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The Outcomes of Silicone Tube Intubation in Dacryocystorhinostomy

Yazicioglu T* and Simsek S

Department of Ophthalmology, Kartal Dr. Lutfi Kirdar Education and Research Hospital, Istanbul, Turkey

***Corresponding author:** Yazicioglu T, Department of Ophthalmology, Kartal Dr. Lutfi Kirdar Education and Research Hospital, Istanbul, Turkey; Tel: +905322947109; E-mail: t_yazicioglu (at) hotmail (dot) com

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Abstract

Purpose: To evaluate the outcomes of silicone tube intubation to prevent common canaliculus or osteotomy site obstructions in dacryocystorhinostomy operations.

Methods: We retrospectively reviewed the medical records of 141 patients complaining about epiphora and discharge for a long period of time. Punctum examination, lacrimal irrigation and probing, dacryocystography (DSG) with contrast, and also full endoscopic examination of the nasal cavity for any nasal pathology were done to all patients. Patients with symptoms of dry eye causes by previous trauma, canalicular obstruction, suspicion of malignancy, traumatic dacryostenosis were not included in this study. External dacryocystorhinostomy operation and silicone tube intubation was performed under general anaesthesia. It is intended to keep the stent in place unless there is a stent-related complication. Patients were followed-up for one year.

Results: There were 117 women and 24 men, and the mean age was 51.6 ± 8.3 years. Symptoms of epiphora improved in 97.2% of the patients. Silicone tube related complications were observed in 29% of patients. 9.2% had rhinitis and complaining about bad smell from the nose, 5.6% had polypoid tissue on the osteotomy side, 2.8% had canalicular tear, especially in thin structure silicone tubes, 2.1% had lost tube spontaneously before 3 months, 2.1% had conjuctival irritation due to prolapsed tube, 2.1% had stenosis in the canaliculus, 2.1% had peripunctal granulation tissue, 2.8% had secretion inside the tube, 1.4% had punctual synechiae, 2.8% had canalicular stenosis continued to suffer from tearing. The most common complication was rhinitis (n=13, 9.2%).

Conclusion: Silicone tubes are tolerant to prolonged intubation for the maintenance of common canaliculus or osteotomy site obstructions in dacryocystorhinostomy operations with careful observation.

Keywords: Dacryocystorhinostomy; Silicone tube intubation; Complications

Introduction

Obstruction of the nasolacrimal duct can be treated by dacryocystorhinostomy (DCR) operation, which was first described by Toti in 1904, took its current form in 1921 with the modification of this technique by proposing an end-to-end anastomosis between the lacrimal sac and the nasal mucosa [1,2]. In order to increase the success rate of DCR operation, silicone tube insertion is recommended, which was first introduced by Quickert and Dryden in 1970 [3]. The use of silicone tubes in DCR operations, prevents the common canaliculus or osteotomy site obstructions and thus improve surgical results [3-6]. Although silicone tube intubation is a safe and effective procedure for canalicular or nasolacrimal duct disorders and generally tolerated in the lacrimal drainage system, it may cause various complications such as chronic infection, punctual or canalicular erosion, and conjunctival irritation [7-11].

In this study, we aimed to investigate silicone tube related complications and its relationship with their removal time.

Methods

We reviewed the medical records of 141 patients complaining about epiphora and discharge for a long period of time. The study was prepared according to the Helsinki Declaration Criteria, and

written informed consent forms were obtained. Eyelid and lacrimal system examinations were performed in all patients with epiphora. Examination of the puncta, determination of the obstruction with lacrimal irrigation and probing and supported by dacryocystography (DSG) with contrast were done. Full endoscopic examination of the nasal cavity for any nasal pathology were also evaluated. All the patients had common canalicular obstruction. Patients with symptoms of dry eye causes by previous trauma, canalicular obstruction, suspicion of malignancy, traumatic dacryostenosis were not included in this study. We performed external DCR by Dupuy-Dutemps and Bourguet technique, and use silicone stents routinely in all cases. We used two different sized tubes that we currently have. One of them is straight stainless steel probes with silicone tubing 35 cm length, 0.30 mm inside diameter, 0.64 mm outside diameter, the other one is angled stainless steel probes with solid silicone tubing - 40 cm length x 0.80 mm diameter. All operations were done by the same surgeon (TY) under general anaesthesia. After lacrimal sac was exposed and dissected from the lacrimal fossa, a 1 cm sized bone window was created on the lacrimal bone and 'H' shaped anterior and posterior flaps of the nasal mucosa and lacrimal sac were performed. After the posterior flaps of nasal mucosa and lacrimal sac was sutured we inserted bicanalicular silicone tube and we knot the ends together and directed into the nose. Then the anterior flaps were sutured, and skin incision was closed with 6/0 vicryl sutures. Patients were checked on postoperative first day, first week, first month, and then every 3 months until one year. Unless there was a stent-related complication, it was not taken before 6 months.

Results

There were 117(82%) women and 24(18%) men, and the mean age was 51.6 ± 8.3 years (range 38 to 64 years). 137 eyes of 141 patients were relieved of epiphora, with a success rate of 97.2%. Lacrimal irrigation test showed good passage without any resistance. Postoperative silicone tube related complications were observed in 42 (29%) of 141 patients. 13 (9.2%) of them had rhinitis and complaining about bad smell from the nose, 8 (5.6%) had developed polyploid tissue on the osteotomy side, seen by endoscopic examination. Tube related punctal slitting was observed in 4 (2.8%) cases, especially in the tubes with thin silicone structure.

3 (2.1%) had falling tube spontaneously before 3 months, 3(2.1%) had tube prolapse causing conjunctival irritation, 3 (2.1%) had stenosis in the canaliculus, 3 (2.1%) had peripunctal granulation tissue, 4 (2.8%) had secretion inside the tube. 2 (1.4%) had Punctal synechiae. 3 (2.1%) had canalicular stenosis continued to suffer from tearing (Table 1).

Table 1: *Silicone tube related complications.*

	Eyes (n:%)
Rhinitis	13(9.2%)
Polypoid tissue	8(5.6%)
Punctal slitting	4(2.8%)
Tube loss	3(2.1%)
Tube prolapsus	3(2.1%)
Canalicular stenosis	3(2.1%)
Peripunctal granulation tissue	3(2.1%)
Punctal synechia	2(1.4%)
Dirty tube	4(2.8%)

Table 2: *Complications related to removal time.*

Complications	**Intubation period 0-3 months**	**Eyes (n) 3-6 months**	**6 months- 1 year**
Canalicular stenosis	-	-	3
Punctal slitting	-	-	4
Tube dislocation	2	1	-
Peripunctal granulation tissue	-	-	3
Secretion inside the tube	-	-	4
Intranasal synechia	-	-	8
Rhinitis	-	-	13

The removal time and the related complications of the silicone tube were shown in (Table 2).

Discussion

Insertion of a tube into the nasolacrimal drainage system in DCR surgery can prevent postoperative blockages, by providing an open pathway in the healing process [12]. The most suitable, ideal synthetic material in living tissues should be chemically inert and should not initiate inflammation or foreign body reaction [13]. Tissue response to silicone implant was tested in mice and found that it is not only well tolerated but also has the tissue response same as the normal healing response in a sterile wound [13]. In DCR operations, although the osteotomy site is made large enough, it can be narrow up to 2 mm due to tissue growth and scarring. Also, the problems such as damage the nasal mucosa or sac flaps, suturing errors, and excessive bleeding during surgery reduce the success rate [14]. The success rate in cases with DCR with silicone tube intubation was reported as 92-94% [9]. In order to obtain a successful result, the inserted tube must be stayed in the patient's lacrimal canal until the damaged mucosa is re-epithelized, but postoperative complications and stent failure are common conditions [15]. Complications of the silicone tube can be listed as punctual erosion, punctual slitting, granuloma formation, nasal migration, tube prolapse, inter-punctual symblepharon, corneal erosions, recurrent nose bleeding, and chronic nasal irritation. The rate of postoperative complications are seen in the first 3 months. Tube prolapse is the most common complication and this may be due to the loose knotting of the silicone tube, and the most common late complication is secretion inside the tube [11].

The surface of the silicone tubes creates granulomatous inflammation at the rhinostomy site, making the operation unsuccessful [16]. On the other hand, the use of silicone does not increase the risk of soft tissue infection. There is no definite consensus on the average length of stay of silicone tube intubation. Although the reported time for tube removal has been reported to be from 1 week to several years, recent studies have indicated that the ideal time is between 2-6 months. The widely suggested theory is that the incidence of inflammatory reaction due to delayed removal of the tube may be high [15-18]. It is suggested that removing the tube before any inflammatory reaction begins may reduce the potential for late failure [13]. In one of the study, the complication rate was reported as high as 41% in the first 3 months after surgery [11].

Although it is a common opinion that long-term intubation is required to ensure repithelization and prevent recurrence in severe cases, it has been stated that this increases the risk of complications and may cause granulation tissue in the punctum [19-20]. This granulated tissue formation can also be occur along the entire lachrymal system, which can be caused by infection and/or mechanical stress. Punctual slitting might be another punctual-related complication after prolonged intubation. Leaving the tubes tight during surgery may cause punctual erosion and slitting. In addition, the patient should be told not to pull the tube and not to rub his eye sharply. Infection is the most serious complication associated with prolonged intubation. The tube should not be removed before the infection is controlled with irrigation and antibiotic treatment, as it may cause more mucosal damage with recurrent occlusion. In our study, we used silicone tube in all DCR operations and left in place for an average of 6 months. In the first three months we generally observed loss of the silicone tube. In the late period we observed peripunctal granulation tissue, intranasal synechia, inter-punctual symblepharon, canalicular stenosis. Peripunctal granulation tissue is simply removed from the site of the punctum. Minimal damage to the puncta was observed in our patients with low education level and very uncomfortable with the tube inside the nose. We think that this might have been due to the thin design of the silicone tube. Pulling the tube through the nose caused a tear in the canaliculus. In cases where the tube was too prolapsed to be pushed back, we removed them early.

Conclusion

Placement of silicone stents prevents rhinostomy stenosis and helps stabilize epithelization between two mucosal surfaces with surgical continuity. To achieve successful results proper intubation and endoscopic observation are necessary.

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Declaration of Interest

The author has no relevant affiliations or financial involvement with a financial interest in or financial with the subject matter or materials discussed in the manuscript.

Conflicts of Interest

There is no conflict of interest

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