



Pathology Biology Section - 2012

G45 A Freak Human-Human Collision: Application of MSCT 3D Modeling to Incident Reconstruction

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After attending this presentation, the attendee will be able to appreciate the usefulness of MSCT as an adjunct tool to the routine forensic autopsy in providing valuable objective and more detailed documentation, and the value of 3D reconstruction of MSCT data in understanding the mechanism of injury in cases of trauma, and its application in assisting the investigation into circumstances and accident reconstruction.

This presentation will impact the forensic science community by showing how 3D reconstruction of MSCT information provides better spatial and orientation information in the total understanding of pattern of injuries, aiding in accident reconstruction.

3D reconstruction of CT scan damage is a useful method in assisting in medicolegal death investigation and scene reconstruction, particularly in traumatic deaths.

The use of MSCT has become more common place. Multiplanar reconstruction (MPR) is the usual mode of reviewing of CT images in the identification and 2D documentation of skeletal injuries. This case study of two simultaneous deaths arising from a human-human collision demonstrates the application of 3D reconstruction in understanding the pattern of injuries, which might have otherwise required painstaking and lengthy forensic anthropological preparations.

While 2D CT MPRs provide a basic documentation of injuries, application of 3D reconstruction provides additional spatial information in a speedy and non-destructive manner. Its use should be considered in more routine forensic work.

In traumatic deaths with severe skeletal injuries, while identification of first level documentation of presence of fractures may be easily done through the routine autopsy method, it is not often possible, without significant effort to examine deep seated structures, such as the pelvis, scapula, and transverse processes of vertebrae. Much painstaking effort is also required if one desires to examine the pattern of fractures so as to understand the mechanism of injury. Additional steps involving further mutilation of the body, recovery, and retention of body parts, and forensic anthropological processing in a laboratory are required. This takes time and additional resource such as a proper anthropological facility. This is made more complicated where retention of human tissue becoming more sensitive medicolegal and ethical issues in the community at large.

Further, removal of the material for processing involves the loss of original spatial orientation and related information. For example, recovery of a severely comminuted fractured skull will disturb the original orientation of the pieces, run the risks of loss of minute fragments, and incur the loss of information on the original fracture pattern. Severe comminution also makes reconstruction difficult due to generation of numerous similar looking pieces and loss of 'fit' characteristics.

In recent years, CT scanning has been used in more and more jurisdictions. Multiplanar reconstruction (MPR) tends to be the most common manner in which CT information is viewed and findings gleaned. The Forensic Medicine Division, Health Sciences Authority Singapore, acquired a multi-slice helical CT scanner and operationalised it in late 2010/early 2011, using it to scan cases of traumatic deaths routinely. Besides reading the MPR images, 3D reconstruction of the skeletal system is routinely carried out. The bulk of traumatic deaths in Singapore are accounted for by self-inflicted fall from a height (tall buildings), road traffic accidents, and hangings.

3D reconstruction has been found to be very helpful in understanding the pattern of skeletal injuries, in cases where severe trauma has been afflicted. To illustrate its application, a case study will be presented to demonstrate the value of 3D reconstruction in a freak accident involving two adult Chinese females who were found side by side dead at the foot of a block of apartment flats, both sustaining serious injuries. There was a lack of eye-witness accounts and investigators were not certain how both women could have come to rest in that situation. Initial investigations appear to suggest that one or both deceased could have fallen from a substantial height. A suicide pact scenario was considered. There has been no previous documented incident where a human falling from a height had impacted another individual.

Prior to the autopsies, both deceased persons were scanned and forensic autopsies were conducted. Following the scanning, 3D reconstruction of CT data was carried out. Analysis of the 3D reconstructions enabled the medical examiner to postulate the mechanism of injuries in both individuals, by looking at the overall patterns and direction of injuries. It was then possible to subsequently make a determination on the relative postures and positions of both deceased persons at the time of impact and form a conclusion that one of the deceased persons had fallen from a height and contacted the other deceased in a back to back manner, resulting in severe injuries to both individuals and instantaneous deaths.

MSCT, Fall From Heights, Human-Human Collision