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Pediatric canalicular tear repairs—revisiting the pigtail probe

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Abstract

Repairing canalicular lacerations can be complicated by difficulty identifying and intubating the proximal injured system, retrieving stents in the nose, and repairing canalicular epithelium. We describe a hybrid method of repair that alleviates these challenges by using an eyelet-type pediatric pigtail probe and a self-threading monocanalicular stent. The pigtail probe is inserted through the intact punctum and canaliculus on the injured eyelid and rotated to identify the medial edge of the torn canaliculus. The stent is threaded through the injured punctum and pigtail probe, drawn back out the intact puncta, and cut flush. The eyelid is repaired without direct suturing of the canaliculus. Applying this technique to 10 children, the injured system was successfully intubated without complication, and all children had good anatomic and clinical results, with negative dye disappearance tests.

The most common primary step in repairing a damaged canalicular system is placement of a silicone tube to act as a surgical stent during the healing process. Knowledge of the canalicular anatomy, meticulous hemostasis, and loupe or microscope magnification can aid in visualization of medial canalicular tissue; however, a challenging search is sometimes necessary, especially by those less familiar with canalicular repairs. Helpful aids have included Crawford (bicanalicular) and Ritleng (unicanalicular) intubation systems; the Mini Monoka (FCI Ophthalmics, Marshfield Hills, MA) stent (firm distal silastic end with which to intubate the torn system); and air bubbles, fluorescein, and other colored agents.

While use of a pigtail probe in this setting has been discouraged because of possible damage to the common or uninjured canaliculus, development of a French eyelet and smaller probe sizes has reduced this risk.¹ Gentle manipulation can allow passage of the probe to reveal even deeply placed cuts at the torn medial edge. We describe here a hybrid method employing the pigtail probe and a self-threading Silastic stent.

Methods—Surgical Technique

The study qualified for Institutional Review Board exemption and was conducted in a manner compliant with the federal Health Insurance Protection and Portability Act.

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Data was collected retrospectively on 10 consecutive children with canalicular trauma repaired using a pigtail probe. No children were excluded from the series. All subjects presented to the emergency department at the Children's Hospital of Philadelphia and were referred to the ophthalmology service for evaluation and treatment. Minimum follow-up was 4 weeks.

A punctal probe/dilator was used to confirm canalicular tear or avulsion. All children underwent repair under anesthesia within 24 hours of their injury by the same surgeon (BJF). The technique is demonstrated in Video 1 (available at jaapos.org). The surgical site was scrubbed with diluted betadine. An initial placement of a Mini-Monoka monocanicular stent or Ritling system was attempted, if the distal canalicular tear could be identified. Other methods of identifying the proximal lumen of the torn canalicular system were sometimes used prior to use of the pigtail probe and included the use of fluorescein, other colored agents, and air bubbles. A pediatric-sized pigtail probe with an eyelet (Storz #E4251C) was inserted through the intact ipsilateral punctum and canaliculus and carefully rotated until the tip was identified, emanating from the proximal lumen of the torn canaliculus (Figure 1A). The polypropylene guide of a self-threading Monoka stent was passed through the punctum of the injured eyelid, advanced out the distal torn canalicular lumen (Figure 1A), threaded through the probe's eyelet, and advanced only a few millimeters (Figure 1B). Lubricating ointment was applied to both the tip of the stent when passed through the eyelet and to the suture-silicone junction to facilitate smooth passage through the system. The pigtail probe was counter-rotated, drawing the guide into the proximal torn canaliculus and out the ipsilateral uninjured canalicular system (Figure 1C). The very tip of the polypropylene guide was purposefully bent back, which greatly facilitated passage of the guide through the system, and in no case was there any injury to the system.

With the probe removed, the polypropylene guide was pulled until the Monoka's Silastic punctal plug was abutting the distal punctum (Figure 1D), although, as with any monocanicular system, there is some risk of displacement of the tube. Tension on the stent aided approximation of the injured eyelid margin and tarsus, which were reapposed with 6-0 polyglactin 910 sutures, with fixation of the eyelid to the medial canthal tendon. Skin was closed with running 6-0 fast-absorbing gut. The torn canalicular epithelium was not directly reanastomosed. With mild tension on the stent, the punctal plug was seated into the punctum with an insertion device, and the silastic stent was cut flush to the uninjured punctum (Figure 1E). Stents were typically removed after 10 weeks and dye disappearance tests were performed.

Results

Seven boys and 3 girls (mean age, 8 years; range, 4 to 14) were treated for 3 upper and 7 lower canalicular injuries due to blunt trauma (7) or dog bite (3); average time to repair was of 14.1 hours. Average follow-up was 14 weeks (range, 4 to 52 weeks). All had good anatomic closure. Stent removal with blunt tipped forceps was done without difficulty at a mean of 8.1 weeks (range, 3–12), with one stent missing at 10 weeks and one unseated stent removed at 3 weeks. No patients suffered a corneal abrasion with the stent in place. All patients were free of tearing symptoms with negative dye disappearance testing on follow-up.

Discussion

The use of a pigtail probe is a simple technique that allows direct visualization of the proximal lumen of an injured canaliculus. Because of the risk of creating a false passage, some authors recommend this instrument as a last resort after failure to identify the injured canaliculus via direct visualization or irrigation.² Others recommend the use of the pigtail probe be abandoned outright.³ Kennedy et al² reviewed 222 canalicular laceration repairs and noted a higher incidence of postoperative epiphora in patients repaired with the pigtail probe (7 of 19 patients),

and Saunders et al reported a 10% incidence of iatrogenic damage to the uninvolved ipsilateral caciniculus.³ Neither report specified if the Worst probe (which has a hooked tip likely to induce trauma) or French-eyed probe (which has a smooth tip) was used. We utilized pediatric-sized pigtail probes with an eyelet at the tip, which both allowed for smooth rotation through the common canaliculus and facilitated intubation of the canalicular system. Classically, repairs using a pigtail probe have employed either a nylon suture or silicone stent alone,⁴ a silicone stent passed over the suture to create a circlage,⁵ or bicanalicular intubation.⁶

It is advised that one not forcibly advance the pigtail probe, as a false passage may be created. However, we found that with a smooth and gentle rotation the pigtail probe can be used successfully. One should also be aware that 10% of canalicular systems do not have a common canaliculus,⁷ so one should not try to forcibly overcome an obstruction with the probe but rather abort its use should too much force be needed to pass it.

Using a pigtail probe in conjunction with a monocalicular stent in the manner described proved to be a successful and easy way to repair traumatic canalicular injuries in the hands of the authors. This novel, hybrid technique appears to create a good clinical result for the management of such injuries.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgements

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Figure 1.

(A) A pediatric, eyelet-type pigtail probe has been inserted into the ipsilateral, uninjured canalicular system and carefully rotated until the probe tip emerges from the proximal lumen of the torn canaliculus. The polypropylene guide of the stent is now being threaded through the punctum and out the distal lumen of the torn system. (B) The polypropylene guide is threaded through the eyelet of the probe. (C) The pigtail probe is counter-rotated, drawing the polypropylene guide into the proximal torn canalicular lumen and out the ipsilateral, uninjured canalicular system. (D) With the probe removed, the polypropylene guide is pulled until the silastic punctal plug of the stent is abutting the distal punctum. Tension on the stent aids in approximating the injured eyelid margin during eyelid repair. (E) The punctal plug is seated into the punctum with an insertion device, and the stent is cut flush at the punctum of the uninjured canaliculus.