

The Success Rate of Endonasal Endoscopic Dacryocystorhinostomy in Acquired Nasolacrimal Duct Obstruction

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Abstract:

Aim: To evaluate the success rate and prognostic factors influencing the endonasal endoscopic dacryocystorhinostomy (DCR) in acquired nasolacrimal duct obstruction. **Patients & Methods:** Retrospective non comparative study recruited all acquired nasolacrimal duct obstruction cases between January 2010 and December 2011. Endonasal endoscopic DCR was performed by one surgeon in all of the cases included in the study. Cases that followed less than 3 months after removal of the stent were excluded from the study. Surgical success was defined as both subjective and objective outcome. The Subjective outcome was defined by asking the patients about the symptoms. The objective outcome was defined by irrigation test. Variable factors were assessed including age, gender, underlying disease, intraoperative technique, complication, operative time and postoperative stent removal time. The prognostic factors also were analyzed. **Results:** All 195 eyes in 131 patients were included in this study with age range of 13 to 89 years old (mean 58.1 years old). They consisted of 122 females (93.1%) and 9 males (6.9%). There were 67 cases with single eye (right 35 cases, left 32 cases) and 64 cases with both eyes involvement. The mean operation time per eye was 16.7 ± 4.7 minutes (range 7.5 to 40 minutes). The mean bone volume was 0.4 ± 0.2 ml. All cases were operated under the same technique, the suturing of anterior flap of lacrimal sac. The anterior flap could be sutured in 169 eyes (86.7%) and cannot be sutured in 26 eyes (13.3%). The surgical success was achieved in 187 eyes (95.9%). The six of eight eyes in the failure group could not be operated with suturing of the anterior flap. Hence, the suturing of the anterior flap was a statistically significant factor in the outcome of endonasal endoscopic DCR (p -value 0.001). There was no significant difference in preoperative factor, age, gender, side, underlying disease, operative time, bone volume removed, complication and postoperative stent removal time (p -value >0.05). There was no serious complication. **Conclusion:** The successful rate of the endonasal endoscopic DCR is very high (95.9%). The endonasal endoscopic DCR has an advantage as compared with the external DCR, with no scarring and the short recovery time. The suturing of the anterior flap enhances the successful rate of the endonasal endoscopic DCR.

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บทคัดย่อ อัตราความสำเร็จการผ่าตัดท่อน้ำตาอุดตัน โดยวิธีการผ่าตัดส่องกล้องทางจมูก
 นารินทร์ เกษมสุข, พ.บ.*
 *กลุ่มงานจักษุวิทยา โรงพยาบาลมหาราชนครราชสีมา จ.นครราชสีมา 30000
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วัตถุประสงค์: เพื่อศึกษาอัตราความสำเร็จการผ่าตัดท่อน้ำตาอุดตัน โดยวิธีการผ่าตัดส่องกล้องทางจมูกและปัจจัยที่มีผลต่อความสำเร็จ **ผู้ป่วยและวิธีการ:** ศึกษาแบบย้อนหลังในกลุ่มผู้ป่วยท่อน้ำตาอุดตันทุกราย ที่ได้รับการผ่าตัด โดยวิธีการเดียวกันคือ ส่องกล้องทางจมูกและผ่าตัดโดยแพทย์คนเดียวกัน ระหว่าง มกราคม พ.ศ. 2553 ถึง ธันวาคม พ.ศ. 2554 ส่วนในกลุ่มผู้ป่วยที่มาติดตามการรักษาหลังผ่าตัดน้อยกว่า 3 ครั้ง หรือเป็นผู้ป่วยท่อน้ำตาอุดตันที่ส่วนต้นก่อนถึงถุงน้ำตา จะถูกคัดออก อัตราการผ่าตัดสำเร็จ พิจารณาจากการซักถามอาการ ซึ่งผู้ป่วยจะต้องไม่มีอาการน้ำตาเอ่อและจากการล้างท่อน้ำตา ส่วนปัจจัยอื่น เช่น อายุ, เพศ, โรคประจำตัว, ระยะเวลาผ่าตัด, ภาวะแทรกซ้อน และระยะเวลาวางสายท่อน้ำตา จะถูกนำมาวิเคราะห์หาความสัมพันธ์กับอัตราความสำเร็จของการผ่าตัดด้วย **ผลการศึกษา:** ผู้ป่วยท่อน้ำตาอุดตันที่พบทั้งหมด 131 ราย นับเป็น 195 ตา อายุเฉลี่ยของผู้ป่วยคือ 58.1 ปี (ระหว่าง 13-89 ปี) เป็นผู้หญิง 122 ราย (93.1%) และผู้ชาย 9 ราย (6.9%) ท่อน้ำตาอุดตันเกิดข้างเดียว 67 ราย (ตาขวา 35 รายและตาซ้าย 32 ราย), เกิดการอุดตันทั้งสองข้าง 64 ราย ระยะเวลาเฉลี่ยในการผ่าตัดโดยวิธีการส่องกล้องทางจมูกต่อข้างคือ 16.7 ± 4.7 นาที (ระหว่าง 7.5-40 นาที) ปริมาตรเฉลี่ยของกระดูที่นำออกในระหว่างการผ่าตัดคือ 0.4 ± 0.2 ลูกบาศก์มิลลิเมตร ทุกรายที่ทำการผ่าตัดใช้เทคนิคการผ่าตัดเดียวกัน คือการเย็บถุงน้ำตา ส่วนหน้า ติดกับเยื่อจมูก โดยสามารถเย็บได้ทั้งหมด 169 ตา (86.7%) ที่เหลือ 26 ตาไม่สามารถเย็บได้ พบอัตราการผ่าตัดสำเร็จ 187 ราย (95.9%) พิจารณาจากทั้งการล้างท่อน้ำตาลงคอดีและต้องไม่มีอาการน้ำตาเอ่อร่วมด้วย ส่วนผู้ป่วยที่ผ่าตัดไม่สำเร็จ 8 ราย พบ 6 รายไม่สามารถเย็บถุงน้ำตาติดกับเยื่อจมูกได้ จากการวิเคราะห์ทางสถิติพบผู้ป่วยที่ไม่สามารถเย็บถุงน้ำตาเชื่อมต่อเยื่อจมูกสำเร็จมีความสัมพันธ์กับอัตราการล้มเหลวอย่างมีนัยสำคัญ (p-value 0.001) ส่วนปัจจัยอื่นไม่พบมีความสัมพันธ์ทางสถิติ ไม่พบภาวะแทรกซ้อนที่รุนแรงจากการผ่าตัดส่องกล้องทางจมูกในการศึกษานี้ **สรุป:** การผ่าตัดท่อน้ำตาอุดตัน โดยการผ่าตัดส่องกล้องทางจมูก เป็นการผ่าตัดใหม่ที่มีอัตราความสำเร็จสูงมาก ซึ่งเหมาะสมกับผู้ป่วยที่กังวลเรื่องแผลเป็นที่ใบหน้าและมีระยะเวลาการพักฟื้นที่สั้นกว่า และยังพบว่า การเย็บถุงน้ำตาเชื่อมต่อกับเยื่อจมูกจะช่วยเพิ่มอัตราการสำเร็จอย่างมีนัยสำคัญ

คำสำคัญ: การผ่าตัดท่อน้ำตาอุดตันด้วยวิธีการส่องกล้องทางจมูก

Introduction

Epiphora⁽¹⁾ is the main symptom of nasolacrimal duct obstruction caused by the bone around nasolacrimal canal (maxillary bone) compressing pathway of lacrimal system⁽²⁾. It can be found in female more than male caused by hormonal change so there is an increase incidence in menopause patients, 50-70 years old⁽³⁾. Incidence of nasolacrimal duct obstruction is 20.24 per 100,000 person in Olmsted County, Minnesota between 1976 to 2000⁽⁴⁾.

Dacryocystorhinostomy (DCR) is the gold standard treatment of nasolacrimal duct obstruction⁽⁵⁾. It's a surgical method of making an osteotomy at lacrimal fossa (lacrimal bone and maxillary bone) to form shunt between lacrimal system to nasal cavity. DCR can be approached in two ways. In the previous century external DCR was the standard treatment. It was firstly described by Toti in 1904^(6,7). It is easy to approach and does not need more experience.

Since the development of rigid fiberoptic endoscope, it has been worldwide used in many operative fields. McDonogh and Meiring described the endoscopic transnasal DCR in 1989^(7,8). Now, endonasal endoscopic DCR is commonly used. The advantages of endonasal endoscopic DCR include no scarring at face, shorten operative time, faster recovery and no interference with the pumping function of orbicularis oculi. Besides the requirement of an endoscope, the extra instruments and surgeon's experience are the factors limiting the performance of endoscopic DCR.

This study is aimed to find the success rate of endonasal endoscopic DCR, the factors influencing the surgical outcome and the complication.

Patients and Methods

The authors obtained prior approval of the study protocol by the ethic committee of Maharat Nakhon Ratchasima Hospital, Thailand. This retrospective non comparative study recruited all acquired nasolacrimal duct obstruction cases between January 2010 and December 2011. All of patients who came with symptomatic nasolacrimal duct obstruction underwent endonasal endoscopic DCR. Patients who had an obstruction at another level of lacrimal pathway (presacral canalicular obstruction) or followed up less than 3 months were excluded.

Preoperative assessment

All of the patients must have complete an ophthalmic examination including the anterior and the posterior segment, visual acuity and intraocular pressure. The irrigation test was used to confirm the diagnosis in all cases.

Operation

The surgical procedure was performed by one surgeon with the same technique. The Patients underwent general anesthesia and gauze soaked with 5% cocaine with epinephrine mixed solution (ratio 1:1) was packed in the nasal cavity to decongest the nasal mucosa about 10 minutes

prior to the surgery. Anterior ethmoidal nerve blocking was done. The upper and the lower punctum were dilated. After local anesthesia was achieved by infiltrating with 2% lidocaine with 1: 1000 epinephrine above and lateral to the middle turbinate, the nasal mucosa at the lateral side of the middle turbinate was incised and the nasal mucosal flap was lifted with periosteal elevator Freer style. So that, underlying bone (the lacrimal fossa: maxillary and lacrimal bone) including the entire the medial wall of the lacrimal sac, was trimmed by Kerrison punch, Chisel and Mallet technique. The osteotomy was increased in size, the upper border being above the common canaliculi more than 45 degree test and the lower border being above nasolacrimal canal, so lacrimal sac could be identified. The lacrimal sac was tented by Bowman probe and opened by a 15 degree knife in vertical line to create the anterior and posterior flap. The flap of the lacrimal sac was widened enough to prevent any sum developing inferiorly. The anterior flap of lacrimal sac was sutured to the nasal mucosa to prevent the flap moving down to cover the common canaliculi. The irrigation test was performed to check the common canaliculi patency. Bicanalicular silicone stent was inserted and the two ends of the silicone stent were tied together inside the nose. Finally a gelform was packed inside the operative field to stop bleeding. The bone volume that was removed, was measured and recorded.

Postoperative assessment

All patients were released from the hospital on the first or second postoperative day. They were taught to wash the nasal mucosa and use the combination of antibiotic and steroid eye solution (Dex-oph) four times a day for two weeks. Oral antibiotic (cephalexin) and nasal decongestant (actifed) were prescribed for one week.

Outcome assessment

Postoperative assessments were carried out at 2 weeks, 2 months (silicone tube removal) and 5 months after

surgery. A complete eye examination was performed in every visit. Surgery was considered successful if no fluid refluxed by the irrigation test and no reported symptoms. Those cases with fluid reflux at any period of the follow up were considered unsuccessful.

Results

All of 194 cases underwent endonasal endoscopic DCR for acquired nasolacrimal duct obstruction in 2010 to 2011. Post operation follow up of less than 3 visits (57 cases) and presaccular obstruction (6 cases) were excluded. Finally, 195 eyes in 131 cases were included in this study. The mean age at time of surgery was 58.1 ± 14.8 years old. They consisted 122 females (93.1%) and 9 males (6.9%). There were 67 cases with single eye (right 35 cases, left 32 cases) and 64 cases with both eyes lesion. Among 131 patients, there were 97 cases with nasolacrimal duct obstruction (74%), 51 cases with dacryocystitis (38.9%) and 4 cases with nasolacrimal duct obstruction by traumatic cause (3.1%).

Table 1 Type of acquired nasolacrimal duct obstruction prior surgery

Eye disease	Right (n=99)	Left (n=96)	Total (N=195)
NLDO	66	71	137
Dacryocystitis	31	23	54
Traumatic NLDO	2	2	4

Note: * NLDO: nasolacrimal duct obstruction

The mean duration of intraoperative per eye was 16.7 ± 4.7 minutes. The mean bone volume removed was 0.44 ± 0.19 milliliters in the right side and 0.4 ± 0.16 milliliters in the left side. The anterior flap of lacrimal sac could be sutured in 169 case (86.7%). The complications

found were intra/postoperative bleeding (epistaxis 16 cases), ethmoidal sinus exposure (16 cases), orbital fat prolapse (5 cases) and stent extrusion (2 cases) but these were not serious complications. The mean of retained stent duration was 65.7 ± 35.9 days. The mean duration of last follow up (third visit) was 164.9 ± 63.1 days.

The surgery was successful in 187 eyes (95.9%; right 93 eyes and left 94 eyes). Suturing of the anterior flap was not successful in six of eight eyes in the failure group. Hence, failure of suturing of the anterior flap was a statistically significant factor in the outcome of endonasal endoscopic DCR (p-value 0.001). Other variable factors had no statistic significance (p-value >0.05).

Table 2 Characteristic of the patients in success and failure groups

	Success gr.	Failure gr.	p-value
No. of eyes	187	8	
Mean age \pm SD	59.4 ± 14.3	63.0 ± 7.4	0.217
F:M	178:9	7:1	0.308
Rt:Lt	93:94	6:2	0.191

Note: No significant difference between both groups

Discussion

External dacryocystorhinostomy is a treatment of choice of nasolacrimal duct obstruction. This technique is approached through the skin incision. It is easy to perform but the difficulty is to identify the lacrimal sac clearly in the small tunnel of the operative field. The incision has to cut the skin and the orbicularis oculi muscle so that it is not proper to do in young patients who concern about scarring and the interference to the lacrimal pumping. However, success rate in the external dacryocystorhinostomy is high approximately 90-95%.

In this era, endoscopes are commonly used worldwide in many operative fields. Endonasal approach by fiberoptic endoscope is the best choice for treatment of lacrimal duct obstruction. It has significant advantage over the external dacryocystorhinostomy including lack of scarring, minimal postoperative hematoma, shorter postoperative recovery time, preservation of the pumping action of orbicularis oculi muscle, clearly visualized to identify structure such as lacrimal sac and common canaliculi and to correct nasal cavity abnormality. The success rate of endoscopic DCR ranges from 84-98%⁽⁹⁾. Many reports about endonasal DCR are hard to be compared because of the difference in the study design, range of follow up time and definition of success. In this study, the authors follow the criteria suggested by Olver who suggested three criteria that all surgeon should agree on⁽⁹⁾. Firstly, the outcome should be assessed at minimum of 6 months after surgery, being at least 3 months after removal of the stent. Secondly, the subjective success is to be assessed based on the patient's symptoms. Thirdly, the objective success (anatomical success) is to be assessed based on the patency on syringing and the presence of a functioning rhinostomy evaluated using the functional endoscopic dye test.

Table 3 Comparison of causes of disease in success and failure groups

	Success gr.	Failure gr.	p-value
NLDO	131	6	0.765
Dacryocystitis	52	2	0.862
Traumatic NLDO	4	0	-

Note: No significant difference in causes of disease between both groups,
* NLDO: nasolacrimal duct obstruction

In this study both, objective and the subjective outcomes are assessed 3 month after the removal of the stent by asking about the symptoms and by the irrigation

test. The successful surgery in this study is 95.9% compared with other reports, there are no significant difference. The suturing anterior flap has increased the successful rate of surgery, with statistical significance in this group (p-value 0.001).

Table 4 Comparison of operative factors between the two groups

	Success gr.	Failure gr.	p-value
No suture flap	20	6	<0.001*
Bone removal ≥0.4 ml	115	6	0.521
Mean duration of surgery ±SD (min)	16.8±4.8	15.8±3.5	0.434
Mean duration of stent left ±SD (day)	65.7±36.5	67.0±21.6	0.857

Note: *There was statistically significant difference in the rate of failure of suturing of the anterior flap

Many factors which enhance a good surgical outcome are firstly, the adequately enlarged osteotomy. There is a tendency to contract from post-operative healing process within 7.5-12.7 weeks⁽⁹⁻¹¹⁾. It is essential to remove the bone medial side of lacrimal sac until the entire of the lacrimal sac is visible. In this study, the upper border of the osteotomy is about 45 degree test and the lower border is above the nasolacrimal canal. Secondly, the stenosis and the scarring of the lacrimal flap is the most important. The nasal mucosa edge and anterior lacrimal flap should be

Table 5 Complications of endonasal endoscopic DCR

Complication	Total	Success gr	Failure gr.	p-value
Epistaxis	16	14	2	0.09
Sinus penetration	16	15	1	0.658
Orbital fat prolapse	5	5	0	-
Stent extrusion	2	2	0	-

Note: No statistic significance

closely opposed to keep the residual exposed bone around the sac to a minimum⁽⁷⁾. Approximating the nasal mucosa and the anterior flap by suturing helps reducing the raw surface. Thereby creating less scar contracture results in a higher success rate. Some studies used antimetabolite (mitomycin C) to inhibit the fibroblasts then inhibit the fibrosis in the wound healing. Mitomycin C can be used to enhance the success rate up to 99.2%⁽¹²⁾. However mitomycin C can cause complications, such as persistent bleeding, poor wound healing and mucosal necrosis or infection⁽¹³⁾. Thirdly, the size and location of the common canaliculi can be the cause of failure. The common canaliculi being too close to the middle turbinate results in adhesion and stenosis⁽⁷⁾. The silicone stent intubation might prevent common canaliculi stenosis and maintain the patency of nasolacrimal anastomosis during the healing process⁽⁹⁾. The duration of the stent ranges from 6 weeks to 3 months but the optimal stent period kept is not known. In this study, the stent were retained for 2 months. However, the silicone stent itself may cause granulation tissue formation, infection, canalicular slitting, and punctual erosion. The tube also may protrude from the rhinostomy site or cause discomfort to the patient⁽¹³⁾. The three factors mentioned above have a great influence on the success rate of the surgery. Other factors that were discussed in many studies such as young age at the time of surgery were associated with a higher rate of failure due to a higher degree of fibrosis in young patients⁽⁹⁾. But many studies concluded that age did not seem to affect the long term success rate as in this study^(14,15). Sinus and nasal abnormality, previous trauma, revision of surgery for failed surgery are associated with the failure of surgery. (15-17) In this study, there were 4 cases having traumatic cause of nasolacrimal duct obstruction. All of them were successfully treated. However, the group of these patients is too small to be discussed so further study should be performed.

Conclusion

This study is retrospective study trying to find the factors that may influence the success rate of endonasal endoscopic DCR. It appears that the suturing of the anterior flap can prevent it from moving down to cover the common canaliculi and approximating the nasal mucosa and the lacrimal sac mucosa reduces the raw surface hence preventing scarring. However, further research about the suturing flap should be done in the future.

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