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3 **Results of endoscopic endonasal dacryocystorhinostomy: a prospective**
4 **cohort study**

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13 **Abstract**

14 **Objective:** To evaluate the success rate of endoscopic endonasal
15 dacryocystorhinostomy.

16 **Method:** The prospective cohort study was conducted at the Ophthalmology and
17 Otorhinolaryngology departments, Shifa Foundation Community Health Centre,
18 Islamabad, Pakistan, from October 2017 to September 2019, and comprised chronic
19 dacryocystitis patients who underwent endoscopic endonasal dacryocystorhinostomy.
20 Endoscopic dacryocystorhinostomy with or without lacrimal intubation was performed
21 under general anaesthesia. The patients were followed up post-operative at 1 week, 1
22 month, 6 months and 12 months. Data was analysed using SPSS 20.

23 **Results:** Of the 47 patients, 41(87.2%) were females. The overall mean age was
24 40.70±10.84 years (range: 25-66 years). Lacrimal intubation was performed in
25 31(66%) patients. Surgical success was achieved in 46(97.9%) patients. Of them,
26 37(78.7%) patients were completely symptom-free, while 9(19.1%) were partially
27 symptomatic and were managed conservatively. Treatment failure requiring repeat

28 surgical procedure was the case with 1(2.1%) patient. Procedure failure was more
29 likely in patients with previous attacks of acute dacryocystitis (p=0.003).

30 **Conclusion:** Endoscopic dacryocystorhinostomy was found to be a safe procedure
31 with good anatomical and functional outcomes in chronic dacryocystitis patients.

32 **Key Words:** Chronic dacryocystitis, Dacryocystorhinostomy, DCR, Epiphora,
33 Endoscopic endonasal, Intubation.

34

35 **Introduction**

36 Dacryocystorhinostomy (DCR) is the treatment of choice in the management of
37 nasolacrimal duct (NLD) obstruction in adult patients^{1,2}. The obstruction is bypassed
38 by creating an opening between the medial wall of the lacrimal sac and the lateral wall
39 of the middle meatus of the nasal cavity. The procedure, first explained in early 20th
40 century, has undergone many modifications since then, and the technique has changed
41 in almost a century from external DCR to non-endoscopic endonasal surgery and then
42 to modern-day endoscopic endonasal DCR³.

43 Different techniques have been employed to improve surgical success rates of DCR,
44 including intraoperative application of mitomycin-C⁴, intubation of lacrimal
45 passages^{5,6} and post-operative topical drugs, including steroids and leukotriene
46 antagonists⁷ etc.

47 Although initially the success percentage for conventional external approach DCR was
48 superior to endonasal techniques, advancements in surgical equipment and more
49 meticulous surgical techniques have led to comparable success rates of endonasal non-
50 endoscopic and endoscopic DCRs^{8,9}. Endoscopic DCR is cosmetically more
51 acceptable with no surface scar having less risks of bleeding, giving early post-
52 operative recovery and being a safer procedure in terms of preserving the lacrimal
53 pump mechanism¹⁰. It is now considered an alternative to external DCR in both adult
54 and paediatric patients^{11,12}.

55 The current study was conducted to investigate the results and success rate of
56 endoscopic endonasal DCR in patients with epiphora secondary to chronic
57 dacryocystitis.

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59 **Patients and Methods**

60 The prospective cohort study was conducted from October 2017 to September 2019 at
61 the Ophthalmology and Otorhinolaryngology departments of Shifa Foundation
62 Community Health Centre, Islamabad, Pakistan. After approval by the institutional
63 ethics review committee, the sample size was calculated using a formula in line with
64 literature¹³. As no recent or old local epidemiological study was found related to the
65 incidence of acquired NLD obstruction, the prevalence was taken as 3.1%, which was
66 the average of two studies reporting adult chronic dacryocystitis (0.79%)¹⁴, and
67 paediatric NLD obstruction (5.8%)¹⁵. Confidence interval (CI) was kept at 95%, alpha
68 value at 0.05, standard normal variate at 1.96, and absolute precision was at 0.05.

69 The sample was raised non-probability convenience sampling technique from among
70 those visiting the out patient departments (OPDs). Those included were patients aged
71 >16 years who were scheduled for endoscopic DCR surgery for chronic dacryocystitis.
72 Those with previous history of intranasal surgery, history of unsuccessful external
73 DCR on the affected side, inflammatory diseases of the conjunctiva that predispose to
74 epiphora, chronic sinusitis and secondary nasolacrimal passage obstruction due to
75 nasal trauma or maxillectomy etc. were excluded.

76 After taking written informed consent, demographic and clinical data were collected
77 using a specially-designed proforma. History of acute dacryocystitis and any previous
78 probing and syringing was noted. A detailed nasal and ophthalmic examination was
79 performed. Preoperative clinical features, like mucocele, deviated nasal septum,
80 epiphora, purulent discharge, patency status of lacrimal puncta on slit lamp
81 biomicroscope and findings on regurgitation test, were documented.

82 Endoscopic endonasal DCR was performed under general anaesthesia. All surgeries
83 were performed by experienced ear, nose, throat (ENT) surgeons with surgical

84 experience of >5 yrs. Preoperative 1ml lidocaine with epinephrine was injected in the
85 axilla of the middle meatus, and nasal packs with adrenaline 1:100,000 were applied
86 for 5 minutes. A rigid nasal endoscope was used. Incision was made at the anterior
87 aspect of frontal process, 2 horizontal and 1 vertical, with blade size 15, and the
88 lacrimal bone was exposed after elevating the mucoperiosteal flap. Kerrison punches
89 45°, 90° were used for bone-cutting. The lacrimal sac was exposed and a window was
90 made in the medial aspect. Lacrimal puncta dilation and syringing was performed. The
91 decision for lacrimal intubation was made depending on the surgeons' preferences,
92 difficulty in dissection, adhesions and the size of the ostium. Polyfax eye ointment was
93 applied at the local site at the completion of the procedure.

94 Post-operative treatment regimen included oral antibiotics, oral antihistamines and
95 non-steroidal anti-inflammatory drugs (NSAIDs) for one week, steroid antibiotic eye
96 drops tobramycin + dexamethasone 4 times a day and nasal moisturizers / emollients
97 for 2 weeks.

98 The follow-up was planned at post-operative 1 week, 1 month, 6 months and 12
99 months with documentation of epiphora, purulent discharge, need for syringing, nasal
100 adhesions on rigid endoscopy, etc. Patients who failed to maintain follow-up were
101 contacted through telephone and were asked about the presence of symptoms, like
102 epiphora or discharge etc. Nasal endoscopy was performed post-operatively in all
103 patients. Lacrimal tubes were endoscopically removed after 6 months in all except one
104 patient in whom it was accidentally pulled out by the patient who then cut the tube at
105 home. Surgical procedure was categorised as successful when patients were totally
106 asymptomatic till the last follow-up. Partial success was considered if they had few or
107 negligible symptoms but were satisfied by the surgical outcome. Procedure failure was
108 indicated by purulent discharge, persisting symptoms or post-surgery recurrence.

109 Data was analysed using SPSS 20. Mean \pm standard deviation (SD) were calculated
110 for quantitative variables, like age, while frequency and percentages were worked out
111 for qualitative variables, like gender. Pearson's chi square test was used to see the

112 effect of various demographic and clinical parameters on surgical success rate. $P < 0.05$
113 was taken as significant.

114

115 **Results**

116 Of the 47 patients, 41(87.2%) were females. The overall mean age was 40.70 ± 10.84
117 years (range: 25-66 years). Lacrimal intubation was performed in 31(66%) patients.
118 The mean follow-up duration was 14.53 ± 3.0 months (range: 12-24 months). All
119 patients presented with a history of epiphora. Majority of patients 39(83.0%) had
120 chronic dacryocystitis with no complaints of acute exacerbations. Regurgitation test
121 was positive in 45(95.7%) patients. Overall, 5(10.6%) had a lacrimal sac mucocele,
122 and 3(6.4%) had a deviated nasal septum which required surgical intervention in the
123 same setting. History of probing and syringing was found in 11(23.4%) patients.
124 (Table 1).

125 Surgical success was achieved in 46(97.9%) patients. Of them, 37(78.7%) patients
126 were completely symptom-free, while 9(19.1%) were partially symptomatic and were
127 managed conservatively. Treatment failure requiring repeat surgical procedure was the
128 case with 1(2.1%) patient (Figure 1).

129 Majority of patients 30(64%) were aged 31-50 years, while 1(2.1%) patient was aged
130 >60 years. There was no significant difference in surgical failure amongst various age
131 groups ($p = 0.087$). The only patient with complete treatment failure was in the 41-50
132 years age bracket. Procedure failure was more likely in patients with previous attacks
133 of acute dacryocystitis ($p = 0.003$), while the rest of the risk factors were not
134 significantly associated with poor surgical outcome ($p > 0.05$).

135 The effect of intubation on surgical outcome was not significant ($p = 0.190$).

136 During follow-up, only one (2.1%) patient had mild turbinate hypertrophy on
137 endoscopy at 6 months (Figure 2).

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141 **Discussion**

142 A large number of patients in oculoplastic clinics present with complaints of epiphora
143 or excessive tearing. Underlying aetiology for epiphora can be multifactorial.
144 Acquired NLD obstruction is reported as a common cause for epiphora¹⁶. DCR is the
145 treatment of choice for managing acquired NLD obstructions^{1,2}. Epiphora was the
146 common presenting feature in all patients in the current study. In addition, DCR
147 indications, like mucocele and acute chronic dacryocystitis, were similar to earlier
148 findings by Zaman et al¹⁷.

149 Endoscopic DCR gives added benefit of treating associated nasal pathology in the
150 same setting and hence improving the surgical success rate. Three patients (6.4%) in
151 the current study had deviated nasal septum and underwent simultaneous septoplasty.
152 All three had complete relief of epiphora till 1-year follow-up. A study also reported
153 septoplasty / additional nasal procedure in 5.55% of their patients undergoing endo
154 DCR¹⁸.

155 Several local and international have shown a gender predilection for epiphora and
156 NLD obstruction. It is more common in females than males¹⁹. Majority of patients
157 (87%) in the current were also females. Similar gender and age groups have been
158 reported by two other local studies^{20,21}, while one study⁴ reported a relatively higher
159 number of male patients.

160 The current study found no significant association of lacrimal intubation with
161 anatomical and functional success after endoscopic DCR. According to some studies,
162 stenting has a limited role in increasing surgical success rate and there is evidence of
163 comparable results without intubation^{12,20}. Others have given importance to
164 intubation^{4,21}. A recent meta-analysis reported that lacrimal stenting by silicone tubing
165 improved success rates, specifically in patients undergoing external DCR, while it was
166 not always the case with endo DCR²². The meta-analysis, however, reported its
167 limitation for not being able to give a concluding decision after statistical power and
168 trial sequential analysis.

169 The overall success rate in the current study was 46(97.9%). Currently, the reported
170 success rates of endo DCR in literature are >90%^{20, 21, 23, 24}.

171 Epiphora and lacrimal passages disorders should be evaluated by ophthalmologists
172 and otorhinolaryngologists²⁵. A joint lacrimal clinic may help in facilitating such
173 patients and reducing individual follow-up to either ophthalmologist or
174 otorhinolaryngologist.

175

176 **Conclusion**

177 Endoscopic DRC is a safe and successful technique for managing acquired NLD
178 disorders and chronic dacryocystitis. Team work between ophthalmologists and
179 otorhinolaryngologists has the potential to improve surgical outcomes.

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182 **Conflict of interest:** None.

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184

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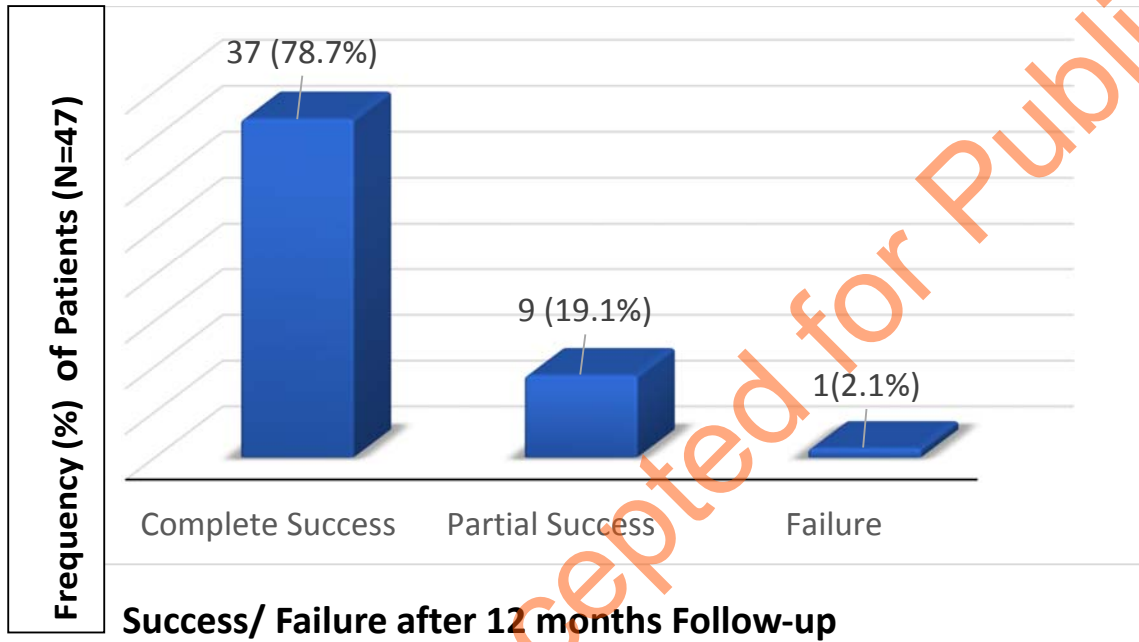
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271 **Table: Demographics and pre-operative clinical parameters and their**
 272 **relationship with surgical outcome.**

Clinical Features	N = 47 (%)	P value
Age in years		
21-30	9.1 (19.1%)	0.879
31-40	18 (38.3%)	
41-50	12 (25.5%)	
51-60	7 (14.9%)	
> 60 yrs.	1 (2.1%)	
Gender		0.911
Female	41 (87%)	
Male	6 (13%)	
Laterality		0.572
Right	24 (51%)	
Left	23 (49%)	
Epiphora	47 (100 %)	Not applicable
History of acute Dacryocystitis	8 (17.0%)	0.003

Mucocele	5 (10.6%)	0.941
Positive Regurgitation test	45 (95.7%)	0.754
History of probing & syringing	11 (23.4%)	0.513
Deviated nasal septum	3 (6.4%)	0.096

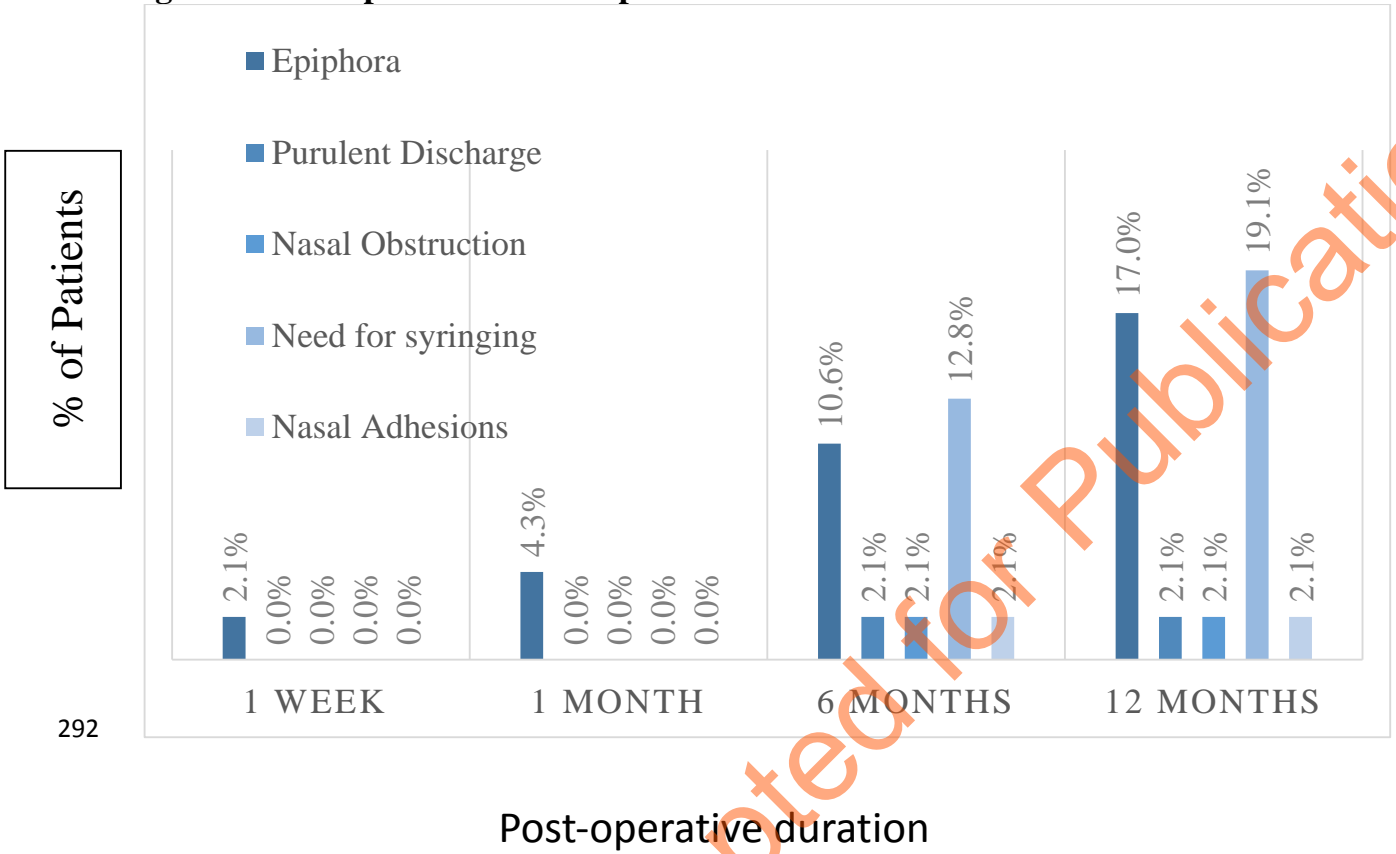
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Figure 1: Surgical outcome of Endoscopic Dacryocystorhinostomy.

291 **Figure 2: Post-operative follow-up.**



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Figure 2: Post-operative Clinical Parameters

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