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Evaluating the Role of Fractional Flow Reserve FFR in the Management of Borderline Coronary Lesions

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Abstract: ***The introduction of pressure wire technology, including fractional flow reserve FFR and instantaneous wavefree ratio iFR, has significantly transformed the management of patients with chronic coronary syndrome. These tools allow for a shift in focus from anatomical assessment to physiological evaluation of coronary artery lesions. This case report highlights a 67yearold male patient with diabetes and systemic hypertension, presenting with breathlessness and undergoing coronary angiography. FFR was utilized to assess the functional significance of borderline lesions, which helped guide the decision to avoid unnecessary stenting. The case underscores the clinical importance of FFR in stratifying patients based on ischemic burden and improving outcomes by deferring revascularization when appropriate.***

Keywords: Fractional Flow Reserve, Borderline Lesions, Coronary Angiography, Revascularization, Ischemia

1. Introduction

The advent of the pressure wire has ushered in a paradigm shift in the management of patients with chronic coronary syndrome with focus changing from anatomy to physiology. It is a class IA recommendation prior to percutaneous coronary intervention PCI in borderline lesions. Fractional flow reverse (FFR) or instantaneous wavefree ratio (iFR) and other non hyperemic indices determine the functional significance of the lesion. Revascularization can be safely deferred if FFR is > 0.8 or iFR >0.89. Revascularization of lesions with FFR < 0.8 (or) iFR < 0.89 results in the lower event rates compared to the medical treatment

2. Case Report

67 year old male, k/c/o diabetes mellitus came with c/o breathlessness NYHA III. No c/o chest pain/palpitation/decreased urine output No c/o giddiness/sweating No c/o fever/vomiting/loose stools Patient is a known smoker, alcoholic Consumes mixed diet Not a known case of SHTN/CAD/BA/PTB in the past Family h/o CAD present O/E: conscious, oriented, afebrile

No pallor, icterus, clubbing, cyanosis, lymphadenopathy, pedal edema.
BP: 140/100 mm hg CVS: S1S2+
Pulse: 78/min RS: B/L air entry+, normal vesicular breath sounds+
P/A: Soft, bowel sounds+, no organomegaly
CNS: NFND
ECG: Normal sinus rhythm, HR - 74/min, no acute ischemic changes
ECHO: Mild hypokinesia of anterior wall segments of LV Adequate LV function No MR/TR No clot/veg No PE/PHT

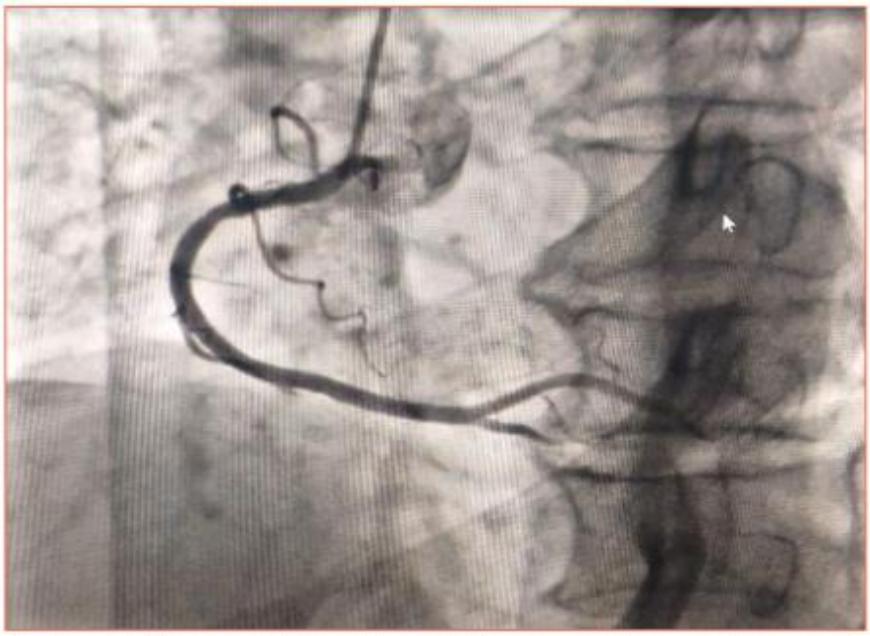
3. Investigations

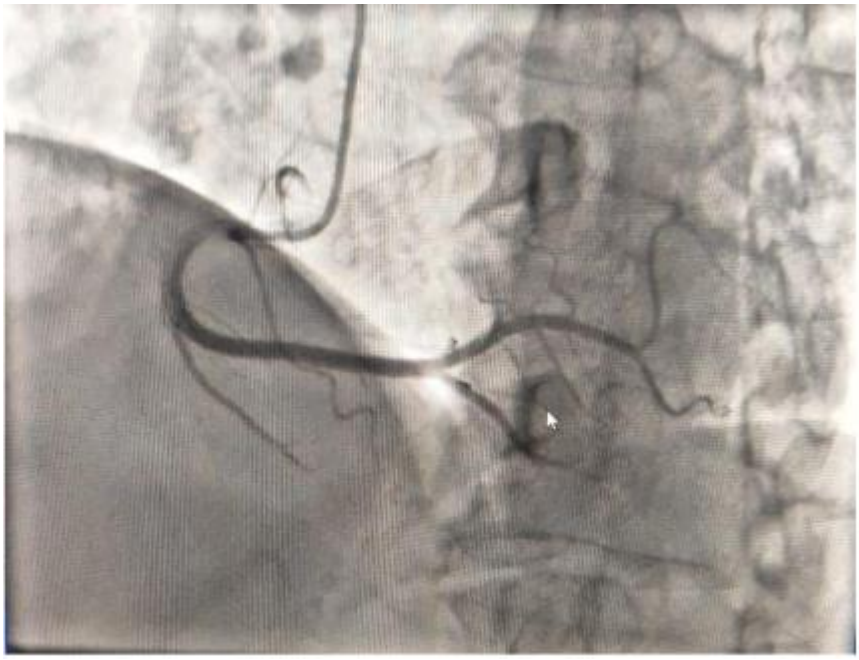
Hb - 14.9 g/dl, PCV - 44%, RBC - 5.4 million cells, Total count - 11, 500 cells, Platelets - 3.1 lakhs, Urea - 33 mg/dl, Creatinine - 1.2 mg/dl, Blood grouping and Rh typing – A positive, Bleeding time – 2 mins, Clotting time – 4 mins, HHH – negative

CAG done - LAD 2.5 mm vessel with 60 - 70% stenosis

Diagonal 2.08 mm vessel with 90% stenosis

By using 6F EBU catheter, LCA was engaged. The distal LAD lesion was crossed with 0.014’ guidewire parked distally. Inj adenosine 400 micrograms was given intracoronary. FFR reading obtained which shows above the cut off value (0.94). Hence, stenting denied. Diagonal lesion was engaged with Rinato guide wire and parked distally. The diagonal lesion was pre dilated with 1.5X12 MM sapphire balloon using curex DES 2.0x20 mm at 8 atm for 45 seconds, at 12 atm for 40 seconds Check CAG shows distal TIMI III flow without any dissection. FFR to LAD + POBA to diagonal





4. Diagnosis

CAD/UNSTABLE ANGINA/NORMAL LV FUNCTION / SYSTEMIC HYPERTENSION / TYPE 2 DIABETES MELLITUS/CAG - SINGLE VESSEL DISEASE WITH BRANCH LESION, LAD AND DIAGONAL.

FFR TO LAD POBA TO DIAGONAL

Fractional flow reserve (FFR) is a diagnostic procedure used to assess the functional significance of coronary artery lesions. It measures the pressure differences across a coronary artery stenosis to determine if the lesion is significantly obstructing blood flow.

In cases of borderline lesions, typically defined as having a diameter stenosis between 40% and 70%, FFR can be especially helpful. Here's how FFR is utilized in this context:

1) Indication for FFR: When coronary angiography reveals a borderline lesion, it can be challenging to determine whether it is hemodynamically significant. An FFR measurement can help guide management decisions, such as whether to proceed with revascularization (angioplasty/stenting) or to continue with medical therapy.

2) FFR Measurement: During the FFR assessment, a specialized pressure wire is inserted into the coronary artery, and the pressure distal to the lesion is measured during maximum medical vasodilation (often induced by adenosine). The FFR is calculated as:

An FFR value of 0.80 or less typically indicates that the lesion is functionally significant and may warrant intervention.

3) Interpretation of Results:

FFR ≤ 0.80: Suggests significant ischemia, and revascularization may be necessary.

FFR > 0.80: Indicates that the lesion is unlikely to cause significant ischemia, and it may be safe to manage the condition with medical therapy alone.

Clinical Implications: The use of FFR helps to stratify patients based on their ischemic burden and can lead to more tailored and effective treatment strategies, potentially avoiding unnecessary procedures in cases where lesions are not functionally significant.

5. Conclusion

Revascularization of borderline lesions is not going to provide symptomatic relief let alone mortality benefit. Identifying such lesions by angiography has limitations. Physiological assessment by FFR/ non - hyperemic indices provide a method to identify those that are significant and to safely differ those that are not. Large - outcome trials show benefit of the approach with reduction in hard endpoints including death, MI and urgent revascularization.

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