

Severe allergic contact dermatitis resulting from occupational exposure to tincture of benzoin aerosol spray in an anesthesiologist

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Abstract

We describe the clinical presentation and management of an anesthesiologist who developed a severe allergic contact dermatitis resulting from occupational exposure to tincture of benzoin aerosol spray. A previously healthy male anesthesiologist with a small laceration between his right thumb and forefinger used a tincture of benzoin aerosol spray to improve adhesion of a small bandage immediately before performing a spinal anesthetic. He had previously used benzoin for skin reinforcement on several occasions during weight-lifting. The anesthesiologist experienced severe pruritus in the affected hand 48 h after benzoin exposure. A well-demarcated, bright red erythematous confluent vesicular dermatitis with and without painful hemorrhagic bullae erupted on the palmar and dorsal surfaces, respectively, of his hand, accompanied by pronounced edema. The palmar bullae were drained with several small incisions and the anesthesiologist was treated with intravenous methylprednisolone. He was unable to work for 10 days while the dermatitis gradually resolved. The case emphasizes that occupational exposure to benzoin represents a potential risk for operating room personnel who may be susceptible to cutaneous delayed hypersensitivity-mediated allergic reactions as a result of previous exposure to benzoin or chemically related cross-reacting substances.

Key words Benzoin · Delayed hypersensitivity · Allergic contact dermatitis · Occupational hazards

Introduction

Tincture of benzoin is commonly used to reinforce adhesive strips [1–4], which act to reduce tension, resist dehiscence, and attenuate subsequent scar formation in surgical wounds [5]. Benzoin is a balsamic oleoresin that is most frequently derived for medicinal use from the Siam or Sumatra species of the *Styrax* tree [6,7]. The

primary chemical components of Siam benzoin are benzoic acid, benzoic resinol, vanillin, and siarinetannol, whereas Sumatra benzoin also contains cinnamic acid and styrol [6]. Allergic contact dermatitis resulting from benzoin exposure is unusual [7–9]. Many of the substances contained in commercial benzoin preparations also cross-react with the chemicals in other naturally occurring resins, including balsam of Peru, storax, and tolu, that may be present in adhesives, cosmetics, and other medical products [7,10]. In this report, we describe the clinical presentation and management of an anesthesiologist (T.G.K.) who developed a severe allergic contact dermatitis resulting from occupational exposure to tincture of benzoin aerosol spray. The case emphasizes that occupational exposure to benzoin represents a potential risk for operating room personnel who may be susceptible to cutaneous delayed hypersensitivity-mediated allergic reactions as a result of previous exposure to benzoin or chemically related cross-reacting substances.

Case report

A previously healthy 36 year-old male anesthesiologist with a small superficial laceration between his right thumb and forefinger used a tincture of benzoin aerosol spray (17% benzoin in denatured ethanol and isobutene; Medici Aerosol, Aurora, IL, USA) to improve adhesion of a small bandage immediately before placing spinal anesthetic in a pregnant woman at term undergoing an elective cesarean section. After the bandage was secured, the anesthesiologist put on sterile surgical gloves and successfully performed a subarachnoid block using hyperbaric 0.75% bupivacaine with the patient in a sitting position. The anesthesiologist removed his gloves and began to check the level of the subarachnoid block. He spoke with the patient as the block was developing and, in retrospect, recalls that he briefly held his

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right hand under his left upper arm and also wiped his right eyelid and brow with his hand while conversing with the patient. The anesthesiologist is a former weight-lifter who had routinely used tincture of benzoin for skin reinforcement when he developed blisters on his hands.

Approximately 48 h after spraying tincture of benzoin on his hand, the anesthesiologist began to experience pruritus in the affected hand that progressively became so intense that he could not sleep. A well-demarcated, bright red erythematous confluent vesicular dermatitis erupted on the dorsal surface of his right hand extending into the web spaces. A corresponding, less severe light red dermatitis, concomitant with moderate pruritus, was also observed on his left upper arm and right eyelid and brow where the anesthesiologist remembered placing his hand within 15 min after it had been sprayed with the benzoin aerosol. A confluent red edematous vesicular dermatitis with intensely painful hemorrhagic bullae also appeared on the palmar surface of the affected hand. The dermatitis and pruritus of the affected hand were accompanied by pronounced edema extending from his fingers to the middle of his right forearm. The edema in his fingers was so severe that the normal spaces between them were obliterated during maximal abduction. The range of motion of his fingers was also very limited. The anesthesiologist denied systemic symptoms and a history of recent infection. Oral diphenhydramine, hydroxyzine, and methylprednisolone provided no relief of his symptoms. Topical hydrocortisone was also ineffective. A dermatology consultant confirmed the diagnosis of severe allergic contact dermatitis resulting from tincture of benzoin exposure. There was no evidence of acute infection or compartment syndrome. The palmar bullae were drained with several small incisions and the anesthesiologist was treated with intravenous methylprednisolone. The anesthesiologist was unable to work for 10 days while the dermatitis gradually resolved (Figs. 1 and 2), but he subsequently made a full recovery with no adverse sequelae. Since this episode, the anesthesiologist reports that he has experienced minor recurrences of dermatitis, located primarily between the web spaces of his first two fingers and thumb, when he has contact with patients whose surgical wounds are dressed with benzoin-reinforced bandages.

Discussion

Allergic contact dermatitis is a delayed hypersensitivity reaction (type IV) produced by T-lymphocyte infiltration in response to a chemical allergen-protein complex presented on the epidermal cell surface by Langerhans cells [5] and facilitated by expression of cytokines (e.g.,



Fig. 1. Photograph of the dorsal surface of the right hand 1 week after the development of benzoin-induced allergic dermatitis, demonstrating residual, well-demarcated vesicular dermatitis and areas of hemorrhage between the web spaces



Fig. 2. Photograph of the palmar surface of the right hand 1 week after the development of benzoin-induced allergic dermatitis, demonstrating residual, well-demarcated vesicular dermatitis

interleukin 2, γ -interferon). This mechanism is distinct from the immunoglobulin E (IgE)-mediated immediate hypersensitivity (type I) that characterizes allergic contact urticaria and anaphylaxis. The clinical presentation of allergic contact dermatitis represents a continuum ranging between mild erythema and pruritus to severe symptoms characterized by confluent vesicular dermatitis with or without bullae, edema, and intense pruritus that are very similar to those experienced by the anesthesiologist described in this case. Sensitization resulting from an initial contact to the chemical allergen enhances T-lymphocyte recruitment and exacerbates the response associated with subsequent exposure. The anesthesiologist had routinely used tincture of benzoin

for the prevention and treatment of friction skin blisters associated with weight-lifting, and these multiple antecedent applications of benzoin in this athletic setting were most likely a major contributing factor to the pronounced allergic response that he developed with the currently described re-exposure. Similar findings were previously reported in a study of tincture of benzoin-induced allergic contact dermatitis in 4500 United States Army cadets who used benzoin for foot friction blister prevention during basic training [8]. In contrast to "scratch" testing for IgE-mediated urticarial dermatitis (in which compromise of epidermal integrity is required), the diagnosis of allergic contact dermatitis is established using "patch" testing. In this procedure, known concentrations of a suspected chemical allergen are simply secured against the skin for 48 h using a flat metal plate or chamber and read 1 to 5 days after its removal following established North American Contact Dermatitis Standard Series guidelines [5,9]. A positive patch test is indicated by the presence of erythema, induration, vesicular dermatitis, and pruritus of the skin that was previously covered by the metal plate. The anesthesiologist described in the current case did not undergo patch testing, at the recommendation of the dermatology consultant, because the strong correlation between the sites of benzoin exposure (dorsal and palmar surfaces of the hand, on the posterior medial aspect of the left upper arm, and over the right eye) and the subsequent development of severe dermatitis 48 h later established the presumptive diagnosis.

Allergy to benzoin was first reported by Tilbury Fox in 1874 [11], but fewer than 100 other cases of benzoin-induced allergic contact dermatitis have subsequently been described in the literature as a consequence of a variety of medical uses [7,9,10,12–19]. The precise incidence of allergic contact dermatitis resulting from tincture of benzoin has yet to be defined. Allergic contact dermatitis to benzoin was reported in 1 of 100 (1%) consecutive hospitalized surgical patients prospectively studied by Marks and Rainey [9] in a general investigation of causes of cutaneous reactions to surgical preparations and dressings. The incidence of benzoin-induced allergic contact dermatitis was estimated to be somewhat lower, at 0.3%, in an athletic setting when used for blister prevention and treatment [8]. More recently, patch testing to compound tincture of benzoin was prospectively examined in 477 patients, and the results demonstrated that 14 (2.9%) individuals had strongly positive tests [7]. As observed in the anesthesiologist described here, 2 of these 14 patients reported previous exposure to benzoin, but 11 individuals also had at least one positive cross-reactive response to similar chemically related allergens [7]. Taken together, these data suggested not only that the prevalence of benzoin allergy may be greater than previously reported [8] but

also that cross-reactivity to related substances may play an important role in stimulating a subsequent delayed hypersensitivity response to benzoin [7]. As a result of its use as a surgical adhesive, tincture of benzoin is applied in an inherently warm, moist environment beneath dressings or plaster casts and may remain in contact with the skin for prolonged periods of time [10,14,17]. These factors may also contribute to the development of allergic contact dermatitis, and this has motivated some authors to recommend the use of gum mastic (e.g., Mastisol; Ferndale Labs, Ferndale, MI, USA) compared with tincture of benzoin as a cutaneous topical adhesive, because these substances have substantially less allergenic potential [3,6].

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