

# Aerocyst urethral catheter insertion compared to expansion sponges application in external dacryocystorhinostomy

Yi Shao<sup>1</sup>, Yao Yu<sup>2</sup>, Chong-Gang Pei<sup>1</sup>, Qiong Zhou<sup>1</sup>, Wen-Jia Dong<sup>1</sup>, Yangluowa Qu<sup>3</sup>, Lu Yang<sup>1</sup>, Gui-Ping Gao<sup>1</sup>

**Foundation items:** Supported by National Natural Science Foundation of China (No. 81160118, 81160105, 81170823, 81100648, 81100649); Technology Foundation of Jiangxi Province, China (No. 20111BBG70026-2); Health Department Foundation of Jiangxi Province, China (No.20091069); Distinguished Young Talents in Higher Education Foundation of Guangdong, China (No.LYM10112); The National High Technology Research of China (863 project)(No. 2006AA02A131)

<sup>1</sup>Department of Ophthalmology, the First Affiliated Hospital of Nanchang University, Nanchang 330006, Jiangxi Province, China

<sup>2</sup>Department of Endocrinology, the Third Hospital of Nanchang, the Affiliated Nanchang Hospital of Southern Medical University, Nanchang 330009, Jiangxi Province, China

<sup>3</sup>Cullen Eye Institute of Baylor University, Houston, Texas 77030, USA

**Correspondence to:** Yi Shao. Department of Ophthalmology, the First Affiliated Hospital of Nanchang University, Nanchang 330006, Jiangxi Province, China. freebee992296@yahoo.com.cn.

Received:2011-07-27 Accepted:2011-09-23

## Abstract

• **AIM:** To evaluate the clinical effect and complications of two different filling materials (aerocyst urethral catheter and expansion sponges) applying in external dacryocystorhinostomy (EXT-DCR) and compare their advantages and disadvantages.

• **METHODS:** A retrospective study was made in the period from April, 1 2000 to April, 1 2005. Totally 180 patients (240 eyes) underwent the EX-DCR using different filling materials and divided into three groups randomly: negative control groups (group 1), expansion sponges group (group 2) and aerocyst urethral catheter group (group 3). The gender, etiology, clinical findings, surgical technique, filling materials, the condition of ocular surface and complications were analyzed. Filling materials were removed during day 7. Postoperative success was determined by lacrimal patency to irrigation, a positive dye test, hemorrhage and errhysis conditions after extubation and subjective resolution of epiphora and liquor puris.

• **RESULTS:** During a mean follow-up of 5.14±1.69 years, the success rate were 73.7% (group 1), 86.5% (group 2), 98.7% (group 3) in three groups. There was significant statistical difference among three groups in the surgical success rate and the operative complications (including hemorrhage, errhysis, periorbital ecchymosis after extubation)( $P<0.05$ ).

• **CONCLUSION:** EXT-DCR with aerocyst urethral cathete intraoperatively have higher success rate, fewer operative complications and a high patient satisfaction, and can be used to simplify and speed up traditional EXT-DCR.

• **KEYWORDS:** aerocyst urethral catheter; filling material; dacryocystorhinostomy

DOI:10.3980/j.issn.2222-3959.2011.05.08

Shao Y, Yu Y, Pei CG, Zhou Q, Dong WJ, Qu Y, Yang L, Gao GP. Aerocyst urethral catheter insertion compared to expansion sponges application in external dacryocystorhinostomy. *Int J Ophthalmol* 2011;4 (5):498–501

## INTRODUCTION

Reconstruction of the lacrimal passages can be achieved by several surgical techniques, although external dacryocystorhinostomy (EXT-DCR), proposed for the first time by Ohm<sup>[1]</sup> and Onerci<sup>[2]</sup> in 1921, is still the most popular and successful operation. Recently, there were so many filling material applications in that operation. Plastic or rubber drainage tube, cosmolin or iodoform gauze strip and compressed gelatin are routinely used as antifibroblast proliferation materials in EXT-DCR in earlier period. But some of these materials have complications such as hemorrhagic after extubation, scar proliferation and nasal cavity errhysis and so on. This study was to report the experience and the results of our service with the application of aerocyst urethral cathete in EXT-DCR, discuss the advantages and disadvantages of this technique comparing to the expansion sponges. This modification of EXT-DCR has not been previously published to the authors' knowledge.

**Table 1 General condition of 180 patients (240 eyes) in EXT-DCR**

Group	n (M/F)	Eye right/left	Age (yr)	Duration (yr)	Follow-up (yr)	TFBUT (s)	Tear meniscus high(um)
1	16/44	42/38	45.8±19.4	3.66±1.28	5.34±2.28	14±2	286±89
2	14/46	40/40	46.9±19.2	3.76±1.33	4.98±1.96	15±3	292±83
3	16/44	42/38	45.7±17.7	3.88±1.16	4.88±1.84	15±3	288±92

## MATERIALS AND METHODS

**Patients** This study was based on the retrospective analysis of 180 medical charts of patients (240 eyes) submitted to EXT-DCR in the First Affiliated Hospital of Nanchang University in the period from April, 1 2000 to April, 1 2005. All patients had severe epiphora, and most of those cases were accompanying with lacrimal sac bulge or pyogenesis. The diagnosis of the chronic dacryocystitis disease was confirmed by the dripping test or infusion of fluorescein in the conjunctiva or lachrymal canaliculus (Jones test) without stained nasal drainage. The level of obstruction was defined by dacryocystography. Out of 180 patients, 120 presented unilateral obstruction and 60 had bilateral obstruction. The age at diagnosis ranged from 18 to 76 years old, with mean age of 46 years old and standard deviation of 18.8 years old (Table 1). This was a prospective interventional study, performed with Institutional Review Board approval. The study was also approved by the ethical Committee for Human Research of Nanchang University. Informed consent was obtained from all patients. According to the different filling material in the EXT -DCR, we divided the patients (180 patients, 240 eyes) into three groups randomly: negative control group (group 1), expansion sponges group (group 2) and aerocyst urethral catheter group (group 3, aerocyst urethral catheter: Unomedical Sdn, Bhd, Kedah, Malaysia; expansion sponges: Medtronic XOMED, Jacksonville, FL, USA). Patients were assessed according to surgical technique performed; intraoperative filling material and duration of insertion; number of surgeries necessary to correct; some aspects of postoperative follow-up, such as the use of antibiotics and the observed complications. Postoperative success was evaluated by DCR patency to irrigation, a positive dye test, hemorrhage conditions after extubation and subjective resolution of epiphora and liquor puris.

**Methods** To prevent nasal lateral wall, stypsis inferior nasal meatus and anesthetize nasal mucosa, we used several gauze strips packing soaked with 5g/L tetracaine or 50g/L cocaine HCl drops and 1g/L adrenaline drops which were inserted into the anodic of inferior nasal meatus before surgery. Group 1: A straight 15-18 mm skin incision placed 5-8 mm nasal to the medial canthus and tangential to the inferonasal rim of the orbit is made. Next the orbicularis

muscle was bluntly dissected, and the anterior limb of the medial canthal tendon and the periosteum were exposed. The medial flap was forwards for about 10mm and raised from the bone with traction sutures. The lateral flap is elevated with the medial canthal tendon toward the anterior lacrimal crest and the lacrimal sac was then reflected laterally from the floor of the lacrimal fossa. Then, an osteotomy, 12mm×15mm wide, in the lateral nasal wall was created and the nasal mucosa was exposed. If an anterior ethmoidal cell was entered, the bony aperture is extended in order to expose the nasal mucosa [3]. Next, anterior and posterior flaps of lacrimal sac and nasal mucosa are created which look like the letter "H", as big and mobile as possible. 6/0 polyglycolic acid sutures are passed through the superior and inferior angles in anterior and posterior flaps of lacrimal sac and nasal mucosa and closed respectively. Group 2: interrupted suture and tile the posterior flaps, put expansion sponges group on, and interrupted suture anterior flaps, inject 1-2mL water into aerocyst, make the expansion sponges touch with and compress on the anterior and posterior flaps, and interrupted suture subcutaneous tissue. Group 3: take out of the plugging gauze strips in nasal cavity, interrupted suture the posterior and anterior flaps, stretch the double-cavity aerocyst urethral catheter into nasal mucosa, inject 1-2mL water into aerocyst, make the aerocyst located in and compress on the anterior and posterior flaps, and interrupted suture subcutaneous tissue. The skin wound is closed with a continuous intradermal suture of 6/0 silk. Meticulous haemostasis is carried out during all phases of the operation. A consultant ophthalmologist or an associate specialist performed the surgery. The persistence time of filling material is recommended for 7 days after surgery. They were followed up a week later and the skin sutures were removed. The use of steroid drops and systemic antibiotics is recommended for a week after surgery. The patency of the dacryocystorhinostomy was examined after 7, 14, 21, 30 days and later every 4 months for the first 6 years. During the first examinations, if the dacryocystorhinostomy was found to be blocked, probing was performed, clots were removed, and steroid drops and systemic antibiotics were applied for one more week. Totally 170 patients (224 eyes) were asked to complete a telephone questionnaire to

Group	n (M/F)	Eye right/left	Hemorrhage	Errhysis	Periorbital ecchymosis	Anatomic deformity	Success rate n(%)
1	58 <sup>a</sup> (16/42 <sup>a</sup> )	76 <sup>a</sup> (38 <sup>a</sup> /38)	14(18.4)	12(15.8)	8(10.5)	3(3.9)	56 (73.7)
2	56 <sup>a</sup> (12 <sup>a</sup> /44 <sup>a</sup> )	74 <sup>a</sup> (36 <sup>a</sup> /38 <sup>a</sup> )	7(9.5)	5(6.8)	4(5.4)	0(0)	64( 86.5)
3	56 <sup>a</sup> (14 <sup>a</sup> /42 <sup>a</sup> )	76 <sup>a</sup> (38 <sup>a</sup> /38)	0(0)	1(1.3)	0(0)	0(0)	75(98.7)

<sup>a</sup> Number of patients reviewed excludes those who were recorded as non-attended at the final review.

evaluate the long-term postoperative improvement of their epiphora. The patients were asked to quantify their symptoms as follows; (A) no improvement, tearing is the same or worse; (B) slight improvement, but still tearing both indoors and outdoors; (C) significant improvement, but persistent slight tearing outdoors; (D) complete resolution of tearing, both indoors and outdoors. Patients self reporting as A or B were defined as "failures," C or D as "successes".

**Statistical Analysis** Summary data were reported as mean±SD. SPSS 15.0 statistical software was used for data analysis.  $P < 0.05$  was considered statistically significant.

## RESULTS

Totally 180 patients attended the final review. Slight conjunctival hyperemia, eyelid congestion and edema with good skin could be seen in all patients at the week post-operation. Gauze and bandage was clean without any bleeding. Two weeks after surgery, conjunctival hyperemia and eyelid congestion and edema were relieved with ocular condition established well. In group 1 and group 2, there was no marked inflammatory reaction and subjective resolution of epiphora and liquor puris observed after 2 weeks. Postoperative pain was mild, and analgesics were applied. We did not observe complications such as epistaxis, healing retardation, infection and suppuration, subcutaneous emphysema, damage to orbital structures or visual affections. Patients presented mild periorbital ecchymosis and dorsum nasi collapse, without visual impairment and progressed with spontaneous resolution. On post-operative day 7, three cases needed probing and clot removal (one of them was a patient with severe coagulation problems due to thrombocytopenia) while five cases needed only probing only. Systemic antibiotics, such as first generation cephalosporins and topical ophthalmic drugs were used in the postoperative period, as well as frequent nasal lavage with sterile solution. Symptomatic outcomes at an average of 60 months follow up are summarized in Table 2 and Figure 1. The percentage of success in three groups were 73.7% (group 1), 86.5% (group 2), 98.7% (group 3), respectively. There was significant statistical difference in the surgical success rate and the operative complications ( $P < 0.05$ ). Compared to other groups, aerocyst urethral catheter application had less complications, higher success

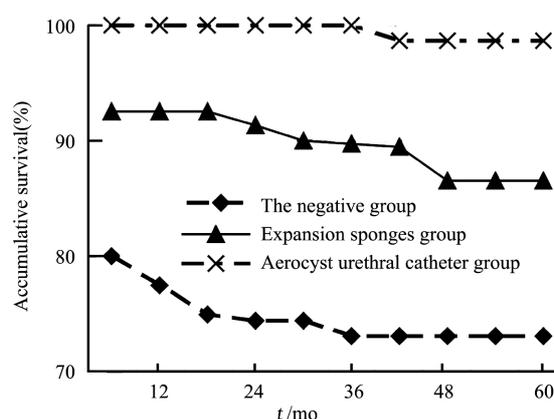


Figure 1 EXT-DCR outcome of 180 cases

ratio and no hemorrhage cases were found after extubation. At the end of follow up period, in group 3, only one patient with dacryocyst mucocele had epiphora symptoms of tearing and abnormal Jones I dye test.

## DISCUSSION

The history of lacrimal pathway surgery dates back from Hamurabi (2200 B.C.)<sup>[4]</sup>. Since then, techniques for treatment of lacrimal pathways have been developed, fighting against infections and restoring the transit of tears through the lacrimal system. The endonasal approach was described for the first time by Caldwell in 1893<sup>[5]</sup>, but it was forgotten for decades by the limited vision and the assessment of nasosinus anatomy. Currently, endoscopic DCR is a well-accepted and established technique in the treatment of the lacrimal sac and nasolacrimal duct disease. It is effective but with limited application due to its high cost and specification in underdeveloped countries and some developing countries.

To overcome the limits of traditional EXT-DCR, several authors have suggested modifications<sup>[6-10]</sup>. In this study we placed different filling material in the anastomotic stoma. There are some respective disadvantages in each surgery group, for instance, no filling material surgery always lead to anastomotic stoma collapse and healing retard; expansion sponges filled surgery always induce the difficulty of exelcymosis. Potential complications when the inflammation spreads include extension around the nasosinusitis or to the orbita (orbital cellulitis). In worst, an orbital abscess might develop that is potentially life threatening. Our previous

study found that aerocyst urethral cathete may as a new antifibroblast proliferation materials regulate the scar formation in dacryocyst mucocele. In this study, we used the aerocyst urethral cathete as the filling material in EXT-DCR, and tried to examine its effectiveness and mechanism after the long-term observation<sup>[11]</sup>. Aerocyst urethral cathete as the filling material<sup>[12,13]</sup> in EXT-DCR have the following characteristics. Firstly, aerocyst urethral, a silica gel stuff, has been confirmed to have effects on the inhibition of fibroblast proliferation and scar formation without immunogenicity. Secondly, it has a stable chemical property and no tissue reaction. Thirdly, after water flooding, the water sac adjustly in the top can be satisfied with different patients. Fourthly, it may also be helpful for wound protection, in addition, it can act as a barrier to expansion space and to separate the surfaces which have potential possibility of adherence. Fifthly, aerocyst urethral catheter also plays an important role in stopping hemorrhage by oppression, preventing adhesion of anterior and posterior flaps by strong support and inhabiting fibrous tissue growth and reducing contraction of anastomosis. Lastly, it can prevent some postoperative complications, such as anastomotic stoma collapse and healing retard, infection by exodus easily, the mechanical injury of anastomotic stoma, hemorrhage by difficulty of exelcymosis and so on. In our cases, we did not see severe complications, only periorbital ecchymosis without visual impairment and of spontaneous resolution. The expansion sponges, has been confirmed to have also effects on the inhibition of fibroblast proliferation and scar formation without immunogenicity, but the water absorption and the adhesiveness can cause the errhysis and hemorrhage after the extubation.

Aerocyst urethral catheter plays an important role in stopping hemorrhage, preventing adhesion, inhabiting fibrous tissue growth and reducing contraction of anastomosis. Aerocyst urethral catheter is a safe, effective and ideal filling material for treatment of the chronic dacryocystitis disease. Additional economic benefits could also be realised by removing the need for readmission for EXT-DCR. We

believe that this modified EXT-DCR procedure is easy and quick to perform. It may be suitable not only for oculoplastic surgeons but also for ophthalmologists whose main area of interest is not lacrimal surgery. The results of this study demonstrate the reliability of our modification although a larger series of cases would be more conclusive.

Acknowledgements: We thank Dr. Hua Wang (Department of Ophthalmology, Xiangya Hospital of Zhongnan University), Gang Tan (Department of Ophthalmology, The First Affiliated Hospital of Nanhua University), Juan Peng (Department of Ophthalmology, the Second Affiliated Hospital of Guangzhou Medical College), for their generous support in clinic study.

#### REFERENCES

- 1 Ohm J. Bericht ü ber 70 toische operationen. *Z Augenheilkd* 1921;46:37-45
- 2 Onerci M. Dacryocystorhinostomy. Diagnosis and treatment of nasolacrimal canal obstructions. *Rhinology* 2002; 40:49-65
- 3 Pelegrinis E, Morphopoulos A, Georgouloupoulos G, Kapogiannis.K, Papaspyrou S. Four-year experience with intranasal transilluminating dacryocystorhinostomy using ultrasound. *Can J Ophthalmol* 2005;40(5):627-633
- 4 Dupuy-Dutemps, Bourguet. Procède plastique de dacryo-cysto-rhinostomie et ses resultats. *Ann Ocul* 1921;158:241-261
- 5 Caldwell GW. Two new operations for obstruction of the nasal duct, with preservation of the canaliculi, and an incidental description of a new lachrymal probe. *NY Med J* 1893;57:581-582
- 6 Ashenhurst ME, Hurwitz JJ. Lacrimal canaliculocopy: development of the instrument. *Can J Ophthalmol* 1991; 26(6):306-308
- 7 Yoon SW, Yoon YS, Lee SH. Clinical results of endoscopic dacryocystorhinostomy using a microdebrider. *Korean J Ophthalmol* 2006;20(1):1-6
- 8 Bartal N, Bahyr J, Kizhner V. Endoscopic dacryocystorhinostomy simplified. *Clin Otolaryngol* 2007; 32(5):413
- 9 Kiroglu AF, Cankaya H, Yuca K, Kiris M. Endoscopic dacryocystorhinostomy with a T-type ventilation tube. *J Otolaryngol* 2007;36(3):164-167
- 10 Demarco R, Strose A, Araújo M, Valera FC, Moribe I, Anselmo-Lima WT. Endoscopic revision of external dacryocystorhinostomy. *Otolaryngol Head Neck Surg* 2007;137(3):497-499
- 11 Pei CG, Shao Y, Yang L, Zhou Q. Aerocyst urethral catheter application for the treatment of dacryocyst mucocele. *Int J Ophthalmol(Guoji Yanke Zazhi)* 2006;6(5): 1194-1195
- 12 Shao Y, Pei CG, Yang L, Zhou Q. Aerocyst urethral catheter insertion compared to compressed gelatin sponges application in dacryocystorhinostomy. *Int J Ophthalmol(Guoji Yanke Zazhi)* 2007;7(1):243-244
- 13 Shao Y, Pei CG, Yang L, ZHOU Q. Aerocyst urethral catheter application in small- dacryocyst chronic dacryocystitis. *Yanke Yanjiu* 2007;12(7):543