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A Fatal Case of Intravascular Coagulation After Bee Sting Acupuncture

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Bee stings can cause severe adverse reactions, leading to anaphylaxis, cardiovascular collapse, and death. In some cases, bee venom also induces disseminated intravascular coagulation (DIC). However, to our knowledge, there has been no fatal case of intravascular coagulation accompanied by anaphylaxis caused by bee sting acupuncture. Here, we report a fatal case of a 65-year-old woman with DIC, following anaphylactic shock after bee sting acupuncture. This case emphasizes that practitioners should consider anaphylaxis followed by coagulation abnormalities when a patient's vital signs are unstable after bee sting acupuncture.

Key Words: Venoms; acupuncture; anaphylaxis; disseminated intravascular coagulation (DIC)

INTRODUCTION

The venom of *Apis mellifera* has been used extensively in oriental medicine for many centuries and has become increasingly popular as a meridian therapy in many nations, including Korea.[1] Bee venom acupuncture is a type of herbal acupuncture taking advantage of either diluted bee venom or an actual bee sting.[2] The extracted and processed venom, or a bee sting, is applied to the relevant sites, or acupoints, according to the specific disease.[3]

Bee venom can cause a severe allergic reaction, leading to anaphylaxis, cardiovascular collapse, and death. The mortality rate is estimated to be 0.3–3%.[4] The prevalence of bee venom allergies in Korea was reported as 7.8% in rural children in a 1986 survey[5] and 5.8% in children and adults living in a rural area of Cheju island in 1998.[6]

Most bee venom cases are hypersensitivity reactions to actual bee stings. In Korea, there have been few reports of allergic reactions to bee venom acupuncture.[7-9] The first report of anaphylaxis after bee venom acupuncture in Korea was in 2002, by Song et al.[7] Cho et al.[8] reported a case of serum sickness reaction caused by honeybee acupuncture, and there was one report of fatal anaphylaxis to a bee sting after sensitization through repeated honeybee acupuncture.[9] However, no fatal case of coagulopathy accompanied by anaphylaxis caused by bee sting acupuncture has been reported, to our knowledge.

We report here a rare case of death by disseminated intravascular coagulation (DIC) following anaphylactic shock after bee sting acupuncture.

CASE REPORT

A 65-year-old woman with knee pain was treated with bee sting acupuncture by an apitherapist. When first treated, her vital signs did not change. However, 30 minutes later, after receiving a second bee sting acupuncture, she immediately presented with nausea, dizziness, weakness, generalized paresthesia, whole-body wheal, and diffuse edema. Twenty minutes later, she lost consciousness and was transferred to Chung-Ang University Yongsan Hospital. She suffered from hypertension and had taken beta-blockers and aspirin for 2 years. However, she had no history of any allergic disease. At admission, the patient was comatose, with dyspnea, generalized edema, arterial hypotension (blood pressure [BP], <60/40 mmHg), and bradycardia

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(heart rate [HR], 40 beats/min). Treatment was begun immediately on admission and consisted of saline infusion, epinephrine, prednisolone, and parenteral anti-histamine. After tracheal intubation, cardiopulmonary resuscitation, and infusions of dopamine and norepinephrine, her BP was 100/60 mmHg, and she was placed on mechanical ventilation due to respiratory failure.

At this point, the laboratory indices were as follows: hemoglobin, 14.5 g/dL; white blood cell count, 30,010/mL with 63% neutrophils and 0.9% eosinophils; platelet count, 70,000 cells/mL; total bilirubin, 0.2 mg/dL; serum alanine aminotransferase (ALT), 60 IU/L; serum aspartate transaminase (AST), 57 IU/L; prothrombin time, 10.5 seconds (normal range, 12-14 seconds); activated partial thromboplastin time, 34.4 seconds (normal range, 22-40 seconds); creatinine kinase-MB, 1.85 ng/mL; troponin-I, 0.013 ng/mL. Serum specific bee IgE was not evaluated. Blood cultures were negative. The findings from electrocardiography and brain computed tomography were normal. Chest radiography showed pulmonary edema, and abdomen radiography showed paralytic ileus. After resuscitation, arterial blood gas analysis (fraction of inspired oxygen, 0.4) revealed a pH of 7.3, pCO_2 of 23.8 mmHg, plasma HCO_3 of 11.4 mEq/L, pO_2 of 186.7 mmHg, and O_2 saturation at 99.2%. The patient was admitted to the intensive care unit.

Six hours after admission, her BP dropped to 90/50 mmHg, and her HR increased to 116/min. In addition, profuse bleeding from the upper gastrointestinal tract was noted. Laboratory analyses revealed a white blood cell count of 17,460/mL, markedly decreased hemoglobin of 3.3 g/dL, decreased platelet count of 68,000 cells/mL, and elevated ALT/AST levels of 504/455 IU/L. Prothrombin (>60 seconds) and activated partial thromboplastin (>110 seconds) times were markedly prolonged. A peripheral blood smear was normal. After injection of bicarbonate, arterial blood gas analysis (fraction of inspired oxygen, 0.25) revealed a pH of 7.190, pCO_2 of 22.5 mmHg, plasma HCO_3 of 8.4 mEq/L, pO_2 of 158.1 mmHg, and O_2 saturation at 98.6%.

Bleeding from the oronasal cavity, gastrointestinal tract, and urinary tract continued. Despite transfusion and injection of bicarbonate, her vital signs were unstable. Twenty-four hours after admission, she died of hypovolemic shock with gastrointestinal bleeding caused by DIC.

DISCUSSION

In Korea, the medical care system is divided into two streams. One is western medicine and the other, oriental medicine. Western medicine is the major part of the healthcare system among people in South Korea. However, oriental medicine is still present, as are small numbers of colleges of oriental medicine. Bee venom acupuncture is a widely used technique in oriental medicine.

Bee venom contains several active components such as apamin, melitin, phospholipase A2 (PLA2), mast cell degranulation peptide, hyaluronidase, histamine, and dopamine.[10] It has both analgesic and anti-inflammatory effects. Therefore, honeybee venom has been used for a variety of conditions, including pain syndrome, herniated nucleus pulposus, cervical disc protrusion, and progressive muscle atrophy.[1,2] However, bee venom also has serious systemic reactions leading to life-threatening conditions in some populations.[11]

The most common mechanism underlying a serious systemic reaction to bee venom is anaphylaxis, which is called type I (or immediate) hypersensitivity. Severe anaphylaxis is characterized by bronchospasm, respiratory failure, profound hypotension, and/or cardiovascular shock.[11] Even though bee venom acupuncture is administered using live bees by stimulating them to sting the affected area or acupuncture points, most apitherapists do not test for allergies before treatment. Therefore, many patients may be at risk for fatal anaphylaxis. In our case, the patient showed symptoms of an anaphylactic reaction, including hypotension, bronchospasm, and cardiovascular collapse, upon admission. After resuscitation, she exhibited coagulopathy.

Although we did not check for fibrin degradation products or antithrombin III, the laboratory and clinical findings suggested that the cause of death was DIC. She bled from the oronasal cavity, gastrointestinal tract, and urinary tract, and had prolonged prothrombin and activated partial thromboplastin times. Despite continued transfusions, she ultimately died after 24 hours due to intravascular coagulation, following anaphylactic shock after bee sting acupuncture.

Coagulation abnormalities are a relatively rare complication after bee stings.[12] PLA2 in bee venom is known to cause coagulation abnormalities.[13] In one study, a patient who presented with a typical immediate toxic reaction and a coagulation abnormality had high levels of PLA2 in the urine and serum.[13] Petroianu et al.[12] reported that in human plasma, several parameters of coagulation such as prothrombin time, activated partial thromboplastin time, and antithrombin III were affected according to the increase in PLA2 concentration. This peptide catalyzes the hydrolysis of 2-acylbonds in natural lipids, including the structural membrane phospholipids of cells, mitochondria, and other cellular constituents, and thereby inhibits cellular functions.[14] In addition, among the bee venom components, melitin is involved in the intravascular hemolysis caused by interactions with PLA2.[15]

Several immunological mechanisms of the development of coagulopathy may also be attributable to bee venom components, but further investigation is required to elucidate these mechanisms. Ratnoff and Nossel[16] suggested that antithrombin plays a leading role in the pathogenesis of blood coagulation disturbances caused by an anaphylactic reaction after a wasp sting. The anaphylactic reaction leads to the release of kallikrein and bradykinin into the circulation, and these may cause coagulation abnormalities.[17] Also, stimulated neutrophils secrete tis-

sue thromboplastin, and a similar release from basophils or mast cells may trigger the extrinsic pathway of coagulation.[18] There are a few reports of intravascular coagulopathy after a bee sting; most cases were caused by extensive wasp stings and did not have any features of anaphylaxis.[19,20] Gawlik et al.[21] reported a patient who presented with coagulation problems after a honeybee sting. The purpuric skin lesion and laboratory abnormality began 10 days after being stung, without allergic symptoms.

Here, we report a fatal case of coagulopathy following anaphylaxis induced by honeybee venom. This patient had no previous exposure or allergy history to bee stings. We believe that in this case, an anaphylactic reaction, rather than a toxic reaction, to honeybee venom mediated the development of DIC, because the number of bees used in bee sting acupuncture for knee pain is not large, and the patient exhibited typical anaphylactic symptoms and signs.

This case emphasizes that practitioners should consider anaphylaxis followed by coagulation abnormalities when a patient's vital signs are unstable after bee sting acupuncture. Additionally, this case highlights the messages that bee sting acupuncture without taking a history, especially for bee venom allergies, and without skin tests for bee venom reactions can be very dangerous, and that bee stings for therapeutic purposes may cause DIC accompanied by anaphylaxis.

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