CATHALOGUE

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CASE REPORT

Precision Care in Isolated Ostial Left Main Coronary Artery Disease: A Guided Approach

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Abstract

Introduction: Introduction: Isolated ostial left main coronary artery (LMCA) disease, a rare condition more prevalent in middle-aged females, presents unique diagnostic and therapeutic challenges. This case report highlights the importance of early diagnosis and tailored interventions for effective management.

Case Presentation: A 45-year-old female with hypertension presented via the emergency room with typical ischemic chest pain. Elevated troponin levels, generalized ST-T depressions on ECG, and isolated critical ostial disease of the left main stem on angiography were evident. Clinical history, symptoms, and angiographic findings were notable.

Results: Due to high TIMI risk score, early catheterization was pursued. Utilizing a "hit and run" strategy, a preloaded Balloon on guide wire within guider before engagement and rapid balloon inflations were employed to minimize ischemic complications. Post-stenting, non-selective guide engagement was employed to prevent stent deformation. The patient's post-procedure course was uneventful, and she was discharged in stable condition with guideline-directed therapy. One-year follow-ups showed medication adherence and good clinical progress.

Conclusion: Isolated LMCA ostial disease, though rare, presents substantial diagnostic and therapeutic complexities. Timely diagnosis and customized interventions are paramount for effective management. The case underscores considering this condition in specific patient groups, excluding coronary artery spasm, using controlled contrast injections, applying the "hit and run" technique, and utilizing available imaging. The core lesson is that a personalized approach enhances outcomes and prognosis in this infrequent ailment.

Keywords

Isolated Ostial Left Main Coronary Artery Disease, Typical Chest Pain, Early Diagnosis, Tailored Interventions, Personalized Approach

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Introduction

Isolated ostial left main coronary artery (LMCA) disease, although a rare occurrence, introduces a complex clinical scenario that requires careful evaluation and personalized management. While the isolated ostial left main coronary artery's involvement is relatively infrequent, its ostial segment's exclusive impairment poses distinctive diagnostic and therapeutic challenges. The scarce incidence of isolated ostial LMCA disease presents unique complexities due to the specific anatomical location and associated physiological consequences. This case report endeavors to shed light on the pivotal role of prompt identification and customized interventions in addressing this intricate condition.

Case Presentation

A 45-year-old female, with an established medical history of hypertension, was urgently admitted to the emergency room with a chief complaint that bore the hallmark of cardiac distress – typical ischemic chest pain after taking informed consent. The duration of this discomfort was 6 hours, prompting immediate attention from the medical team. Upon her admission, the initial evaluation encompassed a comprehensive assessment of vital signs. The patient's blood pressure was recorded at 100/70 mmHg, her heart rate stood at 70 beats per minute, her respiratory rate was noted at 20 breaths per minute, and her oxygen saturation level rested at 94%. These vital signs painted a picture of physiological stability, although in the context of ongoing chest pain.

Diagnostic Assessment

Subsequent to the ECG analysis, echocardiography was performed to gauge the myocardial function and structural integrity. The echocardiographic assessment revealed reassuring results, demonstrating good biventricular systolic functions with no overt abnormalities, however in ECG, (as shown in Figure 1) generalized ST-T depressions with upright Avr were noted. This discrepancy between the electrocardiographic findings and echocardiographic outcomes posed an intriguing diagnostic challenge, necessitating a meticulous review of potential contributory factors. Laboratory investigations, notably blood tests, were pursued to provide additional insight into the patient's condition. Surprisingly, the blood parameters, encompassing a wide array of hematological and biochemical markers, were largely within the normal range. However, a significant deviation from the baseline was noted in the troponin levels, which were markedly elevated. This elevation in troponin levels, indicative of myocardial injury, bolstered the clinical suspicions surrounding her chest pain.

Therapeutic Interventions

Upon admission to the emergency room, the patient was promptly administered a strategic first aid regimen. This included the administration of a plain, chewable tablet of Disprin (300 mg) to mitigate platelet aggregation and a tablet of Clopidogrel (300 mg) orally, providing dual antiplatelet therapy to counteract potential thrombotic events. Additionally, sublingual (S/L) nitrates were employed to swiftly alleviate myocardial ischemia by inducing vasodilation, and an intravenous infusion of heparin was initiated at a rate of 1000 units per hour after the administration of a maximum loading dose of 5000 units intravenously. This combined therapeutic approach aimed to rapidly mitigate the acute ischemic insult and enhance coronary perfusion. With the evaluation of the patient's clinical parameters and the assessment of her TIMI risk score, the patient was engaged in an informed consent dialogue, fostering collaborative decision-making, and acknowledging the importance of early catheterization. The patient was subsequently transferred to the catheterization lab to initiate the diagnostic phase of her treatment.

The subsequent diagnostic angiogram, facilitated by a 5F diagnostic catheters, yielded crucial insights into the patient's coronary vasculature. While the right coronary artery showcased non-dominant characteristics and exhibited a normal vessel (Figure 2a), the left system engagement revealed a distinct pathology. Notably, isolated critical ostial disease of the Left Main stem (LMS) was observed marked by dampening pressures and the absence

of backflush of contrast. To exclude the possibility of coronary artery spasm, a strategic approach was adopted. Intracoronary injections of nitroglycerine (100 mcg) were administered thrice, both after selective and non-selective re-engagements. The diagnostic insights derived from the angiogram exposed an isolated critical ostial disease of the LMS. Concomitant with these observations, the left anterior descending (LAD) artery showcased normal, while the left circumflex (LCx) artery emerged as a dominant, normal vessel (Figure 2b and 2c).

The therapeutic strategy involved calculated measures to avoid procedural complications. Minimal injections were employed to minimize the risk of dissection, and careful clearance of contrast was ensured before every subsequent injection.

The interventional strategy then ventured into utilizing a "hit and run" strategy, a preloaded Balloon on guide wire within guider before engagement (Figure 3). Multiple rapid inflations of the 2.5mm x 12mm NC balloon were executed with calculated precision, a technique designed to pave the way for subsequent therapeutic interventions by effectively dilating the lesion (Figure 4). To optimize the balloon's performance, a strategic maneuver was employed. A contrast preparation technique, integrating 10ml of contrast with 20ml of saline, was skillfully employed. This innovation facilitated the rapid deflation of the balloon, enhancing the efficiency of the procedure.

Intracoronary vasodilators were strategically administered once again, serving to optimize coronary artery dilation and to offer a clear and precise visualization of the therapeutic outcomes (Figure 5). After Predilation, patient has manifested as a sense of comfort and relief from atypical ischemic chest pain.

As a 4.0mm x 12mm drug-eluting stent (DES) was accurately chosen for the delicate task of ostial nailing within the Left Main stem (LMS). The intricate decision-making process was performed to ensure optimal therapeutic outcomes while precisely preserving the bifurcation and preventing any inadvertent incarceration of branch vessels (Figure 6, 7). Stent was inflated at higher pressure and ostium was flared using same stent balloon. There was no waist in both inflations, Pot Puff Sign was also noted to check stent Apposition (figure 8, 9). A deliberate effort was made to anchor the stent within the ostial region of the Left Main stem (LMS), ensuring a seamless integration between the stent and the vessel wall. While securing the stent, a vital precaution was exercised – a minimum of 2mm of the stent was strategically extended into the aorta, not only reinforcing its stability but also minimizing the risk of any potential complications.

Final Images were taken with non-selective engagement of guider to avoid longitudinal stent deformation. There was no flow limiting disease, Dissection, spasm with TIMI III distal flow, noted (Figure 10 a-d).

Follow up and Outcome

Following the procedure, the patient's health was closely monitored for 24 hours, ensuring a stable condition. Guided by standardized therapy protocols, she was discharged and maintained regular monthly follow-ups for a year, exhibiting commendable medication adherence.

Discussion

The occurrence of isolated left main coronary ostial disease is indeed an infrequent phenomenon, characterized by distinct clinical characteristics that warrant comprehensive examination. The prevalence of this condition varies within a spectrum of 0.13% to 2.7%, as reported by studies in the field[1]. Yildirimturk et al.[2] identified 15 cases (0.5%) of isolated coronary ostial stenosis within a cohort of 2898 individuals with angiographically defined coronary disease, encompassing both left and right coronary ostial stenosis. Similarly, Topaz et al.[3] documented 12 instances (0.06%). Additionally, Sasaguri et al.[4] reported the presence of isolated LMCA ostial stenosis in 0.7% of 700 patients subjected to coronary artery bypass grafting (CABG). Although these studies were marked by limited patient enrollment (<10 subjects each), thereby constraining their statistical significance, Mahajan et al.[5] recognized 30 cases

(0.06%) of isolated LMCA ostial stenosis within a larger pool of 44,320 individuals who underwent cardiac catheterization.

Furthermore, Sunil Kumar Srinivas et al.[6] discerned an incidence rate of 0.18% among 15,553 patients who underwent coronary angiography. The predominant causative factor behind isolated LMCA ostial disease emerges as atherosclerosis, particularly in its early atheroma stage[5]. Koh et al.[7] corroborated this observation through histopathological analysis, revealing atherosclerosis in 4 out of 6 patients in their study. Intriguingly, other less common etiologies include fibromuscular dysplasia, Takayasu's aortitis, syphilitic aortitis, iatrogenic causes, congenital ostial membrane of the left coronary artery, and hypoplasia or atresia of the coronary ostium[8-16]. Notably, patient demographics often portray isolated LMCA ostial disease as a condition more prevalent among young to middle-aged women, characterized by acute symptoms of short duration and a lower prevalence of traditional coronary risk factors[17]. Remarkably, several studies concur with these findings, underscoring its frequency among female and smoker populations[5,7,8]. However, Yildirimturk et al.[2] present a contrasting perspective, suggesting no significant age, gender, or cardiovascular risk factor disparities between patients with ostial LMCA and non-ostial LMCA stenosis. Intriguingly, a notable association exists between ostial LMCA stenosis and right coronary artery involvement. Furthermore, the increased mean arterial pressure in the aorta heightens the susceptibility to trauma and intimal injury, contributing to the genesis of atherosclerotic plaque[18,19]. Ostial LMCA disease poses a critical challenge during coronary angiography, with potential misdiagnoses arising from the positioning of the catheter tip beyond the ostial narrowing[17]. To counteract this, a preventive approach includes initiating angiograms with non-selective injections into the aortic sinus, coupled with vigilant identification of ostial stenosis markers: difficulty in cannulation, marked decline in distal coronary pressure post-engagement, and the absence of contrast medium return following intracoronary injection[17]. Given the extensive myocardial territory at risk, patients with coronary ostial stenosis, particularly in the left coronary artery, are at an elevated risk of myocardial infarction and premature death. In this context, revascularization emerges as the optimal approach, either through surgical means or percutaneous coronary intervention (PCI) with drug-eluting stents (DES)[20-24]. Recent trials have reinforced the viability of PCI in low and intermediate Syntax score categories, demonstrating non-inferiority to CABG for major adverse cardiac and cerebrovascular events (MACCE)[21-24]. In the case of the patient with isolated LMCA ostial disease, a PCI with DES was successfully executed, with no mortality observed during peri-procedural, immediate, short-term, or one-year follow-up periods.

Conclusion

Though isolated ostial LMCA disease stands as an exceptional rarity in cardiology, it is known to be Prevalent predominantly among middle-aged females, this distinctive condition tends to unfold with distinct clinical attributes. Notably, affected individuals exhibit preserved left ventricular systolic function, devoid of segmental wall motion anomalies, and often possess only a handful of conventional coronary risk factors. Intriguingly, despite the rarity of this variant, its associated mortality mirrors that of non-ostial LMCA disease, a phenomenon largely unaffected by the treatment modality employed. Timely detection serves as the cornerstone of efficacious management, heralding the potential for enhanced prognosis in these patients.

Learning Points

- **Isolated LMCA Rarity:** Isolated LMCA disease remains an infrequent entity, warranting a heightened sense of awareness when encountered.
- **Exclude Coronary Spasm:** When confronted with this condition, it's imperative to rule out the possibility of coronary artery spasm, thus enabling accurate diagnosis.
- **Prudent Injections:** To safeguard against the risk of dissection and to ensure adequate

clearance of contrast, judicious administration of injections is paramount.

- **The "HIT and Run" Approach:** Employing the "HIT and Run" technique proves advantageous, with preloaded coronary wire and balloon within the guider before engagement. This strategy facilitates swift inflations, effectively averting dampening and guider-induced ischemia.
- **Guiding Post-Stenting Success:** Post-stenting, adopting non-selective guider engagement can serve as a safeguard, preventing guider-induced longitudinal stent deformations and optimizing procedural outcomes.
- **Role of Imaging:** Whenever feasible, harnessing the power of imaging methodologies should be a fundamental consideration.

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Figure/Video

Figure 1: ECG at the time of presentation

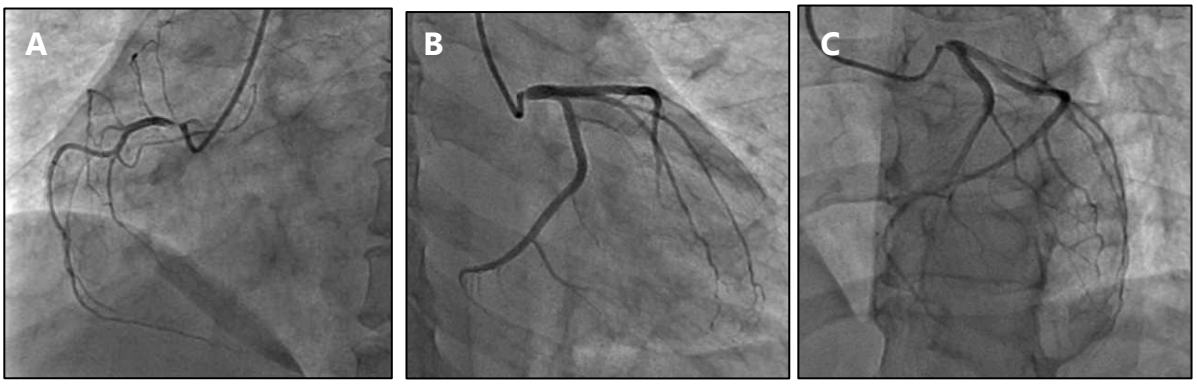

Figure 2 a-c: Diagnostic Angiogram

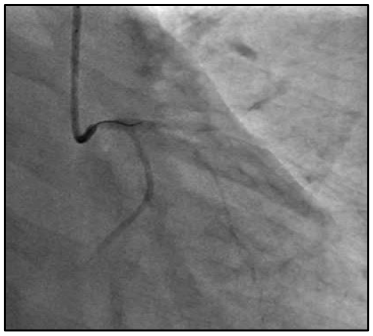

Figure 3: Using Hit and Run method, EBU 3.0 6F guider was taken that was preloaded with work horse (BMW) wire and 2.5 x 12mm NC balloon, before engagement.

Figure 4: Multiple rapid inflations were given for Predilation, using 2.5 x 12 mm NC

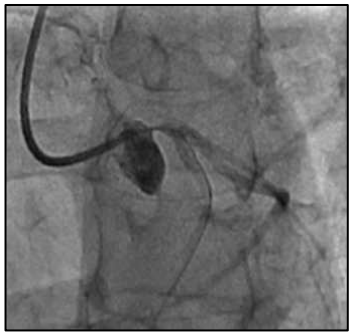

Figure 5: Contrast preparation for inflation device was done using 10ml contrast with 20ml Saline. Intracoronary vasodilators were given again, and findings were re-assessed.

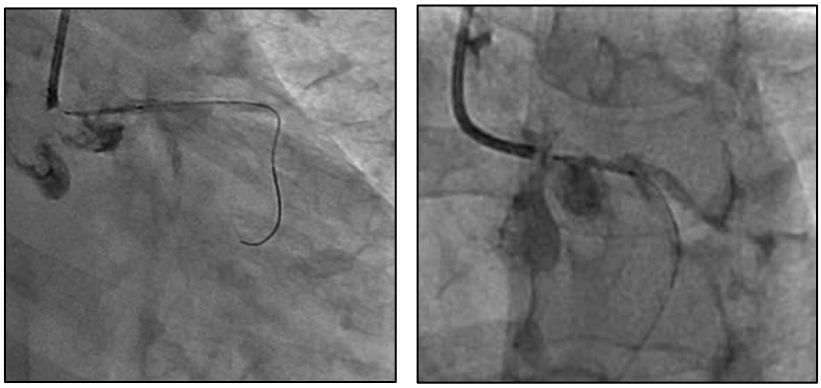

Figure 6, 7: 4.0mm x 12mm DES was chosen for Ostial nailing of LMS. Caution was taken to assure that bifurcation is spared, and no branch vessel is jailed. Also, minimum 2 mm of stent was hanged into Aorta.

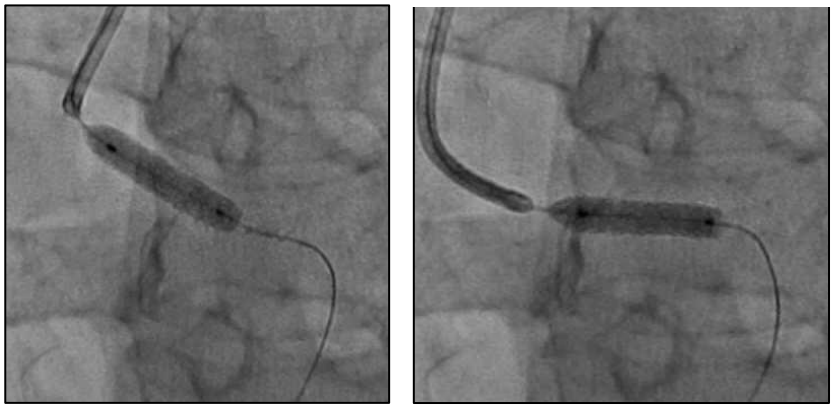

Figure 8, 9: Stent was inflated at higher pressure and ostium was flared using same stent balloon. There was no waist in both inflations; Pot Puff Sign was also noted to check stent Apposition.

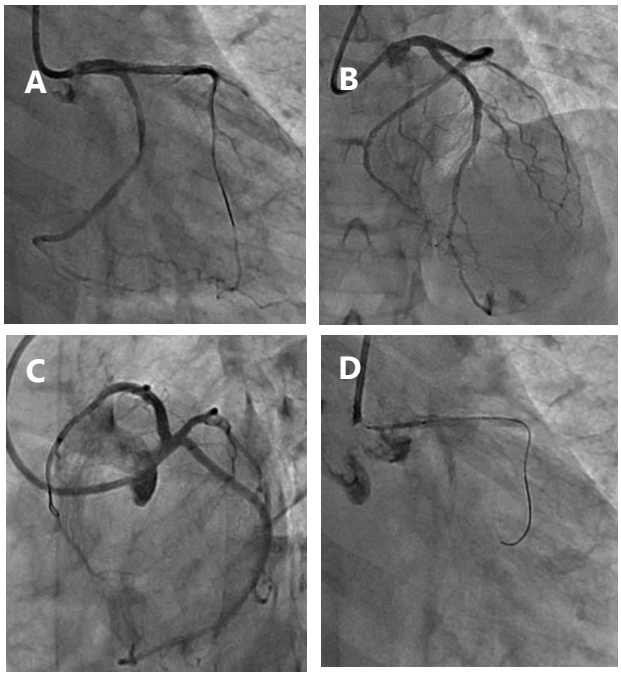

Figure 10 a-d: Final Images were taken with non-selective engagement of guider to avoid longitudinal stent deformation. There was no flow limiting disease, Dissection, spasm with TIMI III distal flow, noted.