Larix Publications

Singapore Journal of Cardiology

https://sjcjournal.com/

Vol. 1, Issue 1, 2020

Original Article

Case report of single coronary artery subtype (R-IIA) in a female patient, with cerebral hemorrhage, its evaluation, and life expectancy

Hameed ullah[1,2], Yuan Zu Yi[1], Fang Yuan[2], Najeeb Ullah[2], Hamad Haider Khan[2], Chen ye Ke[2,3] and Wang Dong Qi[1, 2, 3]

Corresponding Author: *Prof. Wang Dong Qi (MD- Cardiology),*
First affiliated hospital of Xian Jiaotong University School of Medicine, Department of Cardiology, Shaanxi Xian, China.
Email: wdq2004@sina.cn

First Authors:
1. Hameed ullah, Department of Cardiology, Xi'an Jiaotong University, PR China
2. Yuan Zu Yi, Department of Cardiology, Xi'an Jiaotong University, PR China

Co-Authors:
1. Fang Yuan, Department of Cardiology, Xi'an Jiaotong University, PR China
2. Najeeb Ullah, Department of Data Science, Monash University, Australia
3. Hamad Haider Khan, Department of Endocrinology, Xi'an Jiaotong University, PR China
4. Chen Ye Ke, Department of fine Arts, Xi'an University of architecture and technology, PR China

Received on: 23-06-2020; Revised and Accepted on: 30-06-2020

ABSTRACT

I*n the diverse anomalies of coronary arteries, the Single coronary artery arising from the single aortic sinus is the rarest one to find, with a reported incidence of less than 0.03% in the general population undergoing through coronary angiography, Coronary tomography angiography of the coronary arteries or by postmortem evaluation. Clinical presentations from simple angina pectoris to sudden cardiac death and life expectancy have shown variations among the patients of different ages; young patients are more vulnerable to sudden cardiac death, while middle-age patients have revealed long life survival on a single coronary artery. Various classifications have been documented on an isolated coronary artery based on its origin as well as on its anatomical distribution of the equivalent branches arising from single coronary artery. We are going to present a case report of an isolated coronary artery crop up from right aortic sinus subtype of (R-IIA) in a female patient of 64 years old lately died due cerebral hemorrhagic stroke.*

Keywords: *Coronary anomalies; Coronary angiography; Single coronary artery; life expectancy; cerebral hemorrhage; Lipton's classification; anatomical malformation.*

***Corresponding author**:

Prof. Wang Dong Qi (MD- Cardiology),
First affiliated hospital of Xian Jiaotong University School of Medicine, Department of Cardiology, Shaanxi Xian, China.
Postal code: 710061, Tel: 008613891999010
Email: wdq2004@sina.cn
DOI: https://doi.org/10.5281/zenodo.3923475

INTRODUCTION:

The Single coronary artery patient has been diagnosed and presented for the first time in 1841 by Hyrtl and prestigious from 1903, defined as a solitary origin of coronary artery whether from the right or left aortic sinus responsible for whole heart myocardium and coronary circulation(1), is by itself retain a unique presentation in anyone. The Single coronary artery is an inborn exception that accidentally revealed by conventional coronary angiography (CCA) or by

computed tomography angiography (CTA) of coronary vessels and by post-mortem appraising, with assessed prevalence stretching of 0.023% to 0.067% among the patients goes through daily practice coronary artery catheterization(2, 3). Single Coronary artery has 40% association with congenital heart malformations like Ventricular Septal Defect (VSD) Truncus Arteriosus (TA) Transposition of the great vessel (TGV) Pulmonary atresia (PA) Tetralogy of Fallot (TOF) and malformation in the distribution of adjunctive concomitant coronary artery branches, However coronary arteries distribution has shown variations from patient to patient, Moreover 15-20 types of possible anatomical variants have been stated still, Lipton's scheme classification is latest and stereotype (Table 1). Single coronary artery patients have contradictory manifestations, rambling from mild, atypical symptoms to the most serious presentations (4). We are going to report a unique case subtype of (R-IIA) patient who had solitary Right coronary artery originating from the Right coronary sinus of Valsalva with Congenital absence of Left coronary artery without any other cardiac congenital anomalies, Left anterior descending artery (LAD) and the Left circumflex (LCX) equivalent arteries emerging from Right coronary artery anterior to the Right ventricle and perfusing the whole left ventricular myocardium in retrograde flow fashion, the patient had normal life span time of more than 60 years, lately unexpectedly died due to cerebral hemorrhage.

<u>According to Ostial location</u> Originating from Right sinus of valsalva (R-type) Originating from Left sinus of valsalva (L-type)
<u>According to Anatomical distribution</u> **I**- isolated dominant coronary artery coursing either one with normal right or left (R-I, L-I). **II**- Once SCA exits the left or right sinus, crosses at the base of the heart as a large Perfusing vessel for the contralateral side(R-II, L-II). **III-** LAD and LCX arise separately from common trunk originating from the right sinus of Valsalva (R-III, L-III).
<u>Course of the transverse branch</u> **A** -Anterior to the large vessels (anterior to right ventricle) **B** -Between the aorta and pulmonary artery **P** -Posterior to the large vessels **S-** Septal type (above the interventricular septum) **C-** Combined type

Table 1: Lipton's adapted angiographic classification for Single coronary anomaly

A 64 years old well-nourished nondiabetic and non-hypertensive female, with the past history of Gallstones, cervical spondylosis, Transient ischemic attack (TIA) no history of dyspnoea, palpation, sweating, fatigue, syncope, nausea, vomiting, and other discomforts, presented with chest tightness and pain, the chest tightness is basically from last six years, being aggravating from two months, patient description about chest pain was precordial in location and is about the size of palm lasting for 15-20 minutes and is relieved gradually after rest, the pain in the precordial area was significantly worse than before on mild exertion, radiation was directed to the left shoulder and back, the duration was longer than before, the number of attacks was significantly increased. The Patient went to a local clinic for symptomatic treatment, didn't get any relief, later on, received by our CCU department performed ECG showing ST-segment elevation of 0.05-0.1 (mv) in leads II, III, AVF, V5 and V6 (Figure 1), and mild elevation in CK-MB enzymes, the patient admitted to the hospital with Primary Diagnosis of "coronary heart disease" (CAD) and coronary angiography was recommended.

Initially Coronary angiography performed by (5F Tiger) catheter and left Judkins (6F) angiographic catheters, operators failed to perform angiography for left coronary artery and with unsuccessful attempt to engaged the catheter to left main coronary artery ostium, later on performed angiography for the right coronary artery showing a normal RCA arising from the right aortic sinus without any significant lesion across its course (figure 2), the Antero-Posterior Cranial view showing origin of the (LCX-EQ) Left circumflex equivalent artery as branch of the poster-lateral artery of the RCA moving backward and upward supplying the lateral wall of the Left ventricle, More on the (LAD-EQ) Left anterior descending equivalent artery arising from the Right Posterior descending artery (PDA) of the RCA, firstly goes through the apex of heart then proceed to goes upward and in retrograde direction in inter-ventricular groove supplying anterior of the left ventricle myocardium, furthers on the LAD and LCX Equivalent arteries are confirmed by viewing in other cardiac coronary fluoroscopic views (LAO) and (AP-Caudal) (figure 3). For the congenital absence of Left Coronary artery confirmation, the Aortography was performed by (Pig tail) catheter showing a Single coronary artery arising from the right aortic sinus with the complete absence of the Left coronary artery (Figure4). Left ventricular assessment analysed by routinely based echocardiography with Colour Doppler and M-mode, showing normal ventricular function with mild Tricuspid and Bicuspid valves regurgitation, Left atrium and right atrium chamber sizes are in normal range (26mm) and (32mm) anterior-posterior and left to right respectively, Left ventricle chamber size are (27mm) and (39mm) anterior-posterior and left to right respectively, with Left ventricular ejection fraction (LVEF%) of (71%), and Fractional shortening of FS (40%), without any significant abnormality in the aortic and pulmonary valves, there were no detection of any congenital heart anomalies like ventricular septal defect (VSD), Atrial

septal defect (ASD), Tetralogy of Fallot (TOF), Transposition of great vessels or pulmonary atresia etc. (Figure 5)Later the colour Doppler for carotid arteries were performed showing bilateral intimal and medial thickening of common carotid arteries by atherosclerotic plaque showing filling defect by colour flow imaging of the carotids as well as the atherosclerotic plaque in the Right subclavian artery . (Figure 6)The Patient has been discharged on regular basis with initial medications (aspirin, clopidogrel, nitro-glycerin, metoprolol, and Atorvastatin) two days later; the patient developed excessive cerebral hemorrhage in the right parietal and temporal lobes with median shift and died. (Figure 7)

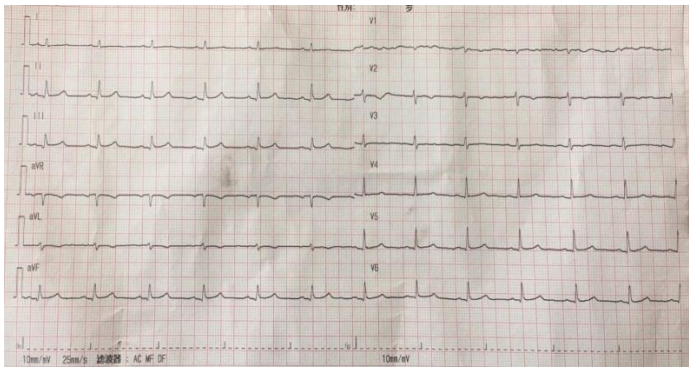

Figure 1, ECG shows normal sinus rhythm with slight ST-segment elevation of 0.05 (mv) in Leads II, III, AVF, V5, and V6

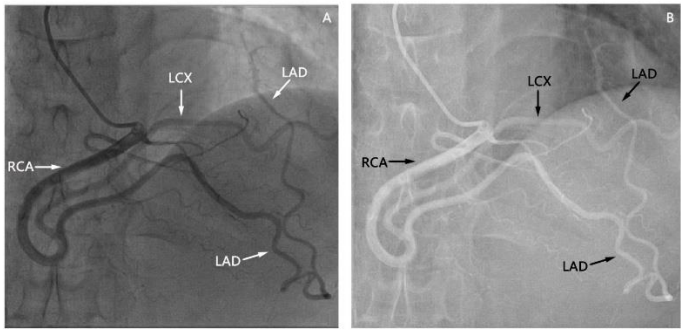

Figure 2, (A) & (B) shows a Cranial view of Single coronary artery arising from the right sinus of Valsalva, with LCX-Equivalent as a branch of postero-lateral artery of RCA while LAD- Equivalent arising from PDA of RCA.

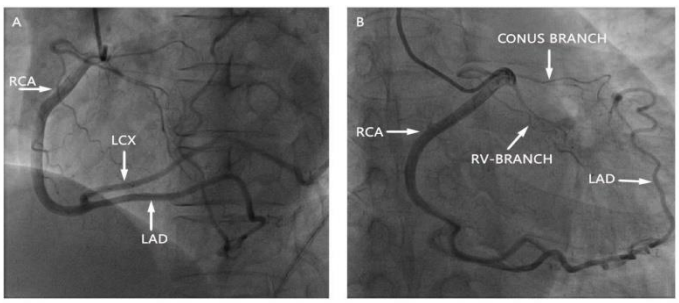

Figure 3, (A) LAO view showing Single coronary artery arising from right sinus of Valsalva,with LCX and LAD arteries from RCA. (B) (AP-Caudal) view showing origination of (LAD-EQ) arising from the PDA of RCA supplying the anterior wall of LV, long conal branch having potential anastomosis with LAD, normal RV branch and the termination of LAD.

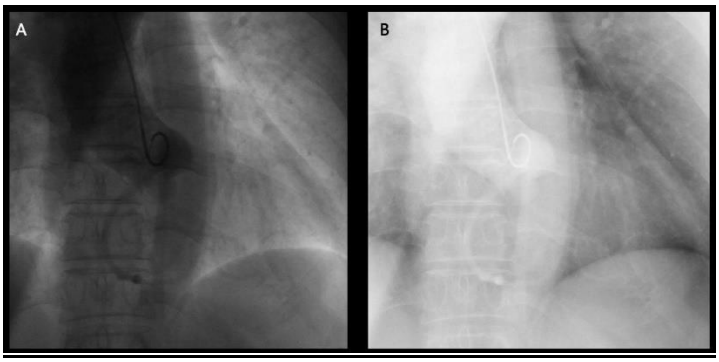

Figure 4, (A) & (B) shows Aortography of the Aorta by Pig-Tail catheter showing origin of the Right coronary artery from the right sinus of Valsalva with congenital absence of the Left coronary artery.

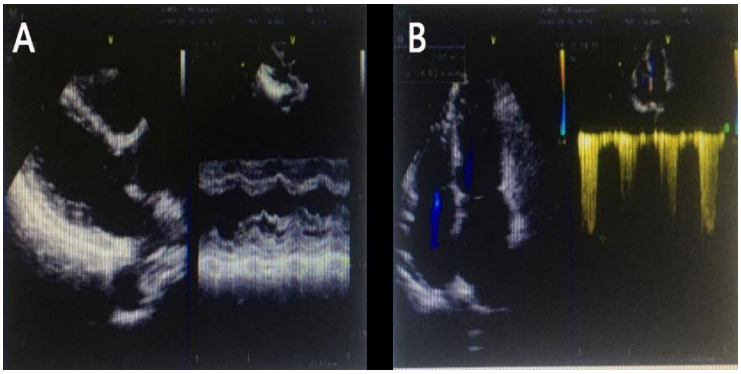

Figure 5, (A) M-Mode Echocardiography (B) CW-Echocardiography showing normal chambers size and with mild regurgitations of tricuspid and Bicuspid valves, free of congenital anomalies, Aortic and pulmonary valves diseases.

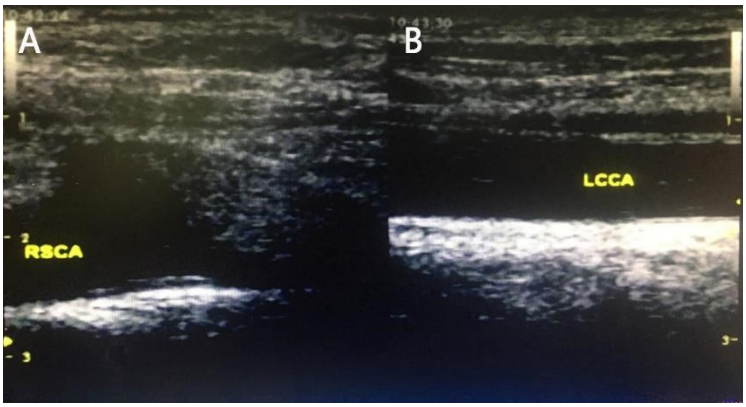

Figure 6, (A) shows Doppler ultrasound of the Right sub-clavian with intimal thickening, and (B) shows presence of

atherosclerotic plaque with intimal and medial thickening in Left common carotid artery (LCCA).

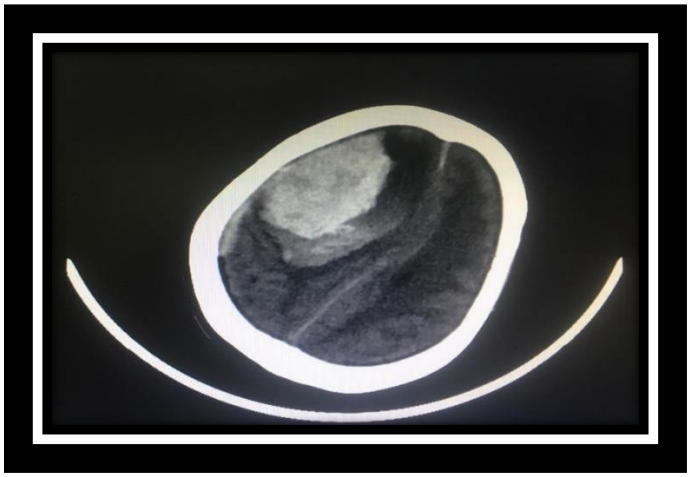

Figure 7, Head CT-Scan showing right cerebral hemorrhage in parietal and temporal lobes with the median shift.

DISCUSSION:

The circulation of the coronary artery circuit may infrequently be supplied by a single coronary artery (SCA) which might be arises from the posterior sinus of Valsalva or either left or right Aortic sinus. The origination of the Coronary vessels in the aorta from a solitary coronary ostium is uncommon and rare to see. Slightly more clinical importance is given to the circulation of the coronary vasculature which branches off from the sole coronary artery and passes between the aorta and pulmonary artery, which can lead a young age person (under 30) to sudden cardiac death (SCD), due external coronary arterial obstructions by compression, nevertheless blockage in the proximal segment of a single coronary artery in a middle-age patient should to be considered as a serious, alarming situation as Left ventricular myocardial flow can jeopardize leading to ventricular arrhythmias and sudden cardiac death (SCD)(5). Congenital heart anomalies which are the defects in the heart structure, these anomalies are linked with (SCA) comprehends of pulmonary atresia, tetralogy of Fallot, and patent truncus arteriosus can shorten the life span time of (SCA) patient due to difficulties in treatments selection and almost impossible to perform. Patients of SCA have shown divergent prognosis based on symptoms having a direct association with the congenital anomalies of heart and anatomical malformation of SCA subtypes, with the presence or absence of atherosclerotic plaque in the course of (SCA)(6).The modified Lipton's classifications of SCA is "L" left-type and "R" right-type is based on its origination, additionally each of them have sub-types of I, II and III relying on concomitant arteries orbit. However, initially 12-16% of patients mimics Ischemic and myocardial infarction like symptoms and have a correlation with anatomical malformation of (SCA) such as, Sharp angulation, a tortuous course with compression between the pulmonary artery and Aorta, having restricted blood flow due to constricted orifice pattern in the aortic wall of an anomalous vessel(7). In few patients, Solitary coronary vessels can be presented with life-threatening symptoms, ranging from a decrease in blood supply to the myocardium, myocardial muscle necrosis leading to heart attacks, Ventricular arrhythmias, syncope, cardiac conduction problems, congestive heart failure symptoms, or unexpected death. Few of the anomalies classifications generally consist of compassionate medical developments, like LI and RI, meantime atypical vessel passages range within outflow areas, in particular, RIII or R-LIIB, who predisposed them for higher grave medical complexities. Basso & Ahmet Akcay et al(6). declare that The subtle group types (L–I and R–I) most of the time have shown less worse outcomes as compared to Type R II-III type and L II-III type of anomalies having 60% of mortality ratio in patients of age less than 30 as well as the second leading cause of death in young athletes routinely after vigorous exertion(8). Lamentably till to date, there is the inadequacy of any specified treatment strategy guidelines for single coronary artery anomalies patients, though patients in group I (L–I and R–I) and the absence or <40% of atherosclerotic plaque presence treating medically and surgical consideration and correction might be decided in young patients of group II (R II-III and L II-III) types, though lacking important clinical and long term outcome data for both medical and surgical treatment preferred patients of (SCA) anomaly on observation and follow up(9). In our case, patient of (SCA) anomaly of Type R-IIA with normal cardiac function and had a normal life span of 64 years, lately died unexpectedly due to cerebral hemorrhagic stroke persuade the thorough investigations for cerebrovascular events in such patients.

ABBREVIATIONS:

SCA; Single coronary artery

CAA; Conventional coronary angiography

CTA; Computed tomography angiography

VSD; Ventricular septal defect

ASD; Atrial septal defect

TA; Truncus Arteriosus

TGV; Transposition of the great vessels

PA; Pulmonary atresia

TOF; Tetralogy of Fallot

LAD; Left anterior descending artery

LCX; Left circumflex

CAD; Coronary artery disease

LAO; Left anterior oblique

LVEF; Left ventricular ejection fraction

FS; Fractional shortening

SCD; Sudden cardiac death

CW; Continuous wave

ACKNOWLEDGMENTS

Professor Wang Dong Qi: Designed the study and overall supervision of the case report, stated the rarity of SCA and treated the patient.

Dr. Hameed Ullah: Performed angiography, collect the data and wrote the manuscript.

Professor Yuan Zu Yi: Revised and edited the manuscript and helped in treatment protocol.

Dr.Fang Yuan: Revised the manuscript and advised suggestions in discussion.

Najeeb Ullah: helped in data presentation.

Chen Ye Ke: Helped in data collection and performed angiography and Echocardiography images adjustments.

Hamad Haider Khan: Helped in data collection and revised the manuscript.

CONFLICT OF INTERESTS

Authors have no conflicts of interest or financial ties to disclose.

REFERENCES

1. D A H Neil RSB, J N Townend. Coronary arteries from a single coronary ostium in the right coronary sinus: a previously unreported anatomy. Heart. 2000:2.

2. Mohanty A. A review on 'single coronary artery. Imaging Med. 2015:2.

3. Fengli Fu HJaYF. A rare case of single right coronary artery with congenital absence of left coronary artery in an adult: a case report. Journal of cardiothorasic surgery. 2015:4.

4. Matthew Corbett M, James Powers, MD, Scott King, MD, Michael Quinn, MD, David Harris, BA Portland, Maine. Single Coronary Artery. Journal of the American College of Cardiology. 2009;53:1.

5. Ferhat Ozyurtlu HA, Mehmet Zihni Bilik, Abdurrahman Tasal, Califf RM. A Rare Coronary Artery Anomaly: Single Coronary Artery Originate From Right Sinus Valsalva R-IIP Sub-Group Type. Cardiol Res. 2012:3.

6. Ahmet Akcay MCT, MD; Talantbek Batyralıev, MD*; Mustafa Gokce, MD**; Beyhan Eryonucu, MD†; Sedat Koroglu, MD; Remzi Yılmaz, MD. Isolated Single Coronary Artery,A Series of 10 Cases. Circulation Cardiovascular Interventions. 2008;72:5.

7. Yamanaka O HR. Coronary artery anomalies in patients undergoing coronary arteriography. Cathet Cardiovasc Diagn. 1990:6.

8. M J Lipton WHB, I Obrez, J F Silverman, L Wexler. Isolated Single Coronary Artery: Diagnosis, Angiographic Classification, and Clinical Significance. Radiology. 1979.

9. KOSTUK DRAWJ. Coronary Artery Disease with Single Coronary Artery. YALE JOURNAL OF BIOLOGY AND MEDICINE 1976:6.

Article Citation:
Corresponding Authors Name. Wang Dong Qi, Case report of single coronary artery subtype (R-IIA) in a female patient, with cerebral hemorrhage, its evaluation, and life expectancy. SJC 2020;1(1): 27-32
DOI: https://doi.org/10.5281/zenodo.3923475