

# Outcomes of canaliculotomy in recalcitrant canaliculitis



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## Abstract

**Purpose:** To evaluate outcomes of canaliculotomy in cases of recalcitrant canaliculitis.

**Methods:** All cases diagnosed with canaliculitis who subsequently underwent canaliculotomy over a 15 year period were included in the study. We reviewed and analyzed demographic data, clinical presentation, microbiological profile and management outcomes.

**Results:** Out of 40 patients, 21 (52.5%) were males. Age range was 17–89 years. Lower canaliculus was affected most commonly (53.81%). Mean duration of symptoms was 8 months (range- 0.5–60 months, median 6 months). The most common presenting symptom was watering (34, 85%) while pouting puncta (32, 80%) was the most frequently documented clinical sign. Concretions were seen in 20 (50%) patients and Actinomyces was the most commonly isolated micro organism in the concretion group. Polymicrobial growth was seen in 18 (45%) patients. Commonly isolated bacteria on culture were Staphylococcus epidermidis (16, 40%) followed by Actinomyces (14, 34%) and Corynebacterium species (5, 12.5%). Complete resolution was seen in 39 cases post-operatively (97.5%,  $p = 0.0002$ ). Mean follow up period was 21 months (range- 3–180 months).

Recurrence was noted in 6(15%) cases, of which 4 were males (66.67%,  $p = 0.069$ ) Four (66.67%,  $p = 0.069$ ) patients had associated diabetes and 5 (83.33%,  $p = 0.046$ ) had associated concretions. Six (15%) patients complained of persistent epiphora.

**Conclusion:** Canaliculotomy is a safe and effective method for management of recalcitrant canaliculitis with a success rate of 85%. Presence of concretions was associated with higher risk of recurrence in our study.

**Keywords:** Canaliculitis, Concretions, Canaliculotomy, Epiphora

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## Introduction

Canaliculitis is a chronic infection of the canaliculus, which accounts for 2% of all lacrimal diseases.<sup>1</sup> Due to the relative rarity of the condition, it is often misdiagnosed as chronic conjunctivitis, dacryocystitis, chronic blepharitis or chalazion, thereby resulting in a prolonged chronic course.<sup>2</sup>

Von Graefe identified Actinomyces as the causative agent for intracanalicular dacryoliths in 1854.<sup>3</sup> Most cases reported

in literature are sporadic, without any recognizable predisposing factors. However, stasis secondary to lacrimal obstruction or a diverticulum can promote anaerobic growth which can cause canaliculitis.<sup>2,4</sup>

Conservative management in the form of topical antibiotics provides relief, but in most cases, this response is transient and the episodes become recurrent and chronic.<sup>5</sup>

Curetage of the canalicular contents through punctoplasty or canaliculotomy has been effective with higher

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success rates.<sup>4-7</sup> However, canalicular stenosis, scarring, lacrimal pump failure and post operative epiphora have been reported as a sequelae of surgical intervention.<sup>4-8</sup>

The aim of the present study was to analyze outcomes of canaliculotomy in cases of recalcitrant canaliculitis and the factors responsible for recurrence. This study is the second largest case series on outcomes of canaliculotomy<sup>8</sup> and the largest one to compare the presence or absence of concretions in canaliculitis and its effect on outcome of canaliculotomy.

## Materials and methods

A retrospective analysis of all cases diagnosed with canaliculitis and who subsequently underwent canaliculotomy, between January 2000 to December 2015 was done. Patient's demographic data, clinical presentation, microbiological profile and management outcomes were reviewed and analyzed.

Pre operatively, the mucopurulent discharge or the concretions expressed from the canaliculus was sent for microbiological evaluation (Fig. 1a-c). Initially, all patients were treated conservatively with topical fortified cefazolin (50 mg/ml, 5%) and fortified gentamycin (1.4%, 14 mg/ml) eye drops hourly for 2 weeks based on sensitivity to geographically based common microbial isolates. Fortified cefazolin (50 mg/ml, 5%) eye drop was prepared by injecting 10 ml of water for injection into the commercially available vial of powdered form of cefazolin (500 mg). Fortified gentamycin eye drop (14 mg/ml, 1.4%) was prepared by adding 1 vial of parenteral gentamycin injection (2 ml of 40 mg/ml) to the commercial 0.3% gentamycin ophthalmic solution. Fortified cefazolin eye drops kept at 2-8 °C is effective for 96 h and prepared freshly every 4 days. Patients who initially were managed conservatively with topical antibiotic eye drops, and showed no improvement for more than 4 weeks or those who had a recurrence within 4 weeks of initial resolution were

defined as recalcitrant canaliculitis. These patients were taken up for canaliculotomy plus curettage of the canalicular contents.

Under local anesthesia, Bowman's probe was passed into the canaliculus and using Bard Parker 11 no. blade, the canaliculus was incised horizontally till the punctum and a 4-5 mm proximal canaliculotomy was done. (Fig. 1d, e). Canalicular curettage was done in all cases using Mayhoeffers chalazion curette and repeated till no further debris or granules were seen. At the end of the procedure, lacrimal sac irrigation with gentamycin (0.5 ml of 40 mg/ml mixed in 1 ml of distilled water) was done. Post operatively, all patients were started on topical antibiotic eye drops (based on the culture sensitivity report) for 2 weeks. The surgery was performed by different oculoplastic surgeons of the same institute following the same technique as described above.

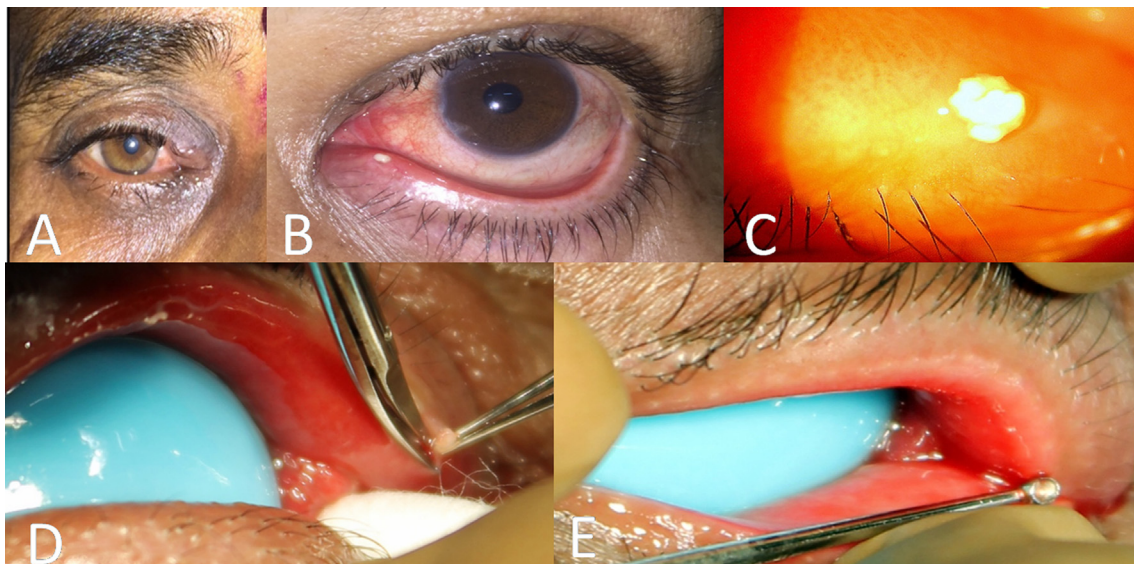
Post operatively, once the acute infection resolved, epiphora and lacrimal passage patency were assessed anatomically by lacrimal sac irrigation and functionally by Fluorescein Dye Disappearance Test (FDDT) and Munk<sup>10</sup> score.

Complete resolution of signs and symptoms post canaliculotomy and its long-term outcomes were studied. Patients with a follow up period of less than 3 months were excluded from the study. Failure was defined as no improvement in signs and symptoms following canaliculotomy whereas recurrence was defined as new episode of canaliculitis after one month of complete resolution.

Statistical analysis was done using Chi - square test and two proportion z test. Data was analyzed using SPSS version 14.0. *P* value of <0.05 was considered significant.

## Results

A total of 40 patients [21 (52.5%), males and 19(47.5%) females] were included in the study. Mean age at presentation was 53 ± 15.4 years (Range, 17-89 years). Thirty two patients [80%, (*p* = 0.02)] were over 45 years, while only eight



**Fig. 1.** (A) External photograph depicting right eye upper chronic canaliculitis. (B) External photograph depicting inferior pointing puncta with discharge. (C) Slit lamp photograph depicting expressed concretions from puncta in a case of canaliculitis. (D) External photograph demonstrating the canaliculus being cut for performing canaliculotomy. (E) External photograph showing Mayhoeffers chalazion scoop being used to curette out the canalicular concretions.

(20%) patients were less than 45 years. The most common presenting symptom was watering (34, 85%) followed by redness of the eye (26, 65%), discharge (14, 35%), foreign body sensation (5, 12.5%) and swelling over the medial canthal area (4, 10%). Mean duration of symptoms prior to a definitive diagnosis was 8 months (0.5–60 months, median 6 months). Five (12.5%) patients had history of similar episodes in the past. Chronic dacryocystitis (8, 20%) was the most frequent misdiagnosis, followed by conjunctivitis (5, 12.5%) and hordeolum externum (2, 5%). Three (7.5%) patients underwent dacryocystorhinostomy and one had undergone incision and drainage elsewhere for the same. Co-existing diabetes mellitus was seen in 16 (40%) cases. Pouting puncta (32, 80%) was the most frequently noted clinical sign followed by medial canthal inflammation or swelling (28, 70%), mucopurulent discharge (21, 52.5%) and concretion expressed on pressing over the canaliculus (20, 50%).

All (100%) patients in our study had unilateral involvement. Right eye was involved in 19 (47.5%) while left was involved in 21 (52.5%) patients. Thirty three (82.5%) patients had involvement of only one canaliculus, the lower canaliculus being more commonly affected (22, 55%). Upper canalicular involvement was seen in 11 (27.5%) patients; 7 (17.5%) patients had involvement of both canaliculi (Table 1).

The discharge or concretions expressed from the canaliculus was sent for microbiological evaluation in all cases (Table 2). Polymicrobial growth was seen in 18 (45%) patients. Most commonly isolated bacteria on culture were *Staphylococcus epidermidis* (16, 40%) followed by *Actinomyces* (14, 34%) and *Corynebacterium* species (5, 12.5%). Fungal, *Aspergillus* canaliculitis was seen in one (2.5%) patient.

Patients who showed the presence of concretions on expression over the canaliculus were compared with those without concretions (Table 3).

Mean age in the concretion group was  $53.67 \pm 8.87$  years, while in the group without concretions was  $55.05 \pm 16.29$  years. No specific gender predilection was seen in either group. Microbiological profile identified *Actinomyces* as the microbe, most commonly causing concretions [13, 65%,  $p = 0.002$ ]. Polymicrobial growth was identified in 6 (30%) cases, and all were in the concretions group. The most common isolated causative microbe in the non-concretions group was *Staphylococcus* species (9, 45%).

All (40, 100%) patients underwent canaliculotomy with curettage of the canalicular contents in accordance with the criteria described in the material and methods section.

**Table 1.** Demographic profile of the patients.

Demographic profile (n = 40)	
Age	53 ± 15.4 years (17–89 years)
Sex	
Male	21, 52.5%
Females	19, 47.5%
Laterality	
Right eye	19, 47.5%
Left eye	21, 52.5%
Canaliculus involved	
Upper	11, 27.5%
Lower	22, 55%
Both	7, 17.5%
Mean duration of symptoms	8.12 months (0.5–60 months)
Mean duration of follow up	20.63 months (3–180 months)

**Table 2.** Microbiological profile of the patients.

Microbiological profile		P – Value
<i>Staphylococcus epidermidis</i>	16 (40%)	0.0016
<i>Actinomyces</i>	14 (35%)	0.0177
<i>Corynebacterium</i> species	5 (12.5%)	0.2358
<i>Streptococcus viridans</i>	5 (12.5%)	0.2358
<i>Staphylococcus aureus</i>	4 (10%)	0.1138
<i>Enterococcus fecalis</i>	4 (10%)	0.1138
<i>Haemophilus para influenzae</i>	3 (7.5%)	0.1840
Methicillin resistant <i>Staphylococcus aureus</i>	1 (2.5%)	0.201
<i>Enterobacter aerogenes</i>	1 (2.5%)	0.201
<i>Chlamydia trachomatis</i>	1 (2.5%)	0.201
<i>Pseudomonas aeruginosa</i>	1 (2.5%)	0.201
<i>Prevotella nigrescens</i>	1 (2.5%)	0.201
<i>Proteus mirabilis</i>	1 (2.5%)	0.201
<i>Acinobacter calcoaceticus</i>	1 (2.5%)	0.201
<i>E. coli</i>	1 (2.5%)	0.201
<i>Aspergillus</i>	1 (2.5%)	0.201

Post canaliculotomy, complete resolution of signs and symptoms was seen in 39 (97.5%,  $p = 0.0002$ ) patients. Six patients had recurrent canaliculitis after a mean duration of 17 months (2–36 months, median 13 months). Overall mean duration of follow up was 20.63 months (3–180 months, median 8 months).

Six (15%) patients complained of persistent epiphora. Three of these six patients (50%) had canalicular fibrosis (2 lower canaliculus, 1 upper canaliculus), one had partially patent lacrimal passage, one developed punctal ectropion and one had punctal stenosis. Mean Munk score was  $2.25 \pm 0.5$  (2–3) and mean FDDT score was  $2.25 \pm 0.5$  (2–3). Long term results were analyzed and good outcome was achieved in 34 (85%) patients.

Amongst the recurrence group, (Table 4) mean duration of recurrence was 17 months (2–36 months, median 13 months). Four (66.67%,  $p = 0.069 > 0.05$ ) were males, 2 (33.33%) were females. Five (83.33%) of the six patients were above 60 years of age. Four (66.67%,  $p = 0.069 > 0.05$ ) patients had associated diabetes. Five (83.33%,  $p$  – value =  $0.046 < 0.05$ ) patients who had recurrence showed presence of concretions. Microbiological profile of 4 (66.67%) patients showed a different causative organism at the time of recurrence. Five (83.33%) patients improved with conservative management; however, one patient despite a repeat canaliculotomy and curettage had persistent *Actinomyces* canaliculitis.

A comparison between the patients who had a recurrent episode of canaliculitis and those with no recurrence was done (Table 4). Though statistically insignificant ( $p = 0.059$ ), the proportion value suggested a strong association with older age, male gender and diabetes mellitus. Nearly 83.3% of patients with recurrence had presence of concretions, while only 44.11% of non-recurrent patients had concretions, indicating that presence of concretions has a higher risk of recurrence and this was statistically significant [OR = 2.375 CI (1.384, 14.702),  $p$  – value =  $0.0383 < 0.05$ ].

## Discussion

Despite canaliculitis being a well documented clinical entity, its masquerading clinical findings and low awareness amongst general ophthalmologists, often accounts for a delay in diagnosis. Mean duration of symptoms prior to an established diagnosis in our study was 8 months, ranging

**Table 3.** Comparison of patients with and without concretions.

Parameters	Presence of concretions (n = 20)	Absence of concretions (n = 20)	P – value
Mean age (years)	53.67 ± 8.87	55.05 ± 16.29	0.749
Sex	Male: 10 (50%) Female: 10 (50%)	Male: 11 (55%) Female: 9 (45%)	0.516
Mean duration of symptoms	6.13 ± 5.4 months	10.24 ± 13.99 months	0.243
Canaliculus affected	Lower: 11 (55%) Upper: 6 (30%) Both: 3(15%)	Lower: 10(50%) Upper: 6 (30%) Both: 4 (20%)	0.525 0.2881 0.6773
Microbiological profile	Actinomyces: 13 (65%, $p = 0.002$ ) Polymicrobial : 6 (30%)	Staphylococcus species: 9 (45%) Streptococcus species: 3(15%) Corynebacterium species: 3 (15%)	
Diabetes mellitus	10 (50%)	6 (30%)	0.1967
Recurrence	Yes: 3 (15%) No: 17 (85%)	Yes: 3 (15%) No: 17 (85%)	0.894

**Table 4.** Comparison of the patients with and without recurrence.

Parameters	Recurrence (n = 6)	No Recurrence (n = 34)	P – value
Age <60 years ≥60 years	2 (33.3%) 4 (66.7%)	24 (70.6%) 10 (29.4%)	0.078
Sex	Male: 4 (66.67%) Female: 2 (33.33%)	Male: <b>17 (50%)</b> Female: <b>17 (50%)</b>	0.533
Mean duration of symptoms (months)	4.83 ± 2.23	8.73 ± 11.37	0.413
Diabetes Mellitus	4 (66.67%)	12 (35.29%)	0.059
Canaliculus affected	<b>Upper:</b> 1 (16.7%) <b>Lower:</b> 4 (66.7%) <b>Both:</b> 1 (16.7%)	<b>Upper:</b> 10 (29.41%) <b>Lower:</b> 18 (52.94%) <b>Both:</b> 6 (17.64%)	0.757
Presence of concretions	5 (83.33%)	15 (44.11%)	0.0383
Most common causative microbe	Enterococcus fecalis (2) Actinomyces (2)	Staphylococcus epidermidis (14) Actinomyces (12)	

from 0.5 to 60 months (median 6 months) depicting the difficulty in initial diagnosis by clinician. This finding was similar to the other two South Indian studies by Kim et al.<sup>11</sup> and Kaliki et al.<sup>4</sup> (8 & 10 months respectively). This delay can be minimized by identifying the characteristic clinical features and having a higher index of suspicion.

Dacryocystography and ultrasound biomicroscopy have been described as diagnostic tools for confirming the diagnosis of canaliculitis.<sup>2</sup> However, we diagnosed all patients based on clinical features alone as described by other studies.<sup>2,4,5,7,11</sup> A higher prevalence of canaliculitis amongst elderly women has been reported in the literature.<sup>2,5,7,8</sup> We did not notice any specific gender predisposition, though prevalence amongst males was slightly higher (52.5%) in our study similar to Kim et al (51.61%).<sup>11</sup> We found a higher prevalence of lower canaliculus involvement (55%), similar to other studies.<sup>2,4,8</sup> Watering and discharge from the eye were the most commonly reported complaints by other studies.<sup>2,4,8,9,11,12,13</sup> Eighty five percent of our patients presented with chief complaints of watering followed by redness and discharge. The classical pouting puncta was seen in 80% of patients in our study, higher as compared to Lin et al (59%),<sup>8</sup> Zaldívar et al (50%),<sup>12</sup> and Kaliki et al (34%).<sup>4</sup>

Pavilack et al have reported presence of concretions in all (11, 100%) patients.<sup>7</sup> We found concretions in 50% of patients, higher than that reported by other studies.<sup>8</sup> Expression of concretions from the punctum has been described as a characteristic sign of canaliculitis.<sup>6-9</sup> Initially, concretions

were thought to be pathognomonic of Actinomyces,<sup>14-16</sup> however, many other organisms have been associated with the presence of concretions as reported by various other studies.<sup>9-12</sup>

We compared patients who showed the presence of concretions on expression over the canaliculus with those without concretions. We did not notice any significant difference between the demographic profiles of the two groups. Xiang et al found a higher incidence of concretions amongst females and mean age of presentation of patient with concretions (54.2 years) was similar to that seen in our group of patients with concretions (53.67 years).<sup>9</sup> However, we did observe an association of Actinomyces with the presence of concretions ( $p = 0.002$ ). We also observed a slightly longer duration of symptoms in the group without concretions. However, this was not statistically significant ( $p = 0.79$ ). This comparison between the two groups of patients with canaliculitis which show presence and absence of concretions has not been reported by any study till date.

The discharge or concretions from all (100%) patients were sent for microbiological evaluation and all (100%) samples were culture positive as documented by Varma et al and Mohan et al.<sup>13,17</sup> Xiang et al found Actinomyces, to be the causative organism for canaliculitis with concretions only in 3 (23.1%) cases on microbiological examination as compared to our concretion group i.e. 13 of 20 cases (65%).<sup>9</sup> This variation could be attributed to different culture methods and media.<sup>9,15,18</sup> Polymicrobial growth was seen in 45% of our

samples similar to other studies.<sup>13,14</sup> This is in contrary to many other studies, which have majorly isolated a single microorganism.<sup>2,5,7,8,11,13</sup> In concordance with other recent studies, *Staphylococcus* species (55%) was the most commonly isolated organism in our study as well,<sup>2,4</sup> while many other studies have reported *Streptococcus* to be the most common causative microorganism.<sup>6,8,11,12</sup>

No specific protocol for the management of canaliculitis has been described in literature. Conservative management alone with topical antibiotic drops, antibiotic irrigation or punctal curettage alone have been reported to have high recurrences.<sup>2,4,5,7,8,14,19,20</sup> Kaliki et al. reported that 41% of patients who were managed conservatively required an additional treatment.<sup>4</sup> This is probably due to inability of the antibiotics to penetrate through the concretions and debris.<sup>2</sup> A thorough canalicular curettage of the infected debris and concretions following a canaliculotomy or punctoplasty has shown promising results with higher rates of resolution.<sup>1,2,6,18,19</sup> Vécsei et al. have described canaliculotomy as the procedure of choice for canaliculitis, as it provides adequate exposure and facilitates complete removal of canalicular concretions.<sup>5</sup>

Canaliculotomy with thorough curettage of the canalicular contents was performed in all cases in our study. Complete resolution of canaliculitis post operatively, was noted in 97.5% of our patients, identical to that reported by Anand et al.<sup>2</sup> and Varma et al.<sup>13</sup> Long term efficacy of canaliculotomy was assessed and good outcome was observed in 85% patients in our study similar to other studies.<sup>2,5,12</sup>

Lin et al noted concretions in 26% of the cases which is low as compared to our series.<sup>8</sup> Similar to our results, they also did not note any specific factor predisposing to concretions formation. Though Lin et al have mentioned that all patients with concretions were culture positive, they have not mentioned any specific microorganism. We noticed *Actinomyces* as the most common isolate in the concretions group.

We compared patients who had recurrence with those who had no recurrence and found a higher recurrence amongst elderly males [Odd's ratio = 13.5, Confidence interval (1.315, 138.615),  $P$  - Value = 0.009 < 0.05], diabetics [Odd's ratio = 2.182, Confidence interval (0.378, 12.583),  $P$  - Value = 0.375 > 0.05] and those with presence of concretions [Odd's ratio = 8.25, Confidence interval (1.898, 75.787),  $P$  - Value = 0.035 < 0.05]. Lin et al have noticed *Actinomyces* to be associated with recurrence, we could not associate the presence of a specific micro organism with recurrence. Presence of concretions and male gender has been described as a prognostic factor for recurrence by Lin et al too.<sup>8</sup>

Canaliculotomy can cause lacrimal pump dysfunction, fistula formation, canalicular narrowing or fibrosis post operatively.<sup>4,6,8</sup> Vécsei et al.<sup>5</sup> and Anand et al.<sup>2</sup> have reported incidence of post canaliculotomy epiphora as 20% and 27% respectively. We observed a slightly lesser incidence (15%) of post operative epiphora. Three patients with epiphora, had a recurrent episode of canaliculitis and developed canalicular fibrosis due to repeated manipulation and recurrent inflammation. Thus, we presume that, recurrence of the disease may be associated with higher incidence of epiphora and canalicular stricture.

Anand et al., had a long follow up (mean: 26 months) and yet found no direct correlation between epiphora and canaliculotomy.<sup>2</sup> They reported pre-existing canalicular block and nasolacrimal duct obstruction (NLDO) in 50% of

cases and the remaining 50% developed NLDO post operatively. They observed these patients to have a chronic history, delayed diagnosis and multiple lacrimal sac irrigations and, attributed these factors to be the probable cause for NLDO. None of our patients had nasolacrimal duct obstruction at follow up. Vécsei et al had a shorter follow up (3 months) and reported persistent epiphora in 26.67%, despite a patent lacrimal passage.<sup>5</sup> They attributed this to either surgical manipulation or secondary to inflammation. We noticed similar finding in one patient who had a partially patent lacrimal passage but a MUNK score of 2 and FDDT grade 2.

## Conclusion

Canaliculitis is liable to be misdiagnosed and a high index of suspicion is required to make correct diagnosis. *Staphylococcus epidermidis* is the most common organism causing canaliculitis. *Actinomyces* is the most common organism responsible for canalicular concretions. Canaliculotomy is a safe and effective method for managing recalcitrant canaliculitis. Risk of recurrence is higher in patients with presence of concretions and elderly males.

## Conflict of interest

The authors declared that there is no conflict of interest.

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