



Editorial Comments

Reflex syncope during a hot bath as a specific cause of drowning in Japan

Out-of-hospital cardiac arrest is a leading cause of death in Japan and other industrialized countries [1,2]. In 2005, the Fire and Disaster Management Agency of Japan launched the All-Japan Utstein Registry—a prospective, nationwide, population-based study of out-of-hospital cardiac arrest [3]. The annual incidence of out-of-hospital cardiac arrest and the number of events with cardiac causes increased gradually from 56,412 in 2005 to 63,296 in 2008. The incidence of out-of-hospital cardiac arrest was highest in the elderly, reaching 71% in individuals > 70 years of age, and more than half of the overall population was male.

There was a significantly higher incidence of out-of-hospital cardiac arrests in the winter season, particularly in January and December, than in other months of the year. This finding was consistent from year to year and at all ages. The Fire and Disaster Management Agency of Japan indicates that the incidence of out-of-hospital cardiac arrest is as follows: (a) more common on Sundays and Mondays than on other days of the week, and (b) more common during early morning and evening hours than at other times of the day. The monthly and weekly distributions of the incidence of out-of-hospital cardiac arrest in populations of individuals < 69 years of age (individuals of working age) are similar to those of all-age populations. In contrast, the daily distributions of the incidence of out-of-hospital cardiac arrest in the working population show a single peak in the early morning hours. One of the possible explanations for this difference in the daily distributions between working populations and elderly Japanese might be syncope during bathing in Japan.

Between 1989 and 1993, approximately 10% of sudden deaths in Japan confirmed by the Tokyo Medical Examiner's Office occurred at home during hot baths in a deep bathtub. The reported risk of sudden death is 10-fold higher during bathing than during sleep in the elderly Japanese people [4]. One of the causes of drowning during immersion in hot water may be syncope due to a precipitous decrease in blood pressure [4,5]. A low external temperature in the winter season increases sympathetic nerve tone and catecholamine release, which increase heart rate, vascular resistance, ventricular contractility, and blood pressure [6,7]. A rapid increase in body temperature by bathing causes a precipitous fall in blood pressure and syncope within the bathtub.

Most Japanese individuals take a deep hot bath each evening because most homes are not as well insulated as those in Western

countries and central heating is uncommon. The deeper bathtub, higher temperature, and longer spent time in the hot bath, particularly in the winter season, are characteristic in Japan. The temperature difference between inside and outside the bathtub or bathroom is considerable in the winter season, which might precipitate hypotension, bradycardia, and loss of consciousness.

In elderly individuals, blood pressure and heart rate begin to rise immediately upon immersion in a hot tub and decrease after approximately 4 min [4]. These changes are associated with a temporary decrease in sympathetic activity without compensatory suppression of the parasympathetic tone, resulting in hypotension- and bradycardia-induced syncope. In addition, in contrast to young persons, older individuals have difficulty maintaining homeostasis during immersion in a deep hot bath because of the autonomic nervous system's inability to respond in a sufficiently vigorous manner to cardiovascular stress [4,8]. Parasympathetic activity is depressed, and sympathetic activity may decrease rather than increase at a time when vasoconstriction is required to maintain blood pressure. Hypotension, bradycardia, loss of consciousness, and death by drowning may ultimately result from this transient autonomic imbalance [4,5,8]. Thus, a putative explanation for the blunted evening peak in the younger sample set might be the higher incidence of domestic drowning in hot baths among elderly individuals [4,5].

In this issue, Nakao et al. [9] report a case involving the collection of direct evidence of reflex syncope due to a marked cardioinhibitory response (possibly associated with hypotension) during bathing by the use of an implantable loop recorder in a young man who had previously successfully recovered from an out-of-hospital cardiac arrest in the same situation. This patient was successfully treated with pacemaker implantation and did not experience any further symptoms during bathing. Thus, drowning—due to reflex bradycardia, hypotension, and syncope during hot bathing—as a cause of out-of-hospital cardiac arrest may not be uncommon in Japan.

References

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