

## LEARNING CORNER



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## CORONARY SLOW-FLOW PHENOMENA AND ARRHYTHMIAS

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## SUMMARY

A 50 years old smoker male with arrhythmias and non-obstructive coronaries diagnosed as a case of coronary slow flow phenomenon.

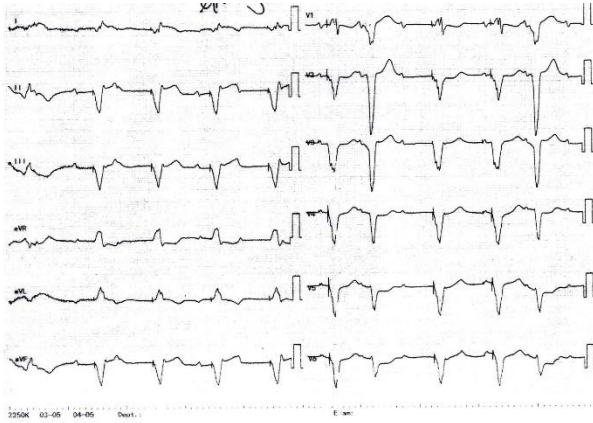
## CASE DESCRIPTION

A 50 years old male, Smoker, presented to Cardiac Emergency in 2018 with complains of dizziness. His EKG showed complete Atrioventricular Block. A temporary pacemaker was implanted and he was admitted for further work-up (Figure 1). His baseline investigations, thyroid profile, ESR, cardiac biomarkers and Echocardiography were unremarkable. Detailed history revealed no evident history of infectious, infiltrative or autoimmune disorders. The patient was not taking any drugs such as beta blockers, Digoxin, Calcium channel blockers, Quinidine and Amiodarone. A coronary angiogram was done to rule out ischemia as a cause of AV block. His angiogram revealed non-stenotic coronaries with slow-flow. As there was no significant stenosis, the patient was discharged home after implantation of a permanent pacemaker. For the following two years patient remained asymptomatic.

On February 1<sup>st</sup> 2021, more than 2 years of initial presentation, he reverted to Emergency Department with complains of Chest heaviness and palpitations. His EKG showed a stable Ventricular Tachycardia of LBBB morphology which was chemically cardioverted. Owing to his chief complains of chest heaviness and a Wide complex tachycardia, he was taken to cath lab after his primary Electrophysiologist interrogated the pacemaker and ruled out the possibility of device related arrhythmias. His coronary angiogram again revealed Non-obstructive coronaries with increased TIMI frame count (Figure 2, Clip 1 and 2). A repeat Echocardiography showed Normal size Left

ventricle with Normal function and no segmental wall motion abnormalities. He was discharged home in a stable condition with an advice to quit smoking. His discharge prescription included oral calcium channel blocker.

The Coronary slow-flow phenomenon (CSFP) was first identified in 1972 by Tambe et al.<sup>1</sup> It is described as delayed opacification of coronary artery on angiography in the absence of any significant coronary obstructive disease. The TIMI frame count, introduced by Gibson, is a reproducible index of the coronary flow and represents the number of cine frames required for the contrast to reach a prespecified distal coronary artery landmark. The prevalence has been reported between 1 to 5% of diagnostic coronary angiograms and occurs in young male smokers.<sup>2</sup> Due to lack of fully understood pathophysiology and definitive treatment, CSFP is usually overlooked and underdiagnosed. Many pharmacologic agents have been studied for the treatment, like statins, Dipyridamole, ACE Inhibitors, alpha blockers, Calcium channel blockers. Of all the medications studied, Calcium Channel blocker have been the most efficacious.<sup>3</sup> Non-pharmacologic interventions suggested are smoking cessation, exercise training, cognitive behavioural therapy.



**Figure 1: 12 lead ECG showing appropriate sensing, pacing and capture by apical RV lead with PPM in VVI mode at lower rate 60 bpm. Underlying Rhythm is complete heart block**

### CLIPS

- Non-obstructive RCA with TIMI II flow: <https://youtu.be/smswPY62PmQ>
- Delayed opacification of Distal LAD: <https://youtu.be/P4Trz8D433s>

### LEARNING POINTS

1. Coronary slow-flow phenomenon is an under recognized and treatable source of chest pain.
2. Phenomenon is more common among young male smokers.
3. Diagnosis is made on coronary angiogram.
4. Of all the medications studied, calcium channel blocker have been the most efficacious.

### QUESTION 1

A 30 year old male, Smoker, presented to ER with complains of chest pain. ECG showed Complete Heart block and troponins were elevated. Transthoracic Echocardiography showed normal LV function. Coronary angiogram revealed non-obstructive coronaries. After detailed lab workup, diagnosis of Coronary slow flow phenomenon was made. What is the most common presentation of such patients?

- A. Bradyarrhythmias
- B. Incidental finding on angiogram
- C. Ventricular arrhythmias
- D. Acute coronary Syndrome
- E. Acute Pericarditis
- F. Constrictive pericarditis.

### QUESTION 2

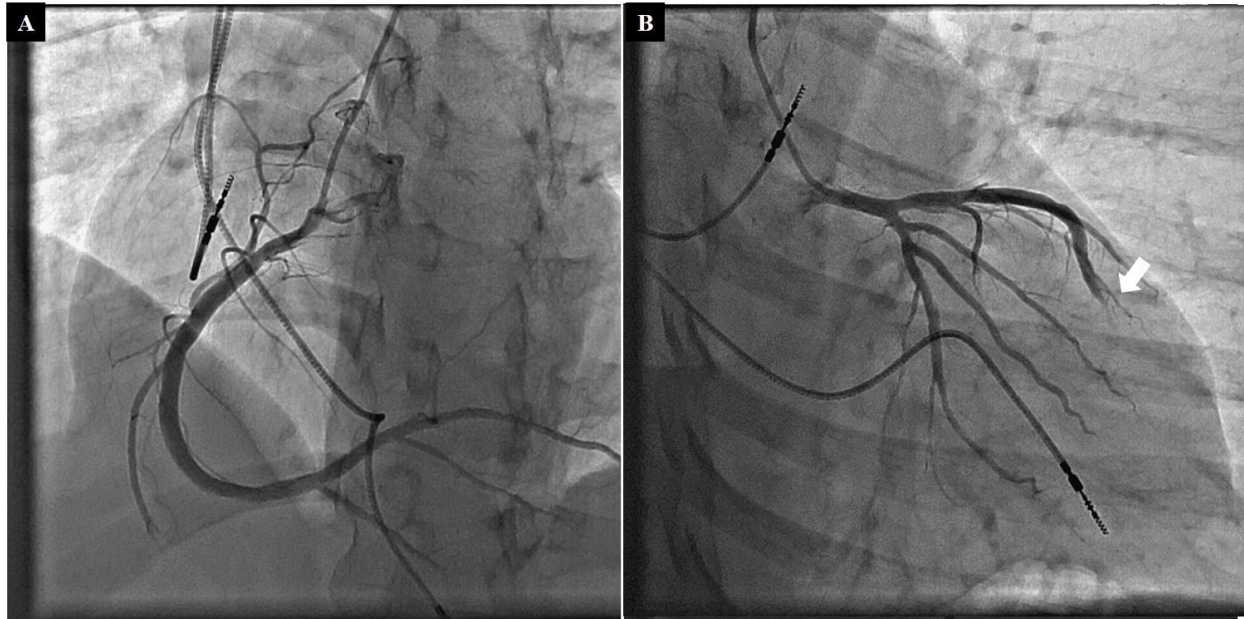
You are the interventional cardiologist and receive a call from fellow who just performed a coronary angiogram of a 57 year old female. He reports that patient has non-obstructive coronaries with TIMI-2 flow. You ask him for frame count to establish a diagnosis of coronary slow-flow phenomenon. What is the corrected TIMI frame count required to label this diagnosis?

- A. 30
- B. <25
- C. >27
- D. <32
- E. 20

### QUESTION 3

During teaching ward rounds, a final year medical student discusses discharge treatment of a 40 year old smoker male who presented with Ventricular arrhythmias, elevated troponins and normal LV function. After a non-obstructive coronary angiogram with TIMI-2 grade flow, a diagnosis of coronary slow flow phenomenon was made. In addition to enrolling the patient in Smoking cessation program, which of the following pharmacological treatment may be considered?

- A. Calcium-channel blocker
- B. Amiodarone
- C. Beta blocker
- D. Statin
- E. Nicorandil



**Figure 2: Non- obstructive RCA on coronary angiogram (A) and Delayed opacification of Distal LAD on coronary angiogram relative to LCX(B)**

### ANSWERS

- **Question 1:** The correct answer is option D. Incidence of coronary slow flow is reported to be 1-5% of all coronary angiograms. CSF phenomenon has variable presentations. Most common being acute coronary syndrome. Most of the patients present with recurrent chest pain. There are case reports of heart blocks, life-threatening Ventricular arrhythmias and sudden cardiac death.
- **Question 2:** The correct answer is option C. The diagnosis of CSFP can be made on the basis of TIMI flow grade or TIMI frame count. TIMI-2 flow grade (i.e. requiring 3 or more beats to opacify the vessel) or a corrected TIMI frame count > 27 frames have been frequently used. The latter is based upon images acquired at 30 frames/sec.
- **Question 3:** The correct answer is option A. Various medications have been evaluated for the treatment of

CSFP. However, the actual efficacies of the majority of these agents have not been established. Oral Calcium channel blockers can attenuate the microvascular effects associated with the condition. Nebivolol and statins have also shown some benefit in certain studies.

### REFERENCES

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