CODEN [USA]: IAJPBB ISSN : 2349-7750

INDO AMERICAN JOURNAL OF
PHARMACEUTICAL SCIENCES
SJIF Impact Factor: 7.187

Avalable online at: http://www.iajps.com *Research Article*

# PREVALENCE AND OUTCOMES OF SINGLE CORONARY ARTERY DETECTED ON CORONARY COMPUTED TOMOGRAPHY ANGIOGRAPHY

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**Article Received:** November 2020 **Accepted:** December 2020 **Published:** January 2021

**Abstract:**

***Introduction:*** *Coronary artery disease (CAD) is one of the leading causes of mortality and morbidity in Singapore.* ***Objectives:*** *Therefore, the main objective of this study is to analyse the prevalence and outcomes of single coronary artery detected on coronary computed tomography angiography (CCTA).*

***Material and methods:*** *This descriptive study was conducted in Health Department Punjab during April 2019 till November 2019. The data was collected from 100 patients. Prior to the scan, electrocardiogram (ECG), heart rate, and blood pressure of all patients were checked. Procedure preparation included administration of 25–100 mg of atenolol orally to all patients with a baseline heart rate >70 beats/min to lower the heart rate. All scans started with toprogram, followed by a prospective ECG-gated non enhanced CT scan at 75% of RR interval.* ***Results:*** *In SCA group, values of SBP, DBP, PP and BMI were higher than the control group, and the difference had statistical significance (P<0.05). There was no significant difference between the two groups in age, FBG, TG, TC, HDL-C and LDL-C. Other SCA included RII-C, RII-A, and RII-S, two in each class. One patient had RI and one had LII-P. Two patients had coronary artery bypass graft.*

***Conclusion:*** *It is concluded that SCA is divided into different subtypes based on the course of the anomalous artery. Awareness of these types is essential as it has an implication for planning patient management.*

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*Please cite this article in press Abdullah Mumtaz et al,* ***Prevalence And Outcomes Of Single Coronary Artery Detected On Coronary Computed Tomography Angiography .,*** *Indo Am. J. P. Sci, 2021; 08(1).*

## INTRODUCTION:

Coronary artery disease (CAD) is one of the leading causes of mortality and morbidity in Singapore. Catheter coronary angiography (CCA) is considered the gold standard for diagnosing CAD, as it is highly reliable and has the ability to determine the extent, location and severity of coronary obstructive lesions [1]. However, CCA is not suitable for all patients with suspected CAD due to its invasive nature and risk of complications. Furthermore, not all conventional angiography procedures proceed to intervention. Weighing the risks of CCA for a patient who may not require intervention may tip the scales in favour of a noninvasive test for diagnosing coronary stenosis [2].

Single coronary artery (SCA) is a congenital anomaly that is usually discovered incidentally and has an estimated incidence ranging between 0.024% and 0.066% among patients undergoing routine coronary artery catheterization [3]. SCA can be either an isolated anomaly or associated with other congenital abnormalities such as coronary artery fistula and bicuspid aortic valve [4]. Based on the site of origin and anatomical distribution of the branches, Lipton et al. classified SCA into two main categories: “R,” right type, and “L,” left type. These two types were further divided into I, II, and III subtypes according to the anatomical courses of the branches [5].

A single coronary artery (SCA) is defined as a single aortic orifice or origin providing for all of the coronary blood perfusion of the entire myocardium. An equal distribution is found between SCA originating from the right sinus of Valsalva (RSV) and the LSV [6]. Exact delineation of the course of the abnormal coronaries relative to the aorta and pulmonary artery is of major importance as myocardial ischemia during exertion can be caused by kinking or squeezing of the branches of the anomalous SCA between the aorta and pulmonary artery. CAG is the first diagnostic tool in the detection of a SCA. Once abnormal coronary arteries are suspected, multi-slice computed tomography (MSCT) and cardiac magnetic resonance (CMR) imaging scans are excellent tools for non-invasive determination of the course of the abnormal coronaries relative to the aorta and pulmonary artery [7].

Therefore, the main objective of this study is to analyse the prevalence and outcomes of single coronary artery detected on coronary computed tomography angiography (CCTA).

## MATERIAL AND METHODS:

This descriptive study was conducted in Health Department Punjab during April 2019 till November 2019. The data was collected from 100 patients. Prior to the scan, electrocardiogram (ECG), heart rate, and blood pressure of all patients were checked. Procedure preparation included administration of 25–100 mg of atenolol orally to all patients with a baseline heart rate >70 beats/min to lower the heart rate. All scans started with topogram, followed by a prospective ECG-gated non enhanced CT scan at 75% of RR interval. The CCTA scan was performed by injecting 60 to 75 mL of contrast followed by 30 mL of saline solution at a rate of 6 mL/s. In the contrast-enhanced scan, ECG-gated prospective or retrospective scan with a slice thickness of 0.6 mm was acquired during breath holding in inspiration. The scan parameters were adjusted automatically or manually to acquire the best quality with the least radiation dose.

### Statistical Analysis

Data was presented by average value ± standard deviation. Comparison between groups was evaluated first by normality and homogeneity test for variance. Those passed the test would be evaluated by t-test. $P<0.05$ was regarded significant of the differences in statistics.

## RESULTS:

**SCA Group and Control Group in General Materials:**

In SCA group, values of SBP, DBP, PP and BMI were higher than the control group, and the difference had statistical significance ($P<0.05$). There was no significant difference between the two groups in age, FBG, TG, TC, HDL-C and LDL-C ($P<0.05$)(Table 1).

Table 1 SCA Group and Control Group in General Materials

| | SCA Group (n=50) | Control Group（n=50） | t Value | *p* Value |
|---|---|---|---|---|
| Age（Year） | 56.56±8.46 | 53.64±8.36 | 1.716 | 0.081 |
| BMI（kg/m2） | 24.31±2.26 | 23.37±2.09 | 2.195 | 0.031 |
| SBP（mmHg） | 140.36±15.70 | 116.53±13.46 | 8.248 | 0.000 |
| DBP（mmHg） | 87.94±10.69 | 75.81±9.94 | 5.967 | 0.000 |

| | | | | |
|---|---|---|---|---|
| PP（mmHg） | 52.42±12.87 | 40.72±8.74 | 5.426 | 0.000 |
| FBG（mmol/L） | 5.12±0.65 | 5.06±0.49 | 1.764 | 0.081 |
| TG（mmol/L） | 1.74±0.75 | 1.69±0.86 | 1.838 | 0.071 |
| TC（mmol/L） | 4.95±0.76 | 4.88±0.82 | 1.712 | 0.090 |
| HDL-C（mmol/L） | 1.30±0.43 | 1.31±0.56 | 1.717 | 0.089 |
| LDL-C（mmol/L） | 3.46±0.58 | 3.38±0.66 | 1.139 | 0.266 |

Note： BMI：body mass index；SBP：systolic blood pressure；DBP：diastolic blood pressure；PP：pulse pressure；FBG：fasting blood glucose；TG：triglyceride；TC：total cholesterol；HDL-C：high-density lipoprotein；LDL-C: low-density lipoprotein

**Comparison between two groups in structural and functional parameters of coronary artery**
IMT, α, β, and PWV of bilateral carotid artery in SCA group were higher than those in control group; CC was lower than that in control group. Those differences were significant in statistics ($p<0.05$)(Table 2, Table 3).

Table 2 Comparison between SCA Group and Control Group in structural and functional parameters of the left arteria carotis communis ($\bar{x}$ ±s)

| Group | IMT(μm) | CC（mm²/KPa） | α | β | PWV(m/s) |
|---|---|---|---|---|---|
| SCA Group | 694.88±77.63 | 0.89±0.13 | 5.68±1.23 | 11.25±1.01 | 9.49±1.09 |
| Control Group | 586.87±62.12 | 0.96±0.08 | 4.77±0.62 | 9.24±1.24 | 7.22±1.11 |
| *T* value | 7.818 | -3.115 | 4.712 | 9.004 | 10.482 |
| *P* value | 0.000 | 0.002 | 0.000 | 0.000 | 0.000 |

Note：IMT：intima-media thickness；CC：compliance coefficient；α：stiffness indicator；β：stiffness parameter PWV：pulse wave velocity

Table 3 Comparison between SCA Group and Control Group in structural and functional parameters of the right arteria carotis communis ($\bar{x}$ ±s)($\bar{x}$ ±s)

| Group | IMT(μm) | CC（mm²/KPa） | α | β | PWV(m/s) |
|---|---|---|---|---|---|
| SCA Group | 637.42±93.30 | 0.91±0.09 | 5.46±1.19 | 11.14±1.02 | 9.29±1.05 |
| Control Group | 545.13±62.28 | 0.99±0.08 | 4.74±0.96 | 9.13±1.20 | 7.07±1.22 |
| *t* value | 5.869 | -4.899 | 3.339 | 9.094 | 9.865 |
| *p* value | 0.000 | 0.000 | 0.001 | 0.000 | 0.000 |

## DISCUSSION:
SCA is a series of diseases which affects encephalic small vessels, manifested as loss of smooth muscle cells in vascular walls, deposition of fibrous transparent materials, thickness of vascular walls and stenosis of lumen. SCA is one of the reasons of ischemic stroke [8]. At present, the pathogenesis for SCA is still unclear. It is assumed that SCA is induced by the combined actions of various cerebrovascular disease risks and genetic factors and then give rise to all kinds of clinical symptoms [9]. SCA can be diagnosed by different diagnostic modalities including conventional coronary angiography, coronary computed tomography angiography, and cardiac MRI [10-12]. Conventional coronary angiography is the gold standard for assessment of the coronary artery; however, it is an invasive procedure and has a risk of complications [13]. Moreover, even with multiple projections and angiographic views, delineation of the anatomy of the complex cases can be difficult [14-16]. On the contrary, coronary computed tomography angiography (CCTA) is a noninvasive diagnostic tool with high temporal and spatial resolution that has

emerged as a gold standard for detection and characterization of coronary artery anomalies [17-19].

## CONCLUSION:

It is concluded that SCA is divided into different subtypes based on the course of the anomalous artery. Awareness of these types is essential as it has an implication for planning patient management. Coronary computed tomography angiography has an important role in diagnosis of different classes of SCA.

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