Venom Hypersensitivity
Venom Allergy

• Large localised reaction ~ 10% in adults

• Systemic allergic reactions
  o Up to 3% of adults
  o Severe sting reactions in up to 1% of children

• In Australia, approximately 2 fatalities per year
  o Most occur between 35-84 years, male
  o US: > 50 cases per year
Fig 1. Causes of anaphylaxis deaths. There were 112 deaths between 1997 and 2005 in Australia. Causes are shown.

Liew et al. Anaphylaxis fatalities and admissions in Australia, JACI 123(2) 2009; 434-442
Aetiology

• 3 families of hymenoptera
  o Bees (honeybees, bumblebees)
  o Vespids (yellow jackets, hornets, European/German wasps, common wasp, paper wasp)
  o Stinging ants (bull ant, jack jumper ant)

• Venoms contain multiple protein allergens

• Honeybee venom immunologically distinct from other hymenoptera

• Vespid venoms have high degree of cross reactivity
  o Paper wasps not as closely related (50% YJ allergic)
Clinical Features

• Normal: transient pain, itch & swelling
• Large local reactions
  o Delayed & prolonged local inflammation, IgE-dependent mechanisms
  o Increases over 24-48 hours, resolve 3-10 days
• Systemic Reaction
  o Cutaneous (60% children vs 15% adults)/GI/Respiratory/CVS
• Reports of chronic urticaria & cold urticaria occurring after insect stings
• Unusual patterns: nephropathy, neurologic syndromes, ITP & rhabdomyolysis
History

• Current sting
  o Identify insect: presence of sting
  o Time of onset of reaction
  o Signs of anaphylaxis

• Previous stings
  o Number of stings
  o Time course and severity of previous reactions

• History of asthma

• Social history:
  o Risk of future sting
  o Location, time to nearest hospital
Risk of systemic reaction

• Sensitisation to venom occurs in > 30% of adults after a sting
  o 15-25% of adults have a positive venom test (SPT/sIgE)
  o Commonly transient with 12% becoming negative every year
  o Asymptomatic sensitisation associated with a 17% incidence of systemic reaction to a subsequent sting

• Once a systemic reaction occurs, risk of future reaction much higher

• Future reactions usually follow same symptom pattern with some variation in severity
Risk of systemic reaction

<table>
<thead>
<tr>
<th>Original sting reaction</th>
<th>Risk of systemic reaction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1-9 y</td>
</tr>
<tr>
<td>No reaction</td>
<td>17%</td>
</tr>
<tr>
<td>Large local</td>
<td>10%</td>
</tr>
<tr>
<td>Cutaneous</td>
<td>10%</td>
</tr>
<tr>
<td>Systemic</td>
<td>20%</td>
</tr>
<tr>
<td>Anaphylaxis</td>
<td></td>
</tr>
<tr>
<td>Child</td>
<td>40%</td>
</tr>
<tr>
<td>Adult</td>
<td>60%</td>
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</tbody>
</table>

Investigations

• Diagnostic testing indicated if high risk of future anaphylaxis (> 10%) where immunotherapy could be considered
• Testing family members is not recommended (frequent occurrence of positive venom tests in asymptomatic individuals)
Investigations

• Measure serum tryptase (& baseline)
  o Mastocytosis

• Skin testing
  o Intradermal testing using venom protein extracts
  o Positive 65-85% of patients with convincing history
  o Negative: loss of sensitivity after remote sting reaction
    • Period of ‘anergy’ weeks after – repeat in 1-6 mths

• Insect venom sIgE
  o Less sensitive

• Sting challenge
  o Considered impractical & unethical
  o If negative, still 15-20% chance of systemic reaction from subsequent sting
Management

• Prevention
  o Cover up: long sleeves, pants & gloves outdoors
  o Bees – usually act in self-defence: light-coloured clothing, avoid perfumes
  o Wasps nest in logs, walls & underground
    • Attracted to food & drink
    • Don’t drink blindly from cans when outdoors
  o Remove nearby nests professionally
  o Drive with windows up
Management

Local Reactions
• Oral H1-antihistamines
• Consider oral corticosteroids
• Ice pack/analgesia

Anaphylaxis
• Epipen & anaphylaxis action plan
• Optimise asthma control
• Immunotherapy
Immunotherapy

- History of systemic reaction to sting & positive diagnostic test
- Various recommended schedules
  - Achieve 100mcg maintenance dose 4-weekly
  - Some patients stretched to 8-12 weekly
Immunotherapy

- VIT reduces risk of systemic allergic reaction to 5% (wasp) & 15% (bees)
- Venom IgE initially rises then declines steadily over time
- Systemic symptoms occur in 10-15% of patients
  - Majority reactions are mild
  - 1/3 require medical treatment

FIG 3. Natural history of insect sting allergy showing the risk of systemic reaction to a sting in untreated patients (solid line) and in patients who received VIT (dashed lines) for a duration of either 1 to 2 years or for a mean of 6 years. Reprinted with permission from Golden DBK, Kagey-Sobotka A, Lichtenstein LM. Survey of patients after discontinuing venom immunotherapy. J Allergy Clin Immunol 2000;105:389.
Relapse after immunotherapy

• When sting reactions occur after stopping immunotherapy, most mild and usually less severe than pre-treatment reaction

• Risk factor for relapse (indefinite treatment)
  - Very severe (near-fatal) sting reaction
  - Systemic reaction during therapy (sting or injection)
  - Honey bee allergy
  - Less than 5 years of VIT

• Children with 3-5 years of VIT have very low chance of systemic reaction, even 10-20 years after stopping treatment
Summary

- Children who have had anaphylaxis at 40% risk of future systemic allergic reaction
- Immunotherapy reduces the risk of systemic allergic reaction
- Risk of relapse
References

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