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A 5-year review of 1220 malignant periocular tumours in an English county

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BACKGROUND/OBJECTIVES: To determine the incidence, proportion and location of periocular tumours in an English county over a five year period, and compare to other studies in the UK and worldwide.

SUBJECTS/METHODS: A retrospective review of histopathology reports was performed for all periocular excision biopsies of malignancies from the county's three main hospitals over a 5-year period. These hospitals cover a population of just over one million. Tumours were classified according to type and location.

RESULTS: 1220 lesions were included in this study. Right-sided lesions were more common than left. The incidence of basal cell carcinoma was 22 per 100,000 and squamous cell carcinoma 1.3 per 100,000, which were found most commonly on the lower eyelid and eyebrow respectively. The incidences of all other types of lesions were less than 0.5 per 100,000 per year.

CONCLUSIONS: The incidence of periocular basal cell carcinomas in the predominantly elderly Caucasian population was at least three times the published national average. The high incidence of periocular tumours in this North East Anglian county is set to increase further as the proportion of over 65 year olds in the population is predicted to nearly double within two decades.

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INTRODUCTION

Skin cancers represent the most common malignancies in the UK [1]. The commonest form of skin cancer is basal cell carcinoma (BCC), which most often affects the head and neck. BCCs are often grouped with squamous cell carcinomas (SCC) as 'non-melanoma skin cancers' (NMSC). Malignant melanomas (MM) cause the majority of mortality. NMSC combined with MM account for over 95% of all skin cancers [1]. Risk factors for skin cancers include age, sun exposure (specifically UV radiation), and Fitzpatrick Type One or Two skin i.e. skin that is less pigmented. In relation to sun exposure, these lesions have a predilection for the lower eyelid. Eyelid skin is thin with no subcutaneous fat and changes are usually apparent as well as being aesthetically displeasing. Excision of periocular tumours can also affect the function of the eyelids which is to protect and lubricate the ocular surface.

Eyelid cancers are a substantial proportion of the Oculoplastic workload. Worldwide, the incidence of periocular tumours is increasing [2–4]. England is following this trend, with an aging population.

The authors' county in the North East Anglia has a mild climate with plentiful coastline. It is a popular retirement destination and therefore has a predominantly elderly Caucasian population. This population is relatively static with roughly 20,000 people entering or leaving per annum. 21.4% of the population are over 65 (retirement age in England), compared to 16.5% for the rest of England. This elderly population subset is projected to reach nearly 40% by 2033. There is a low rate of non-Caucasian ethnic minorities at only 3.5%, compared to 14.6% average in England [5]. This area thus could have a higher incidence rate of skin cancers compared to the rest of England as age, sun exposure and fair skin are risk factors.

The aim of this study is to assess the incidence, proportion and most likely location of different malignant periocular tumours, and compare the results to the rest of the UK and worldwide. This will also provide an indicator of future surgical caseload in this county.

MATERIALS AND METHODS

This was a multicentre study involving the three main hospitals in the authors' county, including one tertiary centre and two district general hospitals. Biopsies were sent to the tertiary centre which hosts the only histopathology lab in the county. All cases from a 5-year period with the word 'eye' or 'brow' or 'orbit' in the request or report were assessed against the exclusion criteria. Benign or pre-malignant lesions were excluded and incisional biopsies were excluded with the exception of lymphoma. Recurrent lesions were also excluded. Tissue came from four specialties; ophthalmology, dermatology, plastic surgery and general practice.

The type and location of each tumour was described as either; upper lid, lower lid, medial canthus, lateral canthus, eyebrow or orbit. The location was recorded as inconclusive when there was mention of being near the eye but exact periocular site was no clear on the biopsy report.

Our data was analysed with SPSS (version 23, SPSS, Chicago, USA). This study adhered to the guidelines of the Declaration of Helsinki.

RESULTS

The three hospitals covers a population of just over one million (1,016,000 in 2018) [6]. 1220 lesions were included of which 124

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Table 1. Proportion, incidence and site of periocular malignancies in an English county over a 5-year period (including eyebrow lesions).

Type	% (*n*)	Incidence per 100,000	Most common location
Basal cell carcinoma	90.7% (1118)	22.0	Lower lid (37.4%, $n = 378$)
Squamous cell carcinoma	5.5% (67)	1.3	Eyebrow (44.8%, $n = 30$)
Melanoma	0.7% (9)	0.2	Lower lid (33.3%, $n = 3$)
Lymphoma	0.5% (6)	0.1	Lower lid (66.7%, $n = 4$)
Sebaceous gland carcinoma	0.5% (6)	0.1	Upper lid (50.0%, $n = 3$)
Basosquamous carcinoma	0.5% (6)	0.1	Eyebrow (33.3%, $n = 2$)
			Medial canthus (33.3%, $n = 2$)
			Lower lid (33.3%, $n = 2$)
Merkel cell carcinoma	0.4% (5)	0.1	Eyebrow (60.0%, $n = 3$)
Porocarcinoma	0.2% (3)	<0.1	Eyebrow (66.7%, $n = 2$)
Total	100% (1220)	24.0	

Table 2. Location of all periocular malignancies in an England county over a 5-year period.

Site of malignancy	% (*n*)
Lower lid	38.2% (438)
Medial canthus	28.6% (327)
Eyebrow	20.7% (237)
Lateral canthus	6.1% (70)
Upper lid	5.9% (67)
Orbit	0.3% (3)
Inconclusive	(76)

were excised using Mohs technique. 20 recurrent lesions were excluded. Table 1 displays the proportion and incidence and site of the different types of tumours. Incidence is calculated from number of lesions divided by number of years, in relation to the county population. Lesions were more common on the right side (52.1%, $n = 632$) compared to the left (47.9%, $n = 582$), however this difference did not reach statistical significance ($p = 0.151$, chi-square goodness-of-fit test). Overall locations of periocular malignancies are displayed in Table 2.

DISCUSSION

The county studied has an incidence of 22 cases of periocular BCC per 100,000 (Table 1). This is much higher than the 4.5 cases per 100,000 across England reported by Saleh et al., although they state likely underestimation in that study due to regional variation in BCC registration and under-reporting [7]. Quigley et al. found a rate of 13–16 per 100,000 in nearby Ireland, although the Irish population is younger (<15% over 65), and proportionally less Caucasian (91.7% vs 96.5% here), so fewer NMSC would be expected [8, 9]. This suggests the rate of 4.5 cases per 100,000 is indeed an underestimation. These studies excluded eyebrow lesions; excluding eyebrow lesions from our results reduces the incidence to 18 cases per 100 000, which remains the highest figure. The higher rate in our county is likely due to the population demographic and environment. Of note this area is relatively rural with significant agricultural and maritime activity, however Paavilainen et al. found no significant difference between different occupation categories or social class in relation to rates of BCC in Finland [3].

SCCs are more likely to metastasize and have a higher mortality rate relative to BCCs [10]. We report an incidence of 1.3 cases per 100,000, reducing to 0.7 cases if eyebrow lesions are excluded. This is comparable to an England-wide study with a mean incidence of 0.6, but lower than the 1.4–2.1 cases per 100,000 found in Quigley et al.'s study [8, 11]. They found a rate of periocular melanoma of one per million in Ireland, much less than this study (1.4 per million excluding eyebrow melanomas), however the rarity of melanomas makes statistical comparison underpowered [8]. Melanomas account for only a minority of periocular malignancies, but have a much higher rate of mortality than any other lesion [1]. England and Ireland have similar latitudes and populations. Studies have shown a relationship between latitude and rate of skin cancer in Caucasian populations, more so for SCC than BCC [12]. In Australia where there is a predominantly Caucasian population exposed to a lot of sunshine, skin cancers have a much higher incidence [13].

The remaining 26 periocular lesions were a mixture of rarer cancers. Porocarcinomas were most often found on the brow given the relative abundance of sweat glands there. SGCs are more commonly found in on the head and neck than elsewhere on the body due to the distribution of sebaceous glands [14]. We found SGCs were most common on the upper lid, correlating with the more numerous sebaceous glands found there compared to the rest of the periocular area.

Table 3 compares our results for malignant lesions to other large studies performed elsewhere in the world, specifically incorporating later studies as incidence changes over time [2–4, 8, 15–22]. Eyebrow lesions from our study have been excluded for better comparison. Differences may be due to factors such as inclusion criteria, cancer registration, ease of access to healthcare (England's National Health Service is free), and healthcare policy. The proportions of malignant lesions align with similar studies in predominantly Caucasian population [8, 15]. Specifically our results mirror those found by Cook and Bartley in an USA study in Minnesota [16]. Our populations are similar (both 96% Caucasian, middle class) with a similar latitude (Minnesota 47 degrees, our county 53 degrees). Our study population was on average older however, with a greater proportion over the age of 45. Our results were also similar to the proportions found in Greece and Iran which is of surprise given that Mediterranean and Middle-Eastern skin tends to be more pigmented and at lower risk of BCC [17, 18].

Racial differences are evident for SGCs, which are more common in Asian populations but account for less than 1% of cases in this study [2, 19, 20]. The proportion of BCCs is lower in Asia; a comprehensive study in Taiwan showed a lower percentage of BCCs (65% i.e. two thirds), and higher proportions of SCCs (13%) and SGCs (8%) [2]. Domingo et al.'s study in a Phillipino population found only 31% of lesions to be BCCs, and 31% of lesions to be SGCs [20]. In India, the proportion of SGCs was 53% [19]. Dasgupta et al. found no racial predilection for SGCs, only a relative lack of other skins cancers in more pigmented races [14]. Darker, more pigmented skin is protective against certain dermatological malignancies, however lighter skin

Table 3. Comparison of the proportions of periocular malignancies based on latitude (excluding eyebrow lesions).

	Quigley [8]	Lin [this paper]	Deprez [15]	Cook [16]	Asproudis [17]	Bagheri [18]	Lin [2]	Kaliki [19]	Domingo [20]
Country	Ireland	Eastern County (England)	Switzerland	Minnesota (USA)	Greece	Iran	Taiwan	Hyderabad (India)	Philippines
Latitude in degrees	53.1	52.6	46.8	46.7	39.1	32.4	23.7	17.4	12.9
Total cases	5457	983	894	174	351	100	1121	536	170
Basal cell carcinoma (*n*)	88% (4824)	94% (921)	86% (772)	91% (158)	86% (303)	83%	65% (730)	24% (128)	31% (52)
Squamous cell carcinoma (*n*)	10% (528)	4% (37)	7% (67)	9% (15)	7% (25)	8%	13% (141)	18% (99)	17% (29)
Melanoma (*n*)	1% (50)	1% (7)		<1% (1)	2% (6)	2%	2% (21)	2% (12)	12% (20)
Lymphoma (*n*)		<1% (6)				1%		<1% (2)	6% (11)
Sebaceous gland carcinoma (*n*)		<1% (6)	3% (29)			6%	8% (89)	53% (285)	31% (52)
Basosquamous (*n*)		<1% (4)			5% (17)		1% (10)		
Merkel cell carcinoma (*n*)		<1% (2)	<1% (4)					<1% (1)	
Adenocarcinoma (*n*)							2% (19)	<1% (1)	

is seen as culturally desirable in some part of Asia, leading to sun avoidance and again reducing the rate of dermatological malignancy [14]. In countries with a high proportion of Muslims, wearing the niqab reduces sun exposure in women. In Saudi Arabia, the incidence of BCCs was found to be 0.8 per 100 000, compared to 18 in this study [23].

Periocular malignancies are more likely to be located where the skin is exposed to sunlight. Accordingly, the lower lid was most likely to be affected (38.2%) and the upper lid least so (5.9%). One finding of interest is the higher number of lesions distributed on the right compared to the left, although the difference did not reach statistical significance. In England the driver sits on the right, and so their right side is more exposed to the sun. Other studies in Australia and Israel concur with this finding based on the side the driver sits [24, 25]. Fewest lesions were found in the orbit, and the studied county does host orbital, maxillofacial and ENT surgeons, and thus orbital lesions would not have been referred elsewhere.

The strengths of this study are the number of tumours, and the inclusiveness of all specialties, resulting in fewer periocular lesions missed. We have also included lesions excised in private practice and from Mohs surgery. There are no other histopathology departments in the county. Our results are therefore likely to be representative of the true incidence.

Limitations of this study include reliance on the subjective descriptions of the operating surgeon to determine lesion location rather than using photographs. Not all malignant periocular lesions are treated with margin control (e.g. curettage) or surgical excision, and although those numbers are small, the incidence rates here may be an underestimate despite being higher than the UK average.

In summary, our results show the incidence of periocular basal cell carcinomas in our predominantly elderly Caucasian population in this North East Anglian county was at least three times the national average. The ratios of each type of periocular malignancy is in fitting with published data for this homogenous population demographic. The relatively high incidence of periocular tumours in is set to increase as the proportion of over 65 year olds in the population is predicted to nearly double within two decades, and subsequently surgical caseload will also rise.

SUMMARY

What was known before

- Skin cancers are the most common malignancies in the UK
- Incidence of periocular malignancies rises with age, and England has an aging population
- The predominant types of periocular malignancies varies with latitude

What this study adds

- North East Anglia has a rate of periocular basal cell carcinomas four times higher than reported for the rest of England, likely due to the population and climate
- The incidence of other types of periocular skin cancers were comparable to other studies from the British Isles

DATA AVAILABILITY

The data that support the findings of this study are not openly available and are available from the corresponding author upon reasonable request.

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AUTHOR CONTRIBUTIONS

All the authors fulfilled the criteria for authorship. ZL and UQ analysed the data and drafted the manuscript. LI and BH provided the data and revised the manuscript.

COMPETING INTERESTS

The authors declare no competing interests.

ADDITIONAL INFORMATION

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