



ORIGINAL ARTICLE

Etiology and Management of Epiphora in an Underserved, Minority Population

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Abstract

Purpose: There is value in understanding the common etiologies of epiphora within different patient populations as well as identifying barriers to adequate treatment and symptom relief. The primary goal of the study is to report common etiologies of epiphora and the impact of treatment in patients of a large, inner-city hospital.

Methods: This is a retrospective review of 10 years of data from the charts of five hundred and sixteen adult patients presenting to a single inner-city ophthalmology clinic with complaints of epiphora. The most common diagnoses and interventions linked to this symptom were evaluated. Subjective symptom improvement and adherence to follow-up were also analyzed.

Results: Three hundred (58.1%) patients carried a diagnosis of dry eye syndrome (DES) and, of these, 40.1% did not have other ocular findings to explain their epiphora. Conservative management (CM) was recommended to the majority (86.4%) of the study population. Of 357 patients that received CM as the only intervention, 27.5% reported symptom improvement. Of patients that underwent DCR, 90.1% reported symptom improvement. Nearly half of patients were lost to follow-up.

Conclusion: Epiphora is a common symptom that may be multifactorial in etiology, making effective treatment a challenge. Reflex tearing secondary to ocular surface dryness was the most common etiology linked to epiphora in this study. Low rates of follow-up limit the ability to fully assess the impact of current interventions on symptoms. Addressing the socioeconomic barriers that lower patient adherence to follow-up should allow more effective treatment of epiphora.

clinics. The disorder, though often benign, can greatly impact patients' vision-related quality of life. This has been shown to be particularly true with outdoor activities, computer work, and activities involving downward gaze, such as reading and using stairs [1-3]. The visual disability in some patients with epiphora has been compared to that in patients awaiting cataract surgery [2,3]. Other non-visual symptoms and social impacts of epiphora have been reported, such as "spattered glasses", periorbital irritation, and feelings of embarrassment [4].

There are several etiological factors that, alone or in combination, may contribute to the development of epiphora. It often occurs secondary to reflex hypersecretion from ocular surface disease and may present in the absence of other symptoms, such as burning and foreign body sensation [5-7]. Alternatively, it may be a consequence of poor tear drainage secondary to obstruction of or trauma to the nasolacrimal system. Anatomic factors, such as eyelid malposition or laxity, may also result in epiphora, particularly in older populations [8-11]. Importantly, patients presenting with tearing may have more than one etiology contributing to their symptoms [7,12,13].

The potential for epiphora to have multiple causes is important to consider when assessing management options and efficacy of treatment. Considering its multifactorial nature, obtaining a comprehensive history and physical exam is paramount to ensure accurate diagnosis and proper intervention. In some cases, persistent tearing may warrant extensive work-

Introduction

Epiphora, or excessive tearing of the eye, is a common complaint in ophthalmology and oculoplastic



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up and imaging to diagnose uncommon masses [14-17]. Misdiagnosis and lack of follow-up may result in vision-threatening complications, such as dacryocystitis. The work-up and treatment of this disorder can be multi-faceted, which may lead to provider and patient frustration when proposed interventions fail. The motivation behind effective treatment of epiphora is to improve patient comfort and quality of life. Additionally, follow-up in these patients is necessary to assess symptom improvement and evaluate the need for subsequent testing or intervention.

Despite the high prevalence and multifactorial nature of this complaint, large cohort studies presenting a comprehensive analysis of the various etiologies of epiphora, as well as the efficacy of various interventions, are lacking. These studies would be helpful, particularly in underserved, minority populations where socioeconomic barriers to proper intervention and follow-up should be readily identified and addressed. A retrospective chart review was performed with two aims. The first was to identify the most common diagnosis linked to epiphora in patients presenting to an inner-city ophthalmology clinic within a large, safety-net hospital. The second aim was to assess follow-up rates and symptom improvement in this population following various surgical and non-surgical interventions.

Methods

We performed a retrospective chart review of all patients presenting to a single ophthalmology clinic at Boston Medical Center (BMC) between January 2008 and June 2019 with complaints of “epiphora” based on *International Classification of Diseases* (ICD) codes. The following ICD-10 codes were used: H04.2, .20, .201, .202, .203, .22, .229, .209, .219, .211, .212, .213, .222, .223. We obtained IRB approval prior to the onset of data collection and the study was HIPAA-compliant. Patients were included if they met the following criteria: (1) diagnosed or presented with symptoms of unilateral or bilateral epiphora, (2) evaluated for epiphora by a BMC ophthalmologist or optometrist, (3) age 18 years or older at time of initial presentation. Exclusion criteria included: (1) no mention of epiphora or tearing in chart notes, (2) incomplete or ambiguous documentation (e.g., tearing mentioned in history but no mention in assessment/plan or subsequent notes).

Chart review was completed by two independent reviewers. Data extracted included patient demographics, clinical presentation, relevant ocular and medical history, exam findings, surgical and non-surgical interventions, and subjective response following intervention. Patients were defined as having “complete” nasolacrimal duct obstruction (NLDO) if canalicular probe and irrigation resulted in 100% reflux and absence of oropharyngeal fluid. “Functional” NLDO was defined as less than 100% reflux on irrigation and presence of oropharyngeal fluid. Patients with history of

dry eye syndrome (DES) and no other ocular history or exam findings to explain their epiphora were considered to have dry eye-related reflex tearing. “Conservative management” included the use of artificial tears and warm compresses. Eyelid surgeries classified as “other” included: Mohs reconstruction, gold weight eyelid implants, or non-specific “lid surgeries” performed outside the country. Patients who were lost to follow-up (LTF) automatically fell under the “N/A” cohort in regard to symptom improvement unless symptom improvement had been documented prior to loss to follow-up.

All collected data was organized and analyzed using Microsoft Excel 2011 (Redmond, Washington). Descriptive statistics were presented as raw numbers and percentage for nominal variables. Statistical differences between groups were analyzed using Pearson’s Chi-squared test for categorical factors. A P-value under 0.05 was considered statistically significant. Of note, statistical analysis excluded patients falling under “N/A” categories.

Results

A total of 1072 patients presenting with epiphora symptoms were seen between January 2008 and June 2019. Of these, 628 adult and pediatric patients met the first two inclusion criteria. Final study population included 516 adults. There were 190 (36.8%) males and 326 (63.2%) females (male-to-female ratio of 0.58). The median age was 61 (range: 18-96) years. In the population studied, 189 (36.6%) of patients were African American and 110 (21.3%) were Hispanic (Table 1).

Table 1: Demographic information of adult patients presenting with epiphora.

Demographic	Number of Patients	Percent
Gender		
Male	190	36.8
Female	326	63.2
Age		
18-30	25	4.8
31-50	120	23.3
51-70	228	44.2
71+	143	27.7
Ethnicity		
African American	189	36.6
Hispanic	110	21.3
White American	94	18.2
Haitian Creole	42	8.1
Asian American	27	5.2
Cape Verdean	17	3.3
Native American	1	0.2
Pacific Islander	1	0.2
N/A	31	6.0

Table 2: The most common ocular symptoms reported in patients complaining of epiphora.

Symptom	Number of Patients	Percent
Irritation	169	32.8
Pruritus	129	25.0
Redness	65	12.6
Pain	64	12.4
Blurred vision	52	10.1
Discharge	52	10.1
Crusting	26	5.0
Photophobia	19	3.7
Lid swelling	15	2.9
None	190	36.8

Of the 516 patients, 143 reported unilateral epiphora (14.3% and 13.4% for right eye (OD) and left eye (OS), respectively); 373 (72.3%) reported bilateral epiphora. Symptoms were more often chronic, lasting months in 146 (28.3%) patients and years in 166 (32.2%) patients. The majority (63.2%) of patients reported additional ocular symptoms with irritation (32.8%), pruritus (25.0%), or redness (12.6%) being the most common (Table 2). Three hundred (58.1%) patients carried a diagnosis of dry eye syndrome (DES) and, of these, 207 (40.1%) did not have NLDO, eyelid malposition, or other ocular history to explain their epiphora. Of patients with history of DES, 248 (82.7%) were treated for epiphora with conservative management (CM) only and, excluding those lost to follow-up, 72 (66.7%) reported symptom improvement with CM alone. Additional relevant ocular history was reported in 145 (28.1%) patients, most commonly pinguecula/pterygium (14.1%) and ocular trauma (7.6%). A minority (21.7%) of patients had medical history considered to be relevant to their symptoms, with the most common being thyroid disease (8.7%) and obstructive sleep apnea (OSA) (7.0%) (Table 3). A total of 179 (34.7%) patients were either current or former smokers, with the percentage of current smokers comparable to the average in Massachusetts over the same time frame (12.6% v. 14.7%, respectively; $P=0.17$) [18]. Nearly a quarter (22.5%) of patients had a history of cataract surgery.

On slit lamp exam, 299 (57.9%) patients had evidence of blepharitis or meibomian gland dysfunction (MGD). Thirty (5.8%) patients had conjunctivochalasis, 56 (10.9%) had ectropion, and 7 (1.4%) had entropion. A total of 47 (9.1%) patients had punctal stenosis and 122 (23.6%) were diagnosed with NLDO. Of those with NLDO, the majority (62.3%) had complete obstruction.

Approximately half (52.9%) of the study population had referral to and evaluation by oculoplastics. Of these, 17 (13.3%) denied symptom resolution despite treatment. Overall, symptom resolution was reported more often by patients evaluated and treated by oculoplastics (39.9% v. 25.9%, $P < 0.001$).

Table 3: Pertinent medical, ocular, and surgical history of the study population.

	Number of Patients	Percent
Ocular History		
Dry Eye Syndrome	300	58.1
Pingueculum/Pterygium	73	14.1
Trauma	39	7.6
Lagophthalmos	20	3.9
Allergic conjunctivitis	16	3.1
Floppy Eyelid Syndrome	10	1.9
Thyroid Eye Disease	5	1.0
Exophthalmos	4	0.8
Keratoconjunctivitis sicca	2	0.4
N/A	371	71.9
Relevant Medical History		
Thyroid disease	45	8.7
Obstructive Sleep Apnea	36	7.0
Facial nerve palsy	20	3.9
Sinusitis	20	3.9
Cancer (on chemotherapy)	16	3.1
Rosacea	7	1.4
Sarcoidosis	5	1.0
Smoking History		
Current	65	36.3
Former	114	63.7
No	327	63.4
N/A	10	1.9
Lacrimal Surgery		
Dacryocystorhinostomy	18	3.5
Punctoplasty	8	1.6
Lacrimal duct repair	2	0.4
Nasolacrimal stents	1	0.2
Lid Surgery		
Blepharoplasty	6	1.1
Ectropion repair	3	0.6
Ptosis repair	2	0.4
Entropion repair	0	0

Table 4: Distribution of surgical and non-surgical interventions performed.

	Number of Patients	Percent
Intervention		
Conservative management	446	86.4
Dacryocystorhinostomy	63	12.2
Ectropion repair	20	3.9
Punctal plugs	18	3.5
Nasolacrimal duct stent	16	3.1
Punctoplasty	11	2.1
Conjunctivodacryocystorhinostomy	4	0.8
Entropion repair	2	0.4

The majority (86.4%) of the study population received CM as part of their treatment regimen. Of 357 (69.2%) patients that received CM as the only intervention, 98 (27.5%) reported symptom improvement. In terms of procedures and surgical intervention, 16 (3.1%) patients had nasolacrimal duct (NLD) stent placement, 11 (2.1%) underwent punctoplasty, and 63 (12.2%) underwent DCR. A minority of patients underwent ectropion (3.9%) and entropion (0.4%) repair (Table 4). A total of 231 (44.8%) patients were LTF, with no significant difference in LTF rate among the four age groups. About half (54.8%) of patients were omitted from analysis of symptom improvement due to lack of documentation regarding symptom persistence or resolution on follow-up. Of the remaining 233 patients, 61 (26.2%) denied symptom improvement. Following any intervention, 172 (73.8%) patients reported symptom improvement, higher than the values seen in prior reports [13,19]. Of patients who underwent DCR, 90.1% reported symptom improvement – a value similar to that seen in prior reports [20,21].

Discussion

Epiphora is a presenting complaint that is familiar to both general ophthalmology and oculoplastic clinics. This complaint, though relatively benign, significantly impacts patient comfort, quality of life, and daily activities. The multifactorial nature of epiphora can make treatment more challenging, particularly in patient populations with poor adherence to interventions or follow-up visits. In the present study, nearly half of patients did not present to subsequent appointments. The predictors of patient “no-shows” have been studied extensively across multiple specialties, with particular emphasis on age, race, income level, and insurance status [22-26]. The diversity of this study cohort is evidenced by the relatively low percentage of White Americans (18.2%), with over half of patients identifying as African American or Hispanic. Unfortunately, the literature demonstrates the high rates of patient absenteeism in urban health centers, similar to Boston Medical Center, that serve predominantly low-income and minority populations [27-30]. The link between missed appointments and poor outcomes, particularly in minority and underserved populations, has been demonstrated time and again [27,31]. Low follow-up rates may be affected as well by the reality that patients with improvement in their symptoms may be less motivated to present to subsequent appointments. Interventions to improve patient follow-up in the future will allow a more comprehensive and accurate review of symptom improvement in these underserved populations.

Similar to prior reports, this study found that middle- and older-aged adults are more likely to present with epiphora [12,19,32]. The population had a mean age of 61 years, with only one-quarter of patients falling between

18-50 years old. Prior studies have suggested that older-aged adults present more commonly with multifactorial epiphora, which is more challenging to treat and less likely to fully resolve following interventions [12,19]. This could explain the lower percentage of patients reporting symptom improvement in the oldest age bracket (age 71+) relative to the other age groups, despite similar LTF rates. The study population had a slight female predominance with no significant association between gender and LTF.

A range of symptoms were reported in association with epiphora. The most common of these was pruritus, followed by redness and irritation. Interestingly, although over half of patients had a history of DES, dryness and foreign body sensation were not commonly reported symptoms. In this cohort, ocular surface dryness was a common cause of epiphora as nearly half of patients did not have other findings to explain their symptoms and the majority of patients with this diagnosis reported symptomatic improvement with CM alone. Regarding prior ocular surgeries, about one-quarter of patients had history of cataract extraction. Epiphora secondary to DES is not uncommon following cataract surgery [33]. However, in the present study, it is not possible to establish correlation between cataract extraction and epiphora without further delineation of timeline and chronicity as well as adjustment of confounders, such as patient age.

Despite the long-standing nature of epiphora in the majority of patients, only half were evaluated by oculoplastics. This may reflect low referral rates, patients’ lack of interest in surgical interventions, or poor adherence to referral appointments. Overall, patients evaluated and treated by oculoplastics were more likely to report symptom improvement. Again, this could reflect, to some degree, patient adherence to treatment and follow-up appointments.

In recent years, there have been a handful of studies published that explore the causes of epiphora. Despite similarity in the data among some of these studies, there is no general consensus as to the most common etiology [7,19,34]. Select studies make the point of emphasizing the multifactorial nature of epiphora [13]. Epiphora attributed to dry eye-related reflex tearing varies in the literature from about 20% to 80% [19,34,35]. This variability can be attributed to discrepancies in confirmation of the diagnosis, particularly if studies rely on patient follow-up and resolution of symptoms with conservative treatment [7,13,19,36]. Other factors to consider include the clinic (general ophthalmology versus oculoplastics) and population characteristics (e.g., age, health literacy). One would expect a higher proportion of DES at a general ophthalmology clinic, with obstructive pathology or lid malposition more often warranting referral to plastics [35]. When considering variations in the study population, a cohort

of older adults may have a higher proportion of DES and a cohort of patients with high health literacy may be less likely to present for dry eye symptoms that can be managed with over-the-counter lubricant eye drops. Finally, studies have also reported the potential for DES to cause NLDO, in which case patients whose epiphora is attributed to one diagnosis may, in fact, be attributed to both [37].

Limitations

It is important to consider the role that language plays in adherence to recommendations and follow-up visits. Language barriers shape the patient experience and can impact health outcomes in patients with Limited English Proficiency (LEP) [38,39]. Some studies demonstrate poor medical comprehension in patients with LEP, despite communication in their primary language via interpreter services or language-concordant physicians [40]. While the present study does not include data regarding patient language, about thirty percent of patients at Boston Medical Center do not speak English as their primary language. Further studies can be done to investigate how socioeconomic factors such as ethnicity, language, education, and employment contribute to patient willingness to proceed with surgical interventions for epiphora. These barriers are likely also impacting patient adherence to conservative management (e.g. ability to purchase artificial tears).

The significant portion of patients that were lost to follow-up leads to one limitation to this study. Another is potential underrepresentation of patients with epiphora symptoms that may not have fallen under the ICD-10 codes used. For example, under 10% of patients in this cohort had OSA and under 2% had floppy eyelid syndrome (FES). In reality, one would expect a higher proportion of patients presenting with epiphora have a component of FES, with underlying OSA [41]. Providers, in this case, may have excluded the code for “epiphora” and used only that for FES. Similarly, patients with thyroid disorders and thyroid eye disease likely have significant dry eye-related reflex tearing that may be missed in this limited search [42]. Finally, patients with entropion and ectropion in this cohort were fewer than expected: 1.4% and 10.9%, respectively. Eyelid malposition is a well-documented and relatively common etiology for excess tearing in patients, particularly in older populations. It is likely that patients with codes only for eyelid malposition were missed.

The multifactorial nature of epiphora makes diagnosis and treatment a challenging prospect. Considerations must be given to contributing systemic medical problems, eyelid position and tone, eyelid and ocular surface inflammation, dry eye/keratopathy, and nasolacrimal malposition or blockage. Efforts to increase patient understanding will likely positively impact treatment compliance. The minority and low-income populations presenting to safety-net hospitals

are particularly vulnerable to under-treatment for a variety of reasons. These range from limited English and medical proficiency to high cost of treatment or limited transportation to visits. Barriers should be further identified to increase follow-up and treatment success as well as improve quality of life in patients suffering from epiphora.

Conclusion

Epiphora is a common symptom and can be multifactorial in etiology, at times requiring multiple office visits for adequate symptom management. This study found reflex tearing to be the most common diagnosis linked to epiphora among patients presenting to a large inner-city clinic. The majority of patients treated and followed in this cohort reported symptom improvement with intervention, particularly after surgical interventions such as DCR. Issues with patient adherence to follow-up remain prevalent, particularly in underserved and minority populations. Addressing the socioeconomic barriers that lower patient adherence to follow-up should allow more effective treatment of epiphora.

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