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Case Report on Anaesthetic Techniques for Minimally Invasive Closure of Left Ventricular Pseudoaneurysm

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Abstract:

- ***Background***

Left ventricular pseudoaneurysm (LVPSA) is a rare but life-threatening complication of transmural myocardial infarction, associated with a high risk of rupture and mortality. While surgical repair remains the gold standard, percutaneous closure is emerging as a viable option in high-risk patients.

- ***Objective***

To describe the anaesthetic management and clinical outcomes of a high-risk patient undergoing percutaneous closure of an LV pseudoaneurysm.

- ***Methods***

We report the case of a 63-year-old male with New York Heart Association (NYHA) class IV symptoms, prior mechanical aortic valve replacement, hypertension, and frailty, who presented with chest pain and dyspnoea. Imaging revealed a 30×17 mm LV pseudoaneurysm with a 10 mm neck. Percutaneous device closure was planned under general anaesthesia with transoesophageal echocardiography (TEE) guidance. Standard ASA monitoring, entropy, and neuromuscular transmission monitoring were used. Haemodynamic stability was maintained with titrated anaesthetic drugs and a low-dose vasopressor infusion.

- ***Results***

The procedure was successfully completed with deployment of an Amplatzer device under combined TEE and fluoroscopic guidance. Post-procedural elevated left ventricular end-diastolic pressure was managed with diuretics. Extubation was delayed to optimize recovery and performed six hours post-procedure. The patient had an uneventful recovery and was discharged on the fourth postoperative day.

- ***Conclusion***

This case highlights that percutaneous LVPSA closure under general anaesthesia with real-time imaging is a feasible and safe alternative in select high-risk patients. Careful haemodynamic optimization and anaesthetic planning are crucial to avoid aneurysm rupture and to ensure favourable outcomes.

Keywords: *Ventricular Aneurysm, Cardiac Catheterization, Transoesophageal Echocardiography.*

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I. INTRODUCTION

Left ventricle pseudoaneurysm is one of the complications of post myocardial infarction which basically happens due to transmural infarction followed by hyaline degeneration and enzymatic digestion. The adherent pericardium that covers the ventricular free wall might cause left ventricular pseudoaneurysms. There is a 30-40% chance that pseudoaneurysms will rupture and cause of mortality [1,2]. Although open heart surgery is the standard advice, percutaneous closure was planned in view of the elevated risk profile of the patient and higher mortality in case of redo surgery [3,4].

II. CASE PRESENTATION

A 63-year-old patient having NYHA IV, clinical frailty index 6 with a history of hypertension, and post-status mechanical aortic valve replacement seven years prior, arrived at the hospital complaining of chest pain and dyspnoea with mild exertion and sometimes even at rest. CT scan was done which revealed a 30*17 mm LV pseudoaneurysm with a 10 mm neck communicating with the pericardial cavity. On echocardiography LV ejection fraction was 45%, the prosthetic valve operating normally and presence posterobasal LV pseudoaneurysm. CT scan of thorax reveals mild bilateral pleural effusion (right more than left side).

Percutaneous closure was planned under general anaesthesia and transoesophageal echocardiography guidance. An ASD amplatzer device was deployed via transfemoral approach through trans septal puncture.

- *Anaesthetic Management*

In order to maintain the hemodynamic stability and facilitate the transoesophageal echocardiography-guided procedure general anaesthesia was scheduled.

- *Monitoring*

Standard ASA monitoring (oxygen saturation, ECG end tidal carbon dioxide, invasive blood pressure and temperature), entropy for depth of anaesthesia, NMT monitoring for measuring the adequacy of neuromuscular blockade.

- *Imaging*

Transoesophageal echocardiography and fluoroscopy guided procedure was done. Transoesophageal echocardiography helped in trans atrial septal puncture, device deployment, fluid therapy, left ventricle systolic and diastolic function and detection of any real time complication like device migration, pericardial effusion, LA puncture or aortic injury.

- *Airway Management*

Patient is edentulous, having loose central incisors, Mallampati grading II. Cautiously intubation done direct laryngoscopy.

- *Induction And Hemodynamic Management*

Three lumen central venous access was taken. Intravenous etomidate, fentanyl and succinylcholine titrated doses were administered at induction along with a background infusion of noradrenaline at a rate of 0.04mcg/kg/min. sevoflurane used as maintenance anaesthesia. Entropy and NMT were also tracked. Maintenance of stable hemodynamic was crucial to avoid aneurysm rupture.

Amplatzer device was used for percutaneous closure of pseudoaneurysm using TEE and fluoroscopy guided. After the device closure, there was elevated Left ventricle end-diastolic pressure, injection Lasix was administered and extubation was postponed. The patient was extubated six hours post procedure and was successfully discharged on the fourth day after surgery.

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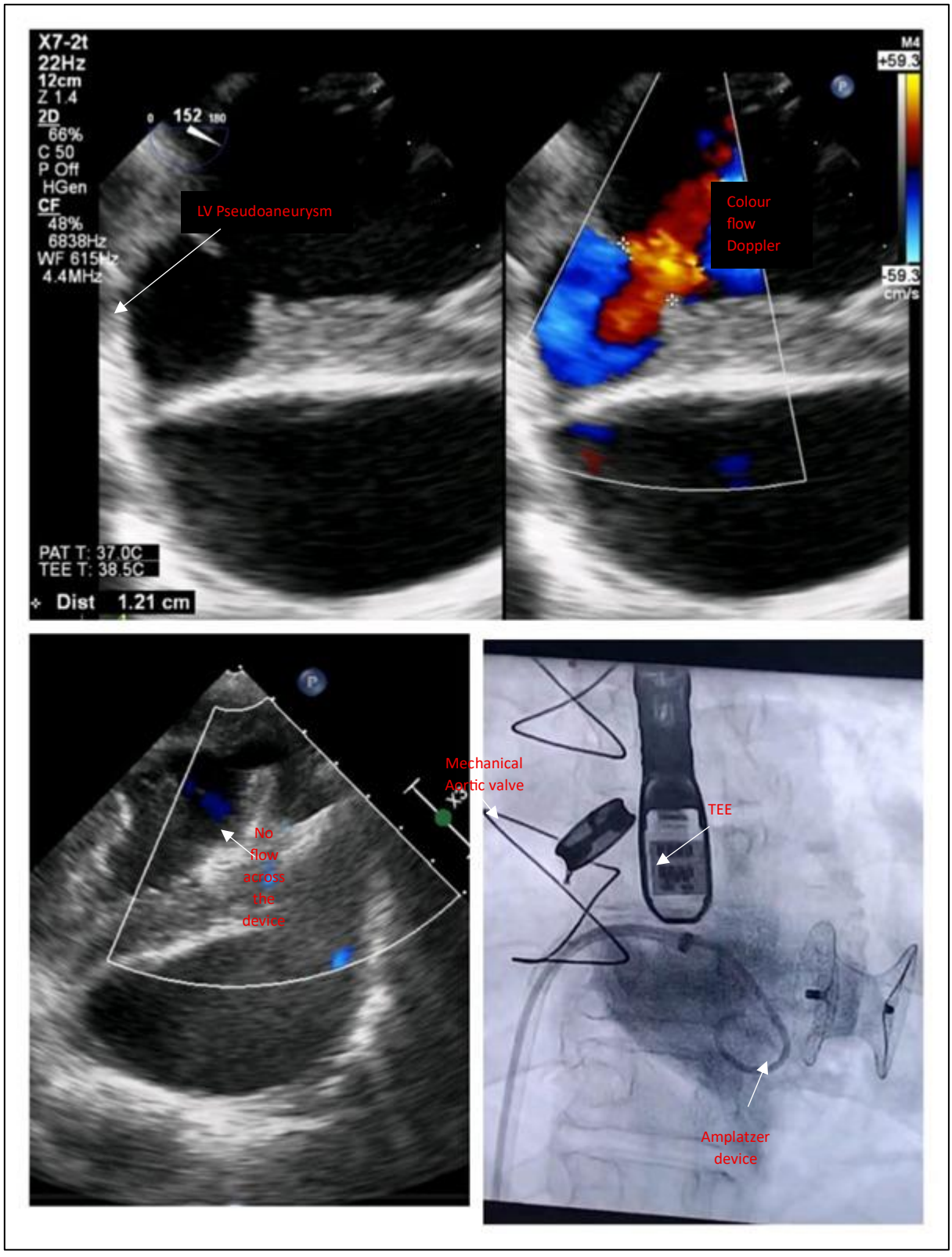

Fig 1 Shows TEE and Fluoroscopy Images of LV Pseudoaneurysm and Device Closure.

III. DISCUSSION

Left ventricular pseudoaneurysm is rare but high-risk complication of post myocardial transmural infarction. High chance of rupture due to fragile aneurysmal wall which increases the mortality. Anaesthetic management is very challenging in part of very high-risk profile with NYHA IV, high euro score (6.35%). Aim of the anaesthetic management include maintaining stable haemodynamic, avoiding fluctuation of blood pressure and facilitating real time imaging. We used titrated dose of anaesthetic drug with background infusion of vasopressor to anticipating hypotension. Patient was having bilateral pleural effusion and elevated diastolic dysfunction causes more dyspnoea due to

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back pressure to pulmonary vessels after extubation for that we postpone extubation and allows sudden diastolic dysfunction after device closure to settle.

According to a study conducted by Hnat et al [5] demonstrates that percutaneous LVPSA closure under general anaesthesia was successful, even in high-risk patients where surgical repair was prohibitive. The findings are similar to our study on the role of anaesthesia in enabling minimally invasive closure with good outcomes.

According to a study conducted by Clift et al [6] it showed successful percutaneous device closure of a pseudoaneurysm, similar to our study findings reinforcing that catheter-based closure is an effective alternative to open surgery.

According to a study conducted by Lee et al [7] it highlighted that anaesthesia in LV aneurysm/pseudoaneurysm surgery must carefully maintain hemodynamics to avoid rupture. This aligns with our study findings on hemodynamic stability during percutaneous closure.

According to a study conducted by Hnat et al [5], general anaesthesia with TTE guidance was used instead of TEE, showing feasibility of less invasive imaging support whose findings were similar to our study.

Another study conducted by Torchio et al [8] acknowledged that surgical repair is the gold standard, but emphasized the high perioperative mortality in fragile post-MI patients. This study findings are dissimilar to our study where percutaneous closure was chosen due to surgical risk.

A study conducted by Frances et al [9] showed that LV pseudoaneurysm has very high rupture risk if untreated; therefore, any safe alternative closure like percutaneous closure becomes clinically valuable, similar to our study.

A study conducted by Torchio et al [8] states that surgical repair (within 3 months post-MI) remains the recommended treatment; percutaneous closure is still considered niche and reserved for inoperable/high-risk patients similar to our study findings.

Another study conducted by Frances et al [9] emphasizes that pseudoaneurysms carry a grave prognosis without surgical repair, suggesting percutaneous management is still relatively unproven, dissimilar to our study findings.

➢ *Novelty of the Study*

This case demonstrates the successful anaesthetic management of percutaneous LV pseudoaneurysm closure in a patient with mechanical aortic valve replacement and significant comorbidities. The novelty lies in highlighting the feasibility of using general anaesthesia with transoesophageal echocardiographic guidance, and real time imaging as well as hemodynamic management.

IV. LIMITATIONS

- Being a single case report, findings cannot be generalized to all patient populations.
- Short follow-up period; long-term outcomes of percutaneous closure were not assessed.

V. RECOMMENDATIONS

- Larger multicentre studies should evaluate anaesthetic strategies in percutaneous LVPSA closure to establish standardized guidelines.
- Long-term follow-up is essential to assess device stability, recurrence, and patient outcomes.
- Comparative studies between general anaesthesia and sedation protocols could help optimize anaesthetic management in high-risk patients.

VI. CONCLUSION

Anaesthetic management in percutaneous LVPSA closure should focus on hemodynamic stability, adequate depth of anaesthesia, and readiness for imaging-guided interventions. Transfemoral percutaneous closure under general anaesthesia is a feasible approach in select high-risk patients.

➢ *Funding Sources*

Nil.

➢ *Conflicts of Interest*

The authors declare no conflicts of interest.

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