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Selected topics in the pathology of epithelioid soft tissue tumors

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Epithelioid morphology, mimicking carcinoma, is a key or defining feature of several soft tissue tumors and may be seen in a wide variety of other tumors. This review will focus on those tumors defined at least in part by their epithelioid morphology, in particular epithelioid sarcoma, epithelioid malignant peripheral nerve sheath tumor, and sclerosing epithelioid fibrosarcoma. The role of loss of the SMARCB1 tumor-suppressor gene in the pathogenesis of these epithelioid soft tissue tumors will be discussed, as will their differential diagnosis with non-mesenchymal tumors, in particular carcinoma and melanoma.
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Epithelioid sarcoma

Epithelioid sarcoma (ES) is a distinctive sarcoma showing epithelial differentiation, most often involving the distal extremities of young patients. It was first formally described by Enzinger[1] in 1970. It had previously been considered part of the spectrum of 'tendosynovial sarcoma', a term previously used to describe what we now consider to represent ES, clear cell sarcoma, and synovial sarcoma. Larger, more pleomorphic tumors, typically occurring in more proximal locations have been labeled 'proximal-type' ES. The morphological, immunohistochemical, and molecular genetics of ES shows considerable overlap with malignant extrarenal rhabdoid tumors (MERTs), as discussed below.

Clinical Features

Classical ES most commonly occur in adolescents and young adults, with a median age of 26 years. The tumor is approximately twice as common in males as in females. Classical ES most commonly involve the hands/fingers, followed by the wrist/lower arm and lower leg/knee but may occur in essentially any location.[1–3] Involvement of tendons and aponeuroses is common but not invariably present. Most are small (3–6 cm) at the time of diagnosis. Proximal-type ES tends to occur in older adults, most often involving the deep soft tissues of the perineum, genital region, and pelvic soft tissues, and is present as much larger masses than do classical ES.[4] Clinically, classical ES often presents as a small, indurated, sometime ulcerated nodule or nodules, frequently present for several weeks or longer, before coming to clinical attention. The clinical index of suspicion for a malignant lesion is often quite low.[2] In contrast, proximal-type ES presents as a nonspecific soft tissue mass.[3,4]

ES recurs in over 70% of cases, often as multiple subcutaneous nodules in the more proximal extremity. Nearly 50% of ES will eventually metastasize distantly, most often to the lymph nodes and the lungs but also to the skin and soft tissue sites.[1–3] Metastatic ES is almost uniformly fatal. ES is not graded; adverse prognostic features are chiefly clinical and include male sex, proximal location, size >5 cm, and deep location. Proximal-type ES may metastasize earlier than classical variants.

Pathological Features

ES typically presents as relatively small (<5 cm), ulcerated, firm, single or multiple nodules, sometimes with overlying ulceration. Proximal-type ES presents as larger nonspecific soft tissue masses, often with grossly apparent areas of hemorrhage and necrosis. The morphological features of classical ES and some significant morphological variants are illustrated in Figures 1a–h. Morphological features of proximal-type ES are illustrated in Figures 2a–d.

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ES are often relatively circumscribed at low-power magnification but are invariably highly infiltrative tumors, frequently extending into the surrounding connective tissue in the form of small nests and single files of tumor cells.[1–3] Tumor nodules often show central necrosis, mimicking necrobiotic

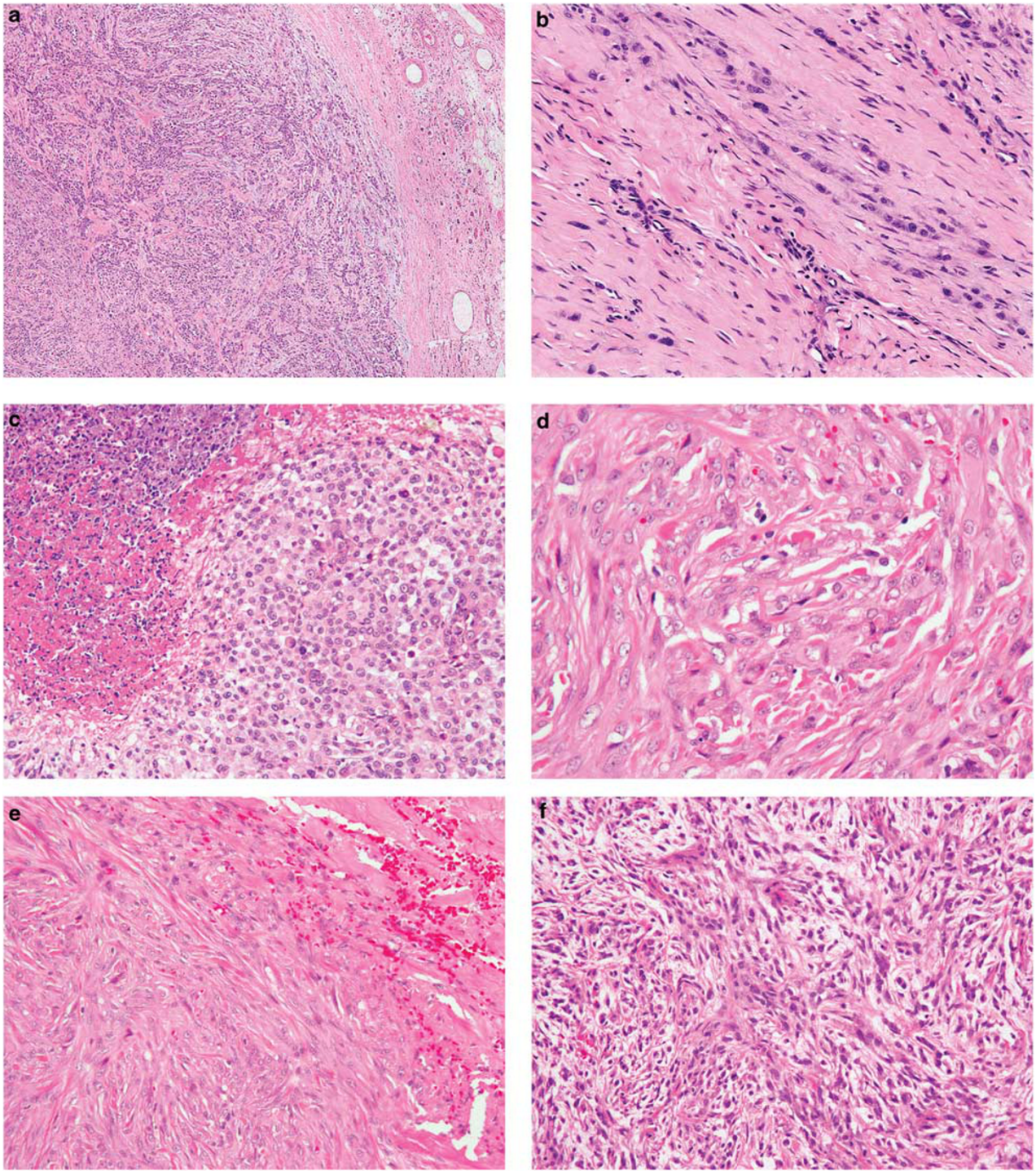
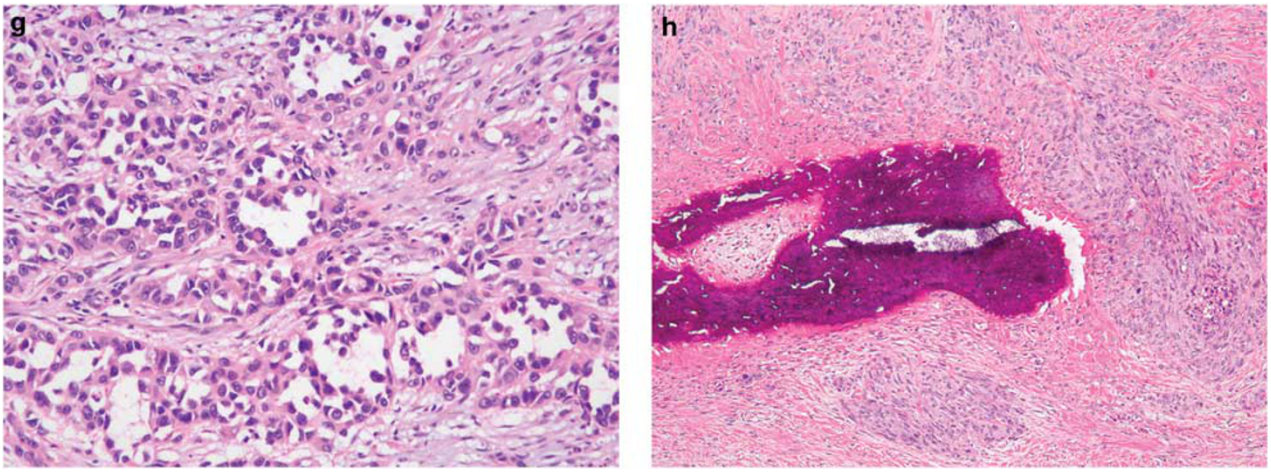


Figure 1 At low-power magnification, epithelioid sarcomas often have a deceptively well-circumscribed growth pattern, mimicking some types of benign processes (**a**). However, infiltrative growth, often in the form of single cells and small tumor cell nests, is invariably present at the periphery of the tumor, likely accounting for the high rate of local recurrence (**b**). Central necrosis, a common feature of epithelioid sarcoma, may suggest the possibility of granulomatous disease (**c**). The cells of classical-type epithelioid sarcoma are typically small, uniform, and relatively bland (**d**). Epithelioid sarcomas typically show a mixture of epithelioid and more spindled forms; extensively spindled epithelioid sarcomas may mimic fibrous histiocytomas and other low-grade spindle cell tumors (**e**). Myxoid change in epithelioid sarcoma (**f**). Pseudogland formation in epithelioid sarcoma, mimicking adenocarcinoma. When these spaces are filled with blood, a vascular tumor is also a differential diagnostic consideration (**g**). Hyalinized collagen, calcification, and occasionally bone formation may be seen in some epithelioid sarcomas (**h**).



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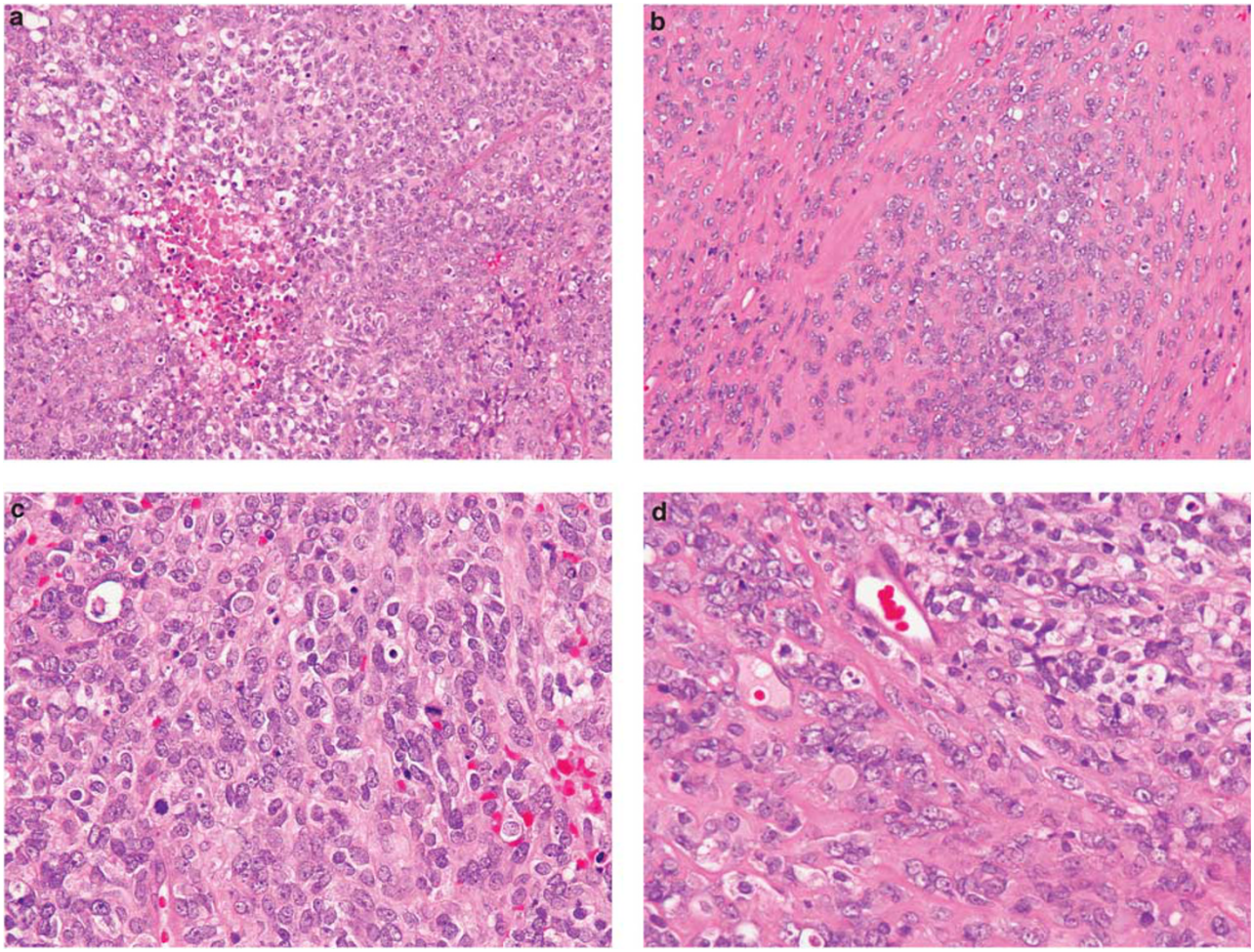


Figure 2 Proximal-type epithelioid sarcomas (PTESs) present as larger masses in the proximal extremities, often with large areas of necrosis (**a**). Stromal hyalinization in PTES (**b**). The cells of PTES show greater pleomorphism and more frequent mitotic figures than do those of the classical type (**c**). Rhabdoid morphology, with glassy intracytoplasmic inclusions, in PTES (**d**).

granulomas. When individual tumor nodules may grow along tendons and fuse, they may produce a 'garland-like' appearance. The neoplastic cells may appear small and epithelioid, or may show greater pleomorphism and a rhabdoid appearance, particularly in larger, more proximally located tumors.[3,4]

Although epithelioid morphology is always at least focally present, many ESs also show spindling, and this combination of features is characteristic. Rare ES consists chiefly of spindled cells.[5] The nuclei of ES are relatively uniform appearing but show hyperchromatism, chromatin abnormalities, and irregular nuclear contours. Unusual morphologic changes include pseudovascular or pseudogland formation, myxoid change, calcification, and bone formation.[6,7] A mixed chronic inflammatory cell infiltrate is typically present and may occasionally obscure the underlying tumor.

Immunohistochemical Features

Using immunohistochemistry, ES expresses vimentin as well as a variety of different cytokeratins, including those of low and high molecular weights (Figure 3a).[3,4] They are generally negative, however, for cytokeratins 5/6.[8] CD34 is expressed by ~50% of cases, in contrast with <2% of carcinomas (Figure 3b).[4,9,10] ES does not express other markers of endothelial differentiation, such as CD31, FLI-1/ERG, or vWF. Over 90% of ESs of all types show the loss of expression of the tumor-suppressor gene product SMARCB1/INI1/BAF47 (SMARCB1) (Figure 3c).[11–13]

Genetic Features

Cytogenetic studies of ES show principally nonspecific chromosomal gains and losses.[14–20] However, loss of 22q11, the location of the *SMARCB1* gene, has been reported in few cases. Using FISH, *SMARCB1* gene deletion has been reported in ES of both classical and proximal types. Mutation of *SMARCB1*, a feature of rhabdoid tumors, does not seem to occur in ES.[7,16,21,22]

Differential Diagnosis

ES differs from granulomatous processes by virtue of its infiltrative growth pattern, the presence of true

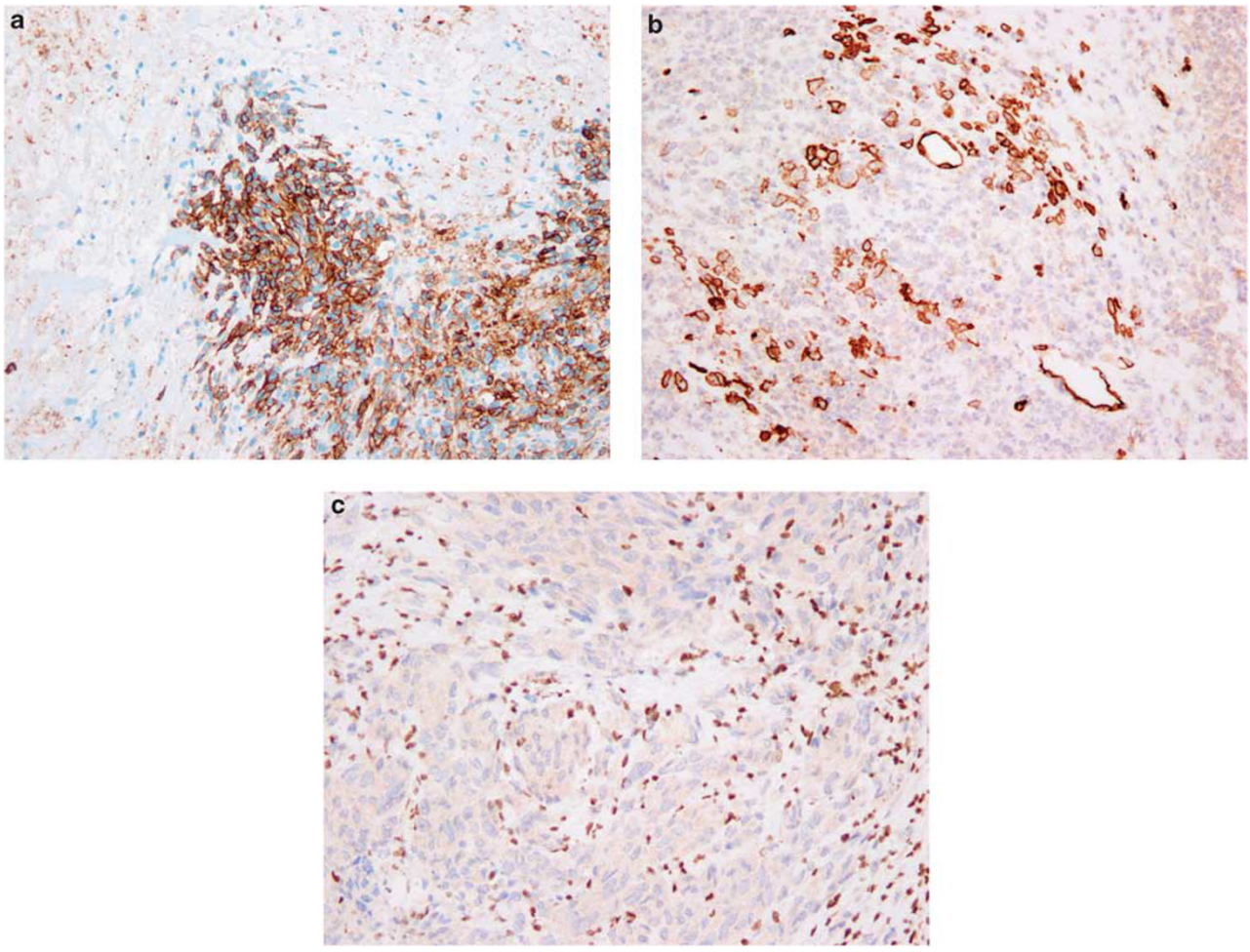


Figure 3 Using immunohistochemistry, epithelioid sarcomas of all types typically show strong expression of cytokeratins, including both low and high molecular-weight forms (**a**). CD34 expression is seen in 50–60% of epithelioid sarcomas, in contrast to <2% of carcinomas (**b**). Complete loss of SMARCB1 (INI1) expression is seen in ~90% of epithelioid sarcomas (**c**).

tumor cell necrosis as opposed to necrobiosis, and the presence of hyperchromatic cells showing expression of cytokeratins and loss of SMARCB1 expression. The loss of SMARCB1 expression is also helpful in the distinction of ES from carcinomas. Pseudovascular ES often expresses high molecular-weight cytokeratins, unlike endothelial cell neoplasms, and the lack of expression of CD31, FLI-1

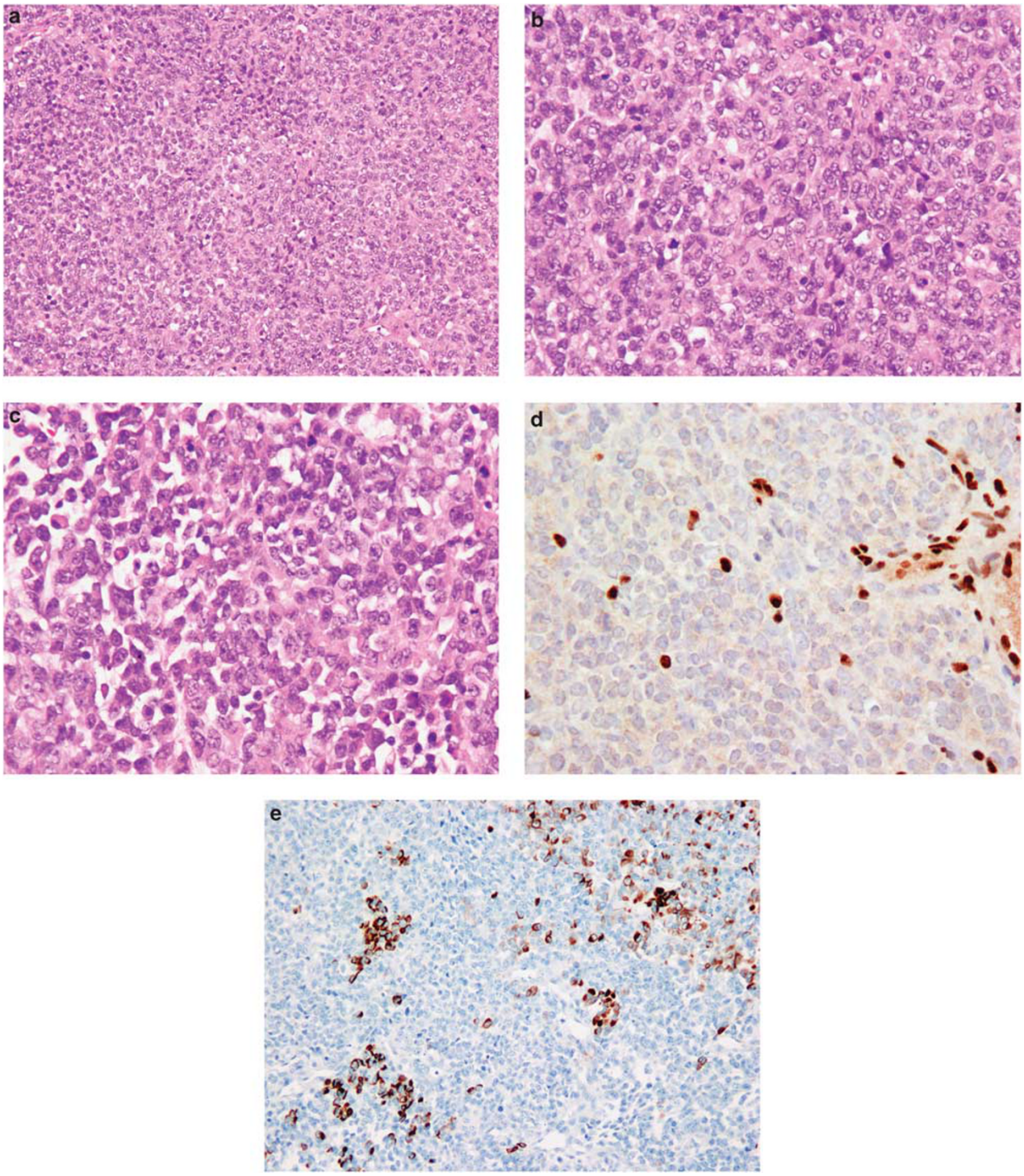


Figure 4 Malignant extrarenal rhabdoid tumor (MERT), consisting of a sheet-like proliferation of primitive round cells, occasionally with a small amount of eosinophilic cytoplasm (**a**). Rhabdoid inclusions may be only focally present in MERT, requiring careful high-power examination (**b**). Myxoid change in MERT may produce a cord or chain-like pattern of growth, mimicking other sarcomas such as extraskeletal myxoid chondrosarcoma (**c**). Loss of SMARCB1 expression, usually as the result of *SMARCB1* mutation (as opposed to deletion) is the molecular hallmark of MERT (**d**). In contrast to epithelioid sarcoma, cytokeratin expression in MERT is typically much more limited in extent (**e**) and CD34 is often negative.

protein, vWF, and SMARCB1. Spindled ES may be bland in appearance, closely mimicking cellular fibrous histiocytoma; cytokeratin immunostains may be extremely valuable here. Factor XIIIa immunostains are not helpful. Synovial sarcomas bear little if any resemblance to ES beyond cytokeratin expression.

Malignant rhabdoid tumors

Malignant rhabdoid tumor (MRT) of the kidney, initially described by Beckwith and Palmer[23] in 1978 as a 'rhabdomyosarcomatoid variant of Wilms' tumor' is now known to be unrelated to Wilms' tumor.[24–26] Most renal MRTs occur in children <1 year of age and have an aggressive clinical course, with rapid death from metastatic disease. MRT may also arise in the central nervous system, where they are referred to as 'atypical teratoid/rhabdoid tumors' and is in a disseminated form, lacking a clear dominant primary tumor.[27,28] Disseminated MRT invariably arises in infants, often as part of familial rhabdoid tumor kindreds.[29]

The great majority of soft tissue MRTs (MERT) occur in young children, and many cases reported as adult MERT more likely represent rhabdoid change within some other types of malignant neoplasms, so-called 'composite rhabdoid tumor' (CERT).[25,30] The term 'MERT' should be applied only to primitive malignant neoplasms showing at least in part rhabdoid morphology, almost always showing SMARCB1 protein loss and/or *SMARC1* gene mutation (discussed below), and lacking any other line of differentiation.

Clinical Features

MERTs have been described in essentially any anatomical site but most frequently involve deep axial locations, such as the paraspinal region and

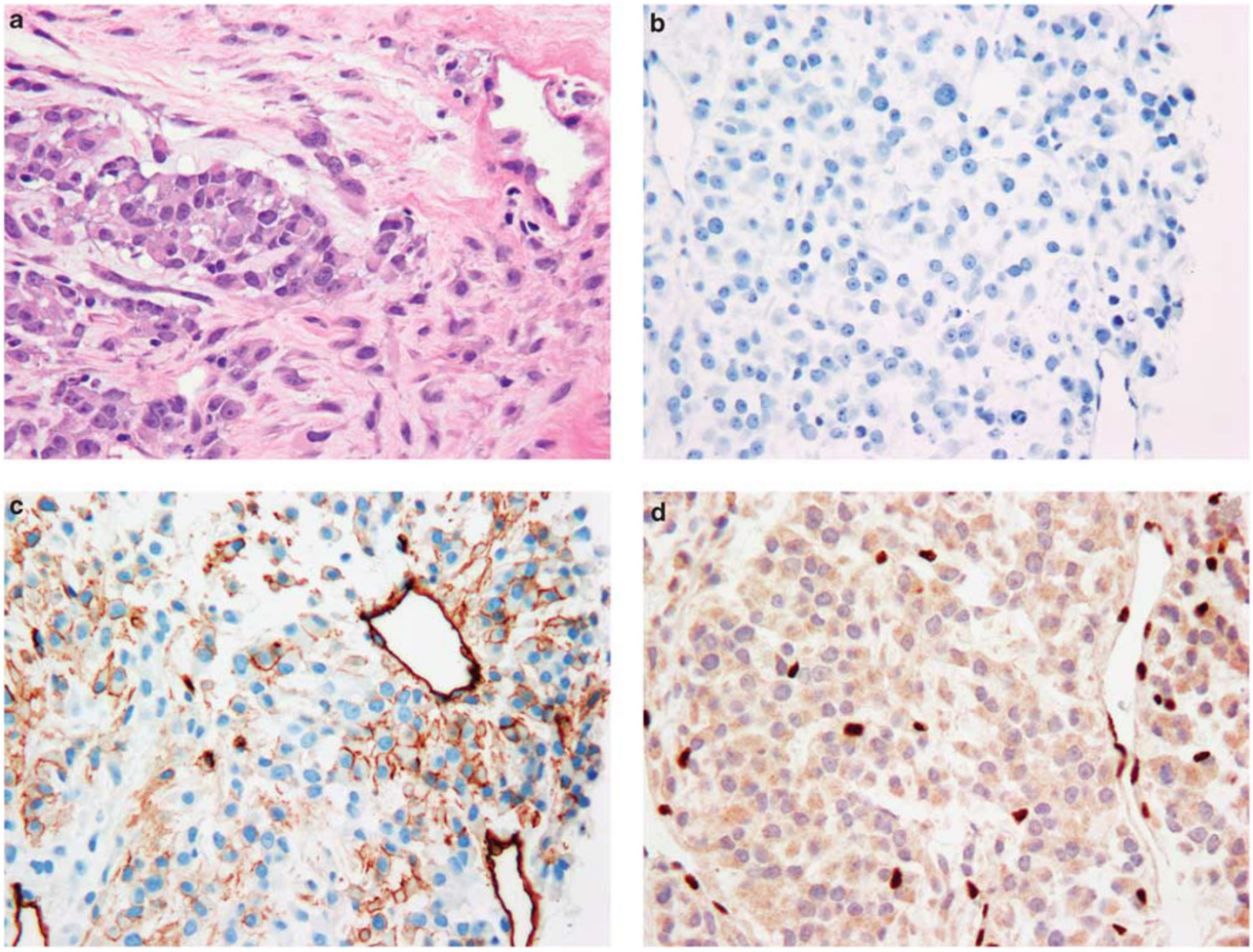


Figure 5 In some instances, distinction of proximal-type epithelioid sarcoma from malignant extrarenal rhabdoid tumor is difficult and potentially subjective. This tumor occurred in the extremities of an older male and consisted of relatively uniform cells with numerous rhabdoid cytoplasmic inclusions (**a**). Cytokeratin expression, however, was entirely absent (**b**), whereas CD34 expression was present (**c**). Loss of SMARCB1 expression using immunohistochemistry (**d**) confirms that this tumor falls somewhere in the spectrum of epithelioid sarcoma and rhabdoid tumor. There are some data to suggest that the presence of *SMARCB1* gene deletions (seen in epithelioid sarcoma) as opposed to gene mutations (seen in rhabdoid tumor) may distinguish these two entities.

the neck. The overwhelming majority of true MERTs occur in infants and young children, although rare *bona fide* cases in adults do occur. Similar to their renal counterparts, MERTs are characterized by aggressive clinical behavior, with fewer than 50% of patients surviving >5 years.[24,31,32]

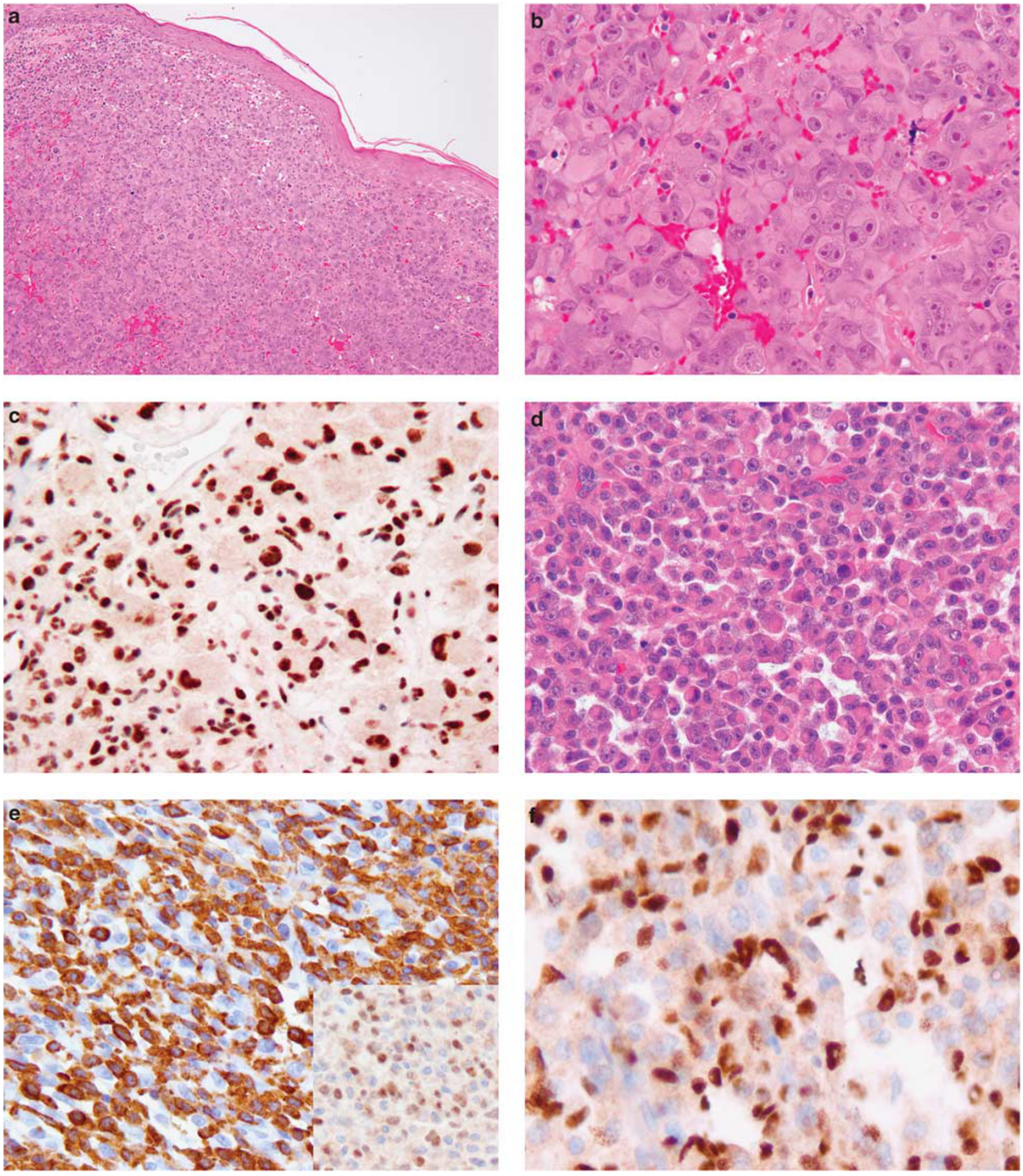


Figure 6 Cutaneous malignant melanoma (**a**), showing striking rhabdoid morphology (composite rhabdoid tumor) (**b**). Retained expression of SMARCB1 is usually seen in composite rhabdoid tumors (that is, other neoplastic types with rhabdoid morphology) (**c**). With increased use of SMARCB1 immunohistochemistry, however, it has become apparent that some 'true' composite rhabdoid tumors exist, such as this rhabdomyosarcoma with rhabdoid-type cytoplasmic inclusions (**d**), which showed diffuse expression of desmin (**e**) and MyoD1 (**e**, inset) but lacked SMARCB1 expression (**f**). Non-neoplastic histiocytes serve as an internal control for SMARCB1.

Pathologic Features

MERT typically presents as soft, fleshy, gray to tan, hemorrhagic/necrotic masses, usually <5 cm in size. MERT is defined by the presence of 'rhabdoid' cells with eccentric vesicular nuclei, prominent nucleoli, and abundant cytoplasm-containing juxtanuclear eosinophilic, PAS-positive hyaline inclusions or globules (Figures 4a–c). Ultrastructurally, these inclusions represent whorls of intermediate filaments.[33] Rhabdoid cells may be relatively rare in MERT, with some tumors consisting chiefly of a sheet-like proliferation of highly primitive-appearing round cells. Particularly in adults, morphologic features suggestive of PT–ES or some other definable primary neoplasms should be carefully searched for.

Immunohistochemical Findings

MERT typically expresses vimentin and is usually cytokeratin-positive, although this immunoreactivity is typically less pronounced than in PT–ES (Figures 4d and e). A wide variety of other markers may occasionally also be positive, including EMA, smooth muscle actin, CD99, CD57, synaptophysin, and S100 protein.[34] SMARCB1 protein expression is consistently lost in true MERT, as compared with other malignant neoplasms showing rhabdoid morphology (Figures 5a–d) (CERT).[13]

Genetic Features

Cytogenetic studies have consistently identified 22q aberrations including monosomy of chromosome 22

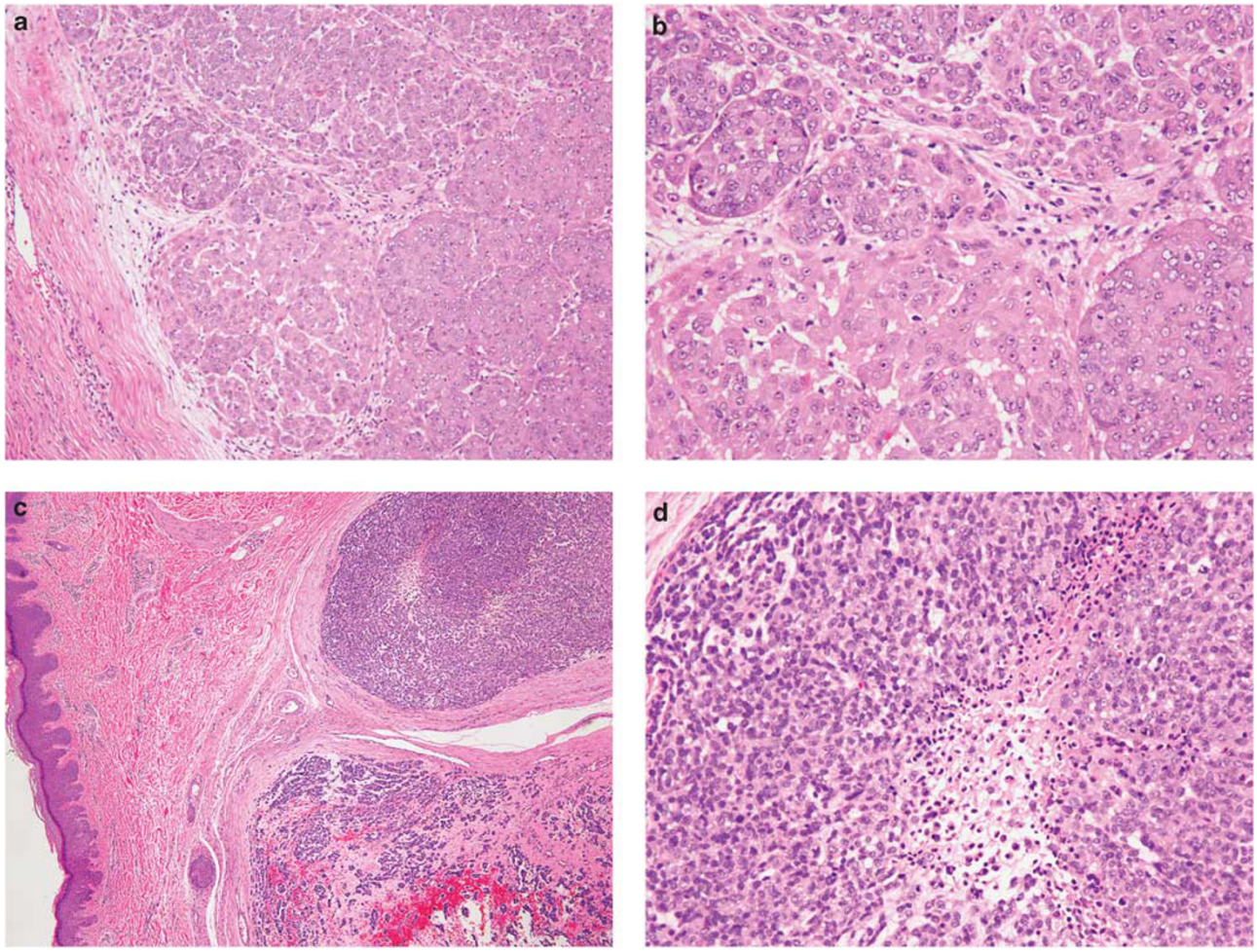


Figure 7 Epithelioid malignant peripheral nerve sheath tumor (EMPNST) presenting as a well-circumscribed but non-encapsulated soft tissue mass (**a**). At higher power magnification, EMPNSTs are typified by a distinctly nested pattern of growth and by 'melanoma-like' epithelioid cells with prominent macronucleoli (**b**). Unlike other forms of MPNST, EMPNST not uncommonly occurs in superficial locations, potentially mimicking cutaneous melanoma (**c**). Note, however, the absence of a junctional component and superficial dermal involvement. Most EMPSTs are obviously malignant, with high-grade cytology and tumor cell necrosis (**d**). Some EMPSTs may mimic a benign peripheral nerve sheath tumor, as in this pseudo-encapsulated with cellular and myxoid zones, simulating the Antoni A and B patterns of schwannoma (**e**). At higher power magnification, however, prominent nucleoli and frequent mitotic figures were present, diagnostic of EMPNST (**f**). Using immunohistochemistry, EMPNST typically shows strong, diffuse S100 protein expression (**g**) but lacks the expression of specific melanocytic markers such as Melan-A. The presence of abundant collagen IV production around nests of cells is also characteristic of EMPNST (**h**).

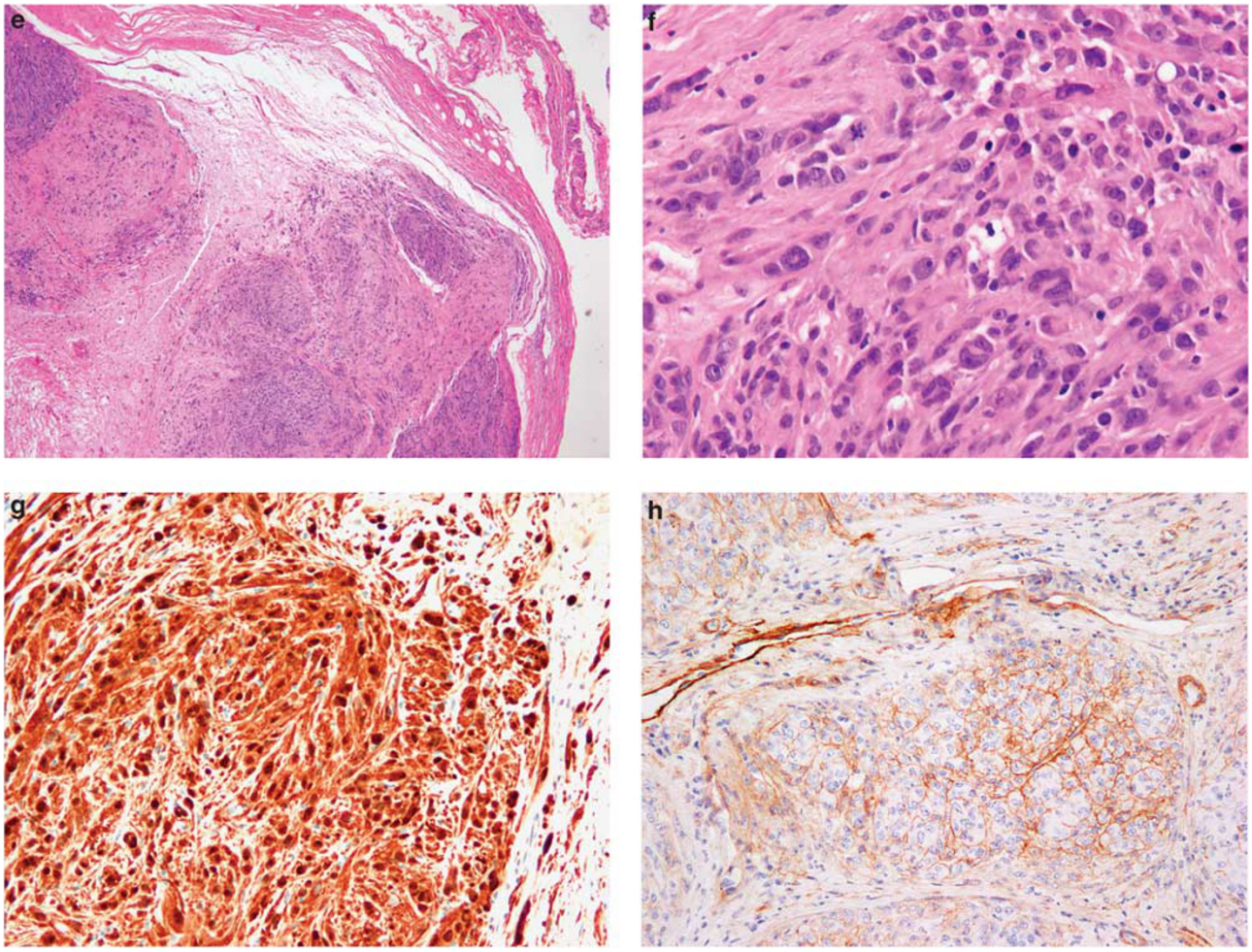


Figure 7 Continued.

with or without partial deletion of the remaining chromosome 22 in MERT.[35,36] It has subsequently been shown that the vast majority of MRTs in all locations show deletions or mutations of the *SMARCB1* gene.[13,37–41]

SMARCB1 (INI1, SNF5, BAF47)

SMARCB1 is a member of the SWI/SNF chromatin-remodeling complex and is thought to have a direct role in activation and suppression of gene expression by displacing DNA from histones and allowing transcription.[39,42] Germline mutations of the *SMARCB1* gene are the causes of the rhabdoid predisposition syndrome.[39,42] With only very rare exceptions, CERT lacks SMARCB1 alterations.[43,44] Alterations of the *SMARCB1* gene affect multiple pathways, which may be central to the pathogenesis of this tumor including the p16/INK4A, p14/ARF, and p21 (CIP1/WAF1) pathways.[13,39,42] As noted above, the loss of SMARCB1 expression is also seen in >90% of ESs of all types. ESs appear to differ from MERT in that they typically show deletions of *SMARCB1*, rather than mutations.[22,37,38,45,46] The loss of SMARCB1 expression is also seen in essentially all renal medullary carcinomas and in subsets of epithelioid malignant peripheral nerve sheath tumors (EMPNSTs), myoepithelial carcinomas, and extraskeletal myxoid chondrosarcomas.[13] Germline *SMARCB1* alterations also appear to underlie schwannomatosis.[47–49] Very rare instances of MRT and epithelioid MPNST arising in schwannomatosis have been reported, presumably reflecting second somatic mutations.[50,51]

Epithelioid malignant peripheral nerve sheath tumor

Malignant peripheral nerve sheath tumors are relatively rare, accounting for roughly 5% of all soft tissue sarcomas.[52,53] Approximately one-third occur in association with neurofibromatosis type 1. EMPNST accounts for <5% of all MPNSTs.

Clinical Features

As with typical spindle cell MPNST, EMPNST occurs most often in patients 20–50 years of age, with a slight male predominance. Most involve major nerves,[54] although rare tumors may occur in unusual locations such as the skin.[55] For unclear reasons, EMPNST accounts for the great majority of MPNST that arises within schwannomas (an exceedingly rare event).[51,56] EMPNSTs are aggressive lesions, with distant metastases eventually occurring in ~50% of patients, typically to the lungs.[54]

Pathological Features

Selected morphological features of EMPNST are illustrated in Figures 6a–f). By definition, EMPNST is composed entirely or nearly entirely of epithelioid cells, resembling those seen in melanoma. The tumors are typically relatively well-circumscribed but microscopically infiltrative and show a variably hyalinized collagenous stroma. The neoplastic cells typically grow in a distinctly nested pattern, at least in part, with other areas usually showing a cord-like pattern of growth. Variable stromal myxoid change may be seen. Metaplastic bone formation is seen on occasion, as is clear cell or signet-ring change. Rhabdoid inclusions may be present. Mitotic activity is invariably present and necrosis is frequently seen.

Immunohistochemical Features

EMPNST is almost always strongly and diffusely positive for the S100 protein, in contrast to other types of MPNSTs, which typically show only patchy

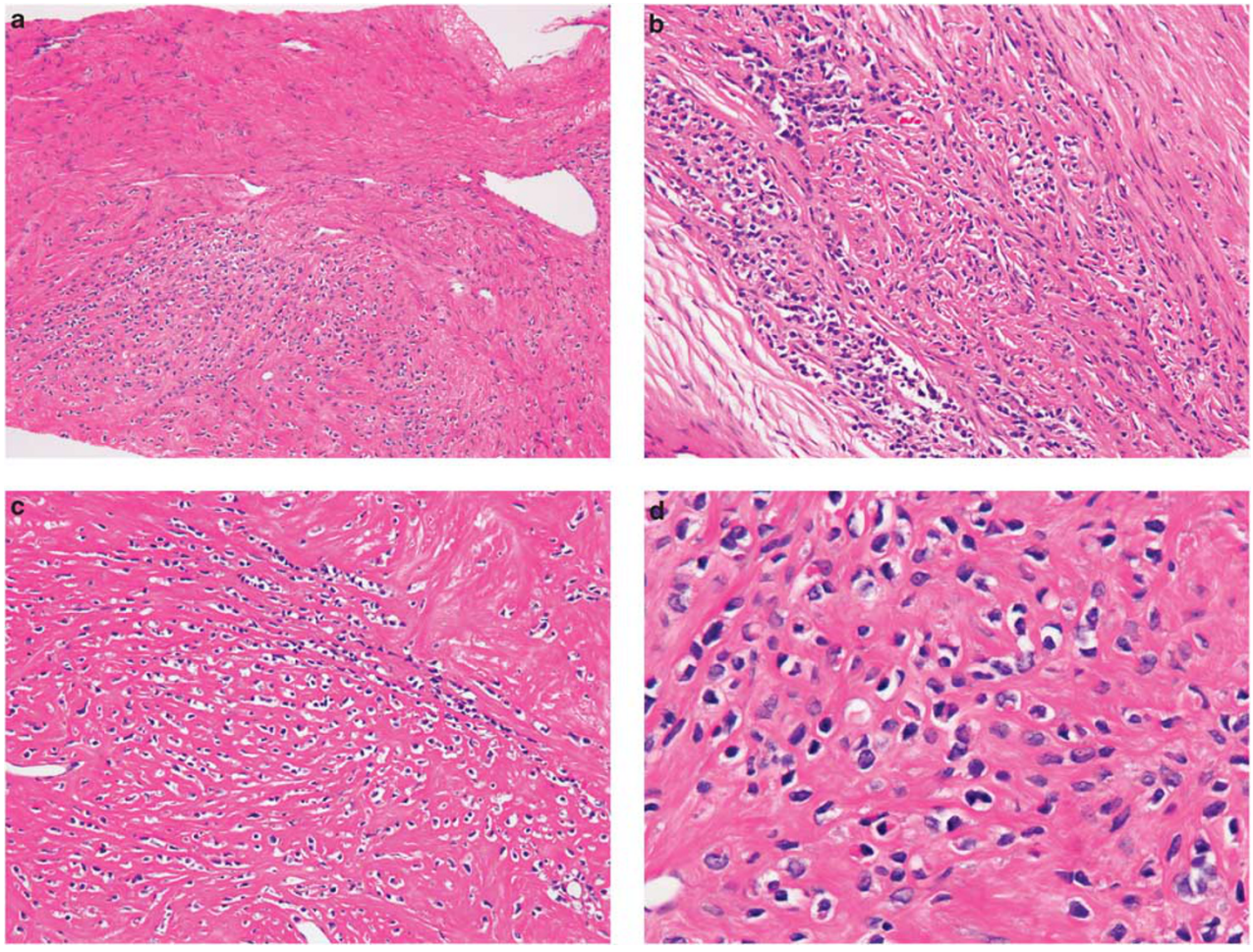
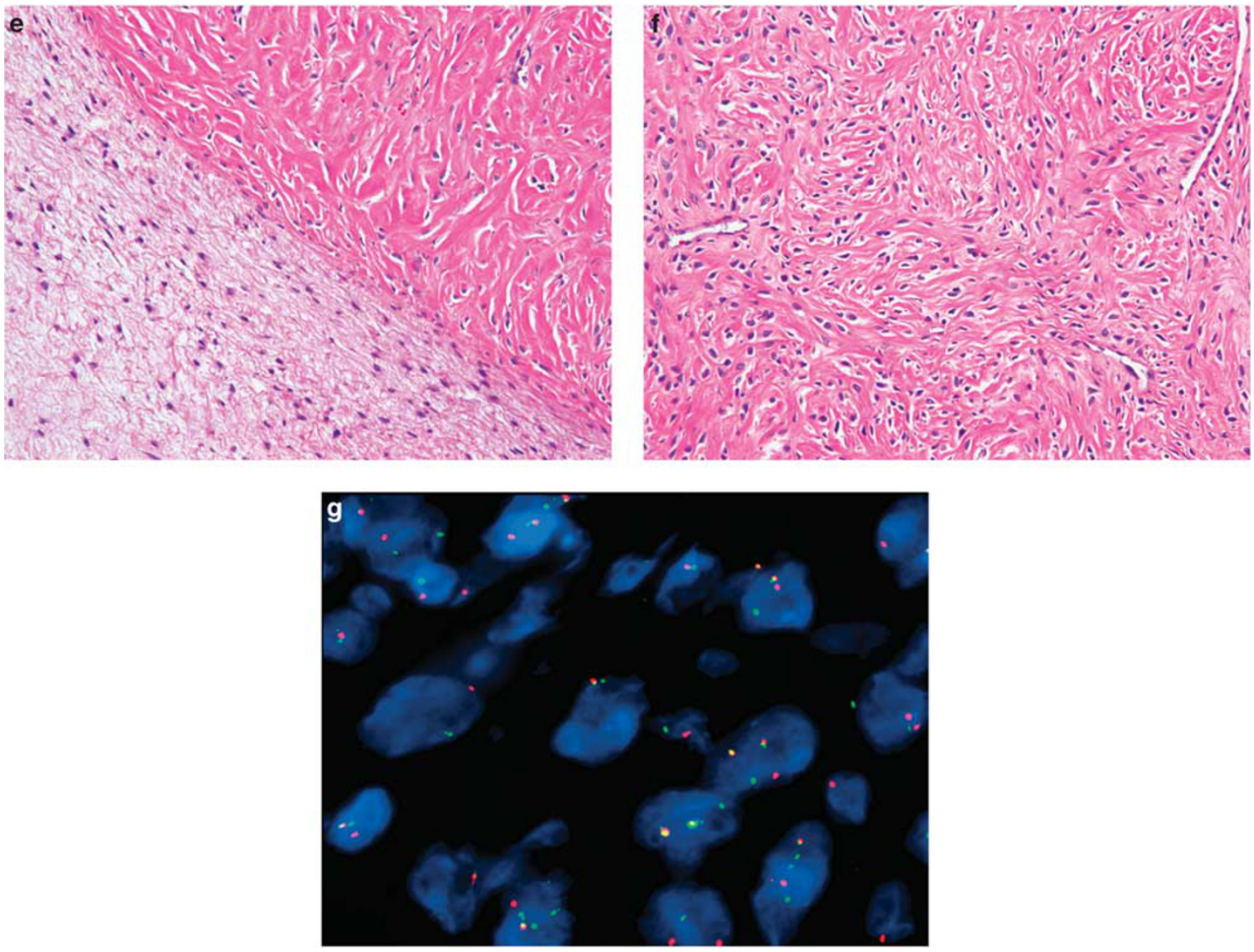


Figure 8 Sclerosing epithelioid fibrosarcoma (SEF) showing areas of both conventional spindled fibrosarcoma (top) and epithelioid morphology (bottom) (**a**). Spindled and epithelioid morphologies in SEF (**b**). Epithelioid cells with pericellular clearing, growing in a densely hyalinized matrix in SEF (**c**). The epithelioid fibroblastic cells of SEF tend to be relatively uniform, with infrequent mitotic figures (**d**). Hybrid SEF-low-grade fibromyxoid sarcoma (LGFMS) with hyalinized, epithelioid foci juxtaposed to myxoid, spindled nodules (**e**). Most LGFMS and hybrid SEF–LGFMS show *FUS–CREB3L2* fusions, as do a smaller percentage of pure SEF. Rarely, however, these tumors may show *EWSR1* rather than *FUS* rearrangements, as in this SEF (**f**) positive for *EWSR1* rearrangement using FISH (**g**).



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and weak expression (Figure 7g). EMPNST characteristically shows abundant collagen IV expression surrounding nests of cells (Figure 7h). Unlike melanomas and clear cell sarcomas, which also show diffuse S100 protein expression, EMPNST is negative for melanocytic markers such as HMB45, Melan-A, and tyrosinase. Approximately 50% of EMPNSTs show loss of SMARCB1 expression, a finding that may be of value in their differential diagnosis with melanoma and clear cell sarcoma, both of which show retained expression of this protein.[13]

Differential Diagnosis

EMPNSTs are most often confused with epithelioid schwannomas, conventional melanomas, and clear cell sarcomas, particularly as all of these tumors typically show diffuse S100 protein expression. Epithelioid schwannomas tend to be smaller than EMPNST, are more often superficial in location, show a well-formed capsule, and are composed of very bland, small epithelioid cells, lacking mitotic activity or necrosis. Conventional malignant melanomas may very closely resemble EMPNST but express HMB45, Melan-A, and/or tyrosinase in roughly 80% of cases. Melanoma shows retained expression of the SMARCB1 protein, in contrast to many EMPNSTs. Clear cell sarcoma usually shows a greater degree of cellular spindling than do EMPNST, often contains Touton-like neoplastic giant cells, and expresses melanocytic markers. Clear cell sarcomas also show t(12;22) (EWSR1-ATF1) in the great majority of cases;[57] this translocation is not seen in EMPNST.

Sclerosing epithelioid fibrosarcoma

Sclerosing epithelioid fibrosarcoma (SEF) is a relatively newly described malignant fibroblastic tumor, considered by the current WHO classification of soft tissue and bone tumors to represent a distinct variant of fibrosarcoma.[58] However, there is considerable morphological and genetic data to suggest a link between SEF and low-grade fibromyxoid sarcoma (LGFMS) (see below).[59–63]

Clinical Features

SEF occurs over a wide age range in patients of either sex as a deeply situated, often large soft tissue mass, typically in the lower extremities.[59–64] SEF is generally considered a low-grade sarcoma, although a more aggressive clinical course has been suggested in one relatively large series.[63] SEF metastasizes to the lungs with overall mortality of 25–57%.[63,64]

Pathological Features

SEFs are usually grossly well-circumscribed, ranging from 5 to 10 cm in size. Microscopically, they show infiltrative borders and are composed of cords, chains, and nests of moderately pleomorphic epithelioid cells, often with clear cytoplasm, embedded in a densely hyalinized stroma (Figures 8a–d). Many cases also contain small spindled foci, resembling adult fibrosarcoma[65] or LGFMS (Figure 8e).[66] Mitotic activity is typically low and necrosis is not usually present. Metaplastic bone formation may be present.

Immunohistochemical Features

SEF typically shows a fibroblastic phenotype, with expression chiefly of vimentin. Very recently, expression of the MUC4 glycoprotein has been described as a sensitive marker of SEF, both 'pure' SEF and those showing hybrid features of LGFMS.[67] Epithelial marker expression has been reported in some SEFs[64] but seems to be very uncommon, in my experience.

Genetic Features and Relationship to LGFMS

The possibility that SEF might not represent a single histopathological entity was first raised by Eyden

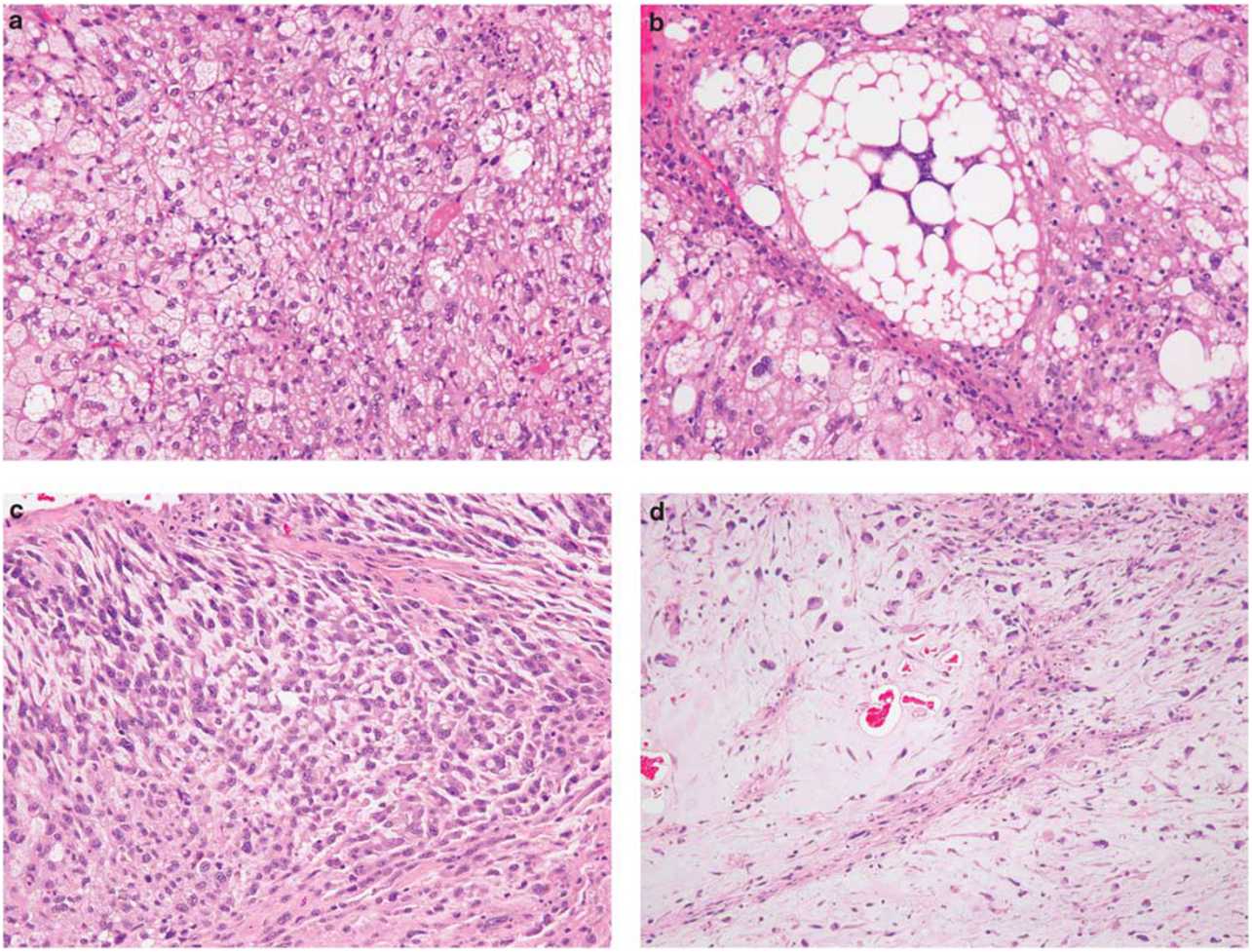
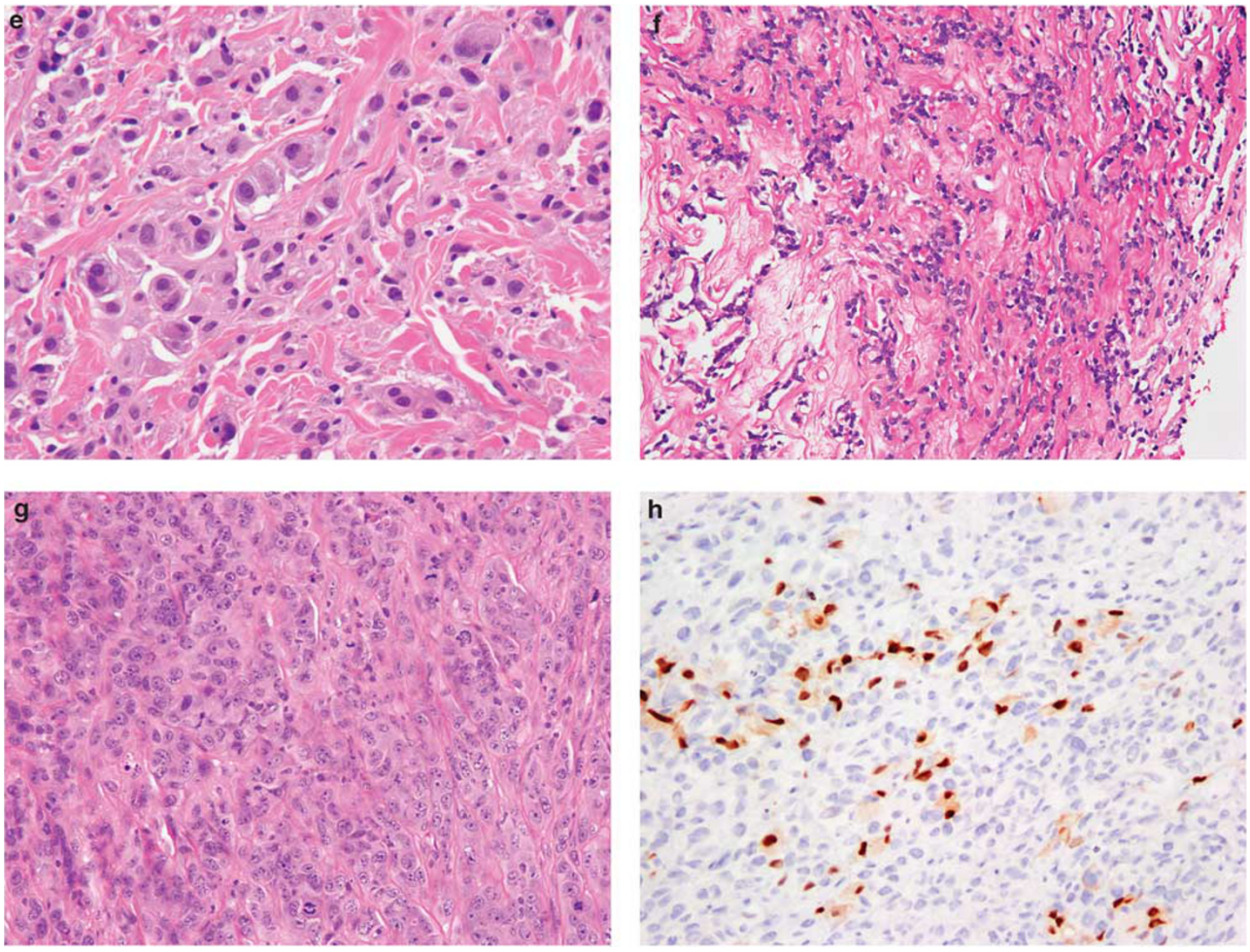


Figure 9 Epithelioid pleomorphic liposarcoma mimicking adrenal cortical carcinoma (**a**). The presence of pleomorphic lipoblasts confirms the correct diagnosis (**b**). Epithelioid change (**c**) in myxofibrosarcoma (**d**) may mimic carcinoma or a malignant myoepithelial tumor. Epithelioid mammary myofibroblastoma may closely simulate lobular carcinoma (**e**). Careful examination of such lesions typically discloses more typical areas of myofibroblastoma, with small aggregates of bland-spindled cells and wiry collagen (**f**). Epithelioid rhabdomyosarcoma (**g**), confirmed with positive myogenin immunohistochemistry (**h**). These extremely rare lesions may closely simulate carcinoma and require an extended panel of immunostains for correct diagnosis.



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et al[68] in a morphologic, immunohistochemical, and ultrastructural study of five cases. A possible link between SEF and LGFMS was first explicitly suggested by Antonescu *et al*,[63] who noted the presence of hypocellular collagenous zones and juxtaposed myxoid nodules, identical to LGFMS, in 4 of 16 studied SEF. Additional evidence linking SEF and LGFMS comes from two genetic studies of LGFMS, from Guillou *et al*[62] and Reid *et al*[69] Guillou *et al*[62] studied 63 tumors with morphological features of LGFMS and 66 non-LGFMS for the LGFMS-specific translocation t (7;16)(q32-34;p11)(*FUS–CREB3L2/L1*). Positive results were found in 81% of putative LGFMS and only 7 of 52 (13%) controls; of these seven positive non-LGFMS, four had been previously labeled 'SEF'. Along similar lines, one of the 4 genetically confirmed LGFMS reported by Reid *et al*[69] showed at least in part classical features of SEF. Rehki *et al*[70] also reported a hybrid SEF-LGMFS showing *FUS* rearrangement.[70]

Two very recent studies have more specifically examined the relationship between SEF and LGFMS. Wang *et al*[71] studied a group of 22 'pure' SEF specifically lacking LGFMS-like areas and found *FUS* rearrangements in only two cases. Doyle *et al*[67] identified *FUS* rearrangement in 6/23 'pure' SEF, one of which was shown to also have *CREB3L2* rearrangement and in two of the six hybrid SEF–LGFMS. Interestingly, two other hybrid tumors showed EWSR, rather than FUS rearrangement (Figure 8g).

It would thus appear that at least some cases of 'SEF' represent instead morphological variants of LGFMS, in particular those cases that show hybrid morphological features. Additionally, subsets of pure SEF show *FUS* and *CREB3L2* rearrangements, suggesting that they too are closely related (if not identical) to LGFMS. It is unclear whether *FUS*-negative SEF represents an entity distinct from LGFMS, or perhaps a form of morphological progression in a heterogeneous group of soft tissue tumors. In this respect, it should be noted that areas identical to SEF may be seen in sclerosing rhabdomyosarcomas,[72] ossifying fibromyxoid tumors,[73] malignant peripheral nerve sheath tumors, hyalinizing leiomyosarcomas, and osteosarcomas, in our experience.

Other sarcomas with epithelioid features

Epithelioid variants of many different soft tissue tumors, including angiosarcoma,[74] leiomyosarcoma,[75] myxofibrosarcoma,[76] pleomorphic liposarcoma,[77] mammary myofibroblastoma,[78] rhabdomyosarcoma,[79] and inflammatory myofibroblastic tumor[80] have been reported. The chief significance of these unusual morphological variants is in their potential mimicry of true epithelioid tumors, in particular carcinoma (Figures 9a–h). The reader is referred to the references for additional information about these rare lesions.

Conclusion

Although epithelioid change may be seen in a wide variety of soft tissue tumors, this morphology is most characteristic of ES, MERT, EMPNST, and SEF. The precise relationship between *SMARCB1* abnormalities and epithelioid morphology remains to be fully elucidated; however, the presence of such aberrations in ES, MERT, and EMPNST suggests that this is more than a coincidence. From a practical perspective, improved recognition of the various sarcomas that may show epithelioid morphology is critical for their distinction from other epithelioid malignancies and for correct treatment.

Disclosure/conflict of interest

The authors declare no conflict of interest.

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