Chemical Contact Burn with Ready-Mixed Concrete: A Case Report

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Introduction

Ready-mixed concrete is one of the main components used by the construction sector. Ready-mixed concrete causes an allergic reaction to the skin and may cause eczema. It may also cause alkali burns due to substances added into its formula. There is not much awareness and experience among constructions workers, the general public, and health care professionals about the chemical contact burns caused by ready-mixed concrete. Here, we report a burn caused by ready-mixed concrete in a patient who was admitted to our burn unit (which has been in active service for 16 years). The patient had full-thickness contact burns that occurred while working with ready-mixed concrete. Our aim was to share our experience with this rare burn type with physicians working in burn units.

Case Report

A 48-year-old previously healthy construction worker bought ready-mixed concrete for his household repair. He stepped on the concrete to spread it with his boots on, and some amount of it poured inside the boots. The patient did not take care of it at the beginning. However, after feeling an increase in temperature in his feet, he removed his boots and noticed redness and experienced itchiness on his feet. The next day, he presented to our hospital's burn unit due to darkening of the redness and new onset pain. On physical examination, he had third-degree burns in a circular-pattern in both lower extremities below the knees involving the ankles; he also had similar burns affecting the dorsal aspect of both feet extending to the toes (Figure 1). His medical history was unremarkable. The patient was admitted to our burn intensive care unit (Ankara, Turkey) for treatment. His treatment plan included daily dressings and 2 debridement procedures. On day 10 after the burn incident, after granulation tissue was formed, the defects were closed with a split-thickness skin graft taken from the thigh region (Figure 1D). The patient was discharged uneventfully.

Figure 1 *(A to C) Burned areas of foot, ankle, and leg. (D) Burn wounds after graft procedure*

Discussion

Although burns usually occur as a result of preventable causes in the household, there also exist some burn types that occur due to extremely rare causes. Burns due to chemical causes are rare, and their treatments are less known. This reported case was our first ready-mixed concrete burn case treated at our burn unit. Contact burns with ready-mixed concrete are usually seen in lower extremities, knees, ands, and fingers. The total burn area is usually not extensive, ranging from 5% to 15%. In the present case, the patient had third-degree burns in both lower extremities, affecting a total area of 10%. As stated in the literature, excision and grafting are performed in more than 75% of reported cases due to the full-thickness nature of ready-mixed concrete contact burns. The literature has also reported that, compared with other burn types, a need for a longer hospital stay and regrafting may appear in this type of burn.1,2 In our case, we similarly performed excision and grafting, and the patient did not need regrafting. More than half of individuals exposed to this type of burn have no knowledge of the ready-mixed concrete's burn risk and thus take no protective measures

Conclusions

We believe that the use of protective gears and taking necessary measures can prevent such burns in both professional and nonprofessional users of these materials.

READY-MIXED CONCRETE

The chemical content of a typical ready-mixed concrete bag used for construction work includes

- Portland ready-mixed concrete (clinker),
- Chalk (limestone or $CaCO_3$),
- Trass (SiO_2, Al_2O_3, and Fe_2O_3), and
- Gypsum ($CaSO_4.2H_2O$).

The ready mixed concrete forms a basic solution (pH 11-14) upon contact with water. This solution has an irritant effect after contact with eyes and skin. The material is allergic and may lead to skin eczema due to its trace chromium (Cr-VI) content.

According to the manufacturers' statements, the main problem is that factories producing ready-mixed concrete add various chemicals into it to increase its liquidity, promote rapid freezing, and prevent it from being affected by cold. It is stated that addition of these chemicals may augment its effects on skin.

TO DO WHEN CONTACT WITH READY-MIXED CONCRETE

Contacted skin site produces

- Pain,
- Burning sensation
- Erythema
- Vesicles

- Full-thickness skin burns and necroses occur within the first 12 to 48 hours after contact.
- Limestone (calcium oxide) found in the ready-mixed concrete passes through clothes when contacted and reacts with sweat on the skin, producing chemical alkali burn.

- Upon contact with ready-mixed concrete,
  users should remove all clothes immediately and
  wash themselves with plenty of water.

The use of neutralizing agents is not recommended because these agents may react with chemicals in the ready-mixed concrete and worsen the lesions.