

A Brief Look into Virtopsy

Introduction

While autopsies have been performed for centuries, the rate of its use is declining. Since an autopsy is invasive, there are religions that do not condone the procedure. Therefore, family members can refuse based on their beliefs or for personal reasons.^{1,2} However, some autopsies are mandatory, and as a result, the family might experience even more unwanted pain.³ Virtopsy, the term used to combine virtual autopsy into one word, is a groundbreaking tool of forensic medicine. The concept was put into action in the 1990's to create a fast and efficient way to digitally document the circumstance and cause of death.⁴ Virtopsy involves the use of computed tomography (CT), magnetic resonance imaging (MRI), and 3D surface scanning. These tools help create a noninvasive environment.^{1,4} There is an instrument called the virtibot (see Image 1), which uses markers and stereoscopic cameras to create an accurate and colored representation of the body. With the use of radiography, the pathologist or the radiologist can: determine the gender of the deceased, possibly identify John Doe or Jane Doe, find the cause and pattern of injuries, notice any diseases, and discover any foreign materials.¹

Current Use of Virtopsy

Currently, some facilities use computed tomography (CT) before an autopsy to help locate any possible foreign objects such as bullets, or any hazards that could cause harm to the pathologist or their assistants. These hazards can be any highly contagious diseases like tuberculosis, or any sharp objects that cannot be seen.⁵ Another benefit of CT is how quickly it can exam the whole body, taking approximately 10 min.¹ CT images can be used to identify fractures, bullets, gas, or any fluids within the body.⁶

Benefits in Court Cases

Radiographic images, as well as 3D reconstructions of the images, can be valuable for lawyers and prosecutors to present in court. The radiographic images can be easier for some people in court to look at, rather than a bloody picture taken during an autopsy (see Image 2). This information can give insight into the crime scene. Another benefit for legal issues is that the data can be retrieved at any time and can be viewed by more than one specialist.^{1,6}



Image #1. An example of a virtibot system with a biopsy module.⁴

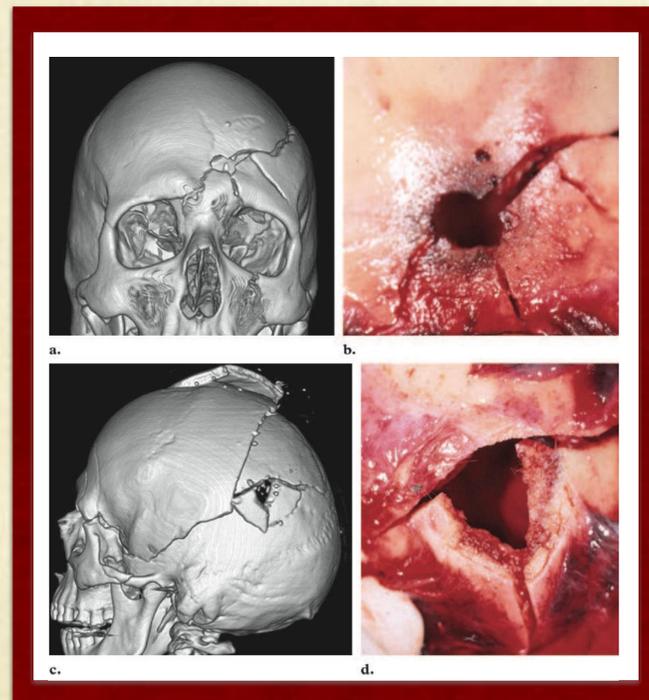


Image #2. Entrance and Exit wounds. (a) A 3D CT reconstruction of an entrance wound. (b) Autopsy picture of the same entrance wound. (c) The exit wound on a 3D CT reconstruction. (d) The same exit wound found during an autopsy.¹

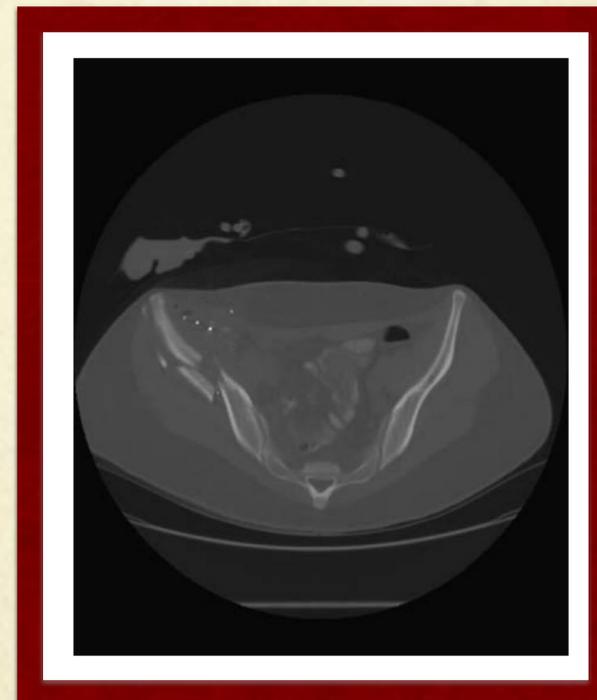


Image #3. The fragments of the right iliac crest are shown to be displaced posteriorly. This indicates the direction of the bullet.⁷

Ballistic Trauma

This type of trauma is caused by gunshots. Post-mortem investigation can give some insight into the crime scene, and can assist in determining the distance and angle of the shot via wound track. The entrance and exit of the bullet can be defined by features of the fractures. The type of gun can be determined if the bullet is found, and any fragments, such as glass, can help reconstruct the scene.⁷⁻¹⁰

Forensic Findings

- Entrance and Exit wounds (see Image 2)
 - Entrance wounds are usually small and round.⁷
 - Exit wounds are more extensive and irregular.⁷
 - No exit wound: The CT can help locate the ammunition by reducing the slice thickness.⁹
- Course of Bullet
 - Identified by the entrance and exit wounds, and by the presence of air or by any displacement of fractures (see Image 3)^{1,7,10}
- Angle of the Shot
 - Investigated further using the course of the bullet⁸

Forensic Case

In the case shown in image 3, the entrance and exit wound could not be determined because the wounds looked similar. The victim had a wound on her abdomen and buttocks. Computed tomography was performed, and the radiologist was able to rule that the entrance wound is located on the abdomen because the fragments from the right iliac crest were displaced towards the buttocks.⁷

References

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