

Management of Soldier's Eye Injuries from Iraq to Home

BY LTC ERIC D. WEICHEL, MD; LTC MARK NELSON, MD; AND COL DAVID ZUMBRO, MD

The views expressed in this article are those of the authors and do not reflect the official policy of the Department of Army, Department of Defense, or US Government.

Although casualties in Iraq continue to decline, injured soldiers are still recovering from their ocular injuries.¹ Two authors of this article, LTC Mark Nelson, MD, and COL David Zumbro, MD, are fellowship trained vitreoretinal surgeons who volunteered to support our soldiers and provide their trauma expertise during deployments into the combat zone of Iraq. Both Drs. Nelson and Zumbro are active duty officers in the United States Army and trained at the Uniformed Services University of Health Sciences medical school in Bethesda, MD. This article focuses on the visual rehabilitation of two soldiers who were injured in Iraq during combat in support of Operation Iraqi Freedom. Each of these soldiers were initially seen and treated by Drs. Nelson and Zumbro.

CASE 1

An active duty soldier, 34 years of age, was on a patrol in a vehicle when a large unconventional fragmentary explosive munition was detonated by Iraqi insurgents. The munition also contained a flammable liquid that ignited upon detonation (Figure 1). An overpressurization primary blast wave caused injury to the tympanic membranes. The secondary blast wave with multiple pieces of shrapnel resulted in numerous facial/lid lacerations. The use of polycarbonate eye protection most likely prevented an open-globe injury. The tertiary blast wave threw the soldier from his vehicle into the air, and he landed on the ground, causing bilateral severe closed injury. The quaternary effects of the blast ignited the flammable liquid, causing facial and eyelid burns. The soldier was evacuated by air via a combat medical helicopter to the combat support hospital in Iraq within min-



(Courtesy of LTC Nelson)

Figure 1. Facial photograph with multiple eyelid lacerations and facial burns following an explosive blast injury during combat operations in Iraq.

utes of the injury. Dr. Nelson was part of the triage team that evaluated this soldier as he entered the emergency room. After a complete anterior segment and fundus examination and a computed tomography of the head/orbits, Dr. Nelson went to the operating room to perform bilateral globe explorations and repair the multiple lid lacerations. The soldier was then air evacuated to Walter Reed Army Medical Center in Washington.

CASE 2

An active duty US Army soldier, 26 years of age, was on a foot patrol in Iraq when a powerful unconventional fragmentary explosive munition buried in the ground exploded approximately 10 feet from the location of the soldier. Due to traumatic brain injury with loss of consciousness and posttraumatic amnesia, the soldier could not remember the exact details of the injury. The other soldiers in the unit later confirmed, however, that he was wearing polycarbon-

Courtesy of COL Zumbro

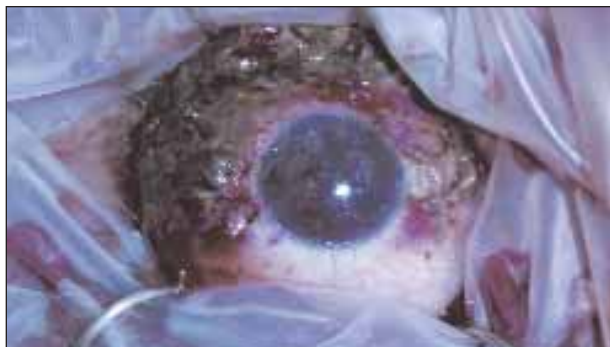


Figure 2. Open globe injury sustained in Iraq secondary to an unconventional fragmentary munition.

ate eye protection at the time of the blast. Again, the soldier was air evacuated to the combat support hospital within minutes of the injury. Dr. David Zumbro was part of the triage team at the emergency room. Dr. Zumbro performed a complete anterior segment exam with a computed tomography of the orbits. The secondary blast wave effects blew multiple pieces of shrapnel, dirt and stone into the face and eyelids. The right eye sustained an open-globe sclera laceration and the left eye an open-globe corneal sclera laceration with a retained intraocular foreign body (IOFB; Figure 2). Dr. Zumbro proceeded immediately to the operating room to repair the bilateral open-globe injuries. Following primary globe repair, the soldier was air evacuated to Walter Reed Army Medical Center (Figure 3).

TERTIARY CARE AT WALTER REED ARMY MEDICAL CENTER

The combat support hospital performs primary repair of life-threatening war injuries.^{2,3} Secondary care is provided in Germany, where ophthalmologists re-examine each ocular trauma patient. Tertiary care with a full complement of ophthalmology subspecialty care is provided in the continental United States. The Department of Defense does not provide vitreoretinal surgery capability in combat zones, but the medical evacuation system is extremely efficient and will fly a medically stable soldier out of the war zone within a day of the injury. Most civilian vitreoretinal secondary repair is performed 4 to 14 days following globe trauma. The vast majority of soldiers with globe injuries are admitted to a tertiary care facility prior to 14 days of the initial trauma. One reason vitreoretinal cases are not handled in combat zones is that soldiers with retained air or gas tamponade cannot fly due to expansion of the air or gas and would need to remain in the combat zone with the constant threat of hostile attacks waiting for the intraocular gas to dissipate. The combat support hospital also does not have the holding capability to observe these patients for extended periods of time, and the large logistic support



Figure 3. Clinical photograph of facial injuries of Case 2.



Figure 4. Case 1 low vision aids obtained after completing the Veteran's Affairs Administration inpatient blind rehabilitation program.



Figure 5. Case 1 postoperative photograph 12 months following injury with left upper lid skin graft and stable blind corneal scarring in both eyes.

to provide vitreoretinal surgery in the war zone is a significant problem when supplies are needed quickly. Additionally, the operating rooms in the combat support hospital must be shared with every subspecialty, including the provision of life-saving surgical support to troops. Consuming OR resources for secondary globe repair is not

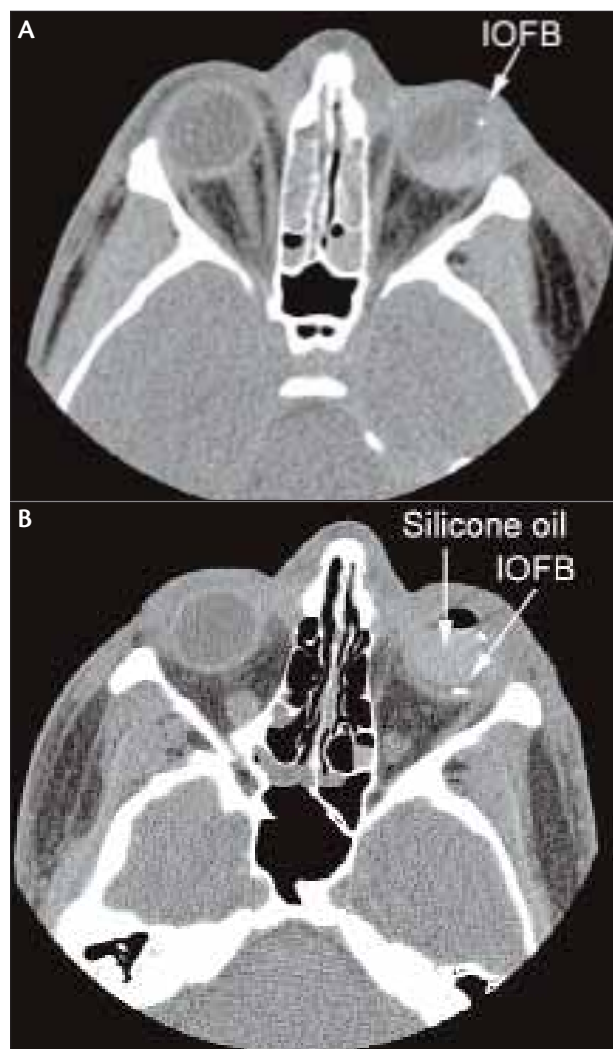


Figure 6. Axial computed tomography scan of a left eye retained intraocular foreign body (see arrow) located in the suprachoroidal space (A). Axial computed tomography scan following pars plana vitrectomy and migration of intraocular foreign body following drainage of a suprachoroidal hemorrhage and silicone oil tamponade (see arrows; B).

practical during periods of mass casualties.

At the start of the war in 2003, some IOFBs were removed in Europe. However, 85% of these soldiers had other systemic injuries requiring multiple subspecialists available only at tertiary care facilities. Since 2004, ocular trauma soldiers are reevaluated in Germany and sent to the continental United States for IOFB removal. We have shown that delayed IOFB removal and secondary vitreoretinal repair has similar visual acuity outcomes and proliferative vitreoretinopathy rates as previous published civilian trauma studies, despite these devastating injuries.⁴ To date, we have not seen a single case of posttraumatic clinical endophthalmitis in over 300 open-



Figure 7. Case 2 postoperative photograph 12 months following injury with cosmetic shell over the left cornea.

globe injuries. This fact is attributed to the excellent initial evaluation and open-globe repair by every ophthalmologist deployed in support of Operations Iraqi Freedom and Enduring Freedom. We hypothesize that the rapid primary globe closure and systemic administration of levofloxacin on a daily basis is the reason for the lack of endophthalmitis. The historical average of posttraumatic IOFB-related endophthalmitis is 8% of open-

globe injuries compared to our soldier population of 0%. The nonexistence of posttraumatic endophthalmitis in combat globe injuries has significantly contributed to the excellent visual outcomes in our soldiers.⁵

CASE 1 FOLLOW-UP

The soldier underwent a left eye 20-gauge pars plana vitrectomy (PPV) and pars plana lensectomy for a dislocated lens in the anterior chamber and nonclearing vitreous hemorrhage. Unfortunately, the left eye had a submacular choroidal hemorrhage and corneal scarring. The right eye developed macular chorioretinal scarring from severe commotio retinae. Three months following vitrectomy surgery, this soldier enrolled in the Department of Veterans Affairs Administration inpatient blind rehabilitation program for 12 weeks to learn activities of daily living with low vision (Figure 4). After completing the blind rehabilitation process with best corrected visual acuity (BCVA) of 20/70 in the right eye and counting fingers in the left eye, this soldier was retained on active duty as a trainer and mentor to younger soldiers (Figure 5).

CASE 2 FOLLOW-UP

This soldier was extubated and regained consciousness 8 days following the blast injury. His initial visual acuity was 20/50 in the right eye and no light perception in the left eye. The visual acuity was checked daily, and the left eye improved to bare light perception (BLP) on postinjury day 11. On day 14 postinjury, he underwent a left eye PPV, drainage of choroidal hemorrhage, endolaser, and silicone oil tamponade for a macula off-retinal detachment. The 2- x 2- x 1-mm IOFB seen on preoperative CT scan was retained in the suprachoroidal space following drainage of the choroidal hemorrhage and could not be visualized during retinal detachment repair (Figure 6). The choroidal IOFB lodged at the inferior equator region was subsequently a nidus of prolif-

Subscribe to RETINA TODAY's e-News

Our monthly electronic newsletter can be delivered directly to your e-mail account. It will bring you full text links to all of the articles in the print edition, as well as periodic news updates. Subscribing is easy and free.

Simply e-mail us at retinatoday@bmctoday.com, type "Subscribe e-News" in the subject line, and include your name in the body of the e-mail. You can unsubscribe at any time by clicking on the "unsubscribe" link in the e-Newsletter.

We look forward to hearing from you!



VISION CENTER FOR RESEARCH ON COMBAT OCULAR WOUNDS TO OPEN

By Jennifer Kreatsoulas, PhD, News Editor

The US Congress and the Pentagon have appropriated \$7 million for a military vision center devoted to finding new treatments for combat ocular injuries.

President Bush signed a law mandating the implementation of the vision center in 2008. Disagreement between Congress and the Pentagon over who would pay the \$5 million to get the vision center started, however, has delayed its implementation by 1 year.

According to military research, 13% of all military casualties suffered ocular damage ranging from distorted vision to blindness. Additionally, troops suffering from traumatic brain injury from a blast have eyes that no longer work together properly, according to research by the Department of Veterans Affairs. While military and Veterans Affairs doctors will continue to treat soldiers with these and other ocular wounds, the vision center will identify and track ocular wounds, connect troops with specialists, and promote research on vision and ocular wounds. In a news release, military officials expressed hope that the vision center will be in operation by mid-2009.

erative vitreoretinopathy formation with subretinal bands. Three months following the injury, the soldier underwent a repeat pars plana vitrectomy, scleral buckle (#41 encircling band), inferior 180° retinectomy, endolaser, removal of choroidal foreign body, removal of subretinal bands and silicone oil exchange. The soldier is now 18 months postinjury with BCVA of 20/20 in his right eye and BLP in his left eye with a flat retina (Figure 7). ■

LTC Eric D. Weichel, MD, is a vitreoretinal surgeon at the Walter Reed Army Medical Center in Washington. He can be reached at +1 202 782 6965; or via e-mail at eweichel@hotmail.com.

LTC Mark Nelson, MD, is a vitreoretinal surgeon at Madigan Army Medical Training Center in Tacoma, WA.

COL David Zumbro, MD, is Chief of Ophthalmology and a vitreoretinal surgeon at Brooke Army Medical Center in San Antonio, TX. The authors report no financial interests.



1. Defense Manpower Data Center/Department of Defense Personnel & Procurement Statistics. Global War on Terrorism-Operation Iraqi Freedom- by month. Available at: <http://sdiadapp.dmdc.osd.mil/personnel/CASUALTY/OIF-Total-by-month.pdf>. Accessed on January 8, 2008.

2. Thach AB, Johnson AJ, Carroll RB, et al. Severe eye injuries in the war in Iraq, 2003-2005. *Ophthalmology*. 2008;115(2):377-382.

3. Mader TH, Carroll RD, Slade CS, et al. Ocular war injuries of the Iraqi Insurgency, January-September 2004. *Ophthalmology*. 2006;113(1):97-104.

4. Colyer MH, Weber ED, Weichel ED, et al. Delayed intraocular foreign body removal without endophthalmitis during Operations Iraqi Freedom and Enduring Freedom. *Ophthalmology*. 2007;114(8):1439-1447.

5. Weichel ED, Colyer MH, Ludlow SE, et al. Combat ocular trauma visual outcomes during Operations Iraqi and Enduring Freedom. *Ophthalmology*. 2008;115(12):2235-2245.