Prevalence of Congenital Coronary Artery Anomalies Detected by MSCT Coronary Angiography

Thesis

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List of abbreviations

3D	3 Dimensional
ACAOS	Anomaly Coronary Artery From Opposite Sinus
ALCAPA	Anomalous Left Coronary Artery Originating From Pulmonary Artery
CAA	Coronary Artery Anomaly
CAAs	Coronary Artery Anomalies
CAC	Coronary Artery Calcium
CACS	Coronary Artery Calcium Score
CAD	Coronary Artery Disease
CAF	Coronary Artery Fistula
CAVF	Coronary Arteriovenous Fistula
CCA	Conventional Coronary Angiography
CT	Computed Tomography
CT-CA	Computed Tomography Coronary Angiography
EBCT	Electron Beam Computed Tomography
ECG	Electrocardiogram
FFR	Fractional Flow Reserve
IHD	Ischemic Heart Disease
IVUS	Intravascular Ultrasonography
LAD	Left Anterior Descending Artery
LCA	Left Coronary Artery

LCS	Left Coronary Sinus
LCx	Left Circumflex Artery
LM	Left Main
LMCA	Left Main Coronary Artery
MB	Myocardial Bridge
MPR	Multi Planar Reconstruction
MRCA	Magnetic Resonance Coronary Angiography
MRI	Magnetic Resonance Imaging
MSCT	Multi Slice Computed Tomography
NCS	Non Coronary Sinus
PA	Pulmonary Artery
PCI	Percutaneous Coronary Intervention
PDA	Posterior Descending Artery
PET	Positron Emission Tomography
PL	Postero lateral Artery
RCA	Right Coronary Artery
RCS	Right Coronary Sinus
ROI	Region Of Interest
SB	Septal Branch
SCD	Sudden Cardiac Death
SPECT	Single Photon Emission Computed Tomography
T2DM	Type 2 Diabetes Mellitus

TEE	Transesophageal Echocardiography

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Abstract

Background: Congenital coronary anomalies are rare and often found incidentally on conventional coronary angiography (CCA) or by other non invasive technique. They may lead to sudden cardiac death. Non invasive coronary angiography is unable to detect all coronary anomalies in details especially those with complex anomalies. Computed tomography coronary angiography is able to demonstrate origin, courses and terminations of these anomalies more accurately.

Aim of the work: Evaluation of the prevalence and types of coronary artery anomalies in a group of patients referred for computed tomography (CT-CA) and determining the extent of atherosclerotic coronary artery disease among these patients.

Methods: Angiographic data of 13611 patients undergoing CT- CA from January 2012 to June 2016 were analyzed to determine presence of coronary artery anomalies. Gensini score and calcium score were calculated to detect prevalence of atherosclerotic coronary artery disease.

Results: We reviewed 13611 patients scheduled for CT-CA, 127 (0.93%) had coronary anomalies. Mean age was 54.2 ± 10.5. Male gender dominated our patients with congenital coronary artery anomalies and represented 66.9% (85 patients). The most common coronary artery anomaly was origin and course 105 (82.7%) and the most common vessel affected was the RCA 63 (48.5%). Prevalence of double LAD was 8 (6.3%) and fistula was detected in 13 (10.2%). Prevalence of severe coronary artery disease in our patients was 20 % detected by Gensini score.

Conclusion: Prevalence of coronary artery anomalies in our study is 0.93%. Prevalence of severe atherosclerotic coronary artery disease in our patients was 20 % detected by Gensini score.

Keywords: computed tomography coronary angiography, coronary artery anomalies.

INTRODUCTION

Congenital coronary artery anomalies are relatively rare in adulthood. However, ectopic origin of a coronary artery from the aorta is a diagnosis that must be excluded in young adults with typical ischemic sounding chest pain or syncope. These anomalies have a high clinical profile and are the second most common cause of sudden exertion related cardiac death in athletes [1,2]. Most cardiologists will see many such patients during their career and should be prepared to investigate them appropriately, which includes ruling out an anomalous coronary artery as the cause of the symptoms. More commonly these anomalies are found incidentally at coronary angiography. Not infrequently the three dimensional course of the coronary artery with an ectopic origin is incompletely defined under these circumstances. Other rare anomalies that present in adulthood, such as coronary artery fistulae, are potentially more challenging to delineate by means of cardiac catheterization [3].

Full, non-invasive assessment of congenital coronary artery anomalies or their exclusion may therefore be advantageous in various circumstances. Echocardiography may provide a definitive diagnosis but traditionally magnetic resonance imaging (MRI) has been the noninvasive imaging modality of choice for congenital coronary artery anomalies. Multi slice row computed tomography (MSCT) has rapidly evolved from the research setting to become a useful clinical tool and must now also be considered for this role. ECG gated MSCT allows rapid acquisition of a whole heart with three dimensional volume of data in one scan. Importantly, it has superior spatial resolution to imaging (MRI) and as a result it appears to be a promising tool for noninvasive diagnostic coronary angiography [4,5]. The quality of the imaging of the main coronary arteries and side branches provided by MSCT may have importance when assessing congenital coronary artery anomalies.

Computed tomography-coronary angiography (CT-CA) is a minimally invasive, 3 dimensional (3D) imaging modality. It is able to evaluate the grade of stenosis of the coronary vessel lumen in patients suspected of coronary artery disease.[1]In this way it is possible to estimate the hemodynamic consequences of atherosclerosis and to guide clinical decision-making.

Furthermore, CT-CA enables accurate assessment of the vessel wall and coronary anatomy in a 3D fashion, thereby allowing optimal relative positioning of anatomical structures[6].

Three dimensional visualization enables not only determination of vessel origin and course but also helps to identify the dependant myocardial territory, and a basic principle of coronary artery anomalies classification.

AIM OF THE WORK

Evaluation of the prevalence and types of coronary artery anomalies in a group of patients referred for computed tomography (CT-CA) and determining the extent of atherosclerotic coronary artery disease among these patients.

LITERATURE REVIEW

Chapter 1

Coronary anomalies in human hearts

Normal coronary artery anatomy and common variations

The aortic root represents the outflow tract from the left ventricle and extends between the aortic valve and the sinotubular junction which demarcates the aortic root from the ascending aorta. Aortic root has three small dilatations called the coronary sinuses. More anteriorly located right coronary sinus (RCS) gives rise to the right coronary artery (RCA) and the left coronary artery (LCA) arises from the more cephaladly located the left coronary sinus (LCS). The posteriorly located aortic sinus normally does not give rise to a coronary artery and named as the noncoronary sinus [7].

Right coronary artery

After its origin from the RCS, the RCA runs downwards in the right atrioventricular groove to reach the cardiac crux. The first branch of the RCA is the conus artery in most of the cases which supply the right ventricular outflow tract. In a small proportion (11.6 to 22%), The conus artery has an origin directly from the aorta which sometimes causes problems during ventriculostomy used to treat ventricular septal defect or pulmonary stenosis [8,9]. The sinoatrial node artery originates from the RCA as the second branch in 55 to 65% of patients and from the proximal left circumflex artery (LCx) in 35 to 45% of the population [10,11,7].

It can also originate directly from the LCS, RCS, LCA, or from the ascending aorta in a small percentage of patients (0.7%) [11]. It courses dorsally towards lateromedial aspect of the right atrium. The middle RCA gives rise to several right ventricular branches which supply the anterior free wall of the right ventricle. The largest of them called as the acute marginal branch that runs along the acute margin