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Report

A Case of Multiple Organ Failure Due to a Bee Sting

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Individual bee stings rarely cause rhabdomyolysis or multiple organ failure. Here we report a case of multiple organ failure after one bee sting with skin necrosis on the neck, fingers and toes. A 58-year-old man experienced one bee (*Polistes*) sting on his neck. Soon after injury, he had no symptoms or signs of shock or anaphylaxis. Twenty-four hours after injury, he was transferred to treat the shock. He had experienced a bee sting 23 years earlier. The skin on his neck was reddish. Laboratory data on admission showed inflammation, acute renal failure, hypoxia, metabolic acidosis and slight hepatic dysfunction. He was admitted to our intensive care unit. We treated him with artificial respiration, antibiotics, γ-globulin, antithrombin-III, steroid, platelets transfusion, endotoxin absorption therapy, plasma exchange, and continuous hemodialysis and filtration. His general condition improved, but his neck and upper and lower extremities became necrotic. A skin graft on the neck and amputation of his fingers, left leg and right foot were performed. We found 18 reports of MOF after bee stings in Japan since 1983. This case shows that even one bee sting can cause multiple organ failure.

Key words: bee sting, multiple organ failure, intensive care, blood purification therapy

Introduction

Bee stings sometimes cause severe anaphylactic reactions. However, individual bee stings rarely causes rhabdomyolysis or multiple organ failure (MOF), which in most cases are due to multiple bee stings[1,~18]. Here we report a case of shock and disseminated intravascular coagulopathy (DIC) with MOF after one bee sting.

Case Report

A 58-year-old man experienced one bee sting (*Polistes*) on his neck during outdoor work. Eight hours after the injury, he went to a neighborhood clinic for wound care. At that time, he had no symptoms or signs of shock or anaphylaxis. Seventeen hours after the injury, he went to the same clinic again because of dyspnea and general fatigue. He was admitted, and his general condition worsened, and 24 hours after injury, he went into shock with confusion and he was transferred to our emergency and critical care center. He had experienced a bee sting 23 years earlier, and had undergone a gastrorrhaphy due to perforated gastric ulcer 1 year prior to this episode. He had no allergies, and no history of diabetes mellitus, arteriosclerosis obliterans or thromboangiitis obliterans. He had no history of cigarettes smoking.

When he arrived at our center, he was confused, and his blood pressure was 140/80 mmHg after previous administration of dopamine. His heart rate was 120/min, respiratory rate 14/min, and body temperature was 37.2℃. The skin on his neck was reddish (Fig. 1). There was one bee sting wound on his neck.

Laboratory data on admission (Table 1) showed inflammation, acute renal failure, hypoxia, metabolic acidosis and slight hepatic dysfunction. The differential leukocyte count revealed a marked left shift. Eosinophilic granulocytes were not increased. Spe-

Table 1 Laboratory Data on Admission

WBC	9,400 /μl	TP	5.4 g/dl	Na	134 mEq/*l*	
Mye	2 %	Alb	3.1 g/dl	K	2.9 mEq/*l*	
Met	3 %	CRP	12.45 mg/dl	Cl	93 mEq/*l*	
Band	22 %	AST	57 IU/*l*			
Seg	61 %	ALT	27 IU/*l*	PT	14.3 sec	
Eosino	1 %	LDH	277 IU/*l*	APTT	44.6 sec	
Mono	2 %	Amy	47 IU/*l*	Fib	492 mg/dl	
Lymph	9 %	CPK	363 IU/*l*	FDP	32.9 μg/ml	
		T-Bil	1.8 mg/dl			
RBC	496×10^4 /μl	BUN	22.1 mg/dl			
Hb	15.9 g/dl	Crn	2.71 mg/dl	Specific IgE	Apis	negative
Ht	46.5 %				Vespa	negative
Plt	11.4×10^4 /μl	BS	271 mg/dl		Polistes	negative
		Hb A1c	5.1 %			

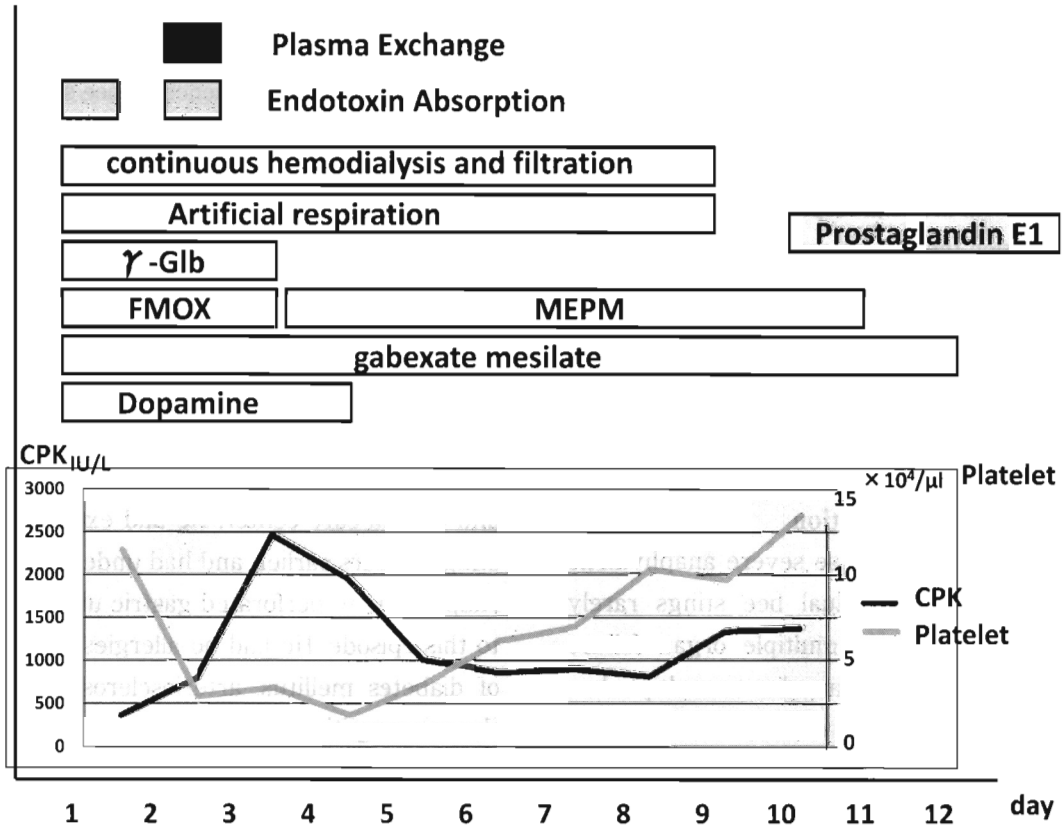

Fig. 2 The clinical course of the case

cific IgE antibodies to bee venom were negative. His chest X-ray and electrocardiogram findings were normal.

We initiated fluid resuscitation, intratracheal intubation and artificial respiration with 70% oxygen. With artificial respiration, his blood gas analysis showed pH, 7.36; Po_2, 84 torr; Pco_2, 32 torr; Base Excess, −6.3 mEq/*l*; and lactate, 6.8 mmol/*l*. The patient was admitted to our intensive care unit and diagnosed with multiple organ failure based on the criteria of Japan Society for Critical Care Medicine[19], because of the respiratory failure (Pao_2/Fio_2 ratio; 120), circulation failure (administration of dopamine), and DIC (serous FDP; 32.9 μg/ml). The platelet count decreased to 29,000/μl on the next day (Fig. 2).

We treated his septic state with antibiotics (flomoxef sodium and meropenem), γ-globulin, and en-

Table 2 The reported cases of multiple organ failure due to bee stings in Japan

Year	Reporter	Age	Sex	Past history of bee sting	Kind of bee	Number of stings	Maximum CPK (IU/*l*)	Blood purification	Outcome
1984	Tsujimura	36	M	−	*Vespa*	50−60	38,510	HD	Survived
1987	Ohashi	62	M	+	*Vespa*	15−16	181,600	HD	Died
1989	Yoshida	71	M	−	*Vespa*	70	330,000	HD	Died
1992	Fujiwara	79	M	−	*Vespa*	1	64,500	HD	Survived
1993	Kanehisa	78	M	−	*Vespa*	50−60	175,000	HD	Died
1997	Nishimura	86	F	+	*Vespa*	30	30,000	—	Survived
1999	Yamaguchi	57	M	+	*Vespa*	many	28,350	HDF	Survived
1999	Mouri	39	F	−	*Vespa*	more than 50	70,000	CHDF, PE	Survived
2001	Ishii	55	F	−	*Vespa*	100	80,000	CHF, HD, PE	Died
2001	Tono	76	M	+	*Vespa*	20	26,080	—	Survived
2001	Fujibayashi	74	M	−	*Polistes*	50	86,290	CHF, PE	Died
2002	Konishi	61	M	−	*Vespa*	15−16	9,700	—	Survived
2003	Shioshita	80	M	−	*Vespa*	30	62,250	HD	Survived
2005	Kobayashi	62	M	−	unknown	1	30,000	—	Survived
2006	Iwamura	80	M	−	*Vespa*	78	52,100	CHDF, PE	Died
2007	Yanagawa	80	F	−	*Vespa*	7	1,080	—	Survived
2007	Yanagawa	57	M	−	*Vespa*	38	39,000	—	Survived
2008	Kajiwara	57	M	+	*Vespa*	17	2,740	—	Survived
	our case	58	M	+	*Polistes*	1	2,466	CHDF, PE, EA	Survived

HD: hemodialysis, HDF: hemodialysis and filtration, CHDF: contenous hemodialysis and filtration, PE: plasma exchage, EA: endotoxin absorption.

dotoxin absorption therapy (twice), his DIC with gabexate mesilate, antithrombin-III, thrombomodulin, and platelets transfusion, and his shock with steroid (prednisolone), plasma exchange (once), and continuous hemodialysis and filtration (8 days). His skin was treated with gentamycin ointment.

His maximum creatinine phosphokinese (CPK) value was 2,466 IU/*l* on the third hospital day, and his minimum platelet count was 18,000/μl on the sixth day. Blood flow in his neck and upper and lower extremities worsened (Fig. 3, 4). Prostaglandin E1 was administered intravenously, but was not very effective. We performed skin biopsy, and pathological finding indicated skin necrosis.

His general condition improved. We stopped the administration of dopamine on the 4th day, and we extubated on the 8th day, but his neck and upper and lower extremities became necrotic. On the 16th day when he could take meals he was transferred to a general ward.

On the 37th day, a skin graft on the neck and amputation of fingers were performed. On the 44th day, amputation of his left leg below the knee and his right foot were performed. On the 71st day, further amputation of his right foot was performed (Fig. 5, 6). Finally, on the 107th day, he was transferred to another hospital for rehabilitation.

Discussion

Bee stings sometimes cause a severe anaphylactic reaction[20]. In Japan, about 40 persons die due to bee stings each year, and most died from anaphylaxis[20]. Our case showed no anaphylactic symptoms or signs after the bee sting. Eosinophilic granulocytes did not increase, and specific IgE antibodies were negative. Bee venom contains amines (histamine, serotonin, acetylcholine), peptides (mastoparan, kinins), and enzymes (phospholipase A, hyalulonidase)[21)~23)]. These substances can cause pain, edema, hypotension, rhabdomyolysis, or acute renal failure[21)~23)]. However, bee venom rarely causes rhabdomyolysis or MOF. Ando[21] reported 1,711 cases of bee stings, and 3% demonstrated anaphylactic shock, and none had multiple organ failure or skin necrosis.

We found 18 reports[1)~18)] of MOF after bee stings in Japan since 1983. We summarized these cases and our case in Table 2. Six cases had a previous history of a bee sting. Fifteen cases were due to stings by *Vespa mandarinia*. Six of the 18 cases were fatal. In five of the six fatal cases, the patients expe-

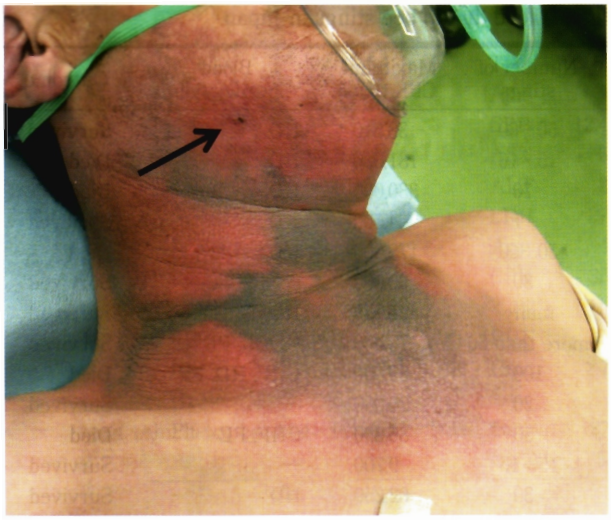

Fig. 1 Findings of neck on admission
The skin of neck was reddish. There was one bee sting wound (black arrow).

Fig. 3 Findings of neck on 2nd day
The skin of neck partially changed to black.

Fig. 4 Findings of neck, fingers and leg on 8th day
The skin of neck, fingers and toes changed necrotic.

Fig. 5 Findings of neck, fingers and leg on 28th day
The skin of neck, fingers and toes were completely necrotic.

Fig. 6 Findings of neck, fingers and leg before discharge
The skin graft of neck and amputation were finished.

rienced more than 50 stings. Good Samaritan Regional Poison Center recommends that older patients and patients with underlying medical problems should be admitted for 24 hours after an envenomation of 50 or more stings[25]. On the other hand, only one sting caused rhabdomyolysis and MOF in three cases including our case[4)14)]. Yanagawa[17] reported that cutaneous hemorrhagic or necrotic change after a bee sting may suggest that the toxicity of the venom is stronger than usual, or the individual's ability to neutralize or inactivate the venom is weak.

In five of the six fatal cases, the maximum CPK value was greater than 80,000 IU/l. It was suspected that severe rhabdomyolysis occurred. In our case skin necrosis occurred not only in the neck, but also in the fingers and legs, which were far away from the location of the bee sting. There are no other reports similar to this in the literature. It was suspected that the blood flow in the fingers and legs

was disrupted by the bee venom and septic shock.

To treat MOF due to bee stings, blood purification therapy was effective in many reports[1)~5)7)~9)11)13)15)]. In our case, the treatment of endotoxin absorption therapy, plasma exchange, and continuous hemodialysis and filtration may have been unnecessary. The condition of the patient worsened, and skin became necrotic, so we felt that all possible methods of therapy needed to be tried.

Conclusion

We report a case of shock and disseminated intravascular coagulopathy with multiple organ failure after one bee sting. This case shows that even one bee sting can cause multiple organ failure.

References

1) **Tsujimura H, Tanaka T, Oryu T et al**: A case study of acute renal failure after being astung by wasps. Kidney and Dial **16**: 351–354, 1984 (in Japanese)
2) **Ohashi H, Ishiguro M, Yasue T et al**: An autopsy case of acute renal and respiratory failure following wasp stings. J Jpn Soc Int Med **76**: 398–403, 1987 (in Japanese)
3) **Yoshida A, Orihashi K, Nishida T et al**: Multiple organ failure due to *Vespa mandarinia* stings. Jpn J Acute Med **13**: 1161–1164, 1989 (in Japanese)
4) **Fujiwara R, Amejima S, Tamai T et al**: A case of acute renal failure after bee sting. Diagnosis and Treatment **80**: 1978–1980, 1992 (in Japanese)
5) **Kanehisa Y, Makihata K, Fujiwara K et al**: Acute renal failure following the bite of the hornet. J Hiroshima Med Assoc **46**: 402–404, 1993 (in Japanese)
6) **Nishimura Y, Nagai S, Tadokoro M et al**: A case of rhabdomyolysis caused by bee sting. J Tottori Med Assoc **25**: 52–56, 1997 (in Japanese)
7) **Yamaguchi Y, Kinoshita Y**: A case of acute renal failure due to bee-sting-induced rhabdomyolysis. J Jpn Red Cross Sendai Hosp **8**: 81–86, 1999 (in Japanese)
8) **Mouri M, Hino H, Yokota E et al**: A case of recovery from multiple organ failure induced by bee stings after treatments of continuous hemodiafiltration and plasma exchange. Jpn J Clini Exp Med **76**: 1355–1358, 1999 (in Japanese)
9) **Ishii T, Hisadome T, Yamamoto A et al**: A case of multiple organ failure following hornet stings. Jpn J Acute Med **25**: 987–990, 2001 (in Japanese)
10) **Tono C, Kawamura H**: A case of rhabdomyolysis and acute renal failure after wasp stings. Iwate Prefecture Med J **41**: 31–34, 2001 (in Japanese)
11) **Konishi N, Suzuki K**: A case of rhabdomyolysis caused by wasp sting. Rinsho Derma **44**: 1125–1128, 2002 (in Japanese)
12) **Fujibayashi T, Yasuda Y, Ishimoto M et al**: An autopsied case of multiple organ failure due to *vespa mandarinia* stings. J Jpn Soc Intensive Care Med **8**: 171–176, 2001 (in Japanese)
13) **Shioshita K, Izumikawa K, Hara K et al**: Multiple organ failure due to *Vespa mandarinia* stings. J Jpn Soc Dial Ther **36**: 131–134, 2003 (in Japanese)
14) **Kobayashi T, Shirai T, Tanaka K**: Rhabdomyolysis caused by a bee sting: a case report. Skin Research **4**: 527–531, 2005 (in Japanese)
15) **Iwamura T, Kitahara M, Nakashima A et al**: A case of fatal multiple organ failure following massive hornet stings. JJAAM **17**: 67–73, 2006 (in Japanese)
16) **Yanagawa Y, Kaneko N, Okada Y**: Cutaneous hemorrhage or necrosis findings after *Vespa mandarinia* stings may predict the occurrence of multiple organ injury. National Defence Med J **54**: 11–14, 2007 (in Japanese)
17) **Yanagawa Y, Morita K, Sugiura T et al**: Cutaneous hemorrhage or necrosis findings after *Vespa mandarinia* stings may predict the occurrence of multiple organ injury: a case report and review of literature. Clin Toxicol **45**: 803–807, 2007
18) **Kajihara I, Itihara A, Higo J et al**: A case of rhabdomyolysis caused by wasp sting. Rinsho Derma **50**: 345–347, 2008 (in Japanese)
19) **Japan Society of Critical Care Medicine**: Diagnostic Criteria of MOF and MODS. J Jap Soc Crit Care Med **23**: 87–88, 2009
20) **Kobayashi M**: The present status and problem of bee stings in Japan. Igaku no Ayumi **183**: 474–475, 1997 (in Japanese)
21) **Hirai Y, Kuwada M, Yasuhara T et al**: A new mast cell degranulating peptide homologous to mastoparan in the venom of Japanese hornet. Chem Pharm Bull **27**: 1945–1946, 1979
22) **Katsu T, Sanchika K, Yamanaka H et al**: Mechanism of cellular membrane damage induced by melittin and mastoparan. Jpn J Med Sci Biol **43**: 259–260, 1990
23) **Abe T, Kawai N, Niwa A**: Purification and properties of a presynaptically acting neurotoxin, mandaratoxin, from hornet. Biochemistry **21**: 1693–1697, 1982
24) **Ando Y**: Patients with Hymenoptera stings treated at Saku Central Hospital. Review of 13 years' statistics. Jpn Assoc Rural Med **42**: 950–955, 1993 (in Japanese)
25) **Kolecki P**: Delayed toxic reaction following massive bee envenomation. Ann Emerg Med **33**: 114–116, 1999

蜂刺創による多臓器不全の1例

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蜂刺創後のショックの原因としてアナフィラキシーがよく知られているが，蜂毒そのものが多臓器不全をきたすことは稀である．今回われわれは1カ所の蜂刺創から頸部・手指・足趾の壊死，ショック，播種性血管内凝固症候群，呼吸不全，急性腎不全をきたした症例を報告する．症例は58歳，男性．アシナガバチに頸部を刺された．直後にはアナフィラキシーやショックの徴候はなかった．24時間後ショックのため当センターへ紹介搬送となった．23年前に蜂刺創の既往がある．下顎部に刺創があり頸部全体に皮膚が赤く変化していた．来院時検査所見では炎症・急性腎不全・低酸素血症・creatine phosphokinase (CPK) 増加がみられた．好酸球の増加はなく，蜂に対する特異的IgEも陰性であった．気管挿管・人工呼吸管理としICUへ収容し，グロブリン製剤・抗生剤・ステロイド・メシル酸ガベキサートなどを投与した．またエンドトキシン吸着療法 (PMX)，血漿交換 (PE)，および持続血液濾過透析 (CHDF) を施行した．CPKは第3病日に最高値2,466 IU/*l*となった．血小板は第6病日1.8万まで低下した．また，頸部皮膚と四肢末梢の壊死をきたした．プロスタグランディンE1製剤を投与した．全身状態は改善し，食事も可能となり，第16病日にICUを退室し形成外科へ転科した．壊死は改善せず，頸部に分層植皮術および，両手断端形成術・左下腿膝下切断術・右下腿膝下切断術を施行した．第107病日に転院した．我々の検索では，本邦における蜂刺創による多臓器不全の文献報告は18例であった．たとえ1カ所の蜂咬傷でも多臓器不全をきたす症例があることを認識させられた．