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Case Report

Eccrine spiradenoma: analysis of the clinical and pathological features of 7 patients

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Abstract: The purpose of this study was to explore the clinical, pathological, and immunohistochemical features of spiradenoma. The clinical and pathological data of seven patients were analyzed. The analysis revealed that the median age of onset was 34 years, with three patients presenting lesions on the extremities. Clinically, the lesions were mostly skin-colored or red subcutaneous nodules or masses, some of which were tender. Histopathological features included well-demarcated tumor masses composed of two types of cells: small cells with round, deeply stained nuclei and larger cells with lightly stained nuclei, accompanied by ductal differentiation and focal adenoid cystic structures. Lymphomonocytic infiltration was observed in the stroma. Immunohistochemical staining revealed positive expression of cytokeratin (CK) and cluster of differentiation 117 (CD117) in luminal cells and tumor protein p63 (p63) and smooth muscle actin (SMA) in outer myoepithelial cells. SRY-related HMG-box 10 (Sox10) expression was typically diffuse positive. Spiradenoma is a sweat gland tumor for which clinical specificity is lacking, but these nodules have distinct histopathological features. In most cases, a definitive diagnosis can be made with the aid of immunohistochemistry.

Keywords: Spiradenoma, adnexal tumor, histopathology, immunohistochemistry

Introduction

Spiradenoma is a benign adnexal neoplasm of the sweat glands that was first described by Kersting and Helwig in 1956 [1]. It commonly presents as a solitary, spontaneously painful, dermal or subcutaneous (D/SC) nodule ranging from 0.2 to 2.5 cm in diameter [2]. Most previous studies of spiradenoma are case reports or presentations of special cases, and the clinical manifestations are not characteristic, resulting in a high rate of misdiagnosis. Here, we report the cases of seven patients with eccrine spiradenoma with a focus on the clinical presentation and characteristic histopathological and immunohistochemical features. The purpose of this case report is to increase doctors' understanding of the clinical and pathological features of this disease and improve diagnostic accuracy.

Medical records

Data from a total of 7 patients diagnosed with eccrine spiradenoma from January 2021 to December 2024 were collected. Surgical excision was performed to minimize changes in recurrence and malignant transformation. The original medical records and pathological reports were reviewed, and clinical photos and pathological sections were retrieved. Two dermatopathologists reexamined all the pathological sections and made a consensus diagnosis and pathological analysis.

General information

Among the 7 patients with small sweat gland spiral adenoma, there were 4 males and 3 females, aged 30-62 years. Among them, 71.4% (5/7) were middle-aged and young patients aged 30-35 years, and only 1 was an elderly patient aged 62 years. All patients had a healthy history and no relevant family history, indicating that this disease is relatively common in the middle-aged and young population, and no obvious family genetic tendency has been found yet.

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Table 1. The basic clinical information of the 7 patients

Case	Gender/Age	Location	Clinical Presentation/Size	Duration	Follow-Up
1	Male/34	Chest	Solitary skin-color nodule with pressing pain; 1 cm	10 yrs	48 mos
2	Female/32	Left thigh	Solitary bluish violet nodule; 6*4 cm	10 yrs	24 mos
3	Female/30	Left forearm	Solitary skin-color nodule; 1 cm	10 yrs	20 mos
4	Male/33	Right forearm	Solitary skin-color nodule with pressing pain; 1 cm	6 yrs	18 mos
5	Female/35	Left lumbar region	three dark red nodules; 0.8 cm	10 yrs	16 mos
6	Male/34	Forehead	Solitary skin-color nodule; 0.5 cm	5 yrs	12 mos
7	Male/62	right retroauricular	Solitary skin-color nodule; 1.5 cm	10 yrs	12 mos

Note: Cases 2, 3, 5 (pathology samples in **Figure 2**) and Case 4 (immunohistochemistry samples in **Figure 3**) had disease courses of 6-10 years, consistent with the cohort's median duration of 10 years.

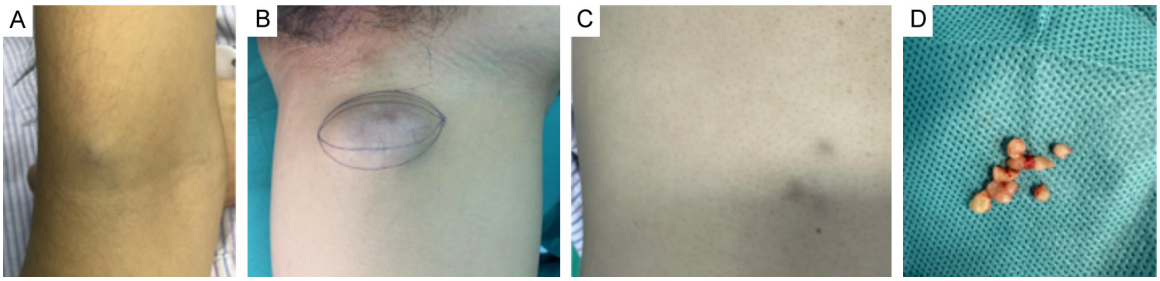

Figure 1. Clinical examination. A, B: Clinical manifestations include solitary. C, D: Multifocal subcutaneous nodules.

Clinical findings

All patients were healthy, with no significant past medical or family history. Hematological and biochemical profiles were within normal limits. Patient basic clinical information is presented in **Table 1**. There were 4 males and 3 females, with ages at diagnosis ranging from 30 to 62 years (mean 48 years and median 34 years). Clinical examination revealed skin-colored or dark red or bluish violet dermal and subcutaneous solitary nodules, except for one patient whose spiradenoma was multifocal, with nodules ranging in size from 0.5 cm to 6.0 cm (mean 1.7 cm) (**Figure 1**). The involved sites included the forearm, thigh, chest, lumbar region, forehead and retroauricular region. The duration of symptoms ranged from 5 to 10 years. All lesions were surgically removed. There was no recurrence during follow-up, which ranged from 12 to 48 months.

Histological findings

Analysis of hematoxylin and eosin-stained sections revealed an intact epidermis with no evidence of dysplasia. In the dermis, several relatively well-circumscribed variable-sized tumor masses extended into the subcutaneous surface and were surrounded by a fibrous pseudocapsule (**Figure 2A**). The nodule was composed primarily of interconnecting cords and trabeculae of epithelial cells. The cells were arranged in linear or spiral patterns and were composed of two types of tumor cells (**Figure 2B**). The cells at the periphery of the cell clusters were small basaloid cells with small, deeply stained nuclei, and these cells were referred to as "dark cells". The central cells were larger in volume, with a pale cytoplasm and vesicular nuclei, and these cells were referred to as "light cells". Foci of sweat gland duct differentiation were present, and lymphocytes were scattered within the tumor nodule.

The lesions of three patients were cystic and solid, with cystic cavities of varying sizes (**Figure 2C** and **Tables 2**, **3**). Some of the cystic cavities were filled with red-stained fluid. No evidence of increased mitotic activity or necrosis was noted. The mitotic rate was less than or equal to one mitotic cell per 10 high-power fields (HPFs).

Immunohistochemistry (IHC) revealed positive staining for cytokeratin (CK) and cluster of differentiation 117 (CD117) in a diffuse or periductular pattern (7/7, **Figure 3A** and **3B**) and

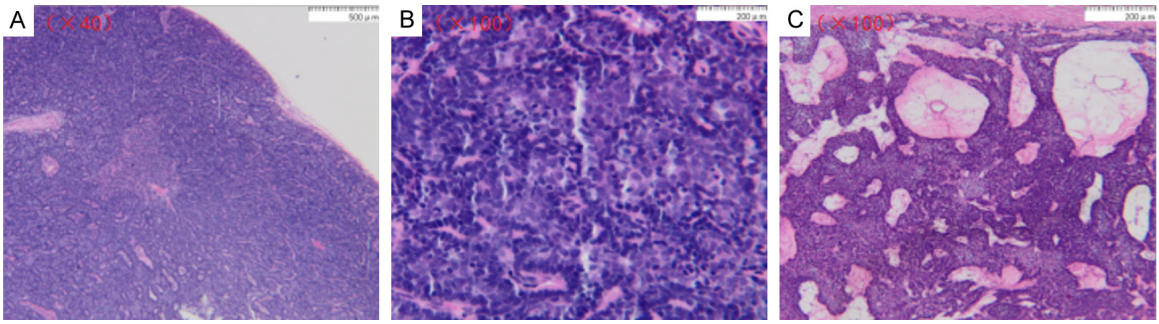

Figure 2. Histopathological features of eccrine spiradenoma (samples from different patients). A: Case 3, disease course: 10 years. Well-circumscribed tumor masses in the dermis, surrounded by a fibrous pseudocapsule (Hematoxylin and Eosin, HE, ×40). B: Case 5, disease course: 10 years. Biphasic cell population: small basaloid 'dark cells' at the periphery and larger 'light cells' in the center, arranged in linear/spiral patterns (HE, ×100). C: Case 2, disease course: 10 years. Cystic and solid lesions with variable-sized cystic cavities (HE, ×100).

Table 2. Summary of pathological features in 7 patients with eccrine spiradenoma

Case	Tumor Boundary	Cell Arrangement	Cell Types (Dark/Light)	Cystic Changes	Lymphocytic Infiltration	Mitotic Rate (per 10 HPFs)
1	Well-circumscribed	Linear cords	Present	Absent	Scattered	≤1
2	Well-circumscribed	Trabeculae	Present	Prominent	Focal	≤1
3	Well-circumscribed	Linear/spiral	Present	Absent	Scattered	≤1
4	Well-circumscribed	Cords	Present	Absent	Scattered	≤1
5	Well-circumscribed	Spiral trabeculae	Present	Mild	Focal	≤1
6	Well-circumscribed	Cords	Present	Absent	Scattered	≤1
7	Well-circumscribed	Linear trabeculae	Present	Absent	Scattered	≤1

Note: HPFs: high-power fields.

positive staining for epithelial membrane antigen (EMA) (6/7) and carcinoembryonic antigen (CEA) (1/7) in a periductular pattern. Cells were positive for myoepithelial cell markers: diffuse or focal positivity for p63, S-100, and smooth muscle actin (SMA) was observed, mainly in the outer layer of cells (7/7). The number of SMA-positive cells was significantly lower than that of p63-positive cells (**Figure 3C** and **3D**). The intensity of S-100 positivity exhibited heterogeneity. Sox10 expression in spiradenoma cells was typically diffuse (6/7, **Figure 3E**). CD3-positive lymphocytes were scattered within the nodules, and the Ki-67 proliferation index (Ki-67 LI) was 1-3% (**Figure 3F**).

Treatment and prognosis

All patients were treated with surgical resection, and during the postoperative follow-up period (12 months to 2 years), no patient experienced recurrence, indicating that surgical resection has a good therapeutic effect on small sweat gland spiral adenoma and a good short-term prognosis after surgery.

Discussion

Eccrine spiradenoma is a rare adnexal tumor with eccrine differentiation. It may present congenitally or spontaneously as a tumor of the sweat glands with unclear etiology. There was no significant sex predilection, and the age at presentation ranged from 15 to 77 years, with an average of 42.6 years [2]. Our sample had a mean age of 48 years, and the highest incidence of spiradenoma was in the third decade (6/7, **Table 1**). Additionally, the size of the lesions ranged from 0.5 cm to 2 cm in diameter (6/7), which is consistent with reports in the literature [2]. Clinically, spiradenoma usually manifested as a solitary skin-colored, dark red or blue-purple subcutaneous nodule (**Figure 1**). A zosteriform distribution or a linear array distribution following the lines of Blaschko has also been reported [3, 4].

Table 3. Summary of immunohistochemical biomarker expression in 7 patients with eccrine spiradenoma

Case	CK (Luminal)	CD117 (Luminal)	EMA (Periductular)	CEA (Periductular)	p63 (Myoepithelial)	SMA (Myoepithelial)	S-100 (Myoepithelial)	Sox10	CD3 (Lymphocytes)	Ki-67 Index (%)
1	+++	+++	++	-	+++	+	++ (heterogeneous)	+++	+	1-2
2	+++	+++	++	-	+++	+	+ (heterogeneous)	+++	+	2-3
3	+++	+++	++	-	+++	+	++ (heterogeneous)	+++	+	1-2
4	+++	+++	++	-	+++	+	++ (heterogeneous)	+++	+	1-3
5	+++	+++	+	-	+++	+	+ (heterogeneous)	+++	++	1-2
6	+++	+++	++	+	+++	+	++ (heterogeneous)	+	+	1-2
7	+++	+++	++	-	+++	+	+ (heterogeneous)	+++	+	2-3

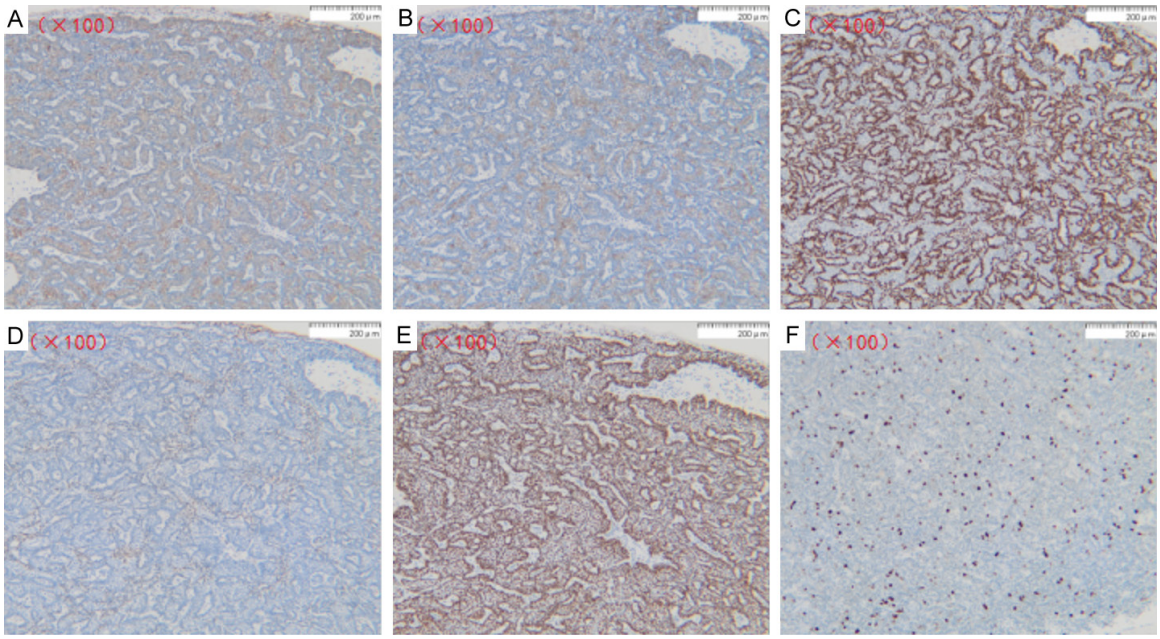

Figure 3. Immunohistochemical features of eccrine spiradenoma (all samples from Case 4). All samples from Case 4 (disease course: 6 years). A: Luminal cells positive for cytokeratin (CK) (×100). B: Luminal cells positive for CD117 (×100). C: Peripheral cells positive for p63 (×100). D: Peripheral cells positive for SMA (×100). E: Diffuse positive expression of Sox10 (×100). F: Ki-67 labeling index of 1-3% (×100).

Compared with other benign sweat gland tumors, spiradenomas are often located deeper, usually without symptoms or with tenderness. Due to their vascularity and painful symptoms, they are easily misdiagnosed as epidermoid cysts or confused with painful lesions of the skin such as glomus tumors and angioleiomyomas. Diagnosis based solely on clinical manifestations is almost impossible. Histologically, the typical lesion is characterized by an epithelial cord formed with small basaloid cells at the periphery and larger oval cells centrally, with lymphomonocytic scattered infiltration and lumen differentiation. Some nodules show significant adenoid cystic changes. Immunohistochemistry reveals a nodule composition of epithelial and myoepithelial cells, with epithelial cells expressing CK and myoepithelial cells expressing p63, SMA, and S-100. Our findings are consistent with those of previously published reports [5, 6]. In some areas, myoepithelial differentiation is not obvious, and the proportion of p63-positive cells in the tumor is much greater than that of SMA-positive cells, suggesting the possible coexistence of secretory and ductal differentiation in sweat glands.

Based on the consistent features observed in all 7 patients, we propose the following diagnostic criteria for eccrine spiradenoma: clinical features include solitary (rarely multifocal) dermal/subcutaneous nodules, which are skin-colored, dark red, or bluish violet, measure 0.5-6.0 cm in size, may or may not be tender, and are associated with a disease duration of 5-10 years; pathological features consist of well-circumscribed tumor masses with a fibrous pseudocapsule, a biphasic cell population (peripheral 'dark cells' and central 'light cells') arranged in linear or spiral cords/trabeculae, focal ductal differentiation, scattered lymphocytic infiltration, a mitotic rate of ≤1 per 10 high-power fields (HPFs), and an absence of necrosis; and immunohistochemical features involve luminal cells positive for cytokeratin (CK) and CD117, myoepithelial cells positive for p63 (diffuse) and smooth muscle actin (SMA, weak/focal), diffuse Sox10 positivity (in 85.7% of cases), a Ki-67 index of 1-3%, and an absence of significant carcinoembryonic antigen (CEA) expression (except in 1 case). These criteria integrate both subjective (cell arrangement) and objective (biomarker expression) features, aiming to improve diagnostic accuracy and reduce misdiagnosis. To evaluate the

impact of disease course on markers, we compared patients with shorter (5-6 years, Cases 4 and 6) and longer (10 years, Cases 1, 2, 3, 5, 7) disease duration. No significant differences were observed in pathological features (e.g., cell arrangement, cystic changes) or immunohistochemical markers (e.g., CK, CD117, Sox10, Ki-67). This suggests that disease course does not substantially alter the core pathological or immunohistochemical characteristics of eccrine spiradenoma, supporting the stability of the proposed diagnostic criteria across different disease stages.

We also evaluated the expression of CD117 and Sox10 in spiradenoma. In normal skin, KIT is expressed in the cytoplasm of melanocytes and the secretory cells of sweat glands [7]. CD117 has also been reported to be expressed to varying degrees in both benign and malignant sweat gland tumors [8, 9]. In this study, the luminal cells of spiradenoma nodules were found to be positive for CD117 (7/7), and the percent positivity is higher than that reported in the literature [8, 9]. Sox10 was expressed at significantly higher rates in sweat gland tumors than in follicular and sebaceous tumors [9, 10]. Our analysis also revealed that Sox10 expression was typically diffusely positive in spiradenoma nodules (6/7), whereas only one nodule was negative, which is in line with previously reported findings [8, 9]. CD117 and Sox10 expression analysis is useful for assisting in the differential diagnosis of sweat gland tumors.

A standard treatment for spiradenoma has not yet been clearly established, but surgical excision is the gold-standard treatment method with low rates of recurrence. In patients with long-standing benign eccrine spiradenoma, malignant transformation is known to occur and presents as rapid enlargement of the nodule, an increase in nodule number, and a change in color or with the appearance of a few symptoms, such as pain and ulceration [11, 12]. Early accurate diagnosis is very important for preventing recurrence and, more importantly, for identifying the onset of malignant transformation.

This study contributes to clinical practice by (1) providing a large (for this rare tumor) cohort analysis of clinical, pathological, and immunohistochemical features, reducing reliance on single-case reports; (2) proposing evidence-based diagnostic criteria to guide clinicians in distinguishing eccrine spiradenoma from mimics (e.g., glomus tumors, angioleiomyomas); and (3) confirming the high expression of CD117 and Sox10 as potential auxiliary markers, which may simplify differential diagnosis, while future research directions include (1) expanding the cohort to validate the diagnostic criteria in larger populations; (2) exploring the molecular mechanisms underlying CD117/Sox10 overexpression to identify targeted diagnostic tools; and (3) conducting long-term follow-up (>5 years) to assess the risk of malignant transformation in patients with long disease courses.

Conclusion

In this study, we present the cases of seven patients with eccrine spiradenoma and the histopathological and immunohistochemical features of their nodules. Spiradenoma is a skin tumor for which distinctive clinical features are lacking, but these nodules have unique histological characteristics, and most nodules have a benign course. The cells are arranged in linear or spiral patterns, and nodules consist of a biphasic cell population with small basaloid cells at the periphery and larger oval cells in the center. CD117 and Sox10 appear to be relatively specific markers for the auxiliary diagnosis of sweat gland tumors.

Disclosure of conflict of interest

None.

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