

Clinical application of three-dimensional reconstruction and rapid prototyping technology of multislice spiral computed tomography angiography for the repair of ventricular septal defect of tetralogy of Fallot

X.J. Ma¹, L. Tao², X. Chen², W. Li¹, Z.Y. Peng¹, Y. Chen¹, J. Jin²,
X.L. Zhang¹, Q.F. Xiong¹, Z.L. Zhong¹ and X.F. Chen¹

¹Department of Radiology, Wuhan Asia Heart Hospital, Wuhan,
Hubei Province, China

²Department of Cardiac Surgery, Wuhan Asia Heart Hospital, Wuhan,
Hubei Province, China

Corresponding author: X. Chen
E-mail: xinChencn@163.com

Genet. Mol. Res. 14 (1): 1301-1309 (2015)

Received May 25, 2014

Accepted October 30, 2014

Published February 13, 2015

DOI <http://dx.doi.org/10.4238/2015.February.13.9>

ABSTRACT. Three-dimensional (3D) reconstruction and rapid prototyping technology (RPT) of multislice spiral computed tomography angiography (CTA) was applied to prepare physical models of the heart and ventricular septal defects of tetralogy of Fallot (ToF) patients in order to explore their applications in the diagnosis and treatment of this complex heart disease. CTA data of 35 ToF patients were collected to prepare 1:1 3D solid models using digital 3D reconstruction and RPT, and the resultant models were used intraoperatively as reference. The operations of all 35 patients were completed under the guidance of the 3D solid model, without difficulty. Intraoperative findings of the patients were consistent with the morphological and size changes of the

3D solid model, and no significant differences were found between the patches obtained from the 3D solid model and the actual intraoperative measurements ($t = 0.83$, $P = 0.412$). 3D reconstruction and RPT of multislice spiral CTA can accurately and intuitively reflect the anatomy of ventricular septal defects in ToF patients, providing the foundation for a solid model of the complex congenital heart.

Key words: Tetralogy of Fallot; Ventricular septal defect; 3D reconstruction; Rapid prototyping