

Insertion of Double Bicanalicular Silicone Tubes after Endonasal Dacryocystorhinostomy in Lacrimal Canalicular Stenosis: A 10-Year Experience

Marco Caversaccio · Rudolf Häusler

Department of Otorhinolaryngology, Head and Neck Surgery, Inselspital, University of Bern, Bern, Switzerland

Key Words

Dacryocystorhinostomy · Lacrimal stenosis · Stent

Abstract

To assess the long-term results of double bicanalicular silicone tubes in canalicular (presaccal) stenosis of the nasolacrimal duct system, a retrospective follow-up was performed on patients operated between 1992 and 2002. Forty-five patients were included in the study, 44 of whom had eyes with canalicular stenosis (primary dacryocystorhinostomy), 4 with congenital agenesis of the lacrimal duct system, and 3 cases after primary external dacryocystorhinostomy. Double bicanalicular silicone tubes were inserted, fixed in the vestibulum nasi, and left in place as long-term space holders. Of the 51 endonasal primary dacryocystorhinostomies with canalicular stenosis, 32 (63%) became symptom-free after one procedure. Nineteen (37%) patients had a relapse. Double silicone bicanalicular tube insertion as long-term spacers in canalicular stenoses has a number of advantages, but canalicular stenoses still remain a challenging area.

Copyright © 2006 S. Karger AG, Basel

Introduction

Epiphora and recurrent dacryocystitis are generally caused by insufficient drainage of the tears. Obstruction of the nasolacrimal duct system with chronic stenosis can be surgically treated by external or endonasal dacryocystorhinostomy (DCR) [1–4]. Using dacryocystorhinostomy, an anastomosis is created between the lacrimal sac and the nasal cavity above the obstruction. Endonasal DCR is performed as an endoscopic procedure with the aid of rigid optics or under a binocular operating microscope. Laser-assisted, microdebrider or radiofrequency DCR have been performed more recently. In cases of presaccal stenosis in which the prognosis is not favorable, the success rates are generally poor, i.e. 30–70% [5]. A search of the literature does not reveal detailed studies comparing the surgical results of procedures with silicone intubation versus those of procedures with no intubation in canalicular stenosis or comparing time inlay and size. In ductal stenosis, comparisons of primary endoscopic dacryocystorhinostomy with and without silicone tubes insertion exist [6]. It appears that silicone intubation itself in postsaccal stenosis has no effect and could even worsen the surgical result [7, 8].

At the Department of Otolaryngology, Head and Neck Surgery, Inselspital, University of Berne, Switzerland, we have been operating on obstructions of the canaliculi

since 1992 using endonasal access or with a microscope and/or with an endoscope [9, 10]. Herewith the operative results achieved with the insertion of our specially designed double bicanalicular silicone tubes on canalicular stenoses are presented [9].

Patients and Methods

Between 1992 and 2002, 51 microsurgical endonasal dacryocystorhinostomies were performed on 45 patients with canalicular lacrimal stenosis (26 women, 19 men), most of whom had been referred to us by ophthalmologists. The operations were performed by the first and last authors. Four of these patients had an agenesis of the lacrimal duct system and three had been surgically treated with the external Toti procedure, without lasting success. The patients ranged in age from 6 months to 88 years (average age: 45 years). Obstruction of the canaliculi was caused by post-eye infection (n = 18), midfacial trauma (n = 14), recurrent infections of the nose and the paranasal sinuses (n = 6), agenesis of the canaliculi (n = 4), and scar tissue after external dacryocystorhinostomy (n = 3); in 6 cases the etiology remains unclear. The diagnosis was performed with water rinsing of the canaliculi and/or with a digital subtraction dacryocystogram. When, clinically, an immediate back-flow of the injected fluorescein is visible and no outflow in the upper, respectively, in the lower canaliculus, a stenosis or a complete obstruction at the site of the Maier'sche sinus (common canal) must be present. During the operation, straight metallic excavators were used to verify the openings of the canaliculi. In 9 cases a light probe (\varnothing 0.5 mm) from Storz GmbH, Tuttlingen, Germany, was used to visualize the canaliculi. In cases of agenesis and scar tissue, artificial canaliculi were created with the excavators or the Er-YAG laser approximately at the location of the natural lacrimal puncta [10]. We previously conducted trials with very thick silicone tubes for maximal dilatation of the canaliculi [9]. Thick tubes, however, caused an obstruction and prevented the natural flow of tears. We overcame this problem by inserting 2 parallel silicone tubes (length: 40 cm; each \varnothing 0.62 mm) that had the advantage not only of maximum permanent dilatation of the canaliculi but also of favoring

the aspiration of the tears by capillary force owing to its double O-shaped contour. For easier introduction, the double bicanalicular silicone tube was connected to a single metallic insertor (\varnothing 0.9 mm) (fig. 1) (Buerki innomed, Berneck, Switzerland).

Patients are given a perioperative intravenous antibiotic prophylactic (e.g. 1.2 g of amoxicillin and clavulanate potassium 3 times in 24 h). For several days after the operation, the eyes are treated with anti-inflammatory eye drops (fluorometholone and neomycin sulphate) (fig. 2). The operation is performed under general anesthesia with the binocular operating microscope or the endoscope



Fig. 1. Double bicanalicular silicone tubes ($2 \times \varnothing$ 0.62 mm) with one metallic insertor (\varnothing 0.9 mm).

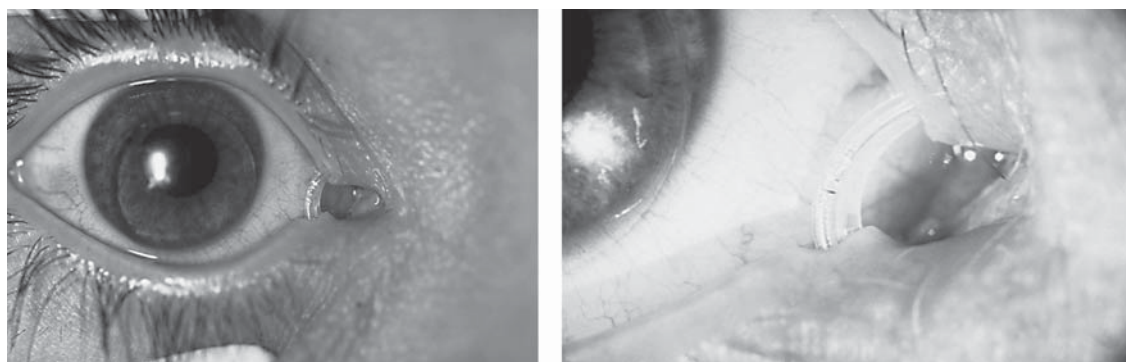


Fig. 2. Close-up view of 2 parallel bicanalicular silicone tubes inserted in the upper and lower lacrimal puncta in a case of recurrent canalicular stenosis. The 2 parallel tubes ensure maximal dilatation of the lacrimal canaliculi and allow aspiration of tears by capillary force.

and as an outpatient procedure or with a short hospitalization (48 h).

A questionnaire was sent out and regular check-ups in the outpatient clinic were performed once annually after the second year. The questionnaire contained questions regarding complaints related to daily work, epiphora or recurrent infections.

Results

There were no major intraoperative or immediate postoperative complications in the 51 endonasal dacryocystorhinostomy of canalicular stenoses. In 44 cases, a single stenosis either of the upper canaliculus or of the lower canaliculus was present. In 7 cases both canaliculi were obstructed. Minor intraoperative complications were erosion of the epithelium at the entrance of the nose due to the drill ($n = 3$) or small hematoma in the area of the lacrimal sac. Minor ocular injuries did occur in 2 cases with a short transient cornea irritation. Postoperative complications were local synechia of the middle turbinate and the lateral nasal wall ($n = 5$), which did not need further treatment. The bicanalicular tubes in the lacrimal ducts were in general well tolerated by all patients. Complaints of nose obstructions with crusts ($n = 24$ and especially in children) and local inflammatory reactions such as pyogenic minigranuloma ($n = 4$) were identified (fig. 3). Granulomas of the lacrimal punctae were successfully treated by cutting the granuloma with scissors and by application of anti-inflammatory eyedrops for 10 days. This granulation tissue could be due to sump of the lacrimal sac or a reaction to silicone tubes. The duration of inlay ranged between 6 months and 7 years, with an average of 12 months (our recommendation). Every 3 months during the first year, the patients were checked for lacrimal canal patency either by passive (sodium fluorescence solution 5%) or by active flushability (sodium chloride solution 0.9%). After the second year the flushability was checked only once every year. The success of treatment was assessed (during the stent placement and after ablation) according to each patient's freedom from symptoms and discomfort and according to active or passive flushability of the nasolacrimal ducts. The evaluation of the 51 endonasal DCR with canalicular stenosis shows that with the silicone tubes in place, 39 (76%) patients had no epiphora. After removal of the probe, 32 patients (63%) became permanently symptom free (no epiphora under normal weather condition without wind) after one procedure. In 19 (37%) cases of DCR, a relapse occurred after removal of the probe, especially when both canaliculi were obstructed. In the 3 cases of agenesis of the nasolacrimal

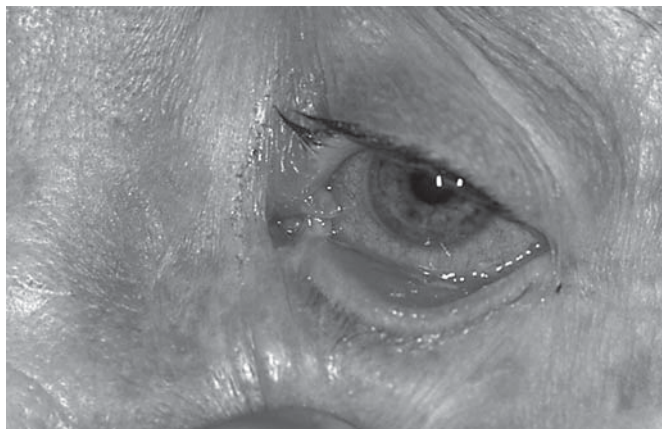


Fig. 3. A visible pyogenic granuloma as a reaction to the double bicanalicular silicone tubes or the 'sump phenomenon'.

system as well in the cases of scar after external dacryocystorhinostomy, a mean of two revision surgeries was necessary. There were no bacterial or fungal analyses of the silicone tubes after the removal. Rejection of bicanalicular tubes usually occurred accidentally because of sneezing or blowing the nose, or because the patient extracted it manually, forgetting that it really was an annular tube ($n = 6$). Three of them were excluded from the study because the removal occurred during the first year.

Discussion

In our view, the positive results of our series of canalicular stenosis depend not only on the operating technique but also on our routine practice of inserting a long-term spacer by means of our designed double bicanalicular silicone tubes. The ideal stent should be nontoxic, nonallergic, gives no foreign body reaction and does not create patient discomfort. The tubes consist either of silicone, polyethylene or polyurethane [9, 11, 12]. Additionally, there must be no impairment to breathing, easy removal and positive influence on postoperative wound healing. The double O-shaped contour not only produces a maximal dilatation of the canaliculi but also allows a natural aspiration of tear liquid by capillary force. There were no harmful side effects from long-term inlay of bicanalicular silicone tubes but, in rare cases, there was formation of minigranulomas. Several methods, such as application of mitomycin-C or fluorouracil to the rhinostomy opening and suturing of the mucosal flaps, have

been suggested for providing a permanent rhinostomy opening after completion of mucosal healing [6]. However, the results are not always satisfactory [13]. Insertion of silicone tubes into the lacrimal duct is the most commonly preferred procedure [4, 9]. However, the results in canalicular stenosis remain controversial. Repetitive insertion of the double bicanalicular tubes could be necessary. DCR with single or repetitive insertion of bicanalicular tubes resembles the classic procedure used for treatment of effusion in the tympanic cavity by transtympanic ventilation tubes. Our short-term results published 1998 [9] showed a better success rate (72%) in comparison to the 10-year, long-term results (63%) in canalicular stenoses.

Failure of stenting is especially seen in scar tissue or agenesis of the canalicular system because a new canal must be produced with a knife or laser and no normal mucosa is present [10]. Another problem of failure could be stenting through the 'via falsa'. The different results of success (40–80%) in the literature depends on the exact etiology of the canalicular stenosis/obstruction and the chosen parameters: improvement or total recovery in symptoms and signs.

Another option for stenting after dacryocystorhinostomy exists through the 'viae naturales' performed by the

ophthalmologists especially. They discover that double bicanalicular silicone intubation (two nested fixed segments of silicone tubes) is an effective alternative to DCR in persistent congenital nasolacrimal duct obstruction with a success rate of 80% [14]. The use of a Hopkins endoscope (0°, Ø 0.89 mm, Storz) could assist better diagnosis. The success rate achieved by the Hofmann laser-assisted DCR, using miniendoscopes for lacrimal endoscopy to visualize the exact site of obstruction, is promising (success rate of canal [and canalicular lacrimal stenoses]: 83%) [15]. The more complex and invasive conjunctival dacryocystorhinostomy with insertion of tubes has remained for several years an alternative to stents of the canaliculi [16, 17]. However, stenting could also be necessary in these cases.

Conclusion

Double silicone bicanalicular tubes insertion as long-term spacers in canalicular stenoses was successful in 63% of the cases. Double bicanalicular tubes have a number of advantages such as maximal dilatation and good drainage by capillary forces but, despite our satisfactory results, the canalicular stenoses still remains a challenging area.

References

- 1 Caldwell GW: A new operation for the radical cure of obstruction of the nasal duct. *NY Med J* 1893;58:476.
- 2 Toti A: Nuovo metodo conservatore di cura radicale delle suppurazioni croniche del sacco lacrimale (dacriocistorhinostomia). *Clin Mod* 1904;10:33–34.
- 3 West JM: A window resection of the nasal duct in cases of stenosis. *Trans Am Ophthalmol Soc* 1910;12:654–658.
- 4 Hartikainen J, Grenman R, Puukka P, Seppä H: Prospective randomized comparison of external dacryocystorhinostomy and endonasal laser dacryocystorhinostomy. *Ophthalmology* 1998;105:1106–1113.
- 5 Mannor GE, Millman AL: The prognostic value of preoperative dacryocystography in endoscopic intranasal dacryocystorhinostomy. *Am J Ophthalmol* 1992;113:134–137.
- 6 Unlu HH, Toprak B, Aslan A, Guler C: Comparison of surgical outcomes in primary endoscopic dacryocystorhinostomy with and without silicone intubation. *Ann Otol Rhinol Laryngol* 2002;111:704–709.
- 7 Allen K, Berlin AJ: Dacryocystorhinostomy failure: association with nasolacrimal silicone intubation. *Ophthalmic Surg* 1989;20:486–489.
- 8 Walland MJ, Rose GE: The effect of silicone intubation on failure and infection rates after dacryocystorhinostomy. *Ophthalmic Surg* 1994;25:597–600.
- 9 Häusler R, Caversaccio M: Microsurgical endonasal dacryocystorhinostomy with long-term insertion of bicanalicular silicone tubes. *Arch Otolaryngol Head Neck Surg* 1998;124:188–191.
- 10 Caversaccio M, Frenz M, Schär P, Häusler R: Endonasal and transcanalicular Er:YAG laser dacryocystorhinostomy. *Rhinology* 2001;39:28–32.
- 11 Gröndahl J: Dacryostenosis: a new technique for the insertion of a temporary polyethylene catheter in lachrymal canals. *Acta Ophthalmol* 1963;41:255–259.
- 12 Nagashima K: 'Silicone-octopus repair' of lacrimal obstructions in children. *Ophthalm Surg* 1983;14:766–769.
- 13 Bakri K, Jones NS, Downes R, Sadiq SA: Intraoperative fluorouracil in endonasal laser dacryocystorhinostomy. *Arch Otolaryngol Head Neck Surg* 2003;129:233–235.
- 14 Mauffray RO, Hassan AS, Elner VM: Double silicone intubation as treatment for persistent congenital nasolacrimal duct obstruction. *Ophthalm Plast Reconstr Surg* 2004;20:44–49.
- 15 Hofmann T, Lackner A, Muellner K, Luxenberger W, Wolf G: Endolacrimal KTP laser assisted dacryocystorhinostomy. *Arch Otolaryngol Head Neck Surg* 2003;129:329–332.
- 16 Steinsapir KD, Glatt HJ, Putterman AM: A 16-year study of conjunctival dacryocystorhinostomy. *Am J Ophthalmol* 1990;109:387–393.
- 17 Sekhar GC, Dortzbach RK, Gonnering RS, Lemke BN: Problems associated with conjunctivodacryocystorhinostomy. *Am J Ophthalmol* 1991;112:502–506.