyed and the surface is irregular and pitted.
What is the diagnosis? Rheumatoid arthritis, elbow joint

CASE 50032/83
The patient was a male aged 71 with a history of prostate carcinoma.

Describe the specimen. The appearances of the femur and the rib on the sides contrast sharply with the normal rib in the centre that has been placed there for comparison. The diseased bones are sclerotic and thickened and the normal distinction between cortex and medulla is greatly reduced. There are ill-defined nodules of pale tumour in the head and neck of the femur with patchy haemorrhage in the femoral head and vaguely nodular tumour in the shaft. The femoral head is distorted, much of the cartilage eroded and there is osteophyte lipping around the articular margin inferiorly.
What is the diagnosis? Osteosclerotic metastases from carcinoma of the prostate, osteoarthritis of the hip

CASE 50052/83
The patient was a man aged 36 with non-Hodgkin's lymphoma for which he was receiving treatment.
Describe the specimen. The specimen consists of a segment of the vertebral column. The marrow of 2 vertebrae contains ill-defined pale areas of tumour with surrounding congestion.
What is the diagnosis? Marrow involvement in Non-Hodgkin's lymphoma
Comment: Without the clinical history, the favoured macroscopic diagnosis of this specimen is metastases.

CASE 50516/83
The patient was a woman aged 58 who died three years after a diagnosis of breast cancer was made.
Describe the specimen. The specimen consists of a length of vertebral column. There are extensive ill-defined deposits of pale tissue with surrounding congestion replacing the normal marrow.
What is the diagnosis? Vertebral column - metastatic adenocarcinoma from the breast

CASE 50642/83
No clinical history is available.
Describe the specimen. The section of vertebral column shows marked osteophyte formation with fusion of the osteophytes of adjacent vertebrae. Where fusion has occurred, the lateral parts of the intervertebral discs have been destroyed and replaced by bone.
What is the diagnosis? Spinal osteoarthritis

CASE 7801/84
The patient was a woman aged 50.
Describe the specimen. The specimen is a coronal slice through the right leg that reveals a lobulated, pale oval tumour 11cm in length with spotty haemorrhages that has destroyed the middle of the fibula.
What is the diagnosis? Sarcoma of the fibula
Comment: Histologically this was said to be a Ewing's tumour. A macroscopic diagnosis of osteosarcoma would not have been unreasonable, although the age, sex and site are not typical. Ewing's sarcoma is an uncommon malignant tumour of bone that typically affects children and adolescents (although this patient was 50) and usually arises in the shaft of long bones. Histologically Ewing's sarcoma consists of solid sheets of small round cells divided by fibrous strands. Using special techniques, the cells demonstrate evidence of neuroepithelial differentiation.

CASE 13423/84
No clinical history is available.
Describe the specimen. The specimen consists of distal ulna that has a fracture of the lower end. The fracture has occurred through a lobulated pale neoplasm with some yellow necrosis and darker areas of haemorrhage. The tumour fills the marrow space and is invading and narrowing the cortex.
What is the diagnosis? Pathological fracture of ulna through a tumour
Comment: Histology revealed chondrosarcoma.

CASE 17064/84
The patient was a man aged 27 with a history of malignant melanoma.
Describe the specimen. The specimen consists of a longitudinal section of the head and upper shaft of the humerus. The cut surface shows an irregular tumour mass 7cm in length with a variegated cut surface and areas of necrosis replacing part of the bone. The tumour has invaded and destroyed the cortex and is causing elevation of the periosteum.
What is the diagnosis? Malignant tumour of the humerus in keeping with metastatic malignant melanoma
Comment: Note that this tumour is not really pigmented. The grey areas may represent areas of necrosis. Melanomas are not always pigmented.

CASE 50086/84
The patient was a man aged 64 with a history of chronic lymphocytic leukaemia.
Describe the specimen. There are 2 specimens, one of each femur sectioned coronally. In one specimen, a pathological fracture has occurred through the neck. The cortex in the region of the fracture is thinned. The medullary cavity is quite abnormal for a patient of this age, containing deep red tissue. The other specimen also shows the normal yellow marrow of the medullary cavity to largely be replaced by red marrow.
What is the diagnosis? Pathological fracture through neck of femur from leukaemic infiltration
What is red marrow and what is white, yellow or fatty marrow?
Red marrow is where there is active haemopoietic tissue. Nonetheless, histologically even in normal haemopoietic areas in the adult, approx. 50% of marrow is fat, 50% is haemopoietic tissue. White marrow is where there is inactive fatty marrow.
In what sites is red marrow normally present in a patient of this age? In adults, red (haematopoietic) marrow is restricted to the bones of the skull, vertebral column, thoracic cage, girdle bones and the proximal femur and humerus.
Where is red marrow normally present in children? In the medullary cavity of all bones. N.B. In the fetus, haematopoiesis occurs in the liver.
What conditions in adults may cause the red marrow to extend down into the long bones?
Haemopoietic cells of the red marrow can proliferate and replace the white or fatty marrow in a number of pathological states. This may happen, if for example, there is an abnormal proliferation of certain cells in the marrow (leukaemias) or in many different types of anaemia where the marrow undergoes hyperplasia in response to the increased demand for erythropoiesis. In some cases, all of the available marrow space may become active and haematopoiesis may also occur in the liver and spleen (extramedullary haematopoiesis).

CASE 2374/85
The patient was a woman aged 35.
Describe the specimen. The specimen is a right forefoot. The toes are grossly enlarged and the skin markedly wrinkled.
What is the diagnosis? Chronic lymphoedema
Comment: This specimen shows the effect of longstanding lymphoedema. Histologically there would be subcutaneous fibrosis and hyperkeratosis of the epidermis. This patient had lymphoedema praecox, a disorder of unknown cause that generally arises in females in adolescence. The swelling has to some extent gone down following loss of interstitial fluid through the exposed area created by surgery. Students are not expected to make this diagnosis.

CASE 50701/85
The patient was a man aged 81.
Describe the specimen. This longitudinal section through the upper femur shows illdefined areas of slightly greyish tumour in the neck and shaft.
What the diagnosis? Multiple myeloma

Comment: Multiple myeloma is a malignant tumour of plasma cells, typically characterised by multiple deposits of tumour in bones. Usually these tumour deposits are osteolytic and can cause pathological fracture, hypercalcaemia and anaemia. The tumour cells often produce immunoglobulin that can be picked up on an electrophoretic examination of serum.

CASE 18309/89
The patient was a man aged 66.
Describe the specimen. The specimen consists of a clavicle from which is arising an irregular pale and focally necrotic mass. The tumour has destroyed the bone and is extending out into the surrounding muscle. The longitudinal slice through the clavicle away from the tumour shows thickening of the cortex and loss of distinction between cortex and medulla with coarsening of the bony trabecular pattern.
What is the diagnosis? Osteosarcoma arising in a bone affected by Paget's disease
Comment: The development of osteosarcoma is a well-recognised complication of Paget's disease of bone.

CASE 1810/92
The patient was a man aged 26.
Describe the specimen. The specimen consists of a short segment of rib with attached 4x3cm tumour. The tumour appears bony with focal haemorrhage and is capped by an irregular layer of cartilage.
What is the diagnosis? Rib - osteochondroma
Comment: On histology both the cartilage and underlying bone were orderly.
Osteochondroma may occur as a sporadic solitary lesion or occur as multiple lesions in the hereditary disorder multiple hereditary exostosis, transmitted by autosomal dominant inheritance.

CASE 18477/92
This patient developed osteomyelitis following plating of a fracture of the tibia.
Describe the specimen. The specimen consists of an irregular piece of the shaft of the tibia. The surface of the bone is irregularly eroded in a pattern reminiscent of white ants working on wood. Pus is visible in the medullary space. The screw holes from a previous plate are apparent.
What is the diagnosis? Sequestrum following longstanding osteomyelitis

CASE 50186/92
The patient was a man aged 72 who presented initially with prostatic carcinoma in 1987 and was treated with transurethral prostatectomy and local radiotherapy. He was admitted in June 1992 with development of an incomplete quadriplegia secondary to infiltration of the odontoid process by metastatic carcinoma with atlanto-axial subluxation. In addition virtually every level of the vertebral column was infiltrated by metastatic carcinoma.
Describe the specimen. There are 2 specimens of vertebral column. The cancellous bone of the vertebral bodies is grossly abnormal with patchy deposits of pale tumour with surrounding congestion. In some areas the normal trabecular pattern is lost and the bone appears dense. In 2 areas in the longer specimen, the intervertebral discs herniate into the weakened vertebral body.
What is the diagnosis? Spinal column - metastatic prostate carcinoma

CASE 24088/93
No clinical history is available.
Describe the specimen. The specimen consists of a tibial plateau. The articular surface has been irregularly eroded and there is slight osteophyte formation at the edges.
What is the diagnosis? Osteoarthritis

CASE 2047/95

The patient was a 30 year old woman who presented with a mass on the left side of her chest, surrounding ribs 10-12.

Describe the specimen. The specimen consists almost entirely of the mass, which can be seen traversing several ribs cut in cross section. The mass is irregular but appears encapsulated and has a variegated cut surface, ranging from white to grey in colour. On the posterior aspect of the pot, the tumour can be seen to have a smooth slightly lobulated surface.

Diagnosis and comment: On the macroscopic appearance alone, this lesion has the features of some sort of sarcoma, a malignant tumour of variable mesenchymal differentiation. It has an expansive pattern of growth. On histology, this tumour was found to be a mesenchymal chondrosarcoma. This tumour tends to affect young people and generally has a poor prognosis.

CASE 21459/95

The patient was a woman aged 53 who presented with a short history of increasing pain in the upper right leg. X-rays revealed an extensive lesion within the proximal femoral shaft and neck, with focal destruction of the cortex. A biopsy was followed by resection of the proximal femur.

Describe the specimen. The specimen consists of the upper end of the femur cut in the coronal plane. The cancellous bone of the upper shaft is replaced by an irregular ill-defined mass of whitish tissue with a vaguely cartilaginous appearance. The prominent white mass with a haemorrhagic margin at the upper end of the tumour is cement that was injected into the biopsy site to prevent fracture.

Comment: On macroscopic examination alone the features are those of a primary malignant tumour of bone. Histology revealed this tumour to be a malignant fibrous histiocytoma, a malignant tumour composed predominantly of spindle cells arranged in a characteristic whorled pattern and with large cells having bizarre nuclei.