

A Rare Chemical, Biological, Radiological, and Nuclear Hazards Event: Asphalt Burns

Orhan Delice and Halil Ibrahim Doru

Department of Emergency Medicine, Erzurum City Hospital, Erzurum, Turkiye

ABSTRACT

Chemical injury in chemical, biological, radiological, and nuclear hazards (CBRN) occurs as a result of exposure to chemical warfare agents or chemical substances after a work accident. Asphalt is a chemical substance and asphalt burns occurring after a work accident are an example of these kinds of burns. The risk of burns due to asphalt material at high temperatures is high for workers engaged in road and roof construction. Most of these burns occur on the face and upper extremities. Different substances are used for skin decontamination in CBRN events. There is no clear consensus on initial approaches to decontamination of asphalt or its derivatives on skin surfaces. In the present case, asphalt residues were found in various parts of the patient's body as a result of isolated high-temperature asphalt exposure. In this case, sunflower oil was used as a solvent after early cooling with water, and the results are presented.

Key Words: *Work accident, Asphalt burns, Sunflower oil, CBRN hazards.*

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INTRODUCTION

Burn is an important health problem caused by damage to the epidermis and dermis layers of the skin, and in some cases, the subcutis, muscle, and bone system at different depths and widths by the effect of heat, electricity, or chemicals.¹ Burns caused by chemicals such as hot tar, asphalt, or their derivatives such as pitch, are considered specific thermal injuries. These substances are very difficult to remove after exposure without causing skin damage. Asphalt, also known as bitumen, is a viscous liquid or semi-solid form of petroleum. Petroleum asphalt is a high boiling point fraction in crude oil components that is refined after the decomposition of crude oil into petroleum gas, gasoline, kerosene, light oil, and heavy oil. Burns caused by the above-mentioned chemicals accounted for approximately 1.8% of all burnt patients hospitalised over 2 years in some units.²

Asphalt is mainly used for paving roads in modern cities. In the paving process, asphalt is heated to 160–250°C to liquefy and be laid on the roads. As asphalt hardens faster than cement concrete, it is more often used for paving.³ In general, the importance of early cooling and the use of liquid solvents, or petroleum-based ointments are emphasized to remove pitch, tar or asphalt.³

In the present case, sunflower oil was used for the decontamination of asphalt from the skin of a patient with high-temperature asphalt burn. In this study, we aimed to discuss the results of the use of sunflower oil in asphalt burns.

CASE REPORT

An accident victim, a 21-year male, was admitted to the emergency department with a post-explosion injury from an explosion due to the high pressure while pouring asphalt from the asphalt tank during road construction work. The vital signs of the patient on arrival consisted of an oxygen saturation level of 95%, blood pressure of 110/75 mmHg, and heart rate of 110 beats/min, and there was no previous disease history.

The patient was conscious, oriented, and cooperative during the physical examination. There were widespread asphalt residues on both upper extremities, starting from the middle of the arms and extending to the fingertips, circularly on the neck, and covering the scalp in the entire occipital region (Figure 1). Except for asphalt exposure, there was no sign of additional trauma. The asphalt residues in the burn areas of the patient with severe pain were monitored in the decontamination unit by administering 2 L/min oxygen under 5 mg midazolam and 60 µg of fentanyl sedation analgesia. Liquid sunflower oil-soaked pads were kept on the lesion areas for 20 minutes, and then the wound was cleaned by rubbing (Figure 2). No excision was performed on any burned tissue. However, after the asphalt residues of the patient were removed, it was observed that there were second-degree burns in some areas. These areas were closed with antibiotic ointments. The process took about 4 hours. The patient, freed from asphalt residues, was admitted to the emergency intensive care unit for follow-up and treatment, and later, the treatment was continued in the burn

Correspondence to: Dr. Orhan Delice, Department of Emergency Medicine, Erzurum City Hospital, Erzurum, Turkiye
E-mail: orhandelice@gmail.com

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centre. The patient was discharged without any complications regarding treatment and follow-up. Antibiotic ointment was used both to soften the bitumen and to prevent subsequent infections. No scar tissue developed in the patient on follow-up. Debridement was not needed. Healing without sequelae was achieved. The infection did not develop.



Figure 1: The distribution of asphalt residues in the patient.

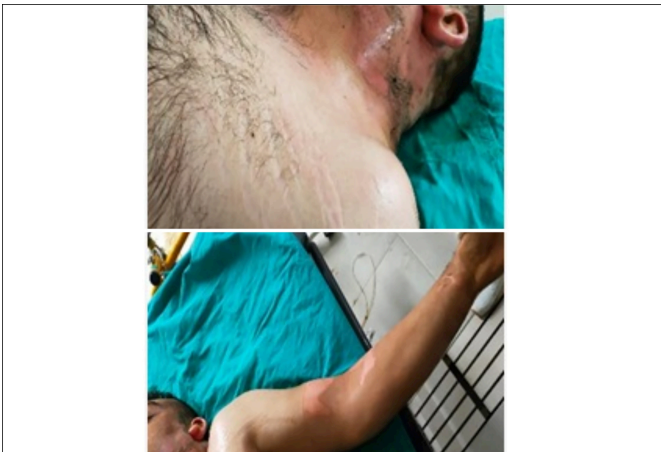


Figure 2: Areas made free of asphalt residues in the patient by sunflower oil treatment.

DISCUSSION

Rapid and effective intervention should be achieved after exposure to caustic chemicals. Chemical burns due to occupational accidents are a critical problem worldwide as well as in this country. Asphalt burns constitute some of the burns due to this chemical substance.

Workers should wear protective clothing according to the type of work for possible occupational accidents within the scope of occupational safety. In the past, all burns were treated with

manual debridement after soaking in cold water. However, this treatment technique is very painful as well as increases the depth of the injury due to the damage it causes to the skin. Cold water immersion may be helpful for patients with mild burns that occur soon after the accident. Various chemicals have been used to clean the asphalt from the skin in asphalt burns. For instance, studies have proven that using baby oil in such burns is very effective, fast, and painless.⁴ Sunflower oil is another substance used in asphalt burns. Sunflower oil, which purifies the asphalt from the skin by emulsification, is an efficient, safe, easily accessible, and inexpensive method. It is used as cooking oil, an edible product safe for both the skin and the oral mucosa, and can be provided easily.⁵ Liquid solvents such as kerosene, gasoline, acetone, and alcohol have been determined to be toxic in asphalt burns, and this is another issue that should be kept in mind.⁵ In this case, sunflower oil was used for skin decontamination of asphalt residues and it effectively removed asphalt residues from the skin.

In conclusion, sunflower oil can be safely used for the decontamination of asphalt residues from the skin surface in cases of accidental asphalt burns. It is an effective, safe, easily accessible, and inexpensive method.

PATIENT'S CONSENT:

Written informed consent was obtained from the patient.

COMPETING INTEREST:

The authors declared no competing interest.

AUTHORS' CONTRIBUTION:

OD, HID: Designed, drafted, and approved the final version of the manuscript to be published.

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