

## Canalicular Laceration - Dog Bite:

### 5-year-old white female presenting with dog bite to left side of face

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**Chief Complaint:** 5-year-old white female presenting with dog bite to left side of face.

**History of Present Illness:** 5 hours prior to this evaluation, patient was playing with the black Labrador retriever of a family friend. Family witnessed the dog making a single lunge at the girl's face, and an incomplete bite resulted with only the top jaw making contact. The dog did not attack further, and the incomplete bite to the left face was the only injury sustained.

**POH/PMH/SH:** No past ocular history. No past medical history. No past surgical history. No medications nor allergies. Well-adjusted kindergarten child lives at home with parents. Childhood immunizations up to date.

#### OCULAR EXAM

- VA 20/25 OD and OS without correction
- Extraocular motility and IOP were normal, OU
- CVF: Full OD, OS
- Lids: Right side - Normal
- Lids: Left side - 2 lacerations on the left upper lid, the larger and deeper of the laceration passes just medial to the upper punctum. Initial exploration of laceration raises concerns for probable canalicular involvement, but further detailed examination in this anxious pediatric patient was unable to be accomplished in the ER (See Photos).

The patient was taken to the operating suite for examination under anesthesia (EUA) and laceration repair, likely to include canalicular repair (see Photos).

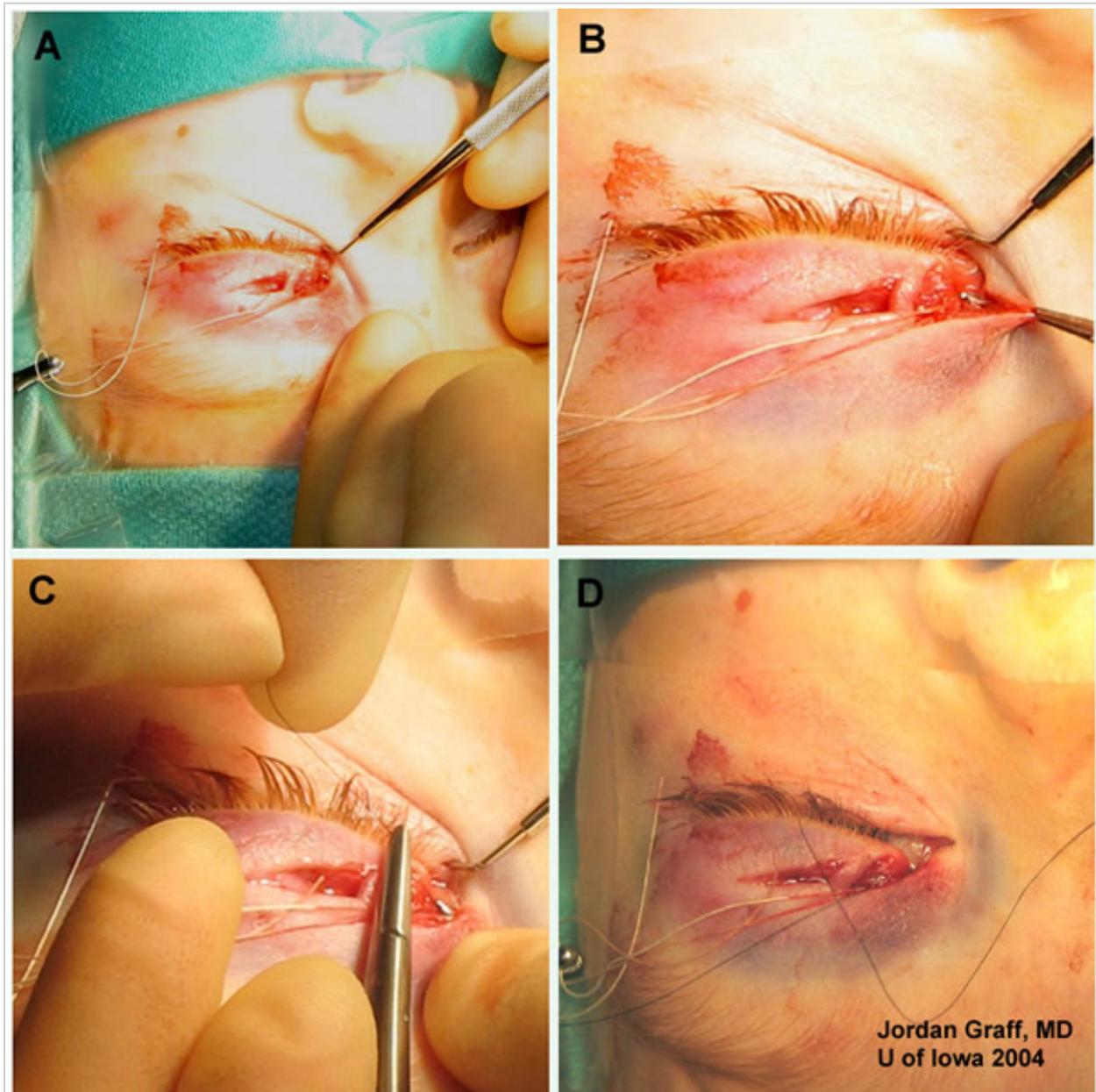
Continuation of the examination in the operating suite revealed that the remainder of the anterior segment examination and DFE were normal.

#### DISCUSSION

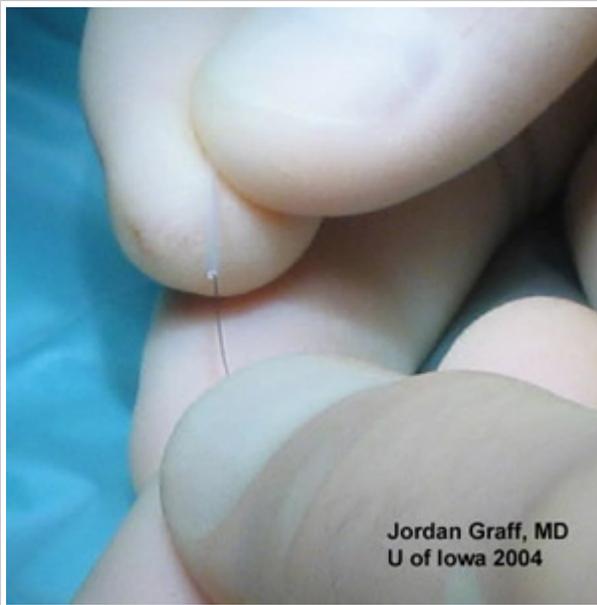
At this point, it is worthwhile to discuss both when to suspect canalicular laceration or avulsion and how to evaluate the wound. In any case where injury extends close to the lid margin medial to the puncta of the eyelids it is reasonable to assume that the canaliculus has been injured (Nerad, *The Requisites, Oculoplastic Surgery* 2001). The canaliculus is relatively superficial and can be readily injured even with cuts only a few millimeters deep. Dog bites commonly result in avulsion of the canalicular system because these are the weakest areas of the lids.

Evaluation should first be attempted directly within the laceration or avulsion injury to search for the proximal and distal cut ends of the canaliculus itself, which can be recognized as a gray or pink ring

within the reddish orbicularis oculi muscle. Canalicular probing from the punctum toward the laceration may reveal the exposed probe within the wound as it exits the canaliculus. If the proximal end of the damaged canaliculus is not found on direct examination nor discovered by following the path of the probe used to explore the torn distal end, a pigtail probe may be used to intubate the intact side of the lacrimal system. The probe will pass through the intact canaliculus, curve through the common canaliculus, and enter the distal end of the torn canaliculus to exit within the wound.



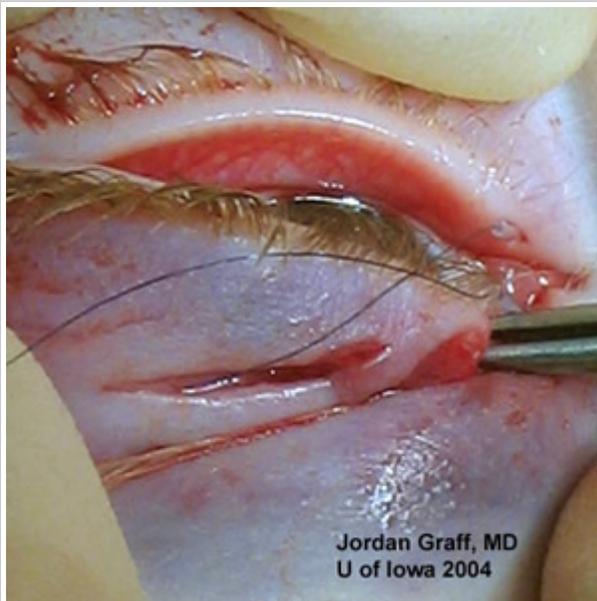
**Figure 1:** Using the pigtail probe in canalicular repair **A)** The wound is explored and cut ends of the canaliculus are identified, if possible. The wound is irrigated and explored for debris. Deep sutures have been placed to reapproximate the deep tissues and medial canthal tendon. They are temporarily held by a bulldog clamp and will be tied later. **B)** The intact canaliculus is intubated with a smooth-tipped pigtail probe. The probe is passed through the common canaliculus, posterior to the medial canthal tendon, and out the proximal end of the lacerated side. **C)** A 6-0 nylon suture is passed through the eye of the probe. **D)** The probe is withdrawn leaving the 6-0 nylon suture in place. (Surgery performed by Richard Allen, MD, PhD).



**2A)** A 25 mm segment of silicone tubing is passed over the nylon suture.



**2B)** Grasping the silicone stent with smooth forceps, the suture and overlying silicone stent are then carefully drawn through the canaliculus.



**2C)** Nylon suture guided the stenting of the avulsed canaliculus.

**Figure 2:** Stenting of the avulsed canalicular system.

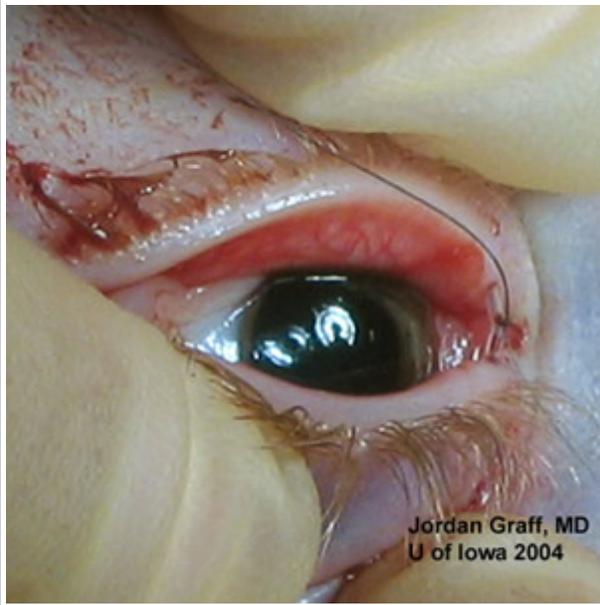
In a small percentage of patients, there is no common canaliculus and both the upper and lower canaliculus enter the lacrimal sac independently. In these patients, the surgeon will be unable to use the pigtail probe technique, and a Crawford stenting procedure will be required.

If at any time the patient is unable to tolerate this examination but suspicion for canalicular involvement remains high, further exploration should be postponed. In these cases, the patient will require exam under anesthesia (EUA) anyway and further examination may then be done in the operating suite during the time of laceration and possible canalicular repair.

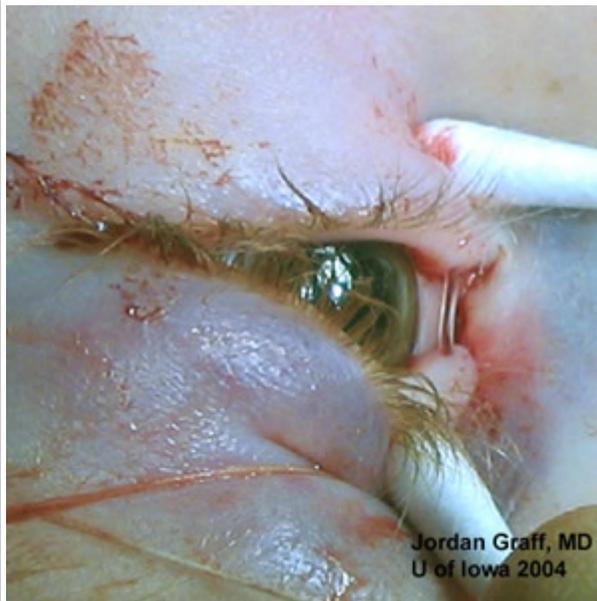
**Figure 3:** Completing repair of canalicular laceration.



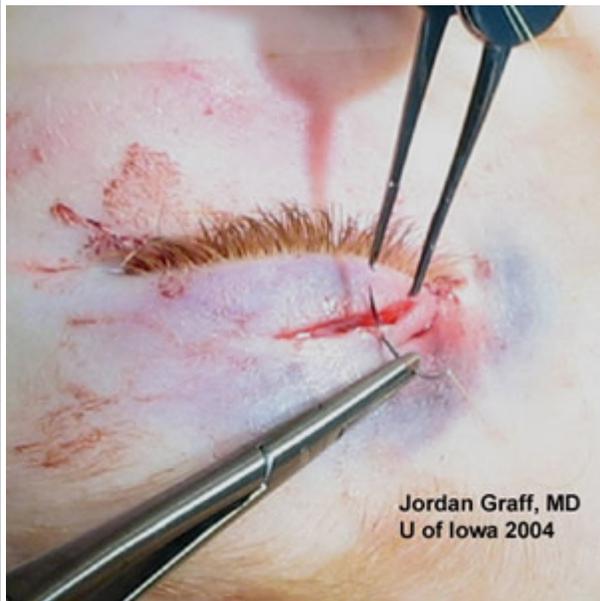
**3A)** The pigtail probe is passed into the punctum of the injured side. The probe exits through the lacerated canaliculus within the wound.



**3B)** The distal end of the same 6-0 Nylon is now threaded through the eye of the pigtail probe and the probe is withdrawn. The silicone stent is further advanced through the superior punctum completing a circular path through both canaliculi. Deep sutures are also tied at this point.



**3C)** With the medial canthal tendon repaired and deep tissues approximated, the 6-0 Nylon is tied off and cut short. This allows the knot to be retracted within the silicone stent. The stent is then rotated out of the palpebral fissure and within the canalicular system.



**3D)** Skin edges are then approximated with 7-0 Vicryl or 5-0 fast absorbing gut sutures.

Such was the case with the young patient presented in this case. The following pictures were taken after EUA and during surgical repair to document the stepwise repair of a single canalicular laceration using

the pigtail probe technique. Repair with Crawford stents is also a common technique and is done as the primary approach by many surgeons. The steps for Crawford stent repair and the less common Jones' tube repair may be found in most oculoplastic surgery texts.

Note that in this particular patient, the laceration lies in the distal half of the canaliculus, closer to the punctum. The two direct lacerations lie across the upper lid. It is worthwhile to point out that this is a less common type of canalicular damage with most dog bites. More commonly, dog bites result in an avulsion injury which tears the canaliculus at or near the lacrimal sac. This is often in the lower lid. When a dog bites the face, the animal will often fix its lower teeth under the mandible of the patient, with the upper teeth grasping on the upper face, including around the lower eyelid. The closing of the jaw results in a tearing force on the tissues of the lower lid and midface. An avulsion injury often results in addition to whatever puncture or laceration wounds may have been caused by the teeth themselves.

This repair took place within 10 hours of the time of injury. It is a general consensus among the major texts that repair be done at least within the first 24 hours. Prompt repair will minimize the degree of scarring and fibrosis which could make canalicular intubation difficult.

There has been discussion in the literature regarding the need for primary canalicular repair if the opposing lid retains an intact drainage system as proven by Jones dye test. However, Linberg and Moore showed that a full 50% of healthy patients will have intermittent epiphora, increased tear film or discomfort if only one of their canaliculi is occluded. Because it is impossible to know which patients may have those symptoms if the damaged canaliculus is not repaired, primary reconstruction of all canalicular lacerations is generally recommended. Additionally, it is significantly easier to repair the drainage system during the primary surgery than to re-operate at a later date after canalicular scarring has occurred.

The surgeon should be reminded that when facial lacerations are the result of a dog bite, decisions regarding rabies vaccination require information about the animal. Regulations vary from state to state within the United States. Usually, the animal is detained in the custody of local animal control for 10 days, and its rabies vaccination status is determined. If the animal cannot be found, shows clinical signs of rabies, or tests positive for rabies, a 6-shot series of post-exposure prophylaxis is recommended. The first shot is given as soon as possible and the next 5 shots over a 28-day period (see your local Animal Control office website for additional details). Obtain contact information for the Animal Control office and a case # for the animal in question so that you may use for future reference.

## Diagnosis: Superior canalicular laceration

### EPIDEMIOLOGY

- Most common as a result of trauma in young adults, generally males.
- Dog bites are a common mechanism for preschool-aged children (these patients are often around the animals as pets and the child's face are at the level of the dog's mouth).
- A few cases have been reported of canalicular lacerations noted at birth, likely the result of unintentional trauma during difficult delivery.



### SYMPTOMS

- Pain at the obvious site of laceration or avulsion with the initial injury.
- If the canalicular system is not primarily repaired and scarring of the involved canaliculus results, over 50% of patients will have symptoms of epiphora, blurred vision, or irritation due to inadequate tear lake drainage.

### SIGNS

- Canalicular damage should be assumed in any laceration that involves the eyelid margin and is medial to the punctum unless proven otherwise.
- Probing of the canalicular system will often allow the surgeon to visualize the probe tip within the wound if the canaliculus has been torn.

### TREATMENT

- Primary surgical repair of the lacerated or avulsed canaliculus is recommended within 24 hours. Complications with early Worst pigtail probes (with an open barbed end that often caused trauma during surgery) have caused some surgeons to use Crawford stents (not described here) in primary repair. However the rounded, smooth, eyed tips of current pigtail probes make repair with the pigtail probe (as described here) an excellent option.
- Jones tube (Pyrex tube placed through a dacryocystorhinostomy ostium) should be used only if other options fail, which is more likely with delayed repair.

### Post-Surgical Care

- Apply antibiotic ointment (e.g. erythromycin or bacitracin) to the skin of the repaired laceration for one week. The silicone stent should be left in place long enough to allow adequate time for re-epithelialization of the canalicular system for the surrounding scar tissue to mature. Most texts recommend removing the stent after 6 months. The nylon stitch can be cut and the suture and silicone stent removed together.
- If a Crawford tube extending into the nose prolapses out into the palpebral fissure and cannot be repositioned, it will eventually have to be removed; and, if adequate time has not passed for healing, the stents must be replaced. The silicone stent from a pigtail probe has no extra slack and cannot prolapse. The prolapsed stent can be taped to the cheek until the surgeon is able to examine the patient. Stent prolapse is not an ophthalmological emergency, and the patients can be reassured.

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