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DECODING THE RELATIONSHIP BETWEEN MEIBOMIAN GLAND DYSFUNCTION AND PRIMARY CHRONIC DACRYOCYSTITIS

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ABSTRACT

Background: Meibomian gland dysfunction (MGD) is a prevalent comorbidity with PCD. In PCD, mucopurulent material regurgitated from the lacrimal sac to the ocular surface causes tarsal and conjunctival inflammation, which predisposes to MG damage.

Aim: The current study sought to determine the relationship between meibomian gland dysfunction and primary chronic dacryocystitis. The study also looked at the impact of DCR dacryocystorhinostomy on MGD and tear film stability.

Methods: The study included 200 participants, 100 of whom had unilaterally acquired PCD and the remaining 100 were age-matched healthy controls. All individuals' histories were documented, as well as the OSDI (ocular surface disease index). Meibography, MG expressibility, Schirmer 1 test, TWD (tear wall diameter), TBUT (tear break-up time), TMH (tear meniscus height), and visual acuity were all part of the ocular assessment. PCD ophthalmics were subjected to DCR, and tests were repeated after 8 weeks.

Results: The results showed that the mean duration of epiphora was 2.4±1 years, that 98% (n=98) of PCD subjects had MG expressibility grade ≥2, which was strongly associated with PCD compared to controls with p=0.000, and that 62% (n=62) PCD subjects and no subjects in the control group experienced MG loss of ≥50% 2qw w33n. Following DCR, MG loss remained unchanged, and that OSDI scores, MG expressibility grade, Schirmer 1 values, and TWD all showed a significant decrease (p=0.003).

Conclusions: The current study comes to the conclusion that meibomian gland dysfunction is strongly associated with PCD. By reversing the meibomian gland's functional alterations, dacryocystorhinostom improves the integrity of the tear film. On the other hand, meibomian gland loss is unaffected.

Keywords: Dacryocystitis, OSDI, meibomian gland dysfunction, punctum, primary chronic dacryocystitis

INTRODUCTION

Large sebaceous glands known as meibomian glands, or MGs, are essential for preserving the integrity and well-being of the ocular surface. The meibomian glands release lipids that assist stabilize tear films and reduce surface tension. Meibomian gland dysfunction, or MGD, is characterized by a persistent generalized abnormalities of the MGs that is linked to blockage of the terminal duct and/or qualitative and quantitative alterations in glandular production, which results in increased evaporation of aqueous tears.

According to reports, the prevalence of MGD is between 21% and 71% worldwide, with Arabs having the greatest frequency, followed by Hispanics, Caucasians, and Africans. In India, meibomian gland dysfunction affects around 57% of people. One Anatomically, the mucosa of the lacrimal glands and the lacrimal drainage system are found to be continuous with the mucosa

of the cornea and conjunctiva. The mucosal immune system that continues from the periacinar lacrimal gland-associated lymphoid tissue through the conjunctiva-associated lymphoid tissue (CALT) to the lacrimal drainage-associated lymphoid tissue (LDALT) is referred to as ophthalmic -associated lymphoid tissue, or EALT.[1] Changes in the microbial flora on the ocular surface might result from occlusion of the meibomian gland because of the adjacent mucosal lining decreased tear clearance, epithelial changes, hyperosmolarity of tears, and stimulation of epithelial cells to create inflammatory cytokines.[2]

The primary chronic dacryocystitis, or PCD, frequently coexists with meibomian gland dysfunction. Primary chronic dacryocystitis may cause tarsal and conjunctival irritation upon regurgitation of mucopurulent material from the lacrimal sac to the ocular surface, hence increasing the risk of meibomian gland injury. With the use of in vivo confocal microscopy (IVCM), changes in the meibomian gland, such as dropout and larger acinar diameters, were seen in eyes with primary chronic dacryocystitis. Prolonged, chronic inflammation can also impair goblet cell activity, which exacerbates the tear film's stability. Following DCR (dacryocystorhinostomy), there is additional evidence of enhanced tear film stability and alleviation from stagnation.3

The current study sought to determine if primary chronic dacryocystitis and meibomian gland dysfunction are related. The impact of DCR dacryocystorhinostomy on MGD and tear film stability was also evaluated in this study.

MATERIALS AND METHODS

The current prospective clinical investigation sought to determine if primary chronic dacryocystitis and meibomian gland dysfunction are related. The impact of DCR dacryocystorhinostomy on MGD and tear film stability was also evaluated in this study. The Institute's Department of Ophthalmology provided the research participants. Prior to research participation, informed permission was obtained from each participant both verbally and in writing.

One hundred adults who reported to the Ophthalmology Department throughout the designated research period and had a verified diagnosis of unilateral acquired PCD were evaluated in this study. These participants were compared to 100 age-matched, healthy controls who were there for refraction and who weren't using any topical or systemic medications that would have an impact on the condition of their tear film. Based on mucopurulent/mucoid/epiphora discharge and NLDO (nasolacrimal duct blockage), which was verified by syringing, PCD was diagnosed. Contact lens wearers, autoimmune conditions, allergic conjunctivitis, chemical injuries, facial nerve palsy, lower lid or punctal malposition, or lid laxity such as that which results in epiphora, distichiasis, trichiasis, entropion, and ectropion-like lid abnormalities were all excluded from the research. Additionally excluded were subjects using topical and systemic medicines, such as antihistamines, antidepressants, antiandrogens, or postmenopausal hormone treatment.

Following the research participants' final inclusion, a thorough ophthalmic examination was conducted, which included a dry ophthalmic test, fundus evaluation, tonometry, slit-lamp examination, best-corrected visual acuity, and symptom history were recorded. A 12-item questionnaire and an OSDI (ocular surface disease index) evaluation created by the Outcomes Research Group at Allergan Inc. (Irvine, Calif.) were administered to all participants in order to gauge the severity of dry ophthalmic disease symptoms and their impact on vision-related function. 4. During the evaluation, the room's temperature and humidity were kept between 30% and 50% and 15°C and 25°C, respectively.

The ocular adnexa was examined for lacrimal sac enlargement, scarring, and fistula. The lid margin location was evaluated using a slit-lamp inspection. By applying digital pressure to the lower tarsus, MG expressibility was graded as 0, 1, 2, and 3, indicating easy expression of clear meibum, murky meibum expressed on light pressure, Medium pressure caused meibum to seem foggy, whereas high pressure prevented meibum from forming. 5 The Sirius Scheimpflug analyzer was used to perform meibography and TBUT (tear break-up time). A TBUT cut-off value of ≤10 s was seen as indicative of dry ophthalmic illness.

On a scale of 0 to 4, the degree of MG loss on meibography was evaluated as a percentage of the whole tarsal region devoid of visible glands. Grade 0 denoted no loss, Grade 1 denoted 0% to 25%, Grade 2 denoted 25% to 50%, Grade 3 denoted 50% to 75%, and Grade 4 denoted >75% loss.

Using anterior segment OCT, TWD (tear wall diameter) and TMH (tear meniscus height) were determined. The patients were asked to stare ahead and blink normally while the examination was conducted in a room with steady ambient light. Using a scan line perpendicular to the mucocutaneous junction, TMH was assessed from the cornea–meniscus junction to the lower lid. Gentle eversion was used to expose the punctum. The length of the tear well's surface was used to calculate TWD. Whatman filter strip number 41 was used for the Schirmer I test, folded at a 5 mm length. The wetness length from the notch was used to calculate the score after 5 minutes.

A skilled surgeon performed external DCR on patients with PCD ophthalmic s without intubating them. For five days, all individuals were given 500 mg of systemic amoxycillin every eight hours and 400 mg of ibuprofen tablets three times a day.

Every day, the wound was cleaned, and for ten days, tobramycin ophthalmic ointment was used every day. On the tenth postoperative day, the sutures were removed. Syringing was done on the tenth day and four and eight weeks after surgery. At presentation, MG loss, MG expressibility, TWD, TMH, TBUT, OSDI, and Schirmer 1 scores were measured in PCD ophthalmic s and the right ophthalmic s of controls. In PCD eyes, same tests were conducted again eight weeks after DCR surgery.

SPSS (Statistical Package for the Social Sciences) software version 24.0 (IBM Corp., Armonk, NY, USA) was used to statistically analyze the collected data. The chi-square test, one-way ANOVA (analysis of variance), and descriptive measures were evaluated. The results were expressed as mean and standard deviation and frequency and percentages. The p-value of <0.05 was considered statistically significant.

RESULTS

The purpose of the current prospective clinical investigation was to evaluate the relationship between primary chronic dacryocystitis and meibomian gland dysfunction. Additionally, the study evaluated how DCR dacryocystorhinostomy affected tear film stability and MGD. 200 participants were evaluated in the research; 100 of them had unilaterally acquired PCD, and the remaining 100 were age-matched, healthy controls. With a mean age of 42.56±12.72 years, the PCD case participants ranged in age from 19 to 70 years. 7:19 is the male to female ratio. Epiphora lasted an average of 2.4±1 years. The average age of the study participants in the control group was 46.92±12.75 years. The ratio of men to women was 11:14.

After DCR, all 100 PCD-ophthalmic participants were patent on syringing. After surgery, PCD ophthalmic s' LogMAR visual acuity did not significantly alter, ranging from 0.0% to 0.20. Meibomian gland expressibility scores of 0 were seen in PCD ophthalmic s preoperatively, postoperatively, and in control participants, respectively, when evaluating meibomian gland expressibility and meibomian gland loss grade in cases and control study subjects. Preoperatively, postoperatively, and in control individuals, 2% (n=2), 74% (n=74), and 38% (n=38) of PCD ophthalmic participants had scores of 1. 46% (n=46), 0%, and 8% (n=8) of PCD ophthalmic patients had a grade of 2 before, after, and after surgery, respectively. Preoperatively, postoperatively, and in control patients, 52% (n=52), 0 and 0 PCD ophthalmic individuals, respectively, had a score of 3 (Table 1).

Preoperative, postoperative, and control individuals with PCD ophthalmic s had meibomian loss grades of 0 in 0, 0, and 8% (n=8), respectively. In PCD ophthalmic s, grade 1 was observed in 2% (n = 2), 2% (n = 2), and 80% (n = 80) of participants before, after, and after surgery, respectively. Grade 2 was found in 36% (n = 36), 36% (n = 36), and 12% (n = 12) of PCD ophthalmic patients before, after, and after surgery, respectively. In PCD ophthalmic s, grade 3 was observed in 54% (n=54), 54% (n=54), and 0 individuals before, after, and after surgery, respectively. In PCD ophthalmic s, grade 4 was observed in 8% (n=8), 8% (n=8), and 0 participants before surgery, after surgery, and in control subjects, respectively (Table 1).

According to the study's findings, meibomian gland loss scores were statistically significant (p<0.001) between postoperative cases and control participants for changes in meibography and dry ophthalmic tests after DCR. TBUT (seconds) revealed a non-significant difference between postop patients and controls (p=0.153) and a significant difference between preop and postop cases (p<0.001). With p<0.001 and 0.003, the Schirmer 1 test revealed a significant difference between preop and postop cases, postop cases, and controls. Additionally, OSI demonstrated significant differences (p<0.001 and <0.001) between preop and postop subjects, as well as between postop cases and controls. MG expressibility grades showed a non-significant difference between postop patients and controls (p=0.08), and a significant difference between preop and postop cases (p<0.001). In preop and postop cases, as well as in postop cases and controls, there was a significant difference in TWD (microns) with p<0.001 and <0.001 correspondingly (Table 2).

The current study evaluated 200 participants, 100 of whom had unilaterally acquired PCD and the remaining 100 of whom were age-matched healthy controls. With a mean age of 42.56±12.72 years, the PCD case participants ranged in age from 19 to 70 years. 7:19 is the male to female ratio. Epiphora lasted an average of 2.4±1 years. The average age of the study participants in the control group was 46.92±12.75 years. The ratio of men to women was 11:14. After DCR, all 100 PCD-ophthalmic participants were patent on syringing. After surgery, PCD ophthalmic s' LogMAR visual acuity did not significantly alter, ranging from 0.0% to 0.20.

These findings were similar to those of studies conducted in 2017 by Singh S et al.6 and Kamal S et al.7, in which the authors evaluated participants whose demographics and illness data were equivalent to those of the current research. According to the study's findings, Meibomian gland expressibility scores of 0 were observed in PCD ophthalmic s before surgery, 26% (n=26), and 54% (n=54) in preoperative, postoperative, and control study subjects, respectively, when evaluating Meibomian gland expressibility and Meibomian gland loss grade. Preoperatively, postoperatively, and in control individuals, 2% (n=2), 74% (n=74), and 38% (n=38) of PCD ophthalmic participants had scores of 1. 46% (n=46), 0%, and 8% (n=8) of PCD ophthalmic patients had a grade of 2 before, after, and after surgery, respectively.

52% (n=52), 0 and 0 participants with PCD ophthalmic s before surgery, after surgery, and as control subjects, respectively, had a score of 3. These findings aligned with research conducted by Sun X et al. in 2005 and Sung Y et al. in 2017, which found that the expressibility of meibomian glands and the degree of meibomian gland loss were comparable to the current study.

Meibomian loss grades were seen to be 0 in 0, 0, and 8% (n=8) in PCD ophthalmic individuals before to surgery, postoperatively, and in control subjects, respectively. In PCD ophthalmic s, grade 1 was observed in 2% (n=2), 2% (n=2), and 80% (n=80) of participants before, after, and after surgery, respectively. 36% (n=36), 36% (n=36), and 12% (n=12) of PCD ophthalmic patients had grade 2 before, after, and after surgery, respectively.

In PCD ophthalmic s, grade 3 was observed in 54% (n=54), 54% (n=54), and 0 individuals before, after, and after surgery, respectively. In PCD ophthalmic s, grade 4 was observed in 8% (n=8), 8% (n=8), and 0 participants before surgery, after surgery, and in control subjects, respectively. The results of this investigation were consistent with those of Arita R et al. (2015) and Baudouin C et al. (2016), whose meibomian loss grades were similar to those of the current study. Additionally, meibomian gland loss scores were statistically significant ($p<0.001$) between postoperative cases and control individuals for changes in meibography and dry ophthalmic tests after DCR in study participants.

TBUT (seconds) revealed a non-significant difference between postop patients and controls ($p=0.153$) and a significant difference between preop and postop cases ($p<0.001$). With $p<0.001$ and 0.003, the Schirmer 1 test revealed a significant difference between preop and postop cases, postop cases, and controls. Additionally, OSI demonstrated significant differences ($p<0.001$ and <0.001) between preop and postop subjects, as well as between postop cases and controls. MG expressibility grades revealed a non-significant difference between postop patients and controls ($p=0.08$), and a significant difference between preop and postop cases ($p<0.001$). The difference in TWD (microns) between preop and postop cases, as well as between postop cases and controls, was significant ($p<0.001$ and <0.001, respectively).

These results were consistent with earlier research by Chhadva P et al. (2012) and Gulmez Sevim D et al. (2013), who showed similar alterations in meibography and dry ophthalmic tests after DCR in their separate investigations.

CONCLUSION

Given its limitations, the current study comes to the conclusion that meibomian gland dysfunction is strongly associated with PCD. By reversing the meibomian gland's functional alterations, dacryocystorhinostom improves the integrity of the tear film. On the other hand, meibomian gland loss is unaffected.

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S. No	Parameter	PCD ophthalmic s (n) Preop		PCD ophthalmic s (n) Postop		Control ophthalmic s (n)	
		n	%	n	%	n	%
1.	**MG expressibility scores**						
a)	0	0	0	26	26	54	54
b)	1	2	2	74	74	38	38
c)	2	46	46	0	0	8	8
d)	3	52	52	0	0	0	0
2.	**MG loss grade**						
a)	0	0	0	0	0	8	8
b)	1	2	2	2	2	80	80
c)	2	36	36	36	36	12	12
d)	3	54	54	54	54	0	0
e)	4	8	8	8	8	0	0

Table 1: Meibomian gland expressibility and meibomian gland loss grade in cases and control study subjects

S. No	Parameter	Cases		Controls (3)	p-value 1vs 2	p-value 2 vs 3
		Preop (1)	Postop (2)			
1.	**Meibomian gland loss scores**	2.66±0.63	2.66±0.63	1.02±0.43	**-**	**<0.001**
2.	**TBUT (seconds)**	7.66±3.22	13.31±2.65	12.55±2.59	**<0.001**	0.153
3.	**Schirmer 1 test (mm)**	29.48±4.58	20.88±2.85	22.46±2.35	**<0.001**	**0.003**
4.	**OSDI**	41.82±28.04	9.36±4.78	4.75±3.64	**<0.001**	**<0.001**
5.	**MG expressibility grade**	2.52±0.52	0.72±0.42	0.52±0.62	**<0.001**	0.08
6.	**TWD (microns)**	518.42±211.56	323.12±95.84	264.76±69.21	**<0.001**	**0.001**

Table 2: Changes in meibography and dry ophthalmic tests following DCR in study subjects