Comparing Efficacy of Punctum-incised Surgery versus Punctum-Sparing Surgery in Primary Canaliculitis Patients

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Abstract

Purpose: This study aims to describe the characteristics of canaliculitis patients and compare the operative outcomes between punctum-sparing canaliculotomy and traditional punctum-incised canaliculotomy.

Methods: The medical records of 58 patients who were diagnosed with canaliculitis were reviewed from March 1, 2010, to December 31, 2020. The demographic characteristics, symptoms, time to disease onset, location of involvement, operation information, and prognosis were recorded and analyzed.

Results: Canaliculitis showed a female (67%) predominance. Epiphora with discharge was the most common symptom which happened in 56 (97%) patients. The recurrence rates of the punctum-incised group and the punctum-sparing group were 5% and 9% respectively, and there was no significant difference between the two groups. ($p=0.514$)

Conclusion: The recurrence rate of the punctum-sparing group showed no significant difference with punctum-incised group. Patients with recurrence finally recovered after multiple treatments. Squeezing by tweezers was a good way to locate the infected lacrimal duct. Punctum-incised surgery can be the first-line therapy for canaliculitis.

Introduction

Canaliculitis is an uncommon ocular disease which makes up 2% of all the lacrimal diseases.[1, 2] The clinical symptoms have been well-described such as swelling punctum, redness, discharge, concretions and pain. It is usually misdiagnosed as chronic conjunctivitis, chronic dacryocystitis or hordeolum.[2] Treatment of canaliculitis can be conservative or surgical. Conservative treatment contains oral and topical antibiotics with corticosteroid.[3, 4] Due to the special anatomic structure of lacrimal duct, conservative therapy may lead to persistence or recurrence compared with surgery.[5, 6] A high recurrence rate from 33–92% of conservative therapy has been found in the previous researches.[7–10] Surgery is considered a more efficient treatment to canaliculitis.[8, 10]

Surgical treatment usually contains canaliculotomy and punctoplasty which were reported as effective ways to treat canaliculitis.[11, 12] Lacrimal duct curettage plays a key role in the treatment, because it can not only clear concretions, but also change the anaerobic environment.[12–14] However, lacrimal pump dysfunction, lacrimal duct narrowing, epiphora may appear as post-surgery complications.[11, 15] In addition, punctoplasty may cause punctum distortion and leave a 2-3mm incision, which affects patients' tear meniscus.[11] James et al tried punctum-sparing canaliculotomy which left the punctum intact to reduce complications, but there isn't any research to compare post-surgery complications between James' and traditional technique.[1, 16]

In our study, we described the characteristics of canaliculitis patients and compared the operative outcomes between punctum-sparing canaliculotomy and traditional punctum-incised canaliculotomy.

Methods

This study contains 58 patients who were diagnosed primary canaliculitis and went through punctum-incised surgery or punctum-sparing surgery between March 1, 2010, and December 31, 2020, at Peking University People's Hospital.

Statistical analysis was performed using SPSS software (IBM SPSS 22.0, SPSS Inc). Recurrence rates were compared with a Chi-square test.

The canaliculitis is diagnosed by mucopurulent punctal regurgitation or concretions extruding from the punctum associated with eyelid thickening or eyelid erythema, which were based upon previous study.[8] Canaliculitis caused by punctual plug placement or nasolacrimal duct obstruction was considered as a secondary canaliculitis and was excluded from this study. Patients' demographic characteristics, symptoms, time to disease onset, operation information, location of involvement and prognosis were recorded from their medical records. Table 1 showed the demographic characteristic and clinical presentations of the patients.

All patients were asked to use antibiotic eye drops (0.5% levofloxacin, Japan Santen or 0.3% tobramycin, USA Alcon) 4 times daily for 3 days before and after surgery. All surgeries were performed under 2% lidocaine local anesthesia. A punctum dilator was used to dilate the punctum. For patients who went through punctum-incised surgery. A 3-snip incision was made in the surgery. Two horizontal cuts were made from the punctum towards the nasal side which formed a letter "V" with the punctum on its turning point. One vertical cut was made and a wedge-shaped tissue around punctum was cut away. The incision in the punctum-incised group was left open. For patients who went through punctum-sparing surgery, a 2-3mm incision was made on the nasal side of the punctum (Figure 1) which was similar to the incision position performed by Khu.[16] In both group, lacrimal curettage was performed using a 2mm curette through the incision and all granulation tissue and sulfur-like concretions were removed. A 10-0 non-absorbable nylon suture (Alcon) was used to suture the incision in the punctum-sparing group.

Outcomes evaluations included complete resolution, partial resolution and recurrence. Complete resolution was defined as the disappearance of all clinical symptoms and signs after the treatment during the follow-up. Partial resolution was defined as remaining clinical symptoms and signs and recovered after extra conservative intervention. Recurrence was defined as the reoccur of clinical symptoms and signs during the period of follow-up and need surgical intervention.[8]

Patients were asked to follow-up in 1 week after the surgery. Further follow-ups were based on the response to treatment. The outcome of surgery was assessed at each visit, which includes symptoms of canaliculitis, treatment response, punctum appearance, ocular surface conditions and complications. Patients who didn't return in one week will be considered as lost to follow-up.

Table 1
Demographic characteristics and clinical presentations of the 58 patients

	Median (25th percentile,75th percentile), (range)
Age(years)	71(63,79), (38,88)
Time to diagnosis(months)	18(6,34), (1,120)
Follow-up(months)	7(1,19), (0.25,78)
	N (%)
Gender	
Male	19(33)
Female	39(67)
Location	
Upper punctum only	25(43)
Lower punctum only	25(43)
Both	8(14)
Laterality	
Right	26(45)
Left	32(55)
Signs and Symptoms	
Epiphora with discharge	56(97)
Eyelid swelling	9(16)
Redness	13(22)
Pouting punctum	40(69)
Palpable thickened canaliculus	24(41)
Punctal regurgitation under syringing	45(78)
Presence of granulation tissue on punctum	7(12)
Punctal regurgitation under compression	16(89 [#])

[#]Compression was performed by using tweezers on 18 patients and 16 of them showed concretion.

Results

60 patients (60 eyes) diagnosed with primary canaliculitis were included in this study. Two patients were lost to follow-up. 58 patients were enrolled in this study which includes 19 males (33%) and 39 females (67%). The median age at the time of diagnosis was 71 years (range, 38-88 years). The median time from symptoms onset to diagnosis was 18 months (range, 1-120 months). The median follow-up was 7 months (range, 0.25-78 months). All patients involved were unilateral. 25 patients (43%) were affected upper punctum only and 25 patients (43%) were affected lower punctum only. 8 patients (14%) were affected both upper and lower puncta. Epiphora with discharge was the most common symptom which happened in 56 patients (97%). Other symptoms include redness (13, 22%) and eyelid swelling (9, 16%). 45 patients (78%) presented regurgitation under syringing. Other clinical signs include pouting punctum (40, 69%) and palpable thickened canaliculus (24, 41%). Granulation or polyp-like tissue was observed on punctum in 7(12%) patients. Punctum squeezing was performed on 18 patients to decide which punctum should be operated and 16(89%) of them showed concretion after squeezing. (Table 1)

The treatment was summarized in Figure 2. 47 patients were treated with punctum-incised surgery. Two of them showed pus and epiphora with discharge during the follow-up and were diagnosed as canaliculitis recurrence. Thus, they went through a second surgery. 11 patients were treated with punctum-sparing surgery. One patient showed redness during the follow-up and went through a second surgery. As for the other patients, they showed recovery of canaliculitis. Figure 3 showed the preoperative and postoperative photos from both groups.

Discussion

Canaliculitis is a rare lacrimal disease characterized by epiphora with discharge, pouting punctum, pus and redness. In our study, the incidence of canaliculitis showed a female predominance which was consistent with previous studies.[10, 17] The female predominance may be due to use of cosmetics which can occlude the lacrimal duct. In addition, menopausal hormone changes may decrease tear production and reduce protection against infections.[9, 17]

All the patients involved were unilateral, which is the same with most of the studies.[12, 18, 19] Very few patients involved bilaterally.[20, 21] In our study, affection rate of the upper punctum and the lower punctum was the same, while in other studies, the lower punctum was affected more frequently. Lin et al reported a predominance of lower canaliculitis up to 73%.[7] In a study with a larger sample size, the lower punctum was also more vulnerable (68%).[20]

Epiphora with discharge and presence of concretions under compression were the typical symptoms and signs of canaliculitis in our study, which emphasized the importance of concretions in canaliculitis disease process. Xiang et al summarized 37 primary canaliculitis patients, 36 of them (97.3%) showed concretions.[22] Other studies indicated that the rate fluctuated between 73% and 100%.[8, 23, 24]

Both punctum-incised surgery and punctum-sparing surgery are effective treatment of canaliculitis. Stucki performed punctum-incised surgery on 10 patients and only one had recurrent canaliculitis.[18] Khu performed punctum-sparing surgery by making an incision 2mm medial to the punctum on three

patients, and none of them showed recurrence.[16] A monocanalicular stent was used instead of suture in Khu's surgery and the incision was left to heal by secondary intention, which was different from our study. In our study, 3 patients showed recurrence (5%). 2 patients were from the punctum-incised group (4%) and 1 patient was from the punctum-sparing group (9%). The clinical information of the three patients were summarized in Table 2. Both punctum-incised surgery (9%) and punctum-sparing surgery (5%) were effective. There was no significant difference between the two methods($p=0.514$). Whether incising the punctum or not had no difference in the recurrence rate. In our opinion, thoroughly concretion cleaning might be the key point in the surgery. As for other recurrence risk factors, being male and presence of concretions were reported, but these were not observed in this study.[7, 25]

All 3 recurrent patients were both upper and lower puncta involved. As for patient A, we got sulfur-like concretions from his upper canaliculus using tweezers while no concretion was found from his lower punctum, which only showed little pus under syringing. Based on this examination, we performed surgery only on his upper punctum. One week after 3-snip surgery on his upper canaliculus, sulfur-like concretions showed from his lower canaliculus under squeezing. So, we operated on his lower canaliculus and he didn't show any sign of recurrence on both puncta. Thus, false negatives may occur when using tweezers to locate concretions, not all the sulfur-like concretions can be detected by using tweezers. Patient B and C shared similar situations. No sulfur-like concretion was found under compression in lacrimal ducts. As for patient B, no sulfur-like concretion was captured from her lower punctum by compression at her first visit. So only her upper punctum was incised during the first operation. In her 2-month follow up, she relapsed. Lower lacrimal duct infection without concretion was considered to be responsible for the recurrence. Punctum-incised canaliculotomy was performed on her lower lacrimal duct during her second operation and she fully recovered. Patient C relapsed 3 months after upper and lower punctum-sparing canaliculotomy. He received a lower lacrimal duct canaliculotomy and recovered in one week after the second operation. Thus, both patients were diagnosed primary canaliculitis and were treated through canaliculotomy. No sulfur-like concretion was found in their lacrimal ducts. Sulfur-like concretion may be concealed or absent in canaliculitis.

In previous studies, lacrimal duct pressing was considered as an important examination as well as treatment, which was usually done by cotton swabs instead of tweezers.[2] In our study, tweezers were used to squeeze the punctum and the lacrimal duct to locate the concretions under local anesthesia (0.4%Benoxil, Santen). Using tweezers to clamp is more precise than using cotton swab and the former action provides more pressure which may improve the detection rate. We have done squeezing on 18 patients and 16 of them showed concretions extruding from a certain punctum. Tweezers-squeezing was useful in assisting diagnosis and a reliable examination to locate the concretion and the lesion. However, not all the concretions can be detected. Absence or concealment of concretions may be the possible reasons.

Previous studies reported other tools like ultrasound and lacrimal endoscopy to assist diagnosis. Ultrasound with 20-Mhz or 80-Mhz has been used to diagnose in patients with atypical clinical presentations.[22, 26] Besides, lacrimal endoscopy was reported as a useful tool to examining the

lacrimal duct by direct visualization. Zheng et al performed endoscopy on 12 patients for both examination and treatment, all 12 patients got complete recovery.[2]

Regarding the punctum choice, surgeries should be performed on the side of punctum which showed concretions by compression. If there is no concretion, surgical treatments should be performed based on clinical symptoms such as pouting punctum and palpable thickened canaliculus.[8, 10] However, it was possible that some lesions were hard to locate. In this scenario, patients should be informed risks of partial resolution or recurrence. As a result, patients who presented symptoms on punctum but showed no sulfur-like concretion under squeezing or syringing were more likely to be non-responsive from the treatment. Ultrasound and endoscopy could be alternative examinations to evaluate which punctum should be treated for these patients.

The Riolan muscle inserts into the punctum and pulls the punctum medially and posteriorly, which helps maintain the shape and position of the punctum and the lacrimal pump function.[27] In punctum-sparing surgery, the Riolan muscle and the connective tissue around the punctum were intact. Therefore, punctum-sparing surgery may preserve the lacrimal pump function. Whereas previous studies reported that epiphora and lacrimal pump dysfunction occurred after punctum-incised surgery.[12] Only a few patients with lacrimal duct obstruction pre-surgery showed epiphora post-surgery in our study. One patient showed focal adhesion around the punctum one week after punctum-sparing surgery on both puncta. The adhesion was loosened and completely alleviated in the follow-up. Other complications were not observed in this study.

Monocanalicular stent was used in previous punctum-sparing surgery to help reestablish the canalicular anatomy and avoid post-surgery epiphora.[16] However, monocanalicular stent wasn't used in our surgeries and no canalicular scarring or outflow obstruction was observed in this study. In our perspective, monocanalicular stent may not be essential in this operation.

There were some limitations in our study. Firstly, the sample size was relatively low in punctum-sparing group. Secondly, squeezing by tweezers was a good examination and could provide guidance for surgical treatment, but not all the concretions can be detected in this way and canaliculitis can develop without concretions. So surgical decisions may be misled, and partial resolution or recurrence would appear. For patients with atypical symptoms that cannot be detected by tweezers clearly, endoscopy and ultrasound might be backup choices.

Table 2
Specific treatment of the patients who showed recurrence.

	Patient A	Patient B	Patient C
Age (Years)	80	84	70
Gender	Male	Female	Male
Time to diagnosis (months)	6	60	12
Laterality	Left	Left	Right
Location	Both	Upper	Both
Symptom	Upper: sulfur-like concretions Lower: little pus	Upper: pus, punctal regurgitation	Both: Pus
1st Treatment	Upper, punctum-incised	Upper, punctum-incised	Both, punctum-sparing
Recurrence time [#]	1 week	2 months	3 months
Recurrence sign	Upper: little pus Lower: sulfur-like concretions	Both: Epiphora with discharge	Redness
2nd Treatment	Both, punctum- sparing	Lower, punctum-incised	Lower, punctum-sparing
2nd Recurrence			1 week
3rd Treatment			Remove the suture

#Recurrence means the time between the surgery to the symptom reoccurred

Conclusion

In conclusion, both punctum-incised surgery and punctum-sparing surgery were effective treatment of canaliculitis. The recurrence rate showed no significant difference between punctum-sparing and punctum-incised group. Punctum-sparing surgery can be the first-line therapy for canaliculitis.

Declarations

Ethics approval and consent to participate

This retrospective study was approved by the Peking University People's Hospital Review Board and adhered to the tenets of the Declaration of Helsinki. Informed written consent was obtained from all patients.

Consent of Publication

Written informed consent was obtained from individual participants for image publication.

Availability of data and materials

The datasets used during the study are available from the corresponding author on reasonable request.

Competing interests

All authors declare no competing interests.

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Authors' contributions

Zhongchengshen and Qin Zhang were responsible for the data analysis and writing of the manuscript. Fangting Li, Qin Zhang and Mingwu Li were responsible for the surgeries. Min Wang and Mingwei Zhao were responsible for the manuscript review. All authors have read and approved the manuscript.

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Figures

Figure 1

Fig1A and Fig1B respectively indicate the start and the end point of the first vertical cut in the punctum-sparing surgery.

Figure 2

Treatment selection of the patients.

Figure 3

Preoperative and postoperative anterior segment photos from both groups. Fig3A, 3B was from the punctum-sparing group. Fig3C, 3D was from the punctum-incised group. Fig3B, 3D were postoperative photos which were taken during the first follow up.