Journal of Pakistan Association of Dermatologists.2023;**33(1)**:123-131.

Original Article

Skin appendageal tumors: A three-year dermatopathologic institutional study in Martin, Slovakia

Vladimír Bartoš

Martin Biopsy Center, Ltd., Martin, Slovakia.

Abstract

Background Skin appendageal tumors (SATs) comprise a wide and diverse variety of neoplasms that exhibit histogenetic differentiation towards one or more of the cutaneous adnexal structures.

Objective The goal of this research was to investigate the incidence, clinical and histopathological profile of patients with SATs registered at a single pathology institute over a 3-year period.

Methods This cross-sectional descriptive study was realized at the Martin Biopsy Center from August 2019 to July 2022. A retrospective analysis of all consecutive skin tumors histologically diagnosed during the study period was performed. The SATs have been extracted from that file and analyzed in details.

Results A total of 80 cases of SATs have been identified in a set of over 10,000 various skin tumors. They were obtained from 80 individuals (40 males, 40 females) in the age range of 10 to 89 years (mean 54.1 yrs.). The most common site affected was the head and neck (55/80; 68.75%), followed by limbs (15/80; 18.75%) and trunk (10/80; 12.5%). The majority (60%; 48/80) of SATs were of hair follicle origin, followed by the tumors derived from sweat glands (37.5%; 30/80). The sebaceous tumors represented only two cases (2.5%). All but one case comprised benign lesions. The most common types were trichoepithelioma, pilomatrixoma, poroma and hidrocystoma. The only case of malignancy (1.2%) was hidradenocarcinoma.

Conclusion SATs represent less than 1% of all cutaneous neoplasms. Compared to global literature data we have observed a higher age of patients, a very low incidence of sebaceous tumors, and a minimum proportion of malignant lesions. The discrepancies regarding the clinicopathologic features of SATs found in many published studies are partly due to inconsistent approach to classification of this peculiar tumor group.

Key words
Skin adnexal tumors, trichoepithelioma, poroma, pilomatrixoma.

Introduction

Skin appendageal tumors (SATs) comprise a wide and diverse variety of neoplasms that differentiate towards one or more of the cutaneous appendages.[1-3] Depending on their origin, they have been traditionally classified into those with follicular, sweat gland (eccrine and apocrine), sebaceous, and multilineage differentiation.[1,2] However, many of them exhibit striking heterogeneity in microscopic picture and substantial histological overlap between the tumors. The origin of SATs is still the subject of debate but there is growing evidence that they arise from multipotent stem cells located within epidermis or adnexal structures, which possess the ability to differentiate along distinct histogenetic

Address for correspondence
Dr. Vladimír BARTOŠ, PhD., MPH
Martin Biopsy Center, Ltd.
Prieložtek 1, Martin, 036 01, Slovakia.
Email: vladim.bartos@gmail.com

lines.[1,2,4-6] Benign SATs are far more common than their malignant counterparts. Since they are typically without a prognostic significance, their strict categorization was considered to be purely academic in the past.[1,4] However, some types of SATs (e.g. trichoepithelioma, trichilemmoma, pilomatrixoma, sebaceous tumors) have got a great importance because they behave as cutaneous marker for certain hereditary syndromes or internal visceral malignancies.[1,2] Therefore, the exact diagnosis is crucial to warn the medical staff to the likelihood of these conditions. SATs usually display no special gross appearance. Since neither the clinical presentation nor dermoscopy can reliably reveal these entities, the diagnosis principally relies on biopsy examination with limited role of immunohistochemistry.[1] Nevertheless, the histopathologic diagnosis of SATs is sometimes challenging, even for experienced dermatopathologists. This is caused by some reasons, such as the large number of tumor types and their variants, the occurrence of multiple lines of differentiation in a single lesion as well as the controversial nomenclature.[1-3]

The goal of this research was to investigate the incidence, clinical and histopathological profile of patients with SATs registered at a single pathology institute over a 3-year period.

Material and Methods

This cross-sectional descriptive study was realized at the Martin Biopsy Center, Ltd. in Martin (Slovakia) and consisted of two steps. The first one was a retrospective analysis of all consecutive primary skin tumors histologically examined by the author of this paper from August 2019 to July 2022. All patients have been archived in the Pathology database program (CONAPAT, version 6.3.0.5). The analyzed cases consisted of all cutaneous tumors, including melanocytic naevi and seborrheic keratoses that comprised the largest part of the study cohort. In the second step, the SATs have been extracted from that file and studied. Basic clinical data were obtained from the information stated on the biopsy request forms. The excised specimens were processed according to standard laboratory protocol, i.e. formalin-fixed, paraffin-embedded (FFPE) tissue blocks which were sectioned at 5 μm thickness on a microtome and stained with hematoxylin and eosin (H&E) before subjecting for evaluation under a light microscope (Nikon Eclipse Ci). Immunohistochemistry and special stains were used when required. SATs were classified according to recent WHO (World Health Organization) classification of cutaneous tumors 2018.[1] Continuous variable (i.e. age) was calculated as a mean with a standard deviation (SD). Other categorical variables (i.e. gender, histological diagnosis, topography) were descriptively documented and percentages determined as a proportion in the whole population. Finally, the data from eligible literature (twenty-four separate studies) were summarized allowing comparison with present findings.

Results

Over 3 years period, the author histologically investigated >10,000 various tumors of the skin. The pseudotumoral lesions (e.g. nevus sebaceus of Jadasson, basaloid follicular hamartoma, folliculosebaceous hamartoma, dilated pore of Winer) were not included. Among them, a total of 80 SATs (0.8%) obtained from 80 patients (40 males and 40 females) have been found. The overall sex distribution showed no gender predilection; the male to female (F/M) ratio was 1:1. The age range of the individuals varied from 10 to 89 years (mean 54.1 years, SD 19.1, median 56 years). There were only three (3.7%) pediatric patients. The mean age of males and females was almost the same (54.3 years, SD

20.0 for men, 53.9 years, SD 18.3 for women). The disease was most commonly encountered at the age range of 60–79 years (31/80; 38.75%). Based on the available clinical information, no patient had a proven genetic syndromic disease.

With respect to anatomical location, the head and neck was confirmed to be the most commonly affected part of the body (55/80; 68.75%), followed by limbs (15/80; 18.75%) and trunk (10/80; 12.5%). Thirty three cases arose from facial and twenty two cases from extrafacial sites. As regards histogenetic line of differentiation, the majority (60%; 48/80) of SATs received were of hair follicle origin. The second were the tumors derived from sweat glands (37.5%; 30/80), with eccrine being more common than apocrine. The sebaceous tumors represented only two cases (2.5%). Follicular tumors were slightly more common in females (M/F ratio of 0.77:1), whereas in sweat gland tumors the males outnumbered the females with M/F ratio of 1.5:1. All but one case comprised benign lesions. In what concerns to the specific diagnoses, the most frequently encountered SAT was trichoepithelioma (28.7%; 23/80), followed by pilomatrixoma, poroma and hidrocystoma. All three children affected (10-, 11- and 11-year olds) were diagnosed to have a pilomatrixoma. There was detected one case of local tumor recurrence (eccrine spiradenoma on the buttock in a young woman). The only case of malignancy (1.2%) in our set of tumors was hidradenocarcinoma found in a middle-aged man. The detailed clinicopathological data are summarized in **Tables 1-3**.

Table 1 Age incidence distribution of SATs in the study.

Age	*Hair follicle tumors*	*Sweat gland tumors*	*Sebaceous tumors*	*Total number*
≤ 19 years	3 (6.25%)	0	0	3 (3.75%)
20 – 39 years	9 (18.75%)	6 (20%)	0	15 (18.75%)
40 – 59 years	17 (35.4%)	9 (30%)	0	26 (32.5%)
60 – 79 years	17 (35.4%)	12 (40%)	2 (100%)	31 (38.75%)
≥ 80 years	2 (4.2%)	3 (10%)	0	5 (6.25%)

Table 2 Topographic site distribution of SATs in the study.

Topography	*Hair follicle tumors*	*Sweat gland tumors*	*Sebaceous tumors*	*Total number*
Head & neck	37 (77.1%)	16 (53.33%)	2 (100%)	55 (68.75%)
Trunk	3 (6.2%)	7 (23.33%)	0	10 (12.5%)
Extremities	8 (16.7%)	7 (23.33%)	0	15 (18.75%)

Table 3 The numbers of the histologic types of SATs in the study.

Tumor origin	*Diagnosis*	*N*	*Male*	*Female*
Hair follicle	Pilomatrixoma	18	11	7
	Classic trichoepithelioma	21	6	15
	Desmoplastic trichoepithelioma	2	0	2
	Trichoadenoma	1	0	1
	Trichofolliculoma	3	2	1
	Pilar sheath acanthoma	3	2	1
Sweat glands	Poroma	8	6	2
	Hidradenoma	3	1	2
	Hidrocystoma	6	4	2
	Syringocystadenoma papilliferum	1	0	1
	Tubular adenoma	3	2	1
	Spiradenoma	5	3	2
	Chondroid syringoma	1	1	0
	Hidradenoma papilliferum	1	0	1
	Cylindroma	1	0	1
	Hidradenocarcinoma	1	1	0
Sebaceous glands	Sebaceous adenoma	1	1	0
	Sebaceoma	1	1	0

The histomorphology of some tumor types is shown in **Figures 1-5**.

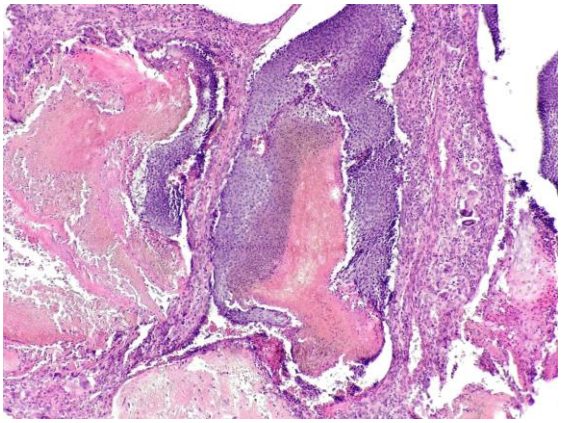

Figure 1 Pilomatrixoma. The characteristic biphasic cell population composed of peripheric germinative basaloid cells and central eosinophilic shadow cells. (H&E eosin, 20x).

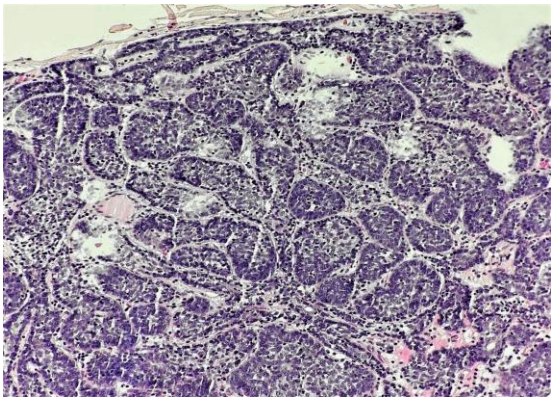

Figure 2 Eccrine spiradenoma. The tumor lobules composed of a mixture of centrally located pale-staining cells and basaloid cells at the periphery. (H&E, 30x).

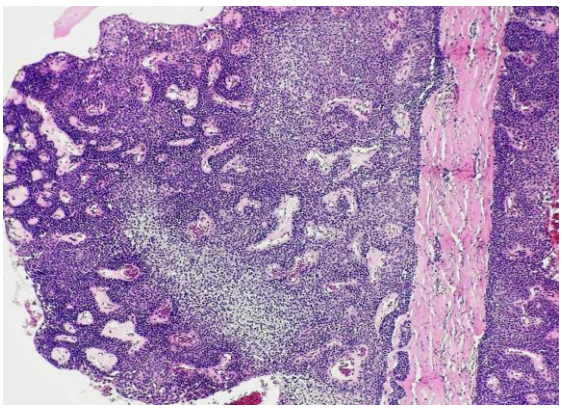

Figure 3 Solid-cystic eccrine hidradenoma. Population of polyhedral slightly basophilic neoplastic cells with focal clear cell differentiation. (H&E, 10x).

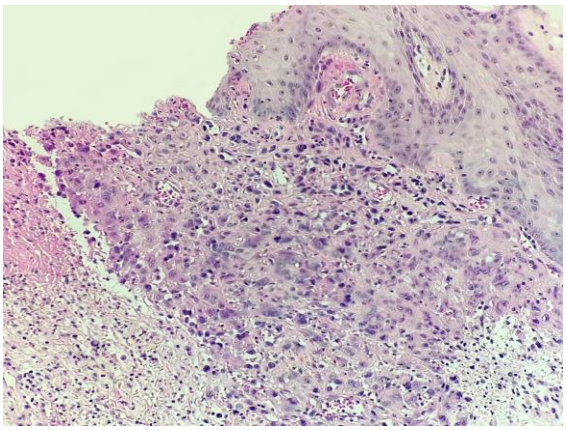

Figure 4 Hidradenocarcinoma. Infiltrative growth pattern of tumor accompanied by ulceration. (H&E, 10x).

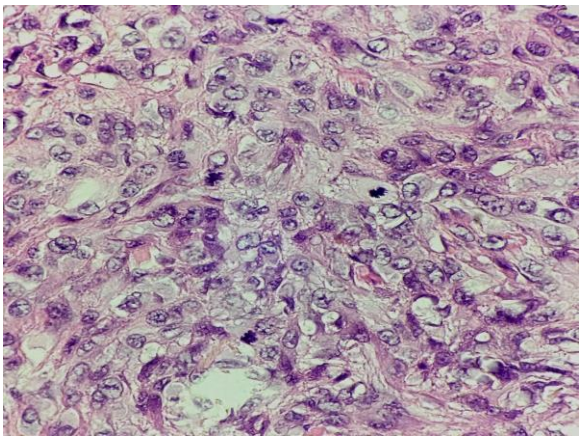

Figure 5 Hidradenocarcinoma. Detail on atypical neoplastic cell population harboring three mitotic figures in the centre. (H&E, 40x).

Discussion

SATs represent important but understudied area in skin pathology. Although they are generally considered rare nosologic entities, the exact ascertainment of their incidence is almost impossible. This is due to several reasons. First of all, these tumors are not separately coded in the ICD-O (International Classification of Diseases for Oncology) registries and there is a paucity of substantial epidemiologic research studies that would explicitly focus on this topic. As a result, there are no comprehensive global data on the geographic and ethnic occurence of appendageal skin neoplasms. Second, many authors have used different approach when

Table 4 Percentages of main histogenetic groups of SATs in given studies.[3-26]

	Total number	*Hair follicle tumors*	*Sweat gland tumors*	*Sebaceous gland tumors*
Cook S *et al*. [3]	1611 (1615)[a]	582 (36.0%)	942 (58.3%)	87 (5.4%)
Kamyab-Hesari K *et al*. [4]	1016	265 (26.1%)	215 (21.2 %)	536 (52.7%)
Sejekan SV *et al*.[9]	105	77 (73.3%)	12 (11.4%)	16 (15.3%)
Kaur K *et al*. [7]	110	43 (39.1 %)	41 (37.3 %)	26 (23.6 %)
Guha PM *et al*. [25]	52	20 (38.4%)	25 (48.1%)	7 (13.5%)
Sharma A *et al*. [15]	56	20 (35.7 %)	24 (42.9 %)	12 (21.4 %)
Valand AG *et al*. [21]	90	43 (37.78%)	24 (26.66%)	23 (25.56%)
El Ochi MR *et al*. [19]	96	49 (51 %)	43 (44.8 %)	4 (4.2 %)
Omar AM *et al*. [13]	18	6 (33.3%)	11 (61.1%)	1 (5.6%)
Nair PS. [5]	33	12 (36.4 %)	19 (57.6 %)	2 (6.0 %)
Bhat SP *et al*. [18]	40	10 (25%)	26 (65%)	4 (10%)
Pujani M *et al*. [16]	25	7 (28.0 %)	14 (56.0 %)	4 (16.0 %)
Parvati M *et al*. [26]	60	20 (33.3%)	25 (41.7%)	15 (25 %)
Suri J *et al*. [6]	66 (64)[b]	25 (39.1 %)	20 (31.2 %)	19 (29.7 %)
Pantola C *et al*. [8]	70	24 (34.3 %)	42 (60 %)	4 (5.7 %)
Sahu A *et al*. [20]	60	14 (23.3 %)	19 (31.7 %)	19 (31.7 %)
Bürgesser MV *et al*. [12]	200	94 (47%)	84 (42%)	22 (11%)
Radhika K *et al*. [22]	35	11 (31.4 %)	17 (48.6 %)	7 (20.0 %)
González L *et al*. [11]	36	16 (44.4%)	19 (52.8%)	1 (2.8%)
Thakuria SK *et al*. [23]	25	8 (32.0 %)	13 (52.0 %)	4 (16.0 %)
Agrawal S *et al*. [10]	47	23 (48.9%)	14 (29.8%)	10 (21.3%)
Gopidesi DT *et al*. [17]	30	8 (26.7 %)	20 (66.7%)	2 (6.6 %)
Vani D *et al*. [24]	51	19 (37.3%)	22 (43.1%)	10 (19.6%)
Samaila MOA [14]	52	4 (7.7%)	41 (78.8%)	7 (13.5%)
This study	80	48 (60%)	30 (37.5%)	2 (2.5%)

[a] among a total of 1615 SATs there were for mixed tumors and
[b] among a total of 66 SATs there were two mixed tumors, which were not calculated.

trying to assess their prevalence among the tumors in the human body. In a study of Kamyab-Hesari *et al*.,[4] the occurrence of SATs among 30,000 histopathology records reached 3.3%. In contrast, Suri *et al*.,[6] Kaur *et al*.,[7] and Pantola *et al*.,[8] revealed the prevalence rates of SATs only 0.6%, 0.3% and 0.3% out of over 10,000, 34,400 and 18,726 consecutive biopsies, respectively. There is no doubt that such a calculation derived from all biopsy reports is misleading and not applicable for scientific practice. Another investigators[9-13] reported a histopathological prevalence of SATs among all skin biopsy specimens in a certain time period. They showed the prevalence rates as 9.5%,[9] 8.4%,[10] 1.3%,[11] 0.8%,[12] and 0.015%.[13] This wide percentage range has proved that it is an imprecise metodology as well. The current study is more representative because it determines the proportion of SATs among cutaneous tumor entities only. Our finding (0.8%) is consistent with a research of Samaila from Nigeria[14] who found out that SATs accounted for 0.9% of all skin neoplasms (52 cases out of a total of 5,642 cutaneous tumors).

To our knowledge, not many original studies dealing with clinicopathological analysis of SATs in details have been published so far. The vast majority of them are conducted from Asian countries and are targeted at a certain regional area. We have reviewed twenty-four such papers, which are briefly summarized in **Table 3** and **Table 4**[3-26] including the current study. In our cohort of patients from European region (Slovakia), we observed disparities when we compared our results to literature data particularly from India.

Table 5 Clinicopathological data of the patients with SATs in given studies. [3-26]

	Country	*M/F ratio*	*Benign SATs*	*Malignant SATs*	*The most common tumor type*
Cook S *et al*. [3]	England	0.7 : 1	97.2%	2.8%	Hidrocystoma
Kamyab-Hesari K *et al*. [4]	Iran	0.96 : 1	93.8%	6.2%	Sebaceous nevus
Sejekan SV *et al*. [9]	India	1.2 : 1	94.3%	5.7%	Pilomatrixoma
Kaur K *et al*. [7]	India	1.03 : 1	82.7%	17.3%	Pilomatrixoma
Guha PM *et al*. [25]	India	0.5 : 1	82.7%	17.3%	Pilomatrixoma
Sharma A *et al*. [15]	India	1.07 : 1	80.4%	19.6%	Pilomatrixoma, Nodular hidradenoma
Valand AG *et al*. [21]	India	1.7 : 1	94.4%	5.6%	Pilomatrixoma, Trichoepithelioma
El Ochi MR *et al*. [19]	Maroco	1.7 : 1	97.9%	2.1%	Pilomatrixoma
Omar AM *et al*. [13]	Egypt	1.5 : 1	94.4%	5.6%	Nodular hidradenoma
Nair PS. [5]	India	1 : 2.3	100%	0%	Syringoma
Bhat SP *et al*. [18]	India	1.1 : 1	55%	45%	Pilomatrixoma, Hidradenocarcinoma
Pujani M *et al*. [16]	India	0.9 : 1	96%	4%	Hidradenoma papilliferum, Pilomatrixoma
Parvati M *et al*. [26]	India	0.7 : 1	93.3%	6.7%	Hidradenoma papilliferum
Suri J *et al*. [6]	India	1.4 : 1	93.9%	6.1%	Pilomatrixoma
Pantola C *et al*. [8]	India	1.8 : 1	95.7%	4.3%	Nodular hidradenoma
Sahu A *et al*. [20]	India	1.7 : 1	78.3%	21.7%	Ecrinne poroma
Bürgesser MV *et al*. [12]	Spain	1 : 1	84.5%a	12%	Pilomatrixoma
Radhika K *et al*. [22]	India	0.88 : 1	77.1%	22.9%	Nodular hidradenoma, Sebaceous nevus
González L *et al*. [11]	Paraguay	0.5 : 1	91.7%	8.3%	Trichoepithelioma
Thakuria SK *et al*. [23]	India	1 : 1.5	84%	16%	Pilomatrixoma
Agrawal S *et al*. [10]	India	1 : 1.4	89.3%	10.7%	Pilomatrixoma
Gopidesi DT *et al*. [17]	India	1.1 : 1	96.7%	3.3%	Clear cell hidradenoma
Vani D *et al*, [24]	India	1 : 1.7	74.5%	25.5%	Nodular hidradenoma
Samaila MOA *et al*. [14]	Nigeria	1 : 1	88.4%	11.6%	Eccrine acrospiroma
This study	Slovakia	1 : 1	98.75%	1.2%	Trichoepithelioma

[a] 3.5% of tumors were classified as having uncertain biological potential

Many previous papers have reported,[4,7,12,14-18] such as we did that both genders are approximately equally involved. Several authors[6,8,9,13,19-21] have noticed a somewhat higher preponderance of men, while others[3,5,10,11,22-26] have found a weak predominance of women.

SATs have a very wide age distribution. In this study, the average age was 54.1 years with the largest number of persons in the group of 60-79 years. These variables are higher when contrasted with most of the documents published so far. Many investigators have reported the mean age in the range of 29-38 years[4,9,13,14,16,19,21] or the greatest frequency of occurrence in individuals between 20 and 40 years of age.[6,7,20,26] In one study,[5] people under the age of 20 were the most prevalent. Our findings corroborate the results of a large recent study published by English researchers[3] who have confirmed the average age of individuals with benign SATs to be 55.1 years.

SATs can arise anywhere in human body, but the head and neck region comprises the most common location. In accordance with the literature[3-26] we have shown that the head and neck was the most preferred site. The presumptive reason for this is the rich

distribution of apocrine and eccrine sweat glands and pilosebaceous units at this body part. Of note, some appendageal tumors have a predominant/ specific anatomic location, e.g. hidrocystoma and syringoma typically occur on the eyelid and periorbital areas,[1] proliferating trichilemal tumor is located on the scalp in >90% of cases,[1] extramammary Paget disease and hidradenoma papilliferum occur most commonly on the vulva.[1] The knowledge of this topographic predilection is helpful for both dermatologists and pathologists in differential diagnostic approach.

In the present research, the follicular tumors were the most common (60%) followed by tumors derived from sweat glands (37.5%) and by far the least frequent were tumors of sebaceous origin (2.5%). These data are in line with other papers[6,7,9,10,12,19,21] that have found follicular tumors to be the most common (37.7-73.3%), while another investigators[3,5,8,11,13-18,22-26] have confirmed the predominance of tumors with sweat gland differentiation (41.7-78.8%). Although sebaceous tumors generally represent the least numerous group, some Indian investigators[6,20,21,26] observed a relatively high percentage (about 25%) and, on the top of that, Kamyab‑Hesari *et al*.[4] reported them to be the most frequent one (52.7%). The main reason for larger proportions is the Asian authors have typically included sebaceous naevi and sebaceous hyperplasia, which are actually not categorized as true tumors,[1] in their analyses.[4-7,9,10,16,21-24,26] In the Iranian study published by Kamyab‑Hesari *et al*.[4] the vast majority of lesions within the group of sebaceous tumors were sebaceous naevi and sebaceous hyperplasia (486 out of a total of 536 lesions), and hence it is not surprising that this category constituted the greatest proportion in their series. After exluding both entities, the pool of sebaceous tumors would have been reduced from 536 to 50 cases only. In addition, several papers have also included another related lesions within the group of SATs, such as trichilemmal (pilar) cyst,[5,9,10] keratoacanthoma,[9,17] hair follicle nevus,[8] piloleiomyoma,[22] Fordyce spots,[22] inverted follicular keratosis and various cutaneous hamartomas.[4]

In our analysis, the most frequently diagnosed tumor types were trichoepithelioma and pilomatrixoma corroborating the fact that follicular tumors were the most commonly present. Among the tumors derived from sweat glands, poroma was the most common. Conventional trichoepithelioma consists of uniform basaloid cells arranged in various growth patterns (cribriform, racemiform, retiform) embedded within a stroma that resembles specific follicular mesenchyme, such as papillary mesenchymal bodies.[1,27] Pilomatrixoma manifests a very typical histomorphology. As shown in **Figure 1**, the neoplastic cells are organized in a biphasic microarchitecture with keratinized so-called shadow cells in the center surrounded by peripheral, deeply basophilic and mitotically active basaloid cells. The ratio of basophilic cells to shadow cells decreases with increasing age/maturation of the lesion.[1,28] Classic poroma is composed of anastomosing aggregates of uniform, lightly basophilic cuboidal cells with scant cytoplasm and oval nuclei (poroid cells) and moderate amount of cuticullar cells having a pale to eosinophilic cytoplasm.[1,29] Foci of small ductal differentiation may be seen.[1,29]

All the earlier papers[3-26] have reported that the incidence of benign SATs is more prevalent compared to the malignant ones. The most frequent malignancies included sebaceous carcinoma, porocarcinoma and hidrdadenocarcinoma. Our population had a notably low proportion of malignant cases (1.2%) compared to global literature (mean 11.7%).[3-26] The only diagnosed malignant SAT

in our study was hidradenocarcinoma in a 55-year-old man arising in the left armpit.

In biopsy practice, the principal approach to the diagnosis of SATs is focused on the questions whether the tumor is benign or malignant, and whether it is a primary SAT or a metastatic infiltration of the skin by a visceral malignancy.[30] The challenging aspect in the differentiation between benign and malignant SATs is an absence of explicit histomorphological or immunohistochemistry findings which could reliably distinguish them.[30] It is generally known that traditional criteria of cytological and nuclear atypia or mitotic activity alone do not render a tumor malignant.[13] For example, numerous mitoses are commonly found in some benign follicular tumors.[30] This raises the importance of silhouettes/architectural attributes of lesions to define the biological behaviour.[13] Certain morphological criteria are constantly related to benign fashion of SATs which include apparent tumor circumscription, sharp and pushing margins, overall symmetry, and lack of necrosis. In contrast, malignant SATs are asymetrical, poorly circumscribed, have irregular arrangement of cells with infiltrative borders, and quite common necroses.[13,30] The above mentioned features are quite easy to detect in a complete surgical excision but diagnostic pitfalls occur with a partial/small biopsy specimen. The greatest difficulties arise when differentiating classic trichoepithelioma from basal cell carcinoma (BCC), desmoplastic trichoepithelioma from infiltrative/morpheaform BCC, trichilemmoma, proliferating trichilemmal tumor and trichilemmal carcinoma from squamous cell carcinoma manifesting a clear cell appearance, microcystic adnexal carcinoma from syringoma, and sebaceoma from BCC with sebaceous differentiation or sebaceous carcinoma.[30] In addition, the distinguishing a primary SAT from a cutaneous metastasis from internal malignancies is very important because it has paramount prognostic significance.[30] The knowledge of clinical background is very useful in the differential diagnosis process. The rapid growth of particularly multiple skin affections and a preceding history of a non-cutaneous malignant neoplasia in a patient rather suggest a cutaneous metastasis, while a long-term solitary lesion is more indicative for primary SATs.[30] For correct classification of malignant SATs a combination of detailed medical anamnesis and thorough histopathologic examination, including sufficient tissue sampling and extensive immunohistochemistry, is necessary.

Conclusion

In our Slovak series, the SATs constituted less than 1% of all cutaneous neoplasms. Compared to global literature data we have observed a higher age of patients, a very low incidence of sebaceous tumors, and a minimum proportion of malignant lesions. This paper stresses that the discrepancies regarding the clinicopathologic features of SATs found in many published studies are partly due to inconsistent approach to classification of this peculiar tumor group.

References

1. Elder DE, Massi D, Scolyer RA, Willemze R. WHO Classification of Skin Tumours. 4th Edition, IARC Lyon, 2018. p. 154-222. ISBN 978-92-832-2440-2
2. Adamicová K, Fetisovová Ž, Mellová Y, Výbohová D. Diagnostika adnexálnych tumorov kože. *Čes-slov Patol*.2006;**42**:59-65.
3. Cook S, Bajwa D, Hollestein L, Husain A, Rajan N. A 5-year retrospective review of skin adnexal tumours received at a tertiary dermatopathology service: implications for linked genetic diagnoses. *Br J Dermatol*. 2022;**186**:167-73.
4. Kamyab-Hesari K, Balighi K, Afshar N, *et al*. Clinicopathological study of 1016 consecutive adnexal skin tumors. *Acta Med Iran*. 2013;**51**:879-85.

5. Nair PS. A clinicopathologic study of skin appendageal tumors. *Indian J Dermatol Venereol Leprol*. 2008;**74**:550.
6. Suri J, Gupta D, Koul KK, Kumari R. A clinicopathological analysis of skin adnexal tumours: four year retrospective study. *JK Science*. 2016;**18**:248-51.
7. Kaur K, Gupta K, Hemrajani D, Yadav A, Mangal K. Histopathological analysis of skin adnexal tumors: A three year study of 110 cases at a tertiary care center. *Indian J Dermatol*. 2017;**62**:400-6.
8. Pantola C, Kala S, Agarwal A, Amit S, Pantola S. Cutaneous adnexal tumours: A clinicopathological descriptive study of 70 cases. *World J Pathol*. 2013;**2**:77–82.
9. Sejekan SV, Biligi DS. Clinicopathological study of skin adnexal tumors with special emphasis on the line of differentiation. *J Med Sci Health*. 2022;**8**:8-13.
10. Agrawal S, Jain R, Panchonia A, Kulkarni CV, Mehar R. "Troublesome tumors" of the skin: Spectrum of skin adnexal tumors at a tertiary care center in Malwa region. *Int J Med Sci Public Health*. 2018;**7**:714-8.
11. González L, Di Martino B, Rodríguez M, Knopfelmacher O, Bolla L, Recalde J. Estudio clínico y epidemiológico de los tumores anexiales en la Cátedra de Dermatología de la Facultad de Ciencias Médicas de la Universidad Nacional de Asunción. Paraguay. Años 2002-2008. *Folia Dermatol Peru*. 2009;**20**:135-9.
12. Bürgesser MV, Metrebián MF, Kurpis M, Diller A. Neoplasias anexiales de la piel. Revisión histopatológica de 8 años de experiencia. Skin´s adnexal tumors. Histopathologic review of eight years of experience. *Rev Argent Dermatol*. 2009;**90**:152-64.
13. Omar AM, Osman NA. Four years retrospective study of skin adnexal tumors: Histomorphology and special stain study. *Int J Med Sci Public Health*. 2020;**9**:273-9.
14. Samaila MOA. Adnexal skin tumors in Zaira, Nigeria. *Ann Afr Med*. 2008;**7**:6-10.
15. Sharma A, Paricharak DG, Nigam JS, *et al*. Histopathological study of skin adnexal tumours-institutional study in South India. *J Skin Cancer*. 2014;**2014**:543756.
16. Pujani M, Madaan GB, Jairajpuri ZS, *et al*. Adnexal tumors of skin: An experience at a tertiary care center at Delhi. *Ann Med Health Sci Res*. 2016;**6**:280–5.
17. Gopidesi DT, Sai PV, Vissa S, *et al*. Skin adnexal tumors: A histopathological analysis of 30 cases at a tertiary care center. *Saudi J Pathol Microbiol*. 2020;**5**:67-71.
18. Bhat SP, Kishan Prasad HL, Bhat VS, Jayaprakash Shetty K. Clinicopathological study of cutaneous adnexal tumors in a tertiary hospital of South India. *Indian J Pathol Oncol*. 2016;**3**:649-652.
19. El Ochi MR, Boudhas A, Allaouni M, *et al*. Skin adnexal tumors: Histological study about 96 cases. *Pan Afr Med J*. 2015;**20**:389.
20. Sahu A, Sa DK, Nayak SK, Agrawal KC. Skin adnexal tumors: A histopathological study of 60 cases at a tertiary care centre. *Annals Pathol Lab Med*. 2018;**5**:A215-A220.
21. Valand AG, Ansari SAH, Sinha RK et. al. A clinicopathological study of adnexal tumors of skin in a tertiary care research hospital. *Int J Health Sci Res*. 2016;**6**:52-8.
22. Radhika K, Phaneendra BV, Rukmangadha N, Reddy MK. A study of biopsy confirmed skin adnexal tumours: experience at a tertiary care teaching hospital. *J Clin Sci Res*. 2013;**2**:132-8.
23. Thakuria SK, Deka MK, Das A, Phukan A, Khakhlari NM. A two years study of histopathological spectrum of skin adnexal tumors in a tertiary care centre of Southern Assam, India. *Int J Res Med Sci*. 2020;**8**:1802-7.
24. Vani D, Ashwini NS, Sandhya M, Dayananda TR, Bharathi M. A 5 year histopathological study of skin adnexal tumors at a tertiary care hospital. *IOSR J Dent Med Sci*. 2015;**14**:1-5.
25. Guha PM, Prabhu MH. Cutaneous Appendageal Neoplasms– A histo-pathological study from a tertiary care centre in North karnataka. *APLM*. 2018;**5**:A329-A333.
26. Parvati M, Lekha GD, Ram M. A clinicopathological study of skin adnexal tumors - an experience at a tertiary care center in South India. *Int J Health Clin Res*. 2020;**3**:107-12.
27. Latif Saba, Arfan ul Bari. Multiple familial trichoepitheliomas: A rare autosomal dominant skin tumor. *J Pak Assoc Dermatol*. 2021;**31**:546-549.
28. Salati Sajad Ahmad, Al Aithan Bandar. Multiple facial pilomatricomas. *J Pak Assoc Dermatol*. 2011;**21**:215-8.
29. Muslimin. A benign eccrine poroma: a case report. *J Pak Assoc Dermatol*. 2016;**26**:72-5.
30. Danialan R, Mutyambizi K, Aung P, Prieto VG, Ivan D. Challenges in the diagnosis of cutaneous adnexal tumours. *J Clin Pathol*. 2015;**68**:992-1002.