International Journal of Allied Medical Sciences and Clinical Research (IJAMSCR)

ISSN:2347-6567

IJAMSCR |Volume 7 | Issue 3 | July - Sep - 2019
www.ijamscr.com

Research article *Medical research*

Association between eyelid swelling and refractive error of the eye

Ms. Sudha. M[1] and Dr. C. Xavier Jayaseelan[2]

[1]*Medical Student (Undergraduate), Department of Ophthalmology, Saveetha Medical College and Hospital, Chennai, India.*
[2]*M.S., DO (Ophthal), Associate Professor, Department of Ophthalmology, Saveetha Medical College and Hospital.*

Corresponding author: Dr. C. Xavier Jayaseelan
Email: xavjaynir@gmail.com

ABSTRACT

Purpose

To study the association between localized inflammatory swellings of the eyelid and refractive error in the outpatients of the ophthalmic department in a tertiary care hospital

Methods

A retrospective, cross sectional, observational study that included patients aged 5 to 39 years of age with various unilateral localized eyelid swellings whose refractory status was assessed.

Results

Overall, 100 eyelids from 100 eyes of 100 patients were studied. The study population comprised of 54 males and 46 females, with mean age of 25.12 ± 9.2 (Range 6-39). The lesions studied included blepharitis (17%), chalazion (43%), hordeolum internum (32%) and hordeolum externum (8%). The lesion was present on the upper eyelid in 44% and lower eyelid in 56% of the patients respectively. The location of the lesion was nasal in 31%, middle in 19%, temporal in 30% and whole eyelid in 20% of the cases. The size of the swelling ranged through small (35%), medium (42%) and large (23%). Mean refractive error (in diopters) of the spherical equivalent was -0.29 ± 0.412 and cylindrical equivalent was -0.3575 ± 0.487. These parameters were studied against the refractive error of the eyelid. For all cases, p-value < 0.05 was considered significant. This implied that swellings of larger sizes in the middle or central areas of upper eyelids have an increased chance of resulting in refractive errors than other subtypes.

Conclusion

Larger swellings in the middle/central, upper eyelid have higher risks of resulting in refractive errors. Hence, they must be treated promptly and adequately.

Keywords: Eyelid swelling, Refractive error, Chalazion, Hordeolum, Blepharitis

INTRODUCTION

Swelling of the eyelid is one of the most common presentations in clinical care.[1] It can be of various types; blepharitis, chalazion, hordeolum internum and hordeolum externum [2]. Blepharitis is a chronic inflammatory condition of the margins of the eyelid. Treatment typically involves lid

scrubs and topical antibiotics. [3] Chalazion is a chronic inflammatory granuloma of the Meibomian glands. Treatment can be medical or surgical-medical including hot formication and topical drops or ointment and surgical including incision and curettage, with or without triamcinolone intralesional injection. [4] Hordeolum internum is a painful inflammatory condition of the lid involving the meibomian gland. [2] Generally mild cases resolve spontaneously, if the inflammation does not spread to the surrounding glands or tissues. Unresolved cases may often progress into chronic state or turn into a chalazion. [5] Treatment modalities include warm compresses, topical antibiotics or steroids and lid massages. Surgical methods are infrequently used. [6, 7] Hordeolum externum is an acute suppurative inflammation of the Zeis gland. Modes of treatment are similar to that of other lesions.

Errors of refraction is the most frequent clinical symptom in ophthalmology. It can be both primary or can attributed to innumerable secondary causes and can often result in secondary changes in the eye.[7] Studies estimate that by the year 2050, the global burden of myopia alone would be 4758 million (49.8% of the world population).[8]

Though various etiological factors contribute to the occurrence of refractive errors, studies have shown that altered corneal topography in case of larger eyelid swellings can also lead to its development. [9, 10] This aspect is however infrequently explored. This study aims to fill this lacuna, by further delving into the association between eyelid swelling and refractive errors.

MATERIALS AND METHODS

This retrospective, cross-sectional study includes 100 patients with various unilateral localized eyelid swellings from our Ophthalmology outpatient sector from January 2018 to March 2019. Inclusion criteria was at least 5 years of age, at least 2 weeks duration of eyelid swelling and no known history of refractive error. The study sample was determined by non-probability convenience sampling.

This study was adhered to the tenets of our Institutional review board (IRB) and Ethics committee (IEC). Medical records of a total of 100 eyes from 100 patients was reviewed retrospectively.

The study population comprised of 100 patients aged between 5 to 39 years with various types of unilateral eyelid swelling. The study group was further classified based on the type of swelling (blepharitis, chalazion, hordeolum internum and hordeolum externum), site (Upper or lower eyelid), location (nasal, middle, temporal, or whole area of eyelid). They also were classified according to their size; small (≤1/5 of eyelid), medium (2/5–3/5 of eyelid), or large (>4/5 of eyelid).

The visual acuity was measured using Snellen's distant vision chart. The refractive status of the eye had been assessed clinically by a qualified optometrist.

Statistical analysis: was done using SPSS v. 22. Further, Chi-square test was used to establish the association between various parameters of the swelling that were assessed and the refractive status of the eye. P-value < 0.05 was considered significant.

RESULTS

Table 1: Totally, 100 eyelids from 100 eyes of 100 patients were studied. The study population comprised of 54 males and 46 females, with mean age of 25.12 ± 9.2 (Range 6-39). Mean refractive error (in diopters) of the spherical equivalent was -0.29 ± 0.412 and cylindrical equivalent was -0.3575 ± 0.487.

Table 1, Demographic details of the subjects (Mean ± standard deviation)

		N
Total		100
Gender (M: F)		54:46
Age (years)		25.12 ± 9.2
Refractive error (in dioptres)	Spherical equivalent	-0.29 ± 0.412
	Cylindrical equivalent	-0.3575 ± 0.487
Axis (degrees)		46.7 ± 64.93

Table 2: The lesions studied included blepharitis (17%), chalazion (43%), hordeolum internum (32%) and hordeolum externum (8%). The lesion was present on the upper eyelid in 44% and lower eyelid in 56% of the patients respectively. The location of the lesion was nasal in 31%, middle in 19%, temporal in 30% and whole eyelid in 20% of the cases. The size of the swelling ranged through small (35%), medium (42%) and large (23%).

Table 2, Association between the refractive status of the eye and parameters of the swelling: (p-value < 0.05 is considered significant)

	N= 100	Refractive status	
		Spherical equivalent-p value	Cylindrical equivalent-p value
Type		0.838254	0.855178
Hordeolum internum	32		
Hordeolum externum	8		
Blepharitis	17		
Chalazion	43		
Site		0.000503	< 0.00001
Upper eyelid	44		
Lower eyelid	56		
Location		0.029088	0.002066
Nasal	31		
Middle	19		
Temporal	30		
Whole	20		
Size		0.000036	< 0.00001
Small	35		
Medium	42		
Large	23		

Table 3: Reference key for figures 1,2,3 & 4

Refractory status (in dioptres)			
Spherical		Cylindrical	
Sphe- 1	0 D	Cyl- 1	0 D
Sphe-2	-0.25D to -0.5D	Cyl- 2	-0.25D to -0.5D
Sphe-3	-0.75D to -1D	Cyl- 3	-0.75D to -1D
Sphe-4	-1.25D to -1.5D	Cyl- 4	-1.25D to -1.5D

Figure 1: No significant correlation was found between the type of the swelling and the spherical equivalent of refractive error ($X2 = 4.9545$, p= 0.838254; Chi-square test) as well as the cylindrical equivalent of refractive error ($X2 = 4.7543$, p= 0.855178; Chi-square test)

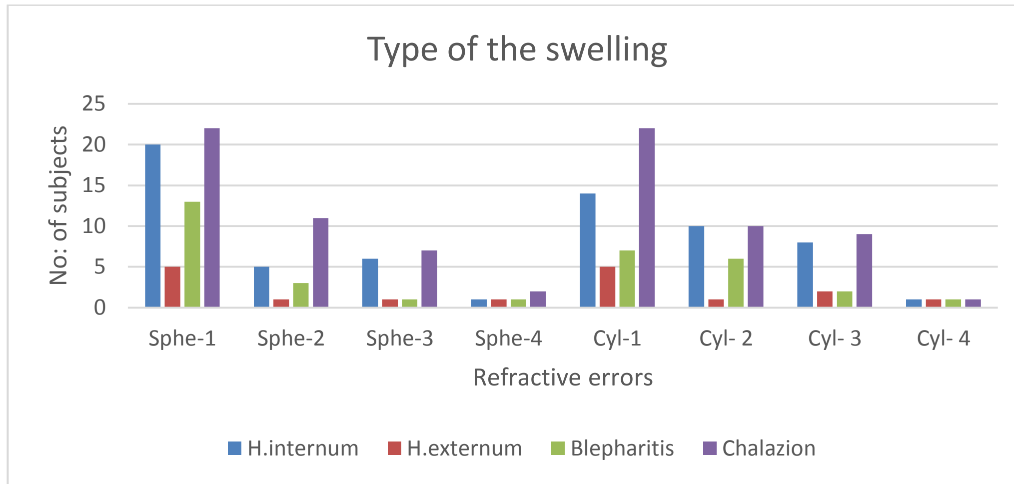

Figure 1. Association between type of the swelling and refractive error

Figure 2: There is a significant correlation between size of the swelling and both spherical (Χ2 = 30.2078, p= 0.000036) and cylindrical (Χ2 = 34.7769, p < 0.00001) equivalents of refractive error. Refractive error was higher in larger swellings when compared to small and medium sized ones.

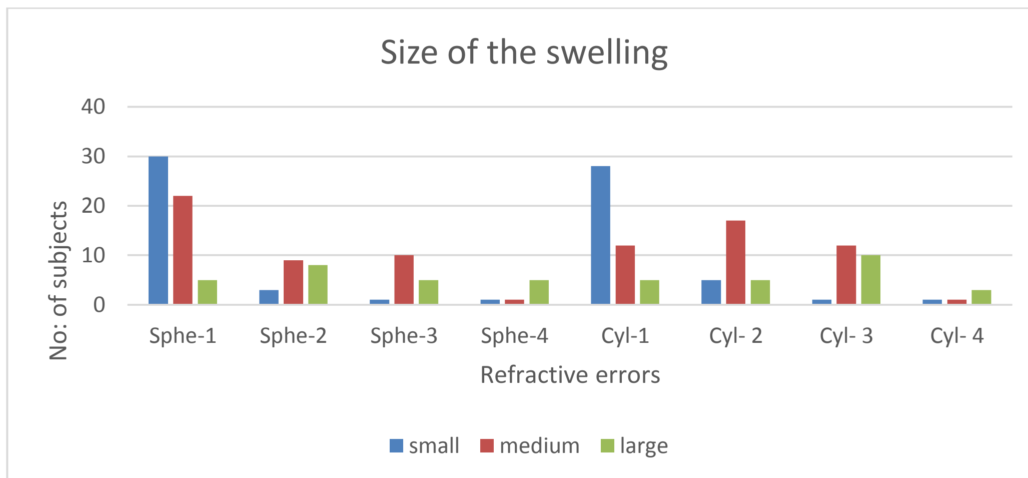

Figure 2. Association between size of the swelling and refractive error

Figure 3: There is a significant correlation between location of the swelling and both spherical (Χ2 = 18.572, p = 0.029088) and cylindrical (Χ2 = 25.9708, p = 0.002066) equivalents of refractive error. Refractive error was higher in swellings present in the middle of the eyelid when compared to swellings present at other locations.

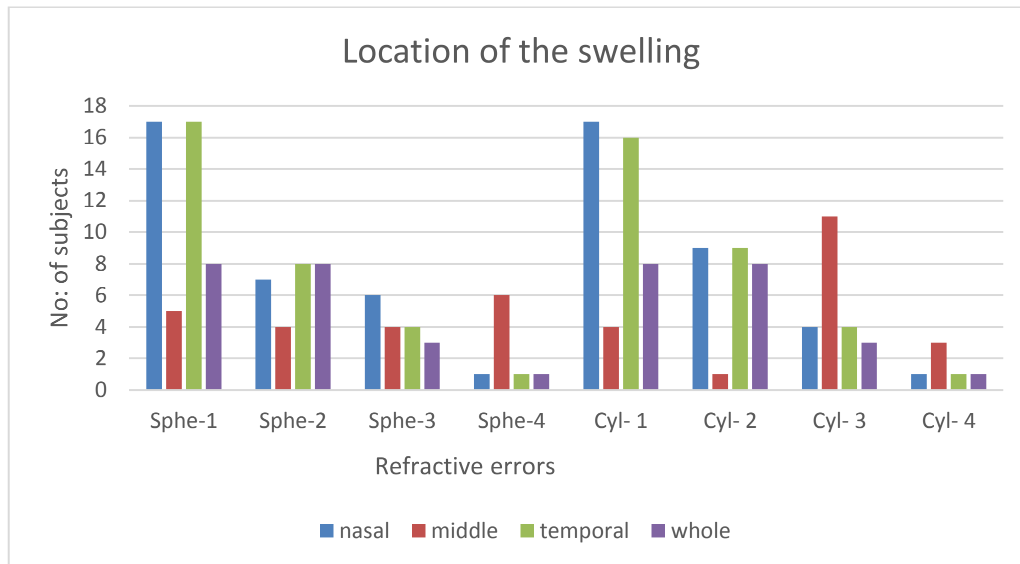

Figure 3. Association between location of the swelling and refractive error

Figure 4: There is a significant correlation between site of the swelling and both spherical (X2 = 17.7177, p = 0.000503) and cylindrical (X2 = 39.9027, p < 0.00001) equivalents of refractive error. Refractive error was higher in swellings present in the upper eyelid when compared to swellings present in the lower eyelid.

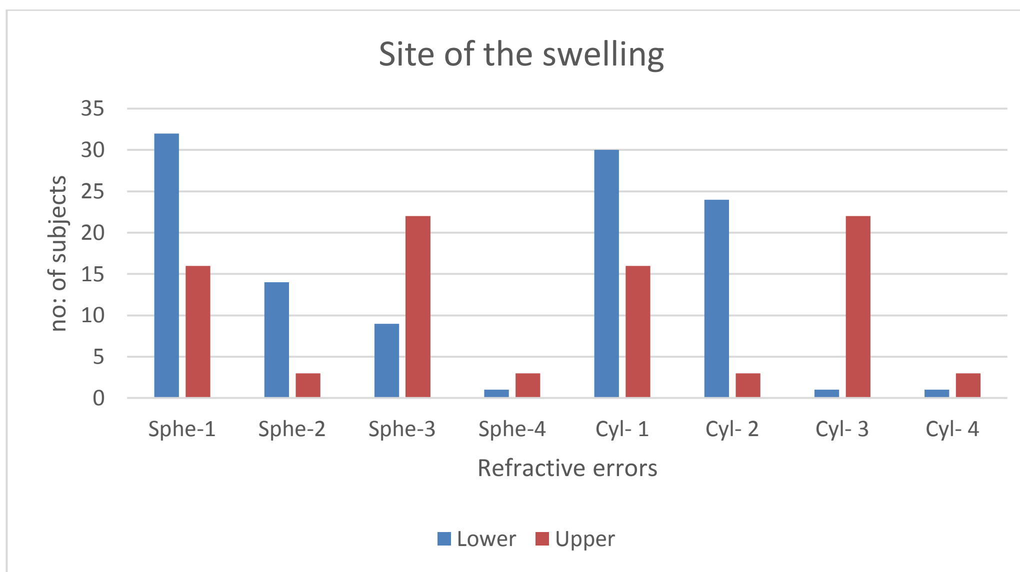

Figure 4. Association between site of the swelling and refractive error

DISCUSSION

Descriptively speaking, the study revealed that eyelid swellings were more common in the young and middle age groups. Chalazion was the most common type of eyelid swelling. Prevalence of swelling had a slight male to female preponderance and swellings occurred more commonly in the lower eyelids.

Analytically speaking, a significant correlation has been found to be present between the eyelid swelling and refractive errors in terms of site, location and size. Various studies have reported that eyelid swellings, chalazion in particular, tends to alter the corneal topography thereby resulting in refractive errors, astigmatism and ocular aberrations. [11,12] This study indirectly substantiates the findings of Santa Crus et al [13]

who noted the pressure effect of chalazion in the upper lid inducing hyperopia and astigmatism and Bagher. A [10] that it's excision can decrease corneal astigmatism and irregularity, which is more prominent in single, firm, and central upper lid lesions.

The chief mechanism that alters the corneal topography is the high compressive pressure exerted by the eyelid lesion on the cornea that supersedes its tensile strength, $\alpha = 42.81 \pm 11.67$ and $\beta = 2.97 \pm 0.21$. [14] Also, the lamellar arrangement of cornea is related to its biomechanical features. [15] The compressive force exerted by the lesion is proportional to its size, i.e., mass. This in turn could be the reason for larger lesions to cause a greater refractive error, as noted in this study.

Another interesting finding in this study is that lesions in the middle or the central eyelid cause larger refractive errors than the lesions at the periphery. This feature can be attributed to the fact that variations have been noted in the elasticity of the cornea in different regions. [16] In other words, along the corneal meridians, Young's modulus of elasticity was the highest at the central and paracentral regions [16, 17] and hence these zones are more susceptible to mechanical strain.

Such altered or enhanced refractive errors, in cases of eyelid swelling can hinder the accurate testing of visual acuity and give false high values for intraocular lens power calculations before cataract surgery. Therefore, cases of eyelid swellings must be promptly treated before taking such readings into consideration. It has been demonstrated that excision of such lesions improves corneal astigmatism and irregularity. [10] Non-surgical interventions include, hot formication, topical antibiotics, incision and curettage and intralesional triamcinolone injection. [6-9]

CONCLUSION

Larger swellings in the middle/central, upper eyelid have higher risks of resulting in refractive errors. Hence, they must be treated promptly and adequately.

REFERENCES

[1]. Carlisle, Robert Thomas, and John Digiovanni. "Differential Diagnosis of the Swollen Red Eyelid." *American Family Physician*, 2015, 106–112.

[2]. Sihota, Ramanjit, and Radhika Tandon. *Parsons' Diseases of the Eye*. 22, 2014.

[3]. Auw-Hädrich, C., and T. Reinhard. "Therapeutische Optionen Bei Chronischer Blepharitis Unter Berücksichtigung Der Evidenzlage." *Der Ophthalmologe*, 113(12), 2016, 1082–1085., doi:10.1007/s00347-016-0382-x.

[4]. Goawalla A, Lee V. A prospective randomized treatment study comparing three treatment options for chalazia: triamcinolone acetonide injections, incision and curettage and treatment with hot compresses. Clin Experiment Ophthalmol. 35, 2007, 706–12.

[5]. Lindsley, Kristina et al. "Interventions for acute internal hordeolum." The Cochrane database of systematic reviews, 9 CD007742. 8 Sep. 2010, doi: 10.1002/14651858.CD007742.pub2.

[6]. Ehrenhaus, Michael P. "Hordeolum Treatment & Management: Medical Care, Surgical Care." Hordeolum Treatment & Management: Medical Care, Surgical Care, 19, 2018. emedicine.medscape.com/article/1213080-treatment.

[7]. Wolfram, C. "Epidemiologie Von Refraktionsfehlern." *Der Ophthalmologe*, 114, 7, 2017, 673–682., doi:10.1007/s00347-017-0518-7.

[8]. Holden, Brien A., et al. "Global Prevalence of Myopia and High Myopia and Temporal Trends from 2000 through 2050." Ophthalmology, 123, 5, 2016, 1036–1042., doi: 10.1016/j.ophtha.2016.01.006.

[9]. Jin, Ki Won et al. "Effects of chalazia on corneal astigmatism: Large-sized chalazia in middle upper eyelids compress the cornea and induce the corneal astigmatism." BMC ophthalmology 17, 2017, 1 - 36. doi:10.1186/s12886-017-0426-2

[10]. Bagheri, Abbas, et al. "Effect of Chalazion Excision on Refractive Error and Corneal Topography." European Journal of Ophthalmology, 19, 4, 2009, 521–526., doi:10.1177/112067210901900401.

[11]. Park YM, Lee JS. The effects of chalazion excision on corneal surface aberrations. Cont Lens Anterior Eye. 37, 2014, 342–5.
[12]. Sabermoghaddam AA, Zarei-Ghanavati S, Abrishami M. Effects of chalazion excision on ocular aberrations. Cornea. 32, 2013, 757–60
[13]. Santa Cruz CS, Culotta T, Cohen EJ, Rapuano CJ. Chalazion-induced hyperopia as a cause of decreased vision. Ophthalmic Surg Lasers. 28, 1997, 683–4.
[14]. Zeng Y, Yang J, Huang K, Lee Z, Lee X. A comparison of biomechanical properties between human and porcine cornea. J Biomech. 34, 2001, 533–7.
[15]. Boote C, Dennis S, Huang Y, Quantock AJ, Meek KM. Lamellar orientation in human cornea in relation to mechanical properties. J Struct Biol. 149, 2005, 1–6.
[16]. Hjortdal JO. Regional elastic performance of the human cornea. J Biomech. 29, 1996, 931–42.
[17]. Shin TJ, Vito RP, Johnson LW, McCarey BE. The distribution of strain in the human cornea. J Biomech. 30, 1997, 497–503.

How to cite this article: Ms. Sudha. M and Dr. C. Xavier Jayaseelan. Association between eyelid swelling and refractive error of the eye. Int J of Allied Med Sci and Clin Res 2019; 7(3): 612-618.
Source of Support: Nil. **Conflict of Interest:** None declared.