

# Acute Left Main Coronary Occlusion Following Transcatheter Aortic Valve Implantation

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**How to cite this paper:** Abburu, A., Ahmad, B., Masri, A., Nery, D. and Rufus, S. (2024) Acute Left Main Coronary Occlusion Following Transcatheter Aortic Valve Implantation. *World Journal of Cardiovascular Diseases*, 14, 695-700.

<https://doi.org/10.4236/wjcd.2024.1411061>

**Received:** September 20, 2024

**Accepted:** November 25, 2024

**Published:** November 28, 2024

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## Abstract

**Background:** Aortic stenosis (AS) is caused by either age-related degeneration of aortic valve or congenital malformation of aortic cusps. Severe aortic valve stenosis is a clinically emerging diagnosis in the current world. The three cardinal signs of severe AS are dyspnea, syncope, and angina. Transcatheter aortic valve implantation is one of the safe and effective methods for treating severe aortic valve stenosis, and an alternative to surgery in high-risk patients. Aortic valve calcification and changes after TAVI were specifically assessed by computed tomography. Excessive aortic valve calcification is related to procedural complications. A possible consequence is obstruction of coronary ostia. Heavy calcification of the aortic valve and surrounding structure is an important risk factor for coronary obstruction, heart block, and embolization during aortic valve implantation (TAVI). Here we present a case of an elderly old man, where critical ostial left main coronary artery (LMCA) disease was caused by shifting of a calcium speck rather than obstruction with native leaflet. He was successfully rescued by an emergent CABG. **Methods and Results:** This is a case of a 69-year-old man with severe calcific aortic stenosis and single-vessel CAD who underwent TAVI with a relatively unremarkable course. Notably, his pre-operative TAVI angiography showed no LMCA stenosis. But 10 days later he presented to the ER with acute myocardial infarction with peak high-intensity troponins, diffuse ST changes, and cardiogenic shock. Urgent coronary angiography and intravascular ultrasound showed critical LMCA stenosis caused by a speck of calcium externally abating the vessel. He underwent emergency coronary artery bypass grafting; intraoperative TEE confirmed the etiology. He had an uneventful postoperative course and was successfully weaned off vasoactive medications. **Conclusion:** This case illustrates that obstruction of coronary ostia could be a possible complication of TAVI. Calcium distribution should factor in TAVI versus surgical candidacy. Calcium shifting should be watched closely during valve deployment, post-

TAVI coronary angiogram should be considered if shifting was significant or suspected to compromise coronary arteries.

## Keywords

TAVI (Transcatheter Aortic Valve Implantation), LMCA (Left Main Coronary Artery), CAD (Coronary Artery Disease), TEE (Transoesophageal Echocardiography), Intravascular Ultrasound, Severe Calcific Aortic Stenosis, CABG (Coronary Artery Bypass Grafting)

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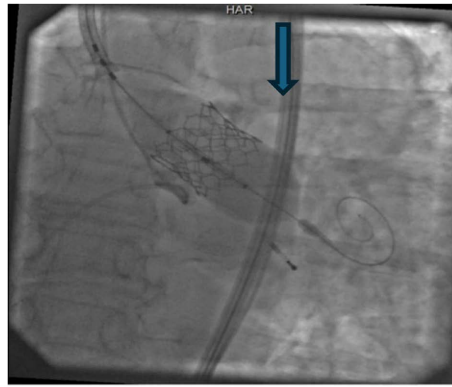
## 1. Introduction

Transcatheter aortic valve implantation (TAVI) provides better results than medical therapy or surgical aortic valve replacement. It is a therapeutic breakthrough for patients with symptomatic severe aortic stenosis (AS) unsuitable for surgery or with a high operative risk [1]. Extreme caution is recommended, against the lethal complications such as coronary obstruction or annulus rupture associated with the procedure. The incidence of coronary obstruction during or after TAVI is reported between 0.4 and 1.4%, with the left main coronary artery being the most affected one [2]. This occurs due to displaced calcium from the commissures or cusps during balloon dilatation and prosthesis enlargement [3]. It can be prevented with the correct positioning of devices in the aortic annulus, because once deployed, it cannot be repositioned. However, the prognosis of TAVI is quite poor with a 30-day mortality of 50% and an immediate PCI is recommended [4].

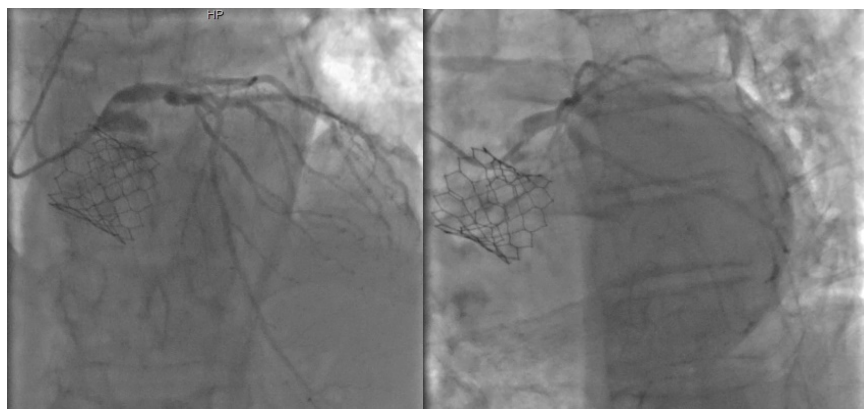
## 2. Case Presentation

A 69-year-old elderly male, a known case of severe aortic stenosis presented with complaints of fatigue and shortness of breath. His past medical history includes severe calcific aortic stenosis, single vessel coronary artery disease which is being medically managed, and chronic back pain. After discussion with the heart team, he finally underwent transcatheter aortic valve implantation (**Figure 1**) with Edwards 29 mm S3 valve via percutaneous left femoral artery access. His post-op course was complicated by a pseudoaneurysm of the left common femoral artery, which was conservatively managed. He was discharged in stable condition with the required instructions and follow-up care.

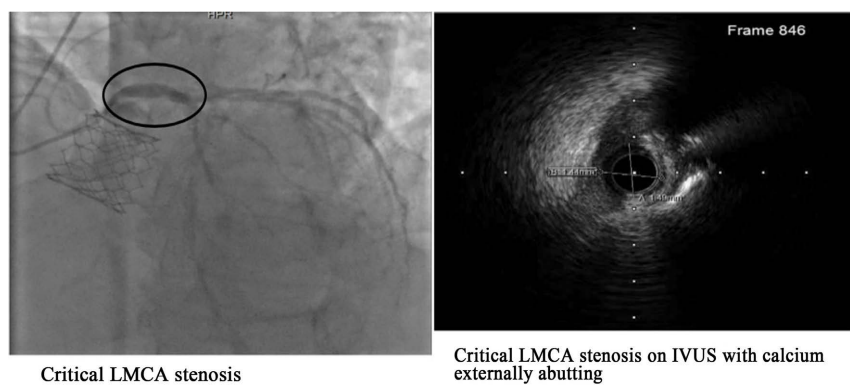
After 10 days, he presented to the ER with complaints of left groin pain and scrotal swelling associated with upper back pain and exhibited signs of cardiogenic shock. His troponins were elevated with some ECG changes significant with NSTEMI. CT abdomen was suggestive of a large pelvic extraperitoneal hematoma extending into the left inguinal canal, he was medically stabilized in ICU. Later, underwent coronary angiography with intravascular ultrasound which showed critical left main trunk stenosis (**Figure 2**) with a speck of calcium externally abating the vessel (**Figure 3**) followed by TEE confirming the external abating of the left trunk (**Figure 4**).



Deployment of balloon-expandable valve

**Figure 1.** TAVI with the deployment of balloon-expandable valve.**Figure 2.** LHC showing calcium moved to left main ostium causing severe stenosis.

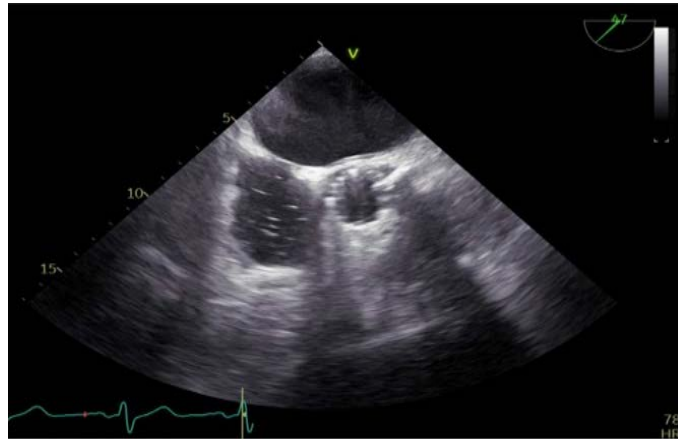
He was further evaluated and planned for emergent coronary artery bypass grafting with (LIMA-LAD & SVG-LCX) Post-procedural TEE demonstrated LVEF 55% without any inotropic support. His hospital course was unremarkable except for an episode of atrial fibrillation, which subsequently reverted to sinus rhythm. He was discharged home with supportive medications and post-op instructions on pulmonary hygiene, ambulation, and follow-up visits. After a month of follow-up, he maintained NYHA class-I symptoms and recovered completely (**Figure 4**).



Critical LMCA stenosis

Critical LMCA stenosis on IVUS with calcium externally abutting

**Figure 3.** CAG showing critical LMCA stenosis with IVUS guidance.



TEE confirming external abutting

**Figure 4.** TEE confirming the external abating of vessel.

### 3. Discussion

Since the past decade, transcatheter aortic valve implantation has become the treatment of choice for high-risk patients with severe calcific aortic stenosis [5]. The most common complications seen following TAVI are aortic root rupture, paravalvular regurgitation, vascular complications, cardiac arrhythmia and coronary artery occlusions. Acute coronary occlusion is the rarest and most life-threatening complication associated with high morbidity and mortality rates of approximately 40% [6]. Peri-procedural Myocardial Infarction is the most fatal complication seen with acute coronary occlusion following TAVI. It might be caused by an embolus or thrombus. A rare case of distal coronary embolization following TAVI was described by Tsujimura *et al.*. The histopathological specimen of the aspirated thrombus was compatible with platelets, fibrin, erythrocytes, and leucocytes without any calcified components [7].

Riberio *et al.*, identified a few of the main predictive factors of coronary occlusion as female gender, low coronary ostia height (<12 mm), narrow aortic root (<30 mm at the SOV), patients with previous surgical bioprosthetic and balloon-expandable valves [8]. This patient developed coronary occlusion probably secondary to the balloon expandable valves since he didn't have any other preprocedural risk factors. Generally, this condition is accompanied by hemodynamic instability or electrocardiographic changes, however, 0.22% of TAVR patients present with subacute presentations similar to that of NSTEMI as this patient did [9].

The spectrum of clinical presentation for coronary obstruction following TAVI is based on the severity of stenosis. Complete obstruction presents with STEMI, cardiac arrhythmias, or cardiac arrest, whereas partial obstruction presents with severe hemodynamic compromise. The preferred treatment options were Percutaneous coronary intervention (PCI) or coronary artery bypass grafting (CABG) [10]. According to Scarsini *et al.*, if a self-expandable valve was deployed, snaring or removing the valve towards the ascending aorta might be helpful to restore coronary blood flow [11]. Considering the high surgical profile of this patient, he was

a suitable candidate for emergent CABG to restore coronary blood flow. Although most cases are successfully managed, the possibility of contraindicating the procedure always has to be considered in the presence of high-risk features such as severe hypotension, lethal arrhythmias, high grade AV blocks and significant ST segment changes [12]. Angiographic assessment of coronary arteries is imperative and rescue angioplasty is the mainstay treatment to prevent fatal complications. Hence, with the use of TAVI, clinicians should be aware of the possible complications and provide timely management.

#### 4. Conclusion

Acute coronary occlusion is the life-threatening complication of TAVI with the highest mortality and procedural death rates despite aggressive resuscitative measures. Calcium shifting should be thoroughly watched during valve deployment, for it might cause occlusion of surrounding coronary vessels. Prompt recognition and timely intervention are crucial for overall survival. Therefore, appropriate patient selection and preprocedural CTA are needed to predict further complications.

#### Consent for Publication

Informed consent was obtained from the subject.

#### Availability of Data and Material

Data is contained within the article.

#### Authors' Contributions

All the authors have equal contributions in the preparation of manuscript.

#### Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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