

CQ24 Can postmortem CT point to subarachnoid hemorrhage as the cause of death?

Grades of recommendations: C1

Similar to clinical CT, postmortem CT can indicate subarachnoid hemorrhages. Subarachnoid hemorrhages may be a possible cause of death, but when interpreting images, it is necessary to be careful to distinguish it from pseudolesions that are similar to hemorrhages, such as in postmortem changes.

Explanation-----

Findings that subarachnoid hemorrhage may be the cause of death

Postmortem CT can help evaluate a wide range of subarachnoid hemorrhages and associated complications, and subarachnoid hemorrhages may be presumed to be the cause of death if there are no other possible causes of death, other than the subarachnoid hemorrhage. However, in postmortem CT, since there are specific findings in postmortem images, it is necessary to pay attention to the false positive findings described below.

False positive findings

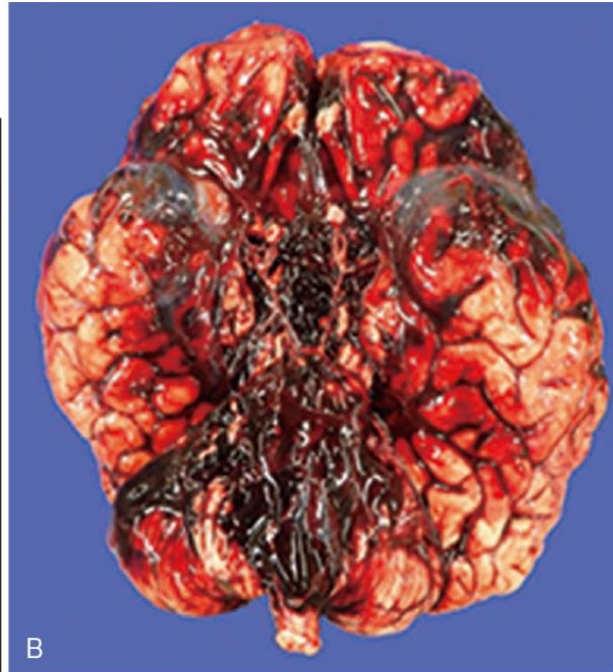
1) Pseudo-SAH

There is a finding known as pseudo-subarachnoid hemorrhage (pseudo-SAH) in clinical CT. It is a finding that cerebral sulci and cisterns appear to have relatively high attenuation when a wide range of low-attenuated cerebral edema/swelling occurs due to hypoxic-ischemic encephalopathy [1-5]. Postmortem CT may also show pseudo-SAH findings. In a study comparing postmortem CT and autopsy findings, pseudo-SAH could not be identified by an autopsy although the postmortem CT suggested suspected subarachnoid hemorrhage [1]. A true subarachnoid hemorrhage is likely to be asymmetric, complicated with cerebral parenchyma/intraventricular hemorrhage in the acute/subacute phase, and to have a thick high attenuated area that may be suspected as bleeding [1].

2) Increased venous attenuation

Postmortem changes caused clots in the cerebral surface veins, which can be identified as high attenuated areas along the sulci on postmortem CT, and which may be difficult to distinguish from subarachnoid hemorrhages [1, 6, 7]. In addition, there is a case report of a child in whom subarachnoid hemorrhage was not observed by the autopsy, although the cerebellar tent was visualized with high attenuation on the postmortem CT [8]. Furthermore, since it may present a false-positive finding of artifacts and a subarachnoid hemorrhage that may occur in postmortem CT, it must be differentiated from a subarachnoid hemorrhage [9].

Figure 1 Male in 50s who was found dead in the home bathtub due to rupture of a cerebral aneurysm (3 days after death)

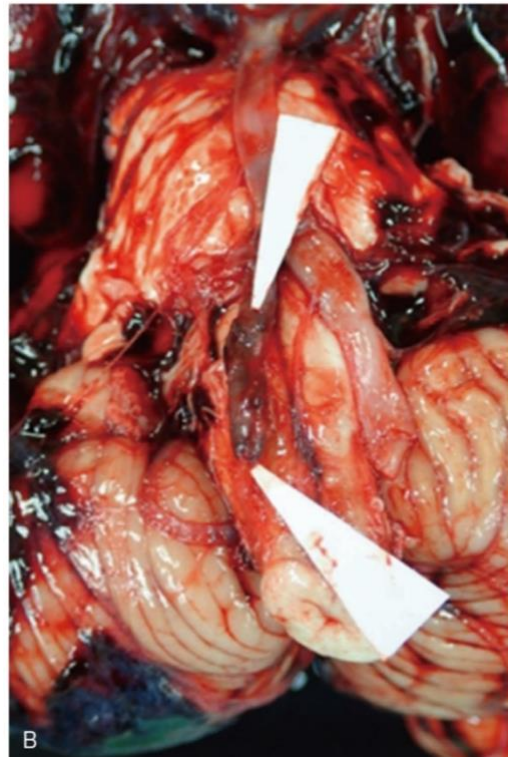
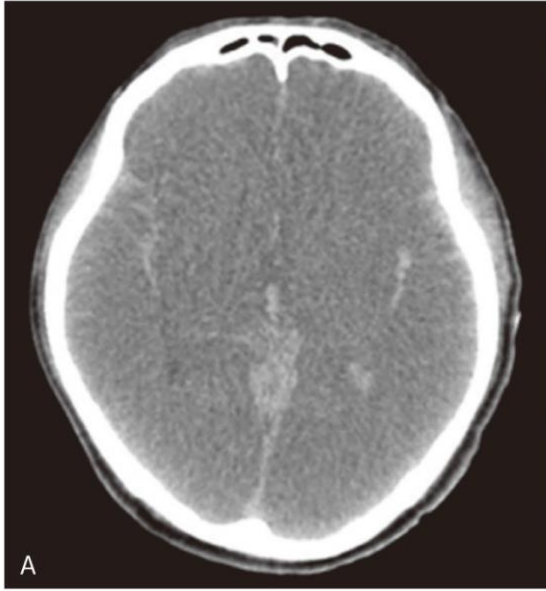


A High attenuation is observed in the subarachnoid space. Subarachnoid hemorrhage was diagnosed.

B Autopsy macroscopic findings: A dense hematoma is found in contact with the bottom of the brain.

C Autopsy macroscopic findings: A ruptured aneurysm is observed in the anterior cerebral artery.

Figure 2 Male in the 60s who died from subarachnoid hemorrhage due to vertebral arterial dissection (2 days after death)



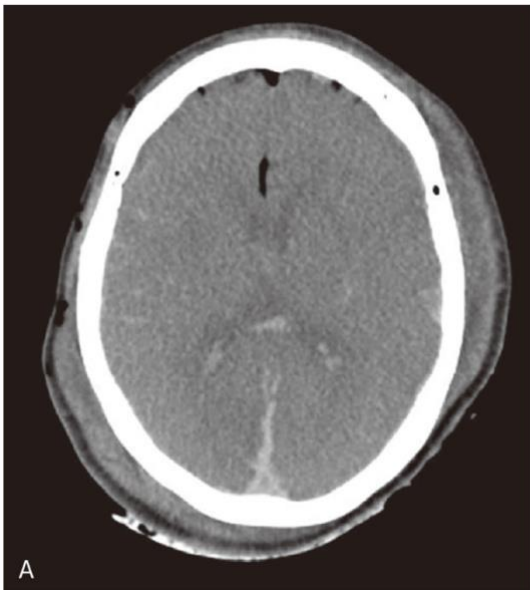
Sudden collapse in front of family.

A Subarachnoid hemorrhage is depicted as high attenuation.

No obvious trauma to the head and neck was observed.

B Autopsy macroscopic findings: A single dissection of the right vertebral artery is observed.

Figure 3 Female in the 70s, traumatic subarachnoid hemorrhage (2 days after death)



A CT: subarachnoid hemorrhage with subdural hematoma with gas. Subcutaneous swelling is observed.

B Autopsy macroscopic findings: No hematoma on the skull base.

Literature search formula and literature selection (2019/6/17)

PubMed

#	Search formula	Number of documents
1	((((((((((((postmortem)OR post-mortem)OR "post mortem"))AND imaging))OR((((postmortem)OR post-mortem)OR "post mortem")) AND CT))OR((((postmortem)OR post-mortem)OR "post mortem")) AND "computed tomography"))OR((((postmortem)OR post-mortem) OR "post mortem"))AND MR))OR((((postmortem)OR post-mortem) OR "post mortem"))AND "magnetic resonance"))OR((((postmortem) OR post-mortem)OR "post mortem"))AND MDCT))OR((MSCT) AND(((postmortem)OR post-mortem)OR "post mortem")))	23,704
2	((cerebral OR intracranial OR cranial OR brain OR head))AND #1	10,374
3	((hyperattenuation OR high attenuation OR hyperdense OR high density OR hematoma OR bleeding OR hemorrhage))AND #2	1,406

Ichushi (Medical Journal)

#	Search formula	Number of documents
1	(死後CT/AL or 死後MRI/AL or(死亡時画像診断/TH or 死亡時画像診断 /AL)or(死亡時画像診断/TH or オートプシーイメージング /AL))and(LA= 日本語, 英語 and PT= 会議録除く)	529
2	(くも膜下出血/AL or 脳出血/AL or 硬膜下血腫/AL or 硬膜外血腫/AL or 脳挫傷/AL)	37

From other than search formula

[1]

References

- [1] Shirota G et al: The pseudo-SAH sign: an imaging pitfall in postmortem computed tomography. Int J Legal Med 2017; 131: 1647-1653 (Level 4b)
- [2] Given CA et al: Pseudo-subarachnoid hemorrhage: a potential imaging pitfall associated with diffuse cerebral edema. AJNR 2003; 24: 254-256 (Level 5)
- [3] Misra V et al: Pseudo-subarachnoid hemorrhage in a patient with acute cerebellar infarction.

Neurol Res 2008; 30: 813-815 (Level 5)

- [4] Chute DJ et al: Pseudo-subarachnoid hemorrhage of the head diagnosed by computerized axial tomography: a postmortem study of ten medical examiner cases. J Forensic Sci 2002; 47: 360-365 (Level 5)
- [5] Yuzawa H et al: Pseudo-subarachnoid hemorrhage found in patients with postresuscitation encephalopathy: characteristics of CT findings and clinical importance. AJNR 2008; 29: 1544-1549 (Level 4b)
- [6] Smith AB et al: Common and expected postmortem CT observations involving the brain: mimics of antemortem pathology. AJNR 2012; 33: 1387-1391 (Level 5)
- [7] Ishida M et al: Common postmortem computed tomography findings following atraumatic death: differentiation between normal postmortem changes and pathologic lesions. Korean J Radiol 2015; 16: 798-809 (Level 5)
- [8] Kibayashi K et al: Dural hemorrhage of the tentorium on postmortem cranial computed tomographic scans in children. Forensic Sci Int 2005; 154: 206-209 (Level 5)
- [9] Anon J et al: Traumatic extra-axial hemorrhage: correlation of postmortem MSCT, MRI, and forensicpathological findings. J Magn Reson Imaging 2008; 28: 823-836 (Level 4b)