



Hot Water Irrigation to Relieve Discomfort After Wasp and Bee Envenomation: A Case Series

Urgent Message: Hot water irrigation for 2 minutes provided immediate and sustained relief of pain and pruritus, as well as rapid de-escalation of large local reactions due to wasp and bee stings in this series of patients.

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Abstract

Introduction: Pain, pruritus, and large local reactions (LLR) are the most common symptoms attributed to Hymenoptera (ie, wasp and bee) stings and can persist for 7 to 21 days after envenomation. Guidelines on the acute management of LLR are lacking, and commonly used treatments are ineffective, leading to prolonged symptoms, unplanned return visits, and inappropriate use of systemic antibiotics. Recent studies show that concentrated heat applied by using portable heat pens provides effective relief of pain and pruritus immediately after Hymenoptera envenomation. The efficacy of other forms of heat on pain, pruritus, and persistent local symptoms after delayed presentation, such as LLR, has not been reported.

Case Selection and Method: Three patients presented to our urgent care (UC) center in suburban Chicago, Illinois, between July-October 2024 with localized symptoms due to wasp or bee stings, which occurred within 3 days of presentation. Treatment involved 2 minutes of hot water irrigation using simple tap water at the highest temperature setting the patient could tolerate from a faucet in the clinic or at home.



Results: In case 1, a 53-year-old female presented with severe pain and mild itching minutes after sustaining more than 14 stings to the lower extremity after disturbing a ground nest of wasps. Hot water treatment resulted in immediate relief of pain and pruritus, which was sustained without need for additional treatment.

Cases 2 and 3 involved patients who presented with LLR and pruritus, 2- and 3-days post-envenomation by

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wasps or bees. In both cases, hot water treatment resulted in immediate relief of pruritus as well as significant de-escalation of LLR within a day. In case 2, the patient presented 3 days post-envenomation and denied prior history of allergic reaction to Hymenoptera venom. Using only topical steroids, the patient reported no recurrence of itching or other symptoms on follow-up. In case 3, the patient presented 2 days post-envenomation and reported a history of LLR to Hymenoptera stings. The patient noted immediate improvement of edema associated with LLR and resolution of itching and pain after hot water treatment. Treatment with oral prednisone and topical betamethasone was also initiated. At follow-up 2 days after treatment, the patient reported marked reduction in swelling and redness, although the patient experienced mild residual itching. None of the 3 patients were treated with oral antibiotics.

Conclusion: Heat applied to areas of local reaction to bee or wasp stings with simple hot tap water provided effective and sustained relief of pain and itching up to 3 days post-envenomation in this case series. Hot water irrigation can also provide rapid de-escalation of LLR. In our patients with a prior history of allergy to Hymenoptera presenting with LLR, topical and systemic steroids were necessary. The effect of heat using hot water appears safe and may provide anti-inflammatory and venom denaturing effects, resulting in faster clinical improvement of symptoms.

Introduction

Hymenoptera envenomation from wasps and bees are common with the life-time risk ranging from 56.6% to 94.5%.¹ While systemic allergic reactions can occur and remain the most critical concern, localized symptoms, specifically pain, pruritus, and LLR, constitute the vast majority of symptoms likely to present to urgent care (UC). The species of wasps and bees that attack humans usually do so when their hives are threatened or disturbed. Wasp and bee venom consists of a mixture of toxins with neurotoxic, lipolytic, proteolytic, immunogenic, and anti-infective properties,² which cause pain, cellular injury, pruritus, and local or systemic allergic reactions. LLR is an IgE-mediated sensitization reaction and a more common type of allergic response (2.4% - 26.4%) than systemic reactions (0.3% - 8.9%).^{3,4,5} Defined as swelling exceeding 10 cm in diameter and lasting over 24 hours, LLR typically lasts between 2 and 10 days, however reactions can last up to 21 days in certain cases.⁵ While

not specifically reported in the literature, our experience suggests that poorly controlled local symptoms, especially LLR, are common reasons for seeking attention in UC. While cellulitis after Hymenoptera envenomation is rare,⁶ many unplanned return visits to UC for LLR occur, and inappropriate antibiotics are often prescribed.^{5,7}

Current Treatments After Envenomation

Common domesticated honeybees can leave a stinger with a venom gland embedded in the skin after a single envenomation, while stinging wasps and other wild bees can sting repeatedly without leaving stingers behind.⁸ Current acute treatment recommendations for bee and wasp stings consists of removing the stinger and gland if present, applying cold packs to affected areas for pain and pruritus, and prescribing oral analgesics, antihistamines, and steroids.⁶ Standard treatment of LLR varies, but antihistamines and systemic corticosteroids are often utilized.^{5,7} While these treatments have been described in the literature, research on their efficacy is lacking.

Infections due to Hymenoptera stings occur rarely.⁵ In a retrospective study of emergency department (ED) patients treated for LLR after Hymenoptera stings, 6% of patients received systemic antibiotics.⁷ Although guidelines have been published advocating against the use of systemic antibiotics unless clinical signs of infection or risk factors are present,⁹ overlap in the appearance and symptoms of cellulitis and LLR can lead both patients and clinicians to inaccurately conclude that antibiotics are necessary. However, importantly, symptom control is critical as uncontrolled pruritus can lead to scratching and secondary infection.

Field studies using battery-operated heat pens have demonstrated highly effective relief of pain and pruritus when used immediately after envenomation by bees, wasps, mosquitoes and biting flies.^{10,11} Heat pens, however, can be painful to use, which is a factor limiting their adoption; no studies to date have demonstrated efficacy of heat pens when treatment is delayed. However, in the acute setting, heat may be anti-inflammatory^{12,13} and cause venom to denature.¹² This case series explores the effects of using hot water irrigation in the treatment of local symptoms from wasp or bee stings ranging from immediate use up to 3 days post-envenomation.

Hot Water Treatment Protocol

Our treatment protocol was developed by the primary author based on personal experience treating wasp and

honeybee stings using heat pens and hot water immediately post-envenomation, as well as experience treating a broad range of toxic marine envenomations using hot water. The protocol involves irrigation of the envenomated area using hot water from a faucet or hand-held shower. Treatment involves irrigating the envenomated area(s) at the patients' maximum tolerated heat level for 2 minutes, which is the duration we have found to effectively alleviate pain and pruritus based on past experience. Patients with distal upper extremity stings are irrigated in the clinic, while patients with stings to other anatomic areas are given instructions to perform hot water irrigation at home and then are contacted by phone to assess clinical response.

Findings

Case 1: Hot Water Treatment for Immediate Symptom Relief

History

A 53-year-old female without prior history of allergy to Hymenoptera, presented 15 minutes after sustaining multiple stings to the left lower leg after accidentally disturbing a ground nest of wasps. The patient reported severe pain to the affected area and mild itching.

Relevant Physical Examination Findings

The patient's vital signs were normal other than a blood pressure of 154/83 mmHg and heart rate of 105 beats per minute. She appeared to be in moderate discomfort. Examination of the left leg revealed more than 14 small erythematous skin lesions of the distal medial aspect of the lower leg near the medial malleolus. The remainder of her exam revealed no signs of systemic allergic response.

Urgent Care Management

The patient was instructed to return home immediately and apply hot water to the affected area per the protocol previously described. She was also prescribed topical betamethasone 0.05% cream and instructed to take over-the-counter antihistamines and analgesics as needed for itching and pain, respectively.

Case Conclusion

During a phone follow-up after 3 days, the patient reported that she had experienced complete resolution of both pain and pruritus immediately after the hot water irrigation procedure, which she implemented shortly after discharge from UC. She remained symptom free and stated she did not require any medications.

Case 2: Hot Water Treatment for LLR – Presentation 72 Hours Post-Envenomation

History

A 39-year-old female without prior history of allergy to Hymenoptera presented to UC 3 days after sustaining a bee or wasp sting to the left distal dorsal forearm while walking her dog. The patient became concerned because of an expanding area of pruritus, warmth, redness, and swelling surrounding the sting over the 48 hours prior to her visit. She denied scratching the affected areas or experiencing any pain, fever, or other systemic symptoms. Her only medication was cetirizine 10 mg daily for allergy symptoms.

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Relevant Physical Examination Findings

The patient's vital signs were normal. Mild erythema and warmth along with swelling were noted to the volar forearm, consistent with LLR, surrounding the site of envenomation. The affected areas were non-tender and there was no induration or fluctuance. No other signs of systemic inflammatory or allergic response were observed.

Urgent Care Management

The hot water protocol was implemented in the clinic as her forearm could be irrigated in the UC center's sink. After irrigation with hot water for several minutes, the patient reported complete resolution of the bothersome pruritus. The patient was instructed to apply topical betamethasone 0.05% cream twice daily and to continue taking cetirizine according to standard package instructions. Oral prednisone 40 mg daily for 5 days was also prescribed to be started the following morning if the swelling and erythema did not de-escalate; the patient was advised to return for follow-up in 2 to 4 days.

Table 1: Summary of Case Findings

Case	Age Sex	Duration since envenomation on presentation	Initial presenting symptoms	Immediate response to treatment	Follow up findings	History of hymenoptera venom allergy
1	53 F	< 1 hour	P	no P	2 days: no P	No
2	39 F	3 days	I, LLR	no I	3 days: no I LLR reduced	No
3	44 M	2 days	P, I, LLR	no P, I	2 days: no P, mild I LLR reduced	LLR

P = pain; I = pruritus; LLR = large local reactions

Case Conclusion

The patient returned for reassessment 4 days after her initial treatment (1 week after envenomation). She reported that the swelling had improved significantly by morning after treatment, and she did not take the oral prednisone. The pruritus did not recur. Topical betamethasone was applied twice daily as instructed to areas of swelling. The patient continued to take cetirizine 10 mg daily as part of her routine for other allergy symptoms. On repeat physical examination, there was less swelling and some dark discoloration to the skin in a small area adjacent to the site of envenomation at the distal forearm. All erythema and warmth had resolved.

Case 3: Hot Water Treatment for LLR – Presentation 48 Hours Post-Envenomation

History

A 44-year-old male with a history of prior local allergic reaction to “bee stings” presented 2 days after sustaining a bee or wasp sting to the right proximal volar forearm. He complained of tense swelling, warmth, and pruritus to the entire right forearm with mild pain localized to the site of envenomation. The affected areas were nontender. He denied scratching the affected areas and denied any systemic symptoms. The patient had not been taking antihistamines due to aversion to side effects.

Relevant Physical Examination Findings

The patient’s vital signs were normal. There was erythema, warmth, and swelling along the entire right volar forearm. The site of envenomation was noted at the proximal volar forearm. No other signs of systemic inflammatory or allergic response were present, and there was no induration or fluctuance to suggest secondary soft tissue infection.

Urgent Care Management

The hot water treatment protocol was implemented in UC, after which the patient reported immediate and complete resolution of pain and pruritus, as well as noticeable reduction of swelling. The patient was prescribed oral prednisone and topical betamethasone in a similar fashion to case 2. He initiated these medications shortly upon discharge. He again declined to take an antihistamine due to side effects.

Case Conclusion

The patient returned for reassessment 2 days after treatment (4 days after envenomation) for recheck. At that time, he reported that the swelling had improved significantly, and he only noticed mild swelling and erythema surrounding the site of envenomation. He did note that mild pruritus had recurred but was managed effectively with topical steroids.

Case Series Conclusion

Heat applied to bee or wasp stings and affected local areas using 2 minutes of hot water irrigation was well-tolerated by each of the patients (both in UC and in the patient’s home). All patients reported immediate relief of pain and itching which persisted through follow-up. Hot water irrigation also resulted in rapid resolution of the signs and symptoms of LLR.

Each of the 3 patients denied history of systemic Hymenoptera allergy. In this group, the symptom relief achieved with hot water treatment appeared to be sustained (Table 1). This symptomatic improvement led to less use of other treatments such as antihistamines, steroids, and antibiotics. The patient with a prior history of local Hymenoptera allergy who presented with LLR also benefited symptomatically from hot water irrigation, however, he also used topical and systemic steroids, which may have contributed to symptom resolution.

Hot water irrigation appears to offer an easier, safer, and more effective method for the treatment of local reactions related to Hymenoptera envenomation compared to other sources of heat (eg, heat pens). All patients reported a significant degree of immediate symptom improvement. The hot water treatment protocol demonstrated efficacy on both immediate reaction and LLR, suggesting efficacy through a broad duration of the phases of reaction after envenomation. Systemic antibiotics were avoided in each case.

We observed that the patients reported a transient and mild increase in pain and pruritus during the first minute of irrigation, followed by a rapid improvement (or complete) resolution of symptoms during the second minute of irrigation during hot water treatment.

Discussion

This case series demonstrates that 2 minutes of hot water irrigation is safe, well-tolerated, and effective as an alternative to heat pens, providing immediate and sustained relief of local symptoms due to wasp and bee stings. In the patients with LLR, the affected areas were pruritic and non-tender, suggesting an immunologic, rather than infectious process. Patients were accepting of deferring antibiotic and other treatments after achieving rapid resolution of symptoms.

Our protocol was easy to administer at home or in the healthcare setting and enables heat to be applied to a larger area all at once. It is important to note that the treatment protocol may be challenging in younger children due to the transient increase in symptoms. Additionally, the protocol should be used with caution in patients with neuropathy or other neurosensory disorders that would impair their ability to identify when the hot water irrigation exceeded safe levels to avoid thermal burn. Either direct or subjective measurement of the water temperature by a caregiver before irrigation and patient coaching may be helpful in these patients.

Previous prospective field studies using portable concentrated heat devices such as Bite Away and Heat It shortly after envenomation have shown marked reduction of pain and pruritus due to bites and stings from mosquitoes, horseflies, bees, and wasps.^{10,11} These therapies have not demonstrated efficacy, however, with more delayed use. Hot water treatment has the added advantage of being widely available and allows for a broader area of coverage, which may explain hot water's efficacy in treating LLR and other persistent symptoms up to 3 days post-envenomation. Since patients may present to UC settings in a delayed fashion after

envenomation, often out of concern for the increasing swelling, pain, and itching associated with LLR, this hot water irrigation protocol provides a desirable tool to quickly address local symptoms.

Reduction of pain and pruritus from applying heat to wasp and bee stings immediately after envenomation has been postulated to rely on desensitization,^{10,11} while studies also have demonstrated immunosuppressive effects when temperatures exceed 41°C (105.8°F).¹² However, neither of these mechanisms of action fully explain the rate, degree, and duration of symptom relief observed in our case series. In a separate exercise, we measured the maximally tolerated water temperatures for 2 minutes of irrigation of several volunteers using an infrared thermometer and found that the temperatures tolerated ranged from 43°C-46°C (110°F-115°F). We postulate that heat, when applied using hot water in this temperature range, may have venom-denaturing effects, and the relief of symptoms may be largely due to thermolability of venom. This mechanism would be similar to what is observed with hot water immersion at 45°C (113°F) in the treatment of envenomation from toxic marine animals (eg, cnidaria [sea jellies], echinoderms [sea urchins], and venomous spiny fishes [stingrays, stonefish, lionfish, catfish]).^{13,14}

Pain, pruritus, and LLR can persist for 7 to 21 days after envenomation.¹⁵ Our observations suggest that using heat can quickly improve local reactions and markedly reduce pain and pruritus. This improvement in symptoms may increase patient acceptance of avoidance for systemic antibiotics. Additionally, the risk of secondary bacterial infection is likely to be mitigated, as less pruritus will lead to less scratching and compromise of the normal skin barrier. It is worth noting that Hymenoptera toxins also exhibit broad antibacterial properties,² which may explain why, in addition to the very superficial nature of envenomation, soft tissue infections from Hymenoptera stings are rare.

Our hot water treatment protocol appeared safe and easy to implement in clinical and home settings for treatment of local symptoms due to wasp and bee stings up 3 days post-envenomation. Prospective randomized studies would be instrumental in determining the treatment effects specific to hot water irrigation for the relief of symptoms after Hymenoptera envenomation. Given the ubiquitousness and safety of hot water, additional studies examining the effects of hot water for the treatment of systemic reactions and risk of future reactions, as well as any effect on rates of prescribing of systemic antibiotics and steroids would be worthwhile.

Limitations

This was a case series involving 3 UC patients without a control group, so drawing broad conclusions on the efficacy of hot water treatment requires further study. Identification of the arthropods responsible for envenomation was based on the patient's recall, therefore the exact species or type of Hymenoptera was unknown, but limited to those residing in suburban Chicago, Illinois. It is uncertain what the efficacy of our protocol might be in the treatment of symptoms related to envenomation from other Hymenoptera species from other geographies. All diagnoses were clinical and based on the judgment of the treating UC clinician.

Ethics Statement

Each patient provided verbal informed consent to try the hot water irrigation protocol in addition to standard care. Patients also provided verbal consent for their clinical histories to be published. ■

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