Abstract

In routine Forensic Odontology practice in Queensland, the availability of Computer Tomography (CT) imaging at Queensland Health Forensic and Scientific Services (QHFSS) supplements plain film imaging techniques by providing an increased ability to investigate in three dimensions and produce images of broad anatomical areas of the teeth and jaws in a timely manner.

Computer Tomography Dentition Reconstruction

CT scans are routinely performed on all coronal cases at QHFSS using a Toshiba Aquilion 16 slice large bore CT scanner. Our head scans are acquired with a slice thickness of 0.5mm although reconstructed at 1.0mm and always include the skull and facial bones in their entirety.

Most commonly, the Forensic Odontology section will request dental images from the Radiography section only when advised to assist in a coronal case. Therefore, the need for dental images is most often advised subsequent to the routine scanning process and no specific dental scan has been performed. We are however able to retrospectively acquire the raw acquisition data to reconstruct high resolution bone images with a reduced field of view or region of interest that only includes the dentition. This is done at a slice thickness of 0.5mm reconstructed every 0.3mm.

This reconstructed image data containing only the necessary areas of the jaws is then rotated to align the dentition in appropriate axial, coronal and sagittal planes, before we can produce a curved MPR (multiplanar reconstruction) which closely mimics an orthopantomogram (OPG) image. The reformatted image is typically 10-15mm thick and follows a trace through the dentition in the axial plane. The resultant image is comparable to a clinical OPG radiograph (Figures 1 & 2).

Separate MPR images are often created for the upper and lower jaws as the positioning of the jaws in a deceased person will seldom be in the correct position for exposing a clinical OPG.

Metallic dental materials can sometimes cause significant artefact in the resultant images. When there is significant artefact from dental restoration in the jaws, raw data reconstruction can be performed using standard bronzy algorithms instead of high resolution algorithms to reduce the degree of artefact in the resultant image, as the high resolution algorithm will tend to exacerbate the artefact.

Changing nature of radiological investigation

The number of Forensic Odontology cases using plain film radiography varies with number of cases per year, and shows a slight increase over time.

The number of Forensic Odontology cases which have been scanned has steadily increased with a shift toward routine scanning.

The number of Forensic Odontology cases for which we acquire a MPR image rose slightly after acquisition of the CT scanner then increased dramatically with the employment of a full-time radiographer at QHFSS.

Conclusions

CT scanning of deceased persons has become routine for coronial cases at QHFSS. This data can be retrospectively accessed to view and image specific areas of the teeth and jaws and provide images that are comparable to standard extra-oral radiographs such as OPGs. The CT scanner also allows for visualisation of the jaws in three dimensions and further allows for selective elimination of tissues to leave the tissues which are of interest to the investigator.

Since the arrival of this technology at QHFSS we have noted a steady increase in the number of forensic odontology cases which have received a CT scan. With the employment of a full-time radiographer, we have noted an increase in the number of Forensic Odontology cases where we have acquired a MPR image as a component of our examination.

The availability of a CT scanner at QHFSS allows Forensic Odontology team to supplement traditional radiographic techniques with newer imaging techniques. The availability of a full-time radiographer has seen a significant increase in use of these techniques.

Figure 1. An orthopantomogram radiograph taken of a missing person which was supplied by police.

Figure 2. A Multi-planar Reconstruction (MPR) from CT scan used to simulate an orthopantomogram radiograph. Note the similarity in dental features with the supplied radiograph in the image above.

Graph 1: Number of cases per year using various methods for radiological investigation