THE IMPACT OF EYELID COSMETICS ON MGD: A SEMI-OBJECTIVE APPROACH TO MEIBOGRAPHY ANALYSIS

Introduction

- Meibomian gland dysfunction (MGD) is characterized by structural changes and atrophy to the Meibomian glands.¹
- The leading cause of dry eye disease is MGD. Several factors including race, sex, age, and environmental exposures are thought to contribute to MGD.¹
- There is a current lack of information on the impacts of eyelid cosmetic application on MGD onset and severity.
- Previous literature has suggested that eyelid cosmetics may lead to subjective ocular discomfort² as well as objective alterations to meibum chemical composition³, contamination of the tear film⁴, and toxicity to ocular surface and adnexal cells⁵.
- Therefore, it is of interest to evaluate the impacts of eyelid cosmetic use on Meibomian gland atrophy and morphology.

Methods

- 109 meibography images from 28 volunteer, Caucasian, female subjects aged 18-28 (mean: 22.14; median: 22) were collected using the OCULUS Keratograph® 5M non-invasive infrared camera.
- Subjects were excluded if they contained one or more of the following:

Active eye infection, autoimmune disease, blepharitis, botulinum toxin injection, contact lens wear (>2 days/week), in-office MGD therapy (e.g. Lipiflow®), Demodex, diabetes, eating disorders, eye surgery, eye trauma, eye or eyelid tattoo, floppy eyelid syndrome, hematopoietic stem cell transplantation, obstructive sleep apnea, pregnancy/nursing, rosacea, thyroid disease, use of anti-depressants or antipsychotics, use of isotretinoin, use of tobacco products, or vitamin A deficiency

- Subjects completed a lifestyle questionnaire and the Ocular Surface Disease Index (OSDI) prior to image acquisition.
- Upper and lower eyelid images were semi-objectively analyzed using ImageJ pixel-counting software provided by the National Institutes of Health (NIH) at *https://imagej.nih.gov/ij/*.
- The region of interest was subjectively determined as the area between the lateral canthus and lacrimal punctum. The areas of the visible lid, gland abnormality, and atrophy were calculated, and percentages were derived from the measurements.
- Gland abnormalities were defined as glands that were tortuous, fragmented, borderless, or ghost glands.
- Tortuous areas were defined as glands deviating 45° or more⁶.

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INDIVIDUAL EYELID SCORES											
	Percent Gland Atrophy			Percent Gland Abnormality (Polative to Total Lid Area)			Percent Gland Abnormality (Polativo to Viable Gland Area)				
RISK FACTOR	n	r-value	p-value	n	<i>r-value</i>	p-value	n	<i>r-value</i>	p-value		
Frequency of Cosmetic Wear (Days/Week)	109	.22	.021*	109	.28	.0027*	109	.26	.0071*		
Years of Regular Cosmetic Wear	109	.0007	.99	109	.20	.039*	109	.13	.16		
Calculated Cumulative Days of Cosmetic Wear	109	.057	.55	109	.23	.017*	109	.17	.074		
OSDI Symptom Scores	109	.002	.98	109	.11	.25	109	.082	.40		

			t-value			t-value			t-value
RISK FACTOR	n	Mean ± SD	(p-value)	n	Mean ± SD	(p-value)	n	Mean ± SD	(p-value)
No Mascara	32	19.39% ±11.23	-4.43	32	8.63% ± 8.62	-2.13	32	12.20% ± 11.51	-2.92
Mascara Wearers	27	22 <i>91%</i> + 12 19	(<0.001)*	27	12 91% + 6 40	(0.038)*	27	20 39% + 9 66	(0.0049)*
(Excluding Eyeliner)	21	J2.J1/0 ± 12.1J		21	12.31/0 ± 0.40		21	20.33/0 ± 3.00	

*Results are statistically significant as p<0.05

- Increased years of wear and calculated cumulative days of wear may or may not increase gland abnormality depending on how percentages are calculated.
- This sample group showed no discrepancies in most of the study results whether areas of abnormality were calculated relative to the area of the total visible lid or area of the glands present.
- Mascara wearers (excluding eyeliner users) showed a significant increase in gland atrophy and pathology compared to non-wearers.
- OSDI scores showed no significant relation to cosmetic use.
- Cosmetic and non-cosmetic results showed <u>statistically significant</u> differences, but many were <u>clinically indistinguishable</u>.
- Upper and lower lids as well as right and left were symmetrical (data not shown; p<0.01)
- The authors plan to continue data collection for further research.
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Conclusions

Increased daily frequency of cosmetic wear showed a significant increase in gland atrophy and abnormality within this sample.

References

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Conflict of Interest