Outcome of Endonasal Endoscopic Dacryocystorhinostomy in Nasolacrimal Duct Obstruction

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ABSTRACT:

BACKGROUND:

Dacryocystorhinostomy (dcr) is the standard trcatmert for nasolacrimal duct Obstruction .based on opening the lacrimal sac, which is connected to the nose, by removing the bone and the mucosa between these two structures at the level of the middle meatus.

OBJECTIVE:

To highlight the procedure of endonasal endoscopic dacryocystorhinostomy.

PATIENTS AND METHODS:

This was a prospective study conducted at Ghazy Al- hariri teaching hospital for surgical specialties during the period from 22nd of February 2011to the 4th of March 2013. A total of 22 patients were referred from the ophthalmologist for endoscopic dacryocystorhinostomy after had been diagnosed as distal obstruction of nasolacrimal duct or sac. Data were collected and all patients were investigated with general pre-operative investigation in addition to CT scanning to exclude any associated abnormalities or neoplasm and rigid nasal endoscopy were performed for all patients. Intranasal decongestant and steroids along with oral antibiotic were given pre-operatively in 14 patients. Endoscopic dacryocystorhinostomy was performed; the patients were followed up for 6 months and evaluated regularly for any complication.

RESULTS:

The mean age of the patients was (32.9 ± 12.7) years with range of (12– 69) years. About 59% of the patients aged 21-40 years. Females were predominant with a female to male ratio of 3.4:1. All patients had mucopurulant conjunctival discharge. The median duration of presentation was 5-6 months. The DCR performed eleven in right side and eleven in left side, and 4 associated operation were conducted for management of associated abnormalities. Eight complications developed during different time of follow up and only one patient needed re insertion giving a success rate of 95.5%.

CONCLUSION:

The endoscopic endonasal DCR is a safe procedure for the treatment of nasolacrimal duct obstruction and with high success rate and less serious complications.

KEY WORDS: endoscopic, dacryocystorhinostomy, endonasal.

INTRODUCTION:

Dacryocystorhinostomy (DCR) is the standard treatment for nasolacrimal duct obstruction[(1)], based on opening the lacrimal sac, which is connected to the nose, by removing the bone and the mucosa between these two structures at the level of the middle meatus. The traditional technique of choice by ophthalmologists was external approach, in which an incision is made on the skin in order to access the bone, followed by an external osteotomy, opening the nasal mucosa and creating the lacrimal sac flaps from outside to the inside.

The endoscopy-assisted endonasal approach follows the inverse pathway. A nasal mucosa flap is first created, followed by endonasal bone osteotomy to expose the lacrimal sac and its marsupialization to inside the nasal cavity. The endoscopic exposure and view of the entire lacrimal sac is simply fantastic. Success rates of this procedure by both approaches, the external and the endoscopic one, are higher than 90% in seasoned hands[(2)].

Endonasal endoscopic dacryocystorhinostomy (EEDCR) has been popularized as a minimally invasive technique. Although preliminary reports revealed less success in comparison with external approaches, recent endonasal endoscopic

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surgeries have preserved advantages of this technique while diminishing the failures [3].

Classically, DCR had been performed by ophthalmologists using an external approach. However, thanks to the use of endoscopes, endonasal dacryocystorhinostomy had been proven to be a safe and effective surgical technique to solve low lacrimal obstructions. It has become an alternative to the approach of lacrimal pathways, owing to low morbidity and results equivalent to the conventional external surgical approach [4].

Epiphora is the usual complaint of the patients and it can be extremely troublesome in some cases. The causes of nasolacrimal duct obstruction (NLDO) may be idiopathic, congenital, infectious, cicatricial, involutional, neoplastic, traumatic, or iatrogenic. The most common form in young adults however, is idiopathic primary acquired NLDO. Inflammatory and cellular debris accumulated in the sac due to ineffective drainage can create environment conductive to the development of infection, and longstanding infections can lead to fibrosis of the sac wall[5].

Indications for surgery include symptomatic epiphora and dacryocystitis. In rare instances, infiltrative diseases such as sarcoidosis, Wegener's Granulomatosis and lymphoma may involve the lacrimal drainage system (LDS) causing secondary obstruction that will require DCR to treat and to obtain biopsies of the lacrimal sac and nasal mucosa.

Endoscopic DCR has the advantages of avoiding a cutaneous scar and major trauma to the medial canthal structures. This is particularly advantageous in individuals who are keloid prone or are at risk of a hyper- or hypopigmented scar formation. In some Oriental patients with a prominent epicanthal fold, the medial canthal webbing resulting from the external approach may be difficult to remedy subsequently. Endoscopic DCR is also useful to revise failed external DCR. The nasal endoscope directly visualizes the cause(s) of failure such as an inadequately sized osteotome and nasal synechiae, allowing more specific treatment[6].

The success rates for the external approach have been reported to be above 90% [7]. Endonasal laser assisted approaches have lower success rate of 60% to 86% [8], probably due to thermal scarring of the fistula. The advent of powered drilling instruments to remove the hard bone adjacent to the lacrimal sac has improved the success rates of endoscopic DCR to 95%[9].

PATIENTS AND METHODS:

Study design and setting:

This is a prospective study conducted at Ghazy Al- Hariri Teaching Hospital for Surgical Specialties during the period from 22nd of February 2011to the 4th of March 2013.

PATIENTS:

A total of 22 patients were included who were referred from ophthalmologist for endoscopic dacryocystorhinostomy after had been diagnosed as distal obstruction of nasolacrimal duct or sac.

METHODS:

Surgical procedure:

I.Endoscopic dacryocystorhinostomy (DCR):

Surgical intervention was performed under general anesthesia with orotracheal intubation, hypotensive technique. Nasal mucosa decongestion was done by placing cotton pledges soaked in 0.1% xylometazoline along the lateral nasal wall at the site of DCR prior to and during the surgery, with the patient lying supine, the operation was performed using a video camera attached to a 4-mm 0o (and sometimes 30o) rigid nasal endoscope. An injection of 1:100,000 epinephrine into the sub mucosa just anterior to the attachment of the middle turbinate.

A vertical incision was made on the lateral nasal mucosa using sickle knife about 10 mm anterior to the middle turbinate and maxillary line. A posteriorly based mucosal flap was elevated by a suction Freer elevator till reach the uncinate process. The flap was excised using either Blackesley forceps or shaver.

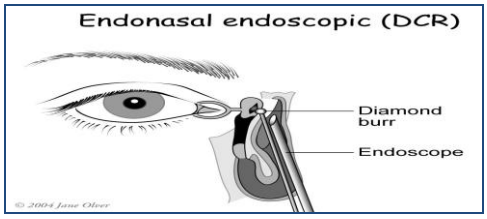

Figure 1: Endoscopic DCR.

The suture line between the lacrimal bone and the frontal process of the maxilla was located with a ball prob. The lacrimal bone at the lateral wall of the nose is easily identified as thin layer of bone just anterior to the uncinate process, in contrast the frontal process of the maxilla which is much thicker allowing a clear definition of the lacrimal bone immediately posterior to it. By using Kerrison bony punch forceps to nibbled away the frontal process of maxilla anteriorly. By Freer elevator the thin lacrimal bone was removed. Sometimes we used powered instrument (drill) for drilling the thicker frontal process of maxilla till appearance of the lacrimal sac which was more dark red than the nasal mucosa.

Gentle external pressure in the region of medial canthus so the sac will bulged in the nasal cavity by using sickle knife incise the sac and enlarge the incision to approximately 10 mm, and excise the medial side of the sac and drainage of the pus. A silicon stent attached metal introducer was passed through upper and lower canaliculi and pass till appearance of the metallic introducer in the nasal cavity, and by Blackesley forceps draw the stent to outside the nasal cavity then tie and trim the stent in the nasal cavity to form a continuous loop around the canaliculi and stent the ostium during the postoperative healing. A merocele sponge pack placed in the middle meatus to be removed 48 hrs. later.

II. Associated surgery:

- **Septoplasty**:was performed in 2 patients for correction of septal deviation for access.
- **Release the adhesion**: In 2 patients with adhesion between the lateral nasal wall and the septum.

Post –operative management:

All patients were treated post operatively according to the following protocol

1. Antibiotic – steroid eye drops for two weeks.
2. Topical nasal steroid for four weeks.
3. Sodium bicarbonate nasal wash accordingly.
4. Oral antibiotic for 10 days.

Follow up:

The patients were followed up for 6 month duration post operatively and visits arranged weekly for the first month then monthly for the remaining five months. Removal of the stent was done at the 12^{th} week. During every visit patients were assessed by using anterior rhinoscopy and rigid nasal endoscope. Debris or crustations were removed, release of adhesions was done and management of the granulation tissue at the rhinostoma was done. The patency of the lacrimal drainage is assessed by using fluorescein dye stick placed in conjunctiva and the dye seen running through the rhinostoma inside the nasal cavity.

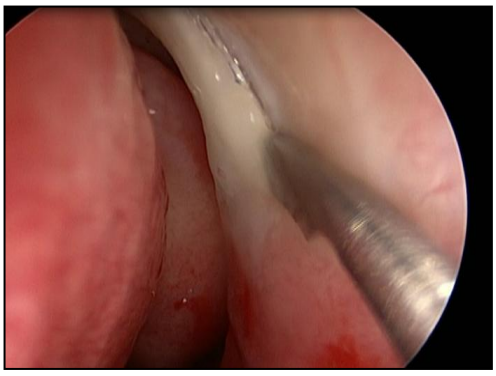

Figure 2: Mucosal incision.

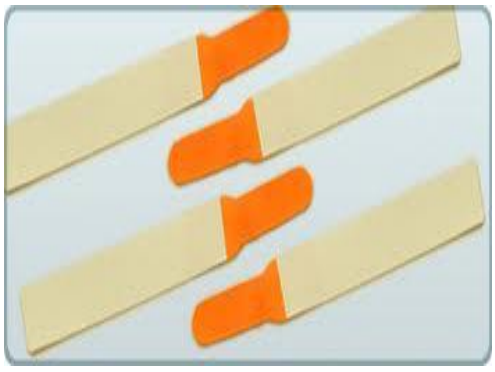

Figure 3: Fluorescein dye stick.

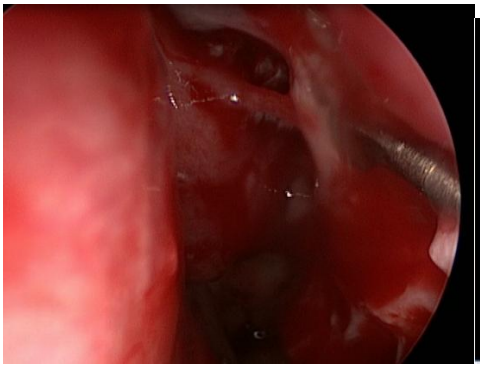

Figure 4: Incising of lacrimal sac.

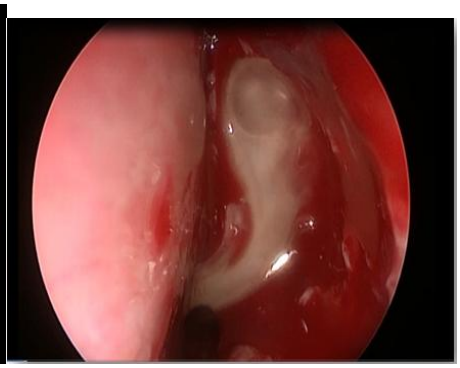

Figure 5: Drainage of the pus.

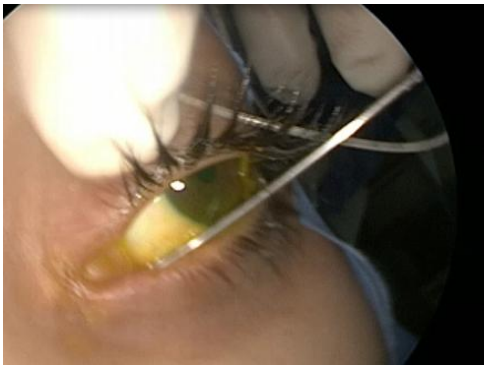

Figure 6: Probing of lower canaliculi.

Figure 7: stent tie inside the nasal cavity.

RESULTS:

The mean age of the patients was (32.9 ± 12.7) years with range of (12– 69) years. Furthermore the distribution of age groups revealed that four patients (18.2%) aged 20 years and less, 6 patients (27.3%) aged 21 – 30 years, 7 patients (31.8%) aged 31 – 40 years and 5 patients (22.7%) aged > 40 years. There were 22 patients recruited in this study, they were 17 females (77.3) and 5 males (22.7), with a female to male ratio of 3.4:1 (table 1)

Table:1 General characteristics of the patients (N=22)

Characteristic		No.	%
Age (year)	≤ 20	4	18.2
	21 – 30	6	27.3
	31 – 40	7	31.8
	> 40	5	22.7
Mean	32.9 ± 12.7		
Range	12 – 69		
Sex	Female	17	77.3
	Male	5	22.7

All patients presented with epiphora in equal distribution on both sides

Table 2:Distribution and duration of presenting symptoms and examination findings.

Presenting symptom	No.	%
Epiphora (n=22)		
Right	11	50.0
Left	11	50.0
With Medial canthal swelling	20	90.9
Without Medial canthal swelling	2	9.1
Medial canthal discharge (n=22)		
Right	11	50.0
Left	11	50.0
Mucopurulant discharge	22	100.0
Total	22	100.0
Duration (months) median (IQR)	6.5 (5.8 - 9)	

History of symptoms, trauma and previous surgery is summarized in table 3, nasal obstruction was given by 12 patients (54.5%), rhinorrhea and trauma history was given by 3 patients for each (13.6%) and none of the patients had previous surgery.

Table 3: Distribution of history of symptoms and surgery of the patients.

History	No.	%
Nasal Obstruction	12	54.5
Rhinorrhea	3	13.6
Trauma	3	13.6
Surgical history	0	0.0

Nasal endoscopic findings revealed enlarged inferior turbinate in 7 patients (31.8%) ,septal deviation in 4 patients (18.2%), adhesion in 2 patients (9.1%) and septalspure of floor in only one patient (4.5%).

Table 4: Nasal endoscopic findings of the patients.

Finding	No.	%
None	8	36.4
Enlarged inferior turbinate	7	31.8
Septal deviation	4	18.2
Adhesion	2	9.1
Septal spur of floor	1	4.5
Total	22	100.0

Table 5: Distribution of side of DCR and stenting.

Variable	No.	%
Type		
Left DCR	11	50.0
Right DCR	11	50.0
Stenting		
Left stent	11	50.0
Right stent	11	50.0
Total	22	100.0

Table 6: Distribution of associated nasal surgery.

Variable	No.	%
Release the adhesion	2	9.1
Septoplasty	2	9.1
Total	4	18.2

Table 7: Distribution of time of operation.

Time of operative	No.	%
45 – 60 minute	2	9.1%
61 – 90	17	77.3%
91 – 120	3	13.6%
Mean time	77.5 ± 18.4 minute	
Range	45 – 120 minute	
Total	4	18.2

The time consumed for operative procedure ranged between 45 minutes and 120 minutes with a mean of 77.5 ± 18.4 minutes, on the other hand, the time consumed was 45 minutes in two patients, 61 – 90 minutes in 17 patients (77.3%) and it was 91 – 120 minutes in 3 patients (13.6%), (table 7).

Table 8: Distribution and onset of Complications during follow up.

Complications	No.	%	Onset (weeks)
Synechia between rhinostoma and middle turbinate	5	22.7	3 - 12
Nasal obstruction	1	4.5	4
Granulation tissue	1	4.5	4
Retraction of the knot of the stent	1	4.5	4
Total	8	36.4	
None	14	63.6	

Regarding the complications, 5 patients (22.7%) developed Synechia between the rhinostoma and middle turbinate within 3-12 weeks of the follow up, one patient developed nasal obstruction after 4 weeks, one patient had granulation tissue after 4 weeks and in another patient there was retraction of the knot of stent after 4 weeks (table 8).

DCR succeeded in 21 patients (95.5%), and failure reported in only one case (4.5%)

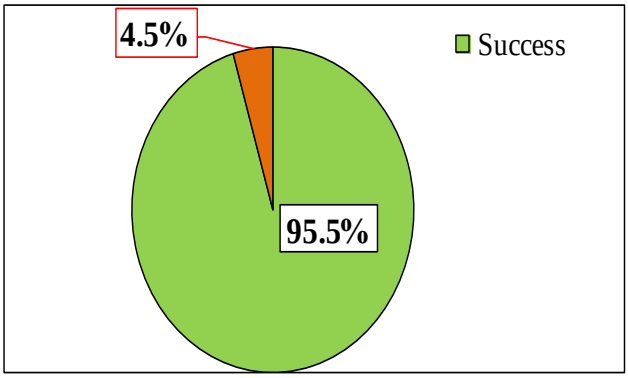

Figure 8: Success rate of endoscopic DCR of 22 patients.

DISCUSSION:

The mean age of patients in this study was (32.9 ± 12.7) years, the youngest patients aged 12 years and the oldest one aged 69 years, a maximum incidence was seen in the 3rd and 4th decades of life approximately similar age ranges are reported in other studies; Cokker et al (2000)[10],found the age of the patients ranged from 4 to 76 years. Whittet HB et al (1993) observed that the age of their patients ranged from 14 to 80 years.[11]

The current study included 22 patients, the female to male ratio was 3.4:1, and this might reflect that the nasolacrimal obstruction is more likely to occur among females. This is comparable to the findings of Moras K et al. they reported in 2011, a female to male ratio of 4:1.[12]Most studies have demonstrated that 70 to 80% cases of chronic dacryocystitis occurred in females. The striking predilection for females can be explained by the narrower lumen of the bony nasolacrimal canal. It is also possible that endocrine factors may be playing a role in the etiology of chronic dacryocystitis.[10-14]

All patients in this study presented with epiphora and medial canthal discharge and majority of patients (90.9%) had medial canthal swelling, these presentations are commonly reported in other literatures.[13,14]

All the patients underwent thorough Endoscopic examination of the nasal cavity in ENT consultation clinic. Radiological evaluation such as CT scan of nose and paranasal sinuses was done to find out the any other nasal pathology.

All the patients were operated under general anesthesia (GA). Intraoperatively, 4 associated operations were performed in combination with DCR for management of pre-operative diagnosed associated pathologies two operations (9.1%) to release adhesions and two septoplasty operations (9.1%), this supported the advantages of intranasal DCR , Since the development of the rigid fiberoptic endoscope, endonasal DCR has been widely used because it has significant advantages, including the concurrent correction of intranasal abnormalities using the endoscope, these abnormalities which can cause failure from synechiae formation between the ostium and the septum or the middle turbinate.[15,16]

The average time consumed for operative procedure in our study was 77.5 minutes ranged between 45 minutes and 120 minutes and in majority of cases (77.3%) the time was within 61 – 90 minutes. Which was relatively higher than that reported by Moras K (2011)[12], where the average time in that study was 75 minutes with a range of 30 -90 minutes. This discrepancy might be attributed to the differences in the facilities and longer time might be attributed to the difficulties in stenting in some patients.

Regarding the complications, synechia between the rhinostoma and middle turbinate was present in 5 patients represented 22.7% of the cases, patients developed this complication at different time of follow up, 2 patients developed this complication at the 3rd week, 1 patients at the 4th

week, 1 patient at the 8th week and another patient at the 12th week of follow up due to granulation tissue developed in the rhinostoma at the fourth week, during the follow up time the synechia was released in 4 patients and they were improved, the 5th patient who developed the granulation tissue at the 4th week and not responded to treatment, not improved ended with failure of the operation and the patient needed re-insertion. However, silicone tubing has some disadvantages; it may cause granulation tissue formation, infection, or canalicular laceration, and the tubing may become dislocated from the rhinostomy site, or it may otherwise cause discomfort to the patient.(17)

Other complications reported in this study included retraction of the knot of stent due to excessive tying of the knot. However, there were no serious complications such as orbital fat prolapse, cerebrospinal fluid leak, or delayed hemorrhage.

The success rate found in this study was 95.5% where the operation succeeded in 21 patients out of the 22 patients and failure reported in only one patient. Many studies reported approximately similar success rates, 90.2% in Korean study (2012)(13), Moras K et al(12) in a comparative study reported a success rate of 90%.This success rate was higher than that reported in Shrestha S et al (2010)(18), where the authors reported a success rate of 84%.

Key points in the success of endonasal dacryocystorhinostomy

In the last two decades, EN-DCR outcomes have been compared with EXT-DCR outcomes. A review of the literature reveals a success rate of 70-99% for EN-DCR (19). The following steps of EN-DCR are recognized in the literatures as being important in minimizing failures.

Localization of the lacrimal sac

When anatomic landmarks of the lateral nasal wall are altered or do not exist, the lacrimal sac is difficult to find. There was idea of transillumination for visualizing the lacrimal sac localization in dacryocystorhinostomy by using an endoilluminator probe introduced through the canaliculis into the lacrimal sac. Today, endoillumination, as a method for identification for localization of lacrimal sac, is widely used in many endoscopic techniques (20). Many authors claim that the axilla of the middle turbinate is a landmark for the roof of the lacrimal sac. However, Wormald and co-authors (2000), in a study with 47 CT-DCG patients, showed that the major part of the lacrimal sac (10 mm) is situated above the axilla of the middle turbinate, extending 1-2 mm below this landmark (21).

Mucosal incision and flaps

Tsirbas and Wormald22 (2003) recommend making a cut in the mucosa superiorly above the insertion of the middle turbinate on the lateral nasal wall and anterior to the axilla and vertically down the frontal process of the maxilla. To avoid trauma of neighboring tissue, the rectangular incisions of nasal mucosa should be made using a scalpel blade 22 and the nasal mucosal flap must include the periosteum23. The main task in EN-DCR is to create the largest possible bony ostium to completely expose the medial wall of the lacrimal sac, and to achieve contact between the lacrimal sac and the nasal mucosa. In the earliest studies, this was achieved by suturing. Later, it was suggested stapling with titanium clips. More recently, Tsirbas and Wormald(2003) described an approach where the lacrimal sac is fully exposed and marsupialized into the lateral nasal wall of the nose with nasal and lacrimal mucosa apposition. This is a one of the most important keys to the success of EN-DCR(22).

Location of the osteotomy

The removal of all the bone between the medial wall of the lacrimal sac and axilla was suggested to achieve an ideal ostium. On the other hand, some authors advocate leaving approximately 5mm free of bone around the canaliculus, at the junction of the middle turbinate and the lateral nasal wall, as a landmark of the floor of the lacrimal fossa. Other authors have recommended developing a larger ostium by removing the frontal process of the maxilla involving the anterior lacrimal crest and superiorly above the attachment of the middle turbinate to remove bone covering the fundus of the lacrimal sac (22,24). Moreover, it has been claimed that a larger osteotomy with complete sac exposure provides better access to the nasal cavity and reduces the incidence of failure. However, in the literature it seems that the success rate has been similar whether the osteotomy was larger or smaller than 10 mm in diameter.

Rhinostoma size

Some authors consider the ostium size to be non-significant, and have suggested creating a small ostium involving the inferior portion of the lacrimal bone. In contrast, Önerci(23)(2002) suggested removing as much as possible of the medial wall of the lacrimal sac. others advised the enlargement of the rhinostoma to a diameter of 10 mm, allowing free passage of a lacrimal probe into the nasal cavity through both

canaliculi. To prevent the development of sump syndrome, some authors suggest performing "terminal" or "inferior" EN-DCR, in which a relatively small ostium is created by marsupialization of only the inferior portion of the lacrimal sac and the adjacent duct into the nose. The available data do not show the clear superiority of any option concerning ostium size and location [25].

Stenting

To prevent the obliteration of the intranasal lacrimal sac ostium, many surgeons prefer to insert bicanalicular silicone tubes to stent the rhino stoma. Some authors believe that silicone intubation after DCR surgery is advisable; while others think it may be a reason for failure [17]. Others object that the silicone tubes keep the lacrimal sac flaps separate. The tube can be fixated by a knot or clip. Nonetheless, there is general agreement on using silicone intubation after DCR in cases with canalicular stenosis. However, silicone tubing has some disadvantages; it may cause granulation tissue formation, infection, or canalicular laceration, and the tubing may become dislocated from the rhinostomy site, or it may otherwise cause discomfort to the patient [17].

Postoperative care

It is indisputable that postoperative care influences the healing process and is important for the success of EN-DCR [26]. Postoperative care options include the administration of systemic antibiotics or a combination of antibiotic-steroid eye drops [27], local irrigation of the rhinostomysite with a saline nasal spray [17], intranasal steroids, and debridement of the intranasal wound.

Follow-up time

The guidelines of the Royal College of Ophthalmologists suggest that the follow-up time should be at least three months. Some retrospective studies have reported a 5year average follow-up period, but in this case the success rate fell from 88% after one year to 75% after 5 years [28]. The outcomes of EN-DCR may decline in long-term follow-up[29].

Complications

Several early complications have been identified: intraoperative or postoperative hemorrhage, silicone tubing prolapse, punctal erosion related to silicone tube use, canalicular obstruction, orbital fat herniation, orbital and subcutaneous emphysema, conjunctival fistula formation, retrobulbar hematoma and temporary ophthalmoplegia[24]. There are rare reports of cerebrospinal fluid leaks and meningitis following dacryocystostomy. Most of the late complications occur between one and three months after surgery [30]. The following late complications after EN-DCR have been identified in the literature: scar formation of the rhinostoma, synechiae between the rhinostoma and middle turbinate, rhinostoma and the nasal septum, and the septum and the middle turbinate, and granuloma formation within the ostium.

Growing experience is evident in nasal endoscopic surgery and so as in this procedure since 2006 when the operation of endoscopic dacryocystorhinostomy is first done in Iraq[31,32].

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