Nasolacrimal Duct Injury from Microscopic Sinus Surgery : Preliminary Report

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Abstract

Nasolacrimal duct injury is a well established complication of functional endoscopic sinus surgery. In 1992, Bolger reported an incidence of nasolacrimal duct injuries in endoscopic sinus surgery of up to 15 per cent, but there is no documentation in microscopic sinus surgery[1]. Fluorescein instillation into the lacrimal system *via* the punctum was done to determine the incidence of nasolacrimal duct injuries in 16 patients who underwent 32 microscopic sinus procedures. Only one patient exhibited nasolacrimal duct injury intraoperatively on the left side (0.3%). He had complete healing of the nasolacrimal duct at 2 months and no postoperative epiphora developed.

Key word : Sinusitis, Microscopic Sinus Surgery, Fluorescein, Nasolacrimal Duct System

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Microscopic sinus surgery is one of the most frequent procedures for chronic sinus diseases performed in King Chulalongkorn Memorial Hospital. The techniques include uncinectomy, ethmoidectomy and enlarging the maxillary ostium under the operative microscope. Because of the close relationship between nasolacrimal duct system, ethmoid sinuses and maxillary ostium, nasolacrimal duct injury may result from sinus intervention. Bolger (1992) reported the incidence of intraoperative nasolacrimal duct injury of up to 15 per cent from 46 endoscopic sinus procedures in 24 patients but none developed epiphora or dacryocystitis postoperatively at least 10-12 months of follow-up[1].

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The purpose of this study was to determine the incidence of perioperative nasolacrimal duct injury and epiphora resulting from microscopic sinus surgery.

PATIENTS AND METHOD

The prospective clinical study was done in the Department of Otolaryngology, Faculty of Medicine, Chulalongkorn University and King Chulalongkorn Memorial Hospital, Thai Red Cross Society, between January 1, 1997 and December 31, 1998.

Sixteen patients diagnosed with chronic rhinosinusitis and/or nasal polyposis who accepted the procedures and signed the consent form were enrolled to the study. Any patients who had previously undergone sinus or nasolacrimal duct surgery or were allergic to fluorescein dye were excluded from the study. There were 7 male and 9 female patients with their ages ranging between 15 and 75 years (mean 33.6±16.9). All patients had bilateral diseases and underwent bilateral microscopic sinus surgery. Preoperatively, each patient was treated with a two-week course of antibiotic and steroid medication to eradicate the infection and to lessen the mucosal inflammation.

Surgical procedure

The patient was placed in the supine position with a 15-degree elevation of the head. Pieces of cotton pledget soaked with a mixture of 4 per cent lidocaine and 3 per cent ephedrine solution (1:1) were lightly packed into both nasal cavities for 5 to 7 minutes to obtain a mucosal decongestion and anesthesia. Surgery was performed under an operating microscope using a 320 mm objective lens.

The patient's face was sterilized and draped. The eyes should not be covered. The surgeon sat or stood by the patient's side (usually the right side) and faced the patient's face. Two per cent lidocaine with 1:80,000 adrenaline solution was injected into the tip of the inferior turbinate, nasal septum, lateral nasal wall, uncinate process and middle turbinate bilaterally (5 ml each side). The surgical procedure began with uncinectomy, then the natural ostium was palpated with curved suction, enlarging the ostium with back-biting cutting forceps, ethmoidectomy was performed (limited or complete) and the sphenoethmoidal recess was cleaned. In case of deviated septum, a localized, limited septoplasty was performed to correct this deformity before the definitive surgery was applied.

At this step, the nasolacrimal duct system was studied by irrigating the system with 1 ml of 0.5 per cent fluorescein dye solution *via* the previously anesthesized inferior punctum, while the surgeon was observing the middle and inferior meatus area. The presence of fluorescein dye in both middle and inferior meati indicated nasolacrimal duct injury. However, the absence of dye in the middle meatus, but presence in the inferior meatus meant an intact nasolacrimal system.

Patients with nasolacrimal duct injury intraoperatively underwent the fluorescein paper testing at 2, 6 months and beyond if necessary until no fluorescein in middle meatus area was detected.

Fluorescein paper testing was performed using fluorescein paper placed on the conjuntiva cul-de-sac allowing fluorescein dye to drain into the nasolacrimal duct. Endoscopic examination was conducted and the presence and location of fluorescein dye was observed.

RESULTS

Nasolacrimal duct injury was detected in one of 32 procedures, on the left side of a patient who underwent a complete microscopic sinus surgery for extensive nasal polyposis. Although nasolacrimal duct injury was observed intraoperatively, no postoperative epiphora developed. Complete healing of nasolacrimal duct was established at 2 months postoperatively when fluorescein paper testing failed to demonstrate the dye in the middle meatus but being visualized in the inferior meatus.

DISCUSSION

Because of the proximity of the nasolacrimal system to the sinonasal surgical field, injury to the nasolacrimal duct may be a result of nasal procedures especially microscopic sinus surgery and functional endoscopic sinus surgery.

Nasolacrimal drainage system begins at the punctums on the edge of the nasal end of the upper and lower eyelids. Each punctum leads into the vertical portion of the superior and inferior canaliculi, which after travelling vertically approximately 2 mm, makes an acute angle to lie parallel to the line of the lid. The superior and inferior canaliculi join to form the common canaliculus and

enter the lacrimal sac approximately 8-10 mm from the puncta. The lacrimal sac is contained within the lacrimal fossa, a bony groove formed anteriorly by the frontal process of the maxilla and posteriorly by the delicate lacrimal bone. The sac courses inferiorly approximately 10 to 15 mm and narrows to form the nasolacrimal duct, which enters a bony canal composed of the maxilla anteriorly and the lacrimal bone posteriorly. This interosseous portion of the lacrimal duct system measures approximately 10 to 12 mm and terminates in a poorly developed fold of nasal mucosa in the inferior meatus. In general, the direction of the osseous nasolacrimal canal extends caudally, laterally, and dorsally[2]. Variations in this basic anatomic pattern have been reported[3]

Calhoun et al[4] found that the nasolacrimal duct lies only 3 ± 2 mm (range 1-8 mm with 2 mm SD) anterior to the root of the uncinate process. As well, care must be taken during exenteration of the agger nasi cell, as this cell pneumatizes the nasolacrimal bone and, hence, only a thin plate of bone seperates this cell from the lacrimal bone. The duct lies 8 to 17 mm (averaging 10 mm) anterior to the ostium and approximately 5 mm from the anterior border of the membranous anterior fontanell. So it is important to be cautious when using the backbiting forceps in order to avoid trauma to the nasolacrimal duct[5].

Although the techniques of microscopic sinus surgery are close to those of endoscopic sinus surgery, the advantages of the microscopic technique include a wide operative field in which the surgeon can monitor the anatomic relationship in order to avoid eye and dural injury. The binocular vision obtained in the microscopic technique also facilitates identification of important landmarks. The surgeon can use both hands simultaneously with the microscopic technique which is very helpful in an excessive bleeding situation[8]. Moreover, most otolaryngologists are familiar with the use of the microscope for otologic surgeries which is also easily applied to rhinologic procedures. Finally, the current economic crisis has made the microscope more available at most hospitals than the expensive, sophisticated endoscopic set.

Bolger, et al[1] found that endoscopic sinus surgery caused nasolacrimal duct injuries in 15 per cent of 46 procedures performed, but from this study we found that the microscopic technique caused nasolacrimal duct injuries in only 0.3 per cent (1/32). The differences between these two rates of incidence may be due to the differences in the shape including the relationship of nasolacrimal duct to the uncinate process and natural ostium of maxillary sinus between Caucasian and Oriental noses. Finally since details of each surgical procedure are different especially the size of the enlarged natural ostium, further studies are needed.

SUMMARY

A study of nasolacrimal duct injury from microscopic sinus surgery was conducted in 16 patients. It revealed that only 0.3 per cent (1/32) of the operations resulted in nasolacrimal duct injuries, determined by intraoperative fluorescein dye testing. However, no clinical epiphora was present.

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รายงานเบื้องต้น การบาดเจ็บต่อท่อน้ำตาจากการผ่าตัดไซนัสโดยใช้กล้องจุลทรรศน์

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เป็นที่ทราบกันดีว่าการบาดเจ็บต่อระบบท่อน้ำตาเป็นภาวะแทรกซ้อนที่อาจเกิดขึ้นได้จากการทำผ่าตัดไซนัสโดยใช้กล้องส่อง จากรายงานของ Bolger และคณะ (1992) ได้รายงานอัตราการเกิดการบาดเจ็บต่อระบบท่อน้ำตาจากการผ่าตัดไซนัสโดยใช้กล้องส่องขณะผ่าตัดถึง 15% เนื่องจากยังไม่มีรายงานที่ศึกษาถึงการบาดเจ็บต่อระบบท่อน้ำตาที่เกิดจากการผ่าตัดไซนัสโดยการใช้กล้องจุลทรรศน์ การศึกษานี้เป็นการศึกษาอัตราบาดเจ็บของระบบท่อน้ำตาที่เกิดจากการผ่าตัดไซนัสโดยใช้กล้องจุลทรรศน์ทั้งหมด 32 ข้างในผู้ป่วย 16 คน โดยการใช้สี fluorescein ฉีดผ่านรูเปิดของท่อน้ำตาเพื่อทดสอบระบบท่อน้ำตา ผลการศึกษาพบว่ามีการบาดเจ็บของท่อน้ำตาข้างซ้ายในผู้ป่วย 1 คน (0.3%) เมื่อติดตามผู้ป่วยเป็นเวลา 2 เดือนพบว่าอาการบาดเจ็บของท่อน้ำตาหายดีโดยไม่มีโรคแทรกซ้อน

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