Shiraz University

IJVR

ISSN: 1728-1997 (Print)
ISSN: 2252-0589 (Online)

Vol. 21 No. 3 Ser. No. 72 2020

IRANIAN JOURNAL OF VETERINARY RESEARCH

Scientific Report

Diagnosis and surgical management of an intraocular foreign body secondary to ballistic wound in a Rhesus macaque (*Macaca mulatta*)

Sharun, K.[1]; Kumar, R.[2]; Kalaiselvan, E.[3]; Singh, M.[3]; Rawat, T.[1]; Saxena, A. C.[2]; Kinjavdekar, P.[2]; Pawde, A. M.[2*] and Amarpal,[2]

[1]MVSc Student in Veterinary Surgery and Radiology, Division of Surgery, ICAR-Indian Veterinary Research Institute, Izatnagar, Bareilly, 243122, Uttar Pradesh, India; [2]Division of Surgery, ICAR-Indian Veterinary Research Institute, Izatnagar, Bareilly, 243122, Uttar Pradesh, India; [3]Ph.D. Student in Veterinary Surgery and Radiology, Division of Surgery, ICAR-Indian Veterinary Research Institute, Izatnagar, Bareilly, 243122, Uttar Pradesh, India

[*]***Correspondence:*** *A. M. Pawde, Division of Surgery, ICAR-Indian Veterinary Research Institute, Izatnagar, Bareilly, 243122, Uttar Pradesh, India. E-mail: abhimp@rediffmail.com*

(Received 30 Sept 2019; revised version 13 Jan 2020; accepted 29 Apr 2020)

Abstract

Background: Intraocular foreign bodies (IOFBs) such as air gun pellet is a rare finding in wild animals like Rhesus macaque (*Macaca mulatta*). The purpose of the present scientific report is to describe the surgical retrieval of IOFB secondary to ballistic wound in a wild Rhesus macaque. **Case description:** A juvenile female wild Rhesus macaque was brought with the history of swollen and inflamed right eye for the past several days. **Findings/treatment and outcome:** Clinical examination revealed presence of partially healed wound over the dorsal eyelid. Radiographic examination revealed the presence of a metallic foreign body inside the right orbit. Inflamed and persistently closed eyelid prevented the further localization of the metallic foreign body. Lateral canthotomy was performed under general anesthesia. Following the failure to recover the metallic foreign body from the ocular adnexa, right eye vitrectomy was performed to retrieve the IOFB. The metallic foreign body was recovered from the posterior chamber of the right eye. Due to the poor prognosis of the already damaged eye, enucleation of the eye was performed which was followed by tarsorrhaphy. Further examination of the foreign body identified it as a 4.5 mm (.177 Calibre) air gun pellet. Post-operatively animal was treated with antibiotics and anti-inflammatory drugs. The animal recovered uneventfully. **Conclusion:** Intraocular foreign bodies secondary to gunshot wound should always be considered as a surgical emergency. Enucleation should be performed in cases having poor prognosis to avoid further complications especially in wild animals like Rhesus macaque.

Key words: Eye enucleation, Eye foreign body, *Macaca mulatta*, Rhesus macaque, Vitrectomy

Introduction

Animals are the common targets for the low velocity air guns. Even though they are harmless when fired from a distance greater than 100 yards due to rapid loss of velocity, they are considered lethal if fired at critical body parts (Merck, 2012). The most common species affected by gunshot wounds are canines followed by cats, hares, birds and deer (Listos *et al*., 2016). It is also reported in wild animals like Sloth bear (Nath *et al*., 2007), crocodile (Shrivastava *et al*., 2011), leopard (Showkat *et al*., 2014), deer (Listos *et al*., 2016), and elephant (Sutradhar *et al*., 2018). The organs affected by projectile gun pellet include lungs, heart, bladder and intestine (Risselada *et al*., 2008), but involvement of eye is scarcely reported. The entry of the intraocular foreign body (IOFB) can occur through three routes but in most of the cases the point of penetration will be through the cornea. It can also penetrate through either the sclera or the limbus (Rathod and Mieler, 2011). Survey radiographs are essential in identification of foreign bodies that do not produce any visible external wounds. Radiography can also be used as an effective tool in defining the projectile trajectory within the body (Bradley-Siemens and Brower, 2016).

The present case report describes a very rare case that involves the diagnosis and successful surgical retrieval of IOFB in a wild Rhesus macaque (*Macaca mulatta*) that occurred secondary to a ballistic wound due to penetration of 4.5 mm (.177 Calibre) conical head tipped air gun pellet.

Case description

A juvenile female wild Rhesus macaque was brought to Referral Veterinary Polyclinic and Teaching Veterinary Clinical Complex, Indian Veterinary Research Institute, Izatnagar with the history of swollen and inflamed right eye for the past several days (Fig. 1). On clinical examination the animal was found to be dull and depressed with normal rectal temperature, respiratory rate and heart rate. Detailed examination of the right eye revealed a partially healed penetrating wound over the dorsal eyelid which was suspected to be

external insult due to a foreign body. The dorsal and ventral eyelids were adhered to the eye ball thus preventing the careful examination of the eye. Intraocular examination was not possible due to the extensive corneal oedema.

Fig. 1: A juvenile female wild Rhesus macaque (*Macaca mulatta*) with swollen, inflamed, and wounded right eye. Red arrow showing the suspected cite of the entry of IOFB

Diagnostic imaging

Radiography was performed to identify the possible cause of the swollen inflamed and wounded right eye. Multiple radiographs of skull were taken for identification of the etiological factor (Figs. 2 and 3). Analysis of the radiographs identified the presence of radio-dense metallic foreign body inside the right orbit. Careful examination identified the orbital bones to be intact thus nullifying the possibility of brain damage. Based on the radiographic findings it was decided to perform right lateral canthotomy to retrieve the IOFB.

Surgical management

General anaesthesia was induced using intramuscular injection of a combination of xylazine (Xylaxin, Indian Immunologicals Ltd., Hyderabad, India) at the dose rate of 2 mg/kg and Ketamine Hydrochloride at the dose rate of 10 mg/kg body weight (BW). The surgical site was prepared aseptically by using chlorhexidine scrub solution. The animal was positioned in left lateral recumbency with the affected eye on the top. General anaesthesia was maintained by using intermittent bolus infusion of ketamine hydrochloride (Aneket, Neon Laboratories Ltd., Thane, India). Pre-operative antibiotic therapy was initiated using amoxicillin-clavulanic acid (Augmentin, Glaxo SmithKline Pharmaceuticals Ltd., Mumbai, India) at the dose rate of 15 mg/kg BW intravenously.

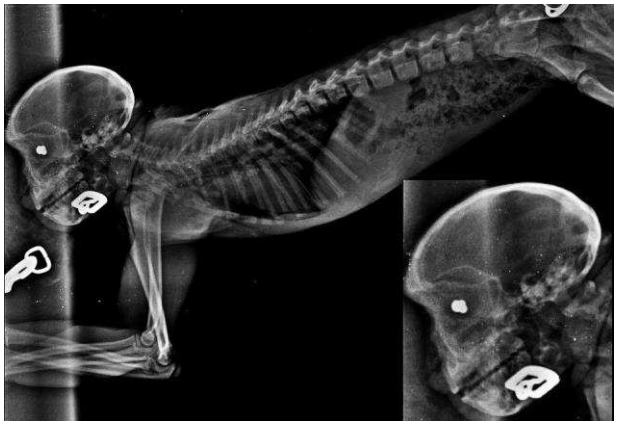

Fig. 2: Lateral survey radiograph showing radio-opaque foreign body in the orbit. Magnified radiographic image of skull (inset) showing intact orbital bones without penetration of pellet to cranium

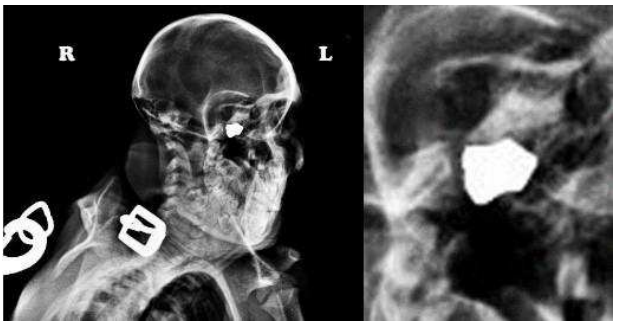

Fig. 3: Radiographic image showing intraorbital radiopaque foreign body in right eye (**R**: Right side and **L**: Left side). Clearly visible outline of intraorbital foreign body with a conical tip (inset)

Lateral canthotomy was performed to access the globe and surrounding tissue. Stay sutures were applied to the palpebral conjunctiva. On examination of the periocular tissues foreign body could not be palpated, thus IOFB was suspected. Since the foreign body was not visible in the anterior chamber of the eye, it was presumed to be inside the posterior chamber. The eyeball was found to be less turgid indicating the loss of vitreous humor, but no external entry point of the foreign body was visible in the cornea or the sclera. This might be due to the delayed presentation of the present case.

It was decided to perform vitrectomy for retrieving the IOFB. Bard Parker (BP) blade No. 11 was used to access the vitreous chamber through a stab incision. The vitreous fluid contained blood clots indicating vitreous haemorrhage. Using intraocular forceps, the foreign body was retrieved from the posterior chamber (Fig. 4). Due to the poor prognosis of the already damaged right eyeball, enucleation of the right eyeball was performed followed by tarsorrhaphy. Post-operatively, the animal was treated with topical ciprofloxacin (Ciplox, Cipla Ltd., Mumbai, India) (0.3%) eye drops and flurbiprofen (Flur, Allergan Pvt Ltd., Bangalore, India) eye drops (0.03%) poured

through the lateral canthus. Antibiotic therapy was continued orally by amoxicillin-clavulanic acid (Augmentin, Glaxo SmithKline Pharmaceuticals Ltd., Mumbai, India) at the dose rate of 15 mg/kg BW twice daily for 5 days along with acetaminophen (Calpol, Glaxo SmithKline Pharmaceuticals Ltd., Mumbai, India) orally at the dose rate of 10 mg/kg twice daily for 3 days.

Analysis of IOFB

Detailed analysis of the retrieved metallic IOFB identified it as 4.5 mm (.177 Calibre) air gun pellet with conical head that might have been projected from an air pistol or air rifle. The air gun pellets are made of alloy containing lead, tin, antimony, and copper (BIS standard for 4.5 mm (.177 Calibre) air rifle and air pistol pellets). The approximate dimensions of the retrieved metallic IOFB are described in Fig. 5.

Fig. 4: Extensive oedema of cornea without any entry point of the air gun pellet. Yellow arrow showing partially retrieved foreign body (for size comparison)

Fig. 5: Intraocular foreign body identified as a .177 Calibre (4.5 mm) conical head tipped air gun pellet used in air rifle and air pistol. Approximate diameter, 4.5 mm; Approximate length, 7 mm; Approximate weight, 756 mg

Results

The patient recovered completely from the anaesthesia after 2 h without any complications. The animal was given liquid diet following the complete recovery. The surgical wound on the right eye healed completely by 7th post-operative day of the surgery (Fig. 6).

Fig. 6: Completely healed right eye on 7th post-operative day after surgery

Discussion

The prognosis for the penetrating injury involving the posterior chamber of the eye would be poor when compared to that of the anterior chamber. This is because posterior segment injury will result in suprachoroidal and subretinal haemorrhages along with retinal damage diminishing the chances for visual recovery (Eagling, 1975). Experimental research on Rhesus monkey following posterior penetrating eye injury reported that the perforating injury involving damage to the posterior segment of the eye will have guarded prognosis (Cleary and Ryan, 1979a and b). The retrieved air gun pellet weighed approximately 756 mg. Pellets weighing more than 58 mg are considered to be heavy weight. Intraocular foreign body with greater weight is associated with poor outcome due to the severe damage associated with it (Woodcock *et al*., 2006). In the present case preoperative posterior segment visualization was not possible due to corneal edema and also due to the

opacities of eye media. This was a major limitation in identifying the extent of damage that has occurred in the posterior segment of the affected eye.

Vitreoretinal surgery is a good surgical option for managing IOFB due to penetrating pellet injury in human subjects. Following the surgery intraocular tamponade is done either by using silicone oil or sulphur hexafluoride gas for maintaining the intraocular pressure. But it requires long term post-operative follow up of several years to manage the complications like hypotony (reduced intraocular pressure), cataract and retinal detachment (Khoueir *et al*., 2015). So in such cases a second vitreoretinal surgery is indicated which may not be possible in wild animals like Rhesus macaque. All of these limiting factors were taken into consideration before deciding to perform enucleation of the eyeball following retrieval of the IOFB.

Since lead is one of the components of the alloy used for making the bullet, failure to remove the foreign body may cause lead poisoning secondary to progressive systemic absorption of lead into the circulation (Merck, 2012). In the present case the air gun pellet produced a blind gunshot wound without any exit. The pellet was lodged freely inside the posterior chamber of the eye and was surrounded by the vitreous humor so removal of the pellet surgically was contemplated. Leaving the pellet in posterior chamber for a prolonged period might have resulted in lead poisoning due to its absorption into the systemic circulation.

In an experimental study a 4.5 mm (.177 Calibre) air gun pellet fired using an air rifle in canines, produced a wound of 55.5 mm depth when the air gun was fired from a distance of 5 m from the subject (Putra *et al*., 2017). In the present case, due to the smaller size of the air gun pellet and possibly low power of projecting system or the distance of shooter from the animal, the pellet could not penetrate the cranium of the animal.

In contrast to human medicine, extensive reports of ballistic wounds are lacking in veterinary medicine, which could be due to lack of concern among the owners or due to difficulty in diagnosis when compared to human patients. To the authors' knowledge this is the first report describing the surgical retrieval of IOFB secondary to ballistic wound in a wild Rhesus macaque.

References

Bradley-Siemens, N and Brower, AI (2016). Veterinary forensics: firearms and investigation of projectile injury. Vet. Pathol., 53: 988-1000.

Cleary, PE and Ryan, SJ (1979a). Histology of wound, vitreous, and retina in experimental posterior penetrating eye injury in the Rhesus monkey. Am. J. Ophthalmol., 88: 221-231.

Cleary, PE and Ryan, SJ (1979b). Method of production and natural history of experimental posterior penetrating eye injury in the Rhesus monkey. Am. J. Ophthalmol., 88: 212-214.

Eagling, EM (1975). Perforating injuries involving the posterior segment. Trans. Ophthalmol. Soc. UK., 95: 335-339.

Khoueir, Z; Cherfan, G and Assi, A (2015). Vitreoretinal surgery for shotgun eye injuries: outcomes and complications. Eye. 29: 881.

Listos, P; Komsta, RE; Łopuszyński, WO; Gryzińska, MA; Teresiński, GR; Chagowski, W; Buszewicz, G and Dylewska, MA (2016). Radiological and forensic veterinary analysis of gunshot cases in eastern Poland. Med. Wet., 72: 453-457.

Merck, M (2012). *Veterinary forensics: animal cruelty investigations*. 2nd Edn., Iowa, USA, John Wiley & Sons. PP: 151-165.

Nath, I; Pattanaik, TK; Sahoo, N; Bose, VS; Das, JK; Das, A and Mishra, AK (2007). Management of gun-shot wounds in a Sloth Bear *Melursus ursinus*. Zoos Print J., 22: 2734-2735.

Putra, BB; Jola, R; AH, EB; Djoko, L and Benjamin, CT (2017). Anatomical pathology and radiology appearance of ballistic wound result of cal. 177 air rifle with 4,5 mm pellets on extrimity of the dog (*canis lupus familiaris*) at different shooting distances. In 1st International Conference Postgraduate School Universitas Airlangga: "Implementation of Climate Change Agreement to Meet Sustainable Development Goals" (ICPSUAS 2017), Atlantis Press.

Rathod, R and Mieler, WF (2011). An update on the management of intraocular foreign bodies. Retinal Physician. Ret. Physician, 8: 52-55. https://www.retinalphysician.com/issues/2011/april-2011/an-update-on-the-management-of-intraocular-foreign.

Risselada, M; De Rooster, H; Taeymans, O and van Bree, H (2008). Penetrating injuries in dogs and cats. Vet. Comp. Orthop. Traumatol., 21: 434-439.

Showkat, SJ; Wali, A and Tasaduq, S (2014). Clinical management of gunshot wounds in a leopard. Intas Polivet. 15: 180-182.

Shrivastava, AB; Bhargava, MK; Singh, R and Shahi, A (2011). Gun shot wounds in a crocodile (*Crocodylus palustris*) and its management. Intas Polivet. 12: 170-171.

Sutradhar, BC; Das, BC; Ferdous, S; Rahman, M; Hossain, S; Hossain, F and Hasanuzzaman, MD (2018). Penetrating gunshot wound, emphysema and inanition followed by death in a wild Asian elephant: a case report. Int. J. Avian Wildlife Biol., 3: 119-122.

Woodcock, MG; Scott, RA; Huntbach, J and Kirkby, GR (2006). Mass and shape as factors in intraocular foreign body injuries. Ophthalmology. 113: 2262-2269.