High-resolution imaging of paediatric non-accidental injuries using micro-CT scanning and visualisation

Exploring the potential of micro-CT scans in the identification of non-accidental paediatric injuries.

Key details

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Police region	West Midlands
Collaboration and partnership	West Midlands Police, West Midlands Surgical Training Centre.
Level of research	Professional/work based
Project start date	September 2015
Date due for completion	September 2024

Research context

The injury pattern in non-accidental injuries in infants is crucial to the overall question of the nature and origin of these injuries. Maximising the number of detected injuries is therefore essential to an accurate interpretation of events.

The problem is that due to the small size of the injured parts and the subtlety of the injuries, standard skeletal survey or hospital computed tomography (CT) scanning might fail to detect all injuries. Micro-CT has the potential to identify these, which can provide suitable guidance for

further, more destructive analyses such as histology.

Using these micro-CT scans to produce visual support for expert testimony in court is an added benefit as images can be helpful to the jury's understanding of medical issues.

Research methodology

Micro-CT scans are conducted in cases of suspected child abuse and examined for evidence of skeletal trauma. The scan images are then provided to the bone specialist to improve their procedure by allowing them to choose the most suitable cutting plane.

Comparison with histology results enables validation of the micro-CT findings. The three-dimensionality of the micro-CT scans has the added advantage of showing injuries that otherwise might not be captured in the histological sections. It further preserves the pre-sectioning state of the sample, thus allowing the identification of sectioning artefacts more easily.

Background research in this area includes determining fracture callus age based on its micro-CT appearance, and establishing baselines of underlying conditions that might influence the actual injury appearance (for example, rickets).

Interim reports or publications

Baier W and others. (2019). Using histology to validate micro-CT findings of trauma in three post-mortem samples: First steps towards method validation. Forensic Science International. 297, pp27-34.

Baier W and others. (2021). Micro-CT for the examination of paediatric rib injuries: a case series. Forensic Science International.