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Patients were assessed for symptomatic improvement as well as clinically for signs at the initiation and end of therapy.

Opening the Block There and Then: Nasolacrimal Duct Block Revisited **124**
Khadija Mohammad, Mubashir Jalis, Mustafa Abdul Hameed Ismail, Gul-e-Naghma Saeed, Fauzia Abdus Samad, Sabahat Rehman

This was a correlational study with quantitative study design to present the success rate in treating congenital nasolacrimal duct obstruction with hydrostatic pressure (Crigler method) as a single maneuver in the outpatient department. A total of 175 children aged up to 12 months with congenital nasolacrimal duct obstruction were treated noninvasively with hydrostatic pressure as a single procedure. Children were followed up after 1 week to ensure opening of obstruction.

Outcome of Conjunctival Auto Graft Surgery in Pterygium **130**
Nusrat Sharif, Muhammad Sajid Munir, Muhammad Arshad, Shahid Nazir, Shadab Hassan, Muhammad Rizwan Ullah

The main aim of this prospective interventional study was to report the outcomes of pterygium surgery with limbal conjunctival auto graft in terms of graft success and preventing the recurrence of pterygium. The key point in excision of Pterygium was to start the topical treatment with steroids and antibiotic combination to quite the inflamed tissue and then proceed with surgery. The success point of the surgery was that the graft tissue loosely attached to the margin of the tissue left behind after excision. Any cases of graft rejection or recurrence were reported.

Determining Effect of Filters on Color Vision and Contrast Sensitivity among Low Vision Patients: A Cross-Sectional Survey **134**
Sana Kanwal, Hina Sharif, Muhammad Kashif Habib

A cross-sectional study was conducted in low vision department of Al-Shifa Trust Eye Hospital to assess difference in contrast sensitivity and color vision among low vision patients without filter and with yellow or pink filter. Diagnosis of each patient was enrolled provided by senior Ophthalmologist. Pelli-Robson contrast chart and AHRR color vision test were used for study. Procedure followed at first without using any filter then yellow filter and at the end with pink filter. Patients' responses were noted.

EDITORIAL

Diabetes Mellitus: The Growing Epidemic

Irfan Aslam Khattak

Diabetes Mellitus (DM) is fast becoming an epidemic. The global estimates suggest that the number of diabetics is going to cross the 500 million mark in the next 10 years and the increase is expected to be more prominent in the lower middle income countries[1,2]. A sedentary lifestyle, the increasing trend of urbanization and an increasing life expectancy around the world seems to be fuelling this trend. As a result, this chronic condition is going to have an enormous impact in the future due to its potential to cause a wide range of complications like diabetic eye disease (Diabetic retinopathy), diabetic kidney disease, diabetic foot etc.

According to the 2010 estimates there are 285 million visually impaired people in the world and 39 million of those are blind. DR makes 1 % of all the blind people and so it is already an important issue[3]. Some studies show that the prevalence of DR among DM patients can be 15 % or higher. What makes the case for DR public health intervention even stronger is its avoidable and treatable nature. There is sufficient scientific evidence to suggest that timely intervention in the DR patients can prevent the blinding complications of this chronic condition. However, this would require a comprehensive DR screening and management programme and generation and mobilization of necessary resources with a special focus on sustainability. Some of the DR patients may need to be examined once a year or even more frequently for the rest of their lives to identify vision threatening diabetic retinopathy (VTDR).

Pakistan is the world's sixth most populous country with a population that exceeds 200 million. It is a low middle income country ranking 146th on the human development index according to the UNDP (United Nations Development Programme) 2014 report[4]. About half of its population is not literate and it spends just 2.5 % of its GDP (Gross Domestic Product) annually on health[5]. The life expectancy at birth stands at over 67 years and is increasing[6]. With these figures in mind and the aging population, DR is going to grow in burden as a public health problem in Pakistan as well. The current DR screening is mainly oppurtunistic, with the result that most of the patients present very late.There is no system for patient record keeping, referral or follow-up reminders.

Our country has a reasonably efficient primary health care (PHC) system but unfortunately, eye care is not seen on ground to be incorporated into that. There is no organized referral system in our health sector and all the health care facilities have an unrestricted access to all patients. This causes a huge burden on the tertiary centres where people come with the hopes of getting the best available treatment option. The result being most of the valuable resources wasted. Eye care does not seem to be getting its due attention due to the competing disease environment.

While we have these estimates, we do not have a concrete idea about the available resources. In order to develop a meaningful programme for DR screening and management, we need to have an accurate knowledge about the available DR services in the region in terms of human resources, infrastructure, current service delivery and capacity to deliver. Studies need to be carried out to compile such information in order to help health managers and public health professionals to lobby more effectively and persuade policy makers to pay due attention to this growing public health issue

References:

1. Whiting DR, Guariguata L, Weil C, Shaw J. IDF diabetes atlas: global estimates of the prevalence of diabetes for 2011 and 2030. Diabetes Res Clin Pract. 2011; 94(3):311-21.
2. Marshall SJ. Developing countries face double burden of disease. Bull World Health Organ. 2004;82(7):556-60.
3. Pascolini D, Mariotti SP. Global estimates of visual impairment: 2010. British J Ophthalmol. 2012; 96: 614-8.

4. UNDP. Explanatory note on the 2014 Human Development Report composite indices Pakistan. UNDP. Available from: http://hdr.undp.org/en/content/explanatory-notes.
5. Indexmundi. Pakistan Demographics Profile 2014 [cited 2015 04/02]. Available from: http://www.indexmundi.com/pakistan/demographics_profile.html.
6. CIA. The World Factbook [cited 2015 06-08]. Available from: https://www.cia.gov/library/publications/the-world-factbook/.

ORIGINAL ARTICLE

Comparison of Effects of Topical Loteprednol Etabonate and Topical Dexamethasone on Intraocular Pressure after Cataract Surgery

Aunaza Maqbool[1], Rabia Sharif Bhatti[1], Muhammad Usman Arshad[2], Zamir Iqbal[3], Sohail Zia[2], Masud ul Hasan[4]

ABSTRACT

Objective: To determine the efficacy of loteprednol etabonate in terms of maintaining intraocular pressure between 12-21mm of Hg after cataract surgery, compared to dexamethasone.

Study Design: Randomized control trial.

Study Duration and Setting: The study was conducted at the Department of Ophthalmology, Benazir Bhutto Hospital, Rawalpindi between December 2015 to June 2016.

Materials and Methods: A total of 362 patients undergoing cataract extraction were included in the study. Any activity in terms of cells and flare was checked in the anterior chamber of the eye pre and postoperatively. Patients of group one were given loteprednol etabonate and patients of group two were given Dexamethasone. Later their intraocular pressure was checked with Goldman applanation tonometer one day before and 28 days after cataract extraction.

Results: The mean + SD age of the study patients in group one was 54.5+ 3.56 years ranging from 18 to 60 years while of study patients in group two was 53.87+4.49 years ranging from 18 to 60. Out of 181 patients in group one 51.9% were males while in group two 50.8% were males. Mean IOP on day 01 in study patients of group one was 18.17+2.11 and mean IOP on day 01 in study group two was 18.18+ 2.17. mean IOP on day 28 in study group one was 19.04+ 1.86 and of group two was 19.27+2.07.

Conclusion: Dexamethasone and Loteprednol have almost an overlapping spectrum in terms of controlling postoperative intraocular inflammation however Loteprednol Etabonate is better at maintaining the intraocular pressure after cataract surgery. *Al-Shifa Journal of Ophthalmology 2019; 15(3): 100-106. © Al-Shifa Trust Eye Hospital, Rawalpindi, Pakistan.*

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Introduction:

The prevalence of cataract in Sindh, Pakistan is 8.6%, while approximately 2.7 million people have undergone cataract surgery in Pakistan by 2007[1]. Cataract surgery is one of the most common surgical interventions being carried out in Pakistan and similar to any other surgical procedures, it is also associated with a number of complications, including postoperative inflammation, specifically in IOL implantation, which presents as cells in Anterior Chamber (AC), proteins (flare), corneal edema and iritis [2-4]. This reaction further induces the release of prostaglandins and the recruitment of

neutrophils and macrophages to the site of trauma.

If treatment is not given promptly, it may decrease the visual outcome postoperatively, owing but not limited to, cystoid macular edema and even endophthalmitis [3]. Therefore, it is important to intervene immediately after the cataract surgery to minimize the inflammation.
Conventionally, to avoid these unwanted side effects patients are administered prophylactic topical steroids after surgery to control the post cataract surgery inflammation [2-5].
The most common steroids used are the topical dexamethasone, prednisolone and fluorometholone postoperatively in restricted doses. However, these drugs may result in elevated intraocular pressure, lower resistance to fight off infections, and increase the time of wound healing [5-6]. Increased IOP can result in compression of the optic nerve leading to an increase in Cup/Disc ratio, loss of visual field and eventually tunnel vision [7-8].

Studies have been inconsistent about which steroid is the most efficacious and results in minimum complications. Loteprednol Etabonate is one such corticosteroid which acts in a retrometabolic way. It provides anti-inflammatory effects but with very minimal to no rise in IOP in postoperative patients. [4-5] In 2016, Sheppard, Comstock, and Cavet reviewed the literature o find the effect of Loteprednol Etabonate on intraocular pressure and revealed that LE has a low propensity to increase IOP while it is a potent anti-inflammatory agent, irrespective of the dosage [9]. Some studies show that 1.7 percent of the patients had an increased IOP who were administered LE compared to the 6.7% patients who were on conventional steroids [6].

Due to the limited studies, and none of these are from Pakistan, we conducted the current study to assess how effective LE is compared to other conventional steroids in maintaining the IOP in patients who had cataract surgery.

We evaluated the efficacy of Loteprednol Etabonate for the maintenance of IOP between 12-21 mmHg, compared to dexamethasone in post-operative cataract patients in our setting.

Materials and Methods:

A randomized controlled trial was conducted at the Department of Ophthalmology, Benazir Bhutto Hospital, Rawalpindi between December 2015 to June 2016. All the patients undergoing cataract extraction, aged between 18 and 60 years, irrespective of gender were included in the study. Patients with pre-existing glaucoma or uveitis, pre-existing complicated cataract, per-operative complications, or those with diagnosed systemic diseases like diabetes mellitus, hypertension, asthma, arthritis, or COPD were excluded from the study. The participants were enrolled in the study after procuring the ethical approval from the Institutional Review Board. Informed verbal and written consent was obtained from all participants prior to the procedure. Sample size was calculated using OpenEPI sample size calculator, keeping the level of significance as 5%, the power of the test as 80%, the anticipated population proportion for group 1 as 1.95% while that of group 2 as 7.48%. A sample size of 181 was obtained for each group making a total sample size of 362.

Patients were randomly divided into two groups with 181 patients in each group. The patients on loteprednol etabonate were labelled as the group 1 while those on dexamethasone were labelled as group 2. The patients were screened for inclusion criterion after an informed written consent as mentioned previously. A thorough eye examination and intraocular pressure (IOP) measurement was done by the principal investigator himself, and only those fulfilling the selection criterion were

included in the study. The study information was gathered on a pre-defined proforma. All the relevant information was filled in the proforma by the principal investigator himself.

All the patients underwent a slit lamp examination of anterior segment and assessment of IOP using applanation tonometer on pre-operative day, and 28 after surgery. Efficacy of the study drug was defined as the capacity of the drug to produce the desired effect on the patient. for producing a desired result or effect. IOP rise was recorded for all patients and was defined as IOP of more than 21 mmHg as measured with Goldmann applanation tonometer described previously.

The data was entered and analyzed using SPSS software version 21. The mean and standard deviations were calculated for numerical variables like age and body mass index. Frequencies and percentages were calculated for categorical variables like age groups and gender. Effect modifiers like age and gender were adjusted through stratification. To determine the efficacy of the study drug, chi square test was applied on post stratification data. A p value of equal to or less than 0.05 was considered as statistically significant. The results were illustrated using tables and graphs.

Results:

The study was conducted at the Department of Ophthalmology, Benazir Bhutto Hospital, Rawalpindi. A total of 362 patients who underwent cataract extraction were included in the study. Patients of group one were given loteprednol etabonate and patients of group two were given Dexamethasone.

The mean (SD) age of the study patients in group 1 was 54.5 (3.56) years and 53.8 (4.46) years in group 2. Six patients of group one were between the ages of 39-48 (3.3%), 143 (79%) patients were between the age group of 49-58, and 32 (17.7%) patients were between the age group of 59-68.
Whereas, in group 2, 16 patients were between the age group of 39-48 (8.8%), 124 (68.5%) patients were between the age group 49-58 and 41 (22.7%) patients were between the age group 59- 68. Out of the total 181 patients in group one 51.9% were males and 48.8% were females. In group two 50.8% were males and 49.2% were females.

On the first postoperative day 22 patients in group 1 had an IOP between 12-15 mmHg, 94 patients had an IOP between 16-19 mmHg and 65 patients had IOP between 20-23 mmHg. In patients on dexamethasone, the IOP on day 1 was comparable to that of group 1. On day 28, the majority of the patients had an IOP between 16-19 mmHg while in group 2, the majority of the patients had an IOP between 20-23, comparatively higher than those patients in group 1. See table I.

While assessing the efficacy of Loteprednol Etabonate in the maintenance of intraocular pressure within the normal limits postoperatively compared to dexamethasone, we found that Loteprednol Etabonate was significantly more effective in maintaining the IOP postoperatively compared to the steroids ($p<0.05$). See figure 1.

Further analysis showed that both gender and age were significantly associated with the efficacy of Loteprednol Etabonate to maintain the intraocular pressure within the normal limits, postoperatively. See table II.

Table 1. Demographic and Clinical Characteristics of Patients in Group 1 and Group 2 (n=362)

Characteristics	Group 1	Group 2
Age group		
39-48	6 (3.3%)	16 (8.8%)
49-58	143 (79%)	124 (68.5%)
59-68	32 (17.7%)	41 (22.7%)
Gender		
Female	89 (49.2%)	87 (48.1%)
Male	92 (50.8%)	94 (51.9%)
IOP on day 1 in mmHg		
12-15	22 (12.2%)	17 (9.4%)
16-19	94 (51.9%)	93 (51.4%)
20-23	65 (35.9%)	71 (39.2%)
IOP on day 28 in mmHg		
12-15	4 (2.2%)	8 (4.4%)
16-19	93 (51.4%)	71 (39.2%)
20-23	83 (45.9%)	98 (54.1%)
24-27	1 (0.6%)	4 (2.2%)
Efficacy		
Yes	97 (53.59%)	79 (43.64%)
No	84 (46.40%)	102 (56.35%)

Table II. Association of Gender and Age with Efficacy of Loteprednol Etabonate

Characteristics	Group 1	Group 2	p-value
Gender			
Male	91 (97.85%)	88 (95.6%)	0.05
Female	86 (97.72%)	86 (96.6%)	
Age Groups			
39-48	6 (100%)	16 (100%)	
49-58	140 (97.9%)	120 (96.8%)	0.05
59-68	31 (96.8%)	38 (92.7%)	

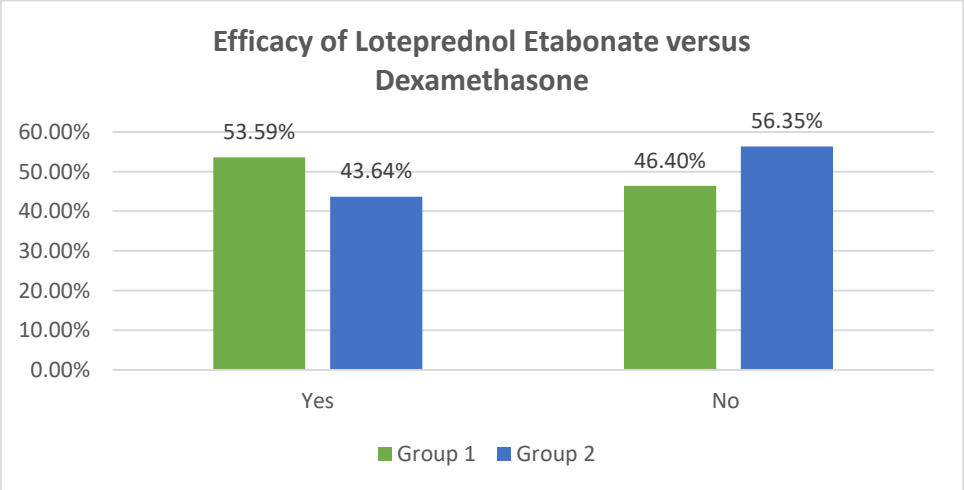

Figure 1. Efficacy of Loteprednol Etabonate versus Dexamethasone ($p<0.05$)

Discussion:

Ocular inflammation is pretty common after ophthalmic surgeries, especially if the surgical removal of cataracts is combined with intraocular lens (IOL) implantation. The inflammatory response includes the metabolism of arachidonic acid to prostaglandin analogues and leukotrienes and the recruitment of neutrophils and macrophages to the site of surgical trauma [10]. The inflammatory process manifests itself as mild iritis, corneal edema, and increased cells and proteins (flare) in the anterior chamber of the eye, accompanied by hyperalgesia [11]. With advancements in surgical techniques (smaller incisions), more improved phacoemulsifier, and better viscoelastics, outcome of cataract surgery has tremendously improved, postoperative inflammation has decreased but pain remains a major source of discomfort for patients. If not timely treated, postoperative inflammation can result in suboptimal vision or complications such as cystoid macular edema (CME). With improvement in surgical techniques, patient demand for excellent postoperative vision without postoperative complications has increased.
Out of the total 362 patients included in the study half were given dexamethasone as a postoperative anti-inflammatory agent and rest were given loteprednol etabonate. IOP were recorded on the pre-op day and on day 28. All the pts had an IOP within normal range on the first post op day however on the 28th day there was an IOP rise in few patients. Out of the total patients 7 on dexamethasone showed a significant IOP rise above the normal range of 21mmhg and only 3 pts on loteprednol showed an IOP rise. Efficacy was compared in terms of maintenance of IOP which was higher with loteprednol etabonate.

Topical corticosteroids are commonly used as postoperative ocular anti-inflammatory agents; however, side effects such as increase in IOP are very often observed with their use [12-14]. Older corticosteroids like dexamethasone and prednisolone acetate are very potent anti-inflammatory agents, but a clinically significant rise in IOP (≥10 mmHg) is usually associated with their use. Loteprednol etabonate, a newer and modified compound C-20 ester-based corticosteroid, was retrometabolically designed to provide efficacious anti-inflammatory property but with decreased effect on IOP. After performing its therapeutic function on the site of action, loteprednol etabonate is rapidly metabolized to its inactive by product, resulting in fewer unwanted effects. Randomized controlled studies have demonstrated the clinical efficacy and safety of loteprednol etabonate ophthalmic suspension 0.5 % for the treatment of postoperative inflammation in post-cataract patients with few patients, if any, exhibiting clinically significant increases (≥10 mmHg) in IOP. Furthermore, safety studies demonstrated a minimal effect of loteprednol etabonate on IOP with long-term use or in steroid responders with a much lower propensity to increase IOP relative to prednisolone acetate or dexamethasone. The anti-inflammatory treatment effect of loteprednol etabonate appears to be similar to that of rimexolone and difluprednate with less impact on IOP compared to difluprednate, although confirmatory comparative studies are needed. The available clinical data suggest that loteprednol etabonate is an efficacious and safe corticosteroid for the treatment of postoperative inflammation. Loteprednol Etabonate is a novel corticosteroid produced by retrometabolic design. In retrometabolic drug design, an inactive and nontoxic metabolite of a reference compound is utilized as a starting point for conversion to a therapeutically active, metabolically labile compound [15]. Loteprednol etabonate was designed starting with Δ1 cortienic acid, an inactive metabolite of prednisolone.

Preclinical studies demonstrated that loteprednol etabonate is highly lipophilic and has strong binding affinity to

glucocorticoid receptors. Indeed, its lipophilicity was found to be 10 times greater while its binding affinity to the glucocorticoid receptor was found to be 4.3 times greater than that of dexamethasone [16].

Conclusion:

We concluded that Loteprednol Etabonate is a retrometabolic drug that is very potent in addressing the postoperative inflammation along with the benefit of maintaining the intraocular pressure within the normal limits. Additionally, dexamethasone and Loteprednol have almost an overlapping spectrum in terms of controlling postoperative intraocular inflammation however Loteprednol Etabonate is better at maintaining the intraocular pressure after cataract surgery.

References:

1. Jadoon Z, Shah S, Bourne R, Dineen B, Khan M, Gilbert C et al. Cataract prevalence, cataract surgical coverage and barriers to uptake of cataract surgical services in Pakistan: the Pakistan National Blindness and Visual Impairment Survey. British Journal of Ophthalmology. 2007;91(10):1269-1273.
2. Amon M, BusinM. Loteprednol etabonate ophthalmic suspension 0.5%: efficacy and safety for operative anti-inflammatory use. Int Ophthalmol.2012, Oct,32(5):507-517.
3. Player U, Ursell P, Rama P.IOP effect of common topical steroids for post cataract inflammatio : Are they all the same? Ophthalmol Ther .2013dec;2(2)55-72.
4. TimothyL. Comstock, Helen H. Decory. Advances in corticosteroids therapy for ocular inflammation. Int J Inflam. 2012;2012:789623.
5. Lane SS, Holland EJ. Loteprednol Etabonate 0.5%versus Prednisolone acetate 1% for the treatment of inflammation after cataract surgery. J Cataract Refract Surg. 2013 Feb, 39(2):168-73.
6. El-Harazi SM, Feldman RM. Control of intra-ocular inflammation associated with cataract surgery. Curr Opin Ophthalmol. 2001;12:4–8.
7. Nuzzi R, Monteu F. Use of Intravitreal Dexamethasone in a Case of Anterior Ischemic Optic Neuropathy. Case reports in ophthalmology. 2017;8(2):452-8.
8. Grzybowski A, Kanclerz P. Early postoperative intraocular pressure elevation following cataract surgery. Current Opinion in Ophthalmology. 2019;30(1):56-62.
9. Sheppard J, Comstock T, Cavet M. Impact of the Topical Ophthalmic Corticosteroid Loteprednol Etabonate on Intraocular Pressure. Advances in Therapy. 2016;33(4):532-552.
10. Amon M, BusinM. Loteprednol etabonate ophthalmic suspension 0.5%: efficacy and safety for operative anti inflammatoryuse. Int Ophthalmol. 2012,Oct,32(5):507-517.
11. Player U, Ursell P, Rama P.IOP effect of common topical steroids for post cataract inflammation : Are they all the same? OphthalmolTher .2013dec;2(2)55-72
12. Yasuda M, Takayama K, Kanda T, Taguchi M, Someya H, Takeuchi M. Comparison of intraocular pressure-lowering effects of ripasudil hydrochloride hydrate for inflammatory and corticosteroid-induced ocular hypertension. PLoS One. 2017 Oct 2;12(10):e0185305.
13. Moss EB, Buys YM, Low SA, Yuen D, Jin YP, Chapman KR, Trope GE. A randomized controlled trial to determine the effect of inhaled corticosteroid on intraocular pressure in open-angle glaucoma and ocular hypertension: the ICOUGH Study. Journal of glaucoma. 2017 Feb 1;26(2):182-6.
14. Zain AM, Noh UK, Hussein S, Hamzah JC, Khialdin SM, Din NM. The Relationship Between Long-term Use of Intranasal Corticosteroid and

Intraocular Pressure. Journal of glaucoma. 2019 Apr 1;28(4):321-4.
15. McCormack PL. Ketorolac 0.45 % ophthalmic solution. Drugs Aging. 2011;28:583–589.
16. McGhee CN, Dean S, Danesh-Meyer H. Locally administered ocular corticosteroids: benefits and risks. Drug Saf. 2002;25:33–55. doi: 10.2165/00002018-200225010-00004.

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ORIGINAL ARTICLE

Spectacle Use among Children: Compliance, Satisfaction, Barriers and Challenges

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ABSTRACT

Objective: To assess the compliance of students with spectacles as well as finding out the predictors for non-compliance.

Materials and Methods: A cross sectional study was done over eight months period in which all secondary school children from 6th to 10th class were enrolled who were spectacle users. The list of public schools was taken from Federal Government Directorate and short listed as per the criteria. Data was collected from a structured questionnaire based on previous literature and advice from experts in the field. The questionnaire collected information related to practice of spectacle use, determinants of spectacle use, impact of spectacle use on personality and barriers and problems associated with spectacle use etc.

Results: A total of 302 students participated in the study having a mean age of 13.96±1.28. Regular use of spectacles was found to be associated with male gender ($p<0.001$), longer time duration since glasses were prescribed ($p<0.001$) and if the glasses were prescribed from optical shop ($p<0.015$). However, choice of wearing glasses willingly or forcefully was not found to be associated with compliance ($p=0.60$). Most reported problem with non-compliance was sweating (57.28%).

Conclusion: Compliance with spectacles was low in students and an array of reasons were highlighted by the students including peer pressure, socially undesirable and material of spectacles etc. interventions to solve this can make a difference to people's quality of life and can enhance spectacle compliance. *Al-Shifa Journal of Ophthalmology 2019; 15(3): 107-116.*

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Introduction:

Refractive error or lack of clear image formation on retina due to discrepancy between dioptric apparatus, axial length and other elements involved in the accurate focusing of light on retina is the most common cause of visual impairment causing with estimated magnitude of 285 million worldwide [1]. According to a recent analysis, uncorrected refractive error (URE) considered most common cause of avoidable blindness causing 123.8 million blind worldwide[2] and is causing a massive economic burden of 202 million globally [3]. In Pakistan, URE is the most common cause of moderate visual impairment[4] and third most common cause of blindness[5].

URE is considered the primary cause of visual disability in children worldwide [6,7]

and is the most common cause of visual impairment in school aged children [8]. The spectacle compliance or coverage rate in school aged children reported from Pakistan is 59% [9]. Comparable results have been reported from the neighboring countries of India and China [10]. Most common barriers reported from the developing countries to pediatric spectacle use were broken or lost spectacles, peer pressure, cosmetic disfigurement[10,11], or that the spectacles were not required or causing headache [12]. There is a lack of data reported from Pakistan in this domain.

Although refractive error screening camps are regularly arranged in schools to increase the number of children using spectacles and are considered an effective way to eradicate URE but these activities will go in vain unless we identify the specific factors which can encourage the children to use glasses as well as the barriers which are leading to decrease in spectacle compliance.

This study was aimed at assessing the compliance of the students with spectacles as well as reasons for non-compliance and finding and suggesting ways to relieve the challenges and barriers faced by children in regular spectacle wear.

Materials and Methods:

It was a descriptive cross-sectional study conducted in 15 schools during duration of August 2015 to March 2016 in Rawalpindi, Pakistan. The study was conducted in public school to eliminate socioeconomic bias as students from all socioeconomic backgrounds are enrolled in them. The sampling frame of the study was obtained from Al-Shifa screening program, containing names of all the schools which were enrolled in the Al-Shifa Center of Community Ophthalmology (ACCO). All the schools offering secondary education were short listed and then principal researcher randomly selected the fifteen schools through lottery method from the short listed schools. All the children in classes ranging from 6th to 10th who were using spectacles present at the day of visit of principal researcher were included in the study. Children who reported use of spectacles but were not wearing spectacles at the time of data collection were also included in the study. Children who were less than age of 11, unwilling to participate in the study and children with ocular pathologies affecting visual functions were excluded.

Data was collected using structured, interview based questionnaire, typed in simple English. The questionnaire was translated into Urdu language for better understanding of respondents and to achieve consistency in questions asked. The questionnaire was constructed based on previous literature[13]. It was validated for content and face validity by circulating them to in clinical optometrists, professional researchers and secondary school teachers. The questionnaire collected information on variables including demographics, history of spectacles, practice of spectacle use, determinants of spectacle use, impact of spectacle use on personality, barriers and problems associated with spectacle use, satisfaction with spectacle use, awareness about vision correcting techniques and impact of spectacles on social life.

Initially vision screening was carried out and data was collected in person by the principal researcher from all those children who were either wearing glasses or had decreased visual acuity and reported spectacle wear but did not had spectacles at the time of data collection. All the other children with reduced visual acuity were explained the need for an eye examination. They were also given a written letter for their parents, which emphasized the need of eye examination and also included the contact information for the nearby eye hospitals.

Statistical package for social sciences (SPSS) V.17 was used for data entry and analysis. All the data was entered and data cleaning was done afterwards. Frequencies of all the variables were generated and any discrepancy or error in the data was corrected by reconsidering the filled questionnaire. For analysis, frequency and percentages were presented for categorical variables. Determinants of regular use, satisfaction with spectacles and impact of spectacles on social life was found by using chi-square. Fisher exact test was reported were observed cell count in any cell was found less than 5 in a 2×2 table. A univariate logistic regression was applied to assess the strength of association of predictors with regular use of spectacles. Odd ratios (OR) with their 95% confidence intervals were reported. Because the cost data was not normally distributed, we opted for non-parametric test (Mann Whitney-U) to compare cost of spectacles between different groups.

The study was conducted after the approval of Hospital's Ethical review board. All the students were examined after obtaining a verbal informed consent of the school authorities on behalf of the children, to undertake this study. Permission was taken before conducting the study from General Staff Officer (GSO-1) Rawalpindi region, as well. The data collected was used only for academic purpose and confidentiality of the data and the participant was ensured.

Results:

A total of 302 students participated in the study. Majority of the participants were females (N=233, 77.2%). Mean age of students was 13.96 years (SD±1.280) ranging from 11-15 years. Almost half 153(50.3%) students were 15 years old. A higher proportion of 126 (41.7%) students were studying in 10^{th} grade, followed by 9^{th} grade (88, 29%) and others from 6^{th}, 7^{th} and 8^{th} (11.3%, 9.6%, 8.3%) grades.

All students had refractive errors and were prescribed spectacles. Professional eye care providers had prescribed spectacles to less than half of the students (127, 42.1%), others (63, 20.9%) said that they were prescribed from optician. Almost one third students (112, 37.1%) could not identify the care provider. A higher proportion (189, 62.6%) of students were prescribed spectacles from hospitals in Rawalpindi, rest of them were prescribed spectacles from optical shops (32.8%) and a few 14(4.6%) were not aware from where they got the spectacles prescribed. Males were more likely to be prescribed from hospitals (84.1%) as compared to females (59.8%), p-value <0.05 (χ^2 (df) =12.61(1)).

Majority of students were using spectacles since 1 to 3 years (N=125, 41.4%) with 96 (31.8%) students having duration greater than 3 years and 74(24.5%) having duration less than 1 year. Cost of spectacles was ranging from a minimum of PKR 150/- to maximum of PKR 3000/- with median 800 and Inter Quartile Range (IQR) 400. There was no significant difference in the cost of spectacles if they were prescribed at a hospital (median 800**,** IQR=450) or optical shop (median750, IQR=600) Mann Whitney-U test 4589, (p>0.05).

Almost half (141, 41.7%) students said they do not use spectacles regularly. A higher proportion 219 (72.5%) said that they started wearing glasses willingly whereas parents had forced 64(21.2%), followed by 19 (6.3%) who were forced by teachers and friends. A major proportion (84.4%) of those students who were forced by someone to wear glasses, reported that they would have not opted for glasses if not forced.

Regular use of spectacles was found to be associated with male gender, longer time duration since glasses were prescribed and if the glasses were prescribed from optical shop. However, choice of wearing glasses willingly or forcefully was not found to be

associated with compliance with (p>0.05) as depicted in (Table: I)

Median cost of spectacles for regular users (800, IQR= 400) was higher as compared to non-users (750, IQR=500). However, it had no significant impact on regular use, as depicted by Mann Whitney-U test 4585, p>0.05. A higher proportion of 237(78.5%) students said that they are not disliked by anyone on wearing glasses. However, 88(29.1%) students reported that they were never appreciated in spectacles.

Out of 302 students, 122(40.4%) students said they do not feel themselves attractive with spectacles followed by 31.1% (94) of students who said that they do not look pretty with glasses. A total of 115(29.1%) students believed that their personality has not improved with spectacles. There was no association shown between the results of above mentioned questions on regular use of glasses as shown in Table II. Students reported different barriers and problems associated with spectacle use. The most common reported problems are shown in figure: 1

Majority of students (N= 149, 49.3%) said they depend on parents for new glasses if old ones get broken, followed by 122(40.4%) who manage to made glasses the next day and a few 31(10.3%) delay repairing/ new making of spectacles. A total of 238(78.8%) students said that they are satisfied with spectacles but almost same number of students (78%) reported that they wished of not needing spectacles at all. There was no gender difference in the satisfaction level of students with glasses. Knowledge about other vision correction method had no impact on satisfaction. However, students who thought glasses are harmful/ problematic were more dissatisfied as shown in Table III.

Almost all 291(96.4%) students said that spectacles are used for vision correction whereas 7 (2.3%) said they didn't know the purpose of using spectacles and a few 1.3% (N=4) believed that spectacles are used for relieving headache and for fashion purpose. A few also said that spectacles are required for watching board only. Almost half of students (N=163, 54%) said that they don't know about other techniques of vision correction like LASER procedure, whereas majority of 191 (63.2%) students were aware of contact lens and were using it. Majority of students reported spectacles as preferred method of vision correction. A higher proportion of 175(57.9%) students said that they will continue spectacle wear even if they have told that ignoring glasses doesn't harm their vision.

Use of spectacles has affected personality and social life of students in different aspects. A total of 184(60.9%) students said that they have been given a title because of using spectacles. Almost 22% (66) have discontinued playing outdoor games because of the fear of spectacles getting broken. A total of 105(34.8%) students told that they ignore spectacles at public gatherings. 16(5.3%) students reported that they ignore glasses while watching TV and 13(4.3%) ignore spectacles during study hours. 68(22.5%) students reported that they believe that they are not good players because they are spectacle users as depicted in figure 2.

A higher proportion of 214(70.9%) out of total 302 said that they were appreciated on wearing spectacles. Out of total 302 students 187(61.9%) students said that their personalities have improved after using spectacles. 180(59.6%) students said that they do feel themselves attractive with spectacles. Most of individuals 208(68.9%) said that they look pretty with spectacle.

Impact on social life was associated with gender with more females not feeling pretty with spectacles. More males reported that their personality improved after spectacle use as shown in Table IV.

An association was found between gender and personality improvement with spectacles, appreciation with spectacles and student feeling that they do not look pretty with spectacles but no association was found between gender and not being a good player.

Majority of 227 (75.2%) said there is no spectacle wearing personality in T.V or any other media group that impresses them.

Table 1: Determinants of Spectacle Use

Determinants		**Regular use of spectacles**		**χ^2(df)**	**p-value**	**OR (95% C.I)**
		Yes N (%)	No N (%)			
Gender	Male	53(76.8)	16 (23.2)	11.66(1)	.000	2.96 (1.60-4.68)
	Female	123(52.8)	110(47.2)			1
Time since using	<1 year	25(33.8)	59(66.2)	30.76 (2)	.000	1
	1-3 year	74(59.2)	51(40.8)			2.84(1.56-5.17)
	>3year	73(76.8)	23(24.0)			6.22(3.17-12.18)
Prescribed from	Hospital	112(59.3)	77(40.7)	8.34 (2)	.015	0.906(0.55-1.49)
	Optical shop	61(61.6)	38(38.4)			1
Using willingly/ forcefully	Willingly	130(59.4)	89(40.6)	.23 (1)	.601	1
	Forced	46(55.4)	37(44.6)			0.85(0.51-1.41)
Using glasses for purpose of vision correction	Yes	171(58.2)	123(41.8)	-	.725*	1.605(.375-6.871)
	No	4(50.0)	4(50.0)			1
Do you think glasses are harmful	Yes	36(56.3)	28(43.8)	.05(1)	.776	.871(0.474-1.60)
	No	140(58.8)	98(41.2)			1

*****Fisher's Exact test

Table II: Impact on Personality

Impact on personality	Regular use of spectacles			χ^2(df)	p-value	OR (95% C.I)
		Yes N (%)	No N (%)			
Dislike you while wearing spectacles	Yes	39(60.0)	26(40.0)	.03(1)	.77	1.09(0.626-1.915)
	No	137(57.8)	100(42.2)			1
Do you think you do not look pretty with glasses	Yes	58(61.7)	11(56.7)	.46(1)	.45	1.22(0.747-2.02)
	No	36(38.3)	90(43.3)			1
Do you find yourself attractive with glasses	Yes	110(61.1)	70(38.9)	1.19(1)	.23	1.33(0.837-2.124)
	No	66(54.1)	56(45.9)			1
Your Personality has improved with glasses	Yes	115(65.3)	61(34.7)	1.76(1)	.15	1.41(0.884-2.26)
	No	72(57.1)	54(42.9)			1
Have anyone appreciated you in spectacles	Yes	123(69.9)	53(30.1)	.09(1)	.70	0.89(0.53-1.48)
	No	91(72.2)	35(27.8)			1

Table III: Determinants of satisfaction

Determinants		Satisfaction with glasses		χ^2(df)	p-value	OR (95% C.I)
		Yes N(%)	No N(%)			
Gender	Male	58(84.1)	11(15.9)	1.09(1)	.245	1.55(0.76-3.16)
	Female	180(77.3)	53(22.7)			1
Have you heard about other techniques of vision correction	Yes	109(78.4)	30(21.6)	.00(1)	.889	0.95(0.55-1.66)
	No	129(79.1)	34(20.9)			1
Do you know about contact lens	Yes	145(75.9)	46(24.1)	2.15(1)	.111	0.61(0.33-1.11)
	No	93(83.8)	18(16.2)			1
Using glasses regularly	Yes	145(82.4)	31(17.6)	2.74 (1)	.087	1.66(0.95-2.89)
	No	93(73.8)	33(26.2)			1
Do you think glasses are harmful to you	Yes	42(65.6)	22(34.4)	7.47 (1)	.006	0.44(0.24-0.81)
	No	196(82.4)	42(17.6)			1

Table IV: Impact on social life

Impact on social life		Gender		χ^2(df)	p-value
		Male N (%)	Female N (%)		
You do not look pretty with spectacles	Yes	13(18.8)	81(34.8)	5.57(1)	.012
Do you think your personality has improved with glasses	Yes	53(76.8)	16(23.2)	7.61(1)	.005
You are not good player because you wear glasses	Yes	12(17.6)	56(82.4)	.99(1)	.325
Have anyone appreciated you while wearing glasses	Yes	42(60.9)	172(73.8)	3.71(1)	.049

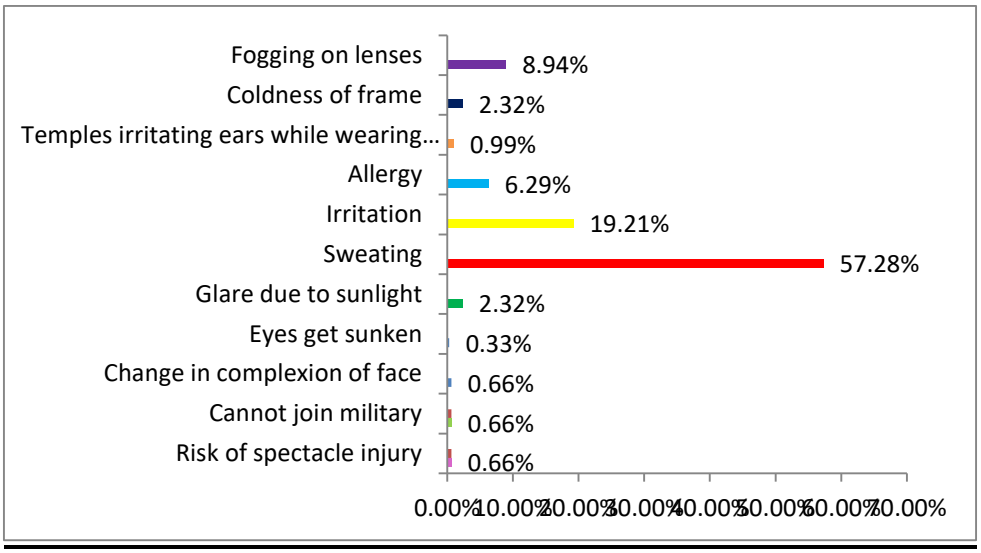

Figure 1: Problems associated with spectacle use

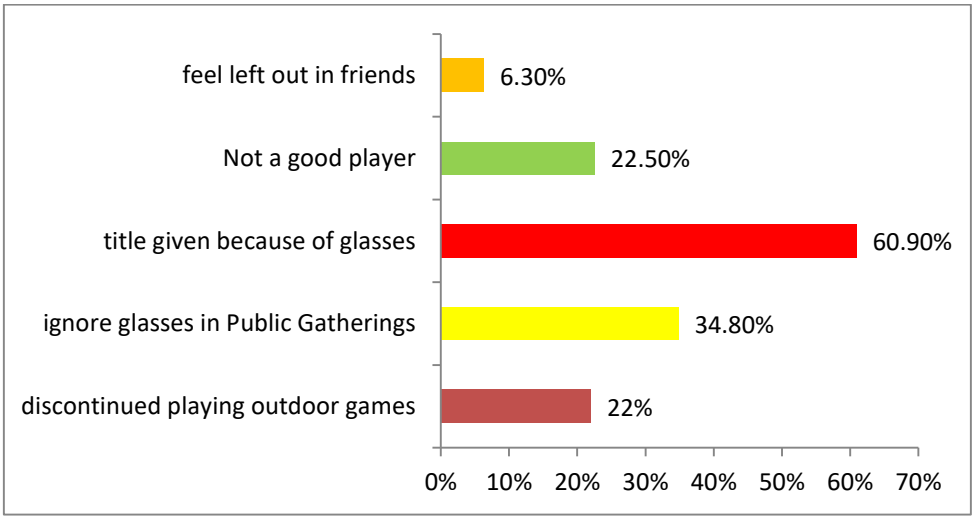

Figure 2: Impact on social life

Discussion:

Major objectives of the study were to determine compliance of spectacles and barriers to spectacle use, satisfaction level with spectacles and impact of spectacles on social life and personality. A total of 302 students were enrolled in the study with females (77.2%) and males (22.8%) having mean age of 13.96 years.

Only 58.6% students reported compliance with spectacles. This is an alarming situation as almost half of the individuals have poor spectacle compliance that can have drastic adverse effects in their visual acuity. The spectacle compliance rate as compare to this study was worse in an Indian and Saudi Arabian study where it was found out to be 29.5% and 33.2%, respectively [2,10]. Children are future of a nation they belong to. Visual impairment due to poor spectacle compliance is a major health challenge to a nation. In this study students reported spectacles as preferred method for vision correction but still, they have poor compliance. Compliance level between genders has shown a high level of compliance among boys (76.8%) as compare to girls which is in contrast to the study carried by Yousef. H. Aldebasi et al in which higher proportion of boys (69.13%) were non-compliant. Usually girls are more beauty conscious in South Asian settings and wearing spectacles is considered as a negative thing in this society. In the recent study male students reported improvement in personality after wearing spectacles as compare to females (p-value <0.005). This may be because girls with spectacles are considered to have nerdy look and this is also being depicted in dramas and films of this society, whereas boys with spectacles are treated as a responsible member of the family. That may be considered a reason for poor spectacle compliance in schoolgirls. The recent study has shown that older students have more compliance to spectacle wear as compare to younger ones. This is in contrast with Parikshit Gogate et al and Yousef. H. Aldebasi et al who concluded that non-compliance was not related to age of student but older students are slightly more non-compliant [10,12]. It is important to assess the reason as there may be increase in refractive error in children with time in the area of Punjab and requires further investigation which was out of scope of this study. Other possible reasons may be that older students get habitual with their spectacles and feel themselves complete and confident wearing their spectacles.

Cost of spectacles was not related to regular use of spectacles ($p< 0.05$). This is in contrast with the African study where cost of spectacle was observed as a main barrier and challenge in spectacle compliance [13]. This finding is highly important for Pakistan which is a low middle income country. As provision of cheaper glasses can have the same compliance rate as expensive one. This also proves that spending money on stylish and attractive frames will not increase the compliance.

According to recent study the main identified barriers faced were sweating (57.28%), irritation (19.21%) and fogging of lenses (8.94%). This is in agreement with the previous study by Yousef. H. Aldebasi et al in which it was found that students were not comfortable wearing spectacles [12]. This is an indication for the policy makers and the spectacle manufacturing companies and organizations that a high level of attention is required in this area of the problem. Compliance can be increased if lens and frame materials are taken into account. [12]

In our study, 60.9% of the students reported that they were given titles and were teased in their class by peers for wearing glasses and this agrees with the studies conducted by Yousef. H. Aldebasi et al, Odedra N et al and Parikshit Gogate et al. Efforts are needed to discourage such negative behaviors.[10,12,14]

In the results of recent study, it was shown that people feel acceptable in society when they see hero/ heroines with spectacles. But unfortunately, spectacle wearing personality is negatively depicted in the TV and films as well as very often worn by actor/ actresses. So, it is important to highlight in TV for improving compliance among children.

Main limitations of the research were that the study was quantitative and the author was unable to quote all the experiences shared by the students during data collection. Qualitative research is needed to encounter this problem. We didn't know up to what level refractive error each student possessed, it may have been good to see impact of it on compliance. As findings were from city school we cannot generalize it on rural area. Further investigations are required. It is suspected that students might have not given the right answers of their compliance i.e. social desirability is shown by students.

References:

1. Visual impairment and blindness [Internet]. World Health Organization. 2016 [cited 19 March 2016]. Available from: http://www.who.int/mediacentre/factsheets/fs282/en/
2. Dunning H. Leading causes of "avoidable blindness" identified as cases set to increase | Imperial News | Imperial College London [Internet]. 2017 [cited 2018 May 21]. Available from: https://www.imperial.ac.uk/news/182338/leading-causes-aposavoidable-blindness-identified-cases/
3. Pascolini D, Mariotti SP. Global estimates of visual impairment: 2010. Br J Ophthalmol [Internet]. 2012 May [cited 2018 May 21];96(5):614–8.
4. Dineen B, Bourne RRA, Jadoon Z, Shah SP, Khan MA, Foster A, et al. Causes of blindness and visual impairment in Pakistan. The Pakistan national blindness and visual impairment survey. Br J Ophthalmol [Internet]. 2007 Aug [cited 2018 May 21];91(8):1005–10.
5. Ali A, Ahmad I, Ayub S. Prevalence of Undetected Refractive Errors Among School Children. 2007;23.
6. Dandona R, Dandona L, Srinivas M. Refractive error in children in a rural population in India. Invest Ophthalmol Vis Sci.2002; 43:615– 22. 7. Fan DS, Lam DS, Lam RF. Prevalence, incidence, and progression of myopia of school children in Hong Kong. Invest Ophthalmol Vis Sci. 2004; 45:1071–75
7. Fan DS, Lam DS, Lam RF. Prevalence, incidence, and progression of myopia of school children in Hong Kong. Invest Ophthalmol Vis Sci. 2004; 45:1071–75
8. Noopur Gupta VG, LakshyaArora PV. Refractive Error & Childhood Visual Impairment. AdvOphthalmol Vis Syst [Internet]. 2016 Oct 14 [cited 2018 May 21];5(1):1–3. Available from: http://medcraveonline.com/AOVS/AOVS-05-00146.php
9. Anwar I, Waqar S, Altaf A. Compliance of Spectacle Wear Among School Going Children in District Rawalpindi, Pakistan. Int J Ophthalmol Vis Sci [Internet]. 2017 [cited 2018 Jun 20];2(111):1–4.
10. Gogate P, Mukhopadhyaya D, Mahadik A, Naduvilath T, Sane S, Shinde A, et al. Spectacle compliance amongst rural secondary school children in Pune district, India. Indian J Ophthalmol [Internet]. 2013 [cited 2018 Jun 20];61(1):8.
11. Barria Von-Bischhoffshausen F, Muñoz B, Riquelme A, Ormeño MJ, Silva JC. Spectacle-wear compliance in school children in Concepción Chile. Ophthalmic Epidemiol [Internet]. 2014 Dec 30 [cited 2018 Jun 20];21(6):362–9.
12. Aldebasi YH. A descriptive study on compliance of spectacle-wear in children of primary schools at Qassim

Province, Saudi Arabia. Int J Health Sci (Qassim) [Internet]. 2013 Nov [cited 2018 Jun 20];7(3):291–9.
13. Ebeigbe JA, Kio F, Okafor LI. Attitude and beliefs of Nigerian undergraduates to spectacle wear. [Internet]. Vol. 47, Ghana medical journal. 2013. p. 70–3.
14. Odedra N, Wedner SH, Shigongo ZS, Nyalali K, Gilbert C. Barriers to spectacle use in Tanzanian secondary school students. Ophthalmic Epidemiology. 2008; 15: 410–7.

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ORIGINAL ARTICLE

Therapeutic Response and Local Adverse Effects of Topical Tacrolimus 0.03% Dermatological Ointment in Refractory Vernal Keratoconjunctivitis

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ABSTRACT

Objective: To evaluate the therapeutic response with local adverse effects of topical tacrolimus (TCL) 0.03% dermatological ointment in patients with refractory/resistant vernal keratoconjunctivitis (VKC).

Patients and methods: A total of 42 consecutive (non-probability sampling) patients with vernal keratoconjunctivitis refractory to standard treatment were recruited in the study by retrospective review of their records. Tacrolimus 0.03% dermatological ointment was applied twice daily after stopping all previous topical medications. The trail span was from one (1) to six (6) months. The clinical symptoms and the clinical signs were graded as normal with a score of 0, mild with a score of 1, moderate with a score of 2 and severe with a score of 3 assigned to their level. Patients were assessed for symptomatic improvement as well as clinically for signs at the initiation and end of therapy.

Results: A total of 42 patients with VKC consisting of 28 male and 14 female were included. The mean age was 12.5 years (age range from, 5 to 30 years). The mean visual acuity improved from 6/12 to 6/9after treatment. The symptoms which achieved statistical significance included, ocular irritation, redness, gritty sensation and secretion all with $p<0.001$. Similarly, improvement was also shown in clinical signs of conjunctival congestion, limbus hypertrophy, horner tranta dot, surface epithelial corneal erosions and upper tarsal conjunctival papillae, all reached to statistical significance with $p<0.001$.

Conclusion: Topical dermatological ointment tacrolimus 0.03% proved efficacious and without local side effects in the treatment of patients with refractory/resistant vernal keratoconjunctivitis. *Al-Shifa Journal of Ophthalmology 2019; 15(3): 117-123. © Al-Shifa Trust Eye Hospital, Rawalpindi, Pakistan.*

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Introduction:

Vernal keratoconjunctivitis (VKC) is a type 1 hypersensitivity ocular disorder, involving the palpebral and/or bulbar conjunctiva bilaterally. Vernal keratoconjunctivitis endangers the vision of patients and runs a course with periods of remissions and exacerbations. Its prevalence varies in different ethnic groups and geographic regions. Mainly it affects adolescents in warm climates. It is more common in temperate regions of the world e.g. silk route region, African regions, the south Asian region, and parts of American region.[1] Patients with VKC present with

ocular irritation, redness, light sensitivity, gritty sensation with constant eye rubbing, foreign body sensation, and watering of eyes, resulting in defective vision which affects the quality of life. VKC is basically an immunoglobulin E (IgE) mediated disease known as type I hypersensitivity reaction (atopic ocular disorder), which is supported by the presence of conjunctival helper T- cells producing immunoglobulin E.[2] Latest findings suggests a more intricate pathogenic mechanism with particular involvement of helper T cells i.e. Th 2 subset of T cells.[3] Existing medications to treat Vernal keratoconjunctivitis include topical H1 blockers, mast-cell stabilizers, combination of the former two, decongestants, steroids, and immune-modulatory agents. Vernal keratoconjunctivitis is a chronic disease which requires prolong treatment in most patients. Topical steroids are mainly used in the treatment of moderate to severe forms of vernal keratoconjunctivitis. Steroids in the long run can be hazardous. Long term therapy with topical steroids may lead to glaucoma, steroid induced cataracts and secondary ocular infections. Steroid use in children with VKC leads to serious ocular complications and are the most affected group among patients .[4]

Steroid sparing agents have recently been proposed to avoid steroid-related complications with promising results. Tacrolimus (TCL) has both an immuno-modulatory and anti-inflammatory activity. It particularly inhibits Th-2 subset of T lymphocytes, T helper cells induced B-cell production, and formation of inflammatory mediators. [5] Different studies were conducted to evaluate the efficacy of topical TCL in the management of patients with refractory/resistant vernal keratoconjunctivitis.

Various trails disclosed the efficacy of comparatively higher doses of topical tacrolimus i.e. topical tacrolimus 0.1%.[6–10] However the use of more potent topical TCL was associated with local ocular side effects like frequent burning sensation and irritation. The rationale of this work was to evaluate the therapeutic response and local ocular side effects of low concentration of topical dermatological ointment form of TCL 0.03% (Eczemus^{R} or Crolimus^{R}) in the management of patients with refractory vernal keratoconjunctivitis.

Materials and Methods:

Permission was granted by the hospital ethical review board. The study was in compliance with tenets of the Declaration of Helsinki. Participants and where necessary parents/guardians consent was obtained prior to the study. Retrospective review of the hospital records of 42 consecutive patients (non-probability sampling) with vernal keratoconjunctivitis refractory to standard treatment who presented to the Ophthalmology OPD at Qazi Hussain Ahmad Medical Complex, Nowshera, from March 2019 to August 2019. The patients were labelled as refractory/resistant by continued presence of symptoms and signs despite the use of standard treatment. Standard treatment included topical steroids, cyclosporine, H1-blockers, mast-cell stabilizers and decongestants. The length of the disease was variable among the patients at the time of initial presentation. The diagnosis of VKC was based upon symptoms of ocular irritation, redness, secretion, and gritty sensations and clinical signs of conjunctiva congestion, upper tarsal conjunctival papillae, limbus hypertrophy, horner tranta dot, and surface epithelial corneal erosions. Each ocular symptom and clinical sign was evaluated and the severity was graded as normal with a score of 0, mild with a score of 1, moderate with a score of 2 and severe with a score of 3 assigned to their level. This is the standard grading system adopted for VKC patients in our OPD. Clinical assessment was performed at the beginning, in the mid and at the end of treatment. Participants with documented allergies to tacrolimus(TCL) or similar drugs, ocular

infections, breast feeding mothers, planning to conceive or already conceived women, those already on systemic therapy for other atopic disorders and patients who had undergone recent ocular surgeries were excluded. Tacrolimus 0.03% dermatological ointment was administered to patients twice daily in the lower conjunctival fornix as 0.5cm of length. All previous topical medications were discontinued 02 weeks before the start of TCL. The length of treatment span from one (1) to six (6) months. The variability in length of therapy was due to the differences in the responses among the treated patients. The therapy was commenced during flare up phase with periodic attempts to stop it whenever possible. At the end of follow up, all the participants were assessed for any improvement in the symptoms, including ocular irritation, redness, gritty sensations, and secretion.

The participants also underwent slit lamp examination for any improvement in clinical signs, including conjunctiva congestion, upper tarsal conjunctival hypertrophy, limbus hypertrophy, horner tranta dot, and surface epithelial corneal erosions. We labelled our patients as improved in terms of signs and symptoms by non-requirement of an additional therapy.

Data analysis was performed using the SPSS 19.0. Continuous data variables were expressed as mean ± standard deviation (SD). Categorical variables such as symptom and signs of VKC were represented in percentages. For statistical significance a p value of < 0.05% was considered significant in the study.

Results:

Forty-two patients with refractory/resistant VKC, consisting of 28 (66%) male and 14 (33%) female participants. The mean age was 12.5 years (range from, 5 to 30 years). The mean visual acuity at the beginning of study was 6/12 (range from, 6/6 to 6/60 by Snellen chart). The mean intraocular pressure (IOP) at the start was 12 mmHg (range: 08–20 mmHg). At initial presentation all patients had bilateral vernal keratoconjunctivitis that was resistant to standard topical treatment. The chief presenting complaints were ocular irritation in 38 (90%), redness in 36 (86%), secretion in 20 (48%) and gritty sensations in 12 (28%) patients. Clinical signs were conjunctiva congestion in 36 (86%), upper tarsal conjunctival papillae in 26 (62%), horner tranta dot in 32 (76%), limbus hypertrophy in 34 (91%) and surface epithelial corneal erosions in 14 (33%) patients.

The mean length of therapy was three (03) months (range from, 1 to 6 months). Response to therapy was evaluated as minimum of 1 step down in severity as compare to values before start of treatment (refer to classification for grading system, in material and methods section). Each of the following symptoms of ocular irritation, redness, secretion, and gritty sensations achieved reduction in severity grading system, that was statistically significant at the end of therapy with TCL ointment 0.03%(p<0.0001; Table I). In a similar manner, each of the clinical signs of conjunctiva congestion, upper tarsal conjuntival papillae, limbus hypertrophy, horner tranta dot, and surface epithelial corneal erosions attained statistically significant reduction in severity (p<0.0001; Table II). It took at least two (02) weeks for mild cases and four (04) weeks for severe cases, for clinically manifested improvement with therapy.

The mean visual acuity achieved at the end of follow up was 6/9 (range from, 6/6 to 6/24). The mean IOP with goldmann applanation tonometry was 12 mmHg, checked at the same time of the day among the participants (range was from, 06 to 18 mmHg). Two (2) out of 42 patients (5%) responded as having mild ocular irritation or transient burning sensations at the time

of application of ointment at the start of study, which improved with continuous treatment. Neither our patients developed cataract, glaucoma or infectious keratitis nor any malignancy throughout the follow-up period.

Table 1: Therapeutic response of topical tacrolimus ointment 0.03% on symptoms of VKC

Symptoms	No. of affected	Improvement achieved (%)	95% Confidence interval	*P*-value
Ocular irritation	38	32 (84.2)	31.68-32.32	<0.001
Redness	36	29 (80.5)	28.67–29.33	<0.001
Secretion	20	16 (84)	15.56–16.44	<0.001
Gritty sensations	12	10 (83.3)	09.43–10.56	<0.001

Table II: Therapeutic response of topical tacrolimus 0.03% on signs of VKC

Signs	No. of affected	Improvement achieved (%)	95% Confidence interval	*P*-value
Conjunctival congestion	36	32 (88.9)	31.67–32.33	<0.001
Upper tarsal conjunctival papillae	26	6 (23)	05.62–06.38	<0.001
Limbus hypertrophy	34	30 (88.2)	29.66–30.34	<0.001
Surface epithelial corneal erosions	14	12 (85.7)	11.47–12.52	<0.001
Horner tranta dots	32	24 (75)	23.65–24.35	<0.001

Discussion:

There is widespread use of TCL in the management of atopic disorders like atopic dermatitis and vernal keratoconjunctivitis, basically it inhibits calcineurin pathway, causing marked reduction in the formation of different inflammatory mediators by activated T lymphocytes, which are pivotal in the pathophysiology of vernal keratoconjunctivitis. [5] It is proved in one study that TCL inhibits calcineurin almost hundred (100) times more efficiently than cyclosporine and was more efficacious in patients who were non-responsive to topical cyclosporine therapy.[8] Mast cells (Eosinophils), are main damaging cells involved in ocular inflammation in patients with vernal keratoconjunctivitis and releases cytokines, chemokines, leukotrienes, and epitheliotoxic mediators. These inflammatory agents play a vital role in inducing ocular surface inflammatory damage including keratitis.[1]Eosinophils largely accumulate in macro papillae in patients with vernal keratoconjunctivitis.[11] Eosinophils chemotactic migration is reduced by TCL through inhibition of IL-5 production.[12]Conjunctival cytological

studies reveal marked reduction in the population of inflammatory cells especially eosinophils with topical TCL. [13]

In this study of retrospective design, we have evaluated the therapeutic response and local side effects of 0.03% TCL dermatological ointment in 42 patients having refractory vernal keratoconjunctivitis, both the symptoms and signs improved, which reached to the level of statistical significance. Along with the improvement in surface epithelial corneal erosions, there was also an improvement in visual acuity (VA by Snellen chart) from 6/12 to 6/9 post therapy. In our study patients the upper tarsal conjunctival papillae were least responsive (23%) to topical TCL 0.03%, in contrast to other studies done with better response, the possible reason could be due to more concentrated form of topical TCL i.e. 0.1% used, prolonged duration and also supplemental therapy with topical steroids in those trails.[6-8]

Various formulation and dosages of topical TCL was tried in the management of atopic inflammatory ocular disorders, including refractory/resistant vernal keratoconjunctivitis. A study was done by Shoughy et al [22] by using 0.01% topical TCL eye drops on 62 patients with refractory VKC showed marked improvement in symptoms as well as clinical signs of VKC with a mean follow up of 9 months, there was no local and systemic adverse effects observed with the therapy. Most of the studies were done on 0.1% concentration of topical TCL in allergic conjunctivitis.[6–10] However some studies were conducted on low strengths of topical TCL, including 0.02% and 0.03%.[14-15] The minimum strength of topical TCL so far used for treatment of vernal keratoconjunctivitis was 0.005% and has shown promising results in terms of both safety and effectiveness in refractory vernal keratoconjunctivitis[16] but frequency of application was in quid doses. We used 0.03% topical TCL in bid doses on daily basis, which is more compliant as compare to more frequent instillation regimen. The efficacy of topical TCL was maintained among all the participants of the study but with re-emergence of symptoms among most of the participants on cessation of treatment.

About 5% of our patients reported transient burning and stinging sensation with topical application of tacrolimus that subsided with continued usage of therapy. There was no local ocular side effect evident in our study with topical application in the form of raised IOP, cataract, infectious keratitis. However, different studies have shown that topical TCL changes the local immunological environment at the ocular surface and predisposes toinfections.[7]There is a fear of HSV keratitis associated with topical TCL, therefore, care is needed, possibly to prevent relapse during prolonged thearpy.[7,17]However we didn't encounter any case of herpetic keratitis among our patients. More studies with larger sample size needs to be conducted to further evaluate, susceptibility to opportunistic ocular infections with long term therapy with topical TCL. One study has shown development of lymphoma (T-cell origin) in atopic dermatitis patients who were treated with TCL dermatologic ointment.[18] However, no such fact is present in the existing literature that shows any predisposition towards malignancy development due to topical treatment with TCL.[19,20] There was not a single case of malignancy reported in our study along the whole length of follow up period up to six (6) months. Rather the more concentrated form of topical tacrolimus i.e. 0.1% which is approximately seven times more concentrated than our formulation, there is very small risk of developing malignancy associated with it.[7] Topical application of TCL is quite safe even in long term with very small risk of adverse effects.[21,22]

The limitations of our study was its retrospective nature and small sample size, further studies in form of double blinded randomized control trails are required to further explore the therapeutic response and side effects of topical tacrolimus in the management of refractory allergic conjunctivitis.

Conclusion:

We concluded the therapeutic effectiveness of 0.03% tacrolimus dermatological ointment in the treatment of refractory/resistant vernal keratoconjunctivitis with no local ocular side effects.

References:

1. Kumar S. Vernal keratoconjunctivitis: a major review. *Acta Ophthalmol*. 2009; 87(2):133–147.
2. Abu El-Asrar AM, Tabbara KF, Geboes K, Missotten L, Desmet V. An immunohistochemical study of topical cyclosporine in vernal keratoconjunctivitis. *Am J Ophthalmol*. 1996; 121:156–161.
3. Bielory L, Frohman LP. Allergic and immunologic disorders of the eye. *J Allergy ClinImmunol*. 1992; 89(1 pt 1):1–15.
4. Ohji M, Kinoshita S, Ohmi E, Kuwayama Y. Marked intraocular pressure response to instillation of corticosteroids in children. *Am J Ophthalmol*. 1991; 112:450–454.
5. Rallis E, Korfitis C, Gregoriou S, Rigopoulos D. Assigning new roles to topical tacrolimus. *Expert OpinInvestig Drugs*. 2007; 16(8):1267–1276.
6. Ohashi Y, Ebihara N, Fujishima H, et al. A randomized, placebo-controlled clinical trial of tacrolimus ophthalmic suspension 0.1% in severe allergic conjunctivitis. *J Ocul Pharmacol Ther*. 2010; 26(2): 165–174.
7. Al-Amri AM. Long-term follow-up of tacrolimus ointment for treatment of atopic keratoconjunctivitis. *Am J Ophthalmol*. 2014; 157(2):280–286.
8. Fukushima A, Ohashi Y, Ebihara N, et al. Therapeutic effects of 0.1% tacrolimus eye drops for refractory allergic ocular diseases with proliferative lesion or corneal involvement. *Br J Ophthalmol*. 2014; 98:1023–1027.
9. Vichyanond P, Tantimongkolsuk C, Dumrongkigchaiporn P, Jirapongsananuruk O, Visitsunthorn N, Kosrirukvongs P. Vernal keratoconjunctivitis: result of a novel therapy with 0.1% topical ophthalmic FK-506 ointment. *J Allergy Clin Immunol*. 2004; 113(2): 355–358.
10. Zribi H, Descamps V, Hoang-Xuan T, Crickx B, Doan S. Dramatic improvement of atopic keratoconjunctivitis after topical treatment with tacrolimus ointment restricted to the eyelids. *J Eur Acad Dermatol Venereol*. 2009; 23(4):489–490.
11. Takamura E, Uchio E, Ebihara N, et al; Japanese Society of Allergology. Japanese guideline for allergic conjunctival diseases. *Allergol Int*. 2011; 60:191–203.
12. de Paulis A, Stellato C, Cirillo R, Ciccarelli A, Oriente A, Marone G. Anti-inflammatory effect of FK-506 on human skin mast cells. *J Invest Dermatol*. 1992; 99(6):723–728.
13. Virtanen HM, Reitamo S, Kari M, Kari O. Effect of 0.03% tacrolimus ointment on conjunctival cytology in patients with severe atopic blepharoconjunctivitis: a retrospective study. *Acta Ophthalmol Scand*. 2006; 84(5):693–695.
14. Miyazaki D, Tominaga T, Kakimaru-Hasegawa A, Nagata Y, Hasegawa J, Inoue Y. Therapeutic effects of tacrolimus ointment for refractory ocular surface inflammatory diseases. *Ophthalmology*. 2008; 115(6):988–992.
15. Kymionis GD, Goldman D, Ide T, Yoo SH. Tacrolimus ointment 0.03% in the eye for treatment of giant papillary conjunctivitis. *Cornea*. 2008; 27(2):228–229.

16. Kheirkhah A, Zavareh MK, Farzbod F, Mahbod M, Behrouz MJ. Topical 0.005% tacrolimus eye drop for refractory vernal keratoconjunctivitis. *Eye*. 2011; 25(7):872–880.
17. Joseph MA, Kaufman HE, Insler M. Topical tacrolimus ointment for treatment of refractory anterior segment inflammatory disorders. *Cornea*. 2005; 4:417–420.
18. Rita L, William L, James C, Schottinger J, Yoshinaga M, Millares M. Association between exposure to topical tacrolimus or pimecrolimus and cancers. *Ann Pharmacother*. 2009; 43:1956–1963.
19. Thaçi D, Salgo R. Malignancy concerns of topical calcineurin inhibitors for atopic dermatitis: facts and controversies. *ClinDermatol*. 2010; 28(1):52–56.
20. Tennis P, Gelfand JM, Rothman KJ. Evaluation of cancer risk related to atopic dermatitis and use of topical calcineurin inhibitors. *Br J Dermatol*. 2011; 165(3):465–473.
21. Ebihara N, Ohashi Y, Fujishima H, et al. Blood level of tacrolimus in patients with severe allergic conjunctivitis treated by 0.1% tacrolimus ophthalmic suspension. *Allergol Int*. 2012; 61(2):275–282.
22. Shoughy SS, Jaroudi MO, Tabbara KF. Efficacy and safety of low-dose topical tacrolimus in vernal keratoconjunctivitis. *ClinOphthalmol*. 2016; 10:643-647

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ORIGINAL ARTICLE

Opening the Block There and Then: Nasolacrimal Duct Block Revisited

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ABSTRACT

Objective: To present the success rate in treating congenital nasolacrimal duct obstruction with hydrostatic pressure (Crigler method) as a single maneuver in the outpatient department.

Study Design: This was a correlational study with quantitative study design.

Place & Duration: Study was conducted for 1 year starting from the date of approval of the study proposal at HBS General Hospital, Islamabad.

Materials and Methods: A total of 175 children aged up to 12 months with congenital nasolacrimal duct obstruction were treated noninvasively with hydrostatic pressure as a single procedure. Children were followed up after 1 week to ensure opening of obstruction.

Results: Success was defined as no epiphora or discharge. The success rate for the whole study group was 22.3% (n=39) for children up to 12 months of age. When the maneuver was performed in patients younger than 6 months of age, the success rate was 14.3%, decreasing to 8% in children older than 6 months of age.

Conclusion: The Crigler method of lacrimal massage was effective in managing congenital nasolacrimal duct obstruction in infants below 1 year. The success rate is greater when the procedure is performed in patients up to 6 months of age. Nevertheless, we recommend this procedure for every infant presenting with CNLDO even after 6 months of age. *Al-Shifa Journal of Ophthalmology 2019; 15(3): 124-129.*

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Introduction:

Congenital nasolacrimal duct obstruction (CNLDO) or dacryostenosis, is a common disorder encountered in pediatric ophthalmology and the most common manifestation is a persistent Hasner's membrane at the lower end of the nasolacrimal duct. [1,2,3] Despite the estimated incidence of CLNDO in newborns ranging between 1% and 20%, it often resolves spontaneously without surgery. [2,4-9] Nasolacrimal duct obstruction and the resultant epiphora is common in early infancy, 20%.[2,10] The parents typically report a watery or mucous discharge, recurrent conjunctivitis, crusting of the eyelids, and a swelling over the medial canthal area, which when pressed causes pus to regurgitate from either puncta. [7,10,11]

Various therapeutic options include conservative as well as surgical interventions. Lacrimal sac massage (Crigler massage) is considered to be the first line of conservative management. However, evidence from past literature seems to suggest that in the majority of cases home massaging tends to turn out to be a futile exercise as most of the parents either don't do it properly or show poor compliance. [12-16] At times the accurate technique of massage may not be correctly demonstrated by the busy clinician or not properly understood by the parent resulting in a high failure rate and a need for surgical probing. On the other hand, we have observed a reluctance on behalf of the parents due to the discomfort it can cause the infant which can affect the technique. Other factors that might be a cause of low cure rates are low maternal literacy rate, early marital age, ignorance and fear of injuring the eye during massage. [17]

Lacrimal sac massage is generally recommended up to the age of 12 months and then, depending on the severity of the symptoms, other therapeutic options can be discussed. The success rate is between 14.2% and 96% depending on the patients' age and compliance to treatment is a key factor. [10, 16, 18, 19] The method of massage varies from mild pressure over the nasolacrimal sac to express pus from the puncta to the method described by Crigler. [4,12, 20, 21]

Majority of clinical studies have focused on the success of lacrimal massage conducted at home by the infant's parent/guardian. After an exhaustive search of the literature we found only two studies [Stolovitch [19], Branco [22]] in which the efficacy of the Crigler massage performed by a specialist was recorded. We believe this to be the first study designed to establish the effectiveness of the Crigler hydrostatic massage when performed once by an experienced pediatric ophthalmologist in an outpatient setting in Pakistan.

Highlighting the importance of the massage to parents and describing its procedure in detail can reduce the need of unnecessary surgical interventions and the possibility of accidentally damaging the lacrimal system. [23, 24]

The objectives of this work were:

1. To find the efficacy of the Crigler hydrostatic massage performed once to treat children with CNLDO at our clinic
2. To find a correlation between age and efficacy of Crigler massage of the lacrimal sac

Material and Methods:

This was a correlational study with quantitative study design conducted at HBS General Hospital, Islamabad. Duration of Study was 1 year starting from date of approval of study proposal. A total of 175 patients were enrolled in the study using consecutive non-probability sampling method. All children from 0 to 1 year of age who presented to the clinic with any or all of the following were enrolled in the study irrespective of any previous treatment attempts:

a) Epiphora since or soon after birth
b) Matting of eyelashes
c) Intermittent conjunctivitis

Cases with other causes of lacrimation were excluded.

Patients included in this study were recruited from the outpatient department of HBS General Hospital, Islamabad. Any child whose age was one year or below and presented with a history of epiphora since birth or soon thereafter, intermittent discharge, or medial canthal swelling, were included in the study.

After explaining the technique of Crigler's massage and obtaining informed consent from the parents lacrimal massage was performed on each child. The infant was held in the parent's lap. One hand was used to hold the child's head in place while the

other was used to hold the child's arms. The clinician applied hydrostatic pressure by placing the thumb over the sac so that the back flow of tears through the punctum was blocked. The thumb was then pressed downward, pushing against the orbital rim and over the sac. In this way the contents of the lacrimal sac transmitted its pressure onto the sac walls, which gave way at its weakest point, the nasal opening. Suggestion of a positive outcome of the maneuver was a feeling of giving way of resistance or an emptying of the sac or hearing a "popping" sound signifying the rupturing of Hasner's valve. The surgeon's judgement of success or failure of overcoming the obstruction was noted in the child's file.

The following variables were noted from the patient's record:

i. Gender
ii. Age at presentation
iii. Response to massage

Once the Crigler maneuver was performed at the time of first presentation to our clinic, the patients were re-evaluated after one week for opening of the blockage by ensuring resolution of all initial symptoms which was defined as no epiphora or discharge.

SPSS 26 was used to analyze data. Frequencies and percentages were calculated for categorical variables like age, gender, and final response to massage (whether or not the obstruction was overcome by the lacrimal massage.) The number of infants in the two age groups (0-6 and 7-12 months) was calculated separately. The correlation of each age group and effect of massage was calculated by applying Chi square test. A p-value of less than 0.05 was considered statistically significant.

Results:

One hundred and seventy-five, 175, consecutive children (98 boys and 77 girls) were prospectively enrolled into the study. (Fig. 1) The median age at presentation was 7 months (range, 0.73– 12 months).

All of the children underwent the Crigler method of hydrostatic pressure to the lacrimal sac of the affected eye(s) on their first visit. The CNLDO resolved there and then in 39 (22.3%) children. (Fig. 2) Parents were instructed to bring the child after 1 week to confirm the cessation of symptoms.

The obstruction was overcome, and the condition resolved after the first attempt in 25 (14.3%) infants below 6 months of age. After 6 months of age, the success rate declined to 8%.

Figure 3 reveals the reduction in success rate after treatment by Crigler method with increasing age (P = 0.014). There were no complications associated with the hydrostatic pressure approach in any of the patients.

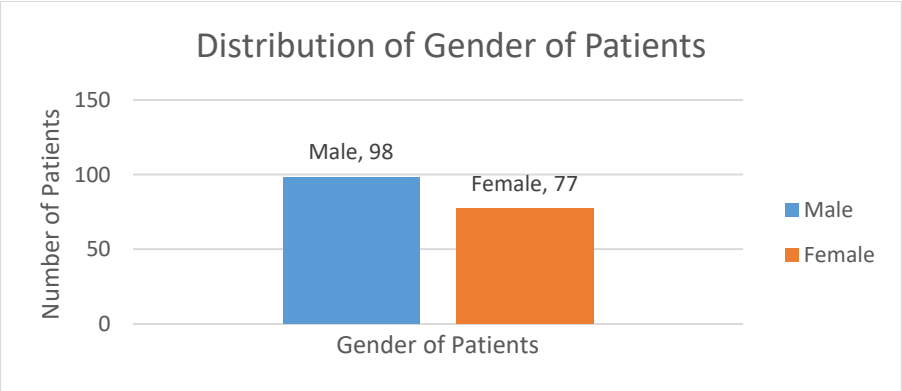

Fig. 1: Shows the number of male and female infants that presented to the OPD

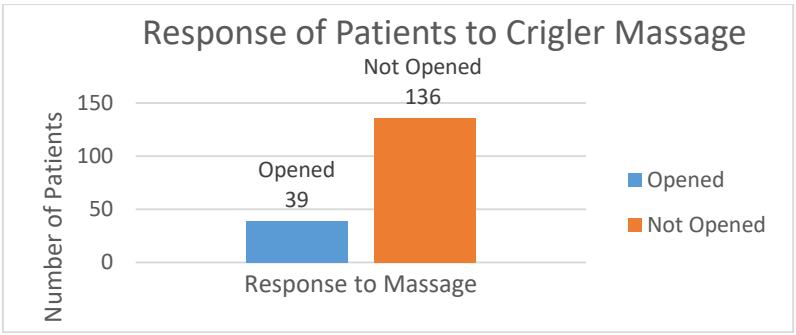

Fig. 2: Shows the number of patients that responded to lacrimal massage

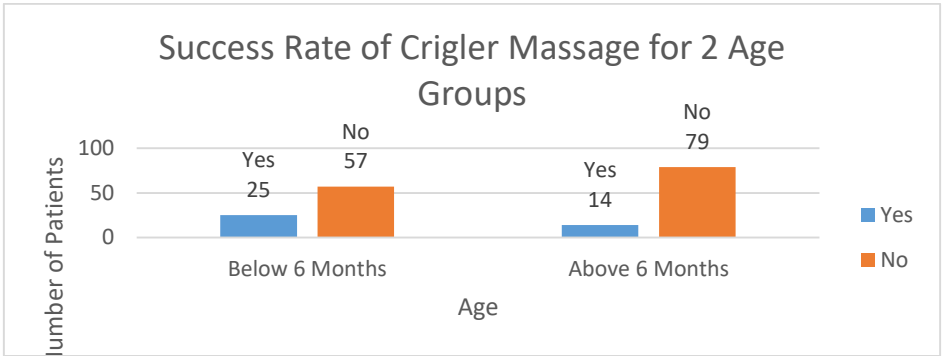

Fig. 3: Shows the decline in response to massage with increasing age

Discussion:

CNLDO is present in as many as 20% of newborns. (2) Typically, there is matting of the eyelashes as the tears spill over the lower lid giving a wet look of the involved eye. As early as 1923, Crigler described a method of applying pressure over the lacrimal sac with the aim of forcing an opening at the Hasner valve within the first year of life. (5, 12, 20) However, it has been our experience that the technique of massage generally followed by parents does not result in opening of the duct and this leads to a subsequent need for probing. When asked to demonstrate the technique of massage being practiced, most parents were found to massage at the incorrect place and often too lightly. In light of these findings we set out to determine the outcome of the Crigler massage when performed correctly by an ophthalmologist.

By using only 1 maneuver at the time of presentation we succeeded in resolving the obstruction in 39 (22.3%) patients. The success rate was 14.3% for children between 0 – 6 months which then declined to 8% at 7 –12 months. Ideal age seems to lay between 1-6 months after which the response starts to decline which is comparable to other studies. [2, 5, 25, 26] (Fig 3)

According to the literature Crigler achieved 100% success for 7 years, but he did not mention the number of patients in his study. Using the same technique as Crigler, others obtained a cure of 87.5% and 94.7%. [8, 12, 22] In a recent study Karti demonstrated a 96.2% remission rate. [16] In 1982, Kushner, illustrated the efficacy of the Crigler massage as compared to a simple massage. [20] The obstruction was cleared in 31 % of 59 eyes with proper massage as compared to 9% of 58 eyes with simple massage. Similarly, Noda et al. reported the opening of NLD block within 9 months of age in a population of Japanese infants treated at home. [5]

Our resolution rate, 22.3%, was lower than those of Stolovitch (46.2%) and Branco (43.6%). [19, 22] This may be due to the fact that the average age of presentation in our study, 7 months, was much higher as compared to their 3 months. [27] Other factors may have contributed to our low success

rate as compared to other investigators 90%. [2, 25, 27-30] The parents might have wiped the eye before coming to the clinic or the child might have inadvertently rubbed the eye, in doing so the sac may not have been fully distended. Also, we did not perform the procedure at multiple intervals as other investigators. [19,22]

Limitations of the study include absence of a control group and a small sample size.
In order to reduce the risk of general anesthesia for small infants and to prevent surgically induced iatrogenic obstructions the results suggest the important role of the Crigler maneuver, which should be emphasized to parents because of the high success rate and the additional benefit afforded by the "wait and see" approach. [31]

Conclusion:

Based on this study, the authors recommend that all infants less than 12 months of age with uncomplicated congenital nasolacrimal obstructions be treated with Crigler lacrimal massage even if only once at the time of presentation. It is strongly recommended that the treating physician must take time to demonstrate the correct technique of massage of the nasolacrimal system to parents of affected infants and make sure they are doing it the right way during follow-up visits.

References:

1. Cassidy TC. Dacryocystitis in infancy. Am J Ophthalmol. 1948;31:773-80.
2. MacEwen CJ, Young JD. Epiphora during the first year of life. Eye (Lond) 1991;5:596–600.
3. Guerry D, Kendig EL. Congenital impatency of the nasolacrimal duct. Arch Ophthalmol 1948;39:193-204.
4. Petersen RA, Robb RM. The natural course of congenital obstruction of the nasolacrimal duct. J Pediatr Ophthalmol Strabismus 1978;15:246-50.
5. Noda S, Hayasaka S, Setogawa T. Congenital nasolacrimal duct obstruction in Japanese infants: Its incidence and treatment with massage. J Pediatr Ophthalmol Strabismus. 1991 Jan-Feb;28(1):20-2
6. Price HW. Dacryostenosis. J Pediatr. 1947;30(3):302-5
7. Paul TO, Shepherd R. Congenital nasolacrimal duct obstruction: natural history and the timing of optimal intervention. J Pediatr Ophthalmol Strabismus. 1994 Nov-Dec;31(6):362-7
8. Nelson LB, Calhoun JH, Menduke H. Medical management of congenital nasolacrimal duct obstruction. Ophthalmology. 1985 Sep;92(9):1187–1190
9. Paul TO. Medical management of congenital nasolacrimal duct obstruction. J Pediatr Ophthalmol Strabismus. 1985 Mar- Apr;22(2):68–70
10. Pediatric Eye Disease Investigator Group Resolution of Congenital Nasolacrimal Duct Obstruction with Nonsurgical Management. Archives of Ophthalmology. 2012;130(6):730-4.
11. Frick KD, Hariharan L, Repka MX. Cost of effectiveness of 2 approaches to managing nasolacrimal duct obstruction in infants; The importance of the spontaneous resolution rate. Arch Ophthalmol. 2011 May;129(5):603-9.
12. Crigler LW. The treatment of congenital dacryocystitis. JAMA. 1923;81:23-4.
13. Shivpuri D, Puri A. Congenital nasolacrimal duct obstruction: the proper technique of massage. Indian Pediatr. 1994 Mar;31(3):337-9.
14. Bardoloi N. Thud or no thud, office massaging in congenital nasolacrimal duct obstruction works. In: Debashish Bhattacharya, editor. AIOS Proceedings. 21st–24th Jan 2010, Kolkata; AIOS. 2010. p. 390–92.
15. Takahashi Y, Kakizaki H, Chan WO, Selva D. Management of congenital nasolacrimal duct obstruction. Acta Ophthalmol. 2010 Aug; 88(5):506-13.

16. Karti O, Karahan E, Acan D, Kusbeci T. The natural process of congenital nasolacrimal duct obstruction and effect of lacrimal sac massage. Int Ophthalmol. 2016;36(6):845–849.
17. Sathiamoorthi S, Frank RD, Mohney BG. Incidence and clinical characteristics of congenital nasolacrimal duct obstruction. Br J Ophthalmol. 2019 Apr;103(4):527-9.
18. Kakizaki H, Takahashi Y, Kinoshita S, Shiraki K, Iwaki M. The rate of symptomatic improvement of congenital nasolacrimal duct obstruction in Japanese infants treated with conservative management during the 1st year of age. Clinical Ophthalmology. 2008;2(2):291–294.
19. Stolovitch C., Michaeli A. Hydrostatic pressure as an office procedure for congenital nasolacrimal duct obstruction. JAAPOS. 2006;10(3):269 –272.
20. Kushner BJ. Congenital nasolacrimal system obstruction. Arch Ophthalmol. 1982 Apr;100(4):597-600.
21. Jones LT, Wobing JL. Surgery of the eyelids and lacrimal system. Birmingham (AL): Aesculapius; 1976.
22. Castelo Branco Neto E, Castelo Branco B, Cardoso CC, Carvalho RG, Mota E, Castelo Branco A. Management of congenital nasolacrimal duct obstruction. Arq Bras Oftalmol. 2009 Jan-Feb;72(1):75-8.
23. Movaghar M, Kodsi S, Merola C, Doyle J. Probing for nasolacrimal duct obstruction with intravenous propofol sedation. J Am Assoc Pediatr Ophthalmol Strabismus 2000 Jun;4(3):179-82
24. Young JD, MacEwen CJ, Ogston S. Congenital nasolacrimal duct obstruction in the second year of life: a multicenter trial of management. Eye 1996;10: 485-91.
25. Katowitz JA, Welsh MG. Timing of initial probing and irrigation in congenital nasolacrimal duct obstruction. Ophthalmology. 1987;94(6):698-705.
26. Goldblum TA, Summers CG, Egbert JE, Letson RD. Office probing for congenital nasolacrimal duct obstruction: a study of parental satisfaction. J Pediatr Ophthalmol Strabismus 1996 Jul-Aug; 33(4):244-7.
27. Nucci P, Capoferri C, Alfarano R, Branco R. Conservative management of congenital nasolacrimal duct obstruction. J Pediatr Ophthalmol Strabismus. 1989;26(1):39-43.
28. Alzweimel FH, Aleassa ME, Alhusban AA, Alquran ML, Al-Rabadi AJ. Congenital nasolacrimal duct obstruction conservative treatment in infants using different techniques of nasolacrimal duct massage. Rawal Medical Journal: 2015;40(4): 424-427
29. Chaudhary MZ, Arshad M, Khan A. Management and Presentation of Congenital Nasolacrimal Duct Obstruction. PJMHS. 2019 Jan-Mar; 13(1): 68-70
30. Durrani J. Crigler Massage for CNLDO. J Coll Physicians Surg Pak. 2017 Mar;27(3):145-148.
31. Lyon DB, Dortzbach RK, Lemke BN, Gonnering RS. Canalicular stenosis following probing for congenital nasolacrimal duct obstruction. Ophthalmic Surg 1991 Apr; 22(4):228-32.

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ORIGINAL ARTICLE

Outcome of Conjunctival Auto Graft Surgery in Pterygium

Nusrat Sharif[1], Muhammad Sajid Munir[2], Muhammad Arshad[3], Shahid Nazir[4], Shadab Hassan[1], Muhammad Rizwan Ullah[5]

ABSTRACT

Pterygium is a degenerative condition, more common in the dry and dusty environment. In Pakistan, its incidence is increasing because 70% of our population is related with the agriculture sector and many outdoors developmental projects are in progress.

Objectives: The main aim of the study was to report the outcomes of pterygium surgery with limbal conjunctival auto graft in terms of graft success and preventing the recurrence of pterygium.

Study Design: A prospective interventional study.

Material and Methods: A total of 50 patients were selected from outpatient department on the basis of convenience sampling method from January 2018 to June 2019. The key point in excision of pterygium was to start the topical treatment with steroids and antibiotic combination to quite the inflamed tissue and then proceed with surgery. Pterygium was completely excised taking care to save the check ligaments and the medial rectus muscle. The success point of the surgery was that the graft tissue loosely attached to the margin of the tissue left behind after excision. Any cases of graft rejection or recurrence of disease were noted.

Results: Number of male patients was more compared to the females as they are more exposed to the outside environment in our country. In 49 (98%) eyes, graft was well taken up. Only one case with graft failure was reported while one case required resuturing. Recurrence of pterygium after the graft was noted in one eye.

Conclusion: Conjunctival auto grafting is a useful technique in our country as recurrence rate is low and complications are very few. *Al-Shifa Journal of Ophthalmology 2019; 15(3): 130-133. © Al-Shifa Trust Eye Hospital, Rawalpindi, Pakistan.*

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Introduction:

Pterygium is a triangular fibrovascular sub epithelial ingrowth of degenerative bulbar conjunctival tissue over the limbus onto the cornea[1]. It is more common in the hot and dry environment. In Pakistan it is more common in people working outdoors who are exposed to the ultraviolet light rays. Before diagnosing a case of pterygium we should differentiate it from pinguecula and pseudopterygium and cicatricial conjunctivitis.[1]

The main indications for Pterygium surgery are decrease in vision due to astigmatism, recurrence of inflammation, sever symptoms of irritation, threat of involvement of the visual axis or cosmesis particularly in the women[2]. It is specially

challenging in cases where pterygium and cataract coexist. [3] Pterygium excision will decrease corneal astigmatism and help to measure intraocular lens power accurately. It is also important to manage pterygium for better visual rehabilitation. There are many surgical techniques for pterygium excision. The bare sclera technique is very popular mainly because it saves time but the recurrence rate is high. Other surgical techniques are conjunctival autograft and amniotic membrane grafting. Adjunctive therapies are also used along with surgery to decrease the recurrence although they have their own limitations. Such therapies include use of mitomycin-C over the exposed area or use of tissue adhesive and beta irradiation. We used conjunctival auto grafting in this study to document the results of this technique in terms of recurrence of the condition.

Materials and Methods:

Approval of study was granted by the ethical committee of Al-Shifa Trust Eye Hospital. A total of 50 patients with pterygium were selected from the outdoor department of Al-Shifa Trust Eye Hospital, irrespective of their age and gender, based on convenience sampling. Patients of primary or recurrent pterygium with complaints of deceased vision, irritation, watering, or redness of eyes or those with cosmetic issues were included in the study. Patients with history of chemical injury or trauma were excluded.

The most important thing in the pterygium excision surgery was to settle down the inflammation in the recurrent tissue or primary pterygium tissue. After adequate topical anesthesia with proparacaine (Alcain), topical ethifrin (alpha agonist) was used as a vasoconstrictor. Injection 2% xylocaine was injected into the body of the Pterygium and then it was cut along its whole thickness near the limbus. Finally, the head and the body of the pterygium were separated. The body of pterygium was excised superficially to save the check ligaments and the sheath of the medial rectus muscle. Excision was done 1 mm above and below the limbus crossing points to minimize the risk of recurrence along these sites. Excessive tenon capsule underlying the excised area was also trimmed without pulling on the exposed tissue. Bleeding was minimized using an intraocular diathermy tip. In the next step the bare sclera area was measured horizontally with a caliper with the eye in abduction. A conjunctival graft was taken from the inferior limbal fornix. Graft was stitched and kept loose in every gaze of the patient. After completion of the surgery antibiotic steroid combination ointment was instilled and dressing applied for one day. After removal of the dressing the next day the patients were given topical antibiotics steroids combination once a day for ten days and lubricant three times a day for one month. Follow up was done after 2 weeks, four weeks and one year. Conjunctival sutures were removed on the first follow-up that is after 2 weeks of surgery. All the data was recorded on predesigned proformas and data was analyzed using Microsoft Excel.

Results:

A total of 50 patients were selected out of which 35 (70%) were male and 15 (30%) females. The main indication for surgery was recurrence of pterygium after primary surgical excision because in our country most of pterygium surgery is still done by bare sclera technique irrespective of age, profession, and outdoor activity of patients. Next major indication was cosmesis.

In 49 (98%) eyes graft was well taken up and only one case with graft failure was reported. Follow-up was done up to one year and satisfactory results were found. Recurrence was seen in only one case of ocular cicatricial pemphigoid. The most common complications of the technique were subconjunctival haemorrahge in 13 (26%) cases and granuloma formation in 2

(4%) cases. One (2%) case required resuturing due to wound dehiscence.

Discussion:

Pterygium formation is thought to be the result of altered epithelial cell proliferation and altered vascularization[4–8]. However, the precise pathogenesis of this disease is still unclear. Increased prevalence of pterygium among people in the equatorial region is due to the damaging effects of ultraviolet radiation, specifically UV-B radiation. The incidence of pterygium is also increasing due to the dry eye problem all over the world[9]. The main concept of our approach in the management of pterygium was control the ocular surface inflammation, reconstructive surgical technique, minimization of the recurrence rates and better cosmesis.

The main purpose of pterygium excision surgery with grafting is to prevent the recurrence of the disease process[10]. Ocular surface healthy should be optimized with aggressive treatment for dry eyes syndrome (key factor in recurrence) and proper timing for of surgery should be decided. Emphasis should be placed on education and proper counseling of the patient and importance of wearing sun light protection glasses should be explained as well.

The pterygium body is properly excised saving the medial rectus muscle, the fascia and the check ligaments. Graft size should be proper and stitching should be done end to end with bare sclera conjunctival tissue. The main problem with auto grafting is that it is time consuming procedure as compared to the tissue adhesive glue procedure and sclera bare technique[11]. In a study 99% patients after conjunctival auto graft were pain free while only 1% patients felt discomfort[12]. Conjunctival auto grafts allow coverage of large defects that occur from large excisions which are often encountered in advanced and recurrent pterygium. A recurrence rate of 21% has been reported by Lewallen et al which was higher than the recurrence rate reported in the current study. [14] Pretreatment of the patients with lubricants and topical steroids might have resulted in a better graft survival and low recurrence rate in our study.

The auto graft technique is also cost effective as compared to other techniques[15]. Recurrence rates of the conjunctival auto graft method were similar to those achieved when mitomycin was used in association with the bare sclera technique.[16] Moreover, this technique has a lower recurrence rate when compared with the application of amniotic membrane or simple bare sclera excision.[17,18] Finally, combination of conjunctival auto graft with intraoperative mitomycin C proved to be more effective in reducing recurrence rates than cases in which the two techniques are separately applied.[19,20]

The long-term results regarding cosmesis and recurrence in the current study is almost same as compared to other studies[21, 22]. In our study recurrence occurred in one case of ocular cicatricial pemphigoid, an autoimmune disorder. Pterygium and its recurrence, both are more common in patients with autoimmune disorders. [22]

Conclusion:

Conjunctival auto grafting is a useful technique regarding prevention of recurrence and is also cost effective.

References:

1. Allen BD, Short P, Crawford GJ. Pinguecula and Pterygia. Surv Ophtalmol.1988;32:41-9.
2. Sihota R, Tondon R, editors Parson's Diseases of the Eye 19th ed. India: Butterworth-Heinemann; 2003 Diseases of conjunctiva; p.193.p.4
3. Duke- Elders SS. System of Ophthalmology. Vol Vlll. London:Henry Kimpton;1965.p.574.
4. Dushku N, John MK, Schultz GS, Reid TW. Pterygia pathogenesis: corneal invasion by matrix metalloproteinase

expressing altered limbal epithelial basal cells. *Arch Ophthalmol*. 2001;119:695–706.
5. Aspiotis M, Tsanou E, Gorezis S, et al. Angiogenesis in pterygium: study of microvessel density, vascular endothelial growth factor, and thrombospondin-1. *Eye*. 2007;21(8) :1095–1101.
6. Kase S, Osaki M, Jin XH, et al. Increased expression of erythropoietin receptor in human pterygial tissues. *Int J Mol Med*. 2007;20:699–702.
7. Tsai YY, Chiang CC, Yeh KT, Lee H, Cheng YW. Effect of TIMP-1 and MMP in pterygium invasion. *Invest Ophthalmol Vis Sci*. 2010;51 :3462-7.
8. Liang K, Jiang Z, Ding BQ, Cheng P, Huang DK, Tao LM. Expression of cell proliferation and apoptosis biomarkers in pterygia and normal conjunctiva. *Mol Vis*.2011;17:1687–93.
9. Suzuki T, Sano Y, Kinoshita S. Conjunctival inflammation induces Langerhans cell migration into the cornea . Curr Eye Res.2000;21:550-3.
10. Sharma AK, Wali V,Pandita A. Corneo Conjunctival auto grafting in Pterygium surgery . J Med Educ Res.2004;6:149-52.
11. Ang LP, Chua JL, Tan DT. Current concepts and techniques in pterygium treatment. Curr Opin Ophthalmol. 2007 Jul;18(4):308-13.
12. Hirst LW. Prospective study of primary pterygium surgery using pterygium extended removal followed by extended conjunctival transplantation. Ophthalmology. 2008 Oct;115(10):1663-72.
13. Kenyon KR, Wagnor MD. Conjunctival autograph transplantation for advanced and recurrent pterygium. Opthlmol. 1985; 92: 1461.
14. Leewan S. A randomized trial of conjunctival autografting in pterygium in tropics. Opthalmol 1999; 96: 1612.
15. MA Baig, SAshar , M Ishaq.Sliding Conjuntival flap in suricial Management of Pterygium . Pak Armed Forces Med J. 2007-Patmj.org
16. Paracha Q, Ayoob M, Dawood Z, Mirza SA. Recurrence rate with use of intraoperative mitomycin C versus conjunctival autograft following pterygium excision. *Pak J Med Sci*. 2014;30:1243–6.
17. Keklikci U, Celik Y, Cakmak SS, Unlu MK, Bilek B. Conjunctival-limbal autograft, amniotic membrane transplantation, and intraoperative mitomycin C for primary pterygium. *Ann Ophthalmol*. 2007;39:296–301.
18. Tananuvat N, Martin T. The results of amniotic membrane transplantation for primary pterygium compared with conjunctival autograft. *Cornea*. 2004;23(5):458–463.
19. Frucht-Pery J, Raiskup F, Ilsar M, Landau D, Orucov F, Solomon A. Conjunctival autografting combined with low-dose mitomycin C for prevention of primary pterygium recurrence. *Am J Ophthalmol*. 2006;141:1044–50.
20. Segev F, Jaeger-Roshu S, Gefen-Carmi N, Assia EI. Combined mitomycin C application and free flap conjunctival autograft in pterygium surgery. *Cornea*. 2003;22:598–603.
21. J Park, Y Son, E Suh. Effect of transverse conjunctival advancement flap surgery for primary pterygium. Canadian J Ophthalmol. 2016:41-9
22. Jaros PA, Delusia VP. Pingeucula and pterygia. Surv Ophthalmol. 188;33;41-9.

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ORIGINAL ARTICLE

Determining Effect of Filters on Color Vision and Contrast Sensitivity among Low Vision Patients: A Cross-Sectional Survey

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ABSTRACT

Objectives: To assess difference in readings of contrast sensitivity and color vision among low vision patients without filter and with yellow or pink filter, and also to check consistency in readings of contrast sensitivity and color vision.

Study design: A cross-sectional study.

Place and duration: Study was conducted in low vision department of Al-Shifa Trust Eye Hospital from 1st of November 2018 to 31st of January 2019.

Materials and Methods: Tow hundred and three patients having decimal visual acuity (>6/240=1.60 log-MAR) age ranged from 10-50 years (24.4±12.6), were included in the study. Diagnosis of each patient was enrolled provided by senior Ophthalmologist. Pelli-Robson contrast chart and AHRR color vision test were used for study. Procedure followed at first without using any filter then yellow filter and at the end with pink filter. Patient`s response was noted.

Results: Repeated measures ANOVA showed that contrast sensitivity and color vision were statistically different among without filter, yellow filter and pink filter (p-value<0.05). This pattern appeared similar for all readings i.e. right, left and both eyes. Intra-class correlation showed high agreement in contrast (0.92, p-value=0.0001) but in case of color vision medium agreement found.

Conclusion: Use of pink filter proved to be effective in increasing contrast color discrimination and also in providing soothing effect to eye among patients having reduced visual functions i.e. decreased contrast and defective color vision. *Al-Shifa Journal of Ophthalmology 2019; 15(3): 134-142. © Al-Shifa Trust Eye Hospital, Rawalpindi, Pakistan.*

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Introduction:

A patient with low vision is one who has visual impairment even after best available treatment (medical, surgical, optical) and who has visual acuity of <6/18 to no perception of light or visual field of 10˚ from center of fixation or 20˚ in largest diameter in better eye but who have potential to do activities of daily life[1]. Globally in 2010, 32.4 million people were blind and 191 million people had moderate to severe visual impairment (MSVI). The MSVI prevalence in older adults was highest in South Asia (23.6%), Oceania (18.9%), and Eastern and Western Sub-Saharan Africa and North Africa and the Middle East (15.9%-16.8%) [2].

Standardized prevalence of low vision in Pakistan was 1.7% and total blindness were 0.2%. In Pakistan an estimated 727,000 adult had low vision. It was estimated that 565,000 adults required assessment for optical services, 735,000 for non-optical intervention and 424,000 for rehabilitation[3]. The major causes of visual impairment are uncorrected refractive errors (43%) and cataract (33%); the commonest cause of blindness is cataract (51%). During 2010 visual impairment was a major global health issue: the preventable causes were as high as 80% of the total global burden[4]. Most common eye diseases or abnormalities causing visual impairment world-wide, include Macular Degeneration**,** Diabetic Retinopathy**,** Retinitis Pigmentosa**,** Amblyopia**,** Retinopathy of Prematurity (ROP),Retinal Detachment**,** Cataracts**,** Glaucoma**,** Acquired (Traumatic) Brain Injury[5,6].

According to National Eye Institute, open-angle glaucoma affects more than 2 million individuals in the United States. The number is expected to increase to more than 3 million by the year 2020 [7]. Majority of patients suffering from these diseases have reduced contrast and color vision. Both of these visual functions depend on binocular vision. Many psychophysical studies have shown that binocular facilitation enhances contrast sensitivity[5]. Contrast is a measure of the difference between the luminance of an object and the luminance of the area surrounding. The contrast sensitivity function "is a measure of contrast thresholds for a range of object sizes" [7]. The contrast sensitivity of patients with low vision is reduced which is important for normal visual functioning. Many activities are difficult to perform for patients with reduced contrast sensitivity such as reading low contrast print, or colored text on a colored background, walking in foggy or cloudy conditions or in dim light, and pouring milk into a white cup [8]. Color vision is the ability of an organism or machine to distinguish objects based on the wavelengths (or frequency) of the light they reflect, emit or transmit[6]. Color vision deficiency can be rehabilitated by tinted lenses. Tinted lenses for everyday use are not supposed to reduce visual acuity (VA) and contrast sensitivity (CS) and perception of colors. But to some extent with all tinted lenses the overall transmittance in the visible spectrum is reduced and the chromatic vision becomes altered to a greater or lesser degree. Filters with selected wavelengths are used against sunlight for protecting the retina and other ocular tissue, making a useful contribution towards low vision rehabilitation. They help to reduce light dispersion and chromatic aberration within the ocular media with an increase in the contrast of the retinal image. Based on the belief that assistive devices are vision enhancing they are being advertised and prescribed, especially orange and yellow tinted glasses[9].

Yellow filters have received the most research attention because of numerous claims by users such as pilots and skiers in haze and snow environments they improve visibility and reduce effects of glare and most beneficial in depth perceptions[10]. Blue light rays are cut by the yellow color, and it gives out a high luminous transmittance with a wavelength of 550 nm, to which human eye is very responsive and sensitive. Effect of yellow lenses on contrast sensitivity has been studied by different authors.

Pink filters mostly in its darkest density were felt to improve color perception[11]. It is also available as rose tint or magenta filter. The magenta or pink pigment or dye preferentially transmits light having the frequencies corresponding to a pink or magenta color, preferably from 380 to 520 nm and optimally from 390 to 470 nm[12].

In Comparison to previous studies, this study focused more on situations where colored filters would increase the contrast

between targets and background compared to a no filter condition. This study will help to evaluate the effectiveness of yellow and pink filter on contrast sensitivity and color vision in different diseases of low vision as no previous study gives quantitative measurement about it.

Materials and Methods:

A cross-sectional study was conducted from 1st November 2018 to 31st January 2019 on 203 patients with visual impairment in either eye with age range from 10-50 years (24.4±12.6), in low vision department of Al Shifa Trust Eye Hospital. Patients were recruited from retina clinic of Hospital to low vision department, in a convenient non-randomized fashion. Patients had been diagnosed with visual impairment in one eye or both due to an ocular pathology (e.g. retinal detachment, AMD, RP) or trauma. Only patients with visual acuity >6/240 (1.60 log-MAR) were selected for further analysis. Patients mentally handicapped and having visual acuity <6/240 were not included. Self-modified questioner used for data collection comprising 2 divisions; first part comprising questions regarding demographic data while second part contain responses with respect to contrast sensitivity and color vision. Pelli-Robson contrast sensitivity chart and AHRR American Hardy Rand Rattlers color vision test were used for study. Yellow and pink optical filters (custom made) used for comparing measurements.

First, demographic data was taken from patients. Following visual acuity measurement with ETDRs vision chart, contrast sensitivity was measured in room illumination by Pelli-Robson chart with full optical correction in place. The illumination level was not measured because light meter was not available; however, approximately the same level of illumination was used for each subject for the procedures. Each subject was asked to read triplet of letters starting from (0.00-2.25) on contrast chart at first with optical correction, and subsequently with each filter with existing optical correction in place. Contrast measured monocularly then with both eyes. Same procedure followed for color vision. Patients at first presented with demo plates and were asked to identify shapes if he/she is able to see. Mostly patients with complete defective color vision unable to identify any shape printed on demo plate. Those who were mild to moderate color blind were able to demonstrate any of shape printed on plates. Then filters applied one by one to check with which filter patient feels improvement in discrimination among colors and further identification of any shape. Patient`s response was noted for three choices without filter, with yellow filter or with pink filter. Patients were also asked question regarding eye comfort with either condition.

Descriptive variables analyzed by using frequencies and percentages and summarized in the table. Repeated measures ANOVA was used to compare for differences in mean scores of contrast sensitivity and color vision between three groups. Data analysis was done using SPSS version 17. The confidence level was set at 5% ($\alpha = 0.05$). The p value < 0.05 was considered statistically significant. All preliminary analysis was done to check the normality of data and for violation of any assumption for using parametric test of statistical significance. In the analysis of response higher number considered improvement while low number considered no improvement.

Ethical approval was taken from institutional research review committee of Al Shifa Trust Eye Hospital. Informed consent was reserved from all participants. Data of all patients was confidential not shared to any other patient. Filters used in the study did not cause any unsafe effects on the health of patient. Also there is no risk of using these filters.

Results:

A total of 203 patients were included in the study. Their demographic data including age, gender, education, systemic disorder, subjective preference for contrast and color vision is shown in table I.

Majority of patients in low vision department presented with retinal diseases. Patients had been categorized according to cause of low vision. Statistical tests repeated measures ANOVA and ICC intra class correlation allowed to compare readings for contrast sensitivity and color vision. Mean values for each condition are shown in table II.

Consistency among readings of contrast sensitivity (RE) with 3 raters i.e. without filter, yellow filter and pink filter were accessed with the help of intra-class correlation co-efficient. The results showed single measure ICC=0.92 (95% CI=0.89 to 0.94) p-value=0.0001. Almost all results of ICC showed same trend (Table III).

Table I: demographic and clinical data of participants

Variable	Groups	%(n)
Occupation	Indoor Outdoor Both	27 (55) 23 (46) 50 (102)
Gender	Male Female	66 (134) 34 (69)
Education	Illiterate Primary-middle Higher education	11.8(24) 59.6 (121) 28.6 (58)
Systemic disorder	Pregnancy Occulo-cutaneous albinism Diabetes Hypertension	1 (2) 7.4 (15) 7.4 (15) 7.9 (16)
Subjective preference for contrast	Without filter With Yellow filter With Pink filter	39.4 (80) 17.7 (36) 42.9 (87)
Subjective preference for color vision	Without filter Yellow Pink	46.8 (95) 15.8 (32) 37.4 (76)

Table II: Comparison of contrast and color vision with filter and without filter

CONTRAST SENSITIVITY				
Right Eye	**N**	**X± SD**	**P-value**	**Bonferroni test**
Without filter Yellow filter Pink filter	186	1.05±0.49 1.06±0.51 1.13±0.49	0.0001	Without-pink (p-value=0.0001) Yellow-pink (p-value=0.0001)
Left Eye	**N**	**X± SD**	**P-value**	**Bonferroni test**
Without filter Yellow filter Pink filter	193	1.06±0.47 1.07±0.49 1.14±0.48	0.0001	Without-pink (p-value=0.0001) Yellow-pink (p-value=0.0001)
Both Eyes	**N**	**X± SD**	**P-value**	**Bonferroni test**
Without filter Yellow filter Pink filter	203	1.09±0.46 1.09±0.48 1.16±0.47	0.0001	Without-pink (p-value=0.0001) Yellow-pink (p-value=0.0001)
COLOR VISION				
Right Eye	**N**	**X± SD**	**P-value**	**Bonferroni test**
Without filter Yellow filter Pink filter	203	0.55±0.54 0.53±0.62 0.74±0.73	0.0001	Without-pink (p-value=0.0001) Yellow-pink (p-value=0.0001)
Left Eye	**N**	**X± SD**	**P-value**	**Bonferroni test**
Without filter Yellow filter Pink filter	203	0.61±0.56 0.56±0.61 0.82±0.74	0.0001	Without-pink (p-value=0.0001 Yellow-pink (p-value=0.0001)
Both Eyes	**N**	**X± SD**	**P-value**	**Bonferroni test**
Without filter Yellow filter Pink filter	203	0.64±0.54 0.59±0.61 0.85±0.73	0.0001	Without-pink (p-value=0.0001) Yellow-pink (p-value=0.0001)

*Repeated measures ANOVA

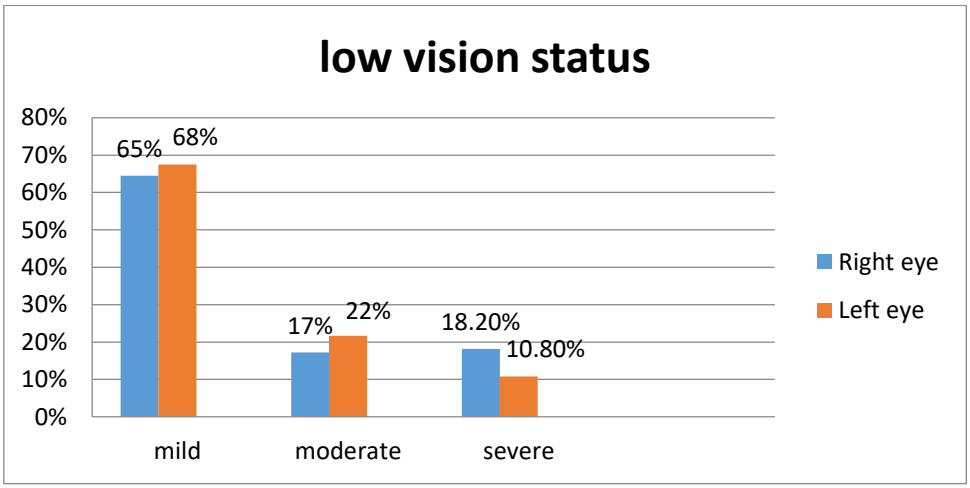

Figure 1: Low vision statuses

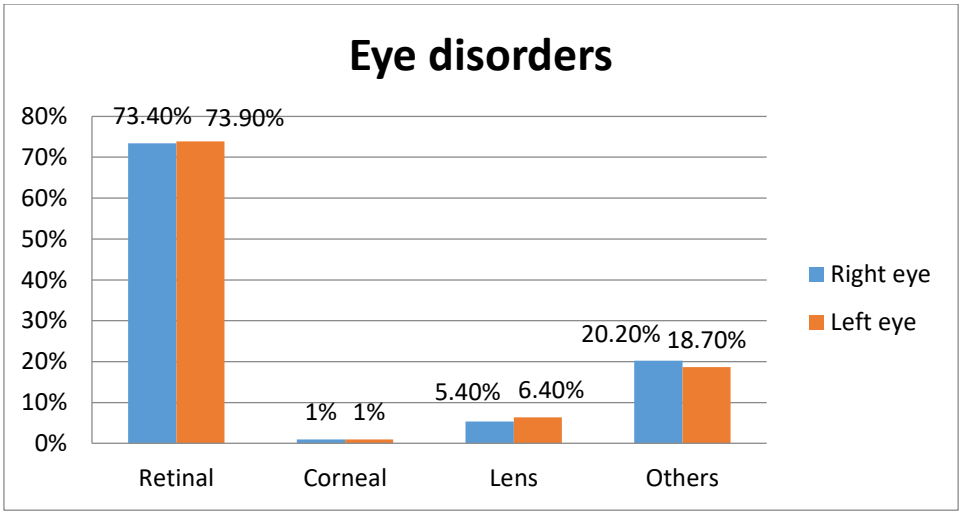

Figure 2: Eye disorders

Table III: ICC intra class correlation

Variables	Single measure ICC	95% CI	p-value
Contrast Right Eye Without filter Yellow filter Pink filter	0.92	0.89 to 0.94	0.0001
Contrast Left Eye Without filter Yellow filter Pink filter	0.91	0.88 to 0.93	0.0001
Contrast Both Eyes Without filter Yellow filter Pink filter	0.91	0.89 to 0.93	0.0001
Color vision Right Eye Without filter Yellow filter Pink filter	0.48	0.40 to 0.56	0.0001
Color vision Left Eye Without filter Yellow filter Pink filter	0.44	0.36 to 0.53	0.0001
Color vision Both Eyes Without filter Yellow filter Pink filter	0.43	0.35 to 0.52	0.0001

Discussion:

Filters are known to improve contrast and color vision. A total of 203 patients participated in the study, who reported symptoms of decreased contrast and color vision. Our results showed that low vision patients; presented with different diseases will benefit from filters because the subjects reported more positive responses hence less negative responses when viewing without filters. Although-- positive responses to pink filter were generally higher than yellow and without filter condition. Repeated measures ANOVA test which was used to establish the differences in means, revealed statistical difference i.e. without filter (1.09±0.46), yellow filter (1.09±0.48) and pink filter (1.16±0.47) p-value=0.0001. For color vision, statistical test (Repeated measures ANOVA) showed substantial difference i.e. without filter (0.64±0.54), yellow filter (0.59±0.61) and pink filter (0.85±0.73) p-value=0.0001. Results suggest that the best benefit of the pink filter was in contrast enhancement and color discrimination, also relates to the subjective comments that the pink filter was more comfortable during contrast and color vision testing than without filter.

There are two characteristics of the filter which may influence color vision and contrast; these are the color (hue) and the transmission value. It has been reported that short wavelength-absorbing lenses such as yellow improve print contrast, therefore improving print appearance by reducing intraocular light scattering[15]. In the present study, the colors and their transmission values which have the potential to provide the greatest benefits for enhancing contrast and color discrimination were pink 50%, yellow 50% in comparison with without filter condition. The filters preference may presumably be attributed to both the transmission values and colors of the filters, as there was no consistent relationship between filters preference and transmission values. Most of the retinal disorders if remain untreated leads to low vision. Retinal disorders commonly presented in low vision department include retinitis pigmentosa, high myopia, acquired macular degeneration, Stargardts disease, retinal detachment, diabetic retinopathy other than these congenital cataract and corneal opacity also included. In this study maximum patients presented with retinal disorders 73.9% (149). Out of which improvement in contrast with eye comfort was preferred by pink filter 45%, 15.4% for yellow (RE) and for (LE) pink filter 44.7% and yellow filter 15.3%. For color vision (RE) with eye comfort preference noted was 50.3% for without filter, 34.9% for pink filter. For (LE) 50%for without filter and 34.7% for pink filter.

In previous study 60 patients with retinal diseases participated. Series of NOIR filters were used to compare their effects. They were asked to choose filter on the basis of best contrast and eye comfort. Subjective preference was noted i.e. 25% for yellow and 13% for pink filter. Higher percentages with yellow filter were shown by patients with macular degeneration and glaucoma disease. But in our study higher percentages shown by pink filter [14]. In another study the effect of wearing yellow or pink filters on contrast acuity for achromatic stimuli as well as contrast sensitivity and visual search under test conditions where gratings and search stimuli contained chromatic and achromatic components were tested. Yellow filter ($p = 0.642$) partially fulfilled expectations. Achromatic contrast acuity and contrast sensitivity not improved but significant improvement in search times with the yellow filter at the higher ambient light level. In contrast the results with the pink filter completely fulfilled expectations ($p < 0.001$). Achromatic contrast acuity was not improved by wearing the pink filter but contrast sensitivity and visual search were[10]. Similar results also appeared in our study i.e. Improvement with pink filter was higher (1.16±0.47) p-value=0.0001. NT Makgaba and OA Oduntan in their study recorded percentage of positive responses

with Wilkins reading rate test with single and double overlays also without overlays, in patients with Occulo-cutaneous albinism. The percentage of positive responses without over- lay was 85.2%. Series of overlays were used. Mean and standard deviation for pink overlay is (46.6± 1.67) and for yellow overlay is (46.2±3.11). It shows preference for pink and yellow overlays. These results also support our study[13]. Most of the studies focused on yellow filters. A study conducted by Rosenblum showed 27–34% increase in contrast sensitivity function (CSF) for all frequencies, a marked reduction in glare sensitivity reduction of photophobia, eye-strain and eye discomfort with yellow filter[16]. Another study focused on filters that allow long wavelengths to pass through them. Filter with wavelength 511 most frequently improved VA followed by 527 and 550 respectively[17]. Results also support our results. Study conducted by Mahjoob, M showed that, contrast sensitivity decrease with red and yellow filter rather than without filter while there was not significant difference between visual acuity with and without colored filter[18]. But according to our results there was no decrease in contrast sensitivity.

Conclusion:

Contrast sensitivity testing and color vision is part of regular eye examination as it gives some additional information regarding any serious pathology that has to be managed and treated at an early stage to preserve sight. The present study showed that for pink filter mean for contrast sensitivity (1.16±0.47) was higher in comparison with without filter (1.09±0.46) and yellow filter (1.09±0.48). For color vision our results also support pink filter (0.85±0.73) p-value=0.0001. Hence it can be concluded that pink filter is beneficial for patients having reduced visual functions i.e. decreased contrast and defective color vision.

Recommendations:

As pink filter is mostly not in trial in low vision department, practitioner should be aware about its functioning benefits. It is necessary for the Low vision practitioners to give trial of pink filter also. Trial should not be specified to the low vision patients but it should also be recommended to the general eye departments, in patients complaining of decreased contrast and color vision.

References:

1. Change the Definition of Blindness. WHO study group; 1972. http://www.who.int/blindness/change%20the%20Definition%20of%20Blindness.pdf.
2. Bourne RR, Stevens GA, White RA, Smith JL, Flaxman SR, Price H, Jonas JB, Keeffe J, Leasher J, Naidoo K, Pesudovs K. Causes of vision loss worldwide, 1990–2010: a systematic analysis. The lancet global health. 2013;1(6):e339-349.
3. Gilbert CE, Ellwein LB. Prevalence and causes of functional low vision in school-age children: results from standardized population surveys in Asia, Africa, and Latin America. Investigative Ophthal Vis Sci. 2008;49(3): 877-881.
4. Pascolini D, Mariotti SPM. Global estimates of visual impairment: 2010. British Journal Ophthalmology Online First published December 1, 2011 as 10.1136/bjophthalmol-2011-300539.
5. Anzai A, Bearse MA, Freeman RD, Cai D. Contrast coding by cells in the cat's striate cortex: monocular vs. binocular detection. Visual neuroscience. 1995;12(1):77-93.
6. Gouras P. Color vision[internet]. The organization of the retina and visual system [Cited 2019 February 04]. Available from: http//webvision.med.utah.edu/book/part-vii-color-vision/color-vision/
7. Liere SV. Contrast sensitivity [internet]. CPOA [Cited 2019 April 22].

Available from: http://www.aoa.org/Documents/optometric-staff/Articles/Contrast-Sensitivity.pdf
8. Ahmad A, Sughra U, Habib MK, Imran M. Contrast Sensitivity Improvement with Yellow Filter in Low Vision Patients. Isra Med J. 2017;9(6):402-405.
9. De Fez MD, Luque MJ, Viqueira V. Enhancement of contrast sensitivity and losses of chromatic discrimination with tinted lenses. Optometry and vision science. 2002;79(9):590-597.
10. Kuyk TK, Garcia PV, McLin LN, Kent JF. Effects of colored filters on visual function. 2008 May. Availablefrom:https://pdfs.semanticscholar.org/430f/98d9feb60299e11133372402330287bc64b9.pdf
11. Improving color vision with lenses for colorblind [internet]. Colblindor [cited 2019 March 12]. Available from: http://www.colorblindness.com/2008/03/29/improving-color-vision-with-lenses-for-the-colorblind/
12. Telemicroscope apparatus [internet]. Edwards optical corporation [Cited 2019 March 10]. Available from:https://patents.google.com/patent/US7911710.
13. Makgaba NT, Oduntan OA. Perceived effects of coloured overlays on reading material in persons with albinism. South Afr Opt. 2008;67(3)118-124.
14. Kitchel EH. Colored light and low vision [internet]. Texas school for the blind and visually impaired [Cited 2019 March 02]. Available from: https://www.tsbvi.edu/colored-light-and-low-vision
15. Khan S, Jay WM. Colored Filter Lens Preferences in Low Vision Patients. Invest Ophthalmol Vis Sci. 2008;49(13):4113-
16. Rosenblum YZ, Zak PP, Ostrovsky MA, Smolyaninova IL, Bora EV, Dyadina UV, Trofimova NN, Aliyev AG. Spectral filters in low-vision correction. Ophthalmic and Physiological Optics. 2000 Jul;20(4):335-41.
17. Leat SJ, North RV, Bryson H. Do long wavelength pass filters improve low vision performance?. Ophthalmic and Physiological Optics. 1990 Jul;10(3):219-24.
18. Mahjoob M, Heravian J, Validad M, Momeni Moghadam H, Hosini T, Tavakoli R. The effect of color filters on the visual acuity and contrast sensitivity in low vision patients. J Babol Uni Med Sci. 2010 Jan 10;11(6):53-7.

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