PULSUS
WWW.PULSUSCONFERENCE.COM

Zhonghua Sun, J Nursing Research and Practice, Volume 3
DOI: 10.4172/2632-251X-C3-008

World
NURSING EDUCATION AND EVIDENCE BASED PRACTICE CONFERENCE
&
4th International HEART CONFERENCE
April 22-23, 2019 Dubai, UAE

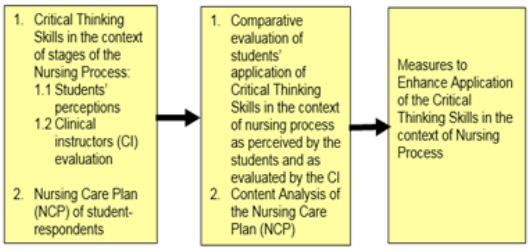
3D printing in cardiovascular disease

Zhonghua Sun
Curtin University, Australia

Statement of the Problem: Three-Dimensional (3D) printing has been increasingly used in clinical practice with promising reports in the cardiovascular disease. Studies have shown that realistic 3D printed models are able to replicate complex cardiac anatomy and pathology with high accuracy. However, comprehensive assessments of 3D printing in cardiovascular disease with regard to model accuracy, clinical value and optimisation of imaging protocols remain to be determined. The purpose of this study is to demonstrate the clinical applications of patient-specific 3D printed models of heart, aorta and pulmonary arteries in terms of quantitative assessment of model accuracy, depiction of cardiovascular disease and development of optimal Computed Tomography (CT) scanning protocols.

Methodology: Sample CT angiographic images of patients with congenital heart disease, aortic aneurysm and dissection, as well as pulmonary embolism were selected for image post-processing and segmentation for generation of 3D printing files. 3D printed models were created with use of different materials including strong and flexible material, elastoplastic and tangoplus materials. Measurements of dimensional diameters were performed to compare the differences between original source CT images and 3D printed models to determine model accuracy. Thrombus was inserted into the pulmonary arteries to simulate pulmonary embolism with different CT angiographic protocols tested on the model. Findings: 3D printed models were successfully generated with excellent demonstration of cardiovascular anatomy and pathology (image). Complicated cardiovascular pathologies such as ventricular septal defect, aortic aneurysm, or aortic dissection can be clearly depicted on 3D printed physical models. Low-dose CT protocols of 70 or 80 kVp and high pitch 2.2 or 3.2 are recommended for dose optimization.

Conclusion and Significance: Patient-specific 3D printed models have potential value to improve clinical practice by simulating surgical procedures and surgical planning. 3D printed models can be used to optimize CT protocols with low radiation dose but acceptable diagnostic images.



Biography

Zhonghua Sun is a Professor and Head of Discipline of Medical Radiation Sciences at Curtin University, Australia. His research interests include diagnostic imaging, 3D medical image visualization and processing (in particular cardiovascular CT imaging), haemodynamic analysis of cardiovascular disease and 3D printing in cardiovascular disease, and 3D printing in medicine. He has published 3 books, 13 book chapters, and over 240 refereed journal papers in medical/medical imaging journals. He is a Fellow of the Society of Cardiovascular Computed Tomography. He serves as an associate editor/academic editor for 6 journals and editorial board member for more than 30 international imaging/medical journals. Specifically, his research on 3D virtual intravascular endoscopy of aortic stent grafts and coronary plaque features has led to many publications in internationally refereed radiology and surgery journals with high citations, and his recent research on 3D printing in cardiovascular disease has also produced a number of publications.

z.sun@curtin.edu.au