Emergency Case

Harold Schubert, MD, MSC, CCFP

Hymenoptera stings

QUESTIONS

A gardener comes to the emergency department 1 day after he has been stung by a wasp. He complains of a large, warm, red, itchy swelling on his left forearm. Is it an allergic reaction? Is infection a concern? What therapies are helpful? Who should receive venom immunotherapy?

Stinging insects are arthropods, of the class Insecta, order Hymenoptera. Hymenoptera are among the most highly socialized creatures and are thought to be more cooperative than most humans. There are two major subgroups: vespids (wasps, yellow jackets, hornets, and fire ants) and apids (honeybees and bumblebees).

Vespids tend to sting with minimal provocation, are capable of stinging repeatedly, and are often attracted to bright colours and strong odours (cosmetics, sweet drinks, barbecues, garbage). Vespids are carnivorous and sting to kill prey as well as to defend themselves.

Apids tend to be more docile, are not carnivorous, and sting only in defence. Bumblebees can sting repeatedly, but honeybees have barbed stingers and can only sting once. Stinging for a honeybee is a suicidal act; stinger and venom sack are torn from the bee, and the bee dies shortly thereafter.

Stings

Hymenoptera venoms contain enzymes capable of causing tissue breakdown and hemolysis (phospholipase, hyaluronidase, acid phosphatase). All stings are painful initially when the toxic venom is injected subcutaneously. The extent of reaction to a sting will depend on the toxicity of the venom, the volume of venom injected, and whether the victim is allergic to the venom. Stings in dependent areas (feet, legs) tend to swell more and for a longer time than stings on the trunk; stings on small parts (fingers, toes, ears) are more painful due to pressure.

After the initial pain, the sting site typically swells a little and reddens; this reaction lasts for several hours. Cold compresses and mild analgesics are usually sufficient treatment. It is important to inspect the sting site for a stinger. If a honeybee sting apparatus with venom sack is found, it should be removed by scraping with a fingernail or sharp object; using a forcep or any squeezing could cause further injection of venom.

Large local reactions

Large local reactions, increasing for up to 2 days and persisting for up to 7 days, are common, especially in response to certain vespid stings. Systemic symptoms (nausea, fatigue) might also occur. The exact nature of large reactions is unclear; perhaps an allergic mechanism is involved or Hymenoptera venoms directly cause release of allergy mediators.

Large local reactions are sometimes confused with cellulitis. Cellulitis rarely develops after a sting[1]; some believe that sting reactions and cellulitis are mutually exclusive because the venoms are also toxic to bacteria. The main way to discriminate between a sting reaction and cellulitis is to notice the sting's relative absence of tenderness compared with the exquisite tenderness of cellulitis.

Treatment for large local reactions consists of elevation, cold compresses, and nonsteroidal antiinflammatory drugs (NSAIDs).[1] Antihistamines might help reduce itch but will not stop the reaction. If swelling is extensive and disabling, oral prednisone, 50 mg/d for 2 or 3 days, is helpful.[1] Topical application of meat tenderizer, baking soda, or other potions have no proven benefit.

People who have large local reactions tend to have similar large reactions with subsequent stings. Most

Dr Schubert *practises emergency medicine at the University of British Columbia Hospital in Vancouver.*

Table 1. Drug treatment for anaphylaxis

DRUG AND ROUTE	INDICATION	FREQUENCY	DOSE	
			CHILD	ADULT
Epinephrine 1:1000 (SC)	Initial treatment	Every 20-30 min	0.01 mL/kg (up to 0.3 mL)	0.3-0.5 mL
Epinephrine 1:10 000 (IV or ET)	Severe shock (systolic BP <60 mm Hg)	Every 20-30 min	0.1 mL/kg (up to 0.3 mL)	3-5 mL
Diphenhydramine (IV or IM)	Urticaria	Every 4-6 h	1.25 mg/kg	25-50 mg
Cimetidine (IV)	Adjunct to diphenhydramine	Every 6 h	4 mg/kg	300 mg
Methylprednisolone (IV)	Severe or persistent symptoms	Every 6 h	0.5-1 mg/kg	125 mg
Prednisone (PO)	Severe or persistent symptoms	Every 6 h	0.5-1 mg/kg	50 mg
Glucagon (IM, IV, or SC)	Patient taking β-blockers and unresponsive to epinephrine	Bolus or IV drip	0.5 mg	1-10 mg (2-8 mg/h)

BP—blood pressure, ET—endotracheal, IM—intramuscular, IV—intravenous, PO—by mouth, SC—subcutaneous.

of these people have positive results on skin tests to venom extract, suggesting that an allergic reaction is involved. Venom immunotherapy is not effective for preventing large local reactions.[1] Risk of subsequently developing anaphylaxis is about 5% per episode.

Systemic toxic reactions

Systemic toxic reactions can result from a large amount of venom entering systemic circulation (50 to 100 stings). An estimated 500 simultaneous stings will be lethal. African "killer bees" kill by virtue of the fact that they act defensively in large swarms; victims receive large volumes of venom, but the venom is no more toxic than the venom of other apids. Killer bees also pursue their victims for much greater distances than other bees. (African bees require a consistently warm environment and will not likely be a threat in Canada.)

Systemic reactions have clinical features similar to anaphylaxis (hypotension, angioedema). Fatal arrhythmias might also occur. Treatment is similar to treatment for anaphylaxis. The few patients who have positive results of venom skin tests should have venom immunotherapy.[1]

Unusual reactions

Occasionally, unusual reactions have been reported days or weeks after a sting. These include vasculitis; nephritis; neuritis; encephalitis; Guillain-Barré syndrome; and serum sickness with urticaria, joint pains, and fever. The pathogenesis of most of these unusual reactions is unknown. Serum sickness likely has an immune origin. Patients with it could be at risk for anaphylaxis with subsequent stings and are candidates for venom immunotherapy.[1]

Anaphylactic reactions

These reactions are the main lethal potential of Hymenoptera venoms. Incidence of anaphylactic reactions to stings is estimated at between 0.3% and 3%[1] (ie, of those stung, up to 3% have anaphylactic reactions). Anaphylactic reactions to Hymenoptera stings are thought to cause more deaths worldwide than reactions to venoms of any other creatures.[2]

The clinical features of Hymenoptera-sting anaphylaxis are most commonly dermal: generalized urticaria, flushing, and angioedema. Life-threatening features are less common: airway edema, bronchospasm, and circulatory collapse. Symptoms usually start within 10 to 20 minutes after a sting but might begin up to 5 hours later. Acute symptoms of anaphylaxis usually subside within 15 to 30 minutes. In up to 20% of cases, anaphylactic reactions have a biphasic pattern such that, after initial improvement, patients relapse up to 6 hours later. A minimum of 6 hours' observation is recommended.[2]

Treatment

Table 1 summarizes drug treatment for anaphylaxis.[2] Patients receiving β-blockers will be somewhat resistant to epinephrine. Epinephrine remains first-line treatment, but glucagon might be required for adequate vasotonic and cardiotonic effects.[2]

Treatment for Hymenoptera-sting anaphylaxis is not complete without giving patients advice about risk of future stings. General advice includes wearing protective clothing in risky environments, using gloves when gardening, and avoiding wearing bright colours and strong scents. Epinephrine in a self-administration kit (Ana-Kit, Epi-Pen) and antihistamines should be carried in risky environments. Referral to an allergist is indicated for skin testing and possibly venom immunotherapy.

Venom skin testing detects the presence of venom-specific immunoglobulin E (IgE) antibodies. Patients with positive skin test results will benefit from venom immunotherapy, which should continue for 2 to 5 years or until skin test results become negative.[1] Venom immunotherapy can reduce risk of recurrent sting anaphylaxis to 10% after 2 years of therapy and to 2% after 3 to 5 years of therapy.[1]

In an ideal world, people with sensitivity to Hymenoptera venom could be identified, treated with venom immunotherapy, and prevented from dying of anaphylaxis. In fact, up to 80% of those who die of Hymenoptera stings have no history of venom sensitivity.[3] Furthermore, only 50% to 60% of patients with prior anaphylactic reactions to stings and positive results on venom skin tests have anaphylaxis with subsequent stings.[1] The natural history of Hymenoptera sting anaphylaxis is of declining severity.

Anaphylactic reactions evoke tremendous anxiety in patients and emergency department staff, and this can hinder recovery. Physicians can reduce this effect with a knowledgeable, confident, and calm approach. Physicians must also provide information and advice on future risks and prophylactic measures. The best way for patients not to be scared is to be prepared, or to quote Dr H. Rubenstein, an expert in the field, "we must strive to liberate patients from unrealistic fears of highly improbable events."[4]

ANSWERS

This is a large local reaction; it might have an allergic component but should be treated mainly with ice, elevation, and NSAIDs. Stings rarely become infected. Systemic toxic reactions and anaphylactic reactions require urgent parenteral drug treatment. Venom immunotherapy is indicated for patients with anaphylactic reactions and some patients with serum sickness or systemic toxic reactions.

References

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