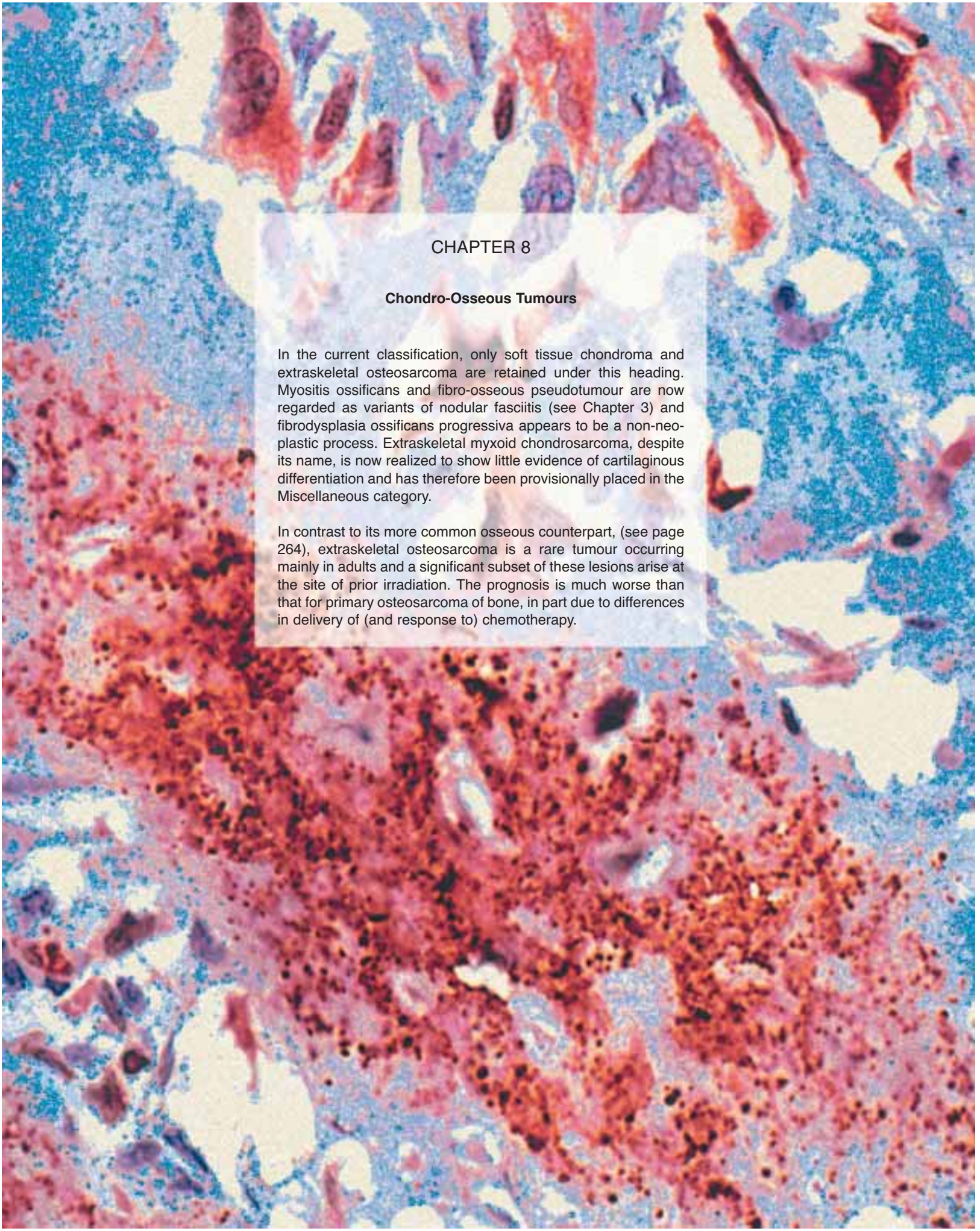

CHAPTER 8

Chondro-Osseous Tumours

In the current classification, only soft tissue chondroma and extraskeletal osteosarcoma are retained under this heading. Myositis ossificans and fibro-osseous pseudotumour are now regarded as variants of nodular fasciitis (see Chapter 3) and fibrodysplasia ossificans progressiva appears to be a non-neoplastic process. Extraskeletal myxoid chondrosarcoma, despite its name, is now realized to show little evidence of cartilaginous differentiation and has therefore been provisionally placed in the Miscellaneous category.

In contrast to its more common osseous counterpart, (see page 264), extraskeletal osteosarcoma is a rare tumour occurring mainly in adults and a significant subset of these lesions arise at the site of prior irradiation. The prognosis is much worse than that for primary osteosarcoma of bone, in part due to differences in delivery of (and response to) chemotherapy.

Soft tissue chondroma

S. Nayler
S. Heim

Definition
Soft tissue chondromas are benign soft tissue tumours occurring in extra-osseous and extra-synovial locations, predominantly composed of adult type hyaline cartilage, devoid of other differentiated elements, except osseous, fibrous and / or myxoid stroma.

ICD-O code 9220/0

Synonyms (Variants)
Extraskeletal chondroma (fibrochondroma, myxochondroma, osteochondroma), chondroma of soft parts.

Epidemiology
The majority of patients are middle-aged, with the reported age range from infancy {762} to 79 years {351, 428, 982}. There is a slight male predominance {351, 428}.

Sites of involvement
The majority of tumours (~64%) occur in the region of the fingers {351}. The remainder of cases occur in the hands, toes and feet, with origin in the trunk, head and neck region {1056} being extremely uncommon. Rare examples have been described in the skin {57, 218}, upper aero-digestive tract {1040, 1244,2211}, dura {281} and, exceptionally, the fallopian tube {2005}.

Clinical features
Most tumours are solitary and present as painless lumps arising in the vicinity of tendons and joints. By definition they are not attached to intraarticular synovium or periosteum. Radiologically they are well demarcated, lobulated neoplasms with central and peripheral calcifications, often curvilinear in nature {120,2347}. Diagnosis can be made on magnetic resonance imaging {2294}.

Macroscopy
Grossly soft tissue chondromas are well circumscribed, lobulated neoplasms. They exhibit a cartilaginous cut surface, although myxoid areas and cystic change may be noted. They rarely exceed 20 to 30 mm in maximal diameter.

Histopathology
Microscopically typical chondromas are composed of lobules of mature, adult hyaline cartilage {1087}. Chondrocytic cells are identified in lacunae, often growing in clusters. When these cells are numerous this variant may be labelled a chondroblastic chondroma {1255}. Prominent fibrosis warrants a designation of fibrochondroma, whilst those tumours with prominent ossification or myxoid change may be classified as osteochondromas {1780} or myxochondromas, respectively {2241}. A chondroblastoma-like variant has also been described

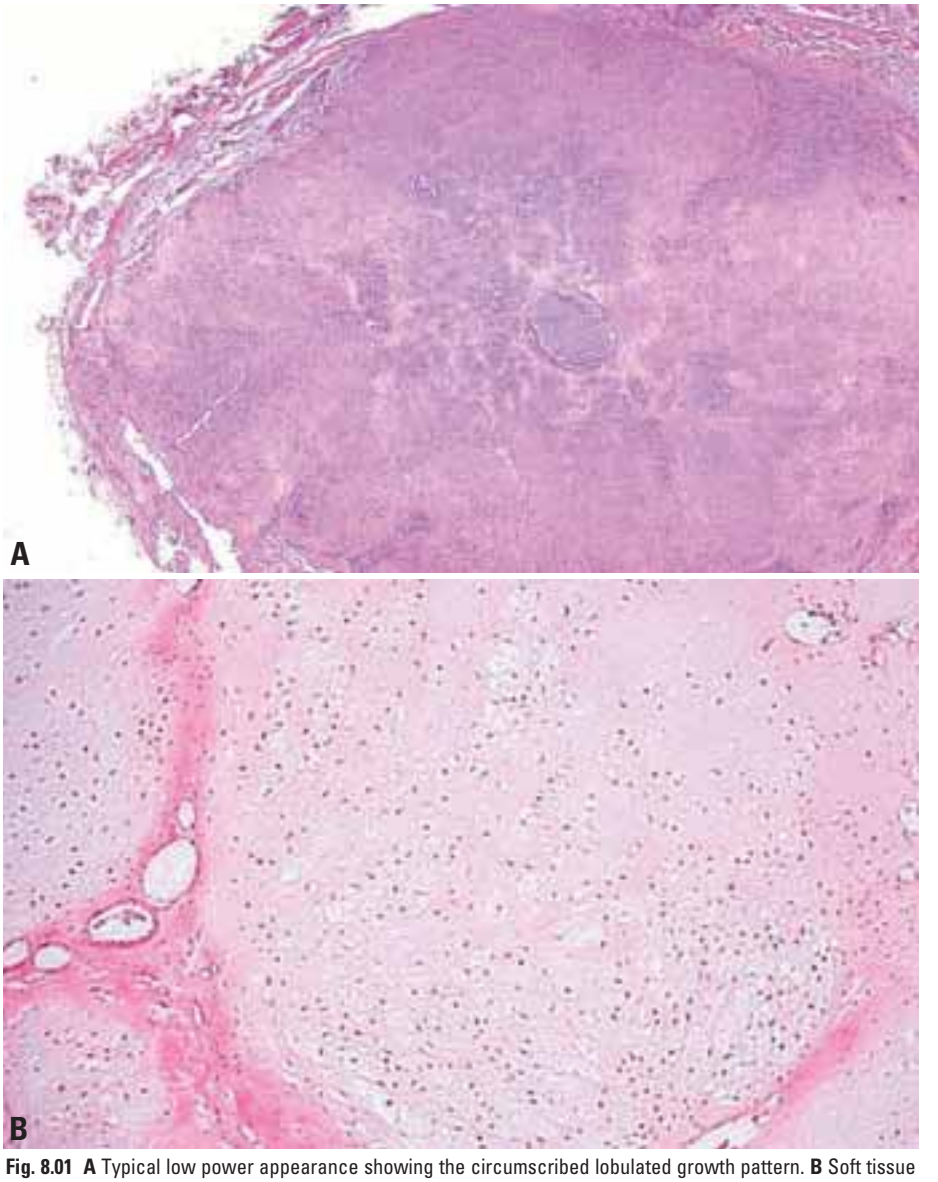

Fig. 8.01 **A** Typical low power appearance showing the circumscribed lobulated growth pattern. **B** Soft tissue chondroma, consisting of lobules of mature hyaline cartilage.

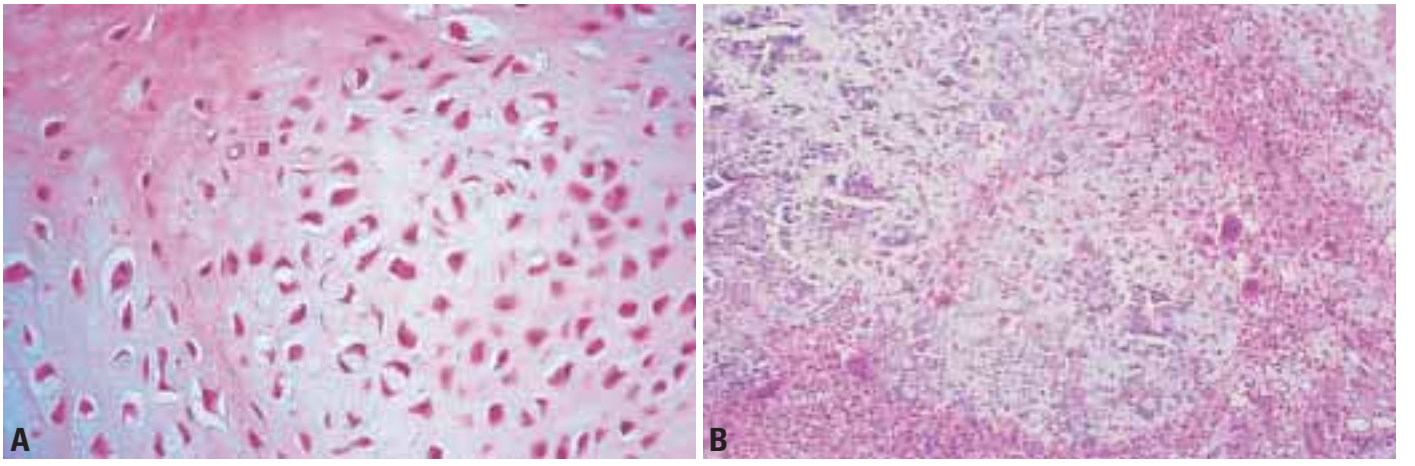

Fig. 8.02 **A** Soft tissue chondroma, mature cartilage wells showing mild variation in size and shape. **B** Soft tissue chondroma, calcified variant, with calcium deposits surrounding cartilage cells.

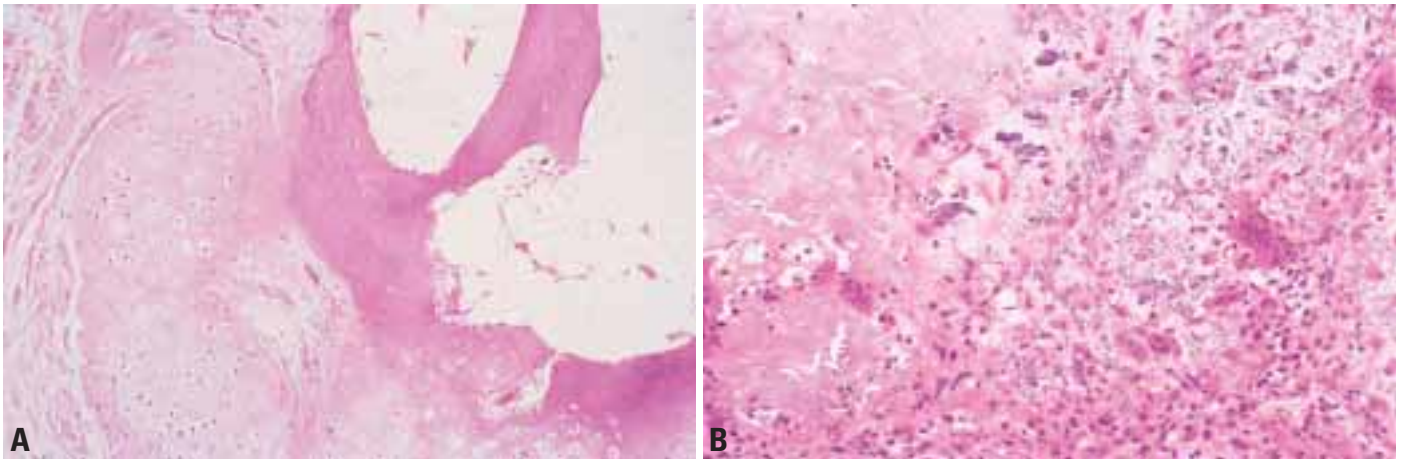

Fig. 8.03 Soft tissue chondroma. **A** Intralesional ossification is quite often seen. **B** Some cases, especially those which are classified, show a striking histiocytic reaction at the periphery.

{315,1012}. One-third of cases may demonstrate extensive calcification, which may mask the cartilaginous appearance of the tumour, particularly in the centre of the tumour lobules. Typical chondroblastic areas are usually discernible at the periphery of the lobules in such cases. Rare tumours may have abundant myxoid matrix with plump immature cells resembling a myxoid chondrosarcoma; however, typical chondroblastic areas are discernible in the periphery of the tumour lobules. Up to 15 percent of cases may show an adjacent granuloma-like reaction {2314} with peripherally situated epithelioid and multinucleated giant cells, surrounding each lobule.

The individual cells are usually small and normochromic. Some tumours cells may be variable in size and shape, with prominent nuclear hyperchromasia and nucleomegaly. Sparse mitoses may be seen, but abnormal mitotic figures are never observed.

Immunophenotype

As with normal cartilaginous cells, the cells of soft tissue chondromas are positive with S100 protein {2314}.

Ultrastructure

Electron microscopy shows typical features of cartilage cells, with abundant rough endoplasmic reticulum, free ribosomes and short irregular microvillous processes surrounded by aggregates of calcium crystals {351}.

Genetics

Only four soft tissue chondromas have shown clonal chromosomal abnormalities {266, 437, 1316, 2105}, and there is no indication of a non-random, let alone specific, aberration pattern.

Prognostic features

Extraskeletal chondromas are benign tumours, although 15 to 20 percent may recur locally {351}. In most instances local excision is curative {351,428,1775}. Transformation to chondrosarcoma, although not uncommon with osseous and synovial cartilaginous tumours, has not been described in extraskeletal chondromas.

Extraskeletal osteosarcoma

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S. Heim

Definition
Extraskeletal osteosarcoma (EO) is a malignant mesenchymal tumour of soft tissue composed of neoplastic cells that recapitulate the phenotype of osteoblasts and synthesize bone. Some EOs also contain cellular elements that differentiate along chondroblastic and fibroblastic cell lines. Accordingly, all EOs contain neoplastic bone but may also have cartilaginous and fibroblastic components. By definition, no other lines of differentiation are evident.

ICD-O code 9180/3

Synonym
Soft tissue osteosarcoma.

Epidemiology
Extraskeletal osteosarcoma is a rare neoplasm that accounts for 1-2% of all soft tissue sarcomas and approximately 2-4% of all osteosarcomas {119,1284, 1994}. It typically arises during mid and late adulthood with most patients in the 5th-7th decades of life at the time of diagnosis. Males are affected more frequently than females at a ratio of 1.9:1 {119,355,663,1231,1257,1284,1994}.

Sites of involvement
The majority of EOs arise in the deep soft tissues and fewer than 10% are superficial, originating in the dermis or subcutis. The single most common location is the thigh (approximately 50% of cases); other frequent sites include the buttock, shoulder girdle, trunk, and retroperitoneum {119,355,663,1231,1257,1284,1994}.

Clinical features
Most patients present with a progressively enlarging mass that maybe associated with pain. Plain radiographs, CT and MRI usually reveal a large deep-seated soft tissue mass with variable mineralization. By definition these tumours do not arise from bone, but may secondarily involve the periosteum, cortex or medullary canal.

Aetiology
The majority of EOs develops de novo but up to 10% are associated with previous radiation or well-documented trauma. Radiation-induced EO usually develops at least 4 years following radiation for another malignancy {355, 1231, 1257, 1994}.

Macroscopy
Extraskeletal osteosarcomas range in size from 1-50 cm (mean 8-10 cm) and are circumscribed, tan-white, haemorrhagic and focally necrotic gritty masses. The tumour bone is frequently most prominent in the centre of the lesion. In a small number of cases (less than 10%) they exhibit extensive haemorrhagic cystic change.

Histopathology
All of the major subtypes of osteosarcoma that arise in bone may be seen in EO. The most common is the osteoblastic variant, followed by the fibroblastic, chondroid, telangiectatic, small cell, and well differentiated types {119, 355, 663, 1231, 1257, 1284, 1994, 2322}. The tumour cells are spindle or polyhedral cells that are cytologically atypical, are mitotically active and frequently demonstrate atypical mitotic figures. Common to all variants is the presence of neoplastic bone, intimately associated with tumour cells, which may be deposited in a lacy, trabecular or sheet-like pattern. The bone is usually most prominent in the centre of the tumour with the more densely cellular areas located in the periphery a pattern that is the reverse of myositis ossificans (see page 52). In the osteoblastic variant, the tumour cells resemble malignant osteoblasts and bone matrix is abundant. Spindle cells arranged in a herringbone or storiform patterncharacterize the fibroblastic subtype and malignant cartilage predominates in the chondroid variant. Telangiectatic EOs contain numerous large blood filled spaces lined by malignant cells. Sheets of small round cells that mimic Ewing sarcoma or lymphoma are typical of the small cell variant. The extremely rare well differentiated subtype contains abundant bone deposited in well formed trabeculae, surrounded by a minimally atypical spindle cell component similar to parosteal osteosarcoma.

Immunophenotype
Several studies indicate that the immunophenotype of EO is similar to osteosarcoma arising in bone {632, 640, 893, 1257}. EOs are uniformly positive for vimentin, 68% express smooth muscle actin, 25% desmin, 20% S100 protein (including cells in non-cartilaginous areas), 52% EMA, 8% keratin, and 0% PLAP {893, 1257}. Osteocalcin is theoretically the most specific antigen for EOs and it is expressed in the malignant cells and matrix in 82% and 75% of cases, respectively {632}. CD99 is expressed in all types of osteosarcoma.

Fig. 8.04 Plain X-ray showing large mineralized mass in posterior thigh.

Fig. 8.05 EO composed of white gritty centre with surrounding soft tan tissue.

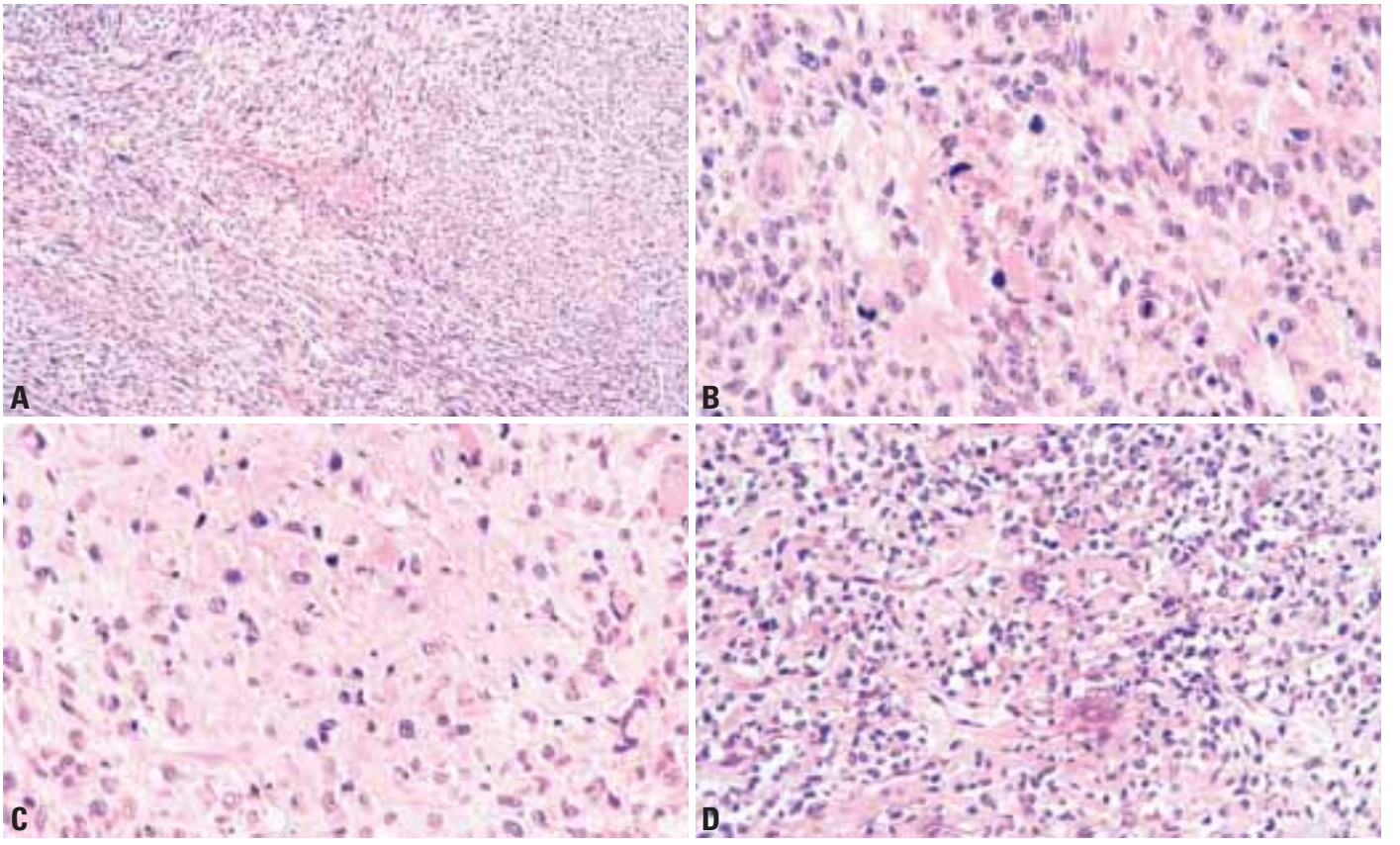

Fig. 8.06 Extraskeletal osteosarcoma. **A** Fibroblastic variant. Fascicles of malignant spindle cells surround a small amount of neoplastic bone. **B** Osteoblastic variant consisting of cytologically malignant cells associated with lace-like tumour bone. Note numerous mitoses. **C** Chondroblastic variant. Cellular malignant hyaline cartilage merging peripherally with tumour bone. **D** Small cell variant composed of sheets of malignant small round cells associated lace-like tumour bone and small islands of neoplastic cartilage.

Ultrastructure

The neoplastic cells of EO vary in appearance. The cells and nuclei are usually large with irregular contours and the cytoplasm contains rough endoplasmic reticulum that may be dilated, as well as a well-developed Golgi complex and filaments {1766}. Desmosomes or tight junctions are rare or absent. Collagen predominates in the extracellular space and electron dense crystals of hydroxyapetite are present in areas of bone deposition.

Genetics

Only three cases with clonal chromosomal aberrations have been reported. In two tumours {1319, 1425}, highly complex aberration patterns were seen, whereas the third {1485} had a moderately hyperdiploid karyotype with relatively few chromosomal abnormalities. So far, therefore, nothing indicates that systematic genetic differences exist between osteosarcomas of bone and soft tissues.

Prognostic factors

Extraskeletal osteosarcoma has a very poor prognosis and approximately 75% of patients die of disease within 5 years of diagnosis {119, 355, 663, 1231, 1257, 1284, 1994}. Morphologic features purported to be associated with a better outcome include small size (<5 cm), histological subtype (fibroblastic, chondroblastic) and diminished proliferative activity as measured by Ki-67 index {119, 355, 1231, 1257}. However, the utility of these prognostic factors has not been confirmed in independent studies. The well differentiated variant may behave in a more indolent fashion; however, too few cases have been reported to draw definitive conclusions regarding their biologic potential.

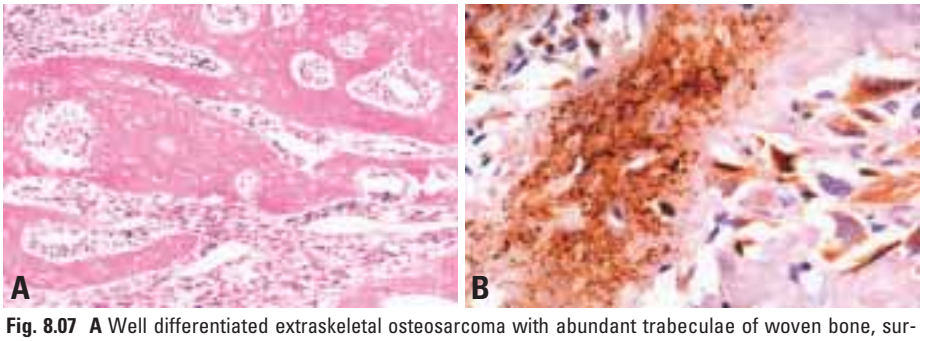

Fig. 8.07 **A** Well differentiated extraskeletal osteosarcoma with abundant trabeculae of woven bone, surrounded by a bland spindle cell component. **B** Tumour cells and stromal osteoid show immunoreactivity for osteocalcin (ABC method).