

Skin and Subcutaneous Injuries with Peroneus Nerve Paralysis Induced By Suction from a Drain in a Hot Spring

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Article History

Received: 14.08.2018

Accepted: 26.08.2018

Published:30.08.2018

DOI:

10.36347/sjmcr.2018.v06i08.028



Abstract: A 48-year-old obese woman with hypertension stayed at a hot springs inn while on vacation. When she sat near the uncovered drain at the entrance to the spring's filtration system, her left thigh became sucked and trapped by the drain, and she was unable to escape on her own. The rescuers were able to successfully pull her out and transported her to the hospital. On arrival, she had left subcutaneous hemorrhaging with multiple small blisters on the left thigh with severe pain and left peroneus nerve paralysis. The patient was treated by conservative therapy and then transferred to the local hospital near her home. To our knowledge, this is the first case of skin and subcutaneous injuries with peroneal nerve paralysis induced by suction from a drain in a hot spring. The patient's thigh was so large it completely covered the drain at the entrance to the filtration system. In addition, the owner of the spring had neglected to install a grilled cover over the hole, so the suction power was increased. These two elements resulted in a rare case of suction injury.

Keywords: suction injury; hot spring; filtration system.

INTRODUCTION

Swimming pools and bath suction injuries are quite rare but carry a substantive risk of fatal drowning consequences [1-4]. The present case of a 48-year-old woman who became trapped when her thigh was stuck by suction to an unsecured drainage hole illustrates the characteristic of this problem in an interesting way.

CASE PRESENTATION

A 48-year-old obese woman with hypertension stayed at a hot springs inn while on vacation. When she sat near the uncovered drain at the entrance to the spring's filtration system, her left thigh became sucked and trapped by the drain (Figure 1). She was unable to escape on her own, so she sought help from nearby guests in the hot springs room. Rescuers initially stopped the filtration system and then tried to drain the water from the bath and were ultimately able to successfully pull her out, transporting her to our hospital.

On arrival, she had a blood pressure of 120/80 mmHg, a heart rate of 100 beats per minute, a

respiratory rate of 20/minute, an oxygen saturation of 98% under room air, and an axillary temperature of 38.9 °C. She had left subcutaneous hemorrhaging with multiple small blisters on the left thigh with severe pain (Figure 2) and left peroneus nerve paralysis. The main results of a biochemical analysis of the blood were only leukocytosis (11,400/ μ l). She received conservative therapy for the left thigh lesions and paralysis. Magnetic resonance imaging on the third hospital day showed only subcutaneous edema without muscle lesions (Figure 3). On the fifth day, she was transferred to a local hospital near her home, and while the pain in her thigh had improved, the peroneal nerve paralysis had not improved.



Fig-1: Covered drain at the entrance to the spring's filtration system. The patient's left thigh became sucked and trapped by the uncovered drain

The patient had left subcutaneous hemorrhaging with multiple small blisters on the left thigh.



Fig-2: Visual findings on arrival

MRI showed only subcutaneous edema without muscle lesions.



Fig-3: Magnetic resonance imaging (MRI) on the third hospital day

DISCUSSION

To our knowledge, this is the first case in a medical English journal concerning skin and subcutaneous injuries with peroneal nerve paralysis induced by suction from a drain in a hot spring.

The Sankei Shinbun in December 28, 2010, reported the results of the Consumer Affairs Agency's research concerning suction injuries suffered at hot springs or in public baths. The agency reported 11

accidental cases from April 2000 to November 2010, including femoral nerve injury in a 70-year-old woman and mild leg injury in a 4-year-old girl. The Consumer Affairs Agency encouraged relevant industries to attach covers with metal plates over the suction hole or to make double-layered suction holes.

There have been two Japanese reports and two non-Japanese reports published concerning traumatic cases associated with suction hole injury. In Japan,

both reports described cases of scrotum injury in the bath due to a suction hole with a grille cover[3,4]. The scrotum is a thin sac of skin protruding from the body wall that is located near the bottom of the body when in a sitting position. The key function of the scrotum is to maintain the temperature of testes at roughly 1 to 8°C below the normal body temperature, and it contracts due to sexual stimulation, exercise, and the cold, while expanding when warm. Japanese people sit in the bath and hot springs while naked; accordingly, the scrotum, expanded by hot water, can easily become sucked into the drainage hole.

Both of the non-Japanese reports described cases of gluteal and hand injuries due to exposure to an unsecured drainage hole at the entrance to the filtration system in a swimming pool [1,2]. The intake of a pool's filtration system may generate sufficient negative pressure to induce acute soft tissue injuries, including compartment syndrome of the interosseous muscles, requiring acute surgical decompression. Inagaki *et al.* reported that the negative suction power generated by the filtration system in a pool was 1kg/cm². [5] In Japan, a girl in second grade of primary school died after being sucked through an uncovered suction hole at the entrance to the filtration system at the Fujimino Public Pool on July 31, 2006. In the present case, patient's thigh was so large it completely covered the drain at the entrance to the filtration system. In addition, the owner of the spring had neglected to install a grilled cover over the hole, so the suction power was increased. These two elements resulted in a rare case of suction injury. The localized and often bizarre, large swellings and suffusions associated with such injury can be treated nonoperatively in the vast majority of cases, similar to the present case[2].

While prophylactic arrangements are widely reported, problems remain with their strict application. In order to prevent such injuries, it is important to inform the public and increase their awareness of the risk of these injuries[2].

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