Corneal bee sting injuries with different presentations and outcomes - experience in a tertiary hospital in Malaysia.

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Background: *Bee sting ocular injuries are a relatively rare but significant source of ocular trauma. Bee sting ocular injuries can result from the bee stinger or its venom. The treatment depends on the mechanism and extent of the injuries.*

Case Series: *First patient had stinger removal almost immediately after the incident. However, his cornea eventually decompensated possibly due to venom toxicity. After cataract surgery and Descemet stripping endothelial keratoplasty, his visual acuity was 6/18.*

Second patient was diagnosed with corneal perforation and toxic anterior segment syndrome in the left eye caused by bee stinger, which required tectonic penetrating keratoplasty. He later required cataract surgery which eventually resulted in secondary graft failure.

Last patient had an intact embedded bee stinger paracentrally at 9 o'clock position in his right cornea. His lesion was initially treated as secondary bacterial corneal ulcer but his condition did not improve. After stinger removal and corneal suturing, he was treated with intensive topical antibiotics. His response to treatment and the periphery location of the lesion, led to good visual outcome.

Conclusion: *Corneal bee sting injuries can have different presentations and outcomes, whose management should be tailored individually in order to achieve good outcome. Proper protective eye wears should be advocated to motorcyclists to prevent such potential blinding condition.*

Conflict of interest: *The authors have no any conflict of interest.*

Key words: *Bee sting injuries, toxic anterior segment syndrome, keratoplasty.*

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Introduction

Bee sting ocular injuries are a relatively rare but significant source of ocular trauma.[1] Bees and wasps belong to hymenoptera species of insects. During stinging, these insects will introduce two components into the eye, which are stinger and specific venom.[2]

Bee sting ocular injuries can result from the bee stinger or its venom. The stinger mainly causes mechanical problem, whereas venom causes toxic or immunological effects.[3] They can be difficult to tackle and manage. Treatment depends on the mechanism and the extent of the injuries.

We report a case series of corneal bee sting injuries with different presentations, management and outcomes in a tertiary hospital in Malaysia.

Case 1

A 69-year-old Chinese man had bee sting injury over the left eye while riding motorcycle one month prior to presentation to a district hospital, where he was treated immediately with stinger removal. The stinger which located paracentral at 5 o'clock was successfully removed by the attending doctor. After the incident, his left eye vision gradually deteriorated over one month. On presentation to our tertiary hospital, visual acuity of his left eye was counting fingers. Examination of the left eye revealed a quiet conjunctiva, generalized corneal 2+ stromal edema with epithelial bullae, a corneal scar involving the middle stroma at paracentral area at 5 o'clock position with no evidence of corneal filtrates. There was also 2+ nuclear sclerotic cataract. There was no anterior chamber reaction. The fundal view was poor due to the corneal edema, but B-scan ultrasonography showed no obvious vitritis. He was diagnosed with left corneal decompensation secondary to bee sting venom. His topical treatment in the left eye included dexamethasone 0.1% q6h, moxifloxacin 0.5% q4h, hypertonic saline 3% q4h and homatropine 2% q8h. On follow up, the corneal edema remained the same and the cataract progressed to nuclear sclerosis 2+ and cortical cataract 2+. Six weeks later, the patient underwent left phacoemulsification surgery with posterior chamber intraocular lens implantation and the operation was uneventful despite poor surgical view due to edematous cornea. Three months later, the patient underwent left eye Descemet stripping automated endothelial keratoplasty (DSAEK) whereby his best corrected vision improved to 6/18 with pin hole. His graft was attached and his cornea was clear. DSAEK was performed as we believed that the corneal decompensated due to endothelial dysfunction. (Figure 1A, B)

Figure 1A: There was generalized corneal edema with bullae showing corneal toxicity secondary to bee sting.

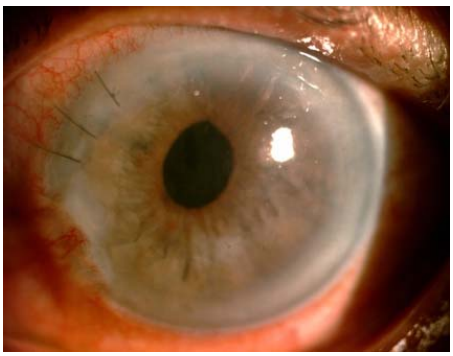


Figure 1B: One week post DSAEK showing clear cornea.

Case 2

A 63-year-old, Malay man with underlying diabetes mellitus, hypertension and dyslipidaemia, was allegedly stung by a bee in the left eye while riding his motorcycle. The stinger was removed from his left cornea by a general ophthalmologist in a district hospital on the same day. Corneal perforation was noted and he was then referred to our tertiary hospital for further management due to inability to close the wound with primary suturing. Two days after the injury, when he presented to us, visual acuity in his left eye was hand movement. Slit lamp examination revealed mild diffuse corneal epithelial and stromal edema and a spindle-shaped paracentral cornea perforation measuring 1.5mm horizontally and 1.0mm vertically with surrounding necrosis. The anterior chamber was flat, pupil was in a mid-dilated state with diffuse loss of pigmentation and there was a mature cataract. He was diagnosed with left corneal perforation with toxic anterior segment syndrome secondary to bee sting venom. Cyanoacrylate glue was applied over the corneal perforation temporarily while awaiting cornea tissue. The patient was started on topical cefuroxime 5% q2h, gentamicin 0.9% q2h, dexamethasone 0.1% q4h and homatropine 2% q8h in the left eye. He later underwent tectonic penetrating keratoplasty for his left eye. Recipient cornea culture failed to isolate any organism. Two months post-operatively, the patient's left visual acuity remained hand movement. Slit lamp examination revealed diffuse corneal edema, formed anterior chamber, mid-dilated pupil with loss of iris pigmentation and dense white cataract. During three months of follow up, his left corneal edema had resolved. Subsequently he underwent cataract surgery five months after penetrating keratoplasty. However, he experienced secondary corneal failure. Patient was advised for a repeated corneal graft, however he was not keen. His final vision was hand movement. (Figure 2a, 2b)

Figure 2A: There was spindle shaped central cornea perforation measuring 1.5mm horizontally and 1.0mm vertically at supero-temporal quadrant.

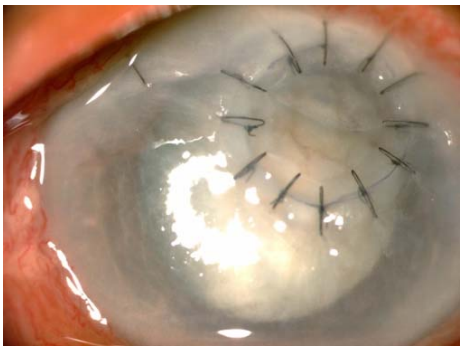
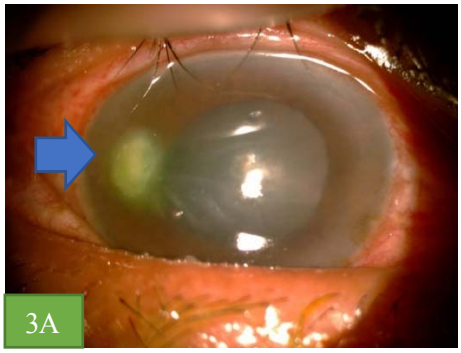


Figure 2B: Intraoperative, tectonic penetrating keratoplasty was performed.

Case 3

A 57-year-old Malay man with underlying ischemic heart disease, was stung by a bee in his right eye while riding his motorcycle. He sought treatment from a district hospital on the next day after experiencing painful red eye associated with blurry vision. He was initially treated as corneal ulcer; however, as his condition did not improve, he was referred to our hospital five days after injury. At presentation, his right visual acuity was 6/60 and improved to 6/36 with pinhole. Ocular examination of the right eye showed a bee stinger measuring 2.4mm

embedded into the corneal mid stroma at the 9 o'clock position, with a paracentral ulcer measuring 1.2mm horizontally and 2.0mm vertically. Anterior chamber had 2+ cells, but no hypopyon noted. He underwent emergency removal of stinger and corneal suturing in the operating theater under local anaesthesia. A linear incision was made over the stinger from apex to base and the stinger was extracted, to ensure complete removal of the stinger. He was treated topically with gentamicin 0.9% q2h, ceftazidime 5% q2h in the right eye post-operatively. Culture report showed Actinetobacter baumannii which was sensitive to ceftazidime and gentamicin. In contrast with previous cases, this patient was not started on any topical steroid as he had secondary bacterial infection. Postoperatively, his condition improved as the infection was able to controlled with topical antibiotics and subsequently resolved. His vision improved to 6/6 three months later. (Figure 3A, 3B, 3C)



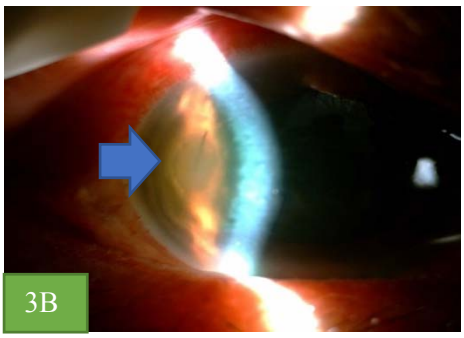


Figure 3A, 3B: There was a stinger embedded in the stroma with surrounding infiltrate located paracentrally at 9 o'clock. (arrows)

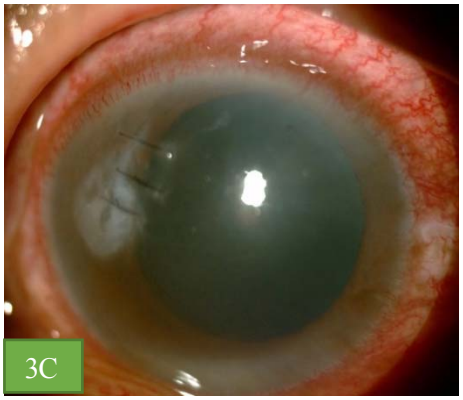


Figure 3C: A linear incision was made over the stinger from apex to base and the stinger removed. The wound was then sutured with nylon 10-0. Day one post-operation.

Discussion

Bee sting injuries can affect various ocular structures and the injuries can be mechanical, toxic or immunological. Systemic allergic reactions can also be seen in hypersensitive individuals. According to the literature, only about 1% to 9.9% of adults experience systemic reactions to bee stings.[4]

Upon stinging, bees and wasps will introduce two structures into the eye: the stinger and the venom.

The stinger consists of stylet-wrapped around double lancets with a saw-like tip and upper bulb. This makes the complete removal of the stinger difficult and it allows the stinger to remain embedded in the tissues.

Figure 4: showing bee stinger with stylet and double lancets.

Bee venom contains biologic amines (histamine), polypeptide toxins (melittin) and enzymes (hyaluronidase). Melittin is the main toxin in bees. It has a hydrophilic terminal which is strongly basic. Mellitin has a strong surface activity on cell lipid membrane, which enable it to cause membrane disruption, hemolytic toxic effect and protein denaturation.[5]

When the cornea is involved, chemotaxis of polymorphonuclear leukocytes result in a white corneal infiltrate with surrounding intense stromal edema at the site of inoculation, which may obscure the stinger. Subsequently, tissue degradation will occur as the toxins impact the cellular structure. These patients are often misdiagnosed as microbial or viral keratouveitis. Unless there is a high degree of suspicious and the presence of a stinger actively sought, these cases are often erroneously treated with antibiotics. Delay in removal of the missed stinger prolongs the inflammatory process and damage.

Stingers removal remains controversial. Retained stingers may represent an additional source of irritation and insult, because they continue to diffuse venom into the tissue long after the initial traumatic event. A case series by Siddharthan et al. emphasised the importance of removal of stingers as early as possible in order to minimise the venom discharge and toxins.[5] However, there are reported cases which showed that once the toxin wears off, the presence of stinger is well tolerated. This was confirmed by Strobel in a study among the rabbits in which the retained corneal stinger is inert. Gilboa et al. had also presented a case where a stinger retained in the anterior capsule of the lens with no inflammatory sequelae over 28 years of follow-up.[6]

Posterior involvements of bee sting injuries are rare. However, there are several case reports describing patients with ocular bee stings developing cataracts, toxic anterior segment syndrome, secondary glaucoma, optic neuritis, ciliochoroidal detachment and vasculopathy.[7-11]

Management of bee stings injuries need to be individualized depending on the clinical presentations. In general, the treatment for corneal bee stings can be divided into acute and long-term measures.

Acute measures include topical corticosteroids to reduce the inflammation induced by the venom, antihistamines to counteract the action of amines, cycloplegics to relieve the pain from ciliary spasm and prevent synechiae formation, topical antibiotics to prevent secondary infection and surgical removal of the stinger.

Long-term management includes refractive correction of the astigmatism caused by a corneal scar, penetrating keratoplasty when the scar compromises the visual axis directly or when there is corneal decompensation due to endothelial cell damage, and cataract surgery if required.[3,12]

In these three cases, different clinical appearances were seen and were managed differently.

Case 1 : Cornea toxicity due to bee sting toxin, which probably was responsible for the patient's poor visual acuity and corneal decompensation. A case reported by Gurlu et al. showed cell death leading to a decrease in endothelial cell density and polymorphism, which caused by the activation of complement cascade by bee venom proteins.[13] Topical dexamethasone 0.1% was given to reduce the

inflammation caused by the venom. Prophylactic antibiotics and cycloplegic were given as acute management. However, the patient's vision did not improve. He was then counselled for a two-stage operation. First, he underwent phacoemulsification and intraocular lens implantation. DSAEK was subsequently performed three months after the cataract surgery. He was able to achieve best corrected vision of 6/18 about one month post-operatively.

Case 2: Cornea perforation and toxic anterior segment syndrome due to bee stinger and venom. Tectonic penetrating keratoplasty was performed due to corneal perforation. Post-operatively, the corneal edema slowly cleared off. His postoperative vision was still poor due to the presence of mature cataract. Cataract was believed to be caused by the inflammation and venom effect.[10,11] Although his cataract surgery went well, his corneal graft developed secondary graft failure.

Case 3: Intact stinger embedded in the cornea. The patient showed evidence of infection with paracentral infiltrates surrounding the stinger. The stinger was removed in the operating theater. A linear incision was made over the stinger from apex to base, in order to allow the complete removal of the stinger without leaving any fragments behind.[14] The corneal incision was sutured with nylon 10/0. He was able to achieve vision of 6/6 subsequently. The stinger was located paracentrally, away from visual axis, and the infection was controlled with intensive topical antibiotics.

Conclusion

Corneal bee sting injuries can have different presentations and outcomes depending on its stinger mechanical and venom toxicity. Acute management and long-term management are both equally important to achieve a good visual outcome. Acute management includes measures to remove the stinger, restore the ocular integrity, reduce inflammation, prevention of secondary infection and to relieve pain, whereas long term measures are aimed for visual rehabilitation.

All bee sting ocular injuries reported in this case report occurred in patients during motorcycle riding. Besides treatment of bee sting ocular injuries, motorcyclists should be advised on proper protective eye wears to avoid such rare but potentially blinding condition.

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