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Articles

Video-based surgical curriculum for open globe injury repair, IV: corneal wounds

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As one of the most severe forms of ocular trauma, open-globe injury (OGI) causes significant vision loss. Timely and meticulous repair of these injuries can improve patient outcomes. This video-based educational curriculum is intended to serve as an efficient, yet comprehensive reference for OGI repair. We hope that these video-based articles help surgeons and trainees from around the world find answers to specific surgical questions in OGI management. The curriculum has been divided into six separate review articles, each authored by a different set of authors, to facilitate a systematic and practical approach to the subject of wound types and repair techniques. This fourth article highlights special considerations in the repair of open-globe injuries affecting the anterior chamber and cornea.

Curriculum Editors

Paracentesis Creation in the Hypotonic Open Globe

Paracentesis creation is often an early step in the repair of an anterior open-globe injury (OGI). Due to the loss of integrity of the eye wall, however, open globes tend to be hypotonic, with unstable anterior chambers, making paracentesis creation difficult.

Our recommended technique is to use toothed 0.12 Colibri forceps to grasp the episcleral tissue immediately adjacent to the location of the desired paracentesis wound.[1] The Colibri forceps stabilize the eye and the anterior chamber, allowing for a "lifting" technique to ensure that creation of the wound does not depress the eye and extrude intraocular contents. A paracentesis blade is then used to incise the cornea near the limbus just anterior to the teeth of the forceps. If the anterior chamber is flat and the iris is abutting the corneal endothelium, the blade cannot be fully inserted, because it would otherwise lacerate the iris or perhaps even puncture the lens capsule. Therefore, the surgeon should not continue to insert the blade centrally but rather cut radially to increase the length of the paracentesis wound after the tip of the blade has penetrated the endothelium and entered the anterior chamber.

Care should be taken to maintain a sharp vertical angle of the blade during incision creation, effectively diving more posterior with the tip of the blade than would normally be performed in a formed eye. This ensures the length of the incision within the stroma is not too long. In hypotonic eyes, it is easy to inadvertently create long paracentesis incisions if the blade trajectory is too "flat." Long wounds limit the ability to utilize and maneuver secondary instruments during subsequent anterior chamber repair. It is also important to direct the paracentesis toward the corneal laceration (as opposed to toward the center of the pupil), to make it easier to perform manipulations near the wound (Video 1, Appendix 1).

(GWA)

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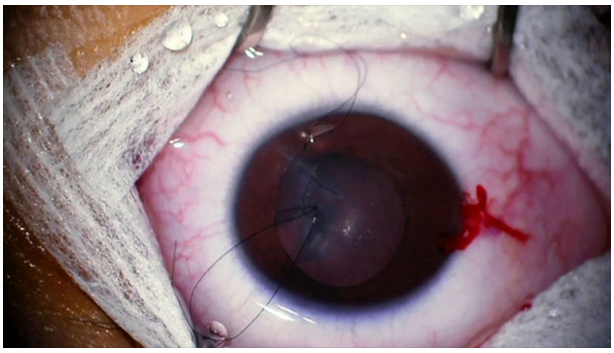
Video 1. Paracentesis creation in open globe with hypotony.



Video 2. Surgical repair of central zone 1 corneal laceration.

Linear Wounds

Proper repair of corneal wounds is a major determinant of best corrected visual outcomes after zone I OGI repair. Linear corneal wounds can present as shelved or nonshelved defects, each with unique properties that require special attention during repair.[2]

As discussed elsewhere in this curriculum (Video-based surgical curriculum for open-globe injury repair, III: surgical repair, "Suture Selection"), corneal wounds are repaired commonly with 10-0 nylon sutures, with proper placement at a depth of 80%–90% of the corneal stroma. It should be noted that some sources posit that corneal wounds can be 100% depth and still provide adequate closure in trauma, although this is considered controversial in OGI, because there are no clinical trials comparing the outcomes of partial versus full-thickness sutures.[3] Therefore, management largely depends on surgeon and institutional preference. Sutures are placed so that there is equal length of suture on both sides of the wound. Non-shelved areas have no self-sealing properties; thus, compression of the wound by the suture itself is critical to obtain corneal wound closure. Very short-shelved wounds may intermittently self-seal but require suturing to maintain wound apposition. It is important to ensure that suture bites are symmetric in depth on each side of the wound to prevent corneal override.[1] In shelved wounds in particular, the deepest component of the suture should be placed so that it reapproximates the posterior wound. On the superficial surface, due to the shelved nature of the tissue, the suture material may appear longer on one side of the wound than the other, but this is to be expected. We encourage the use of a slip knot (see Video-based surgical curriculum for open-globe injury repair, III: surgical repair, "Surgical Knots"), which is tied and buried in the corneal stroma. Care should be taken to ensure that sutures are appropriately taut: overtightening can result in unwanted astigmatism, whereas laxity can result in wound leak and increased risk of infection.

Video 2 (see also Appendix 2) shows repair of a central, zone I laceration. The surgeon placed three interrupted nylon sutures with a spatulated needle and secured the sutures and the wound with slip knots. Tension was confirmed and sutures were secured.

(IL, SB, CC)

Stellate Wounds

Stellate corneal lacerations present a unique challenge because they are often difficult to close given the complex structure and fragility of corneal tissue at the apices of each wound flap. First, we recommend visualization and documentation (with possible drawing or slit-lamp biomicroscopy photography) of corneal wounds as soon as possible after initial injury. Corneal edema will worsen over time—there are often delays in getting the patient to the operating room—which can change the appearance of the wound.[2] Careful planning of suture placement is also essential, because excessive repositioning of sutures can tear or macerate friable corneal tissue, making appropriate wound closure more difficult.

Second, the first suture is very important: the apices of the wound should be aligned, otherwise there may be gaps allowing leak at the apex. One should use the ship-to-shore method described elsewhere in this curriculum (Video-based surgical curriculum for open-globe injury repair, III: surgical repair, "Ship-to-Shore Suturing"). For V-shaped lacerations with a single flap of tissue, a single suture across the apex can be used to hold a thin flap of tissue in place. However, this alone is often not enough to close the wound appropriately, and often multiple sutures are needed along each wound edge at an

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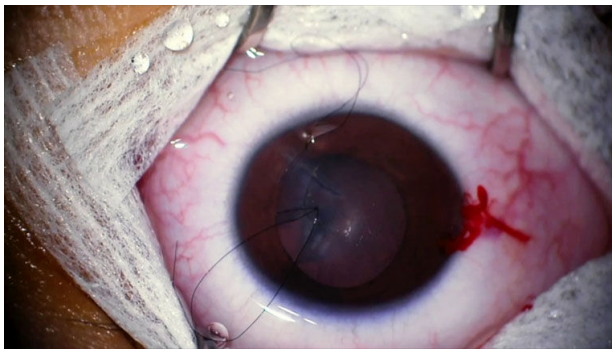
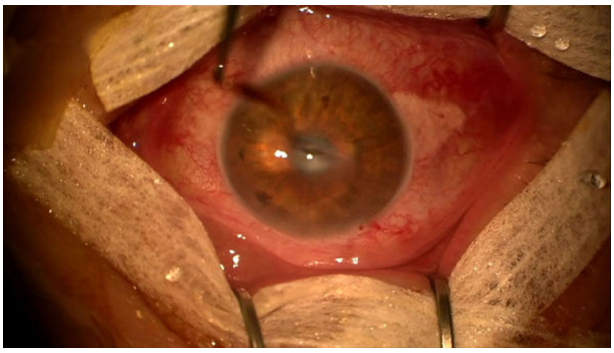


Video 3. Butterfly suture.



Video 4. Removal of foreign body from 3 patients with zone I corneal laceration.

angle to direct the forces toward the apex, allowing for tighter apposition of the wound edges.[4]

When approaching a stellate wound with multiple flaps of corneal tissue, a common issue is that closing one flap can open an adjacent flap. This leads to repeated adjustment and repositioning of sutures to close all the flaps. While the use of multiple adjustable sutures may be helpful in this situation, there are two additional suture techniques that can be used to bring together multiple apices with a single suture. These techniques allow for a more equal distribution of forces across all the flaps and are often used in addition to traditional suture techniques.

Butterfly Suture

In this simple technique, a "figure of 8" suture in which each pass is used to cross different flaps produces tissue compression in multiple meridia. The suture is initiated within the wound so that the final knot is buried. A more sophisticated variant of the butterfly suture uses a star-shaped suture to close stellate lacerations.[5] The first pass starts inside the wound, and the next bite is a full-thickness clockwise bite across the opposing fork. A full-thickness bite is then made in an opposing fork before returning to the fork next to the one originally sutured. The final bite is half thickness in the original fork to allow the knot to be buried inside the wound (Video 3; see also Appendix 3).

Purse String Suture

Purse string sutures are an alternative single-suture solution. They are entirely buried and the circular profile produces even tissue compression in all meridia at the wound fork. However, purse string sutures can be quite technically challenging to place and align correctly. A modified technique[6] was developed for placing a purse string suture in which partial thickness incisions are made between the arms of the laceration and a purse string suture is passed through these grooves and tightened to approximate the apices of the wound. The suture is buried when it is tied, and it is left in place indefinitely.

(NP)

Foreign Bodies in the Cornea and Anterior Chamber

Full-thickness intracorneal foreign bodies and anterior chamber foreign bodies must be removed in the operating room, and the entry site must be repaired. Intraocular foreign bodies can cause damage by direct mechanical injury, metallosis, or endophthalmitis.[7] Prompt removal is important to prevent these sequelae, but the approach must be tailored to the specific case. Preoperative evaluation should include computed tomography of the orbits. If there is a loose foreign body in the anterior chamber, preoperative dilation should either be deferred or should be performed cautiously because of the risk of the foreign body falling posteriorly to the iris.[8]

Embedded penetrating corneal foreign bodies can either be pulled out externally with forceps or pushed out of the anterior chamber using an instrument such as intraocular forceps or a cyclodialysis spatula. Care should be taken to remove these objects along the path through which they entered the eye to prevent excess trauma, and the anterior chamber should be maintained with viscoelastic prior to removal. Video 4 provides an example of a patient with a thorn embedded in the central cornea that was removed using a cyclodialysis spatula and toothed forceps (see also Appendix 4). For foreign bodies that lie entirely within the anterior chamber, a paracentesis incision may be created, and the foreign body

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Video 5. Use of cyanoacrylate glue in corneal wound repair.

can be removed with intraocular forceps. Removal of an anterior chamber foreign body through the entry wound is discouraged, because excess manipulation of the wound may increase scarring and corneal damage.[7]

Viscoelastic may be used to protect intraocular structures and prevent the foreign body from migrating posteriorly during retrieval. Video 4 shows two additional examples: (1) a patient with a zone I corneal laceration with removal of an eyelash from the anterior chamber, and (2) a patient with a zone I corneal laceration and a small piece of wood embedded in the iris. In the second of these examples, intraocular forceps were used to dislodge the foreign body and remove it through the paracentesis.

(NDR)

Using Cyanoacrylate Glue

Cyanoacrylate glue is a useful tool in corneal wound repair on account of its adhesive and bactericidal properties.[2] Scenarios in which to consider using cyanoacrylate include persistent wound leak after suturing, complex wounds with significant corneal edema and friable tissue, delayed open-globe injury presentation, small focal wounds (especially ones that could be infected or are at risk of perforation), and new postoperative wound leaks.[9–11] Different techniques of cyanoacrylate glue application have been reported in the literature. Video 5 (see also Appendix 5) shows our preferred technique, which allows for controlled application of glue.

- A 3 mm skin biopsy punch is used to cut out a small circle of plastic from a sterile drape.
- A small dot of antibiotic ophthalmic ointment is applied to the noncotton end of a sterile cotton tip applicator and used to hold the plastic button.
- A small drop of cyanoacrylate is applied to the button. This allows for focal placement on a wound—if glue were placed directly on a wound, it would spread diffusely.
- The wound is dried using a Weck-Cel sponge tip, and the button is placed over the wound with the glue facing the ocular surface.
- It can be helpful to place a small air bubble in the anterior chamber before applying the glue to ensure that the wound remains dry while the glue hardens.[10] The cotton tip applicator is held gently with the button over the wound for several seconds until the glue dries fully around the disc—there is a visible change after a few seconds, as the glue sets and appears like a window frosting over.
- Further discs can be applied as described above until leaking stops; a bandage contact lens is applied at the end.

Postoperatively, the bandage contact lens improves patient comfort and keeps the glue buttons in place as the wound heals. It is common for a wound to be Seidel negative at the time of repair but become Seidel positive as the corneal edema improves. If there is concern for a nonhealing or leaking wound, the glue can be removed slowly over several visits, or glue reapplication can be considered; the patient will need to continue bandage contact lens wear and topical antibiotic drops until glue removal is complete. Finally, it is important to continue regular follow-up visits until the glue is completely removed, because long-standing cyanoacrylate application can incite an inflammatory reaction (eg, anterior uveitis, elevated intraocular pressure, corneal and iris neovascularization) due to its degradation products, cyanoacetate and formaldehyde.

(CBK)

Corneal Penetrating Keratoplasty Wound Dehiscence

Corneal wound dehiscence from blunt trauma is an infrequent complication of penetrating keratoplasty.[12,13] The risk of developing wound dehiscence persists throughout the patient's lifetime. Keratoplasty dehiscence can lead to severe damage of intraocular structures and permanent vision loss.

The goal of the initial repair is to reposition uveal tissue into the eye and close the wound with interrupted sutures as soon as possible. Because globe irregularity,

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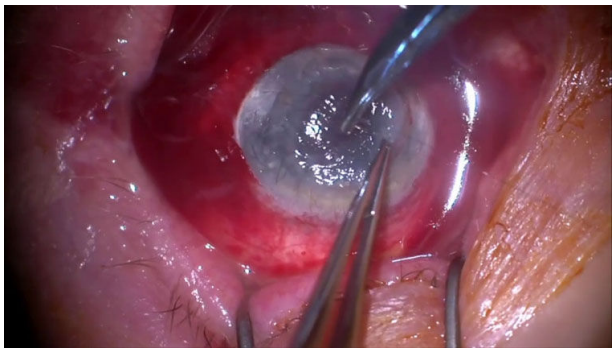
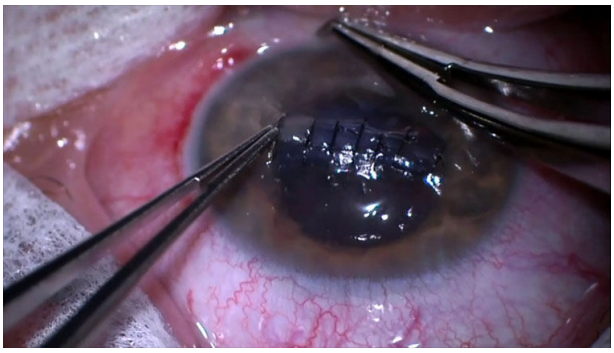


Video 6. Wound closure in a patient with wound dehiscence of the penetrating keratoplasty.



Video 7. Corneal suture rotation.

donor graft override, and corneal edema are not uncommon in the setting of graft dehiscence, these wounds are often best approached using radial, interrupted sutures to continually bisect the open wound.[14]

Sutures should be placed symmetrically, so that there is an equal amount of tissue on both sides of the graft-host junction, and slightly longer passes can ensure adequate closure in the setting of possible tissue maceration. It is preferred to have slightly tighter sutures than would otherwise be used in a fresh corneal graft given that corneal edema at the time of initial repair will undergo deturgescence over time. Anterior vitrectomy can be performed as needed at the time of initial repair, but other procedures, such as secondary intraocular lens placement or vitreoretinal procedures, should be delayed. Video 6 (see also Appendix 6) demonstrates successful wound closure in a patient with wound dehiscence of the penetrating keratoplasty in the left eye after accidental trauma.

(KKM, SOT)

Rotation and Burial of Corneal Suture Knot

Proper rotation of corneal sutures, resulting in buried knots, is critical to long-term success in ocular trauma cases. After proper suture placement, tying forceps are used to gently grasp the suture, and apply either a pulling or pushing force that is parallel with the suture track. The instrument should be held as flat as possible against the corneal surface, having the tips point in the direction of rotation of the suture.[15] Care should be taken to bury the knot in the stroma on either side of the laceration but not leave the knot in the corneal defect. The knot should be rotated away from the pupillary axis. Proper technique prevents breakage of sutures in burying them. An example of a patient who suffered a central zone I laceration is provided in Video 7 (see also Appendix 7). The surgeon placed 7 interrupted 10-0 nylon sutures with a spatulated needle to secure the wound. Notably, in this case, Colibri 0.12 forceps was used to stabilize the eye by grasping the episclera and providing countertraction during suture rotation.

Exposed sutures can lead to a variety of sequelae, including foreign-body sensation, granulomatous inflammation, and corneal neovascularization; it may also serve as a nidus for infection.[11] Proper technique is crucial for the burial of corneal sutures, which ultimately leads to resolution of pain and decreased risk for a subsequent infection.

(TB, GWA)

Key Learning Points

- Paracentesis creation requires careful technique to prevent further damage to a hypotonic eye during OGI repair. During paracentesis creation, firmly grasp the episcleral tissues adjacent to the selected incision site and enter vertically with the paracentesis blade.
- Proper corneal laceration repair improves visual outcomes and prevents infection.
- Proper technique minimizes abnormal corneal shape and unwanted astigmatism.
- Corneal wound repair requires special attention to depth, distance from the wound, and tension to ensure the best visual outcome.
- Corneal wounds may become edematous with time, necessitating early visualization and documentation for proper repair.

- Careful planning of suture placement and alignment of the apices are important initial steps when approaching a stellate wound.
- Closing one flap of a stellate wound may open an adjacent flap; different suture techniques may close stellate wounds by evenly distributing tension across multiple flaps.
- Full-thickness intracorneal foreign bodies and anterior chamber foreign bodies should always be removed in the controlled setting of the operating room, even if they are accessible externally.
- Prompt removal of foreign bodies can minimize the risk of intraocular toxicity and infection.
- Due to its adhesive and bactericidal properties, cyanoacrylate glue is a useful tool in complex corneal wound repair and in sealing corneal wound leaks.
- Proper technique and careful postoperative follow-up increase the likelihood of a watertight wound seal, prevents superfluous glue application, which can be irritating for the patient, and reduces the risk of inflammatory sequelae and scarring related to longstanding cyanoacrylate application.
- During repair of a dehisced corneal penetrating keratoplasty, uveal tissue should be reposited in the eye and anterior vitrectomy performed as needed, but further procedures should be delayed after primary closure.
- Dehisced penetrating keratoplasty grafts should be closed by repeatedly placing radial interrupted sutures half-way along the open wound.
- Slightly longer suture passes and tighter sutures are preferred in cases of traumatic wound dehiscence.
- Proper burial of a corneal suture knots improves patient comfort and may prevent infection and mucous build-up.
- Proper technique in burying sutures minimizes the risk of breaking the suture.

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Appendix 1. Video 1 transcript

00:07 Paracentesis creation is one of the first steps in the repair of the cornea and anterior chamber after ocular trauma. This is the case of a central zone one corneal laceration in a young child. Notably, the anterior chamber is flat.

00:20 Paracentesis creation in an open globe with hypotony can be difficult. We utilize 0.12 Colibri forceps to grasp the episcleral tissue immediately adjacent to the location of the desired paracentesis wound. A paracentesis blade is then used to enter the cornea near the limbus, just anterior to the teeth of the forceps.

00:40 Colibri forceps are used to stabilize the eye to ensure the creation of the wound does not depress the eye and extrude intraocular contents. Since the anterior chamber is flat and the iris is abutting the corneal endothelium, the blade cannot be fully inserted into the anterior chamber, as it would otherwise puncture the lens or lacerate the iris. Therefore, the surgeon increases the size of the paracentesis by cutting sideways after the tip of the blade has entered the anterior chamber, which you can see here.

01:09 Care should be taken to maintain a vertical angle of the blade during wound creation. Effectively this causes us to dive more posterior with the tip of the blade than would normally be performed in a formed eye. Here, you can see us reinflating the anterior chamber with filtered air. By using a vertical approach with the blade, we ensure the length of the paracentesis wound within the stroma is not too long. This allows us to use a cyclodialysis spatula, or really any instrument, to maneuver freely in the wound without disturbing the stroma.

01:48 This is a second case of a central corneal laceration with a traumatic cataract. We again use 0.12 Colibri forceps to grasp the episcleral tissue immediately adjacent to the location of the desired paracentesis wound. Using a vertical approach, we carefully enter the anterior chamber and cut sideways so as not to disturb the iris.

02:09 In hypotonic eyes, it is easy to accidentally create long paracentesis wounds if the trajectory of the blade is too flat. Also take note that in both cases, the paracentesis is directed toward the corneal laceration as opposed to toward the center of the eye, which makes it easier to repair the lacerated cornea and perform manipulation of the iris or otherwise. In this case, we attempted to gently reinflate the anterior chamber with an air bubble, but the anterior chamber was unable to remain completely formed without viscoelastic material.

Appendix 2. Video 2 Transcript

00:06	This patient has a central zone I corneal laceration, which will be repaired using 3 interrupted 10-0 nylon sutures on a spatulated needle.
00:17	Here, the surgeon is careful to place the suture perpendicular to the wound at a depth of 80% to 95% of the corneal stroma and to ensure equal distance on both sides of the wound in order to maintain apposition of the wound edges. You can see the surgeon secures the knot using a slip knot technique careful to avoid a tight or loose suture.
00:41	This procedure is then repeated on both sides of the original central suture in order to adequately reapproximate all edges of the wound.
00:51	Once the final suture is placed, the sutures are adjusted to provide appropriate tension and the suture tails are cut.

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Appendix 3. Video 3 Transcript

00:06 This video will review the repair of a stellate corneal wound. These wounds pose a unique challenge as they're often difficult to close securely, particularly at the point where the apices of each wound flap meet. A number of special techniques exist that allow for a surgeon to bring together the apex of a stellate wound with a single suture.

00:25 In this video, we will demonstrate the simplest of these techniques, the butterfly suture, or figure-of-eight stitch. This case is of a zone I globe rupture in a 7-year-old child that had a sharp piece of glass puncture his cornea resulting in a stellate corneal wound. The outline of the wound is pictured here.

00:45 As we will see in this video, a butterfly stitch will be used to reapproximate the wound edges at the apex of the wound flaps. This will begin with the surgeon entering the tissue to the right of the apex and crossing the wound into the lower flap of tissue. Then the surgeon will make another pass through the cornea parallel to and in the same direction as the original pass, now on the other side of the wound apex, again crossing between wound flaps. The suture will then be tied down, creating an *X* shape that pulls all of the tissue flaps towards the apex of the wound, ideally with equally distributed tension.

01:21 Here we see the surgeon making a pass between wound edges adjacent to the apex of the wound. Now the surgeon will make that second pass parallel to the first pass but on the far side of the apex of the wound.

01:42 This technique led to an excellent surgical outcome in this young child.

Appendix 4. Video 4 Transcript

00:06 This patient was gardening when a thorn penetrated his central cornea and became embedded. A cyclodialysis spatula and 0.12 forceps were used to remove the thorn using an external approach. In cases such as this, it is important to remove the foreign body along the path through which it entered the eye in order to prevent excess trauma.

00:29 This patient, with a zone I corneal laceration, was found to have a retained eyelash within the anterior chamber. After repair of the corneal laceration, a paracentesis was created. Intraocular forceps were subsequently used to remove the eyelash.

00:53 This patient was working with wood when a fragment penetrated his cornea causing a zone one corneal laceration. A paracentesis was created and intraocular forceps were used to dislodge a small fragment of wood from the iris. Viscoelastic and external pressure with a blunt cannula were used to position the foreign body for removal. Viscoelastic is useful to protect intraocular structures and prevent foreign bodies in the anterior chamber from falling posteriorly.

01:33 These cases illustrate several teaching points. Full-thickness intracorneal foreign bodies and anterior segment foreign bodies should always be removed in the controlled setting of the operating room. Foreign bodies can be removed via an external approach or internally using intraocular forceps introduced via a paracentesis with the assistance of viscoelastic. Prompt removal of foreign bodies can minimize the risk of intraocular toxicity and endophthalmitis.

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Appendix 5. Video 5 Transcript

00:06 This is a case of a 38-year-old male with a metallic form body embedded in the cornea, as noted by the forceps here.

00:25 Since the metallic foreign body fully penetrated the cornea, it was carefully removed via internal approach through a paracentesis incision after injection of viscoelastic using MST forceps. After successful removal of the foreign body and residual viscoelastic in the anterior chamber, Seidel testing of the zone I laceration was performed using a wetted fluorescein strip. Although somewhat difficult to appreciate in this video, there was persistent leaking from the small zone I laceration. Although a corneal suture could have been used in this case, given the small size of the wound, the decision was made to use corneal glue to seal the wound.

01:16 Though not shown in this video, a 3 mm derm punch was used to cut out a small circle of sterile plastic from a 1060 face cover. A small amount of erythromycin ophthalmic ointment was placed on the end of a sterile cotton tipped applicator to hold the plastic button. Then a small amount of cyanoacrylate glue was placed on the plastic button. It is important to apply the glue on the plastic button and not on the eye directly, as this will lead to glue spilling everywhere.

01:46 Though not performed in this case, it can be helpful to fill the anterior chamber with air to prevent leaking of fluid from the wound before placing glue.

02:03 Before applying the glue, the ocular surface is dried gently with a Weck-cel.

02:15 The button is gently placed over the leaking wound and the cotton tip applicator is used to hold the button in place for a few seconds as the glue sets. Excess glue can be gently dabbed away with a Weck-cel.

02:40 After the glue is allowed sufficient time to dry, which is usually not longer than a few minutes, a bandage contact lens is applied and air pockets are removed to prevent the corneal glue button from falling off and to minimize patient discomfort. Since the breakdown product of cyanoacrylate is formaldehyde, which can inflame the eye, the corneal glue button should be removed in a timely fashion, usually in about 2 weeks, although it often falls off on its own before then.

Appendix 6. Video 6 Transcript

00:06 A 93-year-old woman with a history of remote penetrating keratoplasty in the left eye for Fuchs endothelial corneal dystrophy presented to our ED with wound dehiscence of the left corneal graft after being accidentally struck in that eye. The PK graft was noted to be dehisced nasally from 6 to 12 o'clock, but the anterior chamber was formed. Vitreous was noted at the wound and a manual vitrectomy was performed.

00:32 Note that earlier the lid retractors were placed in such a way to minimize pressure on the globe. 10-0 nylon suture was first placed at 9 o'clock to secure the graft in place. Care was taken to place the suture symmetrically so that there was an equal amount of tissue on both sides of the graft-host junction.

00:56 In cases of traumatic wound dehiscence, it is often better to err on the side of slightly longer suture passes and tighter sutures to ensure adequate closure. The remainder of the dehisced donor graft was sutured in place with 10-0 nylon sutures in an interrupted fashion by repeatedly bisecting the remaining open wound.

01:28 The broken running suture of the graft that was previously in place was removed. All of the sutures were rotated to bury the knots.

01:50 The anterior chamber was filled with balanced salt solution. Subconjunctival injections of cefazolin and dexamethasone were administered. The graft was watertight at the end of the case and the pressure was palpated to be physiologic.

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Appendix 7. Video 7 Transcript

00:07 This patient suffered from a central zone one corneal laceration. The surgeon had placed 7 interrupted 10-0 nylon sutures on a spatulated needle to secure the wound. After proper suture placement, it's important to properly rotate and bury the suture knot in the corneal stroma.

00:25 A tying forceps is used to gently grasp the suture and apply either a pulling or a pushing force that is parallel with the suture track. The instrument should be held as flat as possible against the corneal surface having the tips point in the direction of rotation of the suture. Care should be taken to bury the knot in the stroma on either side of the laceration, but not leave the knot in the corneal defect.

00:50 The knot should be rotated away from the visual axis. Here you can see that we're using a Vannes scissors to snip excess suture material prior to rotation.

01:01 Notably, in this case, a Colibri 0.12 forceps is used to stabilize the eye by grasping the episclera to provide counter-traction during suture rotation.

01:11 Teaching points in this case are the proper burial of a corneal suture knot improves patient comfort and may prevent infection and mucus buildup. And secondly, proper technique minimizes the risk of breaking the suture.

01:27 Postoperatively, this patient had an excellent anatomic surgical outcome.

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