Clinical -to- Pathological Correlation of Lacrimal Sac Specimens Obtained During Dacryocystorhinostomy Surgery

Original Article

Reem Mohsen Mohamed[1], Radwa Mohammed Nabil[1], Yasser Abdelmaguid Elzankalony[1], Ahmed Mohey El Din Zaki[2] and Sherif Sabry Elwan[1]

[1]Department of Ophthalmology, [2]Department of pathology, Faculty of Medicine, Ain Shams University, Cairo, Egypt

ABSTRACT

Purpose: To correlate the clinical data to the histopathological characteristics of lacrimal sac and bone specimens in adult patients undergoing indicated external transcutaneous dacryocystorhinostomy surgery (DCR) for primary acquired nasolacrimal duct obstruction (PANDO) in order to determine the important clinical parameters that may necessitate selective lacrimal biopsy in certain situations.

Methods: This is non-comparative, non-controlled descriptive case series study with histopathological correlation. Lacrimal sac and bone specimens for each case were collected during DCR from consecutive patients with PANDO presenting to the outpatient clinic of "Ain Shams University" hospitals, then sent for histopathological examination.

Results: Fifty-one lacrimal specimens were obtained from a total of 49 consecutive patients who underwent external DCR for clinical PANDO at the time interval from March 2018 to March 2020 at "Department of Ophthalmology, Ain Shams University" operating theatre. The mean patients' age was 44.82± 13.63 years (range 21- 75). Among the 49 patients recruited, 6 (12.2%) were males and 43 (87.8%) were females. Non -specific lacrimal sac pathology was present in all 51 samples (3.9% acute inflammation and 96.1% chronic non-specific inflammation). Of the chronic non-specific inflammation specimens, mild degree of inflammation was seen in 40.8%, 44.9% showed moderate chronic inflammation, whereas only 14.3% showed severe inflammatory changes. Observing the histopathological findings of lacrimal sac and bone specimens in our series showed that the inflammation and capillary proliferation were more evident in lacrimal sac specimens especially in moderate and severe cases (*p-value* <0.01 and 0.03 respectively). The only two clinical parameters that were strongly correlated with the severity of inflammation are the intraoperative appearance of the sac and the presence of a lacrimal fistula with *P-value* (<0.01).

Conclusions: Lacrimal sac biopsy specimens should not be routinely sent for histopathological assessment after DCR surgery, except for atypical clinical presentation or wary intraoperative appearance. In such situations, lacrimal sac rather than bone specimens should be obtained, being more indicative and revealing of the underlying lacrimal pathology. The most important clinical parameter that strongly correlates with histopathological features is the intraoperative sac appearance. Chronic non-specific inflammation is the most common histopathological feature found in lacrimal biopsy specimens obtained during DCR surgery.

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Key Words: Chronic inflammation; clinical to histopathological correlation; dacryocystitis; lacrimal duct obstruction; lacrimal sac biopsy.

Corresponding Author: Reem Mohsen Mohamed, MSc, Department of Ophthalmology, Faculty of Medicine, Ain Shams University, Cairo, Egypt, **Tel.**: +201 115149972, **E-mail:** reemmohsen89@med.asu.edu.eg, reem.mohsen.89@hotmail.com

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INTRODUCTION

Lacrimal drainage system obstruction causing lacrimation, mucoid or mucopurulent discharge, medial angular tender swelling, recurrent lacrimal sac inflammation, and even orbital infection is a common ophthalmic complaint in daily practice.[1] Primary acquired nasolacrimal duct obstruction (PANDO) is defined as a condition of idiopathic inflammation and subsequent fibrosis eventually leading to nasolacrimal duct obstruction[2] On the other hand, secondary acquired nasolacrimal duct obstruction (SANDO) is the result of lacrimal malignancy, systemic inflammatory disease, infection, or trauma. Although neoplasms that affect the lacrimal drainage system are infrequent, they are potentially life-threatening. Hereby, early diagnosis and proper management are of utmost clinical importance.[3]

Nasolacrimal duct obstruction is surgically managed with DCR, using either external or endonasal approach. The role of routine biopsy of the lacrimal sac after DCR remains controversial, with many publications in scientific literature recommending both for[4-10] and against it.[11-16]

This prospective study correlated the clinical data to the histopathological characteristics of lacrimal sac and bone specimens in adult patients undergoing indicated external transcutaneous DCR for PANDO to determine if lacrimal biopsy should be obtained routinely or only indicated in special circumstances where pathology other than chronic inflammation is suspected pre and/or intraoperatively. Moreover, this study added to our knowledge more about the nature and prevalence of lacrimal sac non-specific and specific pathological features in Egyptian population.

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PATIENTS AND METHODS

Participants

In this non-comparative, non-controlled descriptive case series study with histopathological correlation, fifty-one lacrimal specimens were obtained from a total of 49 consecutive patients who underwent external DCR for clinically presumed PANDO at the time interval from March 2018 to March 2020 at "Department of Ophthalmology, Ain Shams University" operating theatre. Inclusion criteria included adult patients undergoing indicated external transcutaneous DCR for acquired NLDO, lacrimal mucocele, lacrimal pyocele or any acquired aetiology. Patients were excluded from this study if clinical examination results showed any abnormalities suggestive of secondary nasolacrimal duct obstruction such as a mass extending above the medial canthal tendon, bloody tears, reflux of blood on irrigation or repeat surgery for failed DCR. Informed consents were obtained from the patients enrolled in the study after explaining the procedure to be performed and the aim of the study. This study was conducted in accordance with the ethical standards stated by the Ethical Committee of Ain Shams University and was compliant and adhered to the tenets of the Declaration of Helsinki.

Methods

No sex predilection was recommended. All patients were subjected to the following work-up preoperatively:

1. Full history taking which included medical, surgical and ocular, all to confirm the presence of predisposing conditions, previous history of dacryocystitis and duration and grading of epiphora according to Munk scale.[17]
2. Complete lacrimal drainage system examination including:
    a. Lacrimal sac inspection to assess for the presence of mucocele or pyocele.
    b. Lacrimal sac palpation to assess for the presence of lacrimal sac stones.
    c. Digital expression of the lacrimal sac contents using cotton tipped applicator.
    d. Fluorescein dye disappearance test (DDT) using a moistened fluorescein strip to instill fluorescein into the conjunctival sac of each eye. Patients were instructed not to wipe their eyes. Intensity of residual fluorescein stain in the conjunctival sac after 5 minutes was used to grade the tear drainage insufficiency. Excess residual stain suggested delayed clearance and lacrimal system obstruction[18]
    e. Irrigation of the lacrimal system to specify the level of lacrimal drainage obstruction.[19]
    f. If irrigation revealed an obstruction in the lacrimal outflow system, diagnostic probing using Bowman's lacrimal probes was performed to confirm the level of obstruction. Under topical anesthesia, one of the puncta was dilated, and appropriately sized lacrimal probe was gently introduced along the canaliculus till it reached a stop. Hard stop confirmed the presence of nasolacrimal duct obstruction (NLDO) while soft stop indicated canalicular obstruction.[19]
3. Slit lamp examination for all patients to assess the presence of eye lid disorders causing epiphora such as entropion as well as to rule out the presence of punctal stenosis.
4. ENT consultation to exclude intra-nasal pathology as nasal polyps or deviated nasal septum.
5. All patients underwent standard external DCR under general anesthesia. Moreover, a mixture of lignocaine 2% with adrenaline (5 micrograms/ml) was used for local infiltration of the lacrimal sac and nasal mucosa to minimize intraoperative bleeding. The skin is incised for 2.5 cm inferiorly from a point midway between the medial canthal angle and the nasal bridge with downward dissection till reaching the periosteum. It was then incised and reflected toward the anterior lacrimal crest. Using Freer elevators, the fascia surrounding the lacrimal sac was gently dissected from the entire lacrimal sac fossa. This required cutting the inferior portion of the medial canthal tendon. Inferiorly the neck of the sac was exposed where it entered the nasolacrimal canal. The thin lacrimal bone was perforated, and rongeurs were used to resect the bone of the lacrimal sac fossa, anterior lacrimal crest, and some bone medial to the crest. An opening of at least l0 X 10 mm was created with all this bone being collected for further histopathologic evaluation. The lacrimal sac mucosa was incised along its full length using Bard Parker blade into H-shaped anterior and posterior flaps. The biopsy technique involved taking mucosa from the fundus of the sac, as a strip from the postromedial side down, to and including the point of obstruction within the nasolacrimal duct, where the mucosa was more than needed for flap creation.[20]
6. Biopsy specimens (posterior lacrimal sac flap measuring about 4×4 mm and two lacrimal fossa bony fragments each measuring 5×5 mm) were examined by the same pathologist under light microscopy after being fixed in 10% neutral buffered formalin, paraffin embedded, and stained with conventional histological stains (hematoxylin and eosin, H&E).

7. Correlation between the clinical lacrimal variables including history of acute or chronic dacryocystitis, duration of epiphora, grading of epiphora based on Munk score, grading of DDT, presence of mucocele or pyocele, regurgitation of sac contents, probing and irrigation, intra operative sac appearance and presence of sac calculi and the histopathological findings of lacrimal sac and bone specimens to determine the important clinical parameters that may recommend lacrimal biopsy.

Statistical analysis

All analyses were performed using SPSS version 25 statistical software program for windows (SPSS Inc., South Wacker Drive, Chicago, USA) and Microsoft Excel 2020. Qualitative variables were described in terms of numbers and percentages, while quantitative variables were described in terms of means and standard deviation (SD). Associations between the qualitative variables were evaluated using the Pearson chi-squared test. The one-way analysis of variance (ANOVA) test was used to determine whether there were any statistically significant differences between the means of two or more independent groups. The Mann-Whitney U test was used to compare differences between two independent groups when the dependent variable is either ordinal or continuous. The Kruskal-Wallis H test was used to determine statistically significant differences between more than two groups of an independent variable. *P-values* less than 0.05 were considered statistically significant.

RESULTS

In this non-comparative, non-controlled descriptive case series study with histopathological correlation, fifty-one cases (lacrimal sac and lacrimal bone per each) were obtained from a total of 49 consecutive patients. The cases included 43 females (87.8%) and 6 males (12.2%). The mean age of study group was 44.82 ± 13.63 with a range between 21 – 75 years. Two of the 49 patients with lacrimal duct obstruction were bilateral cases (4.08%).

Twelve (23.5%) of the cases had at least one attack of acute dacryocystitis, two (3.9%) had 2 attacks and three (5.9%) had 3 or more. Fifteen (29.4%) cases had swellings over the lacrimal sac with features consistent with mucoceles, while pyocele was found only in 4 (7.8%) cases. According to the nature of the lacrimal discharge, two (3.9%) cases showed copious purulent discharge, whereas 23 (45.1%) cases showed mucopurulent discharge. Five (9.8%) cases showed epiphora with clear fluid and 21 (41.2%) cases showed negative results on lacrimal sac regurge test. Of the 51 cases recruited in this study, 47 (92.2%) had complete NLDO, whereas 4 cases (7.8%) were diagnosed as having partial obstruction of the lacrimal passages.

Fluorescein dye disappearance test was graded as 0 if there was no residual dye, 1 if there was minimal residual dye, 2/3 determined by repeated observation and experience and 4 if there was no decrease in dye intensity after 5 minutes of instillation.[18] According to DDT, two (3.9%) cases showed grade I, sixteen (31.4%) showed grade II, thirty-two (62.7%) showed grade III and only one case showed grade IV results. None of the cases showed lacrimal sac calculi. Munk score by history taking was graded as 0 if there was no epiphora, 1 if there was epiphora requiring dabbing less than twice per day, 2 if there was epiphora requiring dabbing 2-4 times per day, 3 if there was epiphora requiring dabbing 5-10 times per day, 4 if there was epiphora requiring dabbing more than 10 times per day and 5 for constant epiphora.[17] Using Munk score to grade for the degree of epiphora, most of the cases (51.0%) were grade 4 with rest of the cases ranging from grade 1 to 3. Duration of epiphora for cases recruited in this study ranged from 2 to 60 months with interquartile range of 24 months. During the surgery, forty-three (84.3%) of the sacs were grossly normal, four (7.8%) sacs were fibrotic while four (7.8%) sacs showed lacrimal fistula.

Pathological Findings: The lacrimal sac and nasolacrimal duct mucous membrane forms one continuous sheet. It is composed of two-layered epithelium (columnar and basal cells) integrated with goblet cells either in the form of individual cells or intraepithelial mucous glands. Therefore, this epithelium generally appears as a pseudostratified epithelium. The lamina propria of the lacrimal sac and nasolacrimal duct also contains two layers: a loose connective tissue rich with elastic fibres and many lymphatic cells, and a dense venous plexus situated under the loose connective tissue.[21] Normal histology was not found in any of the present study cases. Non- specific lacrimal sac pathology was present in all 51 specimens including varying degrees of acute and non-specific non-granulomatous chronic inflammation, whereas no specific lacrimal sac pathology was found in any of the cases. Distribution of inflammation types among study specimens is shown in (Figure 1). Acute inflammation was confirmed by the presence of neutrophils, while chronic inflammation by macrophages, lymphocytes and plasma cells.

All the chronic inflammation specimens were further examined for specific histopathological features (inflammatory cell infiltration, fibrosis and capillary proliferation) and subsequently graded according to their severity (mild=1, moderate=2, and severe=3). These are: 1) The intensity of inflammatory cell infiltration (number of lymphocytes, macrophages and plasma cells in a HPF): mild<50 cells, moderate 50-200 cells, severe>200 cells; 2) The density of fibrosis (the amount of fibrotic tissue in a HPF): mild <25%, moderate 25%-50%, severe>50%; 3) The degree of capillary proliferation (number of capillary vessels in a HPF): mild<5, moderate 5-10, severe>10. All specimens with chronic inflammation displayed the three features simultaneously. When the lacrimal sac specimens were stratified according to their intensity, 26 (53.1%) had mild, 13 (26.5%) had moderate and 10 (20.4%) had severe inflammatory cell infiltration. In this study, the density of fibrosis was mild in 21 (42.9%) cases, moderate in 20

(40.8%) cases and severe in 8 (16.3%) cases. The degree of capillary proliferation was found to be mild in 40 (81.6%) cases and moderate in 9 (18.4%) cases with no severe cases reported in our study. Comparing the histopathological features between lacrimal sac and lacrimal bone specimens showed statistically significant difference regarding the inflammatory cell infiltration and the degree of capillary proliferation being more evident in lacrimal sac specimens especially in moderate and severe cases as shown in (Table 1).

Thus, a total score was obtained for each case ranging from 1 to 9 and named "chronic inflammatory score" (CIS). Finally, every case was grouped according to its CIS of the sac or the bone specimen (whichever is higher) as: mild chronic inflammation (CIS<3), moderate chronic inflammation (3<CIS<6) and severe chronic inflammation (CIS>6) as shown in (Table 2, Figure 2).

Correlation between CIS and demographic data as well as lacrimal variables was found to be statistically insignificant as shown in (Tables 3,4). Direct proportion was found only between the severity of inflammation and the intraoperative appearance of the sac or the presence of a lacrimal fistula with *P-value* (<0.01).

Correlation between CIS and surgical outcome of the cases was found to be statistically insignificant as shown in (Table 5). Some of our study histopathological sections are shown in (Figures 3-6).

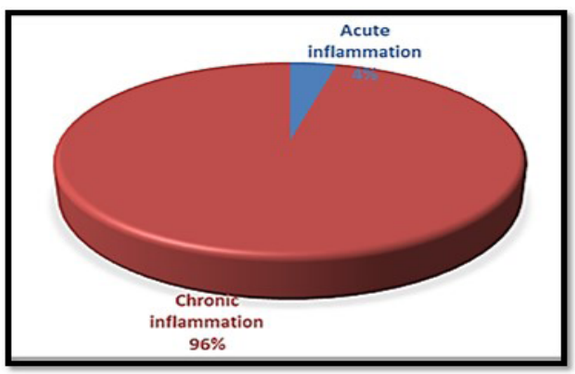

Fig. 1: Distribution of inflammation types among study specimens

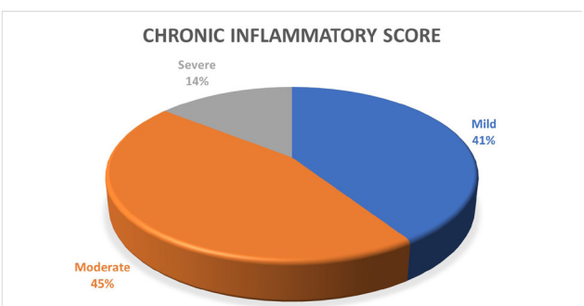

Fig. 2: Chronic inflammatory score grading in the chronic inflammation specimens

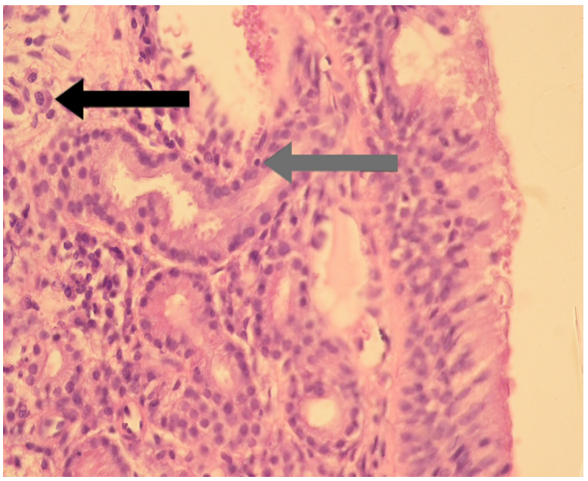

Fig. 3: Mild chronic inflammation of lacrimal sac and lacrimal duct with mild fibrosis and vascular proliferation (black arrow: plasma cells, grey arrow: lymphocytes) (H&E.X 200)

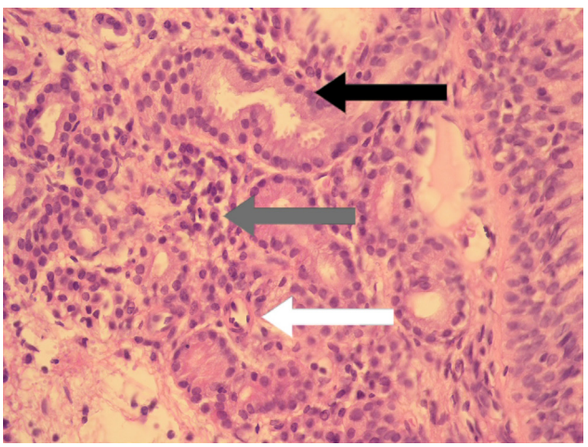

Fig. 4: Moderate chronic inflammation of the lacrimal gland, mild vascular proliferation and mild fibrosis (black arrow: lacrimal acini lined with epithelial cells, grey arrow: plasma cells, white arrow: capillaries lined by endothelial cells) (H& E. X 200).

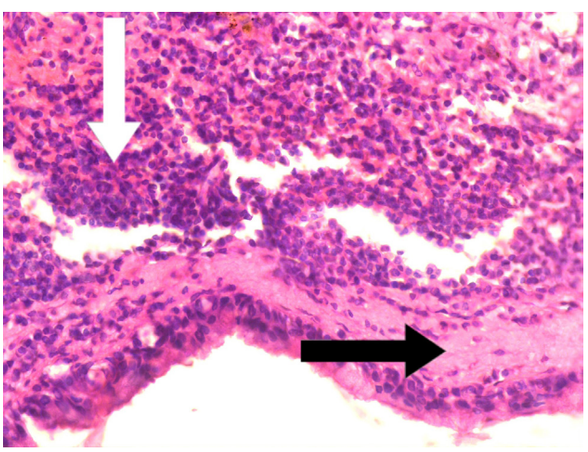

Fig. 5: Lacrimal duct with severe chronic inflammation, and mild fibrosis (white arrow: heavy lymphocytic infiltration, black arrow: mild fibrosis) (H&E.X 200).

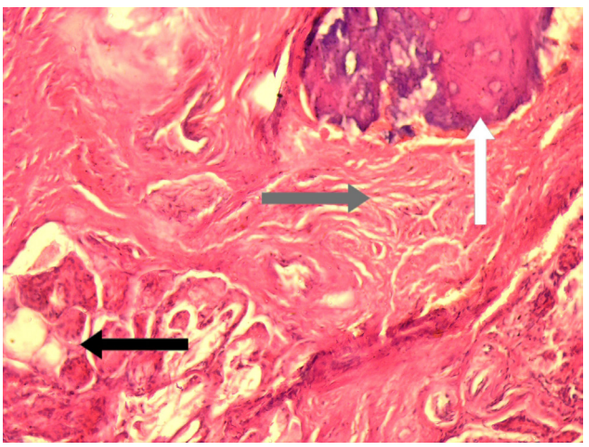

Fig. 6: Necrotic bone fragment, severe fibrosis, mild chronic inflammation, and mild vascular proliferation (white arrow: partial necrotic bone without osteocytes and osteoblastic rimming, grey arrow: severe fibrosis, black arrow: lacrimal acini) (H&E. X100)

Table 1: Comparison of histopathological features between lacrimal sac and lacrimal bone specimens

		Sac pathology	Bone pathology	Test value	*P-value*
		No. = 49	No. = 49		
Inflammatory cell infiltration	Mild	26 (53.1%)	48 (98.0%)	26.904	0.000
	Moderate	13 (26.5%)	0 (0.0%)		
	Severe	10 (20.4%)	1 (2.0%)		
Density of fibrosis	Mild	21 (42.9%)	30 (61.2%)	3.339	0.188
	Moderate	20 (40.8%)	14 (28.6%)		
	Severe	8 (16.3%)	5 (10.2%)		
Degree of capillary proliferation	Mild	40 (81.6%)	43 (87.8%)	11.508	0.003
	Moderate	9 (18.4%)	1 (2.0%)		
	Severe	0 (0.0%)	5 (10.2%)		

Table 2: Chronic inflammatory score in 49 lacrimal specimens obtained during DCR

CIS	Total no. = 49
Median (IQR)	4 (2 – 6)
Range	0 – 8
Mild	20 (40.8%)
Moderate	22 (44.9%)
Severe	7 (14.3%)

Table 3: Correlation between CIS and demographic data. (Here we correlated the demographic data with the number of patients not specimens)

		CIS			Test value	*P-value*	Sig.
		Mild	Moderate	Severe			
		No. = 20	No. = 20	No. = 7			
Age	Mean ± SD	47.15 ± 13.35	40.90 ± 11.52	50.43 ± 16.45	1.854•	0.169	NS
	Range	27 – 75	21 – 65	21 – 65			
Sex	Female	18 (90.0%)	17 (85.0%)	6 (85.7%)	0.242*	0.886	NS
	Male	2 (10.0%)	3 (15.0%)	1 (14.3%)			

*: Chi-square test; •: One Way ANOVA test

Table 4: Correlation between CIS and different lacrimal variables

		CIS			Test value	*P-value*	Sig.
		Mild	Moderate	Severe			
		No. = 20	No. = 22	No. = 7			
Laterality	Right	10 (50.0%)	9 (40.9%)	4 (57.1%)	1.742*	0.783	NS
	Left	10 (50.0%)	12 (54.5%)	3 (42.9%)			
	Both	0 (0.0%)	1 (4.5%)	0 (0.0%)			
Grading of epiphora according to Munk score	Grade 1	3 (15.0%)	2 (9.1%)	2 (28.6%)	2.451*	0.874	NS
	Grade 2	5 (25.0%)	4 (18.2%)	1 (14.3%)			
	Grade 3	2 (10.0%)	4 (18.2%)	1 (14.3%)			
	Grade 4	10 (50.0%)	12 (54.5%)	3 (42.9%)			
Duration of Epiphora (months)	Median (IQR)	18 (12 – 36)	24 (12 – 24)	24 (6 – 36)	0.529≠	0.767	NS
	Range	2 – 60	2 – 48	2 – 36			
Previous attacks of dacryocystitis	Absent	15 (75.0%)	11 (50.0%)	2 (28.6%)	11.492*	0.175	NS
	1 attack	3 (15.0%)	6 (27.3%)	3 (42.9%)			
	2 attack	0 (0.0%)	2 (9.1%)	0 (0.0%)			
	3 attacks or more	1 (5.0%)	2 (9.1%)	0 (0.0%)			
Lacrimal regurge test	Pyocele	1 (5.0%)	1 (4.5%)	2 (28.6%)	6.991*	0.322	NS
	Negative	7 (35.0%)	10 (45.5%)	3 (42.9%)			
	Positive, clear	4 (20.0%)	0 (0.0%)	1 (14.3%)			
	Positive MP	9 (45.0%)	10 (45.5%)	3 (42.9%)			
	Positive, pus	0 (0.0%)	2 (9.1%)	0 (0.0%)			
DDT	Grade 1	2 (10.0%)	0 (0.0%)	0 (0.0%)	8.912*	0.179	NS
	Grade 2	7 (35.0%)	9 (40.9%)	0 (0.0%)			
	Grade 3	11 (55.0%)	12 (54.5%)	7 (100.0%)			
	Grade 4	0 (0.0%)	1 (4.5%)	0 (0.0%)			
Mucocele	Absent	13 (65.0%)	16 (72.7%)	5 (71.4%)	0.311*	0.856	NS
	Present	7 (35.0%)	6 (27.3%)	2 (28.6%)			
Mucocele duration (months)	Median (IQR)	12 (6 – 36)	9 (4 – 24)	24 (12 – 36)	1.459≠	0.482	NS
	Range	1 – 48	4 – 24	12 – 36			
Lacrimal sac calculi	Absent	20 (100.0%)	22 (100.0%)	7 (100.0%)	–	–	–
Probing and Irrigation test	Partial NLDO	2 (10.0%)	2 (9.1%)	0 (0.0%)	0.737*	0.692	NS
	Complete NLDO	18 (90.0%)	20 (90.9%)	7 (100.0%)			
Intraoperative appearance	Grossly normal	19 (95.0%)	20 (90.9%)	3 (42.9%)	20.360*	0.000	HS
	Fibrotic sac	0 (0.0%)	0 (0.0%)	3 (42.9%)			
	Fistula	1 (5.0%)	2 (9.1%)	1 (14.3%)			

*Chi-square test; ≠: Kruskal-Wallis test

Table 5: Correlation between CIS and surgical outcomes

		CIS			Test value	*P-value*	Sig.
		Mild	Moderate	Severe			
		No. = 20	No. = 22	No. = 7			
Surgical outcome	Satisfactory	19 (95.0%)	21 (95.5%)	7 (100.0%)	0.353*	0.838	NS
	Non satisfactory	1 (5.0%)	1 (4.5%)	0 (0.0%)			

*: Chi-square test

DISCUSSION

The value of routine lacrimal sac biopsy during DCR has been a matter of debate among literature in the past two decades. Some publications recommended routine lacrimal sac biopsy since lacrimal sac tumours are mostly malignant in nature and may mimic PANDO in presentation. This may lead to late diagnosis and improper management in the course of the disease with high mortality rate.[4-10]

Alternatively, other studies supported selective biopsy of the lacrimal sac at the time of DCR. Those authors recommended biopsy for histopathological examination only in cases where malignancy was suspected preoperatively, or where there was atypical lacrimal sac appearance intra-operatively. Routine histopathological evaluation is expensive, with surgical pathologic charges ranging from $250 to $480 for each surgical specimen obtained as indicated in a previous review in scientific literature.[11-16] There is no previously published studies among Egyptian population regarding histopathological cost effectiveness of lacrimal sac specimens. However, the average histopathologic charges in non-governmental centres ranged from 800 to 1200 L.E.

In this study, we correlated the clinical data to the histopathological characteristics of lacrimal sac and bone specimens in adult patients undergoing indicated external transcutaneous DCR for PANDO to determine if lacrimal biopsy should be obtained routinely or only indicated in special circumstances where specific pathology other than chronic inflammation is suspected pre and/or intraoperatively. Moreover, this prospective study added more to our knowledge about the nature and prevalence of lacrimal sac non-specific and specific pathologic features in Egyptian patients presented to tertiary care centre over 2 years.

To our knowledge, this is the first study to be conducted on Egyptian population and to add the histopathological features of lacrimal bony specimens to the routinely studied lacrimal sac specimens.

In the present study, among 49 patients with NLDO, 6 (12.2%) were males and 43 (87.8%) females, with a mean age of 44.82 ± 13.63 years. The prevalence of PANDO is well known to be higher among female gender due to narrow diameter of the bony nasolacrimal canal.[22] Our study demographic data are in accordance with many previously published results.[23,24]

The present study is based on a consecutive series of lacrimal biopsy specimens obtained from patients with PANDO and submitted to a single pathology laboratory (Faculty of Medicine, Ain Shams University). Most of the study specimens showed non-specific non- granulomatous chronic inflammation, whereas specific lacrimal sac pathology was not found in any of the biopsied cases. Those findings are consistent with many previously published series.[6,13,15,16,20,25,26]

Observing the histopathological findings of lacrimal sac and bone specimens in our series showed that the inflammation and capillary proliferation were more evident in lacrimal sac specimens especially in moderate and severe cases (*p-value* <0.01 and 0.03 respectively) while density of fibrosis was comparable between sac and bone specimens (*p-value* 0.188). Therefore, obtaining lacrimal sac specimens is more indicative and revealing of the underlying lacrimal passages diseases.

We correlated between the lacrimal variables obtained clinically including laterality, history of acute or chronic dacryocystitis, duration of epiphora, grading of epiphora based on Munk score, grading of DDT, presence of mucocele, nature of regurged sac contents, probing and irrigation test results, intra operative sac appearance and presence of sac calculi and the histopathological findings of lacrimal specimens to determine the important parameters that may necessitate biopsy in certain situations.

The present study showed that the only lacrimal variable strongly correlated with the severity of the underlying inflammation is the intraoperative lacrimal sac appearance with *P-value* <0.01. The presence of a fibrotic sac or lacrimal fistula was associated with moderate to severe chronic inflammation.

Demographic data and other clinical lacrimal variables were not significantly correlated with the underlying pathological findings with *P-value* >0.05.

In the present study, the role of chronic inflammation on DCR outcome was also evaluated, using histopathological features of chronic inflammation such as inflammatory cell infiltration, fibrosis and capillary proliferation. Surgical outcome was classified as satisfactory or non-satisfactory based on improvement of tearing symptoms or patient's satisfaction. There was no significant correlation between the degree of inflammation and fibrosis in lacrimal specimens and the postoperative surgical outcome in our patients.

There is still a lack of consensus in the current literature regarding routine histopathology sampling of the lacrimal sac during DCR. Some publications recommended routine lacrimal sac biopsy.[4-10]

In Linberg and McCormick series, 14 of 16 biopsies showed inflammation and fibrosis, and the remaining two showed granulomatous inflammation consistent with sarcoidosis and chronic lymphocytic leukaemia, respectively.[4] Anderson *et al*, reviewed 377 lacrimal sac biopsies from 316 patients. Only 17 specimens (4.5%) were detected as neoplasms, with eight (2.1%) cases unsuspected prior to surgery.[6]

In 2012, a prospective series of 599 patients undergoing external DCR found eight neoplastic specimens (1.34%), six of which were without clinical signs, symptoms, or intraoperative appearance suggestive of an underlying lacrimal sac tumour.[8]

In 2018, Rauter *et al*. performed a retrospective study of 218 DCR patients and reported five neoplasms (2.3%), all of which were unsuspected. Despite the low incidence of neoplasm in this series, those findings appeared to support routine biopsy of the lacrimal sac during DCR surgery.[9]

In 2020, Banks *et al*. reviewed the histopathology of 769 nasolacrimal specimens, obtained from 654 consecutive patients undergoing endoscopic DCR over a 30-year period. Pathological findings showed inflammation in 73.6%, normal histology in 19.1%, granulomatous inflammation in 1.0%, and neoplastic process in only 0.9%. Patient's history, preoperative CT scan, and intraoperative findings caught the surgeon's attention to the probability of an uncommon diagnosis in 12 of the 15 patients.[10]

Alternatively, other studies supported the idea of selective lacrimal sac biopsy in certain situations during DCR surgery.[11-16]

Lee-Wing *et al*. observed no cases of neoplasm in 202 lacrimal sac biopsies, and therefore they questioned the role of routine lacrimal sac biopsy during DCR surgeries[11]

Bernardini *et al*. reviewed 302 lacrimal sac biopsies based on risk factors. Evidence of systemic disease or neoplasia of the lacrimal sac was present in 10 patients which had a abnormal gross appearance of the lacrimal sac and/or a known pre-existing systemic disease. They concluded that lacrimal sac biopsy in patients undergoing DCR should be performed only in those with a positive history for systemic disease or an abnormal appearing lacrimal sac during surgery.[12]

Merkonidis *et al*. reported a single case of neoplasm (transitional cell papilloma) in a series of 193 consecutive lacrimal sac biopsies during endoscopic DCR. They concluded that lacrimal sac biopsy was a low-yield procedure that was only indicated if there were a reason to suspect any other pathology than chronic inflammation.[13]

Amin *et al*. reviewed 33 cases. Non -specific lacrimal sac pathology was present in all of them. Moderate chronic inflammation was found in 81.8% of the cases, whereas 12.12% showed severe inflammatory changes. Mild chronic inflammation was seen in 6.06%.[16]

The results of the present study suggest that to minimize the risk of overlooking specific pathology it is important to inquire about clinical symptoms and history of pre-existing underlying systemic disease, to assess the lacrimal sac pre and intraoperatively, and to collect biopsy of the lacrimal sac when underlying specific pathology is suspected. Our results are in accordance with many previously published series that also suggested selective biopsy in certain situations.[11-16]

One potential limitation of the current study is the small sample size. Another limitation is the fact that obtaining a representative biopsy of the lesion is sometimes challenging. Tumour or any other specific pathological process may not be presented in the biopsy specimen if a peripheral or inadequate specimen is taken. Therefore, lacrimal biopsy may yield a false-negative result or a misdiagnosis of chronic inflammation. In addition, intra-operative normal appearance of the lacrimal sac is not an absolute guarantee that the sac is devoid of any specific pathological process. In the early course of lacrimal sac tumours, lacrimal sacs may appear grossly normal even in the eyes of experienced ophthalmic plastic surgeons.[26]

Further studies may be required with a larger sample size, more representative biopsy and taking into account more challenging cases.

ABBREVIATIONS

DCR: Dacryocystorhinostomy, **PANDO:** Primary acquired nasolacrimal duct obstruction, **CIS:** Chronic inflammatory score, **SANDO:** Secondary acquired nasolacrimal duct obstruction, **NLDO:** Trachomatis Nasolacrimal duct obstruction, **DDT:** Dye disappearance test, **H&E:** Hematoxylin and Eosin, **SD:** Standard deviation, **ANOVA:** The one-way analysis of variance.

CONFLICT OF INTERESTS

There are no conflicts of interest.

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الملخص العربى

دراسة إكلينيكية باثولوجية لعينات الكيس الدمعي التي تم الحصول عليها أثناء عملية توصيل الكيس الدمعي بالتجويف الأنفي

ريم محسن محمد[١]، رضوي محمد نبيل[١]، ياسر عبد المجيد الزنكلوني[١]، أحمد محي الدين زكي[٢]، شريف صبري علوان[١]

[١]قسم طب وجراحة العين، [٢]قسم الباثولوجي، كلية الطب، جامعة عين شمس

الهدف: يعد انسداد القنوات الدمعية والذي ينتج عنه كثرة الدموع والافرازات المخاطية والألم والالتهابات المتكررة بسطح العين واحدة من أهم الاعراض التي يمكن ان يشتكي منها المريض في عيادات طب العيون.
وقد يحدث إنسداد القنوات الدمعية إما نتيجة مشكلة خلقية منذ الولادة أو نتيجة التهابات او صدمة أو أمراض مناعية او أورام بالقناة الدمعية أو تلقائي بدون أسباب. وعلي الرغم من أن الأورام التي تصيب القنوات الدمعية تعد نادرة الحدوث إلا أنها خطيرة ومهددة للحياة ويجب تشخيصها في مرحلة مبكرة حتي يتسني علاجها بصورة سليمة. وقد تم اكتشاف أكثر من ٤٠٠ نوع من الأورام التي تصيب الكيس الدمعي وأغلبها ليست اوراما حميدة.
المواد والطرق: إن الجراحة المثالية لإنسداد القنوات الدمعية يعتمد علي توصيل الكيس الدمعي بتجويف الأنف عن طريق إزالة بعض من العظام والاغشية المخاطية الفاصلة بينهما.
وقد اختلفت الاراء في الدراسات العلمية الحديثة حول وجوب أخذ عينة من الكيس الدمعي أثناء هذه الجراحة ما بين مؤيد لحتمية ذلك في كل حالة نظرا لارتفاع نسبة اعداد المصابين بأورام الكيس الدمعي والتي قد تصل الي ٤٠ ٪ والتي لن يتم اكتشافها مبكرا الا عن طريق تحليل عينة الكيس الدمعي ومعارض لحتمية هذه الطريقة نظرا لما تفرضه من أعباء مادية زائدة وقصرها فقط علي الحالات المشتبه بإصابتها بمثل هذه الأورام.
حددت هذه الدراسة العلاقة بين الصفات الهستوباثولوجية المتنوعة لعينات الكيس الدمعي المأخوذة أثناء عملية توصيل الكيس الدمعي بالتجويف الأنفي والأعراض الإكلينيكية المختلفة لمرضي انسداد القنوات الدمعية المكتسب.
النتائج: لقد تضمنت هذه الدراسة ٥١ عينة تم الحصول عليها أثناء عملية توصيل الكيس الدمعي بتجويف الأنف ل ٤٩ مريضا مصابا بانسداد القنوات الدمعية الأولي. أظهرت جميع العينات وجود درجات مختلفة من الالتهابات الحادة والمزمنة غير المحددة. اتضح من التحليل الهيستوباثولوجي للعينات وجود علاقة قوية بين شدة الالتهابات ومظهر الكيس الدمعي أثناء العملية بينما لم يتضح وجود أي علاقة بين درجة الالتهابات والمتغيرات الإكلينيكية الأخري مثل التاريخ المرضي السابق للمريض فيما يتعلق بوجود التهابات سابقة مزمنة أو الفحص بالمصباح الشقّي للعُين أو الضغط على الكيس الدمعي لمعرفة طبيعة الافرازات التي يحتويها أونتائج إختبار ممرات القناة الدمعُية بصبغة الفلورسُين أو حقن محلول داخل القناة الدمعُية أو تسلُيك القناة الدمعُية.
الخلاصة: وبمقارنة النتائج الهيستوباثولوجية لعينات الكيس الدمعي بنتائج عينات العظم المكونة للقناة الدمعية تبين أن التغيرات المرضية تتضح بشكل أكبر في عينات الكيس الدمعي عن مثيلاتها من العينات العظمية مما يثبت أن عينات الكيس الدمعي تكون مثمرة بشكل أكبر في تحديد نوعية المرض الموجود في النظام الدمعي.
وعليه، فإن هذه الدراسة لا توصي بوجوبية أخذ عينات من الكيس الدمعي للتحليل الهيستوباثولوجي في جميع الحالات وإنما فقط في الحالات التي يتضح بها وجود تاريخ مرضي أو متغيرات اكلينيكية أو مظهر للكيس الدمعي أثناء العملية ذي طبيعة شائكة.