

Multiple wasp stings in children : a review

Dhevy Watana* Dawan Anuwuthinawin**
Siri Khoprasert*** Pinit Limpokiyagul****
Vibool Sunthornpoj***** Wivat Tapaneyaolarn*****
Vanich Vanapruks***** Sirichit Vasanavathana*****

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Multiple wasp stings can cause severe systemic involvement and death. Twenty cases have been collected from Thai literature and 8 hospitals records in the past 12 years (1976-1987). Their ages ranged between 1-11 years (mean 5.6 ± 3.1). There were 6 boys and 14 girls. The number of stings varied from 5-130 spots. Most had multisystemic involvement, including neurological deficits (17), acute renal failure (12), jaundice (9), gastrointestinal tract involvement (8), respiratory tract involvement (7), hypotension (3). Seven of the twelve ARF had peritoneal dialysis and recovered. Altogether seven patients died 6 hours to 9 days after the attack. All patients with multiple wasp stings should therefore be hospitalized for close observation for at least 48 hours. Early peritoneal dialysis and blood exchange are strongly recommended in severe and life threatening situations.

Reprint request : Watana D, Department of Pediatrics, Faculty of Medicine, Chulalongkorn University, Bangkok 10330, Thailand.

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* Department of Pediatrics, Faculty of Medicine Chulalongkorn University.
** Department of Pediatrics, Nonthaburi Hospital.
*** Department of Pediatrics, Faculty of Medicine, Prince of Songkla University.
**** Department of Pediatrics, Krabi Hospital
***** Department of Pediatrics, Siriraj Hospital, Mahidol University.
***** Department of Pediatrics, Rhamathibodi Hospital, Mahidol University.
***** Department of Pediatrics, Pramongkutklao Hospital.
***** Department of Pediatrics, Khonkan Hospital.

เทวี วัฒนา, คาวลัย อนุตตินาวิน, สิริ ขอประเสริฐ, พินิจ หลิมโกโดยกุล, วิบูล สุนทรพจน์, วิวัฒน์ คปนิยโพนาร, วณิช วรรณพฤษ, สิริจิตต์ วาสนะวัฒน์. เด็กถูกตัวต่อรูมต้อย จุฬาลงกรณ์เวชสาร 2532 กันยายน; 33(9) : 659-664

เด็กที่ถูกตัวต่อจำนวนมากรูมต้อย จะเกิดความผิดปกติของอวัยวะหลายระบบและถึงแก่ความตายได้ เนื่องจากรายงานเกี่ยวกับต่อต้อยในเด็กมีน้อย จึงรวบรวมข้อมูลจากวารสารการแพทย์ไทย และข้อมูลจากโรงพยาบาลบางแห่งในประเทศไทย ในระยะ 12 ปีที่ผ่านมา (2518-2530) มีเด็กถูกตัวต่อรูมต้อยทั้งหมด 20 ราย อายุระหว่าง 1-11 ปี (เฉลี่ย 5.6 ± 3.1) เป็นชาย 6 ราย หญิง 14 ราย มีรอยแผลถูกตัวต่อต้อย 5-130 แผล ในจำนวนผู้ป่วย 20 คนนี้ มีความผิดปกติทางระบบประสาท 17 คน ไตวายเฉียบพลัน 12 คน ตีข่าน 9 คน ความผิดปกติของระบบทางเดินอาหาร 8 คน ความผิดปกติของระบบทางเดินหายใจ 7 คน เม็ดเลือดแดงแตก 6 คน ช็อค 3 คน ผู้ป่วยเสียชีวิต 7 คน ภายในเวลา 6 ชั่วโมง ถึง 9 วันหลังจากถูกตัวต่อต้อย ได้ทำ peritoneal dialysis ในผู้ป่วยที่เป็นไตวายเฉียบพลัน 7 คน และทุกคนรอดชีวิตผู้ป่วยที่ถูกตัวต่อจำนวนมากรูมต้อยควรรับไว้ในโรงพยาบาลอย่างน้อย 48 ชั่วโมง เพื่อให้ความดูแลใกล้ชิด ต้องทำ peritoneal dialysis หรือถ่ายเปลี่ยนเลือดตั้งแต่ระยะแรกถ้าผู้ป่วยอาหารหนักและไตวาย

Being stung by wasps and bees is perhaps a common occurrence and the effects are usually of little consequence. In most cases, a sting by a bee or a wasp causes only a local reaction.

A fatal outcome of the stinging may, however, result from anaphylactic shock or toxic systemic effects due to the venom itself. The latter do not occur until many stings are received coincidentally.^(1,2) The systemic toxic effects could be hemorrhage, hemolysis or renal failure. The wasp venoms contain several substances.⁽³⁾ There were only few reports of multiple wasp stings in children,^(2,4-9) and all of them were case reports. The purpose of this report is to study the clinical manifestations and final outcome of multiple wasp stings in children.

Materials and Method

The Thai medical literatures and the patients's data from some hospitals were reviewed from January

1976 to December 1987. There were 20 patients under the age of 15 years; 3 from Thai medical journals⁽⁷⁻⁹⁾ and 17 from medical records of 8 hospitals. There were 6 cases from Nonthaburi Hospital, 3 from Chulalongkorn Hospital, 2 each from Pramongkutkiao Hospital, Songklanakarin Hospital and Ramathibodi Hospital and one case each from Bhumibol Adulyadej Hospital, Chaiyapoom Hospital, Khonkan Hospital, Krabi Hospital and Siriraj Hospital. There were 6 children who had mild clinical features. Mild cases were defined as the patients who recovered within 48 hours after the wasp stings by antihistamine and intravenous fluid administration only and did not required blood exchange transfusion or dialysis.

Results

The age and sex distributions are shown in Table 1. The sting marks ranged from 5 to 130

Table 1 Selected characteristics of cases.

Characteristics	Number (N = 20)	Percentage
Age distribution		
1-5 years	11	55.0
5-14 years	9	45.0
Age (years) : $X \pm SD$ 5.6 \pm 3.1		
Sex : Female	14	70.0
Male	6	30.0
Number of sting marks (range)	5-130	

There were multisystemic involvement in these patients. (Table 2)

Table 2 Systemic manifestation.

Clinical Manifestation	Number (n = 20)
NEUROLOGICAL INVOLVEMENT	17
EDEMA	13
ACUTE RENAL FAILURE	12
HYPERTENSION	11
G-I INVOLVEMENT	8
JAUNDICE	7
RESPIRATORY INVOLVEMENT	7
HEMOLYSIS	6
SHOCK	3

Seventeen patients had neurological involvement, all of whom had consciousness change ranging from drowsiness to stupor; 2 had facial palsy, and one had convulsion. Thirteen patients developed edema before the onset of renal failure. Seven patients had respiratory tract involvement which included laryngeal edema, pulmonary edema and pneumonia.

Twelve patients who developed acute renal failure had oliguria. The laboratory findings of acute renal failure were illustrated in Table 3. All of these patients had serum sodium of less than 134 mEq/litre and serum potassium 6 mEq/litre or more. The renal biopsy or necropsy were done in 4 children of whom 3 had acute tubular necrosis and 1 had normal renal tissue.

Table 3 Blood chemistry in cases with acute renal failure.

Blood chemistry	Range (n = 12)
BUN (mg./dl)	34-238
SERUM CREATININE (mg./dl)	0.8-13.01
SODIUM (mEq/L)	122-134
POTASSIUM (mEq/L)	6-9.6

Eight patients developed jaundice. Their liver functions are shown in Table 4. Three of these had liver histology studied. The liver pathology was not consistent, showing only nonspecific changes.

Table 4 Liver function test in jaundiced patients.

Liver function test	Range (n = 8)
TOTAL BILIRUBIN (mg./dl)	2.6-33
DIRECT BILIRUBIN (mg./dl)	0.8-28
SGOT (unit)	80.5-24196
SGPT (unit)	180-6080

Six patients had hemolysis, with total white blood cell counts ranging from 10800 to 44000/mm³ (mean = 22798 ± 9487) with neutrophil between 57 to 90% (mean = 76 ± 11). Platelet counts were normal in all but one patient who had thrombocytopenia.

Six patients had only mild clinical features; the number of sting marks ranged from 5 to 27. Three of these had drowsiness or hypertension. One had red urine, transient oliguria or transient difficult breathing. All had edema and normal levels of blood urea-nitrogen, serum creatinine, plasma electrolytes but high levels of serum enzymes (Table 5). These cases required only intravenous fluid and antihistamine.

FINAL OUTCOME : Seven of 20 patients died, 2 within 12 hours, and 5 from 30 hours to 8 days after the stings. Thirteen patients survived. Peritoneal dialysis was performed in 7 of 12 patients with acute renal failure, with complete recovery in all but one patient who was lost to follow up. Serum creatinine was 4 mg/dl when she was sent home. The patients with mild clinical features required only intravenous fluid and antihistamine.

Table 5 Serum enzymes in mild cases and number of sting marks.

Cases No.	AGE (Yr.)	No. Of STING MARKS	SGOT (units)	SGPT (units)	CPK (units)
1	1	12	480	172	8500
2	4	18	465	.*	340
3	5	27	800	.*	6368
4	6	5	201	343	2313
5	10	12	556	523	1289
6	11	8	160	.*	6160

* not done

Table 6 Pharmacologically and biochemically active substances of hymenoptera venoms.⁽³⁾

TOXIN	BEE	WASP	HORNET
1. BIOGENIC AMINES	HISTAMINE	HISTAMINE	HISTAMINE
	DOPAMINE	SEROTONIN	SEROTONIN
	NORADRENALINE	DOPAMINE	ACETYLCHOLINE
2. PROTEIN AND POLYPEPTIDE TOXINS (NONENZYMATIC)	MELLITIN	NORADRENALINE	
	APAMIN	WASP KININ	HORNET KININ
	MCD-PEPTIDE		
	MINIMINE		
3. ENZYMES	PHOSPHOLIPASE A	PHOSPHOLIPASE A	PHOSPHOLIPASE A
	PHOSPHOLIPASE B	PHOSPHOLIPASE B	PHOSPHOLIPASE B
	HYALURONIDASE	HYALURONIDASE	

Discussion

Direct toxic effect of wasp venoms although documented in experimental animals, have been reported only rarely in human. From our study, multiple wasp stings can cause severe multisystemic involvement and mortality. Hymenoptera stings cause more than 30 fatal reactions⁽¹⁰⁾ each year in United States but most of the reports emphasized the allergic aspects and generally attributed death to anaphylaxis.⁽¹¹⁾ In 1948 Hobson⁽⁴⁾ reported a case of a 7 year old boy who died 20 minutes after receiving 30 to 50 stings. In 1952 James⁽⁵⁾ reported a case of an 18 months old infant who received 477 stings and survived after several doses of adrenalin and - ACTH administration. In 1961 Hoh et al⁽²⁾ reported 2 cases of Chinese girls who were stung by many wasps and expired from hemolysis and acute renal failure. In 1972 Sitprija et al⁽¹²⁾ reported a case of renal failure and myonecrosis following wasp stings in a 71 year-old woman. In 1978 Konsomboon reported the first case of fatal reaction from multiple wasp stings in a Thai child. Since then there were only few reports in Thai⁽⁶⁻⁹⁾ and world literatures. The venoms of wasp and hornet contain several toxic substance (Table 6) that may affect the immediate outcome of the patient. Wasp toxins are different from the bee venoms that they do not contain mellitin, apamin or mast cell degranulating (MCD) peptide which are hemolysin, neurotoxin and mast cell destroyer respectively.

The most important substances in wasp toxins are enzyme phospholipase A2 and its product of lysolecithin which may affect the phospholipid of the cell membrane, mitochondria and lysosomes of any organ.⁽³⁾ These two substances can produce a series of effects in experimental animals such as contraction of smooth muscles, hypotension, increased capillary permeability

and destruction of mast cells. The injury to cell membrane causes massive sodium and calcium ions influx into cells increasing cytosolic calcium and further cellular damage, and dysfunction of several organs. The evidence of sodium and calcium ions influx into cells can be demonstrated indirectly in our patients by hyponatremia and hypocalcemia. All of the severe patients had hyponatremia and 4 of 5 patients who had plasma calcium ion studied had hypocalcemia. The severe multisystemic involvement in these patients may explain the effects of receiving large amounts of enzyme phospholipase A2 and its product. Even in mild cases, the evidence of some cellular injuries were shown by elevated levels of serum glutamic oxaloacetic transaminase, pyruvic transaminase and creatinine phosphokinase.

Most of the patients who had multiple wasp stings went to see a doctor early but as they did not show severe clinical findings at the beginning they were usually sent home on analgesic and antihistamine, returning later with severe clinical manifestations.

A patients who has more than 5 stings should be hospitalized for closed observation, because he may have shock, laryngeal edema and may expire early from severe hyperkalemia from hemolysis, cellular damage and acute renal failure. Antihistamine and intravenous fluid should be started immediately and adrenaline if indicated. High dose steroid should be administered early to stabilize cell membrane. In 1948 Hobson treated an infant who received 477 stings with several doses of ACTH successfully without dialysis. Calcium channel blocker may have a role in the management of these patients.

In a very sick child with oliguria, blood exchange or peritoneal dialysis should be performed early in the hope of removing some toxic substances, potassium and other waste products.

References

1. Marshall TK. Wasp and bee stings. Practitioner 1957 Jun; 178(1068) : 712
2. Hoh TK, Soong CL, Cheng CT. Fatal haemolysis from wasp and hornet sting. Singapore Med J 1966 Jun; 7(2) : 122-6
3. Habermann E. Bee and wasp venoms. Science 1972 Jul 28; 177(4046) : 314-22
4. Hobson JJ. Death caused by wasp stings. Memphis Med J 1948 Oct; 23 : 181-4
5. James ES, Walker WG. ACTH in treatment of multiple wasp stings. Can Med Assoc J 1952 Jul; 67 : 50-1
6. สุรวិทย์ คนสมบูรณ์. ต่อยตาย. วารสารกรมการแพทย์ 2521 มกราคม; 3(1) : 27-32
7. Kanjanapipatkul P, Sensirivatana R, Chumdermpadetsuk S, Kongmebhol V. Wasp stings. Chula Med J 1981 Nov; 25(6) : 1175-86
8. Laosombat V, Chub-uppakarn S. Acute renal failure following wasp stings. J Med Assoc Thai 1982 Sep; 65(9) : 511-3
9. กณิการ์ ภิรมย์รัตน์, ลักษมี พุทธพงษ์ศิริพรม ฉวีวรรณ จิวชัยศักดิ์, วีร์นะ ตระกูลสุน, อากา เมธีธรรมมาพงศ์. พิษจากต่อตอย. แพทยสารทหารอากาศ 2528 มกราคม; 31(1) : 7-13
10. Barnard JH. Studied of 400 hymenoptera sting deaths in The United States. J Allergy Clin Immunol 1973 Nov; 52(5) : 259-64
11. Graft DF, Schuberth KC. Hymenoptera allergy in children. Pediatr Clin North Am 1983 Oct; 30(5) : 873-86
12. Sitprija V, Boonpucknavig V. Renal failure and myonecrosis following wasp-stings. Lancet 1972 Apr 1;1(7753) : 749-50