

CT: Method Of Choice

According to the Millennium Research Group, CT device sales are expected to reach \$18.5 billion by 2012. CT is still the imaging method of choice in cardiac and cancer follow-up, but as other, less damaging devices become available this advantage may erode with time. At the same time, we can expect that innovation will increase resolution while reducing exposure times and radiation dosage.

Visible Proofs

"Visible Proofs: Forensic Views of the Body" was an exhibit at the National Library of Medicine, part of the National Institutes of Health, until earlier this year. It describes the work of the Swiss Virtopsy pioneers: <http://tinyurl.com/visibleproofs>.

For more about virtual autopsies, go to the online version of this article at SPIE.org/spieprofessional.

Postmortem Innovation

Performing 3-D reconstruction techniques on cadavers can be a simple and accurate approach to autopsy.

By **Clarence Mayott**

Nearly four decades after the invention of computed tomography scanning, innovation with this process of minimally invasive body imaging has not abated. One of the newest applications for CT scanning is for performing scalpel-free autopsies, or virtual autopsies.

Innovators are now using standard-issue hospital imaging devices for forensic evaluation in mortuaries, and the development of CT devices specifically for autopsies may not be far off.

The U.S. military has been routinely conducting CT-assisted autopsies on soldiers' remains since 2004 to determine precise cause of death and to gather data to improve body armor. And Virtopsy®, a combination of CT and MRI developed by researchers at the University of Bern's Institute of Forensic Medicine and the Institute of Diagnostic Radiology in Switzerland, has become a standard technique.

Even the scalpel-wielding medical examiners on the popular TV series CSI are adding three-dimensional imaging reconstruction techniques to their investigative toolkit.

Repurposing aging CT facilities in hospitals and radiology offices to help determine cause of death could revolutionize criminal and forensic investigation techniques. Considering that the vast majority of reported deaths do not result in postmortem exams, forensic digital autopsies, sometimes called catopsies, could also create new revenue streams and new entrepreneurial opportunities within the medical industry.

Innovative CT scanning for forensic evaluation has several advantages over conventional autopsies.

Radiation is a hazard only to radiology personnel but can be avoided with proper shielding. Extended times and increased radiation levels may be used to increase imaging resolution and definition.

In cases of suspicious death, a virtual autopsy won't

damage important forensic evidence as can happen during a conventional autopsy.

Software programs such as 3-D Doctor and Voxar 3D Express are readily available to take the output from CT imaging machines and convert the two-dimensional slices into a three-dimensional image.

Cost is about \$1,000 versus \$4,000 for a standard autopsy.

Religious and cultural concerns about desecrating the body or burying it within a certain time frame are minimized or eliminated.

CT scans can be performed and stored for later evaluation or transmitted to a coroner in another location. Scans could be useful as a triage tool, for instance, at a scene of natural disaster or other mass casualty, to help determine which bodies should receive a full autopsy.

Challenges for Coroners

Using CT images in virtual autopsy does have some drawbacks, however. CT is very good at showing bone and metal, but different soft tissues often look similar in a CT image. A virtual autopsy would not be helpful in cases where the cause of death is likely to be cardiac, for instance.

CT scanners also tend to overheat or burn out when the volume of scans is high, as might be predictable during warfare or natural disaster. Some critics have suggested that virtual autopsies are useful but will never replace conventional autopsies or enjoy mainstream use. A primary concern is that most publicly funded coroners' offices couldn't handle the bigger workload and its associated costs.

"If a medical examiner's office is faced with the cost of a CT scanner and the radiologist to interpret the scan versus the cost of opening another office or hiring another medical examiner to handle increased workload, they would choose the latter," Joseph Prahlow, president of the National Association of Medical Examiners, told *Radiology Today* earlier this year.

Nonetheless, researchers continue to work on this innovation of an older invention in hopes of overcoming these challenges. ■

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