Dermoscopy of Periocular Skin Tumors

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Introduction

Skin tumors are particularly common on the face, especially on the eyelids, compared to other regions of the skin(1, 2). An aging population and increased sun exposure have led to a continued rise in the incidence of squamous cell carcinoma (SCC) and basal cell carcinoma (BCC), and this trend is expected to persist (3).

BCC is the most common type of malignant skin tumor and is most frequently found on the face, including the eyelids. BCC grows slowly and rarely spreads to other parts of the body but can be highly aggressive locally, causing damage to surrounding tissue (4, 5). When surgically excising a tumor that involves more than half the width of the eyelid, eyelid reconstruction is required. It is crucial to maintain eyelid function and mobility, as well as using tissue with a similar structure and thickness to ensure proper blinking function and protect the sensitive eye from drying out. If the eyelid function is not preserved, the eye can quickly become dehydrated, leading to painful corneal ulcers and severe consequences for the eye. Therefore, early diagnosis and careful assessment of the tumor are essential for choosing the right treatment method and reducing patient risks (6, 7).

When diagnosing tumors near the eye, it is most common for oculoplastic surgeons in Sweden to perform a biopsy, which is then sent for histopathological (PAD) examination. Based on the results, the most appropriate treatment is selected. Despite the high frequency of periocular lesions and the need for delicate surgery around the eye, current diagnostics lack non-invasive techniques for diagnosing and grading skin tumors.

Dermoscopy is a technique first described as early as 1665 by the French scientist Pierre Borell who used a microscope to study capillaries in the nail bed (8, 9). Since its development, the method has evolved and by the late 19th century, an article on "diascopy" highlighted the benefits of using immersion fluid with polarized light for clearer imaging and improved lesion visualization (9, 10). From the 1950s and onward, interest in pigmented lesions grew, leading to the development of more refined techniques.

The modern dermatoscope (also known as a dermascope) is a non-invasive, handheld instrument used for examining the skin. Its fundamental principle is based on transillumination and magnification. Modern dermatoscopes are often equipped with both polarized and non-polarized light sources.

Polarized light works by filtering light waves into a parallel direction, allowing them to penetrate deeper into the skin and enabling the observation of deeper structures—unlike standard surface illumination. By switching between different light settings, important diagnostic clues can become visible depending on the type of lesion. When using non-polarized light, an immersion fluid is required (8, 9). Traditionally, a contact plate measuring 10 × 10 mm is used, but smaller plates measuring 4 × 4 mm are also available which can be particularly useful for examining hard-to-reach areas.

Today, a dermatoscope is considered an essential and indispensable tool, not only for diagnosing skin tumors but also in general dermatology, where it is used to examine various dermatoses as well as changes in hair, the scalp, and nail beds (11-13)

The periocular region has historically been considered a specialized area, and ophthalmologists do not routinely use dermatoscopy in the diagnosis and treatment of skin tumors around the eye. In a review article by Kozubowska et al., the existing knowledge on dermatoscopy in the ocular region was described, encompassing 45 articles where the majority of which consisted of case reports. Most of these articles were written by dermatologists and pathologists, with only a few including ophthalmologists in their research teams (14).

Rubegnis et al. demonstrated that ophthalmologists have a lower diagnostic accuracy than dermatologists when assessing pigmented lesions around the eyes. They proposed a training program in dermoscopy, which increased diagnostic sensitivity (15). Schneider et al suggested video training and a graphical manual for ophthalmologists using a dermatoscope, which improved both image quality and the confidence of the examiners (16).

Dermoscopy is not routinely used by ophthalmologists in Sweden for diagnosing skin lesions. There are only a few published studies and case reports where ophthalmologists have used dermatoscopy. A more precise, earlier, and safer diagnosis of periocular tumors would provide significant benefits for patients both by improving early detection of malignant tumors and by reducing the invasive overdiagnosis of benign skin lesions.

Aim

To investigate whether the addition of dermoscopy improves diagnostic accuracy in the assessment of skin lesions around the eyes compared to clinical evaluation alone.

Method and Materials

Study Population/Sample

This study was conducted at the Ophthalmology Clinic, Växjö Central Hospital, Kronoberg County. The study population was limited to the oculoplastic department.

Patients who attended the oculoplastic department with a skin tumor and assessed to be legally competent, were offered to participate in the study. Participants had to be over 18 years of age. The patients were provided information about the study and subsequently gave written consent. A health declaration, including information about general health, other diseases, current medications, and smoking was filled out (Appendix 1). Information regarding the characteristics of the skin lesion (e.g. size, colour,

development) and the ophthalmologist's suspected clinical diagnosis was also recorded (Appendix 2). In the same form, the final diagnosis was noted after receiving the results from the PAD examination. A patient could have more than one skin lesion, meaning the number of patients might differ from the number of lesions studied.

Fitzpatrick's Classification

The Fitzpatrick classification of skin types is an accepted method for assessing phototypes. The classification includes evaluating the degree of pigmentation, as well as whether the skin type tends to burn or tan easily. The classification is graded from light to dark skin, on a scale from 1 to 6 (14).

Dermoscopy and Pathology

The lesions were photographed using a digital camera for macroscopic images (Canon SX730 HS). After the application of immersion fluid Viscotears (Bausch & Lomb) to the skin lesion, images were taken with the DermLite DL4® dermatoscope using both non-polarized and polarized light (Appendix 3). The images were captured with the digital camera attached to the dermatoscope. A 4x4 mm contact plate (DermLite DL4 Small Area Contact Plate) was used. The dermatoscope was disinfected in between each patient.

In cases where a clinical decision was made for a biopsy or excision, the lesions were subsequently sent for PAD evaluation according to clinical routine.

Dermatoscopic Image Assessment

An experienced dermatologist with specific training in dermoscopy reviewed the images. The dermatologist first assessed the macroscopic image and then the dermatoscopic images, classifying them as benign or malignant and provided specific diagnostic suggestions.

The following diagnoses were classified as:

- **Benign**: seborrheic keratosis, naevus, hidrocystoma, sebaceoma, verruca, hyperkeratosis and chalazion.
- **Malignant**: BCC, actinic keratosis and SCC in situ, melanoma, malignant unspecified.

The cases were categorized into the following groups:

- **Benign:** SK, nevus, sebaceoma, hidrocystoma, verruca, and chalazion.
- **BCC**
- **SCC:** Including actinic keratosis and SCC in situ
- **Malignant unspecified**
- **Melanoma:** Including melanoma in situ and lentigo maligna.

Two ophthalmologists with specific experience in oculoplastic surgery assessed the tumors clinically in the study. The ophthalmologists' clinical diagnoses were then compared to the dermatologist's dermatoscopic diagnosis and the PAD results, which were considered the reference standard.

Statistics

This study was designed as a clinical observational study with the aim of comparing diagnostic assessments. Crosstabulations were used for descriptive statistics, and measures of agreement with kappa value for statistical calculations. The software SPSS version 29 was used for statistical analyses.

No power calculation was performed in this study. At the start of the study, no similar studies had been conducted, making it difficult to obtain data for a power analysis.

Ethical Considerations

Ethical considerations were taken into account before, during, and after the study in accordance with the Declaration of Helsinki (17) . Participation was voluntary, and only individuals capable of providing informed consent were included in the study. Participants received both oral and written information about the project and were given the opportunity to ask questions before and after giving their consent. All data were handled with strict confidentiality, and each participant was assigned a coded patient number to ensure anonymity. Only information considered essential for the study was collected. If a participant wished/wishes to withdraw from the study, they could do so without providing any justification. The study received ethical approval from the Swedish Ethical Review Authority under **Dnr 2022-03144-01** (Title: **Dermatoskopi och bioimaging av hudförändringar)**

Timeline

Data collection took place during **2023**. Statistical analysis and data processing were conducted during **2024-2025**.

Results

Patient Group

A total of 29 patients were included in the study, with 37 lesions examined. The median age of the participants was 71 years (range: 21–88 years). Of these, 69% were women and 31% were men. Information regarding medical history, smoking habits and skin type is presented in Table 1.

The distribution of Fitzpatrick skin type found the majority belonging to type 2 (52%) and type 3 (31%) (Table 1).

Table 1: Patient group including smoking, medical conditions and skin type.

Patient characteristics	**Patients n=29**
Age (median, min-max)	71 (21-88)
Women	21 (69%)
Men	13 (31%)
Diabetes	2 (7%) Type 2 (100%)
Hypertension	14 (48%)
Vascular disease	9 (31%)
Corticosteroid treatment	5 (17%)
Inflammatory disease	6 (21%)
TIA/Stroke	2 (7%)
Smoker	1 (3%)
Previous smoker	8 (28%)
Fitzpatrick type 1-6	Type **1:** 3 (10%) Type **2:** 15 (52%) Type **3**: 9 (31%) Type **4**: 6 (21%)

Tumors

Out of 37 lesions, 18 were malignant (49%). Of these, the majority were BCC (n=11, 61%). Among the benign tumors seborrhoeic keratosis (n=7) and naevi (n=7) were the most common. A summary of the lesion distribution is shown in Table 2.

Table 2: Tumor distribution

	Total n=37
BCC	11 (30%)
Naevus	7 (19%)
Sebborhoeic keratosis	7 (19%)
Actinic keratosis	6 (16%)
Hidrocystoma	2 (5%)
SCC in situ	1 (3%)
Sebaceoma	1 (3%)
Hyperkeratosis	1 (3%)
Verruca	1 (3%)

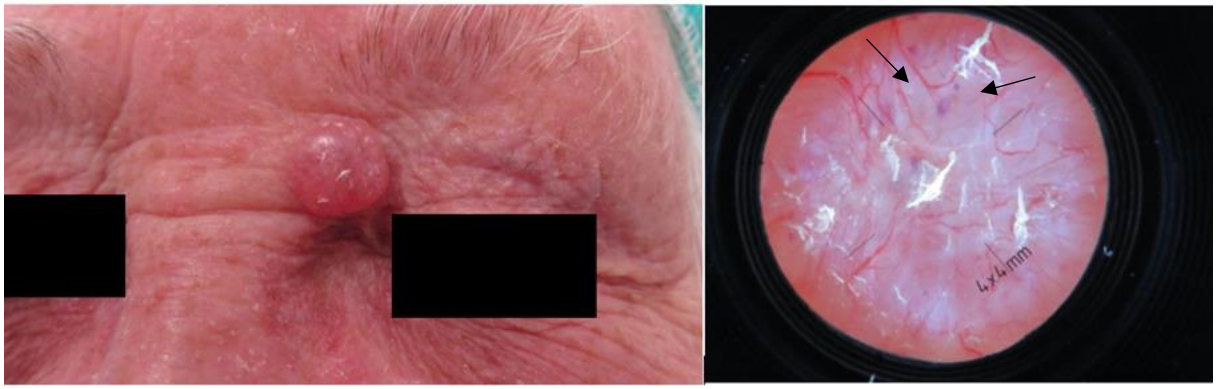

Figure 1. Representative example of BCC on the eyelid. On the left, an exterior image shows pathologically verified BCC. On the right, a dermatoscopic image with typical characteristics; branched vessels, light pink stroma, and blue-coloured structures (arrow).

Measures of agreement

Ophthalmologists diagnosed the malignant tumors in 89% and benign tumors in 79% of cases with only clinical assessment. The dermatologist assessing the exterior images together with the dermatoscopic images found 67% of the malignant tumors and 88% of the benign tumors (Table 3-5). The measures of agreement did not improve for ophthalmologists compared to dermatologists (kappa = 0.676 vs. kappa = 0.556) (Table 3 and 4).

The ophthalmologists assessed benign tumors as malignant in 4 cases (false positive 21%), while dermatologists assessed fewer (12%) (Table 3 and 4).

Table 3. A crosstabulation comparing PAD result with ophthalmologist's clinical diagnosis.

	Ophthalmologist´s clinical diagnosis		
	Benign	Malignant	Total
PAD result			
Benign	15 (79 %)	4 (21 %)	19
Malignant	2 (11%)	16 (89%)	18
Total	17 (46%)	20 (54%)	37

Note: Measure of Agreement Kappa = 0,676, p=<0,001

Table 4. A crosstabulation comparing PAD result with dermatologist´s dermatoscopic diagnosis.

	Dermatologists´ diagnosis dermoscopy		
	Benign	Malignant	Total
PAD result			
Benign	15 (88%)	2 (12%)	17
Malignant	5 (33%)	10 (67%)	15
Total	20 (63%)	12 (38%)	32

Note: Measure of Agreement Kappa = 0,556 p=<0,001. 5 cases N/A by dermatologist.

Diagnostic accuracy

The ophthalmologists and the dermatologist also evaluated the specific diagnoses. The results showed that ophthalmologists identified BCCs in 82% of cases, SCC in 71%, and benign tumors in 79% (Table 5). In comparison, the dermatologist diagnosed BCCs in 44% of cases, SCC in 80%, and benign tumors in 88% (Table 6).

Table 5. A crosstabulation comparing PAD result with ophthalmologist´s clinical diagnosis.

	Ophthalmologist´s clinical diagnosis				
	Benign	BCC	SCC	MM	Total
PAD result					
Benign	15 (79%)	1 (5%)	1 (5%)	2 (11%)	19
BCC	1 (9%)	9 (82%)	1 (9%)	0 (0%)	11
SCC	1 (14%)	0 (0%)	5 (71%)	1 (14%)	7
MM	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0
Total	17 (46%)	10 (27%)	7 (19%)	3 (8%)	37

Note: Measure of Agreement Kappa = 0,666, p=<0,001.

Table 6. A crosstabulation comparing PAD result with dermatologist´s dermatoscopic diagnosis.

	Dermatologists´ diagnosis dermoscopy				
	Benign	BCC	SCC	MM	Total
PAD result					
Benign	15 (88%)	1 (6,0%)	1 (6,0%)	0 (0%)	17
BCC	4 (44%)	4 (44%)	1 (11%)	0 (0%)	9
SCC	1 (20%)	0 (0%)	4 (80%)	0 (0%)	5
MM	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0
Total	20 (65%)	5 (16%)	6 (19%)	0 (0%)	31

Note: Measure of Agreement Kappa = 0,546, p=<0,001. 6 subject N/A by dermatologist.

Discussion

As much as 10% of all skin tumors are situated in the periorbital region, and ophthalmologists diagnose and treat the majority of these due to the sensitive anatomy (1, 2). Ophthalmologists are therefore a natural profession that can greatly benefit from better and safer diagnostics of tumor around the eye. The periorbital skin and its characteristics often demand more advanced surgical techniques due to its delicate structures and the nature of healing. It is of outmost importance to minimize unwanted tension and scarring around the eye, not only for aesthetic results but also for the functional consequences. The use and application of dermatoscopy in the eye region are still in the early stages, particularly among ophthalmologists. With dermatoscopy, it is possible to examine not only the skin but also the eyelashes, conjunctiva, and even the iris(18-22), which should make it even more appealing for ophthalmologists to learn the method.

Our results shows that BCC basal in our material accounted for 61% of the malignant tumors, which is consistent with previous studies (23, 24). The crosstabulations indicate that the sensitivity for detecting benign tumors increases when dermatoscopy is added as a diagnostic aid. The tendency to misidentify benign tumors as malignant (false positive) decreases with the addition of dermatoscopy compared to clinical assessment alone by the ophthalmologist. From a patient safety perspective, as well as an economic perspective, it is crucial to avoid unnecessary biopsies when a correct diagnosis can be made non-invasively. This could lead to reduced risks for the patient and lower healthcare costs.

In this study the measure of agreement did not improve for the dermatologist with dermatoscope, compared to the ophthalmologist without dermoscopy. Some of the dermatoscopic images did not achieve sufficient quality for a good and safe assessment in many cases (up to six images) and where there by excluded by the assessing dermatologist. As a result, the studied group was smaller, which could explain

the lower kappa value. The images were taken by ophthalmologist and perhaps training in taking better quality images could improve the results. Given the rise of teledermoscopy and its potential for external review, it is crucial that the image quality is high, which could be a challenge in the region around the eye due it's complex anatomy. Schneider et al. showed that video training and a graphical manual can improve dermatoscopic image quality (16), an approach that should be implemented to improve diagnostic reliability. Further, if ophthalmologists receive training and gain experience in dermatoscopic interpretation, in-clinic assessments will become more efficient and reliable.

Strengths and Limitations

Only a few studies have studied dermatoscopic assessment of tumors in the eyelid region and none have specifically involved ophthalmologists in this setting. Dermoscopy is simple to implement in clinic and is well studied in other skin regions which makes it an appealing method for evaluation of periocular skin tumors. Further studies are needed to investigate the role of dermatoscopy in the eyelid region.

Image quality proved to be a limiting factor, highlighting the importance of undergoing formal training in dermatoscopic photography to optimize the reliability of the method. No power calculation was performed, as there were no similar studies at the start of the study. Another limitation was that the dermatologist assessed only images of the tumors, without the opportunity to evaluate structural characteristics or perform palpation. This gave ophthalmologists a potential advantage, which may have contributed to their higher diagnostic accuracy, particularly in identifying BCCs. Also, only one dermatologist reviewed the images, additional assessors could have been beneficial.

Conclusion

Our study suggests that the addition of dermoscopy can lead to more accurate assessments when it comes to identifying benign tumors in the periocular region. Identifying benign changes could result in fewer invasive procedures for patients and reduced costs for the healthcare system.

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Appendix 1. Health declaration

Patientnr: **Datum:**

Kön: Man / Kvinna

Ålder:

Har du eller behandlas du för någon av följande **sjukdomar**?	**JA**	**NEJ**
Diabetes (sockersjuka)	Typ 1 eller 2?	
Högt blodtryck		
Hjärt-/kärlsjukdom		
TIA/stroke		
Inflammatorisk sjukdom (t ex ledgångsreumatism eller vaskulit)	Vilken?	
Blödningssjukdomar?	Vilken?	
Lider du av några andra sjukdomar?	Vilka?	

Ange här vilka **läkemedel** du använder:

Använder du **kortison**?
Är du **rökare**?
Har du tidigare **rökt**?

Hudtyp enligt Fitzpatricks skala :

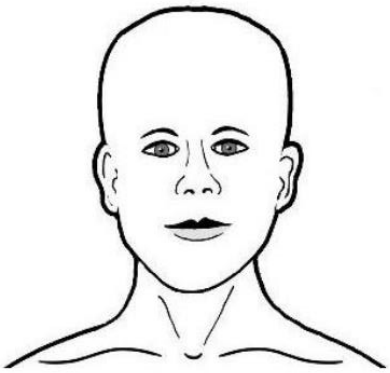
Appendix 2. Protocol

Datum

Patient nr

Födelseår

Markera ut förändringen:



11. PAD-svar

Eventuella kommentarer:

Checklista:

1. Fyll i **samtyckesformulär**
2. Fyll i **hälsodeklaration**
3. Ta **exteriörfoto + dermatoskopifoto**
4. **Lokalisation:** Markera på bild
5. **Duration**
   0-1 månad
   1-3månader
   3-6 månader
   6-12 månader
   >12 månader
   Flera år
   Oklart
6. **Storlek**
7. **Pigmentering** JA/NEJ
8. **Progress**
   Snabbväxande <1 mån
   Medel (1 år)
   Långsamväxande (>1år)
9. **Procedur**
   Stans
   Excision
   Kryo
10. **Misstänkt klinisk diagnos**
11. **Planering**
    Ingen åtgärd
    Uppföljning
    Kryo
    Excision

Appendix 3. Dermatoskop DermLite DL4. Bildkälla: https://dermlite.com/products/dermlite-dl4