CQ09 Is it useful to examine postmortem images before an autopsy?

Grade of recommendations: B

Examining postmortem images before an autopsy, the findings lost by the autopsy can be recorded as objective information, which is useful. It is possible to identify infections the corpse may have suffered from before death or the presence of foreign objects (objects that are not organic parts of the body) before the autopsy and call attention to safety (environmental pollution/secondary infection) concerns during the autopsy. When postmortem images are examined before an autopsy, the image-based findings would be useful for personal identification, establishing marks left by internal treatments or the presence of medical devices. At present, autopsy and postmortem images are considered to perform complementary roles, and it is desirable to obtain postmortem images before an autopsy.

Explanation----------

Background

Postmortem images can be used as a non-destructive test prior to obtaining and recording a series of autopsy and objective records of the pre-autopsy state. There is no disadvantage for the corpse as the subject, making it desirable that postmortem images should be obtained as far as possible. In some cases, it is possible to determine findings that lead to establishment of the cause of death, or it is possible to determine the presence or absence of illnesses or injuries occurring while alive to assist in estimating the state at death that may not be directly related to the cause of death. With corpses in advanced stages of putrefaction, medical devices present inside the body can be identified in advance and can be compared with prenatal medical images [1]. It is also possible to record the positional relationship between the body surface and foreign objects inside the body three-dimensionally, and it is important to obtain postmortem images before an autopsy for objective reproducible evaluations (CQ35, CQ36).

Unlike clinical imaging, postmortem CT does not cause any disadvantage to the subject (corpse) arising from X-ray exposure. This makes its usefulness for an autopsy very considerable, and it is possible to examine the whole of the body in detail through these images. Using images, it is possible to record findings that may have disappeared at the time of the autopsy (for example, with body gas [2] (CQ7), retained liquid amounts and their arrangement (CQ5), or organ positions [3]), and the body surface and internal organs can be recorded. The positional relationship can be observed three-dimensionally with an image workstation (CQ14). It has also been reported that postmortem CT can help evaluate better than an autopsy when it is difficult to fully understand and record observations objectively, such as with multiple facial bone and multiple peripheral bone fractures [4].

Complementary use of an autopsy and postmortem images is useful [5].

Postmortem images can identify lesions in the body, point out the possibility of infection, and/or contribute to the safety of the operator and the environment (environmental pollution/secondary infection) before an autopsy.

In the case of severely putrefied corpses, medical devices such as heart valve prostheses, artificial joint devices, pacemakers, tumor treatment devices, and others, which are placed in the body depending on the individual medical history [1], may be useful for identification of individuals (CQ20).

There are obvious findings in an autopsy that are difficult to identify in postmortem CT, such as surface damage, minor fractures without misalignment, disc dehiscence (CQ37), organ damage, large blood vessel damage, and tumors (CQ22) [4, 9]. At the same time, there are some pathological/abnormal findings such as intracranial hemorrhage (CQ24, 25), pericardial hematoma (CQ29), and gross fractures that enable postmortem imaging to assess the same conditions as an autopsy. In this relation, there is a report that postmortem contrast CT (CQ12) and postmortem MRI (CQ11) can identify abnormal findings that cannot be determined by an autopsy, and the evaluation will differ depending on the subjects examined [9]. In cases of pediatric abuse, evaluation of whole bones before an autopsy makes it possible to compare changes over time with modalities of the same type as in clinical images. Postmortem image observations before an autopsy are considered useful because it is possible to evaluate pathological conditions that cannot be identified by body surface observations, such as determination of old fractures.

Postmortem imaging and autopsies are complementary diagnostic methods, and which one is better or which one is more useful depends on the problems with and the characteristics of the case. Therefore, it is important to select an appropriate method and search for the correct cause of death [10], and at present, it is considered that both have complementary roles [5]. Postmortem images can objectively record the state at the time of death, and when a medical device is identified inside the body, it is necessary to objectively evaluate the presence or absence of positional abnormalities at the time of death [11]. Obtaining postmortem CT images is recommended before the removal of medical devices for a diagnosis based on images at death during hospitalization, and the same treatment (not remove the medical devices) is required for cases with home healthcare.

Literature search formula and literature selection (2019/8/21)

PubMed

#	Search formula	Number of documents
1	Search (((((("postmortem CT") OR "postmortem MR") OR "postmortem imaging") OR "post-mortem CT") OR "post-mortem MR") OR "postmortem imaging"	680

2	Search ((#1) AND autopsy) AND hospitalized patient	2
3	Search (#1) AND support lines	3
4	Search (#1) AND tuberculosis	4
5	Search ((#13 OR #4) OR #5	9

Ichusi（Medical Journal）

#	Search formula	Number of documents
1	(死亡時画像診断/TH or 死亡時画像診断/AL)	925
2	死後 CT/AL	450
3	死後 MR/AL	23
4	死後画像/AL	184
5	(#1 or #2 or #3 or #4) and ((PT=症例報告，事例) AND (PT=原著論文，解説，総説，図説，Q＆A，講義，会議録除く))	136
6	(感染/TH or 感染/AL)	781,803
7	(機器と資材用品/TH or 医療器具/AL)	664,718
8	#5 and #6	16
9	#5 and #7	5
10	#8 or #9	21

From other than search formula

[4, 9]

References

[1] O'Donnell C et al: Contribution of postmortem multidetector CT scanning to identification of the deceased in a mass disaster: experience gained from the 2009 Victorian bushfires. Forensic Sci Int 2011; 205: 15-28 (Level 5)

[2] Takahashi Y et al: Postmortem computed tomography evaluation of fatal gas embolism due to connection of an intravenous cannula to an oxygen supply. Leg Med 2017; 27: 1-4 (Level 5)

[3] Gascho D et al: Use of postmortem computed tomography to detect bowel obstruction and its relationship to the cause of death. Am J Forensic Med Pathol 2018; 39: 30-37 (Level 5)

[4] Daly B et al: Comparison of whole-body post mortem 3D CT and autopsy evaluation in accidental blunt force traumatic death using the abbreviated injury scale classification. Forensic Sci Int 2013; 225: 20-26 (Level 4b)

[5] Cafarelli FP et al: Postmortem imaging: an update. Semin Ultrasound CT MR 2019; 40: 86-93 (Level 5)

[6] McLaughlin S et al: Unexpected active tuberculosis on post mortem CT: a case report and review of the literature. Forensic Sci Int 2016; 266: e64-e67 (Level 5)

[7] Sohail S et al: Postmortem computed tomography for diagnosis of cause of death in male prisoners. J Pak Med Assoc 2010; 60: 4-8 (Level 4b)

[8] Yaguchi D et al: Sudden death from cardiopulmonary arrest on arrival of a patient with pulmonary tuberculosis: a case diagnosed by postmortem CT and autopsy. J Forensic Sci 2018; 63: 1582-1586 (Level 5)

[9] Jalalzadeh H et al: Post-mortem imaging compared with autopsy in trauma victims: a systematic review. Forensic Sci Int 2015; 257: 29-48 (Level 1)

[10] O'Donnell C et al: Can post-mortem CT and angiography provide all the answers? Lancet 2017; 390: 646-647 (Level 6)

[11] Lotan E et al: The role of early postmortem CT in the evaluation of support-line misplacement in patients with severe trauma. AJR 2015; 204: 3-7 (Level 5)