



Service Priorities and Programmes
Electronic Presentations

Convention ID: 1174

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Post title: Resident Specialist, Queen Elizabeth Hospital

Application of Medical 3D Printing in Queen Elizabeth Hospital: A Radiological Perspective

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Keywords:

3D printing

Medical

Radiology

Education

Innovation

Introduction

In recent years, medical 3D printing has gained immense attention worldwide with numerous potential applications. It offers excellent opportunities for healthcare innovation, education and training. Creating accurate models of the anatomy contributes to improved post-operative results and increases surgical confidence in complex cases. We share our experience in medical 3D printing in a radiological perspective with its various clinical applications.

Objectives

- 1) To explore the current use of medical 3D printing and its value in pre-operative planning, teaching and education.
- 2) To discuss radiologists' role in medical 3D printing in terms of image preparation, segmentation and post-processing techniques.
- 3) To investigate the prospects of 3D printing and its role in future healthcare development.

Methodology

All clinical requests for 3D printing models with image acquisition performed in Department of Radiology & Imaging, Queen Elizabeth Hospital from September 2015 to January 2017 were reviewed. Indications, procedure and outcomes for 3D printing models were assessed.

Result

Our first 3D model was created in September 2015. Since 2016, we have collaborated with the engineering department of a local university to provide in-house whole chain service for 3D printing and had seen increasing utilizations in various specialties ever since. The images were acquired from thin-slice CT and MR images in our department. The Digital Imaging and Communications in Medicine (DICOM) images were segmented and post-processed on a commercially available software into specific output format. The indications include pre-procedural planning and teaching for cardiovascular (transcatheter aortic valve implantation, left atrial appendage occlusion, aortic stenting, etc), urological (partial nephrectomy for renal tumour, donor nephrectomy), neurosurgical (brain tumour resection) and orthopaedic (e.g. pelvic fractures) interventions. More than 20 models have been made so far. Several examples will be illustrated with description on image acquisition, post-processing processes and appearance of final product.

Medical 3D printing is one of the most exciting evolution in healthcare provision and offers unique ability to transfer fine anatomical details from the scanning suite into the hands of physicians and patients. It offers invaluable opportunities for better training and pre-operative planning of complicated interventions and surgeries. Radiologists play an important role in 3D printing, while a multidisciplinary approach with collaboration among various specialties is crucial for its successful implementation.