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CASE REPORT

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A rare distributive shock diagnosed only by medical history and inspection

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Abstract

A 78-year-old Japanese man was in a state of shock with skin flushing. Although he denied, his wife revealed his prescription disulfiram for alcoholism. Disulfiram-ethanol reaction, even though it is a rare cause of distributive shock, could be easily and quickly differentiated only based on accurate medical history and inspection.

KEYWORDS

distributive shock, disulfiram–ethanol reaction (DER), inspection, medical history, skin flushing

1 | INTRODUCTION

Disulfiram, a selective aldehyde dehydrogenase (ALDH) inhibiter, is thought as a safe adjunctive therapy and commonly used for the treatment of alcoholism. Disulfiram–ethanol reaction (DER), a rare complication of disulfiram use, causes a distributive shock due to the effect of strong vasodilation secondary to increased serum acetaldehyde concentration. Vasodilation due to acetaldehyde is also responsible for the skin flushing. However, especially, when the patient is in a state of shock and has disturbance of consciousness, because of few adequate medical histories, it would be difficult to diagnose on arrival.

2 | CASE HISTORY/EXAMINATION

A-78-year-old Japanese man presented to our emergency room (ER) with a disorder of consciousness. Approximately 1 h prior to admission, a railway station employee found the patient sitting on the platform of

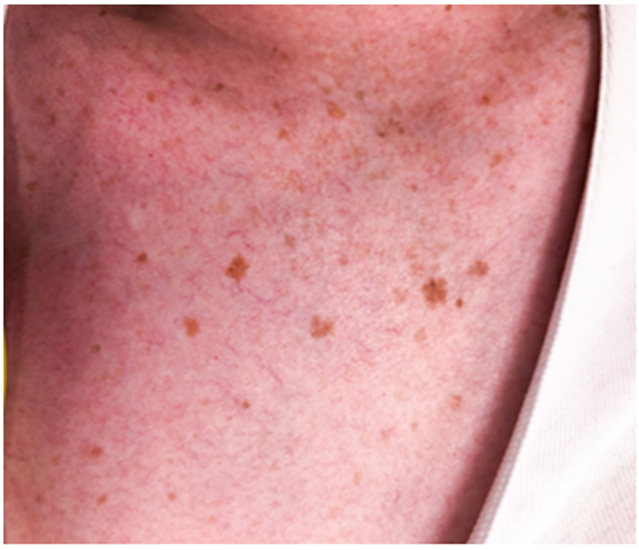

FIGURE 1 Image of the skin flushing at the precordial region.

the station alone. On arrival of paramedic staff, the patient had disorientation but was able to explain that he had been well about 3 h earlier. However, on arrival to our ER (50 min later), his consciousness was exacerbated to E3V3M5 on the Glasgow Coma Scale (GCS). Physical examination revealed systemic skin flushing and warmth of the whole body without any wheals, mucosal swelling, and pruritus (Figure 1). Although his heart rate (HR) and blood pressure (BP) were 80 beats/min and 64/33 mmHg, respectively, his body temperature (35.6°C) and oxygen saturation (97% on ambient air) were normal. Venous blood gas analysis revealed metabolic acidosis and elevated serum lactate, indicating organ hypoperfusion (pH 7.289; bicarbonate 11.3 mmol/L; partial pressure of venous carbon dioxide 23.6 mmHg; lactate 9.3 mmol/L).

3 | DIFFERENTIAL DIAGNOSIS, INVESTIGATIONS, AND TREATMENT

Based on these findings and the normal results of his electrocardiogram and echocardiography, we diagnosed this patient with a distributive shock of unknown origin and initiated fluid resuscitation with 2000 ml lactated Ringer's solution. We administered piperacillin/tazobactam as empirical therapy after performing two sets of blood culture tests, suspecting a septic shock. Other physical examinations and a whole-body computed tomography revealed no remarkable abnormalities, including signs of infection, or the cause of impaired consciousness and distributive shock. Laboratory tests showed a slight elevation of osmotic pressure (306 mOsm), serum sodium level of 141 mmol/L, serum urea nitrogen level of 16 mg/dl, and glucose level of 198 mg/dl. The osmol gap calculated from these results was approximately 7.3 mOsm, indicating an estimated blood ethanol concentration of 33.6 mg/dl. Other laboratory tests, including adrenal and thyroid hormone levels, were within the normal range.

Initial treatment led to an improvement in the patient's BP to 118/75 mmHg and consciousness level to a GCS of E4V5M6. Although the patient denied alcohol ingestion, his wife reported that he had a medical history of alcoholism with the prescription of disulfiram.

Considering the medical history, skin flushing, and clinical course, which could be differentiated from other causes of distributive shock, we strongly suspected DER as the main etiology.

4 | OUTCOME AND FOLLOW-UP

After hospitalization, his mean arterial pressure was maintained above 65 mmHg without additional crystalloid fluid, vasopressors, antibiotics, and other treatments. His serum lactate level also rapidly decreased to the normal range. Repeated history taking from him finally revealed alcohol consumption (ethanol 40 g) with 100 mg of disulfiram approximately 1 h before discovery. With an uneventful clinical course, the patient was discharged on the third day of hospitalization with no symptoms. We instructed him not to drink alcohol and also no to take Disulfiram after he drinks.

5 | DISCUSSION

The most frequent cause of distributive shock is sepsis, followed by anaphylaxis and neurogenic shock.[1] With some other causes of distributive shock, it can be difficult to make a definitive diagnosis. Acetaldehyde, the primary metabolite from ethanol by alcohol dehydrogenase in the liver, is immediately metabolized to acetate by aldehyde dehydrogenase (ALDH). Under administration of disulfiram, a selective ALDH inhibiter which is a commonly used, safe adjunctive therapy for alcoholism, alcohol-induced acetaldehyde may accumulate to blood levels of five- to 10-fold higher than those observed during the metabolism of alcohol alone.[2,3] Typical symptoms induced by high acetaldehyde concentration include nausea, skin flushing, and dyspnea, which help the deterrence of drinking.[4] However, high acetaldehyde concentration, caused by disulfiram and alcohol ingestion, could lead to distributive shock called DER because of strong arterial dilatation.[5] Its time course and physiologic changes correlate with the

acetaldehyde concentration, reaching its peak within 1 h and disappearing within several hours.[3,6] The treatment for DER, as the initial resuscitation for other distributive shock, is required immediate administration of crystalloid and vasopressors depending on its clinical course.[7] Disulfiram–ethanol reaction may also cause severe hypotension, arrhythmias, and changes in cardiac biomarkers and electrocardiography, mimicking anaphylactic, cardiogenic, and septic shock.[2]

In the ER, we need to simultaneously resuscitate the patient and make a definitive diagnosis. However, DER is difficult to diagnose because the concentration of disulfiram in the blood cannot be measured in most hospital laboratory. Moreover, when the patient is in a state of shock, shows disturbance of consciousness, or withholds information on arrival, it is difficult to even suspect DER. Therefore, it is important to start initial treatment for septic shock[8] if an unexplained distributive shock other than anaphylactic shock is suspected and to eliminate it promptly in the subsequent course of treatment and additional medical history, as in this case.

Conversely, the type of erythema is useful in differentiating DER from anaphylaxis. Urticaria, the inspection of anaphylaxis, has "edema," especially mucosal edema, associated with vasodilation and increased vascular permeability. By contrast, "flushed skin," as observed in the inspection of DER, is characterized by only erythema without edema caused by strong vasodilation of acetaldehyde. Considering these pathophysiological differences, we could easily and quickly differentiate DER from anaphylaxis by inspection, as in this case. In addition, after suspecting DER, it is also important to confirm with patient whether the medical and drug history are true or not.

Although a definitive diagnosis may be difficult upon arrival in the ER because of limited information, especially when the patient is in a state of shock, shows disturbance of consciousness, or gives false information, DER could be easily and quickly differentiated from other types of shock and other causes of distributive shock by simple physical examination and collection of an accurate medical history, in addition to the clinical course.

6 | CONCLUSION

Definite diagnosis could be difficult on arrival in ER because of few information, especially when the patient is in a state of shock or has disturbance of consciousness like this case. However, even if the patients were in such situations, primary physicians could make quickly differential diagnosis by collecting immediately true medical histories from various ways, especially from their family and attending doctors, and using simple physical examination such as inspection.

AUTHOR CONTRIBUTIONS

Ayaka Kamada: Conceptualization; data curation; investigation; supervision; validation; writing – original draft; writing – review and editing. **Takayuki Komatsu:** Conceptualization; data curation; investigation; supervision; validation; writing – original draft; writing – review and editing. **Suguru Asako:** Conceptualization; data curation; investigation; validation; writing – review and editing. **Keiko Mizuno:** Conceptualization; data curation; investigation; validation; writing – review and editing. **Hiroki Takami:** Conceptualization; data curation; investigation; validation; writing – review and editing. **Tomohisa Nomura:** Conceptualization; data curation; investigation; validation; writing – review and editing. **Manabu Sugita:** Conceptualization; data curation; investigation; supervision; validation; writing – review and editing.

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CONFLICT OF INTEREST

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DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

ETHICS APPROVAL

Ethical approval is not applicable for this article.

CONSENT

Written informed consent was obtained from the patient to publish this report in accordance with the journal's patient consent policy.

PERMISSION TO REPRODUCE MATERIAL FROM OTHER SOURCES

That permission is not required, because our article does not make use of any previously published material.

CLINICAL TRIAL REGISTRATION

That registration is not required, because our article is a simple case report.

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