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Implementation of the Corneal Sweep Test in the Diagnosis of Recurrent Corneal Erosion: A 2-Year Retrospective Study

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Purpose: The purpose of this study was to evaluate the incidence and epidemiology of recurrent corneal erosion within a clinical population using standard diagnostic techniques and a new technique called the corneal sweep test (CST).

Methods: A retrospective chart review was conducted on 58 eyes of 51 patients with the diagnosis of recurrent corneal erosion from July 2018 to June 2020. All underwent a thorough history and physical examination. The CST was performed as a confirmatory test and on any patient who lacked visible corneal pathology.

Results: The CST was necessary on 49 of the 58 eyes to help confirm the diagnosis of a corneal erosion. Among them, 34 had an occult corneal erosion, which is defined as having a normal-appearing cornea on slitlamp examination but found to have loose corneal epithelium with the CST. Clear corneal cataract surgery (28 eyes, 48.2%) was the most common presumed mechanism of injury, with 20 (71.4%) developing symptoms only after cataract surgery. All 20 eyes had an erosion located directly over a clear corneal cataract incision.

Conclusions: The CST is a new and effective technique to help diagnose corneal erosions in the absence of visible corneal findings. Clear corneal cataract surgery is an under-recognized but important risk factor to consider because the incision can be the source for an erosion. Using the CST could lead to a paradigm shift in the way clinicians approach RCEs and patients with a persistent ocular pain syndrome.

Key Words: recurrent corneal erosion, corneal sweep test, occult corneal erosion

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Recurrent corneal erosion (RCE) typically presents with relapsing, sharp pain, and foreign body sensation on awakening with progressive improvement in symptoms throughout the day.[1] The incidence and prevalence of RCEs have been evaluated in the literature. Nanba et al[2] reviewed 21 eyes of 21 patients with RCE and found that 43% had a history of trauma and 38% had diabetes mellitus; there was 1 case each with a bacterial corneal ulcer, lagophthalmos, band keratopathy, and an eyelid tumor. Reidy et al[3] reviewed 104 patients with RCE and found that 45% had a history of accidental trauma, 29% had epithelial basement membrane dystrophy (EBMD), and 17% had both a history of trauma and EBMD. Diez-Feijoo et al[4] reviewed 117 eyes of 100 patients with RCE and found that 39.3% had previous minor trauma, 17.1% had EBMD, 17.1% had photorefractive refractive keratectomy, 7.7% had laser-assisted in situ keratomileusis (LASIK), and 18.8% had an unknown origin. Based on the published reports, traumatic corneal abrasion was the most common cause of RCE and the most common form of ocular injury presenting to the emergency department.[5] The incidence of traumatic corneal abrasion-related RCE is approximately 1 in 150 cases.[6]

To date, methods to diagnose RCE have been limited. A high index of clinical suspicion is required, followed by fluorescein dye and slitlamp examination to look for non-uniform or negative staining of the corneal epithelium. However, a subset of erosions, which we call occult corneal erosions, lack discernible physical findings on examination.[7] The symptoms of occult corneal erosions can vary widely, potentially misleading the clinician into making a wrong diagnosis, such as dry eye syndrome. Because no definitive diagnostic tool exists, much of the onus falls on the clinician to maintain RCEs high on the differential diagnosis when treating a patient with an ocular pain syndrome.

The authors would like to introduce a new technique called the corneal sweep test (CST), which is a more definitive way to detect corneal erosions by sweeping the corneal surface with a handheld instrument. The CST has been implemented and integrated into the author's practice to diagnose RCEs since 2017. This is the first retrospective chart review study evaluating the use of the CST in the diagnosis of RCE. Its use has helped to diagnose a large number of patients in our group who would have otherwise been missed with standard examination methods. As a result, the CST has led to a new classification of RCE called occult corneal erosion. Within this patient population, the leading cause of RCE was ocular surgery rather than accidental trauma, and the use of the CST in this study has led to remarkably different results from the published reports in the literature.

MATERIALS AND METHODS

The charts of all patients within a comprehensive ophthalmology, private practice setting by a single practitioner (D.B.K.) between July 2018 and June 2020 with a confirmed diagnosis of RCE were identified using a computer database. Fifty-one patients with an ocular pain syndrome were included (58 eyes total). A detailed medical history and ophthalmological examination were conducted on initial presentation. Pertinent data included patient account number, age, sex, affected eye, history of eye surgery, ocular history, systemic history, initial injury, associated risk factors, time until diagnosis, location of RCE, use of the CST, and treatment response. A diagnosis of RCE was made based on slitlamp biomicroscopy of the corneal surface, looking for visible areas of focal epithelial defects or loose epithelium. Fluorescein dye and cobalt blue light were used to identify the areas of irregular or negative staining; however, in cases where there were no visible abnormalities, the CST was used to identify the areas of loose epithelium.

CST Technique

The CST is a novel technique created by the author (D.B.K.) to aid in the diagnosis of corneal erosions (see Video 1, Supplemental Digital Content 1, http://links.lww.com/ICO/B355).[7] At the time of this chart review, a corneal spud was used, but since then, an instrument called the Kim corneal sweeper (Katena, pending released) was developed and designed specifically for this technique. It is a handheld instrument (Fig. 1) with a straight handle and rounded tip with smooth and tapered edges, which is used to sweep the entire corneal surface to identify the areas of loose epithelium. Topical proparacaine eye drops and fluorescein dye are instilled, and gentle pressure is applied to the corneal surface in a tangential manner with the Kim corneal sweeper. The tear film ensures the sweeping maneuver is smooth and atraumatic to the normal corneal epithelium; however, when abnormal loose epithelium is encountered, it separates from the underlying epithelial basement membrane and creates a visible and localized fold (Fig. 2), which is accentuated by the fluorescein dye and cobalt blue light. There is a distinct demarcation line between the loose and normal epithelia, and despite pushing on the loose epithelium, the erosion does not tend to spread into the adjacent normal epithelium.

Validating the CST

Validation of the CST would require screening a large number of patients with corneal erosion symptoms to achieve statistical significance, and a future prospective study would be helpful, although outside the scope of this study. However, to assess the safety of the CST and ensure that it does not induce epithelial injury, 20 control subjects were recruited (40 eyes) with normal-appearing corneas. There were 18 women and 2 men, with ages ranging from 22 to 57 years with a mean of 33.9 years. The exclusion criteria were as follows: no prior corneal surgery, such as LASIK, photorefractive refractive keratectomy, radial keratotomy (RK), clear corneal cataract surgery, or corneal transplant surgery; no prior corneal injury, such as an abrasion; no history of contact lens wear; no history of diabetes mellitus; and no active ocular symptoms, such as foreign body sensation or irritation. Thirty-eight of the 40 eyes (95%) had no evidence for corneal erosion using the CST, but 2 eyes (5%), both the left eyes of 2 subjects, had small 1-mm focal erosions detected by the maneuver. Both subjects were women, aged 55 and 57 years, and the first subject had two 1-mm focal and mid-peripheral erosions at the 12 o'clock position, whereas the second subject had a 1-mm focal erosion at the 1 o'clock position near the limbus. On initial screening, both denied any history of trauma; however, on further inquiry, the first subject admitted having episodes of intermittent foreign body sensation out of the left eye but did not think to disclose this information because her symptoms were not currently active and would always subside after a few minutes without intervention. She later admitted to having poked her eye with a mascara wand on a few occasions, but she did not experience any major symptoms and was never formally diagnosed with a corneal abrasion or erosion. The second subject admitted to being poked in the eye by a tree branch over 30 years ago, but she could not remember which eye was injured and never developed symptoms serious enough to warrant seeing an eye doctor. The CST was well-tolerated, with 0 patients experiencing any discomfort after the anesthetic eye drops wore off, including the 2 patients who had loose corneal epithelium. It has been the author's experience that the CST has never injured the cornea, and this data set, although small, confirms that the procedure is safe and well-tolerated. It is interesting that 5% of the eyes in the control group had areas of loose corneal epithelium, which implies that there are people in the general population with loose epithelium who are completely asymptomatic. This suggests that our definitions and assumptions about corneal erosions may need to be revised. It is the author's impression that these asymptomatic patients with loose epithelium typically have had a remote history of accidental corneal injury or have had prior corneal surgery, usually clear corneal cataract surgery; however, it is unclear as to why these patients are asymptomatic. Further studies are needed to better understand how, why, and which

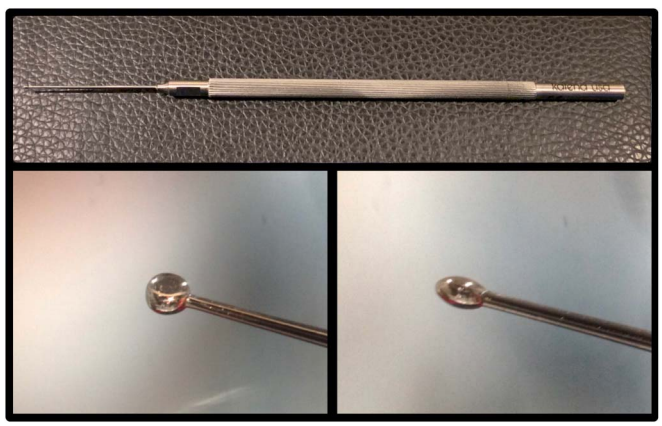

FIGURE 1. The Kim corneal sweeper is a handheld instrument with a straight handle and smooth tip with rounded and tapered edges.

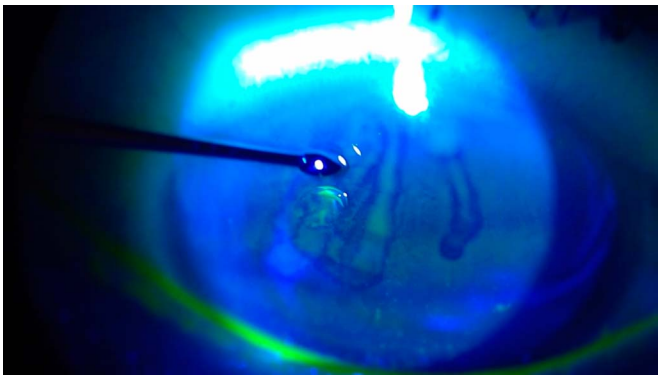

FIGURE 2. The Kim corneal sweeper is used to sweep the corneal surface under cobalt blue light. Observe the green vertical track lines of fluorescein dye on the normal cornea; however, notice the focal area of loose epithelium highlighted by a visible and localized fold, which is distinct and well-demarcated and does not extend into the adjacent normal epithelium.

patients can have loose corneal epithelium yet be symptom-free.

RESULTS

Clinically confirmed recurrent erosions were identified in 58 eyes of 51 patients. There were 22 men and 29 women. The diagnosis of RCE was made in 9 of the 58 eyes (15.5%) using slitlamp biomicroscopy, whereas the other 49 eyes (84.5%) underwent the CST to locate an area of loose corneal epithelium. Among these 49 eyes, 34 (69.4%) showed no evidence for corneal abnormality on slitlamp biomicroscopy. These 34 eyes are classified as having an occult corneal erosion, which occurs when the cornea appears normal on slitlamp examination but is found to have an area of loose corneal epithelium by the CST.

Presumed Mechanism of Injury

The eyes were stratified into 3 groups: 17 (29.3%) had accidental injury which we are calling nonsurgical trauma to contrast from the surgical trauma group. Thirty-one (53.4%) had surgical trauma, and 10 (17.2%) were of unknown etiology. Within the nonsurgical trauma subgroup, 11 of the 17 eyes (64.7%) had blunt trauma, such as from a finger poke, 2 eyes (11.8%) had exposure keratopathy due to the eyelids not being taped during hip surgery, 1 eye (5.9%) had contact lens overwear, 1 eye (5.9%) had a bacterial corneal ulcer, 1 eye (5.9%) had filamentary keratitis due to aqueous tear deficiency, and 1 eye (5.9%) had a corneal foreign body.

Within the surgical trauma subgroup (Fig. 3), 28 of the 34 eyes (90.3%) had prior clear-corneal cataract surgery, 1 eye (3.2%) had prior Descemet's detachment after cataract surgery, 1 eye (3.2%) had a prior intraocular lens exchange, and 4 eyes of the 2 patients had prior corneal refractive surgery with 2 eyes (6.5%) post-RK/astigmatic keratotomy and 2 eyes (6.5%) post-LASIK.

Among the 28 eyes with a history of clear corneal cataract surgery, 20 eyes (71.4%) developed RCE symptoms only after cataract surgery. Among the remaining 8 eyes, 1 patient developed symptoms after macular hole repair, 1 patient (2 eyes) had foreign body complaints predating the surgery, and the remaining 5 patients had surgery so long ago that they did not recall any specific association with the cataract surgery.

Within the unknown etiology subgroup, 5 of the 10 eyes (50%) were truly unknown; 1 (10%) had a history of eye rubbing due to trichiasis, but no corneal trauma was noted; 2 (20%) had prior cataract surgery, but the erosion was not located over a cataract incision; 1 (10%) had a corneal erosion which preceded the time of cataract surgery; and 1 (10%) had a history of diabetic laser and intravitreal injection therapy but no prior corneal surgery.

The differences in age distribution and mechanism of injury were also stratified (Fig. 4). Ages ranged from 11 to 99 years, with a mean age of 63 years, reflecting an older average in our study. However, divided among nonsurgical, surgical, and unknown etiology categories, the age distribution among patients differed from this pattern. In the nonsurgical trauma subgroup, the patients were younger on average, with the 40-year-old subgroup appearing with the highest frequency. By contrast, patients in the surgical trauma and unknown etiology subgroups were older on average, with the 70-year-old subgroup appearing with the highest frequency.

Associated Risk Factors

Thirty-one eyes (53%) had dry eye syndrome or blepharitis, 14 eyes (24%) had diabetes mellitus, 7 eyes (12%) had anterior basement membrane dystrophy, 2 eyes (3%) had floppy eyelid syndrome, 2 eyes (3%) had conjunctivochalasis, and 2 eyes (3%) had trichiasis. Ocular surface disease was a significant risk factor for the

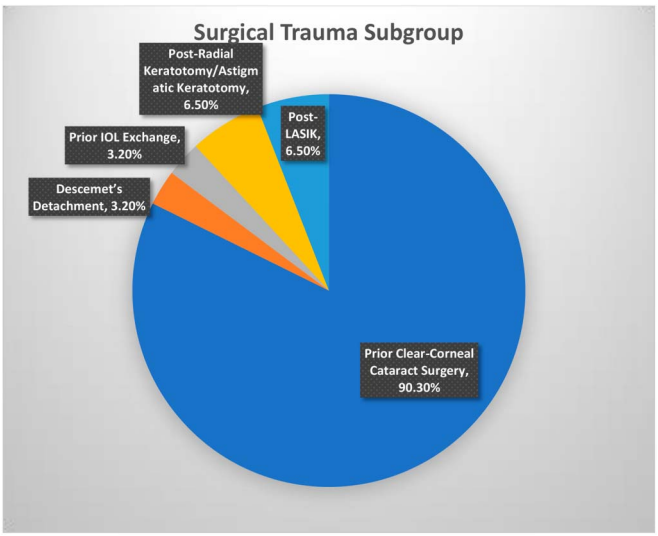

FIGURE 3. Within the surgical trauma subgroup, cataract surgery was by far the most common presumed mechanism of injury (90.3%).

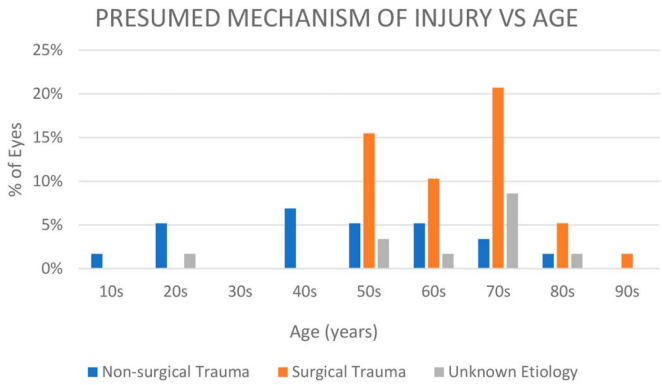

FIGURE 4. Presumed mechanism of injury versus age graph. In the nonsurgical trauma subgroup, the patients were on average much younger which is consistent with the published reports; however, by contrast, our study found them to be a small minority of patients with RCE. In addition, the surgical trauma subgroup comprised a much larger proportion and older average age, which is completely different from the published literature.

development of RCE, although causation is difficult to prove in the context of this study.

Location of Loose Epithelium

In 20 eyes (34%), the loose epithelium was located in the temporal quadrant, 17 (29%) were superior, 10 (17%) were central, 5 (9%) were inferior, 4 (7%) were nasal, 1 (2%) was diffuse, which was associated with the Descemet's detachment, and for 1 (2%), the location was not specified in the medical record (Fig. 5). Among the 20 eyes that developed RCE symptoms only after cataract surgery, 13 were left eyes and 7 were right eyes. All 20 eyes had loose epithelium located directly over a cataract incision: 11 over the superior paracentesis incision, 9 over the temporal main incision, and 1 over the inferior paracentesis incision. Surgeon D.B.K. performed all cases with a temporal clear corneal main incision and a paracentesis incision, 90 degrees to the left and 90 degrees to the right of the main incision.

Occult Corneal Erosion Subgroup

Thirty-four of the 58 eyes (58.6%) had occult corneal erosions (Table 1). For history, 13 of these 34 eyes (38.2%) specifically stated that the symptoms began only after cataract surgery. Seven of the 13 eyes (53.9%) had cataract surgery performed elsewhere and were seen at our practice for a second opinion with a persistent pain syndrome. There were 8 general categories of symptoms: 22 of 68 (32.3%) had complaints of foreign body sensation, 19 (27.9%) had pain, 7 (10.3%) had blurry vision, 6 (8.8%) had photophobia, 5 (7.4%) had tearing, 5 (7.4%) had redness, 2 (2.9%) had itching, and 2 (2.9%) had nonspecific vague symptoms of "the eye is just not right" and "the eye just feels bigger." Regarding treatment, all patients in all categories received standard ocular surface treatment with artificial tear eye drops and nighttime ointments, followed by hypertonic saline (5%) eye drops and ointment treatment once the corneal erosion was identified. Bandage contact lens (BCTL), superficial keratectomy (SK), anterior stromal micropuncture (ASM), or a combination was used as secondary treatment strategies. Within the occult corneal erosion subgroup, 12 of the 34 eyes (35.3%) had complete resolution of symptoms, 17 (50.0%) experienced some improvement but had persistent dry eye symptoms requiring long-term treatment, 1 was lost to follow-up, and 4 (11.8%) experienced no improvement in symptoms. Among the 29 treatment responders, 23 needed BCTL/SK, 1 needed BCTL/SKx2, 3 only needed BCTL, 1 needed both BCTL/ASM, and 1 needed BCTL/SK/ASM. Among the 4 treatment failures, 2 had BCTL/SK, 1 had BCTL/SKx2, and 1 had BCTL/SKx2/ASM with conjunctivoplasty for presumed superior limbic keratoconjunctivitis with no improvement. There was no difference in treatment response rates between the entire case cohort and the occult corneal erosion subgroup.

Time to diagnosis was defined as the time when RCE symptoms began to the time to diagnosis. This ranged from 0.2 to 468 weeks, with a mean of 52 weeks and a median of 16 weeks.

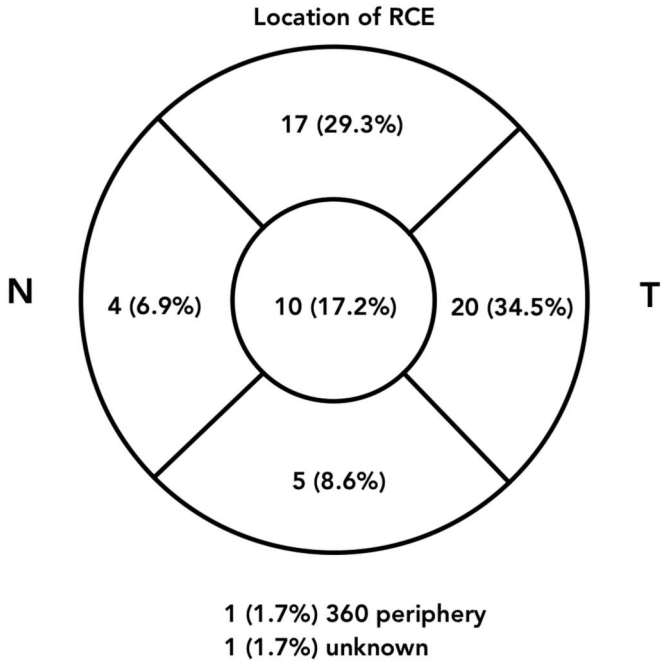

FIGURE 5. Loose epithelium location chart. Most were located temporally (20 eyes), 17 were superior, 10 were central, 5 were inferior, and 4 were nasal. Among the 20 eyes which developed recurrent corneal erosion after cataract surgery, all had erosions located over the cataract incisions, 11 over the superior paracentesis, and 9 over the temporal clear corneal main incision.

TABLE 1. Occult Corneal Erosion Subgroup

Prevalence	58.6% of all eyes had an occult corneal erosion
Pain began only after cataract surgery	38.2% within the occult corneal erosion subgroup
Second opinion consult for persistent pain syndrome after cataract surgery	53.9% had cataract surgery elsewhere and were unhappy because of the pain syndrome
Treatment efficacy	35.3% had complete resolution of symptoms
	50.0% had some improvement but had persistent dry eye symptoms requiring long-term treatment
	11.8% had no improvement
	2.9% were lost to follow-up

DISCUSSION

RCE is a common but poorly understood disorder that affects the corneal epithelium attachment to the underlying basement membrane.[4] RCEs are a diagnostic challenge because they can present with a wide range of symptoms, vary in time of onset, and mechanism of injury. A high index of suspicion is often necessary with directed questions to extract the pertinent information.

Unfortunately, there is no definitive test to diagnose RCE currently.[8] As a result, the clinician is limited to inspecting the corneal surface with slitlamp biomicroscopy, looking for epithelial dots or lines for epithelial basement dystrophy, and using fluorescein dye and cobalt blue light to highlight the areas of epithelial irregularity or negative staining.[3] The CST was developed by the author (D.B.K.) to aid in the diagnosis of corneal erosions by identifying the areas of loose epithelium in patients with normal-appearing corneas who are experiencing a persistent ocular pain syndrome. This particular subset of corneal erosions with normal-appearing corneas on slitlamp examination have been classified by the author as occult corneal erosion.[7] To determine the safety and tolerability of the CST, 20 patients (40 eyes) were recruited as a control group, and 0% patients experienced discomfort after the topical anesthetic wore off. Furthermore, none of the control subjects experienced corneal injury from the CST maneuver. Although the medical literature contains numerous studies evaluating the epidemiology of recurrent erosions, none to date have incorporated the novel CST as a method to diagnose RCEs because it has not been established as a standard diagnostic tool. This is the first retrospective chart review to include the CST, and the authors felt that the data are worth discussing because it is quite disparate from the published literature.

Diez et al used slitlamp biomicroscopy to visualize loose epithelium, which was noted as "black spots" on fluorescein staining. A Weck-Cel sponge was slid across the epithelium, demonstrating folds on the abnormal corneal epithelium; however, they only used the Weck-Cel sponge on the abnormal epithelium as a confirmatory test and did not use the technique on the normal-appearing corneal epithelium. In addition, because the dry Weck-Cel sponge could potentially induce an epithelial defect when touching the loose epithelium, this is not the ideal instrument. Other modalities have been described, such as confocal microscopy and anterior segment optical coherence tomography, but these tools are expensive, not readily available to most clinicians, and not widely used as practical methods to diagnose RCE.[1] Because most reports in the literature[3,9] use slitlamp biomicroscopy as the primary tool to diagnose RCE.

Although it is difficult to attribute causation, especially in the context of a retrospective chart review, the data in our study are compelling because they differ from the published literature and call attention to important points we believe clinicians should consider when treating the patient with an ocular pain syndrome. The most common reported cause of RCE throughout the literature has been accidental injury or, as we call in our group, nonsurgical trauma,[2–4] which is based on a history of trauma and confirmatory findings on slitlamp examination. By contrast, our study showed a much lower percentage, 19.0% of the eyes (11 of the 58 eyes), in the nonsurgical trauma group as compared with the surgical trauma group which was considerably more, with 60.3% of the eyes (35 of the 58 eyes). Within the surgical trauma subgroup, 6.9% had prior keratorefractive surgery, namely, RK and LASIK, which has been described.[10] Indeed, post-LASIK corneal neuralgia is a poorly understood syndrome with no obvious findings to explain the condition, and it is certainly possible that some of these patients with a post-LASIK pain syndrome may have occult corneal erosions as the cause for their pain. Further studies are needed to evaluate these patients with the CST to determine if there is an occult corneal erosion.

Within our surgical trauma subgroup, 80% of the eyes (28 of the 35 eyes) had clear corneal cataract surgery, which was by far the most common risk factor in our review (Fig. 3). Within this subgroup, 71.4% of the eyes (20 of the 28 eyes) specifically noted the symptoms began only after cataract surgery. Because the authors believe that every patient with a history of ocular pain or discomfort should be asked not only about prior accidental trauma but also about prior ocular surgery, specifically cataract or corneal surgery. In the absence of corneal findings on slitlamp examination, the CST should be performed to rule out an occult corneal erosion and symptoms developing only after corneal surgery, especially clear corneal cataract surgery, should raise the index of suspicion for a corneal erosion. It is the author's (D.B.K.) experience that when patients specifically state that the symptoms began only after eye surgery, there is a high likelihood for an occult corneal erosion.

According to the literature, most RCEs occur among younger patients,[9,11] which is consistent with our nonsurgical trauma subgroup (Fig. 4). However, the average age within our surgical trauma subgroup (Fig. 4) is skewed toward a much older population. This could be due to older patients are more likely to have ocular surface disease and more likely to have had cataract surgery, and this is in keeping with the general population.

Regarding associated risk factors, Diez et al found that 59% of their patients had meibomian gland dysfunction, which is consistent with our study that showed 53% of the eyes had dry eye syndrome or blepharitis. EBMD is a major

factor according to some studies[3] but only affected 17% of the eyes in our study. This is likely because EBMD is a diagnosis based on the visual confirmation of epithelial dots, lines, and whirls on slitlamp examination, and most of our cases had normal-appearing corneal epithelium.

Regarding the RCE location, published reports have consistently shown that most corneal erosions are located in the inferior one-third or one-half of the cornea,[4,9] and this is likely because the inferior cornea is more exposed and vulnerable to accidental injury. By contrast, in our study, most cases had an erosion in the temporal and superior locations (Fig. 5). When analyzing the 20 eyes that only developed symptoms after cataract surgery, all but 1 (inferior) had an erosion located either temporally or superiorly with a fairly equal distribution. All 20 eyes had temporal, clear-corneal cataract surgery, and these eyes most likely had cataract incision–related corneal erosions, with the erosion located over the cataract incision.[7]

Within the occult corneal erosion subgroup (Table 1), 38.2% developed symptoms only after cataract surgery. Most of the patients (53.8%) within this subgroup had cataract surgery performed elsewhere and sought a second opinion at our practice for a persistent ocular pain syndrome. It is important for cataract surgeons to be mindful that dissatisfied patients will continue to seek relief from their symptoms. It is tempting to dismiss the patient as having the ocular surface disease when there is a lack of visible signs on corneal examination. In this situation, it is critical to investigate further with the CST to look for the areas of loose epithelium that could signify an occult corneal erosion. Regarding the patients who developed symptoms only after cataract surgery, most complained of pain and foreign body sensation; however, 2 of the 13 patients (15.4%) had nonspecific and vague symptoms of "the eye is just not right" and "the eye just feels bigger." When a patient cannot articulate why something feels wrong after eye surgery, the index of suspicion should always be high and threshold low to perform the CST.

Regarding treatment response, 35.3% of the eyes in the occult corneal erosion subgroup had complete resolution of symptoms, 50.0% experienced some improvement but continued to have persistent dry eye symptoms requiring long-term treatment, whereas 11.8% experienced no improvement in symptoms. Standard ocular surface lubrication treatment, hypertonic saline drops and nighttime ointment, and BCTL were offered to all patients. SK was performed for patients with persistent symptoms and loose epithelium found with the CST, but if the erosion was outside the visual axis, ASM was performed on recalcitrant cases.

Overall, 85.3% of the eyes responded to some form of the above treatment, which strongly suggests that the identification of loose epithelium with the CST does correlate with and confirm the diagnosis of RCE. Among the 4 treatment failure eyes, all 4 developed symptoms only after cataract surgery and all expressed regret for having cataract surgery because of a persistent ocular pain syndrome. Two of the 4 treatment failures had their surgery performed elsewhere, 1 of which required multiple treatments, including BCTL/SKx2. Despite referring this patient to another corneal specialist for a third opinion and subsequently undergoing superior conjunctivoplasty with amniotic membrane for presumed superior limbic keratoconjunctivitis, his foreign body symptoms did not resolve. When reviewing the published literature on treatment failure and recurrence rates, Reidy et al[3] reported an 18% recurrence rate after manual debridement, ointment, and pressure patching. Buston et al[12] had a 100% recurrence rate after SK, but there were only 13 eyes in this study. McLean et al[13] had a 31% recurrence rate after ASM. Morad et al[14] had a 17.4% recurrence rate after phototherapeutic keratectomy. In summary, treatment failure and recurrence of RCE have been shown in the literature, and this is consistent with the results of our study.

Because this was a retrospective chart review, this study has several limitations. There is potential for recall bias when analyzing the data. It would have been helpful to document pain scores before and after intervention and scanning all the patients with anterior segment OCT or confocal microscopy to compare these modalities with the CST.

This is the first retrospective chart review incorporating the CST as a diagnostic tool to help identify RCE. The CST is a new and largely unknown technique that has not yet been established within the greater ophthalmic community as a tool to diagnose RCE. As a result, an occult corneal erosion is also a new and unknown classification because it relies on the CST for diagnosis. The CST could potentially change the way clinicians approach RCE, and the authors hope to bring awareness to and encourage practitioners to use it in their clinical practice. It has been the authors' experience and opinion that the CST using the Kim corneal sweeper is a safe, easy to perform, and highly effective tool to identify the areas of loose epithelium without injuring the cornea. Within this study, the CST was used to effectively diagnose RCE as far as 468 weeks after the time of cataract surgery; as a result, clinicians should consider occult corneal erosions even when there is a remote history of eye surgery. With millions of clear corneal cataract surgeries and close to a million LASIK surgeries performed each year in the United States alone, many potential patients are at risk for developing symptoms from an occult corneal erosion. The CST could lead to a paradigm shift in the way clinicians approach RCEs and patients with a persistent ocular pain syndrome.

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