A Perforating Eye Injury Caused by a Staple Gun, Treated Successfully Without Vitrectomy

Yaron Lang, MD
Nizar Bishara, MD
Yoreh Barak, MD
Edward Fineberg, MD

ABSTRACT
A 30-year-old carpenter accidentally impaled his own left eye with a 5 cm staple ejected from a pneumatic gun. Entering the globe off-axis, the stainless steel staple caused a vitreous hemorrhage. On the day of injury, the staple was removed surgically. The vitreous hemorrhage cleared rapidly enough to permit laser treatment around the equatorial retinal perforation site. Visual acuity improved to 6/9 and remained stable over a one-year period of careful follow-up. No retinal detachment developed. No additional intervention was required. While vitrectomy with or without a circular buckling remains the standard for perforations into the posterior segment, selected cases may be managed conservatively.

INTRODUCTION
Ocular perforating wounds may have disastrous visual consequences. The primary surgical treatment begins with closure of accessible wounds. Additional surgery may include cataract removal, corneal transplantation or vitrectomy for repair of a complex retinal detachment, vitreous hemorrhage and/or endophthalmitis.

We present a case of a perforating eye injury resulting from an accidental staple gun discharge. Initial treatment included removal of the staple and closure of the scleral wounds. Despite the severity of the injury, the only secondary treatment was laser treatment to the retinal exit site. At his 12-month follow-up exam, his vision had improved to 6/9.

CASE REPORT
A 30-year-old carpenter presented to our emergency room with a 5 cm stainless steel staple imbedded in his left eye (Fig. 1) due to an inadvertent staple gun discharge.

On examination, vision of the left eye was finger counting at 1.5 meters. One end of the U-shaped staple passed through the upper eyelid and penetrated the globe 6 mm posterior to the limbus at 12-o’clock position. The other end of the U tunneled deeply within the temporal part of the cornea and extended into the sclera at 3-o’clock position. The anterior chamber was deep with only mild hyphema. The pupil was round and reactive to light. The lens was completely clear. Although vitreous hemorrhage obscured a detailed view of the posterior pole, a good red reflex was seen. The vision in the fellow eye was 6/6 with a normal anterior and posterior segment. Computed Tomography...
(CT) examination of the left orbit validated the clinical findings (Fig. 2).

Under general anesthesia, we observed that the upper end of the staple had exited the eye close to the 12-o’clock equator. The other lower end did not perforate the eye; rather it continued in its intrascleral course and emerged just behind the lateral rectus muscle insertion. The staple was carefully extracted in one piece. Both scleral wounds were sutured with 6/0 vicryl and mild cryo applications were applied around each wound. The skin of the upper eyelid was sutured with 8/0 nylon. At the end of the operation, vancomycin and amikacin were given subconjunctivally. The patient was treated intravenously by gentamycin 240 mg/day and cefazolin 2g/day for 1 week. In addition, topical Atropin 1% tid (Fischer, Israel), Dexamycin qid (Combined dexamethasone & neomycin drops, Teva, Israel) and Ciloxan qid (Alcon, USA) were administered.

We scheduled a vitrectomy in the next few days. However, this vitrectomy was cancelled as the vitreous hemorrhage cleared dramatically. There were no signs of endophthalmitis and the vision improved progressively to 6/9 within four days of injury. Now that the equatorial exit wound could be visualized internally, laser applications with indirect opthalmoscope delivery system were applied in a zone extending anteriorly from this wound to the ora serrata (Fig. 3). When last seen, two years after the injury, visual acuity remained 6/9 with the retina attached, without any sign of an intraocular inflammation or vitreous hemorrhage.
DISCUSSION

A staple or nail propelled under high pressure by an industrial gun may cause severe, even life-threatening, damage. Instances of good results have been attributed to several factors including minimal contusive damage of a sharp, high velocity nail and prompt vitrectomy. In one similar published case, treated with scleral buckling and cryopexy but without vitrectomy, a favorable result was also achieved. We are not aware of any published case reporting successful treatment of this type of injury by cryo and laser alone. In our case, the staple bypassed the lens to enter the eye through the posterior pars-plana and exit via the equatorial retina.

In perforating wounds of the eye, reactive fibrovascular tissue usually connects the entry and exit sites. With shrinkage of this tissue, a tractional retinal detachment with proliferative vitreoretinopathy may result. Ryan et al. have demonstrated that a double perforating wound may result in a significant retinal detachment, especially if the entry site is near the ora serrata and the exit site near the posterior pole. Vitrectomy interrupts the process by removing the scaffold upon which proliferation may develop.

Our case is unique in several aspects. This is the first description, to our knowledge, of a staple gun causing a perforating eye injury, although there are several reports relating to a nail gun. Such nail injuries may cause a double perforating wound with one entry and one exit site. In contrast, a U-shaped staple, could potentially perforate the eye simultaneously in two places, causing a quadruple perforating injury, with two entry and two exit sites, resulting in a significantly more severe injury. Our patient was fortunate in that only one end of the staple perforated his globe, thus this simulated the more common double perforation due to a nail gun. The favorable outcome was achieved here with minimal intervention: laser/cryo treatment applied around pars plana and retinal wounds.

Although we were aware of the importance of vitrectomy in such severe trauma, this was not performed for several reasons: First, the vitreous hemorrhage cleared spontaneously within several days, enabling us to apply laser treatment around the exit site via the pupil. Secondly, no signs of infective or toxic endophthalmitis developed. Furthermore, since the vision had improved significantly with the crystalline lens remaining clear and since both entry/exit wounds were quite peripheral, observable and close to each other, we considered it more reasonable to observe rather than intervene once again.

This unexpectedly favorable result may be attributed to the following factors: First, the contraction of the peripheral fibrovascular tissue did not threaten the posterior pole. Further, rapid clearing of the vitreous hemorrhage enabled timely access of laser treatment to the equatorial exit wound thus preventing a delayed rhegmatogenous retinal detachment (RRD) often seen with progressive liquefaction of the vitreous.

In conclusion, our unique case demonstrates that the hazard of a staple gun is similar to that of a nail gun, but potentially worse if both ends perforate the globe. In the majority of perforating wounds caused by nail guns, surgical repair usually requires either vitrectomy or scleral buckle alone. In selected cases of such injuries, laser and/or cryo treatment around both entry and exit sites may be sufficient when combined with close and meticulous follow-up.

REFERENCES