

Irritant Contact Dermatitis in Military Healthcare Personnel During COVID-19: Case Report

Chubin Goh (✉ chubingoh@gmail.com)

Singapore Armed Forces Medical Corps <https://orcid.org/0000-0003-4393-2273>

Wai Leong Kok

National Skin Centre

Case report

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Abstract

Background:

Irritant contact dermatitis (ICD) is one of the most commonly reported occupational skin diseases, which is hard to differentiate from allergic contact dermatitis (ACD) clinically. Failure to identify the different forms of contact dermatitis can lead to suboptimal treatment and management of the patient, with long-term impacts on occupation and quality of life. In this manuscript, we describe a case of ICD occurring in a military healthcare personnel during the COVID-19 pandemic. While the patient presented with an acute pruritic rash over bilateral hands, a clinical feature characteristic of ACD, the patch tests performed on all test series returned negative. He was eventually diagnosed with ICD.

Case Presentation:

A 18-year old military medic developed an acute pruritic vesicular rash over his bilateral hands. He was exposed to butyl gloves from his personal protective equipment as well as frequent hand washing. As confirmatory patch tests were unavailable during the COVID-19 period, he was initially managed with topical corticosteroids and barrier protection with cotton gloves. He was then reviewed by a dermatologist with the suspension of exposure through discontinuation of direct contact with butyl gloves. The medic's rash resolved with desquamation without scarring within one week of conservative treatment while waiting for confirmatory patch testing at a tertiary dermatological institution when patch test services resumed. The patch test performed on the medic's butyl glove, other gloves, standard series, and rubber series, all returned negative. He was eventually diagnosed with acute ICD to frequent hand washing and wetwork and there was no further recurrence of the rash.

Conclusion:

Occupational history and a heightened awareness of the possibility of work-related illnesses were important factors for accurate diagnosis. Prompt suspension of exposure and engineering control measures through a double glove method helped to prevent a recurrence of ICD.

Introduction

Irritant contact dermatitis (ICD) is one of the most commonly reported occupational skin diseases, which is hard to differentiate from allergic contact dermatitis (ACD) clinically. Failure to identify the different forms of contact dermatitis can lead to suboptimal treatment and management of the patient, with long-term impacts on occupation and quality of life.

In this case study, we described an individual with overlapping clinical features of ACD and ICD. We aim to highlight the importance of detailed occupational history taking and patch testing in obtaining

accurate diagnosis to guide treatment.

Case Presentation

An 18-year old male first presented with an acute pruritic vesicular eruption over his bilateral hands. He has no significant past medical history. He was serving conscript training as a combat medic and undergoing the first week of training in his new unit. The rash started over the dorsal and volar aspect of his distal forearms initially and extended to his hands and fingers bilaterally subsequently. The rash was intensely pruritic but not painful. The rest of his arms, face, trunk, and lower limbs were spared. He reported that the rash was not photo-provoked or photo-aggravated. He was otherwise well with no fever or systemic symptoms.

Physical examination revealed vesicles with surrounding erythema and areas of scaling, which was localised and conformed to the gloves distribution (Figs. 1 and 2). The rest of the photo-exposed areas including the scalp, face, V of the neck was spared. His feet and ankles were unaffected. He had no stigmata of autoimmune disease.

Exposures

The medic reported that the rash started within the first week of his training in this unit, coinciding with using newly issued personal protective equipment (PPE). He had to participate in activities including training, which required him to repeatedly wear rubber gloves, boots, mask, and protective uniform fatigues. The rash affected his ability to continue with his training and he had to stop training temporarily. He recalled undergoing basic chemical defence training five months ago during his foundation training, which involved wearing similar butyl gloves. He wore these gloves two or three times a day ranging from thirty minutes to two hours on each occasion. He developed itch after day four of exposure, with rash onset on day five of exposure, before he reported this to his superior on day six. He wore similar protective butyl coverings for his boots but there was no direct contact with the skin. There was no rash on the feet.

In terms of other exposures, he reported more frequent usage of chlorhexidine hand wash, as well as frequent hand washing coinciding with the COVID-19 period. During his training, he was also exposed to water and soap for training on decontamination procedures, once or twice a day for thirty minutes to one hour, as part of the course.

Besides, as a medic, he had no rash with wearing latex gloves previously during his training in a prior course. There were no other biological, physical, or chemical agent contact. He has no hobbies, pets, or contact history with any new agents over the area of the rash. He also did not use any new soaps or other personal clothing. He did not have any secondary jobs outside of his vocation. In addition, he did not have any history of any rash to rubber products like watch straps. As his rash started within the first week of exposure to the gloves, he was unable to ascertain if the rash improved on rest days.

Management

He was initially managed by his unit medical officer (MO) and was given topical hydrocortisone 1% cream. He was subsequently issued barrier protection using a cotton glove interface to his butyl gloves, with some improvement. However, as the rash did not resolve completely despite compliance to topical medication, a dermatologist reviewed him. He was managed topically with a combination of betamethasone valerate cream and fusidic acid, antihistamines for itch relief. Suspension of exposure through discontinuation of direct contact with butyl gloves was also advised. His rash resolved with desquamation without scarring within one week (Fig. 3). He was also concurrently referred to a tertiary dermatological institution for confirmation via a patch test. However, patch test services were unavailable at tertiary institutions during the COVID-19 pandemic.

Fitness for work evaluation

After evaluation by a dermatologist in the contact dermatitis (CD) clinic, the dermatologist issued a memo to his MO to consider discontinuation of further exposure to the butyl gloves and redeployment. The MO then reviewed the safety data sheets available including the butyl gloves product inserts to identify possible allergens. It was concluded that while butyl compounds are inert and there were no reports in the current literature of ACD to butyl gloves, the possibility of the presence of rubber accelerators and an allergy to that couldn't be conclusively excluded. His unit MO and direct superior also decided to review the working conditions in the unit compound. Given the control measures put in place, a decision was made not for unit reassignment, and he retained his vocation as a combat medic. He continues to remain free from recurrence, with strict adherence to the control measures at his workplace.

Diagnosis

Three months after the initial onset of rashes, he was reviewed at a tertiary dermatological centre, when patch test services resumed. A patch test was performed on his butyl glove, other gloves, standard series, and rubber series (including rubber accelerators), which all returned negative [1]. In this case, even though occlusion dermatitis (from gloves) was a contributory factor, but, because of the acute nature of the presentation, a final diagnosis of acute ICD due to frequent hand washing and wetwork was made.

Discussion

Diagnosis and Confirmation

Occupational skin diseases include a spectrum of conditions which include irritant contact dermatitis; allergic contact dermatitis; skin cancers, infections, and injuries; amongst other skin diseases. ACD is one of the most commonly reported occupational skin diseases in Singapore and worldwide [2].

Given the non-specific pattern of hand dermatitis, it is often clinically difficult to differentiate between ACD and ICD. A detailed occupational and social history is required to identify the possible agent. The clues for ICD are that the rash occurs more subacutely and sometimes chronic after exposure. The rash is

also more dramatic and the pain is more prominent than the itch. On the other hand, ACD tends to affect all exposed areas. In this case, the feet were spared. Hence, making the diagnosis of ACD less likely. ACD requires prior sensitisation before the presentation thus; the duration of rash from exposure may be variable. There is a more prominent itch in ACD as compared to the pain and the rash takes longer to resolve after onset [3]. Other differential diagnoses to consider include photo-provoked dermatoses such as polymorphous light eruption, infections, or blistering dermatoses associated with autoimmune conditions. However, the history and physical examination excluded these differentials.

While a clinical diagnosis may suffice in most cases, a full evaluation with a patch test is still warranted, to confirm the diagnosis in the patient. It is important to understand if he was truly allergic to the butyl gloves or other allergens [4]. The initial management was still critical, to eliminate exposure to the suspected offending agent to prevent recurrence of the rash. Butyl gloves are made of inert compounds, meant to act as protective barriers when handling hazardous material. However, there is the presence of rubber accelerators and compounds within the gloves during the manufacturing processes. Therefore, material data safety sheets are useful adjuncts for clinicians to make the correlation with the possible offending agent.

Long-term use of occlusive gloves has been reported to have a negative effect on skin barrier function, especially when the occlusion is extensive and combined with exposure to skin irritants such as soap and detergents [5]. The occlusion results in moisture trapped in the skin, resulting in softer skin that is more sensitive to irritants [6]. Hence, the cotton gloves served two functions. Firstly, it served as a barrier to prevent direct contact with the butyl gloves. Secondly, to soak up water and sweat that may accumulate in the thick non-absorbent butyl gloves to prevent ICD. This double glove technique, which includes a cotton liner, can prevent the development of the impaired skin barrier function that can be caused by prolonged wearing of occlusive gloves [7]. Chemical additives in gloves, including rubber accelerators such as benzothiazoles and thiurams, may also contribute to skin irritation; and natural rubber latex gloves have been reported to cause occupational contact dermatitis and urticaria [8].

Fitness for work

In this instance, the specialist or occupational medicine officer did not require a workplace visit. This was because the unit MO had a good understanding of the exposure, temporal sequence of the rash, and can also recommend modifications in the training, schedule, rest days, reduce exposures. The MO also has direct access and contact with the unit superiors for communication. Moreover, in the military, if it was due to ACD to the protective gloves, the medical board can decide the suitability for continued deployment and fitness for return to work.

In addition to the above, education of the affected individual is equally important to prevent recurrences out of the workplaces. Therefore, patient information leaflets or online resources should be given to enhance understanding of common materials or products with the offending agent. The unit medical officer and patients' direct superiors should also continue to monitor the individual for further recurrences, as ICD can recur in other similar settings.

Based on the hierarchy of controls by The National Institute for Occupational Safety and Health (NIOSH), different control measures can be utilised to eliminate foreseeable risk. In this case, substitution or change of personal protective equipment was not possible as the protective gloves were part of the requisite force protection posture for combat medics in this military environment. Moreover, there are no suitable alternatives in the logistics chain to replace the gloves. While engineering controls through using a “double-glove” method of donning a cotton glove before the protective glove was employed, this was not possible to eliminate using protective gloves. Administrative controls to change work processes or institute instructions to reduce exposure were deemed not satisfactory for PPE. Therefore, the decision for revocation or to change his work environment was deemed unnecessary.

Implementation and review

After the implementation of suitable control measures, regular reviews and surveillance must be conducted. The MO can also look out for trends of similar cases occurring within the unit or other units and to flag out possible alarming statistics early, to alert the authorities to review existing equipment. There was heightened awareness in this case due to the exposed individual being a healthcare worker and low barrier to access to a medical officer. However, there may be a lack of awareness of the possibility of occupational diseases in other vocations and/or units in the military. Hence, there remains a need to increase awareness of occupationally related diseases (including occupational dermatoses) in military commanders, as well as education of military medical officers to assess and look for occupational exposures. The unit should be vigilant to look out for similar conditions or introduce cotton gloves as a barrier function. This can be calibrated to at-risk personnel, especially those with a history of hand eczema, or a reported history of previous ICD of the hands. At the systems level, the military should reinforce and encourage open reporting of occupational disease.

A workplace registry is important to detect trends of occupational disease, as well as work-related illnesses. Also, a joint clinic by dermatologists and occupational medicine specialists may be useful to provide a holistic assessment of the patient; but this is only available in a tertiary dermatological referral centre. In terms of monitoring at the macroscopic level, it is important to amalgamate disease trends across other units within the military. This is important to decide if the systematic introduction of intervention and preventive measures is required for other troopers who train with protective gloves and equipment.

Learning points & Clinical relevance

While butyl gloves are mainly used in specialised areas within the military, the growing need for PPE usage in the COVID-19 pandemic necessitates increased awareness for contact dermatitis to PPE [9]. There are increased numbers of healthcare workers, as well as ancillary personnel working in the frontline who are required to don PPE. This similar phenomenon was also observed in the SARS epidemic according to a local study at the National Skin Centre Singapore [10]. Biosafety Level (BSL) 3 precautions are also undertaken when handling samples associated with COVID-19 to reduce the risk of infection in

healthcare workers [11]. This has led to the development of protective gloves used in biosafety cabinets for swabbing, which are made of heavy-duty rubber such as Neoprene [12].

In addition, it is important to recognise that latex or nitrile gloves used by healthcare workers may also result in contact dermatitis. There have been numerous studies showing glove ACD affecting healthcare workers due to their prolonged exposure with regular use [13, 14]. Rubber accelerators such as carbamates, thiurams, 2-mercaptobenzothiazole (MBT), and 1,3-diphenylguanidine (DPG) are a few of the common contact allergens identified to be responsible allergens amongst healthcare workers as well [15].

Conclusion

This was a case of a CD occurring in a medic in the military. He presented with an acute episode of localised rashes over the hands and forearms related to frequent handwashing and wetwork. A history, physical examination, targeted at exposures due to his vocation in the military revealed a recent exposure to protective gloves as part of his training, as well as significant exposure to wetwork, hand-washing, and immersion with water. Due to the unavailability of patch test services during the COVID-19 period, a decision was made for suspension of exposure through discontinuation of the offending agent. Occupational history and a heightened awareness of the possibility of work-related illnesses were important factors for diagnosis. Prompt suspension of exposure and engineering control measures through a double glove method helped to prevent a recurrence.

List Of Abbreviations

ICD: Irritant Contact Dermatitis

ACD: Allergic Contact Dermatitis

CD: Contact Dermatitis

PPE: Personal Protective Equipment

MO: Medical Officer

BSL: Biosafety Level

MBT: Mercaptobenzothiazole

DPG: Diphenylguanidin

Declarations

Ethical approval: Not Applicable

Consent for publication: There is a written patient consent available for the case study.

Availability of data and materials: Not Applicable

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Author Contributions: W.L.K conceived the original idea and led the writing of the manuscript. C.G. interviewed the patient, obtained pictorial data for the figures, and contributed to the manuscript. Both authors reviewed the final manuscript.

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Tables

Due to technical limitations, table 1 is only available as a download in the Supplemental Files section.

Figures



Figure 1

Vesicular eruption over the palmar aspect of right hand and wrist

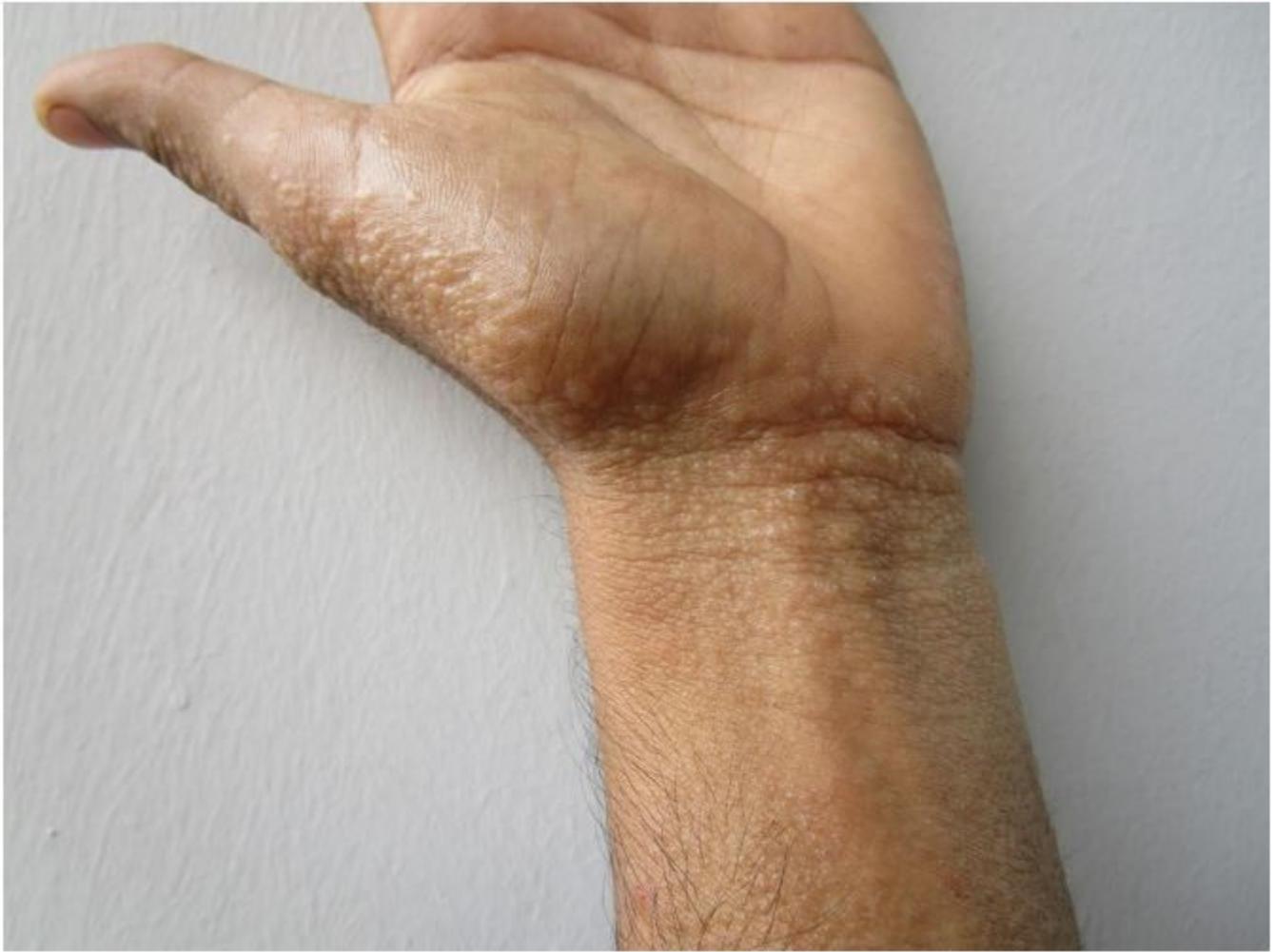


Figure 2

Vesicular eruption over the palmar aspect of left hand and wrist



Figure 3

Resolution of rash with desquamation without scarring

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [Table1.jpg](#)