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Intoxication by hand sanitizer due to delirium after infectious spondylitis surgery during the COVID-19 pandemic: A case report and literature review

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ABSTRACT

INTRODUCTION: Alcohol-containing hand sanitizers are part of the strategy to prevent person-to-person transmission during the COVID-19 pandemic. The purpose of this report was to present a case of ethanol-induced hand sanitizer intoxication after spine surgery in a patient with a postoperative delirious state. **PRESENTATION OF CASE:** A 63-year-old man was admitted to the spine department with intractable back pain as the main symptom and diagnosed with infectious spondylitis with discitis. The patient suddenly showed mental changes, resulting in a semi-comatose mental state the first day after surgery, without seizure-like activity and asphyxia. We subsequently discovered the patient had consumed half of an ethanol hand sanitizer bottle (about 300–400 mL) which was placed at the foot of the bed to prevent infection transmission during the COVID-19 pandemic. The patient did not tend to depend on alcohol or psychiatric medication in the past, and had no addiction. After seven months, the patient had complete bone union and independent ambulation.

DISCUSSION: Acute ethanol intoxication can result in life-threatening clinical effects. One of the major problems after orthopedic surgery is delirium, with the largest number appearing after spine surgery.

CONCLUSION: Hand sanitizer, mainly composed of ethanol, did not cause abnormal findings or interfere with the course of treatment of infectious spondylitis. However, it is expected that such accidents will increase, due to the increase in the use of hand sanitizers caused by COVID-19. It is, therefore, necessary to avoid potential patient abuse, especially after spinal surgery in patients at risk of delirium.

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1. Introduction

Postoperative delirium is associated with poor outcomes such as extended hospitalization [1]. Delirium is diverse and often reflects the pathophysiological consequences of an acute medical illness, medical complications, or drug intoxication [1,2]. Due to the coronavirus disease 2019 (COVID-19) pandemic, handwashing has become more critical. If flowing water and soap are not available, the use of a hand sanitizer that contains at least 60% alcohol is suggested by the Centers for Disease Control and Prevention (CDC). Hospitals often use hand sanitizers to prevent the spread of infection to patients as a strategy to prevent person-to-person transmission. As the use of hand sanitizers increases, the probability of various complications is increasing and expected. This report details ethanol-based alcohol sanitizer intoxication in patients in a delirious state after infectious spinal surgery during the COVID-

19 pandemic. This article has been written according to the SCARE criteria as described by Agha et al. [3].

2. Presentation of case

This case study was approved by the relevant institutional review board and informed written consent was obtained from the patient for publication of this case report and accompanying images.

A 63-year-old man was admitted to the spine department with intractable back pain as the main symptom, and diagnosed with infectious spondylitis with discitis on MRI. He underwent more than three months of conservative treatment with antibiotics and orthosis in a local clinic. The patient had progressed to a collapsing disc space, and infectious spondylitis at the L3–4 level with an epidural abscess (Fig. 1).

Epidural abscess drainage through posterior decompression and morselized interbody bone graft with pedicle screw fixation was performed (Fig. 2). The first day after surgery, the patient presented with restlessness and disorientation without neurological symp-

Abbreviations: MRI, magnetic resonance imaging; CT, computed tomography; CK, creatinine kinase; CK-MB, creatinine kinase myocardial band.

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Fig. 1. Collapsing disc space, and infectious spondylitis at the L3-4 level with an epidural abscess in MRI and CT.

toms. We consulted the psychiatric department and the patient was scheduled for oral medication. Thirty minutes later, the patient suddenly showed a mental change; he fell into a semi-comatose mental state without seizure-like activity and asphyxia. He was unresponsive to any voice or pain stimulation, except for voluntary lower extremity movement (hip, knee, and ankle contractions). The skin of the whole body was reddish and warm, but afebrile. The pupil light reflex was intact. Hemoglobin was 10.4 g/dL; blood pressure was approximately 108/67 mmHg; self-respiratory rate was 30–40 times per minute; heart rate, 120 beats/min. Oxygen saturation of 96% in room air. A finger-stick blood sugar level was 128 mg/dL. The intravenous parenteral fluid was normal saline.

We urgently consulted a neurologist and examined the emergent brain computed tomography (CT) and perfusion brain CT. There was no infarction or hemorrhage in the brain from the radiologic results, and we were informed that semi-comatose mentality was not the cause of brain disease. However, the neurologist did not rule out a silent seizure, and recommended aspirin and statin administration under Levine tube insertion. A lorazepam injection was performed due to suspected silent stroke and prevention of transient ischemic stroke. Arterial Blood Gas Analysis (ABGA) and laboratory results showed an increase in lactic acid, CK, and anion gap with a decrease in $p\text{CO}_2$. As for the result of CK-MB, the possibility of cardiac origin was low. The respiratory rate was 30–40 times per minute in the state of compensatory hyperventilation due to lactic acidosis. Systolic blood pressure was maintained at around 100 mmHg, and urine output was below 50cc/Hr. However, there was a possibility of transition to a septic condition. An infection specialist recommended the prescription of cefazolin with vancomycin and ceftriaxone prior to obtaining the intraoperative culture results. The patient's inputs and outputs were monitored and balanced, as was ABGA, and frequently followed up.

The patient's status was conferred to his family and we admitted him to the Surgical Intensive Care Unit (SICU) for observation.

The patient stabilized, and 10 h later started waking from the semi-comatose mental state. Upon regaining full consciousness, he stated that he had drunk half of a bottle of hand sanitizer (70% ethanol, 3 M Health care, St. Paul, MN) which had been placed at the foot of the bed to assist in the prevention of infection transmission during the COVID-19 pandemic. We confirmed the amount to be approximately 300–400 mL. The patient did not have a history of alcohol consumption or psychiatric medication and had no dependence. The blood alcohol level was slightly elevated at 100 mg/100 mL.

The patient complained of heartburn in the epigastric area; a gastroscopy was performed and a duodenal ulcer was diagnosed. He was treated for the ulcer with proton pump inhibitor medication, without gastric lavage. Delirium was controlled with haloperidol through psychiatric consultation.

After discharge, there were no adverse problems at the operation site of the infectious spondylitis. After seven months he had achieved complete bone union (Fig. 2), resolved the inflammatory reaction, and independent ambulation.

3. Discussion

In 2007, the first case of intoxication caused by the ingestion of an ethanol-based hand sanitizer was published [4]. In this first report, the patient recovered through fluid supply and haloperidol, with no sequelae, as in our case. Acute ethanol intoxication can result in life-threatening clinical effects, including hypothermia, central nervous system and respiratory depression, cardiac dysrhythmias or arrest, hypotension, nausea and vomiting, acute liver injury, and lactic and ketoacidosis [5]. Blood alcohol concentrations



Fig. 2. Epidural abscess drainage through posterior decompression and morselized interbody bone graft with pedicle screw fixation was performed, and seven months later had achieved complete bone union.

of 150–250 mg/100 mL are usually associated with intoxication, but are fatal in the range of 400 mg/dL or greater; although death has occurred at lower levels [6]. Moreover, treatment primarily consists of symptom-directed supportive care. However, hemodialysis is considered for severe life-threatening poisoning. Patients usually make a complete recovery provided by supportive care [7], but other causes of death have also been reported [6,8,9].

Delirium is usually a sudden, reversible disturbance of mental function. It is characterized by an inability to pay attention, disorientation, an inability to think clearly, and fluctuations in levels of consciousness. Clinically, delirium occurs in hyperactive, hypoactive, or mixed forms, based on psychomotor behavior [10]. Postoperative delirium is associated with poor outcomes, such as functional decline and extended hospitalization. The etiologies of delirium are diverse and multifactorial and often reflect pathophysiological consequences [1,2]. However, there are no reports of postoperative delirium induced by hand sanitizer intoxication.

One of the major problems after orthopedic surgery is delirium, with the largest number appearing after spine surgery [11]. The risk factors and incidence of delirium after spinal surgery occur more frequently in patients over 70 years of age, with decreased hemoglobin on the first day after surgery [12]. Preoperative C-reactive protein (CRP) is significantly higher in those with delirium compared to those without, and there were no cases of spinal infection in a previous study [12]. In our case, the patient was under

70 years of age. Preoperative hemoglobin level was 12.0 g/dL and postoperative first day, hemoglobin was 10.4 g/dL on the day of delirium, and there was a significant difference from the postoperative period. However, spinal infection caused a high CRP of 16.4 mg/dL (normal: < 0.3 mg/dL). According to a systemic review and meta-analysis, the incidence of delirium after spine surgery is 8%, and there are significant differences in developing delirium with age [13]. In elderly patients after lumbar spine surgery, risk factors associated with delirium were male gender and parkinsonism, and lower baseline Mini-Mental State Examination (MMSE) scores showed a more regular occurrence rate [14].

Studies on the effect of alcohol consumption on postoperative surgical wound infection or complications have shown contradictory results [15–18]. Furthermore, there are no studies about the impact of alcohol on postoperative outcomes in infectious spine disease. However, current recommendations regarding preoperative alcohol consumption trend toward overall alcohol cessation, regardless of the procedure. In a meta-analysis of primary spine fusions from 2005 to 2013, alcoholism was a major risk factor for pseudoarthrosis [19]. Acute alcohol exposure resulted in significant impairment of fracture callus tissue formation, disturbing the Wnt pathway, and disruption of Wnt-mediated transcription. In alcohol-abusing individuals, impaired fracture healing is observed, which accelerates the activity of osteoclasts by inducing IL-1 β , IL-6, and TNF α expression and activating RANKL [20].

4. Conclusion

Hand sanitizer, mainly composed of ethanol, did not cause abnormal findings or interfere with the course of treatment of infectious spondylitis. However, it is expected that such accidents will increase, due to the increase in the use of hand sanitizers caused by COVID-19. It is, therefore, necessary to avoid potential patient abuse, especially after spinal surgery in patients at risk of delirium.

Conflicts of interest

The authors have no conflict of interests to declare.

Sources of funding

The authors have no conflict of interests to declare.

Ethical approval

This case report has been approved by institutional review board (IRB) of Sanggyepaik Hospital, Inje University with waived informed consent (SGPAIK2020-07-009).

Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images.

Author contribution

Dong-Ju, Lim - study concept, design, writing the paper and data interpretation, data collection, data analysis.

Registration of research studies

Institutional review board of Sanggye paik Hospital, Inje University with waived informed consent (SGPAIK2020-07-009) and informed written consent was obtained from the patient for publication of this case report and accompanying images.

I will send the documents if you want.

Guarantor

Dong-Ju, Lim.

Provenance and peer review

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