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UNDERSTANDING THE CONNECTION BETWEEN PRIMARY CHRONIC DACRYOCYSTITIS AND MEIBOMIAN GLAND DYSFUNCTION- A CLINICAL EVALUATION

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ABSTRACT

Background: One prevalent comorbidity of PCD (primary chronic dacryocystitis) is meibomian gland dysfunction (MGD). In PCD, regurgitation of mucopurulent material from the lacrimal sac to the ocular surface causes inflammation of the tarsal and conjunctival tissues, which increases the risk of MG damage.

Aim: The purpose of this study 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.

Methods: The study evaluated 200 participants, 100 of whom had unilaterally acquired PCD and the remaining 100 of whom were age-matched healthy controls. Every subject's medical history was documented, and the OSDI (ocular surface disease index) was calculated. Meibography, Schirmer 1 test, MG expressibility, TWD (tear wall diameter), TBUT (tear break-up time), TMH (tear meniscus height), and visual acuity were all part of the ocular evaluation. After eight weeks, PCD eyes underwent DCR, and the tests were conducted again.

Methods: the average duration of epiphora was 2.4±1 years. When compared to controls, 98% (n=98) of participants with PCD eyes had MG expressibility grade ≥2, indicating a high correlation with PCD (p=0.000). A ≥50% 2qw w33n MG loss was seen in 62% (n=62) PCD participants and none in the control group. MG loss remained constant during DCR, although OSDI scores, MG expressibility grade, Schirmer 1 values, and TWD all significantly decreased. With p=0.003, the mean TMH decreased from 767.62±331.60 µm to 382±204.27 µm after DCR.

Conclusions: The present study concludes that Meibomian gland dysfunction is strongly linked to 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. According to current research from the Indian context, meibomian gland dysfunction is present in around 57% of Indians.

Anatomically, the corneal and conjunctival mucosa are discovered to be continuous with the mucosa of the lacrimal glands and drainage system. Eye-associated lymphoid tissue, or EALT, is the mucosal immune system that extends from periacinar lacrimal gland-associated lymphoid tissue to conjunctiva-associated lymphoid tissue (CALT) to lacrimal drainage-associated lymphoid tissue (LDALT).

Because of this continuous mucosal lining, ocular surface microbial flora changes, poor tear clearance, activation of epithelial cells to create inflammatory cytokines, hyperosmolarity of tears, and epithelial modifications can all result from meibomian gland blockage.2 One prevalent comorbidity of PCD (primary chronic dacryocystitis) is meibomian gland dysfunction. In primary chronic dacryocystitis, regurgitation of mucopurulent material from the lacrimal sac to the ocular surface may cause inflammation of the tarsal and conjunctival tissues, which increases the risk of meibomian gland injury.

Using in vivo confocal microscopy (IVCM), it was possible to identify changes in the meibomian gland, such as dropout and larger acinar diameters, in eyes with primary chronic dacryocystitis. Chronic, long-term inflammation can also impair goblet cell activity, which makes the tear film's stability even worse. Additionally, better tear film stability is shown to alleviate stagnation following DCR (dacryocystorhinostomy).3

The purpose of this study 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.

MATERIALS AND METHODS

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 the impact of DCR dacryocystorhinostomy on MGD and tear film stability. The study subjects were from the Department of Ophthalmology of the Institute. All individuals gave their written and verbal informed permission before to participating in the study.

One hundred adult participants who attended 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 tear film's condition. Based on mucopurulent/mucoid/epiphora discharge and NLDO (nasolacrimal duct blockage) verified by syringing, PCD was diagnosed. The following conditions were excluded from the study: contact lens wearers; autoimmune diseases; allergic conjunctivitis; chemical injuries; facial nerve palsy; lower lid or punctal malposition; or lid laxity, including that which causes epiphora, distichiasis, trichiasis, entropion, and ectropion-like lid abnormalities.

Additionally excluded were subjects using topical and systemic medicines, such as antihistamines, antidepressants, antiandrogens, or postmenopausal hormone treatment. A thorough eye examination, including a dry eye test, fundus evaluation, tonometry, slit-lamp examination, best-corrected visual acuity, and symptom history recording, was conducted following the final inclusion of study participants. The OSDI (ocular surface disease index), created by the Outcomes Research Group at Allergan Inc. (Irvine, Calif.), was evaluated for all individuals along with a questionnaire to gauge the symptoms of dry eye disease and how they affected 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, the MG expressibility was graded as 0, 1, 2, and 3. These numbers indicate that clear meibum can be expressed easily, that cloudy meibum can be expressed under mild pressure, that cloudy meibum may be expressed under moderate pressure, and that meibum cannot be expressed under extreme pressure.The Sirius Scheimpflug analyzer was used to perform meibography and 5 TBUT (tear break-up time). A TBUT cut-off value of ≤10 s was seen as indicative of dry eye 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. The Schirmer Whatman filter strip number 41 was used for the test, and it was folded at a 5 mm length. The wetting length from the notch was used to calculate the score after 5 minutes.

A skilled surgeon performed external DCR on patients with PCD eyes 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 eye ointment was used every day. On the tenth postoperative day, the sutures were removed. Syringing was done four and eight weeks after surgery, as well as on the tenth day. At presentation, MG loss, MG expressibility, TWD, TMH, TBUT, OSDI, and Schirmer 1 scores were measured in PCD eyes and the right eyes 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 findings were presented as frequency, percentages, mean, and standard deviation. Statistical significance was defined as a p-value of less than 0.05.

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-eye participants were patent on syringing. After surgery, PCD eyes' LogMAR visual acuity did not significantly alter, ranging from 0.0% to 0.20. Meibomian gland expressibility scores of 0 were seen in PCD eyes preoperatively and postoperatively, with 26% (n=26) and 54% (n=54) having meibomian gland expressibility scores of 0 when comparing the cases and control research participants, and control subjects respectively. Preoperatively, postoperatively, and in control individuals, 2% (n=2), 74% (n=74), and 38% (n=38) of PCD eye participants had scores of 1. 46% (n=46), 0%, and 8% (n=8) of PCD eye 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 eye individuals, respectively, had a score of 3 (Table 1).

Preoperative, postoperative, and control individuals with PCD eyes had meibomian loss grades of 0 in 0, 0, and 8% (n=8), respectively. In PCD eyes, 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 eye patients had grade 2 before, after, and after surgery, respectively. In PCD eyes, grade 3 was observed in 54% (n=54), 54% (n=54), and 0 individuals before, after, and after surgery, respectively. In PCD eyes, 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 eye 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).

DISCUSSION

200 participants were evaluated in this study; 100 of them had unilaterally acquired PCD, while the remaining 100 were age-matched healthy controls. The PCD case participants ranged in age from 19 to 70 years, with a mean age of 42.56±12.72 years. 7:19 males to females. On average, epiphora lasted 2.4±1 years. The research participants' average age in the control group was 46.92±12.75 years. It had an 11:14 male to female ratio. After DCR, all 100 patients with PCD eyes were syringe-patent. After surgery, PCD eyes showed no appreciable changes in their LogMAR visual acuity, which varied from 0.0% to 0.20. Similar statistics were found in the 2017 investigations by Singh S et al.6 and Kamal S et al.7, whose authors evaluated participants with comparable illness data and demographics to the current research.

According to the study's findings, Meibomian gland expressibility scores of 0 were observed in PCD eyes 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 eye participants had scores of 1. 46% (n=46), 0%, and 8% (n=8) of PCD eye patients had a grade of 2 before, after, and after surgery, respectively. 52% (n=52), 0 and 0 participants with PCD eyes before surgery, after surgery, and as control subjects, respectively, had a score of 3.

These findings were in line with research by Sun X et al. (2005) and Sung Y et al. (2017), who found that the expressibility of the meibomian glands and the degree of gland loss were comparable to those in the current study. Meibomian loss grades were seen to be 0 in 0, 0, and 8% (n=8) in PCD eye individuals before to surgery, postoperatively, and in control subjects, respectively. In PCD eyes, 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 eye patients had grade 2 before, after, and after surgery, respectively. In PCD eyes, grade 3 was observed in 54% (n=54), 54% (n=54), and 0 individuals before, after, and after surgery, respectively.

In PCD eyes, grade 4 was observed in 8% (n=8), 8% (n=8), and 0 participants before surgery, after surgery, and in control subjects, respectively. These findings 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 investigation. Additionally, meibomian gland loss scores were statistically significant (p<0.001) between postoperative cases and control individuals for changes in meibography and dry eye 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). Preoperative and postoperative patients differed significantly, according to the Schirmer 1 test and postop cases and controls with p<0.001 and 0.003. OSI also showed significant differences in preop and postop cases and postop cases and controls with p<0.001 and <0.001. MG expressibility grades revealed a non-significant difference between the postop patients and controls (p=0.08), and a significant difference between the 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.12 in 2017 and Gulmez Sevim D et al.13 in 2020, where the authors documented meibography and dry eye test alterations after DCR that were similar to the current study. The current study comes to the conclusion that meibomian gland dysfunction is strongly associated with PCD. Dacryocystorhinostom improves tear film stability by reversing meibomian gland functional alterations. On the other hand, meibomian gland loss is unaffected.

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TABLES

Parameter	PCD eyes (n) Preop		PCD eyes (n) Postop		Control eyes (n)	
	n	%	n	%	n	%
MG expressibility scores						
0	0	0	26	26	54	54
1	2	2	74	74	38	38
2	46	46	0	0	8	8
3	52	52	0	0	0	0
MG loss grade						
0	0	0	0	0	8	8
1	2	2	2	2	80	80
2	36	36	36	36	12	12
3	54	54	54	54	0	0
4	8	8	8	8	0	0

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

Parameter	Cases		Controls (3)	p-value 1vs 2	p-value 2 vs 3
	Preop (1)	Postop (2)			
Meibomian gland loss scores	2.66±0.63	2.66±0.63	1.02±0.43	-	**<0.001**
TBUT (seconds)	7.66±3.22	13.31±2.65	12.55±2.59	**<0.001**	0.153
Schirmer 1 test (mm)	29.48±4.58	20.88±2.85	22.46±2.35	**<0.001**	**0.003**
OSDI	41.82±28.04	9.36±4.78	4.75±3.64	**<0.001**	**<0.001**
MG expressibility grade	2.52±0.52	0.72±0.42	0.52±0.62	**<0.001**	0.08
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 eye tests following DCR in study subjects