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Eyelid Tumors: A Comparative Analysis of Benign and Malignant Cases in a Tertiary Referral Center-Retrospective Study

Göz Kapağı Tümörleri: Üçüncü Basamak Merkezde Benign ve Malign Vakaların Karşılaştırmalı Analizi-Retrospektif Çalışma

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ABSTRACT Objective: To compare the demographic and clinical features of benign and malignant eyelid tumors in a tertiary referral center from 2018-2023. **Material and Methods:** This retrospective study analyzed medical records of 256 patients who underwent eyelid tumor surgery, with institutional review board approval. Histopathological findings were classified as benign, malignant, or premalignant. Demographic data, tumor characteristics, and recurrence rates were compared between benign and malignant cases. **Results:** Of the 256 histopathologically confirmed lesions, 191 (74.6%) were benign, 62 (24.2%) were malignant, and 3 (1.2%) were premalignant. Patients diagnosed with malignant tumors were significantly older than those with benign tumors (65.4±13.1 vs. 47.8±19.3 years, p<0.001). The most common benign tumors were xanthelasma (17.8%, n=34), squamous papilloma (17.3%, n=33), and seborrheic keratosis (11.5%, n=22). Among malignant tumors, basal cell carcinoma (BCC) (82.3%, n=51) was most frequent, followed by squamous cell carcinoma (8.1%, n=5) and sebaceous gland carcinoma (6.4%, n=4). Benign tumors were more often found in the upper eyelids and in younger patients (p=0.011), while malignant tumors were more common in the lower eyelids and in older patients (p<0.001). Patients from outside İstanbul had a significantly higher rate of malignant tumors compared to those from İstanbul (p<0.001). Malignant tumors required more extensive excision and reconstruction. **Conclusion:** BCC was the most common malignant tumor, while xanthelasma and squamous papilloma were the most frequent benign lesions. Malignant tumors, more common in older patients, were often located in the lower eyelids.

Keywords: Basal cell carcinoma; eyelid disease; eyelid neoplasm; pathology

ÖZET Amaç: 2018-2023 yılları arasında bir üçüncü basamak başvuru merkezinde benign ve malign göz kapağı tümörlerinin demografik ve klinik özelliklerini değerlendirmek ve karşılaştırmak. **Gereç ve Yöntemler:** Bu retrospektif çalışmada, göz kapağı tümörleri nedeniyle cerrahi geçiren 256 hastanın tıbbi kayıtları, etik kurul onayı ile analiz edilmiştir. Histopatolojik bulgular benign, malign ve premalign olarak sınıflandırılmıştır. Demografik veriler, tümör özellikleri ve nüks oranları benign ve malign olgular arasında karşılaştırılmıştır. **Bulgular:** Histopatolojik olarak doğrulanan 256 göz kapağı lezyonunun 191'i (%74,6) benign, 62'si (%24,2) malign ve 3'ü (%1,2) premalign olarak saptanmıştır. Malign tümörleri olan hastaların yaş ortalaması, benign tümörleri olan hastalara göre anlamlı derecede daha yüksekti (65,4±13,1 vs. 47,8±19,3 yıl, p<0,001). En sık görülen benign tümörler, ksantelazma (%17,8, n=34), skuamöz papillom (%17,3, n=33) ve seboreik keratoz (%11,5, n=22) idi. En sık görülen malign tümörler ise bazal hücreli karsinom [basal cell carcinoma (BCC)] (%82,3, n=51), skuamöz hücreli karsinom (%8,1, n=5) ve sebase bez karsinomu (%6,4, n=4) olarak tespit edildi. Benign tümörler daha çok üst göz kapaklarında ve genç hastalarda görülürken (p=0,011), malign tümörler daha çok alt göz kapaklarında ve yaşlı hastalarda tespit edilmiştir (p<0,001). İstanbul dışından gelen hastalarda, İstanbul'dan gelen hastalara kıyasla anlamlı derecede daha yüksek oranda malign tümör görülmüştür (p<0,001). Malign tümörler, benign tümörlere kıyasla daha geniş eksizyon ve rekonstrüktif prosedürler gerektirmiştir. **Sonuç:** Çalışmamızda en sık görülen malign tümör BCC olup, en sık görülen benign tümörler ksantelazma ve skuamöz papillomdur. Yaşlı hastalarda daha sık görülen malign tümörler, genellikle alt göz kapaklarında yer almakta olup malignite riski yüksektir.

Anahtar Kelimeler: Bazal hücreli karsinom; göz kapağı hastalıkları; göz kapağı tümörleri; patoloji

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The eyelid is a protective structure comprising the epidermis, dermis, and skin appendages. Its primary function is to shield the eyeball from external elements while maintaining the moisture of the cornea and conjunctiva. It consists of squamous epithelium, subcutaneous tissue, meibomian glands, and palpebral conjunctiva.[1] Eyelid skin, despite its limited surface area, is highly exposed to sunlight and ultraviolet (UV) radiation, making it susceptible to developing tumors. These tumors are common in ophthalmology and can be found in various tissues, but they are primarily derived from the outermost layer (epidermis) and the layer beneath it (dermis). According to the most recent studies conducted in our country, the majority of eyelid tumors are benign, which is consistent with previous research.[2-5] Implementing delayed excision and repair of periocular tumors is difficult since there is a limited amount of skin tissue in this area. Furthermore, proper treatment of these tumors is critical for preserving the patient's visual acuity and cosmetic appearance.

This study examines the demographic characteristics, location, and histopathological results of primary eyelid tumors in a tertiary referral center in İstanbul, Türkiye, over a period of 5-years.

MATERIAL AND METHODS

This retrospective study, conducted from November 2018 to November 2023, analyzed the medical records of 256 patients who underwent eyelid tumor surgery by surgeons MO and TY. The study included patients recently diagnosed with benign, premalignant, or malignant eyelid tumors, confirmed through histological examination. The patients were under observation at the oculoplastic surgery outpatient clinic of Kartal Dr Lütfi Kırdar City Hospital. Various factors were examined, including the patients' ages, genders, the location of the eyelid lesion, the clinical and histopathological diagnosis, and the specific areas of tumor occurrence around the eye, namely the medial canthus, lateral canthus, upper eyelid, and lower eyelid. Patients were divided into age groups of under 20, 20-40, 40-60, 60-80, and over 80 for comparison. Cases involving multiple quadrants were categorized based on the quadrant where the majority of the tumor and its epicenter were situated. We additionally examined the rate of occurrence of these benign or malignant tumors. The study also encompassed inflammatory lesions, such as chalazion, that did not exhibit relief with medical intervention. The study excluded tumors outside the eyelids and patients lacking a histopathology report. Local anesthesia was used to perform an incisional or excisional biopsy for visually benign lesions. The surgical excision of malignant lesions involved removing the tumor along with a safety margin of 3-5 mm of intact tissue. This procedure was carried out while the patient was under intravenous sedation and local or general anesthesia, and a frozen section examination was performed. If tumor cells were found in the surgical margins during frozen section analysis, additional excision was performed, and the procedure was repeated until clear margins were achieved. Following that, either primary closure or eyelid reconstruction using a flap or graft, or a combination of both, were carried out. The excised specimen was sent to the pathology laboratory for a definitive diagnosis through permanent section analysis. The specimens were measured in mm^3 to determine their volumes, which were retrospectively examined. In addition, the study retrospectively analyzed the patients' places of residence, classifying them into three categories: İstanbul, surrounding provinces, and other geographical regions.

The study received approval from the Clinical Research Ethics Committee of Kartal Dr Lutfi Kirdar City Hospital and was conducted in compliance with the Declaration of Helsinki (date: 15 December, 2021, no: 2021/514/215/2). Every participant, including the parents or guardians of children, gave written informed consent for both the research and the publication of images. We did not document the patient's name and maintained strict confidentiality about their identity (Figure 1, Figure 2 A, B, C, D).

STATISTICAL ANALYSIS

The data analyses were conducted using SPSS for Windows version 27.0 software (IBM Corp., Armonk, NY, USA). Descriptive statistics, including mean, standard deviation, median, minimum, maximum values, frequency, and percentage, were utilized to summarize the data. The Kolmogorov-Smirnov test was applied to assess the normality of the sample

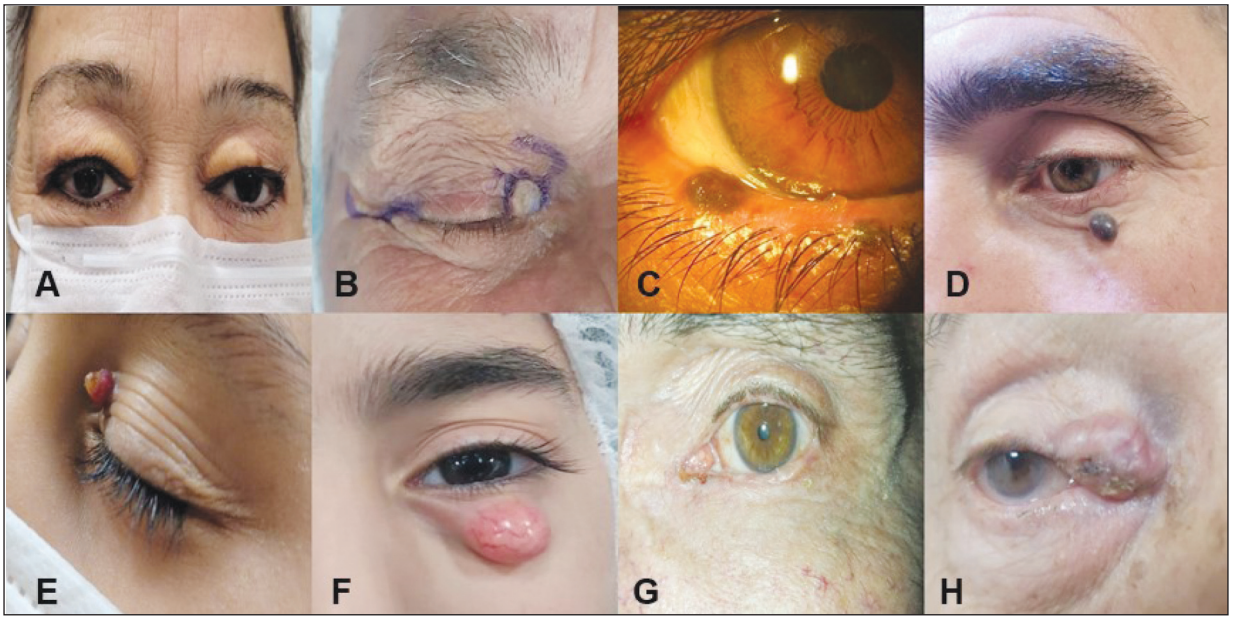

FIGURE 1: Examples of common benign and malignant eyelid tumors.
A) Xanthelasma with dermatochalasis, **B)** Seborrheic keratosis, **C)** Intradermal nevus, **D)** Dermal nevus, **E)** Pyogenic granuloma, **F)** Molluscum contagiosum, **G)** Morpheaform basal cell carcinoma, **H)** Bebaceous gland carcinoma

FIGURE 2: The pathology report confirmed a morpheaform basal cell carcinoma located in the right lower eyelid **(A)**. The tumor was outlined with a 4 mm clear margin **(B)**. After the tumor was excised and confirmed by a frozen section, a tarso-conjunctival flap from the upper eyelid was used to reconstruct the posterior lamella, while the anterior lamella was created using a bridging flap from the upper eyelid **(C)**. The patient's image at the 8th postoperative week **(D)**.

distribution. For the comparison of quantitative data between groups, the Mann-Whitney U test was used. When comparing more than 2 independent groups that did not follow a normal distribution, the Kruskal-Wallis test was employed. The relationships between categorical variables were examined using the chi-square test, or Fisher's exact test where appropriate. Statistical significance was set at $p<0.05$ for all analyses.

RESULTS

In our study conducted over a 5-year period, we analyzed a total of 256 patients who underwent surgery for eyelid tumors. Histopathological findings showed that 191 patients (74.6%) had benign results, 62 (24.2%) had malignant outcomes, and 3 (1.2%) had premalignant results. The comparison of clinical characteristics between benign and malignant eyelid tumors is outlined in Table 1. Examples of benign and malignant tumors, along with their various clinical appearances, are shown in Figure 1.

Out of all the patients, 47.7% (n=103) were between the ages of 40-60. 84.4% (n=216) of the patients resided in İstanbul, while 8.2% (n=21) were from other geographical areas and 7.4% (n=19) were from neighboring provinces. Patients from İstanbul had a notably higher proportion of benign tumors,

TABLE 1: Analysis of demographic, clinical characteristics, and recurrence rates for benign, premalign and malignant tumors

Tumor's type	Benign tumors (n=191)	Malignant tumors (n=62)	Premalignant tumors (n=3)	p value
Age (mean, years)	47.8±19.3	65.4±13.1	58.3±5.1	**< 0.001***
Gender				
Male	85 (44.5%)	32 (51.6%)	2 (66.7%)	0.505
Female	106 (55.5%)	30 (48.4%)	1 (33.3%)	
Laterality				
Right	44.5%	56.5%	66.7%	
Left	40.8%	41.9%	33.3%	**0.027***
Bilateral	14.7%	1.6%	0%	
Location				
Upper	47.6%	24.2%	33.3%	
Lower	38.7%	64.5%	66.7%	**0.011***
Both	3.7%	6.5%	0%	
Recurrence	2 (1.0%)	2 (3.2%)	0 (0%)	0.287

*Fisher's Exact test

while patients from surrounding provinces and other regions had significantly higher percentages of malignant tumors (p<0.001).

The most common eyelid tumor, regardless of benign or malignant classification, was basal cell carcinoma (BCC), affecting 19.9% (n=51) of patients, followed by xanthelasma (13.3%, n=34), squamous papilloma (12.9%, n=33), seborrheic keratosis (8.6%, n=22), and intradermal nevus (7.0%, n=18). Among the benign tumors affecting the eyelids, xanthelasma was the most frequently diagnosed condition, accounting for 17.8% (n=34) of cases. This condition was largely observed in female patients (73.5%) and primarily affected the upper eyelids (85.3%). Subsequently, there were 17.3% (n=33) cases of squamous papilloma, which mainly affected male patients (66.7%) and were primarily situated on the lower eyelids (60.6%). The analysis of the demographic details and clinical characteristics of benign eyelid tumors is presented in Table 2.

The mean age of patients with malignant eyelid tumors was considerably higher compared to patients having benign eyelid tumors (65.4±13.1-47.8±19.3, p<0.001). There was no statistically significant disparity in gender distribution among malignant and benign eyelid tumors (p=0.505). Nevertheless, there was a notable disparity in age groups, as the incidence of malignancy was considerably greater in the 60-80 age group compared to the 53.2% rate in other age groups (p<0.001). Benign eyelid tumors had a higher likelihood of being found on the upper eyelid compared to malignant eyelid tumors (47.6-24.2%). On the other hand, malignant tumors were more likely to be detected on the lower eyelid compared to benign tumors (64.5%-38.7%, p=0.011). BCC was shown to be more frequent in individuals aged 40-60 and those above 80 (p<0.05). Cases of BCC typically occurred on the lower eyelid, while cases of squamous cell carcinoma (SCC) were more common on the upper eyelid. However, this difference was not statistically significant (p=0.085).

There was a substantial disparity in specimen volume between benign and malignant tumors, with malignant tumors exhibiting a considerably higher specimen volume (874.35±743.01 mm^3-407.53± 729.31 mm^3, p<0.001). Despite the difference in mean specimen volumes between BCC and SCC (BCC: 764±544 mm^3, SCC: 1017±707 mm^3), this disparity did not have any statistical significance (p=0.467). Malignant eyelid tumors were observed to be more common on the right side than benign tumors (56.5-44.5%, respectively); however, this difference was not statistically significant (p>0.05). On the left side, the rates were found to be similar (41.9% for malignant and 40.8% for benign). The incidence of bilateral involvement was markedly greater in benign tumors as compared to malignant tumors (14.7-1.6%, p=0.019).

TABLE 2: Analysis of the demographic details and clinical characteristics of benign eyelid tumors

Benign tumors	n (191, %)	Gender (M/F)	Mean age	Laterality (R/L/B)	Location (U/L/B)
Xanthelasma	34 (17.8%)	9/25	53.1±12.5	20/12/2	29/0/5
Squamous papilloma	33 (17.3%)	22/11	47.3±15.4	16/14/3	13/20/0
Seborrheic keratosis	22 (11.5%)	13/9	60.2±20.4	11/9/2	5/15/2
Intradermal nevus	18 (9.4%)	5/13	44.6±13.8	9/8/1	11/7/0
Chalazion	14 (7.3%)	6/8	41.2±18.6	7/5/2	8/5/1
Verruca vulgaris	10 (5.2%)	3/7	45.6±15.3	6/3/1	3/4/3
Epidermal cyst	9 (4.7%)	3/6	48.8±17.9	5/3/1	4/1/4
Fibrosis with granulation or chronic inflammation	6 (3.1%)	3/3	51.4±10.6	3/3/0	4/2/0
Capillary hemangioma	5 (2.6%)	2/3	36.4±8.9	3/2/0	1/4/0
Molluscum contagiosum	3 (1.6%)	1/2	22.3±5.1	1/2/0	1/0/2
Dermoid cyst	3 (1.6%)	2/1	35.3±12.8	1/1/1	2/1/0
Papular elastosis	3 (1.6%)	2/2	71.7±7.5	1/2/0	2/1/0
Fibroepithelial polyp	3 (1.6%)	1/2	68.3±10.8	1/2/0	2/1/0
Pyogenic granuloma	3 (1.6%)	2/1	35.7±19.7	2/1/0	1/2/0
Fibroblastic mesenchymal tumour	2 (1.0%)	0/2	22.5±6.4	1/1/0	1/1/0
Granulomatous inflammation	2 (1.0%)	1/1	52.0	1/1/0	1/1/0
Compound nevus	2 (1.0%)	1/1	42.5±10.7	1/1/0	0/2/0
Keratoacanthoma	1 (0.5%)	0/1	56	1/0/0	0/1/0
Melanocytic nevus	1 (0.5%)	0/1	30	1/0/0	0/1/0
Dermal nevus	1 (0.5%)	1/0	25	1/0/0	1/0/0
Neurofibroma	1 (0.5%)	1/0	40	0/1/0	1/0/0
Schwannoma	1 (0.5%)	0/1	55	1/0/0	1/0/0
Pilomatrixoma	1 (0.5%)	0/1	35	1/0/0	1/0/0
Sebaceous gland hyperplasia	1 (0.5%)	0/1	60	1/0/0	0/0/1
Others*	12 (6.3%)	5/7	58.7±13.74	6/5/1	6/5/1

*Eccrine hidrocystoma, lipoma, Moll cyst, Zeiss cyst. M: Male; F: Female; R: Right; L: Left; B: Bilateral; U: Upper; L: Lower; B: Both. Upper eyelid, lower eyelid, medial canthus, lateral canthus, periocular region

The number of cases of lower eyelid localization in malignant tumors was substantially higher compared to the benign group, with rates of 64.5-38.7%, respectively (p=0.011). The analysis of the demographic details and clinical characteristics of premalignant and malignant eyelid tumors is shown in Table 3. The comparison of benign, premalignant, and malignant tumors by age groups and gender is shown in Table 4.

TABLE 3: Analysis of the demographic details and clinical characteristics of premalign and malignant eyelid tumors

Malignant tumors	n (62, %)	Gender (M/F)	Mean age	Laterality (R/L/B)	Location (U/L/B)	Recurrence
BCC[a]	51 (82.3%)	24/27	64.2±11.8	27/20/4	7/37/7	0
SCC[b]	5 (8.1%)	4/1	73.8±21.2	3/2/0	4/1/0	1
SGC[c]	(6.4%)	1/3	68.7±9.4	2/2/0	4/0/0	1
BSCC[d]	2 (3.2%)	1/1	72	1/1/0	2/0/0	0
Premalign tumors	**Number (3, %)**	**Gender (M/F)**	**Mean age**	**Laterality (R/L/B)**	**Location (U/L/B)**	**Recurrence**
Actinic keratosis	2 (66.7%)	1/1	57.0±5.0	1/1/0	1/1/0	0
Bowen's disease	1 (%33.3)	1/0	60	1/0/0	1/0/0	0

[a]Basal cell carcinoma; [b]Squamous cell carcinoma; [c]Sebaceous gland carcinoma; [d]Basosquamous cell carcinoma M: Male; F: Female; R: Right; L: Left; B: Bilateral; U: Upper; L: Lower; B: Both. Upper eyelid, lower eyelid, medial canthus, lateral canthus, periocular region.

TABLE 4: Comparison of benign, premalignant, and malignant tumors by age groups and gender

		Benign tumors		Malignant tumors		Premalign tumors		
		n	%	n	%	n	%	p value
Gender	Female	106	55.5%	30	48.4%	1	33.3%	0.505
	Male	85	44.5%	32	51.6%	2	66.7%	
Age groups	Under 20 years	24	12.6%	0	0.0%	0	0.0%	
	20-40 years	26	13.6%	3	4.8%	1	33.3%	
	40-60 years	103	53.9%	18	29.0%	1	33,3%	**<0.001***
	60-80 years	30	15.7%	33	53.2%	0	0,0%	
	Over 80 years	8	4.2%	8	12.9%	1	33,3%	

*Fisher's exact test

Out of the 62 patients diagnosed with malignant eyelid tumors, the majority (82.3%) had BCC, followed by SCC (8.1%), sebaceous gland carcinoma (SGC) (6.4%), basosquamous cell carcinoma (BSCC) (3.2%). No instances of malignant melanoma were detected. SCC was reported histopathologically in 2 patients who underwent excision without biopsy because they were thought to have cutaneous horn and papilloma. A secondary wide excision was performed to these patients due to a positive surgical margin. For 3 cases initially suspected of SCC, pathological results revealed BCC in 2 cases and SGC in 1 case. For 2 cases initially suspected of BCC, pathological results showed BSCC in one case and SGC in the other. The diagnostic accuracy for malignant tumors was observed to be 91.9%. One patient with a benign tumor required reconstructive surgery. A patient operated on for a fibroblastic mesenchymal tumor underwent reconstruction with a Tenzel flap. In addition, 2 individuals with benign tumors needed canthotomy or cantholysis. Out of the patients with malignant tumors, 6 (9.7%) were treated with total excision and primary suturing, while an additional 13 patients (20.9%) also had lateral canthotomy/cantholysis. Eleven patients (17.7%) underwent the application of a Tenzel flap to repair full-thickness eyelid defects following excision. The Hughes tarsoconjunctival flap was utilized for the posterior lamella in 22 patients (35.5%), making it the most frequently used method (Figure 2). For the anterior lamella, either a skin advancement flap or a skin graft was employed for complete removal and restoration of the defect. Additionally, various other reconstruction methods were utilized: the Cutler Beard flap was used in 4 patients (6.5%), the Glabellar flap was also used in 4 patients (6.5%), the periost flap was applied in 1 patient (1.6%), and an auricular cartilage graft was used in 1 patient (1.6%) (Figure 3). Radiotherapy was initiated in a patient diagnosed with SCC after the cancer advanced from the bulbar conjunctiva to the orbit. This individual experienced exenteration. Two instances of xanthelasma recurrence were reported in benign eyelid tumors, while two instances

FIGURE 3: The pathology report confirmed an infiltrative basal cell carcinoma located in the left lower eyelid with invasion towards the lateral canthus and upper eyelid **(A)**. The tumor was outlined with a 4 mm clear margin **(B)**. After the tumor was excised and confirmed by a frozen section, a periosteal flap raised from the lateral wall of the orbit for the lower eyelid posterior lamella and a tarsoconjunctival graft from the right upper eyelid for the upper eyelid posterior lamella were used for reconstruction, while the anterior lamella was created using a preauricular skin graft for the lower eyelid and partially for the upper eyelid **(C)**. The patient's image at the early stage, 4 weeks postoperative **(D)**.

of recurrence were observed in malignant eyelid tumors, one due to SGC and one due to SCC. The recurrence rates were 1.0-3.2% respectively, with no significant difference (p=0.287). No morbidity was observed among benign eyelid tumors. A patient who underwent exenteration succumbed in the postoperative period in the intensive care unit due to pneumosepsis.

DISCUSSION

The distinctive skin and glandular characteristics of the eyelids make this region susceptible to both benign and malignancies. Confirming diagnoses pathologically and planning appropriate treatment and follow-up are crucial due to the resemblance in early stages of the conditions. The repair of the eyelid presents unique difficulties because of its limited surface area and close proximity to the eye. This emphasizes the significance of early identification and intervention to prevent the need for sophisticated surgical procedures. Periocular tumor occurrence is highly influenced by factors such as ethnicity, geography, and genetics. Eyelid tumors, which make up 5-10% of all skin tumors, are particularly common due to the eyelid's exposure to sunlight, UV radiation, and various irritants.[6] The objective of the current study was to analyze and contrast the demographic and clinical features, rates of recurring, and treatment results of both malignant and benign eyelid tumors over a 5 year period. This research provides valuable perspectives and contrasts with previous literature.

In this study, 74.6% of the eyelid lesions were benign tumors, and 24.2% were malignant tumors. A review of the literature indicates that most studies report benign rates of 84-95%, with data from China (86.2%), Switzerland (84%), and Taiwan (95%) falling within this range.[7-9] However, contrary to these findings, some studies in the literature report malignant rates as high as 50%.[10-12] The statistical variations may be attributed to differences in the study populations, UV exposure, methodology, and healthcare systems. Our study, similar to the study conducted by Xu et al. found no significant variation in gender ratio among patients with malignant eyelid tumors.[7] Additionally, consistent with the findings of Sendul et al. there was no observed gender bias in the occurrence of either benign or malignant tumors.[4]

Studies from Türkiye have reported that the most common benign eyelid tumors are squamous papilloma, intradermal nevus, xanthelasma, and seborrheic keratosis.[3-5,13,14] Consistent with the literature, in our study, the most common benign eyelid tumor was xanthelasma (17.8%), followed by squamous papilloma (17.3%), seborrheic keratosis (11.5%), and intradermal nevus (9.4%). Similar to our findings, Savur et al. reported xanthelasma (24.3%) and intradermal nevus (20.9%) as the most common benign eyelid tumors, followed by fibroepithelial polyp (8.3%) and squamous papilloma (6.5%).[3] Sendul et al. found squamous papilloma (17.7%) and xanthelasma (15.0%) to be the most frequent, followed by epidermal cyst (11.3%) and seborrheic keratosis (8.3%).[4] Zırtıloğlu et al. also reported high frequencies of seborrheic keratosis (18.8%), squamous papilloma (18.6%), and xanthelasma (13.8%).[13] These studies support our findings of xanthelasma and squamous papilloma being common benign eyelid tumors, though with some variation in their relative frequencies. While xanthelasma was the predominant benign tumor in our study, this may be attributed to the fact that previous researchers did not specifically seek a pathology diagnosis, as xanthelasma can be easily identified from visual examination. Therefore, when xanthelasma is excluded, the top 2 benign tumors in our study, squamous papilloma and seborrheic keratosis, are consistent with the findings of Yu et al. who conducted a large series of 2,228 cases of eyelid tumors.[15] Additionally, we observed that the prevalence of xanthelasma was higher in individuals aged 40-60, while seborrheic keratosis was more prevalent in individuals aged 40-60 and those over 80. This suggests that xanthelasma and seborrheic keratosis may have a distinct age distribution pattern, which could be attributed to different etiological factors and skin changes associated with aging.

The occurrence of malignant eyelid tumors varies depending on geographical location, and there may also be genetic and racial factors that contribute to this.[16] In their study, Huang et al. found that 5% of eyelid tumors were malignant.[9] In contrast, Sendul et

al. reported a higher malignancy rate of 12.9%, and Eren et al. observed an even greater rate at 25.2%.[4,5] Our study found a similar malignant tumor rate of 24.2%, aligning with these findings. Additionally, we have determined that malignant tumors in the periocular region are more likely to occur in elderly people, which is consistent with previous research.[4,7] The most prevalent malignant tumor affecting the eyelid is BCC, with research indicating that BCC accounts for 56.5% to 95.4% of all malignant eyelid tumors. Our study found that BCC was the most prevalent malignant tumor affecting the eyelid, accounting for 82.3% of cases. The occurrence of malignant eyelid tumors was markedly higher in the lower eyelid compared to benign eyelid tumors (64.5-38.7%, respectively). Similar to our study, several other studies have observed a predominance of malignant eyelid tumors in the lower eyelid.[9,15,17] The variation could potentially be attributed to the heightened ultraviolet rays that the lower eyelid is exposed to. Our study indicates that malignant eyelid lesions predominantly occur in patients aged 60-80. The incidence of malignancy in this age group is significantly higher compared to the 53.2% rate observed in other age groups. Additionally, the frequency of malignant tumors rises to nearly 50% in patients over 80 years old. These findings are also consistent with the literature.[5] Therefore, any suspicious eyelid lesion in patients over 60 should be evaluated with particular caution.

SCC and SGC are less prevalent than BCC, but they tend to be more aggressive and have the potential to be life-threatening. In our study, SCC was the second most common malignant eyelid tumor with representing 8.1% of cases. This finding aligns with the prevalence of SCC in Western countries, where it ranks as the 2nd most common malignancy of the eyelid, comprising 5-10% of all eyelid malignancies.[18] In our study, although SCC was more prevalent in males, we did not observe any significant statistical gender difference. Previous research indicated a higher risk of SCC in males, with a relative risk 1.9 times that of females.[19] Contrary to past findings, SCC in our series was more commonly located on the upper eyelid, consistent with the results of the study by Eren et al.[5,20] SGC was the 3rd most frequent malignant tumor in our series, with a rate of 6.4%. SGC is aggressive, with tendencies for metastasis and a high 5-year tumor-associated death rate, which can be reduced with early diagnosis and treatment.[21] In our study, the mean age at diagnosis for SGC was 68 years, with all cases occurring in the 60-80 years age group. In our study, similar to previous research.[15,22] SGC mostly affects women and is more common in the upper eyelid. This is likely because that's where the meibomian and Zeis glands are located. The occurrence of this condition is uncommon among Caucasians, representing just 1-5.5% of all cases of eyelid malignancies. SGC rates are typically highest in Asian countries, ranging from 42% to 53%.[22,23] Wang et al. reported a 23.6% rate of SGC among 127 malignant eyelid tumors.[16] Other studies, however, found no cases of SGC despite high malignancy rates in tumor cases.[10] One study in Greece with 351 cases reported only one instance of SGC (12), while another study found nearly half of the patients had SGC.[24] These variations can be attributed to differences in demographics, genetic predispositions, and environmental factors, emphasizing the importance of developing region-specific awareness and management measures. No cases of malignant melanoma, a highly aggressive and deadly form of cancer, were found in our research.

Consistent with prior research, we found that malignant eyelid tumors exhibited indistinct characteristics and necessitated more extensive excision and reconstructive surgeries in contrast to benign tumors.[17] The mean excised specimen volume for malignant tumors was 874.35 mm³, whereas for benign tumors, it was 407.53 mm³. In our study, patients from İstanbul had a notably higher proportion of benign tumors, while those from surrounding provinces and other regions had significantly higher percentages of malignant tumors. This disparity is likely due to our hospital's status as a referral center, attracting more complex and severe cases from other cities and regions. Recurrence rates in our study were 3.2% for malignant tumors, which is a lower ratio compared to other studies.[4,9,10,12] "6.5-12.7%" and similar to the findings of Çömez et al. (3.9%).[25] This variation might be attributed to differences in study populations, treatment protocols, follow-up durations, and diagnostic criteria across different research settings.

In their study, Çömez et al. reported that approximately half of the surgeries for malignant eyelid tumors required reconstruction with a graft or flap.[25] In our study, this rate was found to be 69.4%, with the Hughes tarsoconjunctival flap (35.5%) being the most frequently used method. The choice of reconstruction technique depends on the tumor's location, the length of the defect along the eyelid margin, and the surgeon's preferred method.

This study has several limitations. Firstly, as a single-center study, the number of patients was lower than in multicenter studies, which might affect the generalizability of our findings. Additionally, our hospital's status as a referral center may introduce a selection bias, as it tends to attract more intricate and serious cases. Furthermore, the retrospective nature of the study might introduce some limitations due to potential inconsistencies in record-keeping. A key limitation is the absence of detailed data on potential confounding factors such as sun exposure, ethnicity, broader geographic location, systemic illnesses, smoking habits, drug use, immune status, and genetic history. Although we differentiated between patients from İstanbul and other regions, this geographic distinction was not comprehensive. Future research should consider incorporating these variables to enhance the robustness of the findings and provide a more complete understanding of eyelid tumor characteristics.

CONCLUSION

Our findings indicate that benign eyelid lesions are more prevalent than malignant tumors, occurring more frequently in younger individuals and predominantly affecting the upper eyelids. In contrast, malignant tumors were more frequently observed in elderly patients and were predominantly found in the lower eyelids. In our study, among malignant tumors, BCC was the most common, while among benign tumors, xanthelasma and squamous papilloma were the most prevalent. The higher rate of challenging cases from outside İstanbul suggests a selection effect due to our hospital's status as a tertiary referral center, which may have influenced the distribution of tumors, leading to a higher referral rate of malignant tumors. Our findings highlight the significance of understanding the demographic and clinical characteristics of eyelid tumors, especially across different age groups and anatomical locations, in order to enhance diagnostic accuracy and optimize patient management. Further multicenter studies are recommended to validate these results and enhance generalizability.

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Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

Idea/Concept: *Murat Oklar, Titap Yazıcıoğlu;* ***Design:*** *Murat Oklar, Gizem Kardaş;* ***Control/Supervision:*** *Murat Oklar, Titap Yazıcıoğlu;* ***Data Collection and/or Processing:*** *Murat Oklar, Gizem Kardaş, Murat Erkan, Ezgi Tanyeri Kılınç;* ***Analysis and/or Interpretation:*** *Murat Oklar, Mustafa Talan, Murat Erkan;* ***Literature Review:*** *Murat Oklar, Mustafa Talan, Murat Erkan;* ***Writing the Article:*** *Murat Oklar, Titap Yazıcıoğlu;* ***Critical Review:*** *Murat Oklar, Titap Yazıcıoğlu;* ***Materials:*** *Murat Oklar, Gizem Kardaş, Ezgi Tanyeri Kılınç.*

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