Anterior Flap Anastomosis Alone with Silicone Intubation for Successful External Dacryocystorhinostomy in Primary Acquired Nasolacrimal Duct Obstruction

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Abstract

Objective: To evaluate the outcomes of external dacryocystorhinostomy (DCR) by only anterior flap anastomosis with silicone intubation.

Study design: Prospective consecutive case series

Methods: A total of ninety two eyes (eighty four patients) with primary acquired nasolacrimal duct obstruction were enrolled in the study. A presenting age of 62.2 +/- 10.2 years (range, 44-89 years) underwent external DCR from January 2013 to December 2013 in Department of Ophthalmology, Chaopraya Yommarach Hospital Suphanburi. All ninety two eyes underwent external DCR with U-shaped nasal mucosal flap and only anterior flap anastomosis. Silicone tube was placed for one month. The success rate was determined based on the patency of lacrimal system by irrigation and resolution of patient symptoms up to 6 months.

Results: The external DCR with only anterior flap anastomosis with silicone intubation for one month had a success rate of 97.83% (90/92 eyes). The average duration of surgery was 44.0 minutes. No adverse effect (eg. abnormal nasal bleeding, secondary infection, increase intraocular pressure) or any other surgical adverse events were observed. The patients almost satisfied of unremarkable cutaneous scar.

Conclusion: Creating only the anterior anastomosis with silicone intubation is technically simpler than traditional double flap anastomosis with a good surgical outcome. The silicone intubation for one month augmented the successful external DCR without any adverse effect. Thai J Ophthalmo 2014; January-June 28(1): 1-9.

Keyword: nasolacrimal duct obstruction, external dacryocystorhinostomy, anterior anastomosis, silicone intubation

No Author has a financial or proprietary interest in material or method mentioned

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ผลการรักษาผู้ป่วยโรคหอหน้าตาอุดตันโดยวิธี external dacryocystorhinostomy โดยใช้เทคนิคเย็บเฉพาะ anterior flap ร่วมกับการใส่หอย silicone tube

จุฑารัตน์ ป้อมภิษณ์ย์ พ.บ.

บทคัดย่อ

จุฬาภรณ์: เพื่อประเมินผลการผ่าตัดรักษาผู้ป่วยโรคหอหน้าตาอุดตัน โดยวิธี external dacryocystorhinostomy โดยใช้เทคนิคเย็บเฉพาะ anterior flap ร่วมกับการใส่หอย silicone tube

รูปแบบการศึกษา: Prospective consecutive case series

วิธีการศึกษา: ผู้ป่วยที่ได้รับการวินิจฉัยโรคหอหน้าตาอุดตันชนิดปฐมภูมิที่หน่วยตรวจผู้ป่วยโรคตา แผนกจุฬาภรณ์ โรงพยาบาลจุฬาลงกรณ์ กรุงเทพมหานคร จำนวน 28 คน ได้รับการผ่าตัดรักษาโรคหอหน้าตาอุดตันโดยวิธี external dacryocystorhinostomy โดยใช้เทคนิคเย็บเฉพาะ anterior flap ร่วมกับการใส่หอย silicone tube เป็นระยะเวลาโดยประมาณ ด้วยการประเมินจากการล้างหอยตามหลังการผ่าตัด 3 ครั้ง ผลการประเมินจากการล้างหอย 1-2 ครั้ง ผลการประเมินจากการล้างหอย 2-3 ครั้ง

ผลการศึกษา: การผ่าตัดรักษาผู้ป่วยโรคหอหน้าตาอุดตัน โดยวิธี external dacryocystorhinostomy โดยใช้เทคนิคเย็บเฉพาะ anterior flap ร่วมกับการใส่หอย silicone tube เป็นระยะเวลา 1 เดือน พบว่าได้ผลสำเร็จ สามารถล้างหอยได้ตลอดค่ำที่ระยะเวลา 6 เดือน หลังผ่าตัด ร้อยละ 97.83 (90/92 ด้าน) ใช้เวลาในการผ่าตัดเฉลี่ย 44 นาที ไม่พบการก่อการแทรกซ้อน เช่น เลือดออกผิดปกติทางแผลหรือขุ้น, การติดเชื้อหรือขุ้น, ภาวะความดันตาขั้นสูง เป็นต้น ผู้ป่วยส่วนใหญ่ฟังก์ชั่นปกติได้ตามปกติ


ผู้เรียนทั้งหมดไม่มีส่วนเกี่ยวข้องหรือประโยชน์ใดๆ กับผลิตภัณฑ์ที่ได้กล่าวถึงในงานวิจัยนี้

กลุ่มงานจุฬาภรณ์โรงพยาบาลจุฬาลงกรณ์ กรุงเทพมหานคร
Anterior Flap Anastomosis Alone with Silicone Intubation for Successful External Dacryocystorhinostomy in Primary Acquired Nasolacrimal Duct Obstruction

Introduction

Primary acquired nasolacrimal duct obstruction is the most common form of nasolacrimal duct obstruction and causes epiphora. The evolution of surgical therapy for lacrimal obstruction dates back to 1893 when Caldwell described an intranasal dacryocystorhinostomy (DCR) performed via trephination of the nasolacrimal duct. Almost a century ago in 1904, a French ophthalmologist Adeo Toti, introduced the external DCR using skin sutures alone for wound closure after resection of the lacrimal sac, nasal mucosa and intervening bone. In 1921, Dupuy-Dutemps and Bourguet modified Toti’s procedure by direct suturing of the cut edges of nasal and lacrimal sac mucosal flaps with improved rates of successful epithelium-lined fistulization. This technique has remained the gold standard in the treatment of acquired nasolacrimal duct obstruction. Suturing the anterior and posterior flaps of the nasal mucosa with the lacrimal sac was suggested by Ohm. Routine use of silicone tube intubations as a useful adjunct to external DCR procedure was advocated by Older. External DCR is the most popular operation done for nasolacrimal duct obstruction and the gold standard by which other methods can be measured and compared. The objectives of this study were to determine the success rate and to determine the intra and postoperative complications of this technique for treating primary acquired nasolacrimal duct obstruction by anterior flap anastomosis alone with silicone intubation external DCR.

Materials and Methods

A prospective study was conducted in 84 patients, 92 eyes, all of whom had primary acquired nasolacrimal sac or duct obstruction underwent external DCR from January 2013 to December 2013 at Department of Ophthalmology, Chaopraya Yommarach Hospital Suphanburi. All patients were assessed by complete ophthalmic examinations. There were more female patients 83 (90.2%). Range of age group was 44-89 years, mean age was 62-2 years (Table 1).

Preoperative assessment included syringing and probing. The lids were inspected, focusing on the positions of the lacrimal puncta and the function of orbicularis muscle. Finger palpation of the lacrimal fossa of the enlarged lacrimal sac is essential. Mucoid or mucopurulent reflux on gentle pressure on the lacrimal sac establishes the diagnosis of dacryocystitis. Only patients with primary acquired nasolacrimal sac or duct obstruction were included to this study. Exclusion criteria were canalicular obstruction ascertained with probing, noticeable lower lid laxity, previous lacrimal surgery, age younger than 15 years, suspicion of malignancy, radiation therapy, posttraumatic bony deformity and bone diseases and antiplatelets user who could not suspend treatment before surgery at least 7 days.

All operations were performed between November 2011 and July 2013. The external DCR operations were performed with the patient under general anesthesia. Gauze strips in ephedrine were applied intranasally between the posterior part of the middle and lower turbinate, as well as the roof of the nasal cavity, to achieve a good hemostasis. An incision of approximately 0.8-1.2 cm. in length was made medial to the angular vein, starting at the level of the medial canthal tendon. The orbicularis muscle fibers were separated with blunt dissection. The periosteum overlying and medial to the anterior lacrimal crest was exposed. The periosteum incision was made just medial and inferior to the bony insertion of the medial canthal tendon. The osteotomy, approximately at least 10 mm. in diameter, was created with Kerrison rongeurs. The nasal mucosa were opened to form
an anterior U shaped flap, the shorter posterior flaps were left without suture. The lacrimal sac mucosa was inspected. The site of nasolacrimal obstruction was localized by probing, and the internal punctum was inspected as well. Bleeding was checked and stopped by bipolar electrocautery or occasionally by use of surgicell when massive bleeding occurred. The silicone tube was inserted and tied with several knots. The 6-0 Vicryl sutures were used to join the two flaps. One suspended suture of two flaps of the periostium was performed, to elevate them anteriorly in order to avoid adhesions with underlying tissue, and to approximate the deep planes of wound. The skin incision was closed with 6-0 silk sutures. Nasal packing was performed in some cases which blood oozing still occurred after completing the DCR procedure. The operative time was measured from starting the ephedrine soaked gauze nasal packing to the end of the application of the pressure bandage. Postoperative care consisted of frequent cold compression, head elevation, topical dexamethasone 4 times a day, Steroid nasal spray twice a day for one month, and systemic antibiotics only in cases that had flank pus in the operative field.

At the first follow up visit 1 week after surgery, the suture stitches were removed and the lacrimal passage was irrigated with saline solution. At one month after surgery, the silicone tube was removed and the lacrimal passage was irrigated. The tube was removed by cutting the silicone tube between the puncta and by either blowing the nose or by extracting the tube from the nose with forceps. The next follow up visit was at 6 months after surgery. The surgical outcome was considered successful if the saline solution freely reached the nose during the lacrimal sac irrigation and if the patients had no tearing, or recurrent conjunctival discharge. Patients were asked about their satisfaction with the cosmetics of the cutaneous scar.

### Results

The operation was classified as successful by the objective demonstration of a patent nasolacrimal system through irrigation. The success rate at 6 months after surgery was 90 in 92 eyes (97.83%).

(Table 2)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total No. of patients /Operations</td>
<td>84 / 92</td>
</tr>
<tr>
<td>Age (year)</td>
<td></td>
</tr>
<tr>
<td>Mean ± SD</td>
<td>62.2 ± 10.2</td>
</tr>
<tr>
<td>Range</td>
<td>44 - 89</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
</tr>
<tr>
<td>Male / Female</td>
<td>9 / 83</td>
</tr>
<tr>
<td>Duration of symptoms (month)</td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>22.4</td>
</tr>
<tr>
<td>Range</td>
<td>1 - 240</td>
</tr>
<tr>
<td>Laterality of surgery (right / left)</td>
<td>43 / 49</td>
</tr>
</tbody>
</table>
there was only one copious intraoperative hemorrhage. She needed intraoperative intranasal packing. She was discharged from the hospital in the next two days and there was no more postoperative hemorrhage after that. (Table 3)

Postoperative delayed intranasal bleeding occurred in three cases. None of them had copious intraoperative bleeding. Operation times were 50, 25 and 55 minutes. The duration of delayed bleeding was 8, 7 and 6 days. (mean 7 days)

Mean postoperative intraocular pressure at the first week visit was 12.70 mmHg. At the first month visit it was 13.26 mmHg. Three cases had transient increase in intraocular pressure at the first month visit. The pressures were 22.7, 22.5 and 22.2 mmHg. All of these patients were evaluated by gonioscopy, and open angles were found. The intraocular pressures returned to normal level after ceasing topical dexamethasone in all cases. All of them had surgical success. The patient’s satisfaction about the cutaneous scar was evaluated at the 6 month follow up visit, with mean 8.7±0.9 by Numeric Rating Scale (NRS; 0 = unsatisfied patient, 10 = satisfied patient).

### Discussion

Technically, the external DCR technique of Dupuy-Dutumps and Bourguet, in which the anterior flaps and the posterior flaps are sutured to achieve a controlled epithelium-lined anastomosis, was used in this study.10-16 The advantage of external DCR is good intraoperative visibility inside the lacrimal sac, allowing inspection of the internal punctum and lacrimal sac mucosa and permitting biopsies to be performed easily. Dacryoliths could be detected and

### Table 2. Patency rates at scheduled postoperative follow-up visits

<table>
<thead>
<tr>
<th>Postoperative Follow-up Visit</th>
<th>1 week</th>
<th>1 month</th>
<th>6 months</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 (failed irrigation)</td>
<td>1 (1.09 %)</td>
<td>2 (2.17 %)</td>
<td>2 (2.17 %)</td>
</tr>
<tr>
<td>1 (partial patency)</td>
<td>13 (14.13 %)</td>
<td>1 (1.09 %)</td>
<td></td>
</tr>
<tr>
<td>2 (full patency)</td>
<td>78 (84.78 %)</td>
<td>89 (96.74 %)</td>
<td>90 (97.83 %)</td>
</tr>
</tbody>
</table>

### Table 3. Intraoperative details

<table>
<thead>
<tr>
<th>Intraoperative Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intraoperative Time (minute)</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Intraoperative Packing (Eye)</td>
</tr>
</tbody>
</table>
also removed. The good exposure and visualization allowed creation of large bony ostium and easily to stop intraoperative bleeding. The external DCR with various modifications consistently has yielded success rates of approximately 90-100%.13-16

Though the suturing of the anterior and posterior mucosal flaps increases the probability of primary healing of the mucosal anastomosis and reduces the tendency to primary and secondary hemorrhages as pointed out by Jones and Welham,17-18 we have found it simpler in lacrimal surgery to use anterior suspended flaps only. Many reports found the anastomosis of posterior flaps does not seem to affect the success rate of external DCR. Creating only the anterior anastomosis is technically simpler and does not seem to negatively influence the outcome of DCR surgery.

Yazici B and Yazici Z,19 who used digital subtraction macrodacryocystography to evaluate the nasolacrimal ostium 6 months after successful external DCR, they found that the lacrimal sac reforms after surgery, and the final ostium develops at the inferior part of the regenerated sac, which confirms the irrelevance to final ostium size of suturing the posterior and anterior flaps. Recently, one meta-analysis identified and analyzed seven studies. Overall, DCR with anterior and posterior flap anastomosis was performed on 368 eyes, while primary external DCR with anterior flap anastomosis was performed on 397 eyes. There was no significant difference in the success rates of both techniques. (risk ratio: 0.987; 95% confidence interval 0.946-1.030)20

Despite meticulous surgery, failures are often found. The two most common causes of DCR failure are common canalicular obstruction and obstruction at the rhinostomy site. McPherson and Egleston noted that 3 out of 7 patients in their study who underwent a second operation were found to have a dense scar

<table>
<thead>
<tr>
<th>Postoperative Complication</th>
<th></th>
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<tbody>
<tr>
<td>Pain score postoperative</td>
<td>2 - 5</td>
</tr>
<tr>
<td>Range</td>
<td></td>
</tr>
<tr>
<td>(0 = no pain)</td>
<td></td>
</tr>
<tr>
<td>(10 = intractable pain)</td>
<td></td>
</tr>
<tr>
<td>Mean ± SD</td>
<td>4 ± 0.7</td>
</tr>
<tr>
<td>Delayed Bleeding (Eye)</td>
<td></td>
</tr>
<tr>
<td>no bleeding</td>
<td>89</td>
</tr>
<tr>
<td>present bleeding</td>
<td>3</td>
</tr>
<tr>
<td>Mean Postoperative (IOP, mmHg)</td>
<td></td>
</tr>
<tr>
<td>1 week</td>
<td>12.70</td>
</tr>
<tr>
<td>1 month</td>
<td>13.26</td>
</tr>
<tr>
<td>Cutaneous scar complaint</td>
<td></td>
</tr>
<tr>
<td>Range</td>
<td>8 - 10</td>
</tr>
<tr>
<td>(0 = unsatisfied patient)</td>
<td></td>
</tr>
<tr>
<td>(10 = satisfied patient)</td>
<td></td>
</tr>
<tr>
<td>Mean ± SD</td>
<td>8.7 ± 0.9</td>
</tr>
</tbody>
</table>
tissue present at rhinostomy site.\textsuperscript{21} To prevent post
DCR obstruction, a technique of inserting a silicone rubber was described by Gibbs in 1967.\textsuperscript{22} Most im-
portantly, the insertion of a silicone tube into the
lacrimal drainage system during DCR may prevent
postoperative obstructions by securing an open path-
way during the healing process. Moreover, surgical
cases involving either excessive bleeding or inad-
vertent nasal mucosal tears are more easily com-
pleted in the presence of a tube. In addition, a sili-
cone tube lifts the flaps anteriorly into a position that
reduces the technical demands of suturing, which is
most appreciated in cases with decreased visibility
due to excessive bleeding, and a tube can also act
as a support structure for torn anterior flaps and
maintain patent drainage passage in cases that would
otherwise require very difficult near impossible su-
turing.

DCR with silicone tube intubation has been
accepted as a highly successful procedure in pa-
tients with a history of epiphora and discharge fol-
lowing chronic dacryocystitis. A review of the litera-
ture reveals a success rate of 90-95\%.\textsuperscript{23-25} The du-
ration the tube is left in place varies depending on
surgeon preference, from several weeks up to more
than 12 months. The time frame for silicone tube
removal varied in the literature from as early as 3 to
7 weeks to as late as over a year.\textsuperscript{26-32} Pandya et al. in
a retrospective study, reviewed 338 external DCR
surgeries and found that silicone intubation for longer
than 6 months increased the success rate of the
procedure.\textsuperscript{33} Charalampidou et al. reviewed a ret-
rospective study of external DCR and found that out
of 180 cases, 94 tubes were removed between 2 to
4 months, 24 tubes were removed before the planned
2 month period and 62 tubes were removed after
the 4 month period. This study suggests that timing
between two and four month of silicone tube re-
moval does not influence surgical success in exter-
nal DCR regardless of the cause of early or late tube
removal.\textsuperscript{34} A survey of ophthalmologists also found
out that the tubes were removed as early as 4 weeks.
Importantly, duration of silicone tube intubation and
granulation tissue formation are known to be impor-
tant factors for surgical failure in DCR. Prolonged
intubation has been shown to associate with higher
failure rate because of granulation reaction induced
at ostium.\textsuperscript{35} Our study found that only one month for
silicone removal contributed to the success rate in
anterior flap anastomosis external DCR without granu-
lation tissue formation or any complication.

In this study, the success rate was defined by
an anatomically patent nasolacrimal system ascer-
tained by irrigation at 6 months after surgery. Our
success rate is 97.83\%, it showed a similar ten-
dency to previous reported success rates: 98.33\%
reported by Zaman et al\textsuperscript{36}, 89.41\% reported by
Turkcu\textsuperscript{37} et al and 96.67\% reported by Serin.\textsuperscript{38} Anas-
tomosis of only the anterior flap is not disadvanta-
geous to the outcomes of external DCR surgery when
compared with the more traditional approach of anas-
tomosis of both flaps. Silicone intubation for one
month can augment the success rate without seri-
ous complication.

The perceived disadvantages of the highly suc-
cessful external DCR include the risk of cutaneous
scar and lengthy surgery with significant blood
loss.\textsuperscript{39-42} A Previous study reported the cutaneous
scar from external DCR rarely causes serious cos-
metic problems, especially if the incision respects
relaxed skin tension lines.\textsuperscript{43} Our study also shows
that the patients accepted the cosmetic cutaneous
scar with a high score (mean 8.7±0.9) for patient’s
satisfactory at the six months follow up visit. The
mean surgical time for our modification technique
was 44.0±16.2 min. not different from 41.1±10.3 min.
reported by Malhotra et al with no difference with endonasal endoscopic DCR (39.6±13.8 min.). No massive bleeding was observed in our study.

**Conclusion**

Creating only the anterior anastomosis with silicone intubation is technically simpler than traditional double flap anastomosis with a good surgical outcome. The silicone intubation for one month augmented the successful external DCR without any adverse effect.

**References**


28. Saiju R, Morse LJ, Weinberg D, Shrestha MK, Ruit S. Prospective randomized comparison of external Dacryocystorhi-
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