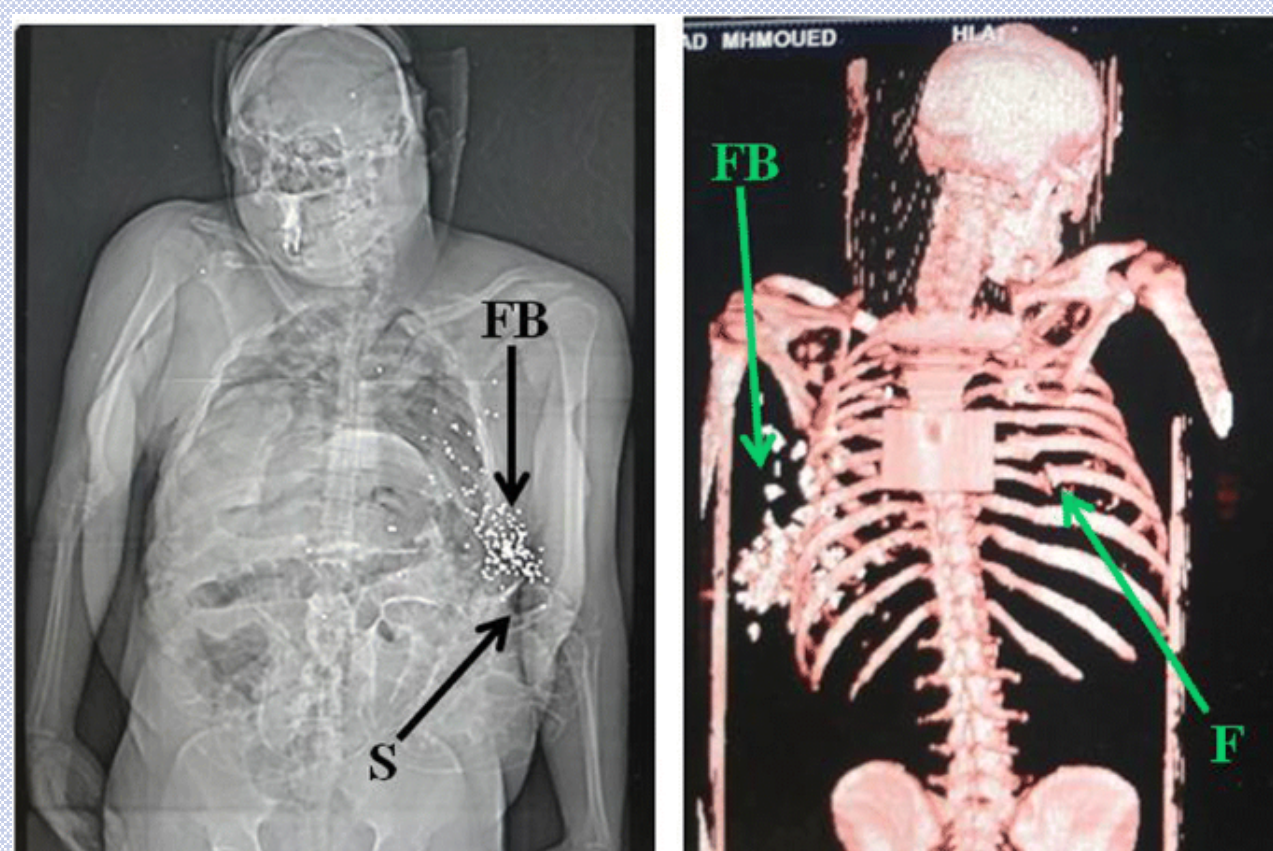


POSTMORTEM CT

INTRODUCTION

Postmortem conventional radiography has been present in determining cause of death since the discovery of x-rays in 1895. In more recent years, postmortem CT (PMCT) has become more popular. According to an article written by Silke, Grabherr PMCT is the most commonly used technique for forensic imaging². In PMCT the body can be partially or entirely scanned. These scans allow the technologists to reconstruct the images in any plane so the scans can be easily viewed and understood. The use of PMCT is commonly used in trauma cases. The CT scan is able to quickly determine the presence of bone fractures, gunshot trajectories, or foreign bodies. PMCT is also used for identification purposes. PMCT's, when read by a trained radiologist, are able to determine many different kinds of death. This can be used to replace an invasive autopsy or enhance the findings of the study.



Foreign body and fracture identified on a CT scan

APPLICATION OF PMCT

In a study completed by Kunihiro Inai, PMCT was able to determine the immediate cause of death in 70% of hospital deaths³. The most common found causes of death were:

- Respiratory failure
- Pneumonia
- Pulmonary congestion

PMCT is a great tool used in cases of trauma, such as abrasions of the skeletal system, sharp trauma, and gunshot trauma³. Other than trauma cases PMCT is also used to investigate are child abuse, foreign bodies, age estimation, body identification, changes in the skeletal system, and the detection of gas². Compared with a classic autopsy CT makes the detection of small fragmented object much easier. PMCT can also guide sampling of the postmortem tissues. With the use of CT sampling can become minimally invasive and much more accurate. PMCT guided sampling is able to test the toxicology of bodily fluids such as gastric contents, bile, urine and other samples. PMCT is a great tool that can be applied to find cause of death and perform basic autopsy exams less invasively².

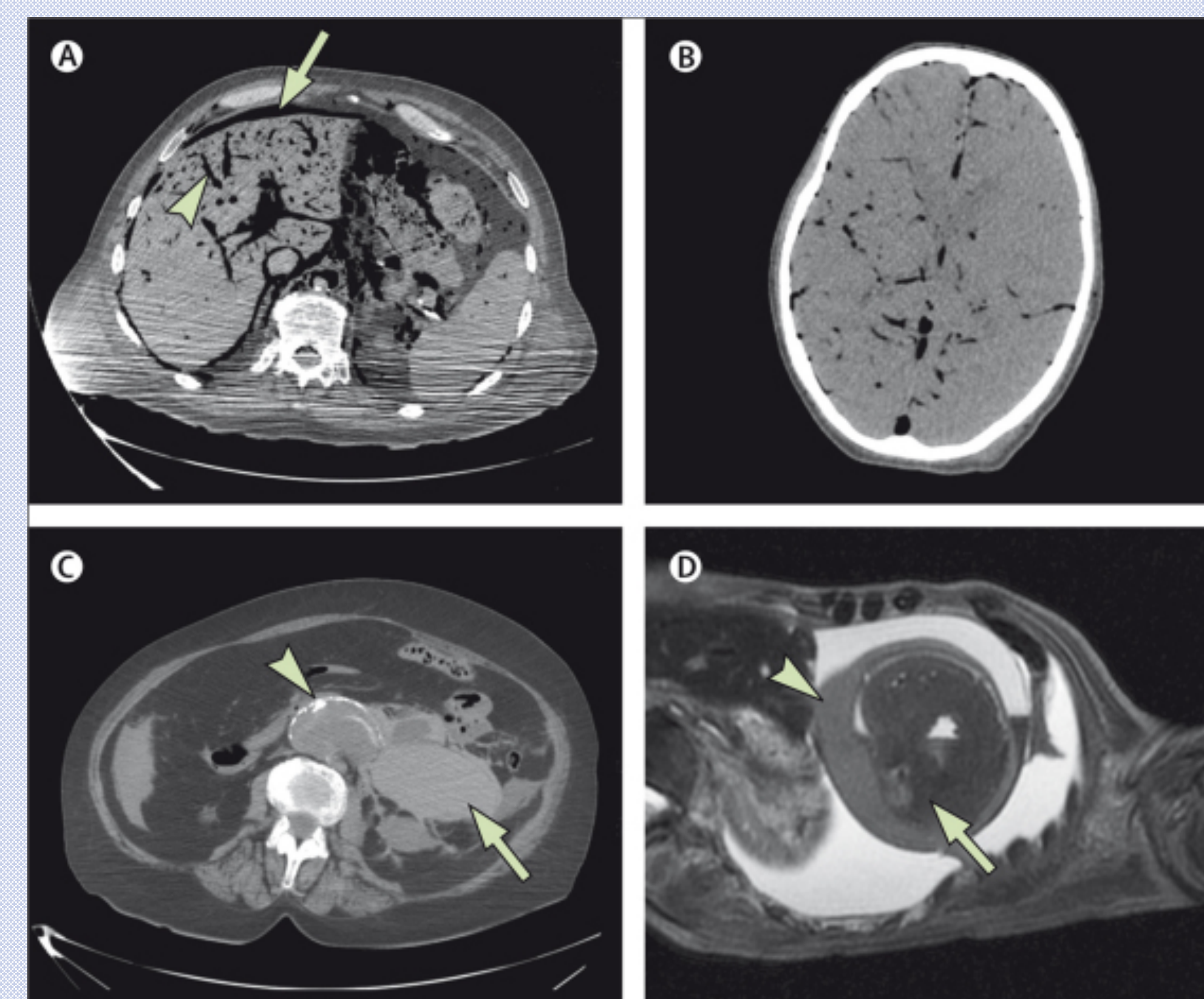
DISADVANTAGES OF PMCT

PMCT can be applied in many different ways to add additional information to the conventional autopsy but there are some ways PMCT cannot be applied.

The disadvantages of PMCT are:

- Radiation
 - Sparse visualization of the vascular system, soft tissues, and organs.
 - Additional radiologist training for interpretation
- Kunihiro Inai³ found that PMCT was not able to detect:
- Acute myocardial infarction
 - Pulmonary embolism
 - Organ failure

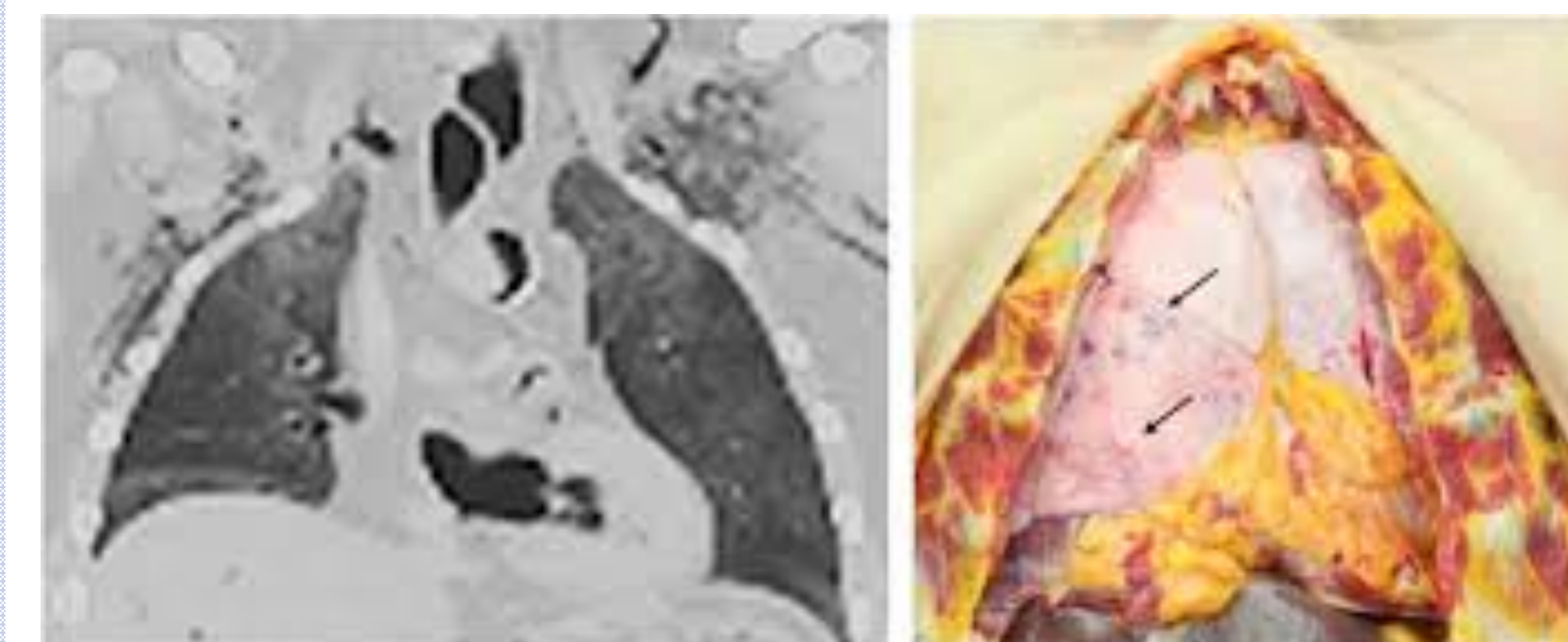
These causes of death are hard to detect postmortem because contrast is not able to be given to the patient. PMCT also finds trouble when the cause of death is natural causes. When cause of death is sudden cardiac death, PMCT cannot confirm the diagnosis. The CT scan will be able to identify calcifications in the coronary arteries, but it will not be able to draw conclusions about the pathological changes of the heart. Postmortem scans have limitations when viewing the vascular system and essential portions of organs. This is due to vessels flattening after death and decreased contrast in the decreased tissue. When vessels are flattened their lumen may be obscured. Although PMCT is able to indicate hemorrhage, it is not enough to determine the exact location of the blood source. Due to the lack of blood flow in the postmortem body, stenoses or occlusions cannot be identified.



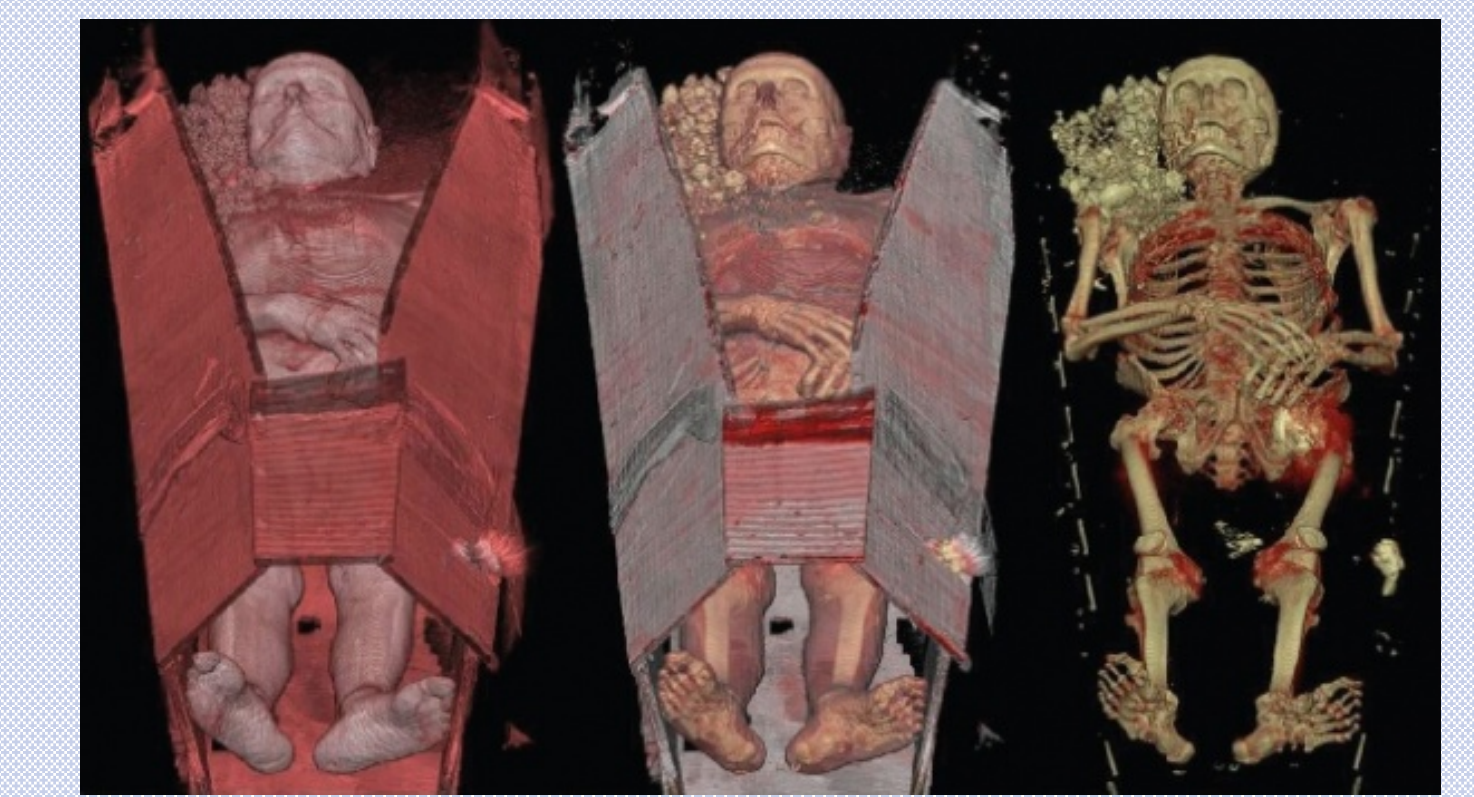
Postmortem changes detected on a CT scan⁵

CONVENTIONAL AUTOPSY VS. PMCT

A routine autopsy is very invasive. The exam starts out with an external examination, inspecting the body looking for the cause of death. The next part of the exam is an internal inspection. A pathologist will dissect the chest and remove the abdominal organs and occasionally the brain. The extremities are not normally dissected or examined internally. Each organ will be removed, examined and weighed. Tissue samples, stomach contents, and bodily fluids will be tested for abnormalities¹. A conventional autopsy has been the regular way to identify cause of death but with implementing PMCT, finding cause of death may be much easier and less invasive. A PMCT is a quick CT scan. From the scan cross sectional images can be made to identify any abnormalities in the body in different planes or by 3D reconstruction. The image below identifies a PMCT and a routine autopsy identifying blood aspiration.



According to an article called "Utility of Postmortem X-ray Computed Tomography (CT) in Supplanting or Supplementing Medicolegal Autopsies" by Sarah Lanthrop⁴, it was found that the cause of death determined by PMCT was in consensus with a conventional autopsy. Lanthrop⁴ also found that when PMCT determined the wrong cause of death, the autopsy was correct. From their study, PMCT determined the wrong cause of death in 10% of blunt forced trauma, 1.5% of firearm fatalities, 17% of pediatric deaths, and almost 100% of drug poisoning deaths⁴. PMCT is able to determine non-natural deaths more accurately. Lanthrop determined that when compared to conventional autopsies, PMCT was able to determine more deaths by blunt force and firearms⁴. Pneumothorax, pneumocephalus and vertebral body fractures were only identified from PMCT. This is due to the fact that these exams are not looked for when conducting a routine autopsy. Lanthrop determined that PMCT can be used to supplement an autopsy if an external examination is completed as well⁴. It was found that PMCT can detect the internal injuries but does not correctly identify any external lacerations or contusions. It is also necessary that a radiologist knows how to read post-mortem scans.



Conclusion

It has been suspected that postmortem CT scans can be faster and less invasive when compared to a conventional autopsy. The PMCT scan may be able to identify the cause of death much sooner than an autopsy. There are many ways that the CT scan can be applied to find out what happened to a body after death. PMCT is best applied in trauma cases, specifically looking for complicated fractures or bullet trajectories. There are also ways that PMCT cannot be applied. The CT scan runs into complications when looking for cause of hemorrhages or heart problems. This is due to the fact that blood does not flow after death. It is also difficult to view soft tissue changes due to lack of contrast. To apply PMCT in regular autopsies, radiologists would need additional training to notice postmortem bodily changes. Although PMCT scans may have some disadvantages, they are a great examination and when applied with conventional autopsies can give the most thorough and detailed postmortem results.

RESOURCES

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