Corneal hymenoptera stings
A new therapeutic approach

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Abstract

Purpose: To describe five cases (four children) with ocular sequelae from honeybee or wasp sting injuries to the eye treated with anterior chamber irrigation to reduce venom concentration and subsequent complications.

Design: Interventional case series.

Methods: Patients with hymenoptera corneal sting injuries were treated in the operating room by performing an anterior chamber irrigation with balanced saline solution and triamcinolone in an effort to minimize the tissue damage induced by bee venom.

Results: Early clearing of inflammation and more rapid recovery of baseline acuity were associated with early surgical intervention. Late complications included corneal decompensation, iris heterochromia, paralytic mydriasis, glaucoma and cataract; these complications are irreversible and sight threatening.

Conclusion: Performing an early anterior chamber irrigation is a treatment option for this type of trauma, since it results in faster resolution and fewer late complications.

Key words: hymenoptera, cornea, bee, wasp, sting

Introduction

The most common treatment for hymenoptera corneal stings includes topical and systemic corticosteroids, topical antibiotics and cycloplegics. The prognosis for severe cases is poor and, in most of these eyes, the sting may lead to severe sight threatening complications.1 We often see patients, mostly children, with severe ocular hymenoptera stings and poor outcomes with traditional treatments. It is possible that a more aggressive treatment could lead to better results. In our protocol, patients are submitted to surgery as soon as possible after the sting for an extensive irrigation of the anterior chamber, in an effort to remove all the venom and prevent further damage of intraocular structures.

We, hereby, present the report of corneal hymenoptera sting managed with the proposed technique.

Case Report 1

An 8-year-old boy from Chocó, western Colombia, was admitted with a wasp sting to his right cornea, that had occurred three days earlier. Visual acuity in the right eye (OD) was hand motion at 25 cm. In the left eye (OS) was 20/20. At the slit lamp, there was conjunctival hyperemia, a 70% epithelial defect, and diffuse corneal edema with bullae in the central and inferior cornea. Iris details could not be seen. The sting was partially removed at the time of the initial examination at the slit lamp, and topical treatment with ciprofloxacin and dexamethasone drops 4 times/day was started.

The patient returned five days later with intense pain and poor vision. There was severe corneal edema, ciliary congestion, intense flare, paralytic mydriasis and anterior subcapsular lens opacity. Intraocular pressure (IOP) was 38 mmHg, and, therefore, treatment with topical anti-glaucoma medication was initiated.

Two weeks later, the patient was submitted to surgery to perform irrigation of the anterior chamber and to extract the remaining foreign matter from the cornea. Subconjunctival steroid was administered at the end of the procedure.

The corneal opacity persisted, and IOP increased. A penetrating keratoplasty with cataract surgery and intraocular lens implantation was performed, in addition to two unsuccessful trabeculectomies and a...
bleb revision. The patient was then scheduled for the implantation of a glaucoma drainage device.

**CASE 2**

A 4-year-old girl was admitted with anaphylactic shock that required intubation and mechanical ventilation for two weeks after experiencing a massive attack by Africanized bees. On examination, there were two stings in each cornea, severe corneal edema and infiltrates. The lens remained clear. It was not possible to assess visual acuity.

The patient was submitted to surgery twenty-four hours after admission. The sting fragments from the corneal stroma were removed, and an anterior chamber irrigation with a Simcoe cannula of both eyes was performed with 10 ml of balanced saline solution. Triamcinolone 0.2 ml (2 mg) was placed in the anterior chamber at the end of the procedure and subconjunctival corticosteroid was injected, additionally. Post-operatively, the treatment regimen included systemic methylprednisolone 60 mg/4 times a day for a total of twelve doses, topical moxifloxacin, prednisolone 1% every three hours, carboxymethylcellulose and therapeutic contact lenses.

One week later, the patient had pupillary paralysis on the right and a normally reactive left pupil. There was moderate right corneal edema with a sting fragment visible, and two infiltrates at the sites from which the stings had previously been removed. The left cornea was clear, with a normal anterior segment. The patient underwent surgery again for removal of the residual sting.

**Case 3**

A 7-year-old boy was admitted with a honeybee sting that had occurred the day before, and his mother had removed the sting from the cornea with her own hands. At the time of biomicroscopic examination, the patient had diffuse corneal edema, and an epithelial ulcer measuring 4.5 x 4.5 mm. Iris detail could not be seen. The IOP was normal. Treatment was begun with oral prednisolone 1mg/kg/day, topical prednisolone 1%, topical moxifloxacin, and cycloplegics.

The patient returned the next day with increased corneal edema and pain. He was submitted to surgery to perform an anterior chamber irrigation and steroid infusion similar to patients 2 and 3.

On the first postoperative day the patient exhibited a decrease in corneal edema, no epithelial ulceration, and there was improved visualization through the cornea revealing an atrophic iris and a hypoactive pupil. Ten days after surgery, visual acuity was 20/25. Tonometry was normal and there was heterochromia iridis and a hypoactive pupil. (Figure 1).

Three months later, his condition is unchanged.
**Case 4**

A 12-year-old boy was admitted with a corneal wasp sting to his right eye that had occurred 12 hours earlier. Visual acuity in his OD was 20/400, and in OS was 20/20. At the time of biomicroscopic examination, he had conjunctival hyperemia, a 90% corneal epithelial defect, corneal edema and opacification (Figure 2). There were small fragments of the sting in the anterior and mid-stroma with infiltrate around the fragments, Descemet folds, and anterior capsular lens opacity. The IOP was 14 mm Hg. Anterior chamber irrigation with 10 ml of balanced saline solution was performed 15 hours after, and triamcinolone 0.2 ml (2 mg) was placed in the anterior chamber at the end of the procedure.

Eleven days after surgery, visual acuity was 20/100. Cornea was clear, IOP was normal, and there was no cells or flare. Pupil was dilated and non-reactive, with no afferent pupillary defect. There was an anterior cortical cataract (Figures 3 and 4).

**Results**

Table 1 summarizes the cases, results and sequelae.

<table>
<thead>
<tr>
<th>Eye</th>
<th>Patient No</th>
<th>Age</th>
<th>Sex</th>
<th>Eye</th>
<th>Insect</th>
<th>Beginning VA LogMAR</th>
<th>Time to surgery</th>
<th>Final VA LogMAR</th>
<th>Sequeae</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>8</td>
<td>M</td>
<td>OD</td>
<td>Wasp</td>
<td>2.4</td>
<td>17 days</td>
<td>2.4</td>
<td>Corneal opacity, glaucoma, cataract,</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>4</td>
<td>F</td>
<td>OD</td>
<td>Bee</td>
<td>NA</td>
<td>1 day</td>
<td>Fixes and follows</td>
<td>Small peripheral leucoma</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>4</td>
<td>F</td>
<td>OS</td>
<td>Bee</td>
<td>NA</td>
<td>1 day</td>
<td>Fixes and follows</td>
<td>None</td>
</tr>
<tr>
<td>4</td>
<td>3</td>
<td>7</td>
<td>M</td>
<td>OD</td>
<td>Bee</td>
<td>2.0</td>
<td>2 days</td>
<td>0.1</td>
<td>Iris Heterochromia, hypoactive pupil</td>
</tr>
<tr>
<td>5</td>
<td>4</td>
<td>12</td>
<td>M</td>
<td>OD</td>
<td>Wasp</td>
<td>1.7</td>
<td>15 hours</td>
<td>0.7</td>
<td>Cataract, esotropia</td>
</tr>
</tbody>
</table>

**Discussion**

In the large rural populations treated in our emergency department, insect stings to the eye is a common event. Although, insect sting in other areas of the body may be painful, more commonly this produces a relatively slight annoyance and only rarely anaphylaxis. On the other hand, direct ocular involvement is a serious injury that can lead to severe and permanent complications.

The toxicity induced by the venom of the hymenoptera (bees, wasps and ants) is produced by non-enzymatic polypeptide toxins (mellitin, apamin, iminimine, mast-cell degranulating peptide) and enzymes (phospholipase A, phospholipase B, hyaluronidase, lipase, acid phosphatase, alkaline phosphatase, esterase, and phosphodiesterase).

Mellitin causes iris heterochromia, induces serotonin and histamine liberation, as well as protein denaturation, that can lead to cataract and delayed zonulolysis favoring to lens subluxation. Apamin is a neurotoxin that can induce ophthamoplegia and pupil paralysis. Furthermore, the high
molecular weight enzymes that enter the anterior chamber due to the sting are highly antigenic and responsible for the inflammation that results from enzymatic hydrolysis of structural phospholipids. They are also responsible for inducing vasodilation and dissemination of the other toxic components. This insult induces a reaction in the anterior chamber similar to a chemical burn.

Some authors have described retrobulbar neuritis, papilledema, and optic atrophy in patients with stings in other areas of the body. The severity of the symptoms may differ depending on the type of insect and the amount of chemical agent that enters the anterior chamber. 

The described case series presents different outcomes, which, we believe, correlate with the celerity of the surgical intervention. The best results were achieved when we were able to remove the insect sting early, with a 90% improvement of the symptoms and resolution of the keratouveitis. However, attempts to remove the sting manually prior to ophthalmologic intervention, induced even greater inoculation of the venom due to the pressure exerted on the venom glands adherent to the sting.

The poor outcome of the patient who underwent conventional treatment (Case 1), led us to consider a more aggressive approach on the other cases. This included an early irrigation of the anterior chamber with 10 ml of balanced saline solution, followed by intracameral application of triamcinolone (2 mg/0.2 ml) in order to decrease the inflammatory reaction as well as the amount of circulating toxins in the anterior chamber.

The excellent functional and visual outcomes in the patients with earlier and more aggressive treatment led us to suggest that the management of insect stings to the cornea should include early surgical intervention, in order to remove the stings and to perform an anterior chamber irrigation with balanced salt solution. Subsequent management includes topical corticosteroids and antibiotics. These patients require frequent and ongoing follow-up due to the risk of delayed complications including persistent endothelial loss, cataract, and glaucoma. Corneal transparency in the cases described in this report was achieved approximately 4 to 6 weeks after removing the sting and initiation of intensive anti-inflammatory treatment.

**Conclusion**

Insect stings to the cornea are ophthalmic emergencies that can produce a severe toxic anterior segment syndrome. Early irrigation of the anterior chamber can result in faster resolution of the acute clinical picture and improvement in the long-term prognosis.