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Original article

The Value of Endoscopic Dacryocystorhinostomy in Management of Acquired Nasolacrimal Duct Obstruction

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ABSTRACT

Background: The epiphora is the most common manifestation of obstruction of the nasolacrimal duct, which is treated by dacryocystorhinostomy either by external or internal endoscopic endonasal approach. With the advance of the nasal endoscope, the endoscopic dacryocystorhinostomy became well established.

Aim of the work: To evaluate the efficacy and safety of intranasal endoscopic dacryocystorhinostomy [DCR] in the management of patients with acquired nasolacrimal duct obstruction.

Patients and Methods: This is a retrospective study of patients with acquired obstruction of the nasolacrimal duct who underwent intra-nasal endoscopic dacryocystorhinostomy [EDCR] at Al-Azhar University Hospitals from September 2012 to October 2015. Forty-five procedures were done where primary endoscopic DCR was done on forty patients and revision endoscopic DCR was done on failed five patients. The outcome is measured by subjective improvement of epiphora.

Results: The patients were followed up for three years, improvement of 35 patients with epiphora from 40 patients [the rate of success was 86.7%] and the remaining five failed cases undergoing revision EDCR with the improvement of four from them. The success was confirmed with the subjective improvement of epiphora. The rate of minor complications reported was 28.8% and managed conservative, and only one major complication occurred in one patient.

Conclusion: The endoscopic intranasal DCR is an effective and safe procedure in the management of acquired obstruction of the nasolacrimal duct and gives a high success rate.

Keywords: Endoscopic; Endonasal; Dacryocystorhinostomy; Nasolacrimal duct; Epiphora.

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* Main subject and any subcategories have been classified according to the research topic.

INTRODUCTION

Dacryocystorhinostomy is the creation of the functional pathway for the lacrimal canaliculi to the nose by doing osteotomy and opening the nasolacrimal sac into the nose, and this is performed by either external or endonasal approach^[1]. The lacrimal system obstruction is manifested by continuous watery eyes with sometimes an attack of lacrimal sac swelling and redness in chronic dacryocystitis. The main treatment of this disease was an external approach, but the intra- nasal dacryocystorhinostomy approach was first described by Caldwell in 1983, which is used nowadays^[2-3]. Obstruction of the lacrimal system may be congenital or acquired, the acquired caused by chronic inflammation causing fibrosis, stenosis with closure of the ostium of the lacrimal duct^[4]. The lacrimal system obstruction can be solved by making fistula between the lacrimal and nasal mucosa to by-pass the obstruction and maintain the tear flow^[5]. The external endoscopic DCR was the traditional management for acquired obstruction of nasolacrimal duct in the past, even after endoscopic DCR is discovered because of limited technology and success rate 80%-100%^[5]. As a result of advances in endoscopic evaluation, the presence of new rhino logic instruments and unique experience increases the rate of success of EDCR over external approach^[6,7]. Although E DCR has several techniques, the most successful one is the powered instrumentation with preservation of mucosal flap .the powered EDCR is first developed by Wormald in 2002^[8]. Subsequently, published reports have proved the efficacy of EDCR^[9]. The disadvantages of the external approach of DCR are external scar, the possibility of injury of the ligament of medial canthus, immediate post-operative morbidity as epistaxis and periorbital ecchymosis, delayed postoperative morbidity as the development of sinusitis, and intra-nasal crusting^[10]. Advantages of EDCR: no external scar, preservation of lacrimal pumping system, short recovery time, and low postoperative morbidity^[11].

AIM OF THE WORK

The study is designed to evaluate the advantages of endonasal EDCR in managing patients with acquired obstruction of the nasolacrimal duct.

PATIENTS AND METHODS

This is a retrospective study of 45 patients. Forty primary EDCR and five revision EDCR were done from September 2012 to October 2015 who acquired the nasolacrimal duct's obstruction. All the operations were done in Al Azahr university hospitals. The local ethics and research committee approved the research protocol, and an informed consent was taken from all patients after explaining the procedure.

Inclusion criteria were: patients with acquired nasolacrimal duct or lacrimal sac obstruction, patients with post-traumatic epiphora, canillicular obstruction, and primary neoplasm of lacrimal system. However, congenital cases were excluded.

All operations were done under general anesthesia, any underlying sinonasal pathology as septal deviation and middle turbinate deformity is corrected with the surgery. The surgery begins with the patient in anti-trendelenberg position with hypotensive anesthesia, instillation of local anesthesia and vasoconstriction [2 % lidocaine and 1 mg adrenaline diluted in 200 cc saline] into upper anterior part of the lateral wall of the nose; a rectangular incision was done with sickle knife at the level of the upper end of attachment middle turbinate with the lateral wall of the nose anterior to the maxillary line, the incised mucosa is lifted with freer elevator, removal of the bone over the lacrimal protuberance with mico-drill [corresponding to the medial bony half of the lacrimal sac]. Through the canilliculus, the probe is inserted tenting the membranous medial wall of the lacrimal sac, in which the probe is seen with the nasal endoscope; the medial wall of the lacrimal sac was identified, excised with sickle knife and removed with a Blakesley forceps or placed as inferior flap .Insertion of silicone tube into each canilliculus down to the lacrimal sac which dragged into the nasal cavity and sutured together with multiple knots which is secured. The blood clots and secretions are removed at the end of operation. Broad spectrum antibiotic and topical antibiotic were prescribed .Nasal packing is inserted if septoplasty was done with the operation and removed after 48 hours. Irrigation the nasal cavity 4 to5 times with saline per day for 2 weeks to remove any blood crusting and promote mucosal healing.

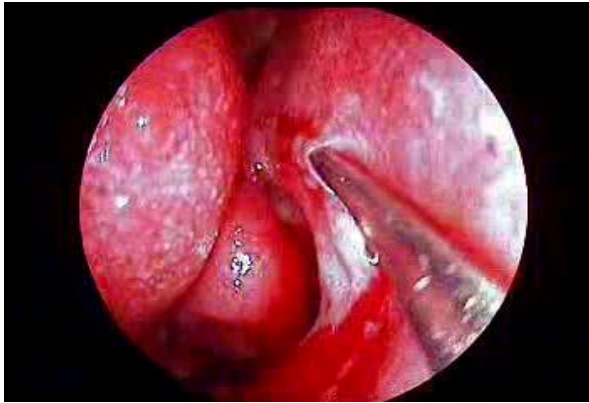


Figure [1]: Incision with the sickle knife of the lateral nasal wall at the upper end of attachment of the middle turbinate anterior to the maxillary line.

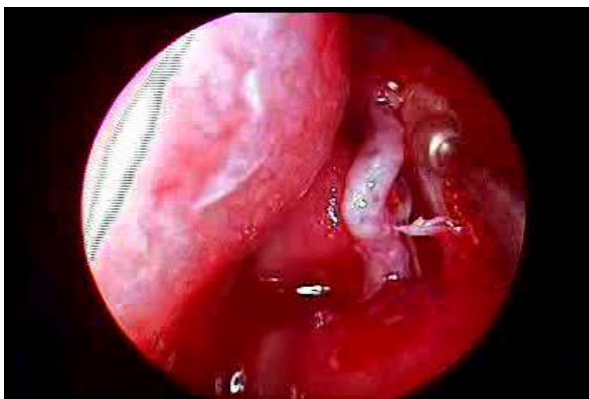


Figure [2]: Drilling of the lacrimal protuberance bone over the lacrimal sac with micro-drill.



Figure [3]: is the passage of a silicon tube into the canaliculi and secured into the nasal cavity with multiple knots with the aid of an endoscope.

The patient is seen after one and two weeks postoperative to remove any dried blood clots and crusts in the ear, nose, and throat [ENT] office. Topical eye drops and nasal irrigation is started on the first post-operative day. Silicone tube is removed from the nasal cavity after cutting it at the medial canthus without any complications. The silicone tube is removed within 2-6 months. The patients were followed up for the subjective

improvement of epiphora.

Data analysis: The collected data had been coded and fed to a personal computer, Categorical data presented in the form of frequencies and percentages, while mean and standard deviation calculated for presentation for numerical data. Groups compared by [t] or Chi-square tests according to data types. $P < 0.05$ had been considered significant. The SPSS version 18 [SPSS Inc., Chicago, USA] had been used to calculate all statistical processes.

RESULTS

A total of 45 EDCR were performed on 40 patients where the mean age in succeeded patients is 37.49 and SD is 12.3, the mean age in failed patients is 37 and SD is 11.8, as shown in table [1]. 29 female 26 of them succeeded, and three failed, 16 male 13 of them succeeded and 3 failed as shown in table [1]. The succeeded patients in primary EDCR were 35 from 40 patients and 4 from 5 patients in revision EDCR. The average follow up of post -operative patients was 3-24 months. The rate of success was 86.7% and the failure rate were occurred in 5 endoscopic DCR 13.3%. The failed 5 eyes undergoing revision endoscopic DCR, and four eyes were improved as presented in table [1]. There are minor intra and post -operative complications among all primary and revision EDCR occurred in 13 patients and managed conservative without interference where intra nasal synechia occurred in 5 patients, eye and cheek bruises in 6 patients, stent fallen out in 3 patients, 4 patients with nostril burn and intranasal synechia with the stent fallen out in one patient in revision operations as presented in table [2]. Only one major complication which is orbital penetration, with orbital fat exposure was occurred in one patient in primary EDCR and didn't occur in revision EDCR as as presented in table [2]. The failure has occurred as a result of post- operative scar at the operation site, associated septal deviation, neo bone formation with osteogenesis, failure in locating the lacrimal sac, and intra nasal synechia, which was corrected in the revision surgery where septoplasty, release and cut of intra nasal synechia were done with good results as presented in table [3].

The deviated septum was present in 6 patients and corrected where septoplasty done in 5 patients

with primary EDCR and one patient with revision EDCR with improving the result of surgery as presented in table [4].

Chronic sinusitis was present in 3 patients during the primary EDCR, and FESS was done without affection the result of surgery as presented

in the table [4].

The average time of stent removal within an average 4-34 weeks where the stent was removed under topical anesthesia in primary EDCR with Mean \pm SD 11.31 \pm 5.20 and EDCR 7.00 \pm 1.73 in revision operations as shown in table [5].

Table [1]: Comparison between the success and failure groups regarding age, sex and the type of operation

		Succeeded	Failed	test	P. value
Age [years] Mean \pm SD		37.49 \pm 12.30	37.00 \pm 11.86	0.091	0.928
Sex [n,%]	Female	26 [66.7%]	3 [50.0%]	0.630	0.427
	Male	13 [33.3%]	3 [50.0%]		
type of operation [n, % of total]	PEDCR	35 [86.7%]	5 [13.3%]	0.216	0.642
	REDCR	4 [10.3%]	1 [16.7%]		

SD: standard deviation; PEDCR: primary endoscopic dacryocystorhinostomy; REDCR: Revision endoscopic dacryocystorhinostomy.

Table [2]: Comparison between the PEDCR and REDCR regarding the incidence of both minor and major intra and postoperative complications

		PEDCR	REDCR	X ²	P.value
Minor intra and postoperative complications	Eye and check bruises	3 [7.7%]	0 [0.0%]	30.84	<0.001*
	Eye and check bruises and stent fell out	0 [0.0%]	1 [16.7%]		
	Intra nasal synechia	1 [2.6%]	2 [33.3%]		
	Nostril burn	2 [5.1%]	0 [0.0%]		
	Nostril burn and eye and check bruises	2 [5.1%]	0 [0.0%]		
	stent fallen out and intra nasal synechia	0 [0.0%]	1 [16.7%]		
	stent fallen out and intra nasal synechia	0 [0.0%]	1 [16.7%]		
Major intra and postoperative complication	No	38[97.4%]	6[100.0%]	0.157	0.692
	Orbital penetration, with exposure of the orbital fat.	1 [2.6%]	0 [0.0%]		

Table [3]: The cause of failure in revision EDCR.

	Success	Failed	X ²	P. value
No.	39[100.0%]	0 [0.0%]	45.00	<0.001*
Failure in locating the lacrimal sac	0 [0.0%]	1[16.7%]		
High deviated septum,granulation tissue,fibrosis and synechia	0 [0.0%]	1[16.7%]		
Insufficient opening the lacrimal sac	0 [0.0%]	1[16.7%]		
Insufficient osteotomy and neo bone osteogenesis	0 [0.0%]	1[16.7%]		
Intra-nasal synechia and neo bone osteogenesis	0 [0.0%]	1[16.7%]		
Neo bone osteogenesis	0 [0.0%]	1[16.7%]		

Table [4]: The rate of septoplasty and FESS in PEDCR and REDCR.

		PEDCR	REDCR	X ²	P. value
Septoplasty	No	34 [87.2%]	5 [83.3%]	0.067	0.796
	Septoplasty	5 [12.8%]	1 [16.7%]		
Functional endoscopic sinus surgery	FESS	3 [7.7%]	0 [0.0%]	0.495	0.482
	No FESS	36 [92.3%]	6 [100.0%]		

FESS: Functional endoscopic sinus surgery

Table [5]: Removal of the stent [per weeks] in primary and revision EDCR.

	PEDCR	Revision EDCR	t .test	P. value
Time of stent fallen out and removed [weeks]	11.31 \pm 5.20	7.00 \pm 1.73	1.414	0.165

DISCUSSION

The current work results revealed that the rate of success in PEDCR was 86.7% and 80% in REDCR compared with the study done by Peng et al., who showed the success rate was 92.7 % who use the lacrimal and nasal mucosal flap in endoscopic dacryocystorhinostomy^[12]. Another study done by Orsolini et al. showed that the success rate was 94% in stent placement versus 90.4% without stent placement^[13]. The rate of minor complications was 28.8%. The intranasal synechia was the most frequent minor complication; it was treated conservatively in primary cases and needs intervention by cutting the adhesion and removing synechia in revision cases. The second most frequent minor complications are stent falling out and eye and cheek bruises where eye and cheek bruises are treated conservative while if the stent fell out before the tract is made, the patient was needed revision surgery, and if it fell after the tract is made, it removed endoscopic ally in ear, nose, and throat [ENT] office. The less frequent complications are nostril burn and was treated conservative. Only one major complication was occurred in this study in two patients in the form of orbital penetration with exposure of orbital fat and was managed intra operative without any sequelae. A study was done by Lehmann et al who showed 20 % postoperative complications, and other authors, as Durvasula *et al.* showed [20%], and Lester *et al.* showed [19%]^[14-16]. Germany Horn et al. showed in their study that minor complications rate 10%^[17]. Orsolini et al concluded that the most frequent minor complications were stent extrusion, false passage and granulation tissue formation with intra nasal synechia^[13]. Continuous fluid flow and epithelial anastomosis are necessary for patency of surgical rhino -stoma, and this is done through silicone tube placement^[18]. In our study, the average of silicon tube fallen out and removed is from 4-34 weeks with the mean is 11.31 ± 5.20 in PEDCR and 7 ± 1.73 in REDCR.

Kong *et al.* recommended removing the silicon stent before eight weeks to avoid granulation tissue formation^[19]. Boush et al. observed the relationship between the silicon tube retention and the success

rate^[20]. One of the most challenges in endoscopic DCR is the removal of the bone over the lacrimal sac because of the narrow confine of the sac, and meticulous care is needed to avoid injury by the powered drill. In this study, the most frequent cause of failure of primary and revision EDCR is scarring of the ostium by neo-bone osteogenesis, failure to locate the lacrimal sac, intra nasal synechia, and associated deviated nasal septum, which is corrected in the revision surgery. Five cases of 40 PEDCR were failed; one case of five cases of the revision endoscopic DCR is failed. Prakash et al. concluded in their study, failure reported in two endoscopic sinus surgeries from 37 operations and said the cause of failure is extensive granulation tissue in one patient and chronic canalculitis in the other^[21]. The most important cause of surgical failure is scarring of the ostium and difficulty in localization of the ostium^[19]. Metson et al. also concluded re-closure of the the ostium for four endoscopic revisions from 5 failed revision endoscopic DCR^[10]. On the contrary, Boush et al. showed five successes from 6 patients in revision EDCR^[20].

Conclusion: we could conclude that the endonasal endoscopic DCR is the best treatment for primary acquired nasolacrimal duct obstruction for experienced surgeons compared with external DCR as endoscopic DCR has many advantages as less intraoperative bleeding, shorter operating time, better cosmeses [no external scar], preservation of the lacrimal pump mechanism of orbicularis oculi muscle and high success rate.

Financial and Non-financial Relationships and Activities of Interest

None

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