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Endoscopically assisted balloon dacryocystoplasty and silicone intubation versus silicone intubation alone in adults with incomplete nasolacrimal duct obstruction

M.B. KASHKOULI[1], B. BEIGI[2], K. TARASSOLY[1], R.C. KEMPSTER[3]

[1]Oculoplastic Unit, Eye Research Center, Rassoul Akram Hospital, Iran University of Medical Sciences, Tehran - Iran
[2]Ocular Adnexal Unit, Norfolk and Norwich University Hospital - UK
[3]Department of Ophthalmology, Mater Health Services, South Brisbane - Australia

PURPOSE. *To compare the success rate of endoscopically assisted balloon dacryocystoplasty (DCP) and silicone intubation (DCP-SI) with endoscopically assisted silicone intubation alone (SI) in adults with incomplete nasolacrimal duct (NLD) obstruction.*
METHODS. *In a retrospective nonrandomized comparative case series, 62 eyes of 55 adult patients with incomplete NLD obstruction underwent endoscopic probing and either SI (n=39 eyes) or DCP-SI (n=23 eyes) under general anesthesia. The last follow-up examination included diagnostic probing and irrigation if there was not success. Success was defined as disappearance of the symptoms and failure as partial improvement or absence of improvement at last follow-up.*
RESULTS. *Patients ranged from 20 to 85 years of age (mean: 60.93, SD: 15.60). Tubes were removed between 6 and 20 weeks (mean: 7.49, SD: 2.25) postoperatively. Follow-up ranged from 6 to 63 months (mean: 14.60, SD: 10.33). Success rate of the eyes with SI (21/39, 53.84%) and DCP-SI (14/23, 60.86%) were not statistically different (p=0.60). Complications included slight nasal and canalicular bleeding in almost all eyes in both groups which was easily controlled, slit punctum in four eyes with bicanalicular intubation (4/50, 8%), and monocanalicular tube lost in three eyes prematurely.*
CONCLUSIONS. *Success rate of endoscopic DCP-SI had no statistically significant difference from silicone intubation alone in treatment of incomplete NLD obstruction in adults. (Eur J Ophthalmol 2006; 16: 514-9)*

KEY WORDS. *Adult, Balloon dacryocystoplasty, Incomplete nasolacrimal duct obstruction, Silicone intubation*

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INTRODUCTION

In adults, epiphora is usually secondary to obstruction of the nasolacrimal duct (NLD) (1). The etiology of the obstruction is mostly an idiopathic inflammation of the lacrimal drainage system (1). Surgical treatment is usually carried out by recanalizing the occluded lacrimal system with probing (2, 3), silicone intubation (4-6), balloon dacryocystoplasty (DCP) (7-11), or dacryocystorhinostomy (DCR).

Recanalization of the obstructed NLD is, however, appealing in that it restores the integrity of the natural lacrimal drainage system and avoids the necessity of making a new opening through the medial lacrimal sac wall, lacrimal fossa, and lateral nasal wall.

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Perry and associates (7) and Couch and White (10) performed balloon DCP and silicone intubation for incompletely obstructed NLD in adults and raised a question whether balloon DCP is any more effective than silicone intubation alone for treatment of adults with acquired NLD obstruction.

This study aimed to retrospectively compare these two techniques performed in two university-based hospitals to assess their efficacies. To our knowledge, this is the first study comparing silicone intubation alone with balloon DCP and silicone intubation for recanalization of the incompletely obstructed NLD in adults.

METHODS

A retrospective comparative analysis of interventional cases was performed between November 1999 and December 2003. During this period 62 eyes from 55 consecutive adult patients with epiphora and incomplete NLD obstruction underwent either endoscopic probing, balloon DCP, and silicone intubation (DCP-SI group) or endoscopic probing and silicone intubation (SI group), by two surgeons (B.B. and M.B.K.) at two university-based hospitals. Different surgical options, including procedures involved and reported success rates, were explained and an informed consent was obtained. All patients' notes were reviewed and those with less than 6 months follow-up were recalled to clinic for further assessment. Patients with previous eyelid and/or lacrimal surgery, punctal and/or canalicular obstruction, eyelid malposition, nasal or lacrimal drainage system tumors, and less than 6 months follow-up were excluded.

The diagnosis of NLD obstruction was based on a history of tearing, dye disappearance test, and diagnostic probing and irrigation tests. The dye disappearance test was performed with either instillation of a drop of 2% fluorescein sodium (Chauvin Pharmaceuticals Ltd., UK) or a fluorescein sodium strip (Elham-Teb Ltd, Iran) placed in the conjunctival fornix and assessed after 5 minutes to see how much of the dye remained in the tear meniscus. A diagnostic probing of the upper lacrimal drainage sys-

TABLE I - RESULTS OF STATISTICALLY INSIGNIFICANT FACTORS ASSOCIATED WITH 39 SILICONE INTUBATIONS (SI) AND 23 BALLOON DACRYOCYSTOPLASTY AND SILICONE INTUBATIONS (BSI) FOR INCOMPLETE NASOLACRIMAL DUCT OBSTRUCTION IN ADULTS

		SI, n (%)	BSI, n (%)	p*
Sex	Male	9/33 (27.27)	4/22 (18.18)	0.52
	Female	24/33 (72.72)	18/22 (81.81)	
Age, yr	20–59	16/39 (41.02)	8/23 (34.78)	0.57
	60+	23/39 (58.97)	15/23 (65.21)	
Laterality	Right	21/39 (53.84)	10/23 (43.47)	0.60
	Left	18/39 (46.15)	13/23 (56.52)	
Duration of symptoms, mo	0–12	12/39 (30.76)	9/23 (39.13)	0.88
	13–24	6/39 (15.38)	3/23 (13.04)	
	>24	16/39 (41.02)	10/23 (43.47)	
	Missing data	5/39 (19.23)	1/23 (4.34)	
Time of tube removal, wk†	6–8	30/39 (76.92)	22/23 (95.65)	0.14
	>8	6/39 (15.38)	1/23 (4.34)	
	Fell out	3/39 (7.69)	0/23 (0)	
Follow-up time, mo	6–12	20/39 (51.28)	14/23 (60.86)	0.59
	>12	19/39 (48.71)	9/23 (39.13)	

*Chi-square/Fisher exact test
†Mean time of tube removal in success group (7.65, SD: 2.90 weeks) was not statistically different (CI = –0.82 to + 1.54, df = 57, independent sample t-test, p=0.54) from failure group (7.29, SD: 1.10 weeks)

tem and irrigation of the nasolacrimal duct was then performed in a similar way as has been previously described (12). Patients with reflux of fluid through the opposite canaliculus and late and little passage in to the nose and throat on irrigation test were included. The patients were told that if there was failure to open the obstructed NLD by endoscopic probing the procedure would then be converted to a DCR.

All procedures were performed under general anesthesia. The nose was packed with 1/1000 adrenaline-soaked cotton buds. The inferior turbinate was elevated with a Freer periosteal elevator to make easier insertion of the endoscope into the inferior nasal meatus. The inferior punctum was dilated atraumatically and a Bowman's lacrimal probe (size 00 or 0) was passed through the canaliculus and the NLD into the inferior meatus. In some cases a small bulge was seen on the lateral nasal wall of the inferior nasal meatus where the vertically oriented probe lay submucosally. In these cases, an incision overlying the bulging mucosa was made and the end of the probe was released into the inferior nasal meatus. If the probe could not be passed through the obstructed NLD, the procedure then converted to a DCR. These patients were subsequently excluded from this study.

In the DCP-SI group, a 3X 15-mm Lacricath® (Atrion Medical Products Inc.) balloon was lubricated with ophthalmic ointment and passed through the inferior canaliculus and NLD. The catheter was visualized endoscopically. The balloon was then inflated to 8 atmospheres of pressure for 90 seconds and deflated before being pulled back to the proximal black ring, and inflated again to 9 atmospheres of pressure for 60 seconds. The catheter was vigorously aspirated before it was withdrawn. It was then replaced with a Ritleng probe which was likewise observed with an endoscope to ensure correct passage into the inferior meatus. A bicanalicular Ritleng tube (FCI, France) was used which consists of a silicone tube with attached Prolene threads at either end. One of these Prolene ends was then inserted into the probe and retrieved from the inferior meatus. The silicone tube was then pulled into the nose. This process was repeated from the upper canaliculus to retrieve the second end of the tube. Eight to 10 knots were made at the ends of the tube in the nose with adjustment of traction on the punctal side of the tube.

Endoscopically assisted silicone intubation of the NLD was performed after withdrawing the Bowman probe in the SI group. Two types of silicone tubes, bicanalicular Ritleng or monocanalicular (Monoka, Ritleng type, FCI, France), were used in this group. The bicanalicular silicone intubation technique was the same as explained in the DCP-SI group. In the monocanalicular technique, a Monoka tube (3-mm flange) was inserted via the Ritleng probe in a similar way to the bicanalicular intubation but just from the lower canaliculus. The nasal end of the Monoka tube was pulled into the nose and the head (flange) was fixed into the inferior external surface of punctum with forceps. The distal end of the tube within the nose was cut and left to dangle freely in the inferior meatus.

Postoperatively, patients received antibiotic and steroid drops 4 times daily for 2 weeks. Follow-up was arranged in 6 to 8 weeks for removal of the tubes.

The Monoka tube was easily removed by pulling it out with a pair of forceps from its flange end at the lacrimal punctum under topical anesthesia. In removing the bicanalicular tube, the nasal end of the tube was endoscopically found and grasped before cutting the loop between the two lacrimal puncta. The tube was then pulled out via the nasal cavity. A 2-week course of topical steroid (4 times daily) was instructed after tube removal. Patients were again reviewed 6 months post tube removal.

Success was defined as disappearance of the symptoms. Failure was defined as partial improvement, absence of improvement, or worsening of symptoms. The last follow-up examination included diagnostic probing and irrigation if complete success was not achieved. Results of the diagnostic probing and irrigation were recorded and appropriate management was offered to the patients at the last follow-up. Data were studied using SPSS MS Windows Release 11.0 (Chicago). Chi-square/Fisher exact test was used for statistical analysis.

TABLE II - SUCCESS RATE OF 39 SILICONE INTUBATIONS (SI) AND 23 BALLOON DACRYOCYSTOPLASTY AND SILICONE INTUBATIONS (BSI) FOR INCOMPLETE NASOLACRIMAL DUCT OBSTRUCTION IN ADULTS

	SI, n (%)	BSI, n (%)
Success	21/39 (53.84)	14/23 (60.86)
Failure	18/39 (46.15)	9/23 (39.13)

Fisher exact test, p=0.60

RESULTS

Sixty-two eyes of 55 patients with NLD obstruction were studied. The age range was 20 to 85 years (mean: 60.93, SD: 15.60). Forty-two patients (76.36%) were female. The right eye was involved in 24/55 (43.63%), left eye in 24/55 (43.63%), and both eyes in 7/55 (12.72%) patients. Duration of symptoms ranged from 3 to 60 months (mean: 21.51, SD: 13.06). Thirty-nine eyes (62.90%) underwent endoscopic probing and either bicanalicular (27/39, 69.23%) or monocanalicular (12/39, 30.76%) silicone intubation (SI group) and 23 eyes (37.10%) underwent balloon DCP and bicanalicular silicone intubation (DCP-SI group).

Slight nasal and canalicular bleeding was seen in almost all eyes at the time of probing in both groups, which was easily controlled. Three monocanalicular tubes fell out within 3 weeks postoperatively. A slit punctum was observed in four eyes with bicanalicular intubation (4/50, 8%). No other complications were seen.

Tubes were removed between 6 and 20 weeks (mean: 7.49, SD: 2.25) postoperatively. Mean time of tube removal in SI group (7.55, SD: 2.39 weeks) was not statistically different (95% CI = −1.04 to + 1.37, df = 57, independent sample t-test, p=0.78) from DCP-SI group (7.39, SD: 2.06 weeks). There were seven tubes removed between 9 and 20 weeks postoperatively due to patient unavailability. Follow-up period ranged from 6 to 63 months (mean: 14.60, SD: 10.33) after operation. No significant difference was found among patients in either group (Tab. I).

An overall success rate of 56.5% (35/62) was achieved at the last follow-up visit (Tab. II). There was no statistically significant effect of sex, age, unilateral or bilateral involvement, duration of preoperative symptoms, time of tube removal, or duration of follow-up time on the success rates in the SI and DCP-SI groups ($0.11<p<1.00$).

Diagnostic probing and irrigation performed on the 27 eyes with failure showed NLD obstruction in all failures in the SI (18) and 8 eyes (8/9) in the DCP-SI group. There was one normal irrigation test in the DCP-SI group. A successful DCR procedure was performed on 12 eyes. Further surgical intervention was declined in the other patients.

DISCUSSION

Becker and Berry first reported balloon DCP in 1989 (13). Since then, there have been widely varying degrees of success, from 20% to 90%, of retrograde and antegrade balloon DCP in an obstructed NLD (7-11, 14-18).

Endoscopically assisted balloon DCP seems to have some advantages over balloon DCP without direct visualization. Observation of the balloon will confirm proper passage through the nasolacrimal duct (10). Not only will this prevent false passage but the proximal ring of the catheter may not be an exact marker for the real position of the inferior meatus in some patients (10). We used this technique to increase the chance of successful dilatation of the stenotic region and prevent the untoward complications caused by blind manipulation of the catheter and silicone tube head while doing intubations in both groups.

Perry and associates performed an antegrade balloon DCP and found failure in two patients who previously had had failed silicone intubations (7). They raised the question of whether balloon DCP is any more effective than silicone intubation alone for treatment of adults with acquired NLD obstruction (7). Couch and White recently performed an endoscopically assisted balloon DCP with silicone intubation in adults with incomplete NLD obstruction and found a complete success rate of 56% (10). They stated that their results seem to be better than what have been reported for silicone intubation alone, but a study comparing silicone intubation alone and concomitant with balloon DCP should be performed (10). To our knowledge, this study is the first to compare the results of these two methods of NLD recanalization in treatment of NLD obstruction in adults.

Kuchar and Steinkogler performed endoscopic balloon DCP and silicone intubation in 30 adult patients with complete NLD obstruction and reported a 73.3% subjective success rate at 1-year follow-up (8). Yazici and associates, however, reported a 25% success rate of balloon DCP for complete NLD obstruction in adults (11). Our results showed a success rate of 60.8% after balloon DCP and silicone intubation with a mean follow-up of 14.60 months.

In adults, silicone intubation without balloon DCP of the NLD has success rate ranging from 22% to 83% (19-24). Liu and Bosley performed silicone intubation with mitomycin-C for complete NLD obstruction in adults and found a 53% success rate with a mean follow-up of 18 months (6). Angrist and Dortzbach found a 22.2% success rate for complete NLD obstruction and 77.8% for incomplete NLD following silicone intubation (4).

We have previously demonstrated no difference in achieving success after NLD silicone intubation either

with monocanalicular or bicanalicular tubes in adults with NLD stenosis (25). This study also showed no significant difference (Fisher exact test, p=0.48) between the success rate of monocanalicular (16/27, 59.25%) and bicanalicular (5/12, 41.66%) silicone intubation. Overall success rate of 53.84% was achieved in patients who underwent endoscopic assisted silicone intubation alone.

We have used endoscopic assistance in both groups whereas none of the previous studies of silicone intubation alone in adults have used this technique. In addition, patients with false passage of the probe and/or inability to pass the probe through the obstruction were excluded. This may account for the good success rate we achieved in the SI group.

Our results showed that the success rate of balloon DCP with silicone intubation (60.8%) was not significantly different (p= 0.60) from silicone intubation alone (53.84%) in the treatment of adults with incomplete NLD obstruction. There has not been such a comparative study in adult NLD obstruction, but Gunton and colleagues (26) reported no statistically significant difference (p=0.22) between the success rate of balloon DCP (73%) and probing (79%) for the treatment of congenital NLD obstruction in children more than 18 months of age. The obstructed area is opened as the balloon is inflated with pressure (11). Intubation works by the same mechanism but does so with less pressure against the mucosa at the obstructed area. Although balloon DCP resolves the obstruction initially, it does not remedy the primary inflammatory process, so recurrence of the fibrotic obstruction is likely. That is why silicone intubation or stent placement has been advised to ensure long-term patency after a balloon DCP (9). Where an obstruction is opened by probing, balloon DCP does not appear to increase the benefit any more than that achieved with silicone intubation alone. Patients who exhibit no clinical signs of chronic infection may benefit more from the balloon DCP (7). Difference in results of various series may be attributed to patient selection. Varying degrees of success rates after a balloon DCP implies that the procedure does not yet seem predictable enough to determine which subgroups of patients with NLD obstruction would most benefit from the procedure (5).

The retrospective nature of this study did not allow for the precise data collection of severity of preoperative symptoms. Therefore this study does not have the statistical power to prove that one method of treatment is more successful than the other in regard to the preoperative symptoms of NLD obstruction.

In conclusion, this is the first study comparing balloon DCP and silicone intubation with silicone intubation alone in adults with incomplete NLD obstruction. We retrospectively compared the success rates of these methods with a relatively long follow-up time and found no difference. A prospective comparative clinical trial in a rigorous scientific fashion is suggested to further clarify the role of balloon DCP in the treatment of NLD obstruction and in the delivery of optimal and financially sound care.

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Reprint requests to:
Mohsen Bahmani Kashkouli, MD
Eye Department
Rassoul Akram Hospital
Sattarkhan-Niayesh Street
Tehran 14455-364, Iran
bahmanik@yahoo.com

REFERENCES

1. Linberg JV, McCormick SA. Primary acquired nasolacrimal duct obstruction: a clinicopathologic report and biopsy technique. Ophthalmology 1986; 93: 1055-63.
2. Guinot-Soera A, Koay P. Efficacy of probing as treatment of epiphora in adults with blocked nasolacrimal duct. Br J Ophthalmol 1998; 82: 389-91.
3. Tsai CC, Kau HC, Kao SC, Hcu WM, Liu JH. Efficacy of probing the nasolacrimal duct with adjunctive mitomycin-C for epiphora in adults. Ophthalmology 2002; 109: 172-4.
4. Angrist RC, Dortzbach RK. Silicone intubation for partial and total nasolacrimal duct obstruction in adults. Ophthalmic Plast Reconstr Surg 1985; 1: 51-4.
5. Becker BB. Recanalization of the obstructed nasolacrimal duct system. J Vasc Interv Radiol 2001; 12: 697-9.
6. Liu D, Bosley TM. Silicone nasolacrimal intubation with mitomycin-C. A prospective, randomized, double-masked study. Ophthalmology 2003; 110: 306-10.
7. Perry JD, Maus M, Nowinski TS, Penne RB. Balloon catheter dilation for the treatment of adults with partial nasolacrimal duct obstruction: a preliminary report. Am J

Ophthalmol 1998; 126: 811-6.
8. Kuchar A, Steinkogler FJ. Antegrade balloon dilatation of nasolacrimal duct obstruction in adults. Br J Ophthalmol 2001; 85: 200-4.
9. Fenton S, Cleary PE, Horan E, et al. Balloon dacryoplasty in the management of adult epiphora. Eye 2001; 15: 67-9.
10. Couch SM, White WL. Endoscopically assisted balloon dacryoplasty treatment of incomplete nasolacrimal duct obstruction. Ophthalmology 2004; 111: 585-9.
11. Yazici Z, Yazici B, Parlak M, Erturk H, Savci G. Treatment of obstructive epiphora in adults by balloon dacryocystoplasty. Br J Ophthalmol 1999; 83: 692-6.
12. Kashkouli MB, Beigi B, Murthy R, Astbury N. Acquired external punctal stenosis: etiology and associated findings. Am J Ophthalmol 2003; 136: 1079-84.
13. Becker BB, Berry FD. Balloon catheter dilatation in lacrimal surgery. Ophthalmic Surg 1989: 20: 193-8.
14. McCullough KM. Nasolacrimal duct balloon dilatation: medium to long term follow-up. Clin Radiol 2001; 56: 13-6.
15. Kumar EN. Technical note. Non-surgical treatment of epiphora by balloon dacryocystoplasty: the technique. Br J Radiol 1995; 68: 1116-8.
16. Munk PL, Lin CTD, Moris DC. Epiphora: treatment by means of dacryocystoplasty with balloon dilation of the nasolacrimal drainage apparatus. Radiology 1990; 177: 687-90.
17. Janssen AG, Mansour K, Bos JJ. Obstructed nasolacrimal duct system in epiphora: long term results of dacryocystoplasty by means of balloon dilation. Radiology 1997; 205: 791-6.
18. Lee JM, Song HY, Han YM, et al. Balloon dacryocystoplasty: results in the treatment of complete and partial obstructions of the nasolacrimal system. Radiology 1994; 192: 503-8.
19. Keith CG. Intubation of the lacrimal passages. Am J Ophthalmol 1968; 65: 70-4.
20. Soll DB. Silicone intubation: an alternative to dacryocystorhinostomy. Ophthalmology 1978; 85: 1259-66.
21. Pashby RC, Rathbun JE. Silicone intubation of the lacrimal drainage system. Arch Ophthalmol 1979; 97: 1318-22.
22. Angrist RC, Dortzbach RK. Silicone intubation for partial and total nasolacrimal duct obstruction in adults. Ophthalmic Plast Reconstr Surg 1985; 1: 51-4.
23. Fulcher T, O'Connor M, Moriarty P. Nasolacrimal intubation in adults. Br J Ophthalmol 1998; 82: 1039-41.
24. Ariturk N, Oge I, Oge F, et al. Silicone intubation for obstruction of the nasolacrimal duct in adults. Acta Ophthalmol Scand 1999; 77: 481-2.
25. Kashkouli MB, Kempster RC, Galloway GD, Beigi B. Monocanalicular versus bicanalicular silicone intubation for nasolacrimal duct stenosis in adults. Ophthalmic Plast Reconstr Surg 2005; 21: 142-7.
26. Gunton KB, Chunh CW, Schnall BM, Prieto D, Wexler A, Koller HP. Comparison of balloon dacryocystoplasty to probing as the primary treatment of congenital nasolacrimal duct obstruction. J AAPOS 2001; 5: 139-42.