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The Steam Humidifier Hand Burn in Infants, A Case Report

Ken-ichi Homma *and Kei Numazaki **

** Sapporo Aesthetic Plastic Surgery, Sapporo, 060-0003 Japan*

*** Department of Virology III, National Institute of Infectious Diseases,
Tokyo, 208-0011 Japan*

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ABSTRACT

The aim of this study is to present the problems of steam humidifier burn victims and to warn not only customers but also the manufacturers of them, concerning their inherent dangers. We experienced six cases of infants' hand burn caused by the steam humidifier between the years of 1995 to 2004. The age of the patients ranged from 7 to 19 months and the average was 11 months. Three out of six patients suffered scar contracture and needed a skin graft. All six patients suffered burns to one palm of their hands. As the parents did not think that the steam humidifier might cause severe burns and left the humidifier unattended on the floor, the infant could touch them easily. We guess that the infants were attracted by the unusual white plume of steam emitted from the humidifier. The temperatures of two types of humidifiers tested at the National Consumer Affairs Center of Japan were 96 and 97°C at the ejection port. They dropped to 80 and 89°C respectively at the distance of 3 cm. Development of safety products for infants is necessary.

INTRODUCTION

We experienced infants' hand burn injury caused by the stem humidifier. Although the temperature of the stream is so high that there is a possibility to cause severe burns, the parents do not realize that the nature of the burns could be severe enough to need surgical treatment. With the recent increase in the use of steam humidifier in Japan, the number of infants with burn has increased. We present two severe cases out of six burn victims.

PATIENTS AND METHODS

We treated six Japanese infants who suffered hand burn caused by the electric steam humidifier between the years of 1995 to 2004. The age of the patients (three boys and three girls) ranged from 7 to 19 months and the average was 11 months. The medical records were reviewed and the temperatures of the streams of humidifiers involved in the two most severe cases were determined by the National Consumer Affairs Center of Japan were 96 and 97°C at the ejection port.

RESULTS

All six patients suffered burns to one palm of their hands. Being curious about the white plume of steam ejected from the top of the humidifier they probably tried to touch them (Table 1). No dorsal involvements were observed. Although three of six patients recovered by conservative ointment therapy, other three suffered scar contracture and needed a full thickness skin graft. The right hand sustained injury in three patients, left hand in three and no case of bilateral injury. Three patients injured three digits, two injured two and one injured one respectively. The middle finger was involved in five cases, ring finger in four and index finger in three. Flexion contractures were observed on the index, middle and ring fingers in two cases. The contractures were found on the middle and ring fingers in one case. Web space involvement was observed in three-flexion contracture patients.

Table 1 Patient data of steam humidifier hand burns in infants.

Age	Sex	Burned hand	Fingers	Degree of burn	Scar Contracture	Treatment
7 m	M	Right	II, III, IV	DDB	+	FTSG
1 y 7 m	M	Left	II	SDB	-	none
7 m	M	Right	III, IV	SDB	-	none
10 m	F	Left	II, III, IV	DDB	+	FTSG
10 m	F	Right	III, IV	DDB	+	FTSG
1 y 6 m	F	Left	I, II, III	SDB	-	none

SDB: superficial dermal burn

DDB: deep dermal burn

FTSG: full thickness skin graft

As the parents did not think that the steam humidifier might cause severe burns and left the humidifier unattended on the floor, the infant could touch them easily. We guess that the infants were attracted by the unusual white plume of steam emitted from the humidifier.

The temperatures of two types of humidifiers tested at the National Consumer Affairs Center of Japan were 96 and 97°C at the ejection port. They dropped to 80 and 89°C respectively at the distance of 3 cm.

CASE PRESENTATION

Case 1

A 10-month-old female playing with the steam from the humidifier in the presence of her grandmother suffered a deep second degree burn. Grandmother thought that the humidifier was an ultrasonic device and the white vapor was cool. After conservative treatment at a local hospital the patient was referred to a university hospital for reconstitution of the flexion contracture of her left index, middle and ring fingers. After excising the scar there was a skin defect on the volar aspect of the second to fourth fingers. A full thickness skin graft was performed from the groin. Although the scar contracture was eliminated, a colour mismatch of the skin was recognized one year postoperatively.

Case 2

A 7-month-old male trying to gasp the plume of steam from the unattended humidifier on the floor in the living room suffered a deep second degree burn. He received conservative treatment at a local clinic and his parents were not aware of his scar contracture until they consulted to a university hospital. The mother complained that her son did not move his fingers after burn. Scar contractures on his right index, middle and ring fingers were pointed out. Although the scar was excised, a skin defect remained on the volar aspect of the second to fourth fingers. A full thickness skin graft was performed from the groin. Although the scar contracture was released, the pigmentation remained on the grafted skin one year postoperatively.

DISCUSSION

The steam humidifier, a system that heats water electrically, has an inherent danger of causing burn injury. They are often used in houses with children for their effectiveness for prevention of common cold and influenza. There are several types of electric humidifiers or vapors. The number of steam humidifiers sold has doubled in the last five years and this increased use resulted in a parallel increase in the number of burns victims.

The most common sites of injury were hands and palms. Children can easily get burned by either touching the steam jets or by hot water spillage after knocking the humidifier over. The manufacturers have effected improvement in recent years and the steam fan humidifier which blows off steam at a lower temperature was developed. There are several reports of burn injury due to the steam vaporizer^{2,3,4}. Most of them were scald burns resulting from overturned vaporizers.

The issue of whether it is best to use a full-thickness skin graft (FTSG) or split-thick skin graft (STSG) for the paediatric palm is controversial^{5,6,7}. Pensler and colleagues⁵ reported comparable functional results between FTSG and STSG for palmar burn scar contractures in paediatric patients.

The dangers of burn injury should always be borne in mind when using a steam humidifier and we would like to see legislative action to force manufacturers to announce the hazards of these devices. A greater awareness among manufactures and retailers would also lead to the development safer products for infants. Paediatricians should also play a greater role in burn prevention.

CONCLUSION

As the parents did not think that the steam humidifier might cause severe burns and leave the humidifier unattended on the floor, the infant could touch them easily¹. The manufacturers should announce the warning statements about the possibility of burn injury.

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Address all correspondence concerning this manuscript to:

Kei Numazaki, M.D., Ph.D.
Virology III
National Institute of Infectious Diseases
Gakuen 4-7-1, Musashi-murayama
Tokyo, 208-0011 Japan
Tel: 042-561-0771 EXT.707
FAX: 042-565-3315
E-mail: