G40 Multidetector Computed Tomographic (MDCT) Autopsy in Suicide by Gunshot to the Head

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After attending this presentation, attendees will be able to discuss the ability of MDCT to identify critical forensic elements in suicide by gunshot to the head. The discussion will include both strengths and limitations of MDCT imaging.

This presentation will impact the forensic science community by showing the potential for postmortem MDCT imaging to simplify cause of death determination in selected cases of suicide.

Postmortem MDCT has been showed to be accurate in the evaluation of gunshot wounds with regard to presence of ballistic fragments, entry and exit wound determination, and determination of wound track. Two-dimensional and three-dimensional CT images from a consecutive series of ten cases (nine male, one female; age range 19- 32 years) with history of self-inflicted gunshot wound(s) to the head by small arms were studied retrospectively by a radiologist and forensic pathologist. Neither individual had knowledge of the autopsy findings. Using a computer workstation to view axial images and 2D/3D computer reconstructions, determinations of number of shots, entry and exit wounds, soot/stippling, beveling, and wound direction were ascertained. The results were compared to the autopsy findings. All autopsies were performed by board certified medical examiners with access to 2D radiographic images.

The radiographic conclusion that all cases were single shot perforating wounds (one with residual metal fragments) agreed with autopsy reports. There was agreement in designation of all entry and exit wounds (20); entry wounds were submental (1), glabellar area (3), right temporal region (5) and intraoral (1). Three-dimensional surface rendering of scalp wounds was not as helpful as skull findings in classifying wounds. Presence of soot was not mentioned in any of the radiographic assessments but was described at autopsy in all cases. Stippling was not noted in either the MDCT or autopsy findings. Presence of beveling was agreed upon at 9/18 sites, in 8/18 sites MDCT was positive for beveling but not mentioned or called negative in the autopsy report. At one entry site, the autopsy noted beveling whereas the radiology review did not call it (intraoral and submental entry sites are often not subject to beveling).

There was agreement in 10/10 cases regarding the track direction (anterior vs posterior, left vs right, up vs down) with only a minor variance in one case (horizontal track by MDCT vs downward by autopsy measure from vertex). The internal description of brain injury reflected some differences in terminology. While the MDCT tended to describe direction and distribution of bone fragments and pathway, autopsy was more descriptive of hemorrhage and brain anatomy but overall the pathways were in agreement.

Self inflicted, perforating GSW's of the head were correctly described by MDCT in regard to number of shots, entry and exit wound determination and description of wound direction and track. Significant limitations of MDCT are its inability to assess the external soft tissue findings at entry and exit sites and in particular to determine the presence of soot. This study shows that MDCT adds objective information to the invasive part of the cranial autopsy in cause of death determination for cases of suicide with perforating GSW's; however, it cannot replace external assessment of wounds.

However, the combination of hands-on external/internal autopsy assessments and non-invasive internal evaluation by MDCT are not enough. The knowledge of the circumstances leading up to the death and laboratory tests are required to strengthen the medical examiner's ability to objectively establish the cause and manner of death in cases involving self inflicted, perforating GSW of the head.

Suicide, MCDT Autopsy, GSW to Head

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