CQ17 Does cardiopulmonary resuscitation infusion affect postmortem imaging?

Grade of recommendations:
C1 for evaluating the condition

When resuscitation is performed in cases of cardiopulmonary arrest that are not due to trauma, it is thought that the CT attenuation in the lung increases due to the infusion administered.
Although it is necessary to confirm the volume of fluid used for resuscitation in advance for accurate interpretation of postmortem images, few method has been reported to identify the pathology of antemortem or the state of pulmonary alveolar exudation due to fluid infusion. It is desirable to interprete postmortem images based on the volume of fluid used in the resuscitation.

Explanation----------
Backgrounds

Regarding secondary life-saving measures for adults, there are few studies on fluid administration during cardiopulmonary resuscitation, and it is difficult to discuss the harmful effects and benefits of fluid therapy [1].

Cardiopulmonary resuscitation for traumatic cardiopulmonary arrest is used to prevent local hypoperfusion, tissue hypoxia, and rapidly restore systemic blood flow for conditions such as hypotension due to blood loss [2]. For early resuscitation of sepsis, it is recommended to administer an extracellular fluid replacement solution of more than 30 ml/kg after assessing intravascular volume reduction as fluid therapy [3].

Image findings

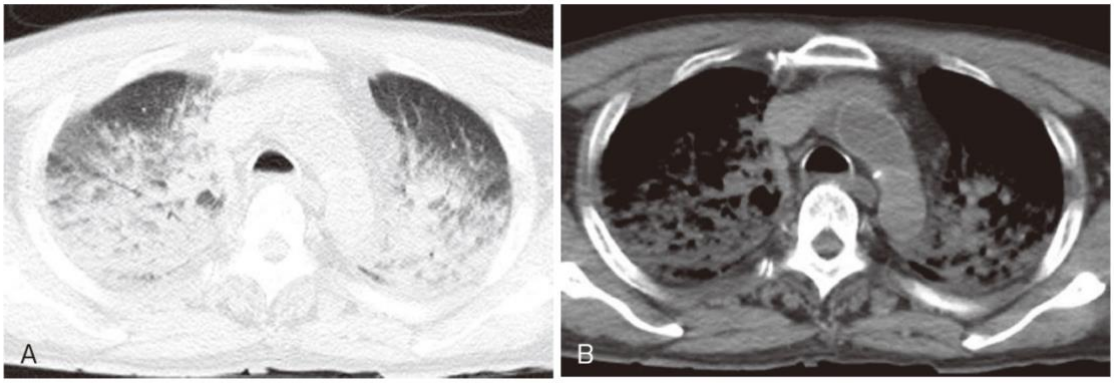
Postmortem CT images recorded after the infusion procedure show higher alveolar absorption values than without infusion [4, 5]. At the emergency department where cardiopulmonary resuscitation is performed, circulatory support by precordial compression is also performed, and this may influence increased lung attenuation.

Since the lungs show hypostasis on postmortem images, increasing attenuation on the gravity side occurs as a normal postmortem change (CQ2). If cardiopulmonary resuscitation is performed (with infusion therapy) but the patient dies, a postmortem image with fluid exudation to the lung may result and it is recommended to perform a careful image interpretation about the increased lung attenuation due to fluid infusion. So far, there have been few report on the effects of infusion therapy using postmortem CT [6].

Postmortem CT images recorded after infusion therapy have shown that there is diffusion attenuation, which is not related to gravity, which diffuses in addition to the expected lung hypostasis, and caution

is required when interpreting images. Diffusion increased lung attenuation on postmortem CT has been presented in the following causes of death: acute left heart failure (CQ27), drowning (CQ39), drug poisoning (CQ41), intracranial hemorrhage (CQ23, 24, 25), blood aspiration, and pneumonia (CQ31). If postmortem imaging was performed on a corpse that died after cardiopulmonary resuscitation (infusion therapy) for these conditions, it must be evaluated whether increasing lung alveolar attenuation was a result of the cause of death in addition to normal postmortem changes or it was caused by the infusion effect. It is often difficult to distinguish and identify any of the above from the postmortem image findings alone, and caution is required when interpreting postmortem images.

Figure Male in 60s A case of large volume infusion associated with cardiopulmonary resuscitation, hypothermia (2 days after death)



A. Lung air content, which is characterized by hypothermia (CQ44), is easily modified by resuscitation such as infusion. In this case as well, a diffused low air content area extends to both lungs.

B. Retrograde fluid retention from the alveoli reaches the tracheal bifurcation.

Literature search formula and literature selection (2019/7/12)

PubMed

#	Search formula	Number of documents
1	Search(((((("postmortem CT")OR "postmortem MRI")OR "postmortem imaging")OR "post-mortem CT")OR "post-mortem MRI")OR "postmortem imaging"	831
2	Search(#1)AND infusion	6

Ichushi（Medical Journal）

#	Search formula	Number of documents
1	(死後 mri/AL)and(PT= 原著論文, 会議録除く)	16

2	(死後 ct/AL)	442
3	(輸液療法/TH or 輸液/AL)	30,040
4	#1 and #3	0
5	#2 and #3	2

From other than search formula

[1-3, 5, 6]

References

[1] Support AL: ALS; Advanced life support. https://minds.jcqhc.or.jp/docs/minds/Res/Ch.2_ALS.pdf#search=%27%E4%BA%8C%E6%AC%A1%E6%95%91%E5%91%BD%E5%87%A6%E7%BD%AE+%E8%BC%B8%E6%B6%B2%E7%99%82%E6%B3%95+%E6%9C%89%E5%AE%B3%E6%80%A7+%E6%9C%89%E7%9B%8A%E6%80%A7%27.（level 4a）

[2] Spahn DR et al: Management of bleeding and coagulopathy following major trauma：an updated European guideline. Crit Care 2013; 17: R76 (Level 4b)

[3] Nishida O et al: The Japanese Clinical Practice Guidelines for Management of Sepsis and Septic Shock 2016 (J-SSCG2016). J Jpn Soc Intensive Care Med 2016; 24 (Suppl 2): 73-74 (Level 4a)

[4] Metry G et al: Lung density for assessment of hydration status in hemodialysis patients using the computed tomographic densitometry technique. Kidney Int 1997; 52: 1635-1644 (Level 4b)

[5] Michiue T et al: Forensic pathological evaluation of postmortem pulmonary CT high-density areas in serial autopsy cases of sudden cardiac death. Forensic Sci Int 2013; 232: 199-205 (Level 4b)

[6] Hyodoh H et al: The infusion effect in postmortem lung CT. Forensic Imaging 2020;200367 (Level 4b)