Idiopathic Canalicular Inflammatory Disease: New Disease Description of Clinical Patterns, Investigations, Management, and Outcomes

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Purpose: The objective of this perspective is to present a separate disease description of "idiopathic canalicular inflammatory disease" and outline the diagnostic criteria and early experiences with its investigations and management.

Methods: Retrospective case series of 44 canaliculi of 22 eyes of 11 patients presenting at a tertiary care Dacryology service over a period of 2 years with typical clinical patterns of inflammatory canaliculitis and its outcomes were studied. All the patients underwent microbiological work-up with culture and sensitivity, dacryoendoscopy imaging, serial Fourier domain ocular coherence tomography, and collagen vascular profiles. Stages in the evolution of the disease were studied. All patients were treated initially with topical steroids followed by punctal dilatation and placement of mini-monoka stents. Five patients in addition had a small biopsy from the inflamed portion of the vertical canaliculus. Stents were extubated at 6 weeks.

Results: Forty-four canaliculi were diagnosed to have idiopathic canalicular inflammatory disease during the study period. There was a female preponderance (81.8%, 9/11) and the mean age at presentation was 57 years. All patients presented with unilateral epiphora without any discharge, pain, or swelling. Collagen vascular profiles and screening for autoimmune diseases were negative. Clinical picture ranged from stages 1 to 5, consisting of edema, progressive centripetal vascularization, pouting of vascularized mucosa, membrane formation, and progressive scarring. The presentation begins in 1 eye and usually involves the other eye at a mean of 6 months. Ocular coherence tomography and dacryoendoscopy were of adjunctive value in the diagnosis. Histopathological examination was suggestive of a chronic inflammation. All patients had relentless progression to end-stage disease, although delayed significantly by steroids and monoka intubation.

Conclusion: Idiopathic canalicular inflammatory disease has a distinct and typical clinical behavior and the current study proposed diagnostic features and disease staging. The use of topical and systemic immunosuppressive agents needs to be explored to formulate effective protocols for its management.

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The lacrimal canaliculi form the proximal lacrimal drainage system and run within the eyelid tissues before converging as common canaliculus, which opens into the lacrimal sac. Inflammation involving the canaliculi is referred to as canaliculitis. Canaliculitis could be primary or secondary. Primary canaliculitis, if not specified refers to infective canaliculitis, whereas secondary canaliculitis is referred when it occurs secondary to punctal and canalicular plugs, specific inflammations like in lichen planus and Stevens-Johnson syndrome or secondary to chemotherapy or radiotherapy.[1–3] Common presenting features of primary canaliculitis are epiphora, mucopurulent discharge, unilateral conjunctivitis, and medial canthal inflammation.[1] The most common organisms isolated include *actinomycetes, streptococci*, and *staphylococci*.[1–3] This study presents case series of idiopathic, noninfective, canalicular inflammations with typical clinical profiles and behaviors and attempts to categorize the pathognomonic findings and classify the course of the disease.

METHODS

Institutional review board and ethics committee approval was obtained. Retrospective chart review of 44 canaliculi of 22 eyes of 11 patients presenting at a tertiary care Dacryology service over a period of 2 years with typical clinical patterns of noninfective inflammatory canaliculitis were studied. All the patients underwent microbiological work-up in the form of culture and sensitivity, dacryoendoscopy imaging and serial Fourier domain ocular coherence tomography at every visit as per earlier published protocols.[4] Patients also underwent a detailed collagen vascular profile (complete blood picture, erythrocyte sedimentation rate, C-reactive protein, rheumatoid factor, anti-nuclear antibodies, anti-dsDNA, c-anti-nuclear cytoplasmic antibodies, p-anti-nuclear cytoplasmic antibodies, serum angiotensin converting enzyme, Anti-Ro antibodies, and Anti-La antibodies, CT-chest and USG abdomen and renal and liver function tests) to rule out secondary causes of inflammation. Stages in the evolution of the disease were studied. All patients were treated initially with combination of topical antibiotics and steroids and once inflammation was controlled, punctal dilatation with or without membranotomy and placement of mini-monoka stents were performed for all except 2 patients, who refused monoka stents. Membranotomy technique was performed as per earlier published protocols.[5] Five patients in addition had a small biopsy from the inflamed portion of the vertical canaliculus. Stents were extubated at 6 weeks. Data collected include demographics, presentation, past photographic documentation if any, associated systemic, ocular and lacrimal features, outcomes of investigations and changes over the course of disease, and the anatomical and functional outcomes. Anatomical success was defined as restoration of punctal and canalicular patency and functional success as resolution of inflammation and epiphora.

RESULTS

Forty-four canaliculi were diagnosed to have idiopathic canalicular inflammatory disease during the study period. There was a

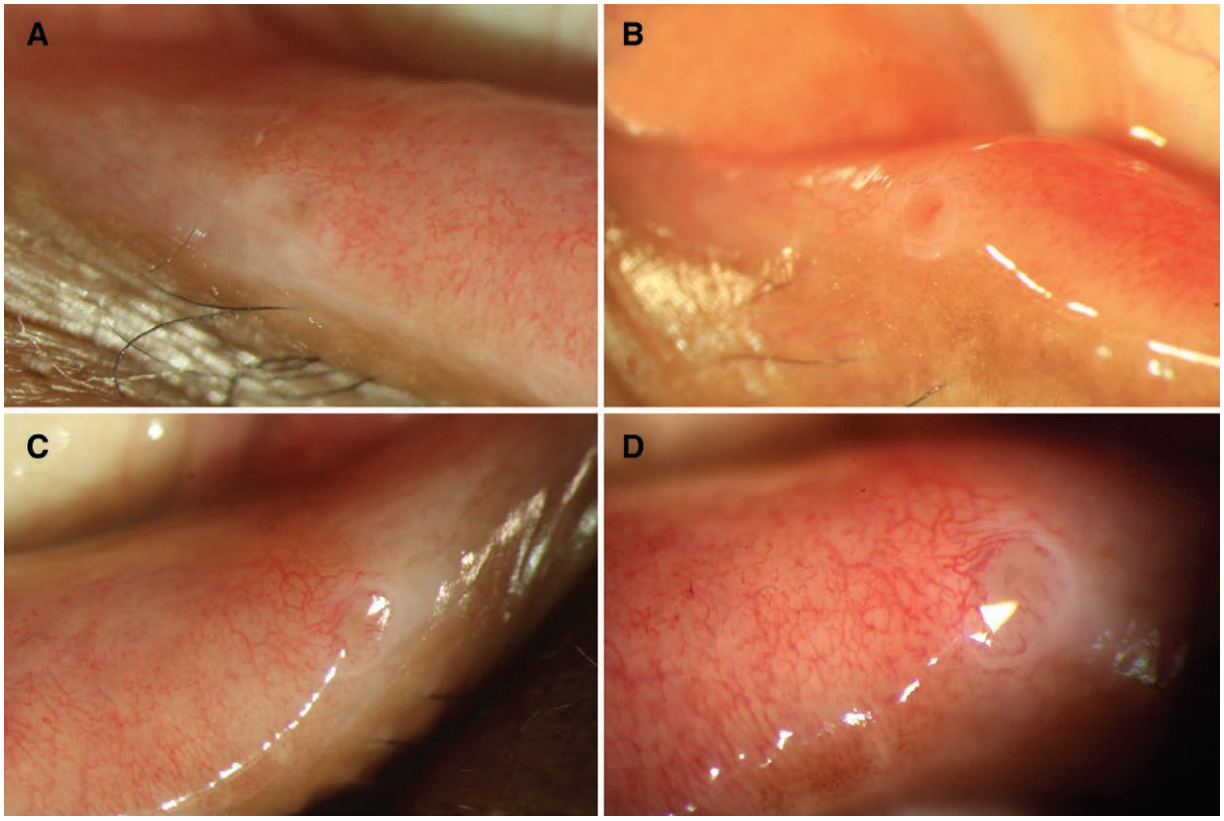

FIG. 1. Slit lamp photograph of a lower punctum showing stage 1a disease—pearly white mucosal edema with narrowing of the punctal opening (A). Slit lamp photograph of stage 1b disease showing increased and hyperemic mucosal edema with near total occlusion of the punctal opening (B). Slit lamp photograph of stage 2a disease showing peripheral peripunctal vascularization (C). Slit lamp photograph of stage 2b disease showing the centripetal progression of the peripheral dilated vessels (D).

female preponderance (81.8%, 9/11) and the mean age at presentation was 57 years (range: 34–75 years). All patients presented with unilateral epiphora without any discharge, pain, or obvious swelling. The mean duration of symptoms at presentation was 5 months (range: 3–10 months). All patients were systemically healthy except for hypertension in 2 patients. None of the patients had any history of canalicular infections or trauma or any prolong topical or systemic drug use other than antihypertensives in 2 patients. Microbiological evaluation for culture and sensitivity were negative. Collagen vascular profiles and screening for common autoimmune diseases were negative. There were no systemic and local features of lichen planus. Ocular surface, anterior and posterior segment examinations were normal in all patients. There was no evidence of meibomitis.

Clinical Profile. The presentation typically begins in 1 eye and usually involves both the puncta although in an asymmetric fashion (Figs. 1A–D and 2A–F). The other eye canaliculi invariably get involved at a mean of 6 months (range: 3–8 months) after the first eye involvement. The Table depicts the proposed major and minor features for the diagnosis of ICID. Clinical stages of the disease could be divided into 5 stages as follows:

Stage 1: Stage of Progressive Edema. The disease typically begins with a pearly-white mucosal edema of the vertical canaliculus with secondary narrowing of punctum opening (stage 1a) (Fig. 1A). Subsequently, the edematous mucosa shows hyperemia with near total occlusion of the punctum lumen (stage 1b) (Figs. 1B and 2D).

Stage 2: Stage of Progressive Centripetal Vascularization. This phase begins with increased peripunctal vascularity, typically arranged radially or circumferentially at the peripheral punctal rim (stage 2a) (Fig. 1C). Subsequently, there is a centripetal growth of radial or irregular dilated vessels which progress to thinly cover the entire punctal surface (stage 2b) (Figs. 1D and 2E).

Diagnostic findings in a case of ICID

Major
1. Demonstrable canalicular mucosal edema
2. Negative microbiology work-up
3. Negative collagen vascular profile
4. Chronic inflammation on histology
5. Relentless disease progression

Minor
1.Unilateral and asymmetric onset
2. Response to steroids
3. Progress to involve the other eye
4. Ocular coherence tomography features
5. Dacryoendoscopy features

Stage 3: Stage of Pouting of Vascularized Mucosa. In this phase, the hypertrophic reddish and densely vascular mucosa of the vertical canaliculus pouts out of the punctum area with no visible signs of a punctal entrance (Fig. 2A, F).

Stage 4: Stage of Dense Membrane Formation. This phase begins with the formation of initially translucent membranes which progress to form dense whitish membranes, covering the entire punctal circumference with or without dilated vessels in the periphery (Fig. 2B).

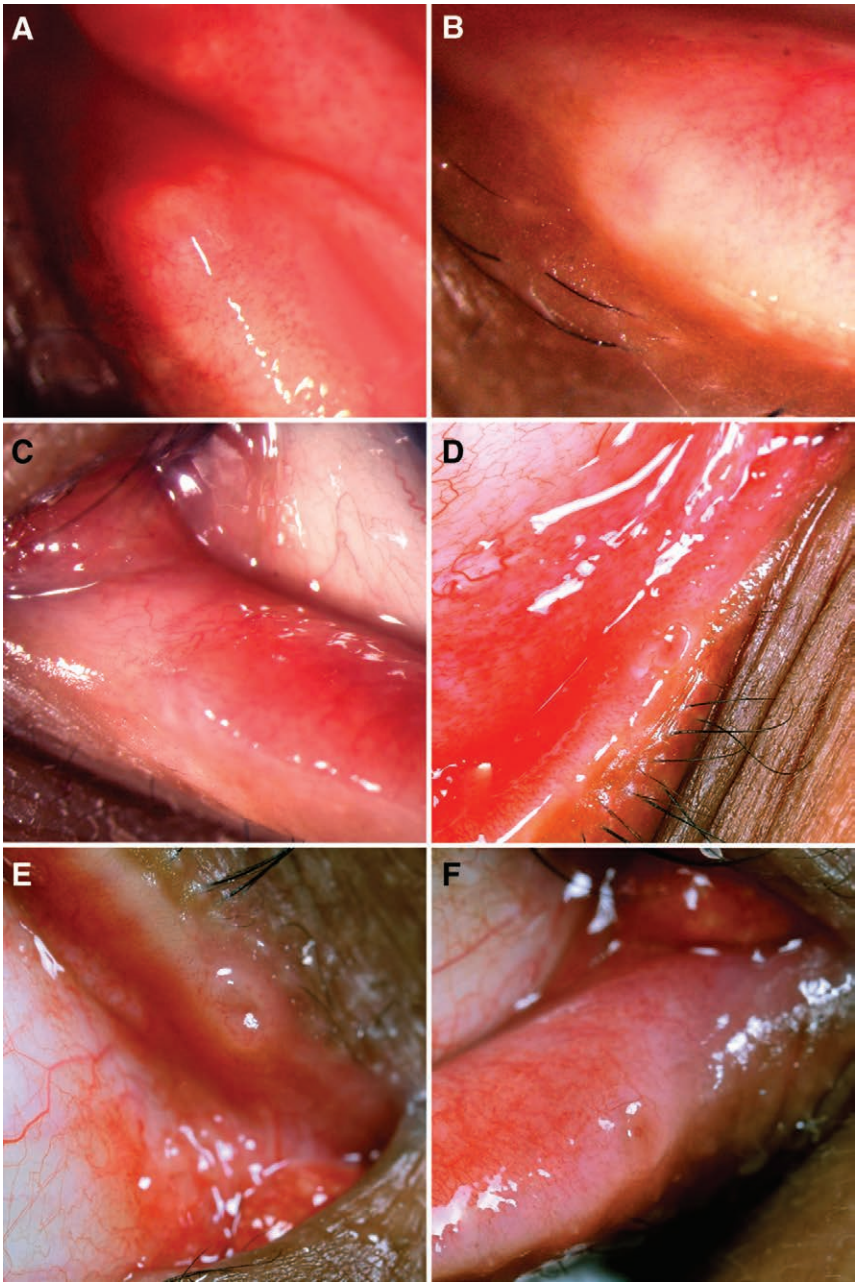

FIG. 2. Slit lamp photograph of stage 3 disease showing pouting of the vascularized canalicular mucosa without any discharge (A). Slit lamp photograph of stage 4 disease showing complete membranous obstruction of the punctal area (B). Slit lamp photograph of stage 5 disease showing scarred punctal area (C). High-magnification external photograph showing recurrence of the disease following medical therapy and mini-monoka stents. Note the dilated punctum and stage 1b disease (D), stage 2 disease (E), and stage 3 disease (F).

Stage 5: Stage of Progressive Scarring. This is the final phase where the punctal area is gradually replaced by scar tissue with no signs of punctum and atrophic features of the conjunctiva over the canaliculus (Fig. 2C).

Ocular Coherence Tomography Features. Ocular coherence tomography initially showed delineation of the edematous vertical canalicular mucosa with narrowing of the lumen and subsequent edematous closure of the lumen which partly reverses following monoka intubation (Figs. 3A–F). The punctum and the vertical canaliculus are not discernable in stages 4 and 5 of the disease.

Dacryoendoscopy Features. Dacryoendoscopy shows edematous canalicular mucosa with areas of hemorrhages (Fig. 4A) and circumferential narrowing of the lumen (Fig. 4B). There was no evidence of discharge or dacryoliths. The lacrimal sac and the nasolacrimal ducts showed mild hyperemia but otherwise were normal.

Histopathology Features. Histopathology was suggestive of an intraepithelial edema (Fig. 4C) with chronic inflammatory infiltrate (Fig. 4D) without any other features of storiform or obliterative fibrosis.

Management. Of the 44 canaliculi, 84% (37/44) had stage 1 disease at presentation and the remaining presented with stage 2 disease. All patients were initially treated with combination of topical antibiotics and steroids to downstage the disease. All patients initially responded favorably to steroids. There was a decrease in the mucosal hyperemia

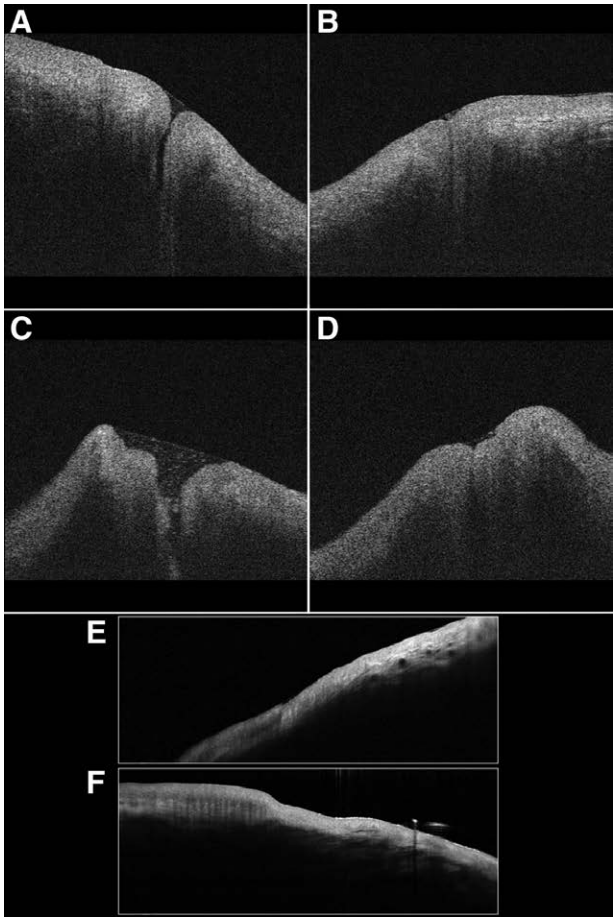

FIG. 3. Ocular coherence tomography photographs showing stage 1 disease. Note the narrowing of the vertical canaliculus with well-delineated edema of its mucosa (A). OCT image showing stage 2 disease with complete obstruction of the vertical canaliculus and punctum with delineated mucosal edema (B). OCT image showing reversal of changes following monoka dilatation with well-delineated punctum and vertical canalicular lumen (C). OCT image showing stage 3 disease (D) and not discernible features in stage 4 (E) and stage 5 (F). OCT, ocular coherence tomography.

and edema and reduction in the peripunctal vascularization. However, disease progression was noted once the steroids were stopped with progressive stenosis of the puncta. Hence, all patients were restarted on steroids and once the inflammation was controlled, all patients except 2 underwent a monoka stent dilatation. Intraoperatively, following punctal dilatation, nasolacrimal ducts were found to be patent in all the patients. All stents were extubated at 6 weeks and steroids were also used in a tapering fashion following stent extubation. Although all patients showed anatomical and functional success following monoka dilatation and steroids, that could not be maintained beyond 3 months. All patients again showed an aggressive recurrent inflammation with similar progression and underwent steroids therapy with repeat monoka dilatation. Temporary relief was obtained again but all showed relentless and aggressive progression to stage 5 disease in spite of all efforts with multiple courses of steroids and monoka stent dilatation. The 2 patients who refused monoka stents progressed rapidly to stage 5 disease at 3 months follow up.

DISCUSSION

This study performed focused analysis of idiopathic canalicular inflammatory disease and proposed major and minor diagnostic features. The clinical behavior was typical and could distinctively

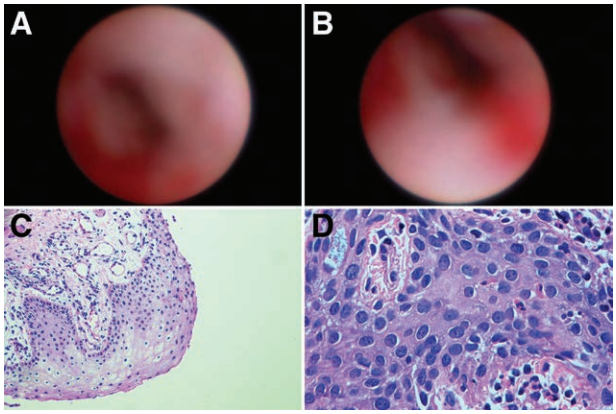

FIG. 4. High-definition dacryoendoscopy features showing canalicular mucosal edema and focal hemorrhages (A) and narrowing of the lumen (B). Microphotograph showing severe intraepithelial edema of the canalicular epithelium (H&E, ×100, C) and numerous areas of dense inflammatory infiltrates (H&E, ×400, D). H&E, hematoxylin–eosin.

be classified into 5 stages. All patients progressed to end-stage disease with complete cicatricial closure of the puncta and canaliculi in spite of early recognition, treatment with steroids and mini-monoka punctal dilatation. There is a need to explore the use of topical and systemic immunosuppressives in this condition and also to study the molecular pathways to decipher the accurate etiopathogenesis.

Canalicular obstructions with associated nasolacrimal obstructions have been described in cases of cicatrizing conjunctival diseases like ocular cicatricial pemphigoid and lichen planus. In addition specific inflammations secondary to herpetic infections and use of systemic chemotherapeutic agents have been described earlier. Most of these present with bicanalicular obstructions. The patients in the current series demonstrated staged and characteristic involvement of the canaliculus and puncta and typical clinical behaviors in the absence of the above-mentioned predisposing factors.

The patients in the study presented with progressive, noninfective inflammatory canaliculitis; it was prudent to rule out any systemic disorders and the common autoimmune diseases and other causes of vasculitis and hence all the patients were investigated extensively as has been mentioned in the methodology. The results were negative for systemic disorders other than hypertension in 2 older patients.

The use of mini-monoka stents in punctal and canalicular stenosis is well known.[6–8] Hussain et al.[6] studied 123 consecutive eyes of punctum and canalicular stenosis and noticed improvement in up to 88% of the patients with mini-monoka stent dilatation alone. They found the management to be simple, quick, effective, and relatively noninvasive. Smith et al.[7] reported similar outcomes in their 30 patients; however, they reported high rates of premature stent loss (59%) and attributed it to the additional one snip punctoplasty they performed, which could have compromised the punctal anatomy. In this series, although the disease patterns were different, all demonstrated progressive inflammation of the canaliculus and narrowing of the punctum. Hence, once the inflammation was controlled, patients underwent a simple mini-monoka punctal and canalicular dilatation. Any additional snip punctoplasty could have had the potential for aggravating inflammation and premature stent loss in these subsets of inflammatory canalicular diseases. All stents in this study were extubated at 6 weeks in view of the past evidence of monoka stents harboring extensive biofilms beyond this duration, which has the potential to further worsen the inflammation in these patients.[9]

Unlike a primary punctal stenosis, ICID shows relentlessly progressive canalicular inflammation with secondary stenosis of the punctum and canaliculus. Hence, the initial good results with steroids for inflammation and monoka stent for punctal and canalicular dilatation fades on their withdrawal. Inflammation recurs first followed by progressive restenosis. Perhaps the molecular triggering factors persist and steroids were only able to temporarily mask the clinical features. Currently, the author believes that it is not a wise idea to further insult the inflamed canalicular mucosa by incisional techniques like punctoplasty, which is likely to aggravate the disease to stage 5.

In conclusion, this study is the first of its kind on idiopathic inflammations of the canaliculus. It is important to explore the use of topical and possibly systemic immunosuppressive agents to halt the relentless progression of the disease. There is a need to further understand the molecular etiopathogenesis to be able to formulate proximal lacrimal drainage salvage therapies.

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