

Clinical Features of Systemic Contact Dermatitis Due to the Ingestion of Lacquer in the Province of Chungcheongnam-do

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Background: Lacquer contains an allergen, which can cause severe contact dermatitis. Systemic dermatitis resulting from the ingestion of lacquer is quite common in Korea, until now.

Objective: The purpose of this study is to elucidate the clinical features and laboratory findings of systemic contact dermatitis (SCD), due to the ingestion of lacquer in Chungcheongnam-do. **Methods:** We retrospectively reviewed the medical records of 33 patients with SCD, after ingestion of lacquer from Soonchunhyang University Hospital in Cheonan, over a 6-month period. **Results:** In this study, 33.3% of patients ate lacquer, as a health food, and some (15.2%) by encouragement of friends or spouse. The most common way of ingestion was the lacquer-boiled chicken (48.5%), but many also ate lacquer tree sprouts (42.4%). The skin lesions developed as erythematous maculopapular eruptions, erythema multiforme, erythroderma, purpura, wheals and vesicles. On laboratory findings, 13 patients (52%) exhibited leukocytosis and 11 patients had elevated eosinophil counts. **Conclusion:** The general public is becoming more aware of the toxic effects of lacquer ingestion, but still does not fully understand the dangers of lacquer tree sprouts, and this ignorance is frequently causing SCD in Chungcheongnam-do. (*Ann Dermatol* 24(3) 319~

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-Keywords-

Chungcheongnam-do, Lacquer tree sprout, Systemic contact dermatitis

INTRODUCTION

In Korea, lacquer, exudates obtained by cutting the bark of *Rhus verniciflua* Stokes, has a wide variety of traditional applications, including the decoration of ornaments, furniture or dishes. Urushiol is also a key ingredient of lacquer boiled chicken, a dish that is thought to improve health¹. According to Korean traditional herbal medicine, the ingestion of lacquer is thought to be an effective treatment for gastrointestinal diseases and is thought benefit the general health^{2,3}. But lacquer, due to the presence of urushiol, a compound prevalent in plants of the genus *Rhus*, can cause localized contact dermatitis as a result of direct contact with the skin, and the ingestion of lacquer may cause systemic contact dermatitis (SCD), as a result of the active compound reaching the skin via the circulatory system⁴. Although there have been many case reports of SCD due to the ingestion of lacquer, in light of the fact that lacquer tree is still widely eaten by the Korean people, there is a need for a systematic study of the clinical features and laboratory findings of SCD. Especially in Chungcheongnam-do, eating lacquer tree sprouts in spring is a regular custom, and the frequency of developing SCD, due to their ingestion, is similar to that of lacquer-boiled chicken. This study reviewed and analyzed the clinical features and laboratory findings of 33 patients, who had developed SCD, after ingesting lacquer in the

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province of Chungcheongnam-do.

MATERIALS AND METHODS

Thirty-three patients, presenting with SCD in the Department of Dermatology at Soonchunhyang University Hospital, in Cheonan between Jan 2010 and June 2010, were enrolled in this study. All the patients involved were confidently considered to have developed SCD, due to ingestion of the lacquer as a result of their history and the time of onset. In this study, data were obtained from the retrospective study of patient's medical records. For general histories of the patients, we reviewed admission medical records for the admitted patients, and the outpatient clinic records for those patients treated in an out-patient clinic. General history included history of allergy to lacquer, the reason for and the way of ingestion, the type of skin lesion, and the general symptoms. Routine laboratory examinations, including a complete blood count, urinalysis, liver function tests, renal function tests and serum immunoglobulin E (IgE) level, were performed for some patients. We classified the skin manifestations into four groups: a localized or generalized erythematous maculopapular type, an erythema multiforme type, an erythroderma type and a separate group for other skin lesions (purpura and petechia, pustules, wheals or vesicles).

RESULTS

Characteristics of patients

The study population consisted of 13 men and 20 women (male/female ratio 1 : 1.5), who had developed SCD due to the ingestion of lacquer, and who had visited our outpatient clinic over a 6 month period (January~June, 2010). The age distribution was between 27 and 74 years old, and the majority of patients, in both groups, were in their third decade, which is reflective of the age most commonly associated with eating lacquer. Among them, 9 patients had a known history of allergy to lacquer. We also reviewed the past medical histories of the patients: 2 had a history of diabetes mellitus and 5 had a history of cardiac disease, including hypertension, arrhythmia and cardiomegaly. In regards to the occupations of the patients, housewives were the most affected group (9; 27.3%), followed by the office workers (7; 21.2%), there were also 6 private storekeepers, 2 hairdressers, 1 business man, 1 journalist and 1 firefighter, suggesting that, in this area, lacquer ingestion is spread throughout various groups in society.

The reasons for, and the ways of lacquer ingestion

Eleven patients ate lacquer as a health food (33.3%), and 5 by encouragement of their friends or spouse (15.2%). It was also ingested simply as a meal. Lacquer-boiled chicken was the most common way of ingestion (16 patients, 48.5%), but 14 patients ate lacquer tree sprouts (42.4%), and one patient ingested lacquer-boiled dog. Most of them ate it at a restaurant, but some ate it at their own home.

Clinical features and systemic symptoms of the patients

In this study, SCD after the ingestion of lacquer presented a variety of skin manifestations, which we classified into four types of the skin lesions (Table 1). The most common cutaneous features were localized or generalized erythematous maculopapular type (30 patients, Fig. 1), followed by the erythema multiforme type (2 patients, Fig. 2), and one patient presented with erythroderma type. Some patients also exhibited other skin lesions, such as purpura, wheals or vesicles.

Table 1. Types of the skin lesions

Skin lesions	Patients (n=33)
Types of the skin lesions	
Erythematous maculopapular type	30 (91)
Erythema multiforme type	2 (6)
Erythroderma type	1 (3)
Other skin lesions	
Purpura and petechia	6 (18)
Pustules	1 (3)
Wheals	8 (24)
Blisters	3 (9)

Values are presented as number (%).



Fig. 1. Generalized erythematous maculopapular type.



Fig. 2. Erythema-multiforme type.

Out of the 9 patients with a past history of allergic contact dermatitis to lacquer, 6 (66.7%) exhibited systemic symptoms. Further, of the 24 without a past history of allergy to lacquer, 13 (54.2%) exhibited systemic symptoms. These results suggest that those with a past history of allergy to lacquer easily develop more systemic symptoms.

Incubation period of the patients

Except in the case of one patient, we were able to check the exact incubation time, to the development of SCD, after the ingestion of lacquer. Forty-five percent of patients (15/33) developed cutaneous signs and symptoms of SCD within a day, with the total range for all patients being from immediately to 10 days after ingestion. The incubation times were not different for patients with a past allergic history and for those without it.

Laboratory findings

Leukocytosis ($>10 \times 10^9 \text{ L}^{-1}$) was evident in 52% of the patients from whom a complete blood cell count had been obtained (13/25). Out of those 13 patients, 11 (85%) had eosinophilia ($>70\%$), and 10 also had increased serum IgE levels. Out of the seven patients with a past history of allergy to lacquer, three (43%) had elevated serum IgE levels. On the other hand, out of the 19 patients without a past history of allergy, 12 (63%) exhibited elevated IgE. Of all of the patients, five had increased liver enzyme levels. There were no other specific findings from the other laboratory examinations, including the urinalysis and renal function tests.

Treatment

All patients were treated with systemic corticosteroids and antihistamines, which were effective for all cases. Some patients were admitted to the hospital for treatment, but

the patients with less severe skin eruptions or systemic symptoms were treated from an outpatient clinic.

DISCUSSION

Allergic contact dermatitis (ACD) is ordinarily caused by an external exposure of the skin to an allergen⁵. In people who have been presensitized to an allergen by previous external exposure, the ingestion, injection or inhalation of the same allergen may result in SCD, which develops when the allergen reaches the skin via the circulatory system⁶. ACD has been well established as a type IV immune reaction, and SCD is known to be caused through an immune system, by a wide range of substances, such as plants, including *Rhus spp.*, food additives, and antibiotics (eg. penicillin, neomycin, streptomycin and sulphonamides), as well as other drugs (eg. NSAIDs, acetyl salicylic acid, oral hypoglycemic agents, phenothiazines and benzodiazepines)⁷.

Most studies of ACD have considered poison ivy, which has urushiol produced by plants in the genus *Rhus*⁸. The genus *Rhus* contains over 150 species, with a global distribution covering most of the subtropical areas. Of which, about 30 species are thought to sensitize humans. In Korea, there are six *Rhus* species: *R. javania* Linne (var *chinensis*), *R. ambigua* Lavalley (*T. radicans*), *R. succedanea* Linne (*T. succedaneum*), *R. trichocarpa* Miquel (Japanese sumac), *R. sylvetris* Sieb. Et Zucc. (woodland sumac) and *R. verniciflua* Stokes (*T. vernicifluum*). Among these species, *R. verniciflua* is the most common cause of 'Rhus dermatitis' in Korea^{9,10}. Lacquer is obtained by tapping the tree sap through incisions in the bark. The raw sap (oleoresin) from the incised trees contains urushiol, the active antigenic component of genus *Rhus*. Urushiol acts as hapten and exhibits antigenicity, which binds with a self-protein. Urushiol contains a mixture of pentadecylcatechol (PDCs), and is comprised of either a C15 or C17 alkyl or alkenyl group on the side chain^{11,12}. Both, the saturated and unsaturated, side chains were identified and the basic molecule of PDC has a completely saturated side-chain at position 3. Desaturation of the side-chain leads to a greater antigenicity. Urushiol reacts with self-protein at the catechol phenol ring and with unsaturated side chain sites^{10,11,13}.

In East Asia, the use of lacquer for the decoration or protection of furniture, floors, tea-pots and ornaments is a widespread, and traditional, practice². Many Koreans ingest lacquer in various forms, such as lacquer-boiled chicken, a sap drink, and lacquer tree sprouts, because they are thought of as an effective treatment for gastrointestinal diseases, and generally, benefit the health. For these

reason, in contrast to other countries, lacquer-related illnesses in Korea are mostly caused by the ingestion of lacquer, which results in SCD, rather than ACD¹⁻³. Lacquer-boiled chicken, a traditional dish that consists of chicken boiled with the bark, branches and stem, is the commonest manner of lacquer ingestion in Korea. Although our study also showed that lacquer-boiled chicken was the most common way of lacquer ingestion, there were also many people who ate lacquer tree sprouts (14/33: 42.4%), due to seasonal and local factors. The data of this study were collected during the spring, and many Koreans in Chungchoengnam-do, more than in other areas, conventionally eat lacquer tree sprouts during this time in the belief that it can help overcoming spring fever.

In our study, SCD resulting from the ingestion of lacquer was slightly more common among women, which has been corroborated by another study that had a similar sex ratio³. However, in another study, male patients outnumbered the female patients¹⁴. Our patients were aged between 27 and 74 years old, suggesting that traditional folk food is not consumed solely by older Koreans. The patients also had a wide range of occupations. The most commonly affected group was the housewives, but some patients were highly educated professionals. One third (11/33) of the study population ingested lacquer as a health food, and 15.2% were persuaded by their friends or spouse. These findings suggest that Koreans, regardless of their age, sex and occupation, still consider traditional herbal food, including lacquer, to be an effective means of some disease and health.

The generally reported cutaneous manifestations of SCD are eczema, pompholyx and/or a symmetrical maculopapular rash, but rarely reported cases have presented with vasculitis or fixed drug eruption, erythema multiforme¹⁵. Systemic manifestations, such as headache, fever, nausea, vomiting, diarrhea have also been reported^{3,6}. Park et al.³ classified the skin eruptions associated with SCD into three types: a localized or generalized erythematous maculopapular rash type, which was most common, an erythema multiforme (EM) type and a generalized erythroderma type. Although EM is a rare symptom of SCD in general, it has frequently presented in patients with SCD, resulting from the ingestion of lacquer. Similarly, Kim et al.⁴ reported that erythroderma was more frequently observed in patients with a known history of allergy to lacquer (4 of 10 patients) than in those without such history (2 of 21 patients).

In our study, out of the nine patients with a history of ACD from contact with lacquer, six (66.7%) developed systemic symptoms, and out of the 24 patients without such history,

13 (54.2%) exhibited systemic symptoms. These results suggest that, if ingested, lacquer can cause SCD even in patients without a known history of allergic reaction. This is strongly supported by a study by Park et al.¹⁶, in which 12% of the patients who had no previous history of lacquer allergy exhibited positive patch-test results. There can be possibilities of patient's ignorance of their previous exposure to lacquer or cross-reaction by pre-sensitization of other materials like ginkgo.

Urushiol is a very potent allergen and it commonly causes contact dermatitis, after exposure¹⁷, and it has caused great economic loss due to debilitation of the work force¹⁴. In Korea, contact dermatitis cases comprise 5~13% of dermatological outpatients, of these cases 18% are due to plants, with lacquer tree being the most common cause^{1,14,18}. Generalized misconceptions and ignorance of the toxic nature of lacquer, combined with health official's indifference, regarding the public knowledge of these issues, is resulting in the continued ingestion of foodstuffs made from lacquer tree and developing SCD cases. SCD causes much more severe itching and debilitation than contact dermatitis resulting from direct exposure¹⁸.

Treatment of SCD is similar as the management of ACD, which is dependent on the severity of the symptoms, and consists of systemic antihistamines and corticosteroids. But prevention, which depends upon the avoidance of allergens, is the fundamental treatment⁶. To this end, there has been a recent attempt to produce urushiol removed foodstuff and drug by using a biological detoxification and heating, respectively^{19,20}. However, this new product may still cause allergic reactions, although to a diminished degree¹².

In conclusion, we found that SCD commonly occurs in Koreans after the ingestion of lacquer until now. In this study, the ingestion of lacquer-boiled chicken and the ingestion of lacquer tree sprouts were equally the most common way of lacquer ingestion in the province of Chungcheongnam-do. Although the Korean people are becoming more aware of the dangerous effects of lacquer-boiled chicken, which has been thought to be the most common way of lacquer ingestion in Korea, there is still little awareness of the dangers of other food stuffs, containing lacquer, such as sprouts. Our study highlights the importance of educating the people concerning the dangers of lacquer ingestion, considering regional factors. Furthermore, we would suggest that unsafe food, containing lacquer, should be banned.

REFERENCES

1. Lee YN. Flora of Korea. 1st ed. Seoul: Kyo-Hak Publishing,

- 1996;444-446.
2. Yun SK, Ko KB, Song IM, Choi SP, Ihm CW. Epidemiologic study on systemic contact dermatitis due to ingestion of *Rhus*. Korean J Dermatol 2002;40:253-257.
 3. Park SD, Lee SW, Chun JH, Cha SH. Clinical features of 31 patients with systemic contact dermatitis due to the ingestion of *Rhus* (lacquer). Br J Dermatol 2000;142:937-942.
 4. Kim HJ, Park YK, Lee SK. Hematogenous contact dermatitis due to ingestion of *Rhus*. Korean J Dermatol 1977;15:505-507.
 5. Choi JM, Lee JD, Kim HO, Kim CW. A case of connubial contact dermatitis due to *rhus*. Korean J Dermatol 1998;36:469-472.
 6. Rietschel RL, Fowler JF Jr. Metals. Fisher's contact dermatitis. 6th ed. Hamilton Ontario: BC Decker Inc, 2008:641-699.
 7. Oh SH, Haw CR, Lee MH. Clinical and immunologic features of systemic contact dermatitis from ingestion of *Rhus* (Toxicodendron). Contact Dermatitis 2003;48:251-254.
 8. Rademaker M, Duffill MB. Allergic contact dermatitis to Toxicodendron succedaneum (*rhus* tree): an autumn epidemic. N Z Med J 1995;108:121-123.
 9. Fisher AA. Poison ivy/oak/sumac. Part II: Specific features. Cutis 1996;58:22-24.
 10. Yoo KH, Seo SJ, Li K, Hong CK. Ingestion of *Rhus* chicken causing systemic contact dermatitis in a Korean patient. Clin Exp Dermatol 2010;35:756-758.
 11. Kalish RS, Wood JA, LaPorte A. Processing of urushiol (poison ivy) hapten by both endogenous and exogenous pathways for presentation to T cells in vitro. J Clin Invest 1994;93:2039-2047.
 12. Cheong SH, Choi YW, Min BS, Choi HY. Polymerized urushiol of the commercially available *rhus* product in Korea. Ann Dermatol 2010;22:16-20.
 13. López CB, Kalergis AM, Becker MI, Garbarino JA, De Ioannes AE. CD8+ T cells are the effectors of the contact dermatitis induced by urushiol in mice and are regulated by CD4+ T cells. Int Arch Allergy Immunol 1998;117:194-201.
 14. Kim YJ, Seo SJ, Kim MN, Hong CK, No BI. Six cases of systemic contact dermatitis caused by chicken boiled with lacquer. Korean J Dermatol 1995;33(Suppl. 5):73(Abstr.).
 15. Klaschka F, Ring J. Systemically induced (hematogenous) contact eczema. Semin Dermatol 1990;9:210-215.
 16. Park KB, Eun HC, Lee YS. A study of the prevalence of contact sensitization to *Rhus* and Ginkgo antigens. Korean J Dermatol 1986;24:22-27.
 17. Kalish RS, Morimoto C. Urushiol (poison ivy)-triggered suppressor T cell clone generated from peripheral blood. J Clin Invest 1988;82:825-832.
 18. Eun HC. Epidemiological and clinical review of contact dermatitis in Korea. Korean J Dermatol 1995;33:209-224.
 19. Choi HS, Kim MK, Park HS, Yun SE, Mun SP, Kim JS, et al. Biological detoxification of lacquer tree (*Rhus verniciflua* Stokes) stem bark by mushroom species. Food Sci Biotechnol 2007;16:935-942.
 20. Yoon SW, Park JW, Kim KS, Jung HS, Choi WC. The study on the safety and case series of the acute lymphocytic leukemia using *Rhus verniciflua* Stokes (Nexia). J Kor Oriental Oncology 2006;11:1-21.