MANAGING SEVERE OPEN GLOBE INJURIES THROUGH THE YEARS

A brief history: Part 1.

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For most of mankind's existence, the occurrence of a severe open globe injury was a death sentence for the eye, and in many cases the fellow uninjured eye was subsequently lost to sympathetic ophthalmia (SO). Only in the past 35 years have we developed the technology and understanding to manage these most severe of ocular injuries. We surely have come a long way on this front, and yet we have a long way to go toward restoring useful vision for most of these patients.

Open globe injuries involve full thickness defects of the eye wall that completely penetrate the sclera and/or cornea. Today, such injuries are classified by the mechanism of trauma. *Ruptures* are caused by a blunt force that results in a bursting open of the eye wall, whereas *lacerations* are the result of a sharp or cutting force. Lacerating injuries are further subclassified as *intraocular foreign bodies (IOFBs)* when the lacerating object remains in the eye, *perforations* when the lacerating object results in a through-and-through injury of the eye, and *penetrations* when there is a lacerating wound alone.

DEALING WITH OPEN GLOBE INJURIES

Today, such injuries are most often approached in a staged fashion. The wounds are closed primarily, and then, somewhere between 3 and 14 days later, posterior segment surgical repair (when necessary) is undertaken. One exception is in the case of an IOFB, in which case a vitrectomy is performed to address the IOFB acutely to reduce the risks of injection and IOFB-specific complications. Most of these procedures require the use of an operating microscope, vitrectomy equipment, and adjuncts such as lasers, intraocular gases, perfluorocarbon liquids, and silicone oil, all of which are relatively recent developments.

How did surgeons address such cases before these technologies were available? Let us travel back in time to see how our historical colleagues managed open globe injuries during past centuries.

A Tailored Approach to Treatment

Sir William Read was born in England around 1648. He trained as a tailor but his true talent was marketing. Read became interested in ocular surgery and developed a thriving practice, eventually becoming the oculist to Queen Anne and King George I. However, he was by all accounts a notorious quack, as were many medical practitioners of the day. He published a book entitled *A Short But Exact Account of all Diseases Incident to the Eye with Causes, Symptoms, and Cures*, a most audacious title, especially for a book of less than 200 pages.[1] With a flair for marketing, Read published the first printing labeled as a second edition, giving it an air of endorsement.

The text was mostly a plagiarism from the earlier work of Richard Banister,[2] although Read did include a short chapter on the *broken eye*, which provides insight into how eye injuries were managed during this time period. In this chapter he suggests treatment with pigeon blood applied with a linen cloth around the eye, a practice that benefited neither the patient nor the pigeon. Understandably, Read's approach is met with raised eyebrows today. However, even respected physicians of that time, such as Peter Kennedy, likewise recommended the application of pigeon blood, although Kennedy suggested its use in combination with "woman's milk."[3]

AT A GLANCE

- Open globe injuries involve full thickness defects of the eye wall through the sclera and/or cornea.
- In the 17th century, pigeon blood was recommended to treat open globe injuries.
- Leeches and deadly nightshade were at one time used to treat patients with all types of maladies including eye injuries.

Photo courtesy Stanley B. Burns, MD, and The Burns Archive.

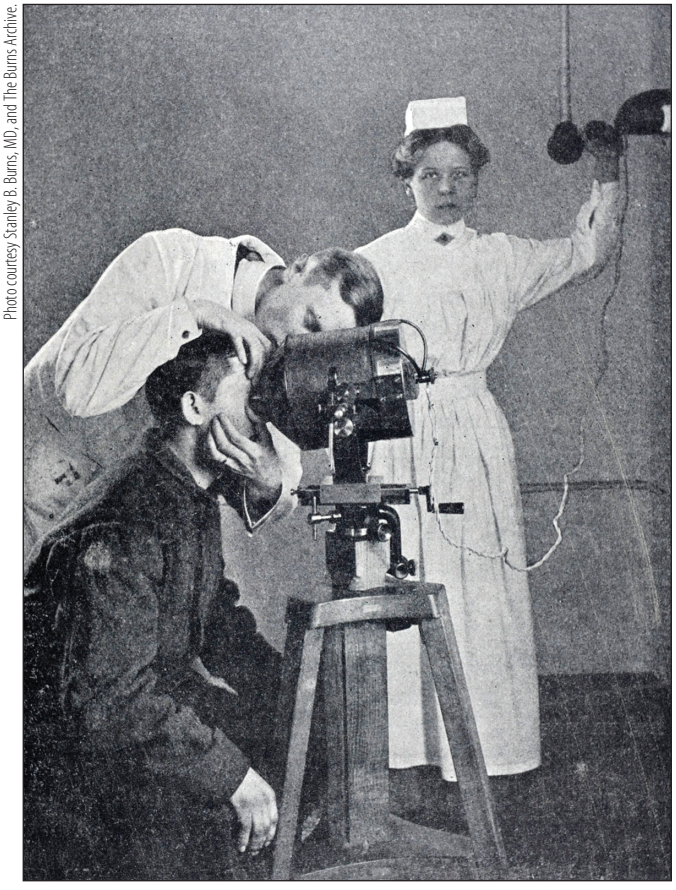

Figure. A powerful magnet developed by the Swiss ophthalmologist Otto Haab was used to remove metallic particles from the eye.

The Era of Enucleation

Fast forward some 150 years more to 1867 during the time of clinician and scientist George Lawson, who published one of the foremost trauma texts of his time.[4] This popular reference book was reprinted in six additional editions and served as a key reference for the management of eye and periocular injuries for the next century and a half. In the text, Lawson described the care of a 24-year-old patient who acquired an IOFB of the posterior segment while hammering a nail. Lawson reported that the patient could still read large print and that the patient's pupil was reactive. On ophthalmoscopy, vitreous blood and a posterior segment metallic IOFB could be visualized. Removal was suggested, but how would this be accomplished in this era directly following the US Civil War?

Lawson described positioning the patient by a window so as to provide lighting. With the patient seated, he inserted a lid speculum and then approached the patient from behind with a Jaeger knife so as not to block the light or scare the patient. He then made an incision in the sclera near where the IOFB rested and placed forceps in the wound without direct visualization so as to grasp the IOFB. This technique may have worked sometimes, but surely not often. Following the procedure, the patient's wounds were not closed with sutures. Instead, Lawson placed belladonna, or deadly nightshade, in the patient's eye and plastered it closed. Leeches were then placed on the patient's forehead, as bloodletting was still in vogue in the 19th century.

Lawson did a fine job describing the essential characteristics and risk factors for SO, which was first described years earlier by the Scotsman William MacKenzie.[5] In particular, Lawson highlighted the fact that early removal of the injured eye could prevent the development of SO, whereas later removal might not help. These concerns undoubtedly drove the recommendation for rapid enucleation in most cases of severely injured eyes for the next several centuries.

X-Rays and Magnets Enter the Scene

At the beginning of the 20th century, Henry Vanderbilt Würdemann, MD, who practiced at Marquette University and the Chicago Eyes, Ears, and Throat College, published an extensive text that discussed the latest medical technology of the time—the x-ray—and various techniques that could be used with it to localize IOFBs, even in eyes filled with vitreous blood.[6]

He also described another new technology of the time, large external electromagnets such as the Haab magnet (Figure), which could draw ferromagnetic IOFBs to the sclera so as to permit removal through a scleral incision. At $450 in 1911, the Haab magnet was an expensive piece of equipment and not widely available. It also did not solve the problem of removing nonferromagnetic IOFBs or issues surrounding the removal of vitreous blood and the development of intraocular infection or inflammation, retinal detachment, and phthisis bulbi. There were also significant risks of iatrogenic injury during the magnetic procedure.

HOW FAR HAVE WE COME?

Major improvements in the management of IOFBs would require the development of two additional technologies: the operating microscope and vitrectomy. We will explore these and other 20th century advances in the management of severe open globe injuries in an upcoming issue. ■

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