Case Report

Healthcare Worker Having Irritant Contact Dermatitis Due to Rubber Accelerators: A Case Report

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Irritant contact dermatitis (ICD) is common among workers, especially healthcare workers, partly due to medical latex gloves. The main element found in gloves is the accelerator. Most research indicates that thiurams and dithiocarbamate groups cause allergic contact dermatitis (ACD). Rattanarak et al, 2019 reported that accelerators could cause ICD. The current research was of a 26-year-old working as a nurse in the operating room, having symptoms of erythematous rash, burning sensation, and mild itching. Opened application test of the rubber gloves was negative. The suspected glove came from the Thai rubber latex company, which declined to provide information. However, Rojruthai et al, 2022 extracted and analyzed residual accelerators from Thai rubber latex gloves and found dithiocarbamates, ZDEC, ZDBC, ZMBT, and thiuram. The worker was diagnosed with occupational ICD from rubber accelerators, thiurams and dithiocarbamate, albeit cases are rare. The worker was treated with low-dose steroids and provided access to low-dermatitis potential medical gloves. After six months of follow-up, the worker recovered. Therefore, physicians should be aware of the signs and symptoms of ICD in workers exposed to accelerators in medical gloves. Avoiding causative substances is the most effective way to avoid ICD, so providing suitable low-dermatitis potential medical gloves is essential for this group of patients.

Keywords: Case reports; Irritant contact dermatitis; Medical gloves; Rubber accelerator; Occupational

Received 19 September 2022 | Revised 1 November 2022 | Accepted 7 November 2022

J Med Assoc Thai 2022;105(12):1292-5

Website: http://www.jmatonline.com

Occupational contact dermatitis can be more common among workers, especially healthcare workers, which constitute more than 50% of affected persons[1]. Irritant contact dermatitis (ICD) is the most manifestation outcome in 44%[1]. Diagnosis of ICD can be challenging as contact urticaria (CU), or allergic contact dermatitis (ACD) must first be excluded. It is essential to determine the cause of ICD. The most common causes in healthcare workers are soaps, disinfectant products, and medical gloves[1-3]. Since medical personnel must wear gloves regularly, latex gloves represent a critical potential causative agent to rule in or out.

The essential elements in the medical gloves comprise (a) proteins from natural rubber latex (NRL), and (b) rubber accelerators, consisting of several groups, including thiurams, dithiocarbamate, thiazoles, and thioureas[4]. In the previous research, accelerators accounted for most allergic reactions to gloves and evoked ACD[2,5]. Dithiocarbamate is the most common accelerator, while only a small number of factories still use thiuram or thiuram mix[6]. However, both accelerators are typical contact allergens among patients with ACD of the hand[4].

In a 2019 study in a semiconductor factory, Rattanarak et al reported that rubber accelerators included MBTS, ZDEC, and ZDBC could cause ICD[7]. In addition, the current case report showed that rubber accelerators, thiurams, and dithiocarbamates groups may also cause ICD.

Prevention rules to protect against ICD constitute a key occupational health. The physician needs to diagnose ICD early and determine the cause. Therefore, manufacturers can be apprised of any risk posed by accelerators irritant[8]. It is important to offer suitable low dermatitis potential medical gloves for avoidance of contact with the dithiocarbamates or thiuram[9].

Case Report

A 26-year-old Thai woman worked as an operating room nurse for three years. While working, she used medical latex gloves coated with or without powder five days a week, averaging wearing gloves

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How to cite this article:

Woradee T, Chaiear N. Healthcare Worker Having Irritant Contact Dermatitis Due to Rubber Accelerators: A Case Report. J Med Assoc Thai 2022;105:1292-5.

DOI: 10.35755/jmedassocthai.2022.12.13724

four to five hours per day with handwashing eight to ten times per day. Throughout this period, there were no problems with allergy to gloves. However, the patient's unit changed to a new brand of medical gloves. After wearing these for about four hours, the patient experienced stinging and an erythematous rash on the backs of her hands, followed by slight itching. The rash did not appear on the finger web or other areas of the body. There were no other systemic symptoms and no skin papule. The presenting rash is shown in Figure 1. None of her associates had these symptoms.

The patient reported no history of other substance exposure or use of ointments on the backs of her hands during this period. In childhood, the patient had a frequent history of unexplained hives but had been asymptomatic since she was ten years old and had no other medical conditions. The patient went to an occupational medicine physician a day after the symptoms presented. It was recommended that she changed to nitrile low dermatitis potential glove. She received treatment with urea 10% in 0.02% triamcinolone cream and underwent further laboratory tests for specific IgE latex and a skin prick test by latex fluid from medical gloves, both negative. All ten controlled standard tests were similarly negative. Opened application test by rubber gloves that the patient used was a negative reaction at the cubital fossa area. The patient refused for skin patch test by some limitations.

After a week of follow-up, the erythematous rash, itching, and burning on the backs of the hands disappeared. The patient had hyperpigmented, dry, scaly skin (Figure 2). After six months of follow-up, the patient's rash and other symptoms were cleared (Figure 3). No more medication was needed on her hands, and the patient continued to use nitrile accelerator-free gloves.

Discussion

Occupational ICD was diagnosed in the present case patient, according to the symptoms, which included a well-demarcated erythematous rash, prominent burning sensation, and mild itching skin on the posterior of both hands. Symptoms were a delayed onset, occurring within 24 hours after exposure to the agent[10]. Excluding ACD by clinical, the lesion had no spongiotic vesicles presented, and opened application test was negative(5). Although CU was considered, elicitation time was delayed in the present case. In addition, specific IgE latex and a skin prick test were negative[5,10].

Figure 1. Patient had an erythematous rash, burning, and slight itching at the posterior of both hands.

Figure 2. Follow-up after one week, the patient's hands were dry, scaly, and hyperpigmented.

Figure 3. Follow-up after six months, clinical presentation completely normal.

All these symptoms were associated with areas of contact with the substance. Previously, the subject denied using of creams, new soap, or disinfectants. In addition, the patient denied doing wet work[2,10]. In childhood, the patient had a frequent history of unexplained hives suspicious of atopic dermatitis. However, in adulthood, she had no such symptoms of chronic dermatitis or other signs of allergy that would

lower the inflammatory threshold for irritants. The latter may be a predisposing factor, but it was not the leading cause of ICD in the current patient.

The patient, moreover, worked as a scrub nurse, and it had been known that certain occupations increase the risk of repeated contact with water, detergents, and disinfectants. Increased humidity can disrupt the skin barrier and increased the risk of ICD[10]. Notwithstanding, the patient's dermatitis did not show signs of chronic or cumulative ICD, with attendant scaly rash, lichenified lesions, or a reaction extending to the finger webs. Such responses are associated with repetitive exposure to wet work, detergents, and soaps[8,10]. These possibilities can be ruled out as the patient's co-workers had no irritant dermatitis symptoms, so atopy, detergents, and disinfectants played less of a role in the present case.

The most likely causative factor was wearing the new brand of medical gloves. Previously, the patient had regularly worn powdered or non-powdered medical gloves without any allergic dermatitis, but when she wore the new brand of non-powdered latex gloves, she had erythematous rashes on the dorsum of both hands within four hours.

The authors identified accelerators in original medical gloves by Safety Data Sheet and literature review[6,11]. The accelerator in original medical gloves included dithiocarbamates groups as zinc diethyldithiocarbamate (ZDEC), zinc dibutyl dithiocarbamate (ZDBC), zinc dimethyl dithiocarbamate, and zinc dibenzyl dithiocarbamates, and Benzothiazole, the most common accelerators used in medical gloves in the international market[6]. The new glove company that was used when the patient developed symptom is a Thai Rubber Latex Company group, which declined to provide information. However, Rojruthai et,al 2022 had extracted and analyzed residual accelerators from the Thai Rubber Latex gloves and found dithiocarbamates, ZDEC, ZDBC, ZMBT, and thiuram. These ZDEC and thiuram could be more recognized from the artificial sweat analysis than ZDBC and ZMBT[12,13]. However, the thiuram was not contained in the original gloves.

In concluding thiurams and dithiocarbamate groups were the most frequently identified rubber accelerator contact allergens according to global surveys of patients with ACD of the hand[4]. However, the present case showed that clinical ICD was uncommon. A single publication had similar results to the present case. Rattanarak et al, 2019 reported on a semiconductor factory case and found the cause of ICD was from the dithiocarbamate group, albeit there was no case report caused by accelerator[7]. Consequently, the present case clinical developed lesion after 4-hour of post-exposure timeline. Due to the nature of nursing job task, gloves were required for extended periods of time and cleaning hands frequently. Rubber accelerators are known to leach out at high temperatures, under extreme acid or base, or after lengthy exposure[7], especially when surrounded by isopropyl alcohol[11]. In addition, high concentrations of accelerators can cause cellular damage when in contact with the skin for prolonged periods[2,7].

The patient received an early diagnosis by an occupational medicine physician, was given topical corticosteroid, and patient changed to a low dermatitis potential medical glove[3,10]. After the patient's symptoms were completely resolved, she was ready to return to work. She was advised to switch to low dermatitis potential medical gloves[9].The ICD did not recur, confirming the hypothesis that a rubber accelerator caused ICD in the present case.

Conclusion

Thiurams and dithiocarbamate groups used in medical gloves might cause ICD, albeit rare. Preventive rules are protective. Physicians must diagnose ICD as early as possible and determine the causative agent(s). The authors recommend offering suitable gloves for patients to mitigate the development of a worsening or severe response. The risk of accelerator irritation should encourage manufacturers to limit the use of substances but also guide sensitive users to use low dermatitis potential medical gloves.

What is already known on this topic?

To the authors' knowledge, previous research, accelerators accounted for most allergic reactions to ACD. There is a rare, reported case of ICD caused by an accelerator in medical gloves, especially thiurams or dithiocarbamate.

What this study adds?

The authors described adding thiurams and dithiocarbamate groups accelerator in medical gloves can cause ICD.

Ethical approval

The present study was approved by the Ethics Committee of Khon Kaen University (EC number: HE641413).

Acknowledgment

The authors thank (a) the patient for permission to publish this report and for the clinical images, (b) the advisor for recommendations, and (c) Mr. Bryan Roderick Hamman for assistance with the English-language presentation of the manuscript.

Conflicts of interest

The authors declare no conflict of interest.

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