

Allergic contact dermatitis caused by a traditional Chinese medicine treatment—moxibustion

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Moxibustion is a traditional Chinese medicine (TCM) therapy using moxa wool made from dried *Artemisia argyi*, which is widely used in the treatment and prevention of various diseases worldwide by applying burning moxa to stimulate the human body surface.¹⁻⁴ The common types of moxibustion include moxa cone (direct moxibustion or

indirect moxibustion), moxa roll, and moxibustion with warmed needles. Doctors, especially traditional Chinese practitioners, believe that moxibustion has an active regulating functions of the body to improve and rectify the disturbance and dysfunction of certain organs in the body.

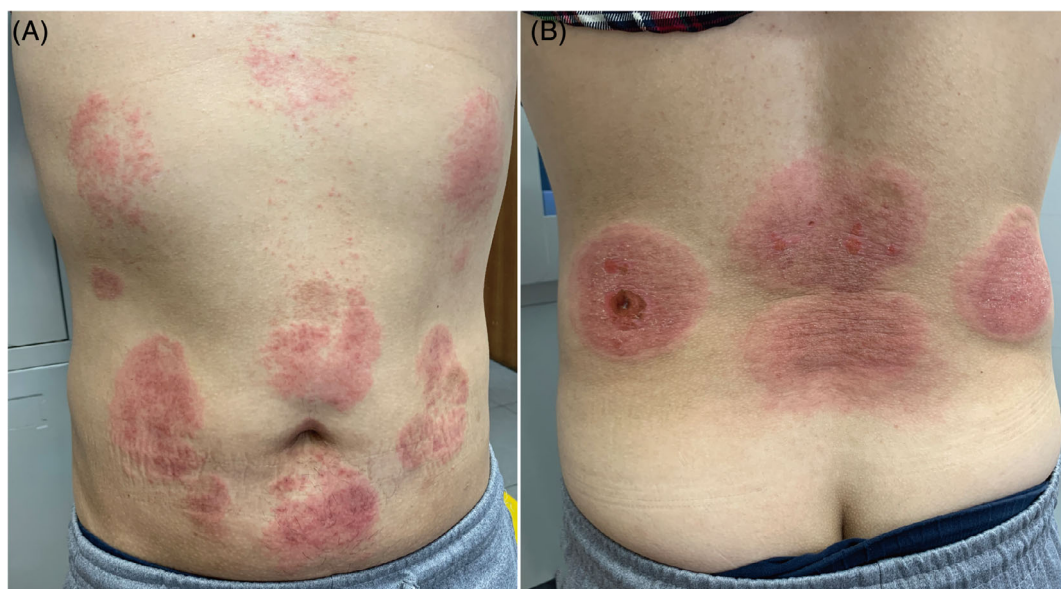


FIGURE 1 Twelve circular erythema with clear borders can be seen on the front chest, abdomen (A), and back (B), and blisters and papules are still seen on partial erythemas

Y. Su and H. Zhang contributed equally to this work.

CASE REPORT

A 28-year-old man was referred to us for 12 itchy and eczematous patches with well-defined borders on the anterior aspect of the chest, abdomen, and back, corresponding to the contact areas of smokeless packages with ignited moxa in metal boxes for indirect moxibustion

(Figure 1). Four days before, the patient purchased a moxibustion device from an online store, to achieve the purpose of strengthening the body's resistance and eliminating pathogens from the body. The method is to insert the moxa cone (burning at one end) into the box and close it, and then put the moxibustion box into the smokeless bag and fix the moxibustion area with an elastic band (Figure 2). According

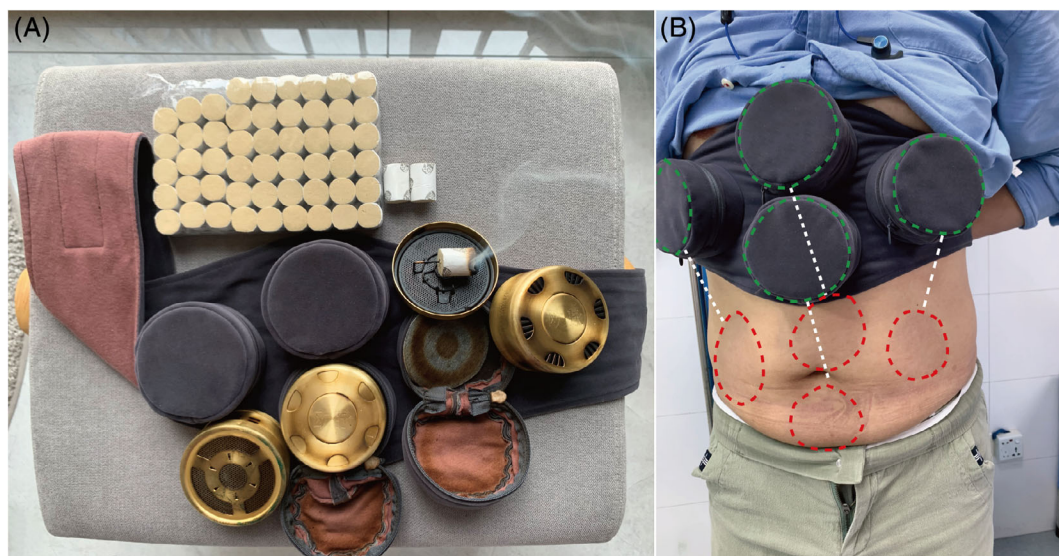


FIGURE 2 Moxibustion device using a smokeless pack design (A, B). After treatment, complete healing was achieved accompanied by pigmentation (B)

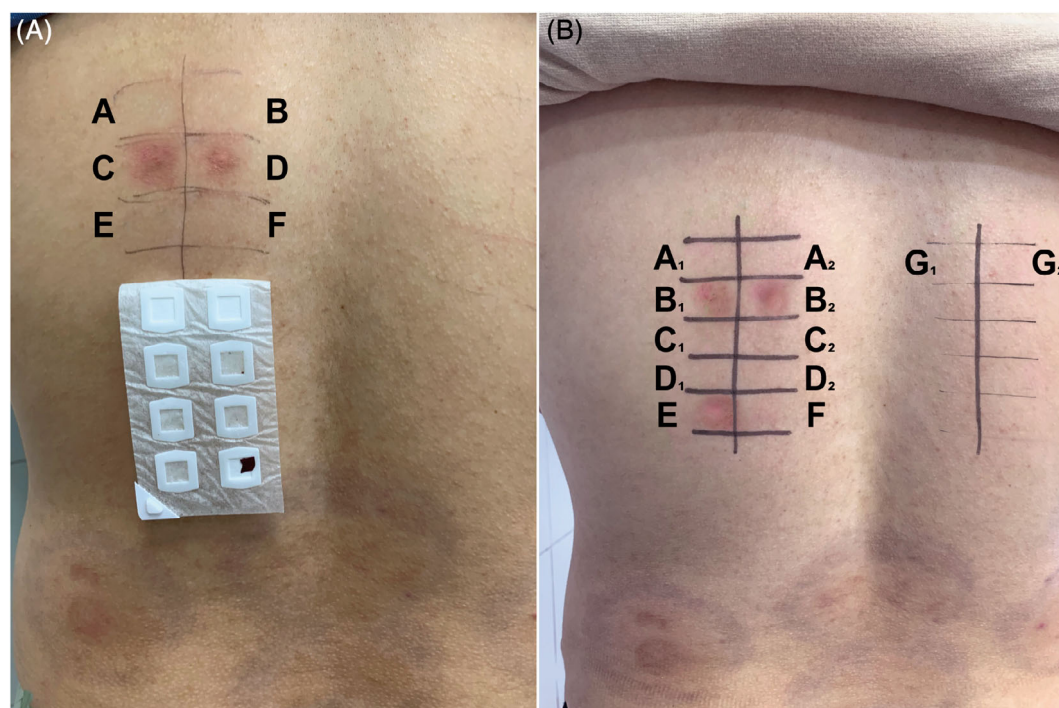


FIGURE 3 (A): Positive patch test (++) on D4, to the two different concentrations of AEEO. A: generic petroleum jelly; B: Textile material in skin-contact surface of smokeless bag; C: AAEO 5% pet.; D: AAEO 1% pet.; E: MSP 5% pet.; F: MSP 1% pet.; (B): Pigmentation and positive patch test (++) with β -Caryophyllene and eugenol on day 4. A-D and G (1/2) respectively represent caryophyllene oxide, β -caryophyllene, borneol, α -thujone, and δ -carene (1% pet. / 5% pet.) E: Eugenol 2% pet. F: generic petroleum jelly

TABLE 1 Patch test results

	Concentration	Patch test reading D4	Source
Generic petroleum jelly	"as is"	–	Aladdin, China
Textile material	"as is"	–	Moxibustion device
AAEO	1% pet. / 5% pet.	++ / ++	Moxibustion device
MSP	1% pet. / 5% pet.	– / –	Moxibustion device
(E)-beta caryophyllene oxide	1% pet. / 5% pet.	– / –	Aladdin, China
(E)-betacaryophyllene	1% pet. / 5% pet.	++ / ++	Aladdin, China
Borneol	1% pet. / 5% pet.	– / –	J&K Scientific, China
α -Thujone	1% pet. / 5% pet.	– / –	Aladdin, China
Eugenol	2% pet.	++	Chemotechnique diagnostics, Sweden
Generic petroleum jelly	"as is"	–	Aladdin, China
δ -3-carene	1% pet. / 5% pet.	– / –	J&K Scientific, China

to this procedure, moxibustion was performed on his chest, abdomen, and back in turn, each for 20 minutes and without discomfort. A day later, dermatitis developed and worsened gradually at the contact areas of the smokeless bag containing the ignited moxa box, accompanied by obvious itching and slight pain. He has no history of allergic diseases such as eczema. Hence, we suspected allergic contact dermatitis (ACD) caused by the moxibustion. Dermatitis resolved after oral prednisone (30 mg/d for 4 days) and topical hydrocortisone butyrate cream 0.1% (twice daily for 1 week). After 2 months of follow-up, no recurrence was observed (Figure 2).

Patch tests with the Chinese baseline series (Chemotechnique Diagnostics, Vellinge, Sweden) showed positive reactions to colophonium and 2-*tert*-butyl-4-methoxyphenol on day (D) 2 (+) and D4 (++). Using the unused moxa cone provided by the patient, we collected *Artemisia argyi* essential oil (AAEO) through the volatile oil extractor and collected moxa smoke particles (MSPs) through the smoke absorber. By using IQ Chambers (Chemotechnique Diagnostics), patch tests were carried out on the upper back of the patient, and six healthy controls with textile material in skin-contact surface of smokeless bag, AAEO, MSPs, and generic petroleum jelly. Tests were evaluated according to ESCD guidelines on D2/D4, and only AAEO elicited +/+ to 1% and ++/++ to 5% in the patient (Figure 3(A)), whereas no reactions were observed in six healthy controls. Thus ACD caused by AAEO was confirmed. A month later we performed further patch tests on the six most common and potentially allergenic ingredients (caryophyllene oxide, β -caryophyllene, borneol, α -thujone, eugenol, and δ -3-carene) contained in AAEO, and yielded positive reactions to (E)-beta caryophyllene (CAS no. 87–44-5) and eugenol (CAS no. 97–53-0), whereas others gave negative results (Table 1).

DISCUSSION

Moxibustion is used worldwide to prevent and treat diseases, especially in Asian countries. The mechanism is generally considered to include thermal effects, light radiation, and drug effects, and so

on.^{5,6} Moxibustion works by the MSPs and AAEO, which all contain complex chemical components.⁷

On present understanding, MSPs contain more than 20 chemical components, including borneol, thujone, camphor, eucalyptol, phenol, 4-hydroxy-4-methyl-2-pentanone, and others. The moxibustion products used by this patient has smoke filter settings to avoid possible side effects of the smoke,⁸ but severe contact allergic reactions still occurred, which were caused by the AAEO confirmed by the patch test. The AAEO contains nearly 70 chemical constituents, mainly composed of terpenes, ketones, alcohols, and alkenes, which contain some of the same chemical components (such as borneol, thujone, eucalyptol, β -caryophyllene, 4-hydroxy-4-methyl-2-pentanone, and 2,2'-dithiophene) as MSPs. Due to the complexity of the ingredients and the fact that most of them are not available as commercial allergens, we tested only the six most common allergic ingredients, and the results demonstrated eugenol and β -caryophyllene as culprit allergens in this patient.

The patient did not have obvious discomfort during the moxibustion treatment, and severe manifestations of dermatitis accompanied by itching and slight painful sensation appeared at the contact areas 1 day later. Combined with the results of patch test, it seems evident that the skin lesions were not caused by local scalding. After oral and topical glucocorticoids treatments, the skin lesions resolved quickly. To our knowledge, this is the first report of ACD caused by moxibustion. Due to the worldwide application of moxibustion as a TCM treatment, both patients and doctors should be aware of severe allergic reactions related to its use.

AUTHOR CONTRIBUTIONS

Zhen Xie: Conceptualization; formal analysis; investigation; project administration; resources; writing-original draft. **Yan Zhang:** Data curation; investigation; validation; writing-original draft. **Ya-Ting Yang:** Conceptualization; formal analysis; resources; writing-original draft. **Yang Su:** Conceptualization; project administration; resources; supervision; writing-review and editing. **Hao Zhang:** Funding acquisition;

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