

CQ45 What are useful findings in postmortem CT to determine heat stroke?

Grades of recommendations:

C2 for evaluating the condition

D for determining the cause of death

At present, no findings specific to heat stroke have been reported, and careful evaluation of the cause of death with postmortem CT seems to be necessary.

Explanation-----

Background

Heat stroke is a type of hyperthermia in which the body temperature exceeds the normal range of 36 ~ 37.5°C due to central nervous system dysfunction caused by excessive heat and dehydration. In severe cases, symptoms such as headache, vomiting, disturbance of consciousness, organ failure, and blood coagulation disorders may occur, leading to death.

Autopsy findings include pulmonary edema, cloudy swelling of the kidneys, cerebral edema, and hemorrhage of the gastrointestinal mucosa.

Postmortem CT findings

The following reports attempted to determine the cause of death, including heat stroke, from postmortem CT images. In the method of calculating the vessel flattening index (vessel flattening index: vFI), which is the ratio of the short to the long diameters of the aorta and inferior vena cava divided by the area of a circle of this perimeter length [1], a decrease in vFI indicates a greater flattening of the cross-sectional surface of the vessel. It has been reported that in heat stroke vFI is reduced in the ascending and descending aorta, abdominal aorta, and inferior vena cava, but vFI is also reduced in hemorrhages, asphyxiation and methamphetamine poisoning.

A method for measuring the estimated weight of the lungs [2] has confirmed that the estimated air content is reduced in cases of heat stroke, but it has also been reported to be lower in acute cardiac death, carbon monoxide poisoning, and drug poisoning.

A study of pulmonary field permeability and causes of death [3] reported a decrease in pulmonary field permeability in heat stroke, but also in poisoning, congestive heart failure, and acute ischemic heart disease.

Measurements of the estimated weight of the heart and the presence of intracardiac hematomas [4] have been reported to be reduced in heat stroke, as well as in fatal hemorrhages, pericardial hematomas, and acute cardiac death.

A method for measuring heart and bilateral lung volumes from CT images [5] did not show any

heatstroke-specific findings.

In conclusion, no findings specific to heat stroke has been reported to date. In addition, all of the reports included in this study were from the same institution, and the number of cases of heat stroke is not sufficient.

Literature search formula and literature selection (2019/6/2)

PubMed

#	Search formula	Number of documents
1	Search(postmortem)AND((computed tomography OR magnetic resonance))	10,449
2	Search((((postmortem)AND((computed tomography OR magnetic resonance))))AND heat stroke	6
3	Search((((((postmortem)AND((computed tomography OR magnetic resonance))))AND heat stroke))AND humans	5

References

- [1] Sogawa N et al: Postmortem CT morphometry of great vessels with regard to the cause of death for investigating terminal circulatory status in forensic autopsy. *Int J Legal Med* 2015; 129: 551-558 (Level 4b)
- [2] Sogawa N et al: Postmortem volumetric CT data analysis of pulmonary air/gas content with regard to the cause of death for investigating terminal respiratory function in forensic autopsy. *Forensic Sci Int* 2014; 241: 112-117 (Level 4b)
- [3] Michiue T et al: Quantitative analysis of pulmonary pathophysiology using postmortem computed tomography with regard to the cause of death. *Forensic Sci Int* 2012; 220: 232-238 (Level 4b)
- [4] Michiue T et al: Cardiac dilatation index as an indicator of terminal central congestion evaluated using postmortem CT and forensic autopsy data. *Forensic Sci Int* 2016; 263: 152-157 (Level 4b)
- [5] Sogawa N et al: Postmortem virtual volumetry of the heart and lung in situ using CT data for investigating terminal cardiopulmonary pathophysiology in forensic autopsy. *Leg Med* 2014; 16: 187-192 (Level 4b)