ROLE OF 64 MULTI-DETECTOR COMPUTED TOMOGRAPHY IN CONGENITAL HEART DISEASES

Duong Phi Son MD
Nguyen Tuan Vu PhD
Phan Thanh Hai MD
Department of Cardiology
Medic Medical Center, Vietnam
I. INTRODUCTION

- Congenital heart diseases effect ~ 2% of all live births in the general population.

- Over the past few decades, the diagnosis and treatment of congenital heart diseases have greatly improved.

- Diagnostic tools: X-ray, ECG, Echocardiography, MRI and MDCT-64.

* ECG and X-Ray suggest the diagnosis but are not specific.

Michael H.Crawford: *Current diagnosis & treatment in cardiology*, chapter 27
Mathew J.Budoff, Jerold S.Shinbane, Stephan Achenbach: *Cardiac CT Imaging Diagnosis of Cardiovascular Disease*
* Echocardiography is the initial diagnostic method for patients with suspected CHD but this method can be limited in complex CHD.

* The great capabilities of MRI for anatomic and functional assessment of the heart but MRI is time-consuming and may require patient sedation.

* Cardiac MDCT-64 is a useful tool for the evaluation of complex CHD.
  . Improves both spatial and temporal resolution.
  . Increases scanning speed.
  . Improves diagnostic image quality by reducing respiratory artifacts.

R. C. Gilkeson1, Leslie Ciancibello1 and Kenneth Zahka2. Multidetector CT Evaluation of Congenital Heart Disease in Pediatric and Adult Patients
- Now enable CT to be used as an accurate noninvasive clinical instrument that is fast replacing invasive cine-angiography in the evaluation of CHD.

- Currently, CT is being used extensively at many centers for the evaluation of patients with CHD.

- Cardiac MDCT is a useful tool for the evaluation of complex CHD in small children.

- MDCT allows physicians to evaluate cardiac and coronary calcification, congenital heart disease.....

Newswise Medical News: New CT Scanner for Early Detection of Heart Disease; Matthew J. Budoff, Jerold S. Shinbane and Stephan Achenbach: Cardiac CT imaging diagnosis of cardiovascular disease; Matthew J. Budoff, Stephan Achenbach and Jagat Narula: Atlas of cardiovascular computed tomography, chapter 11; RSNA 2004-Effectiveness of Cardiac-Gated MDCT for the Diagnosis of Congenital Heart Disease in Small Children with High Heart Rates
Development of Multi-detector Computed Tomography Technique

From U. Joseph Schoepf (2005),
II. PURPOSE:

To assess the role of MDCT-64 in Congenital heart diseases (CHD) diagnosis compare with operative result and interventional angiography.
III. MATERIAL AND METHODS

1. Subject:
   250 patients with congenital heart diseases of 6000 patients underwent coronary angiography with 64 section CT at Medic Medical Center since 09/09/2006 up to 09/09/2010.

2. Means of diagnosis:
   - Kontron Iris 440 machine with 3.5MHz and 5.5MHz probes.
   - MDCT- 64 Aquilion Toshiba
   - Medrad pump of Stellant, Ultravist.

3. Data analysis:
   - The prospective study and case series report compare with operative and interventional angiography.
   - Ho Chi Minh city heart institute, Tam Duc cardiology hospital, University medical center.
IV. RESULTS:

- Operated cases : 136 cases.

- Most of operated cases demonstrated the exact diagnosis of MDCT-64 in congenital heart diseases.

- The rest is not operated due to having complications and financial reason.
Pulmonary Atresia with Ventricular Septal Defect:

- Ventricular septal defect 23mm
- Overriding of the Aorta <50
- Pulmonary trunk size is small
3D- image show: **Pulmonary atresia**

**Complex aortopulmonary collateral arises from descending Aorta to the left pulmonary artery**
Transposition of the Great Vessels:

The Aorta and Pulmonary arise from a single ventricular.

The Aorta and Pulmonary artery are parallel together, the aorta is anterior to pulmonary artery.
Double-outlet Right Ventricle:

The Aorta and Pulmonary artery arise from right ventricular, parallel together.

The Pulmonary artery is posterior and left site to Aorta.
Single Ventricle

The single ventricle is anatomic left ventricle

The main chamber is right ventricle

The single ventricle is anatomic left ventricle

The main chamber is left ventricle
Truncus Arteriosus:

The Aorta and Pulmonary artery have a common trunk.
Tetralogy of Fallot:

- Pulmonary trunk atresia
- Ventricular septal defect 15mm and right ventricular hypertrophy
- Overriding of the aorta 50%
- Collateral from arch
Abnormal Systemic Venous Connection
Abnormal Pulmonary Venous Connection
Interruption of the Aorta:

The Aorta arises from Pulmonary trunk.

Descending Aorta arises from Pulmonary trunk.
Coarctation of the Aorta:

Coronal section: Coarctation of the Aorta

3D image: Coarctation of the Aorta and poststenotic aneurysm of the descending AO
Alcapa syndrome:

3D image: Origin of the left coronary artery from pulmonary trunk

Origin of the left coronary artery from pulmonary trunk
Fistula and Aneurysm of the Coronary Artery:

Fistula from RCA to the right ventricular. The RCA is dilated, elongated and tortuous.

Fistula from LCX to right atrium.
Ventricular Septal Defect, Atrial Septal Defect and Patent Ductus Arteriosus:
V. DISCUSSION

- Complex congenital heart diseases associated with more malformations, complex aortopulmonary collaterals and anomalous coronary artery.

- ECG and X-Ray suggest the diagnosis but are not specific.

- Echocardiography is the initial diagnostic method but this method can be limited in complex congenital heart diseases.

Congenital Heart Disease Tests. U.S. News and World Report
R. C. Gilkeson1, Leslie Ciancibello1 and Kenneth Zahka2. Multidetector CT Evaluation of Congenital Heart Disease in Pediatric and Adult Patients
- MDCT-64 overcomes the limit of Echocardiography by multiplanar reconstruction (MPR) and volume rendered techniques (VRT) reconstruction.

- Volume rendered techniques (VRT) reconstruction clearly demonstrates the relationship between the heart and great vessels.
VI. CONCLUSION

- MDCT-64
  
  * Is the fast and non-invasive diagnostic method with the high accuracy.
  
  * Overcomes the limit of Echocardiography in complex congenital heart diseases diagnosis.
  
  * Provides the panorama and useful informations prior to the operation.
VII. REFERENCE

1. Harrison, s Principles of Internal Medicine. Isselbacher, Braunwald, Wilson, Martin, Fauci, Kasper. MD


3. Atlas of Non-invasive Coronary Angiography by Multidetector Computed Tomography, edited by Guillem Pons-Llado’ and Ruben’ Leta-Petracca, MD;

4. Cardiac CT Imaging Diagnosis of Cardiovascular Disease edited by Mathew J. Budoff, Jerold S. Shinbane, Stephan Achenbach, Paolo Raggi and Jonh A. Rumberger;

5. Sebastian leschka, Erwin Oechslin, Lars Husmann… Pre-and Postoperative Evaluation of Congenital Heart Disease in Children and Adults with 64-Section CT;


7. R. C. Gilkeson1, Leslie Ciancibello1 and Kenneth Zahka2. Multidetector CT Evaluation of Congenital Heart Disease in Pediatric and Adult Patients;


10. Edwin Rodriguez-Cruz, MD. **Pulmonary Atresia With Ventricular Septal Defect**;
11. Harvey Feigenbaum. **Echocardiography, 5th**;
12. **Aortic arch interruption**, thomas C.Wheeler, MD; Philippe Jeanty, MD, PhD;
13. Celoria GC, Patton RB. **Congenital Absence of The Aortic Arch**. Am Heart J 1959;
15. Van Mierop L, Kutsche L, ** Interruption of The Aortic Arch and Coarctation of The Aorta: Pathogenetic Relations**. Am J Cardiol, 1984;
16. **Case Report: Doppler Finding in A Rare Coronary Artery Fistula**. Christian Jung, Carl Jorns and James Huhta;
17. Hauser M: **Congenital Anomalies of The Coronary Arteries**. Heart 2005;
18. **Case Report: Coronary Artery to Left Ventricle Fistula**. Angle lipez-Candales and Vivek Kumar;
20. **Congenital Heart Disease**. U.S. News and World Report. Mayo Clinic;
Thank you for your attention!