Air Medical Journal 37 (2018) 37–40

Contents lists available at ScienceDirect

Air Medical Journal

journal homepage: http://www.airmedicaljournal.com/

Original Research

An Analysis of Intoxicated Patients Transported by a Doctor Helicopter

Ikuto Takeuchi, MD, Kazuhiko Omori, MD, PhD, Hiroki Nagasawa, MD, Kei Jitsuiki, MD, Takashi Iso, MD, Akihiko Kondo, MD, Kouhei Ishikawa, MD, PhD, Hiromichi Ohsaka, MD, PhD, Youichi Yanagawa, MD, PhD *

Department of Acute Critical Care Medicine, Shizuoka Hospital, Juntendo University, Shizouka, Japan

A B S T R A C T

Objective: We retrospectively investigated all of the intoxicated patients who were transported by a doctor helicopter (DH) in eastern Shizuoka between April 2004 and December 2015 to determine when air medical transport was used in cases of toxic exposure.

Methods: Subjects were divided into 2 groups: an outpatient group of subjects who went home after receiving a medical evaluation and treatment and an admission group.

Results: The outpatient and admission groups included 17 and 31 subjects, respectively. The ratio of dispatching the DH to the scene and the median Glasgow Coma Scale score in the outpatient group were greater, and the shock index in the outpatient group was significantly smaller than in the admission group. The duration from exposure of intoxicated agents to contact by staffs of the DH in the outpatient group was also smaller than in the admission group.

Conclusion: The level of consciousness and shock index may be important factors dictating whether or not to dispatch the DH in order to prevent secondary damage induced by unstable circulation.

To enable earlier treatment, helicopters and other aircraft are used to carry doctors to the sites of emergencies in many countries. After the occurrence of many preventable disaster-related deaths during the acute phase of the Great Hanshin/Awaji earthquake in 1995, the Ministry of Health, Labour and Welfare decided to establish a physician-staffed helicopter emergency medical service (HEMS) in 1999, which had not previously existed in Japan.[1] The results of the trial in 2 prefectures (Okayama and Kanagawa) showed the efficacy of the HEMS, so the Ministry of Health, Labour and Welfare continued to promote the HEMS, and the Japanese cabinet enacted a law to establish an HEMS in Japan in 2007.[1] By February 2017, 51 helicopters had been deployed in 41 prefectures across Japan. The HEMS service in the western part of Shizuoka Prefecture commenced in 2001, and service in the eastern part of the prefecture was added later.[1] Two helicopters cover all of Shizuoka Prefecture, with an arrival time of ≤ 20 minutes. Our hospital (Juntendo University Shizuoka Hospital) serves as the base hospital and is responsible for the eastern region of Shizuoka Prefecture, including the Izu peninsula. This region, approximately 4,090 km^2 in area with a population of approximately 2 million, is mountainous, with only a few hospitals.[1] The Eastern Shizuoka helicopter, known as a doctor helicopter (DH) in Japan, treats patients with a variety of medical and trauma-related conditions.[1-10] The DH also treats intoxicated patients. However, there have been no reports on the numbers and outcomes of intoxicated patients transported by the HEMS. In addition, there have been no reports describing the efficacy of early medical intervention for intoxicated patients and what kinds of intoxicated patients should be evacuated from the scene or transported between hospitals by helicopter. Therefore, we performed a retrospective study to examine this population in order to determine when air medical transport was used in cases of toxic exposure.

Methods

The protocol of this retrospective study was approved by our institutional review board, and the examinations were conducted in accordance with the standards of good clinical practice and the Helsinki Declaration.

We retrospectively investigated all of the intoxicated patients who were transported by the DH between April 2004 and December 2015 using the registry data of the DH control room of our

Supported by the Ministry of Education, Culture, Sports, Science and Technology (MEXT)-Supported Program for the Strategic Research Foundation at Private Universities, 2015-2019.

* Address for correspondence: *Youichi Yanagawa, MD, PhD, Department of Acute Critical Care Medicine, Shizuoka Hospital, Juntendo University, 1129 Nagaoka, Japan.*

E-mail address: yyanaga@juntendo.ac.jp (Y. Yanagawa).

1067-991X/$36.00

https://doi.org/10.1016/j.amj.2017.09.009

hospital. The exclusion criteria were patients with carbon monoxide poisoning who were principally transported to other hospitals to receive hyperbaric oxygen therapy. The subjects were divided into 2 groups: an outpatient group of subjects who went home after receiving a medical evaluation and treatment and an admission group of subjects admitted to the hospital to undergo further medical treatment. The patients' age, sex, type of intoxication, underlying psychiatric disease, mechanism of intoxication (accident/suicide attempt), duration from exposure of intoxicated agents to encountering staff of the DH, dispatch of the DH to the scene or for interhospital transportation, Glasgow Coma Scale (GCS) score, systolic blood pressure, heart rate, shock index (heart rate divided by systolic blood pressure) when the staff of the DH evaluated the subject, frequency of oxygen therapy, frequency of securing the infusion route, frequency of tracheal intubation, and outcome (survival/death) were compared between the 2 groups.

Statistical analysis was performed using the Student unpaired *t*-test for age, duration, systolic blood pressure, heart rate and shock index, and a median analysis for GCS; contingency table analyses and the chi-square test were used for other categories. *P* values < .05 were considered to indicate statistical significance.

Results

There were a total of 7,699 dispatches of the DH during the investigation period, and 73 cases in which a DH was dispatched for intoxicated patients. Among them, there were 25 cases with carbon monoxide poisoning. After excluding these cases, the 48 remaining cases were enrolled in the present study. The outpatient and admission groups included 17 and 31 subjects, respectively. There were 3 lethal cases in the admission group (2 organophosphate poisonings and 1 creosol). One subject with organophosphorus poisoning was in cardiopulmonary arrest when the staff of the DH evaluated them at the scene. The other 2 lethal subjects were initially transported to local medical facilities by ground ambulances. Once there, treatment for their intoxication was deemed impossible, so they were transported to our hospital by the DH. However, the intensive care failed to obtain a survival outcome because of multiple organ failure.

Table 1 shows the results of an analysis of the 2 groups. All subjects in the 2 groups underwent oxygen therapy and had a venous route secured for drip infusion. There were no significant differences between the 2 groups with regard to age, sex, classification of intoxication, underlying psychiatric disease, mechanism of intoxication, systolic blood pressure, heart rate, or outcome. However, the ratio of dispatching the DH to the scene and the median GCS score in the outpatient group were greater than in the admission group. The shock index and ratio of tracheal intubation in the outpatient group were significantly smaller than in the admission group. The duration from exposure of intoxicated agents to contact by staff of the DH in the outpatient group was also smaller than in the admission group but not to a significant degree.

The 6 subjects with a full GCS score in the admission group underwent acetylcysteine treatment for acetaminophen overdose, treatment for multiple organ failure induced by lithium, observation for malingestion of benzodiazepine by a 3-year-old child, treatment for ingestion of hypochlorous acid, treatment for intoxication of aconite, and treatment for ingestion of mixed acid and alkaline detergents.

We encountered 1 case of aconite intoxication. A 26-year-old man intentionally ate the root of an aconite plant in order to commit suicide. After eating the aconite, he felt numbness in the oral cavity and could not speak. He was transported to the local hospital, but the physicians there were unable to treat aconite intoxication. Therefore, the DH was requested for interhospital transportation. When the medical staff of the DH met the patient at the rendezvous point, he was alert. Without dysarthria, he had a blood pressure of 144/84 mm Hg, a heart rate of 115 beats/min and an SpO_2 of 96% with room air. After performing gastric lavage on the scene, he was evacuated by the DH. After transportation, conservative treatment was selected with percutaneous cardiopulmonary support on

Table 1
Results of an Analysis of the 2 Groups

	Outpatient n = 17	Admission n = 31	*P* Value
Age (years)	50.4 ± 24.7	45.5 ± 19.4	NS
Sex (male/female)	9/8	12/19	NS
Classification of intoxication			NS
Alcohol	2	0	
Major tranquilizer	3	12	
Minor tranquilizer	6	5	
Illegal drug	0	1	
Medical drug	3	3	
Disinfectant	1	3	
Agricultural agent	2	6	
Medicinal plant	0	1	
Psychiatric disease			NS
Depression	13	26	
Schizophrenia	0	1	
ADHD	1	0	
None	3	4	
Accident/Suicide attempt	3/14	5/26	NS
Duration from exposure to contact (minute)	331.8 ± 80.4	714.3 ± 868.3	.08
Dispatch at scent/interhospital transportation	15/2	19/12	.04
Glasgow Coma Scale	14 (11.5-15)	9 (4-14)	< .01
Systolic blood pressure (mm Hg)	128.8 ± 24.6	117.5 ± 34.9	NS
Heart rate (beats per minute)	82.7 ± 18.0	92.5 ± 31.8	.1
Shock index	.64 ± .13	.80 ± .29 (n = 30)	.04
Oxygen therapy (yes/no)	17/0	31/0	NS
Securing infusion route (yes/no)	17/0	31/0	NS
Tracheal intubation (yes/no)	0/17	13/18	.001
Outcome (survival/death)	17/0	28/3	.1

ADHD = attention-deficit/hyperactivity disorder; NS = not significant.