Unveiling the Gravity: Ventricular Septal Rupture as a Lethal Sequelae in Myocardial Infarction

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BACKGROUND

- In the pre-thrombolysis era, ventricular septal rupture(VSR) complicated 1–3% of all acute myocardial infarctions.

- However, since the introduction of reperfusion therapy, the incidence of ventricular septal rupture has decreased, complicating 0.17–0.31% of acute myocardial infarctions.

- Despite a reduction in incidence, the mortality of patients with ventricular septal rupture remains high (41–80%) in those who have undergone PCI.

- It is important to identify this rare but lethal complication earlier, as it is associated with high morbidity and mortality.

- Even with early diagnosis ,the survival rate is not good.
- The management of this fatal complication is also topic of debate.
- Even after much research, management of this fatal complication is not standardized.
- Here ,we present a case series of 4 patients who developed ventricular septal rupture as a post myocardial infarction complication and discuss management options for this rare lethal complication.

Case 1

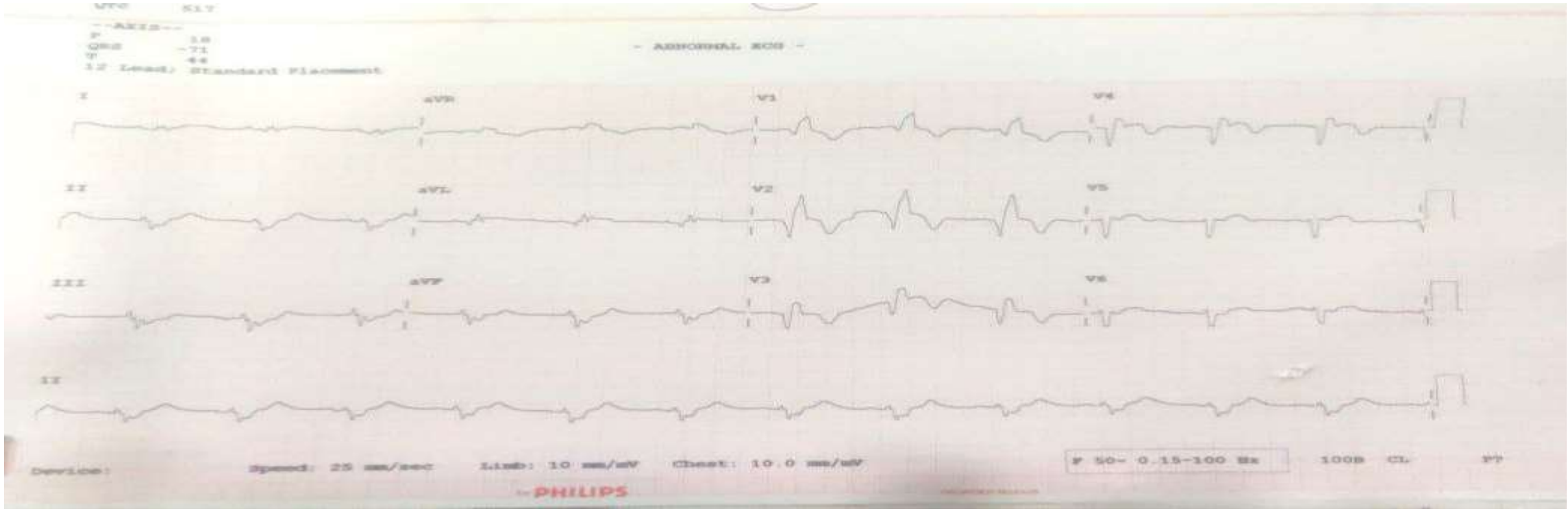
- 46 years old male patient diagnosed as anterior wall myocardial infarction was thrombolysed successfully with streptokinase.

- After 7 days of myocardial infarction, patient had c/o chest pain and dyspnea on exertion NYHA class II.

- On examination:
- The patient was conscious, oriented and hemodynamically stable:
  - BP- 130/80 mm Hg
  - PR- 88 / min
  - Spo2 was 96 % at room air.

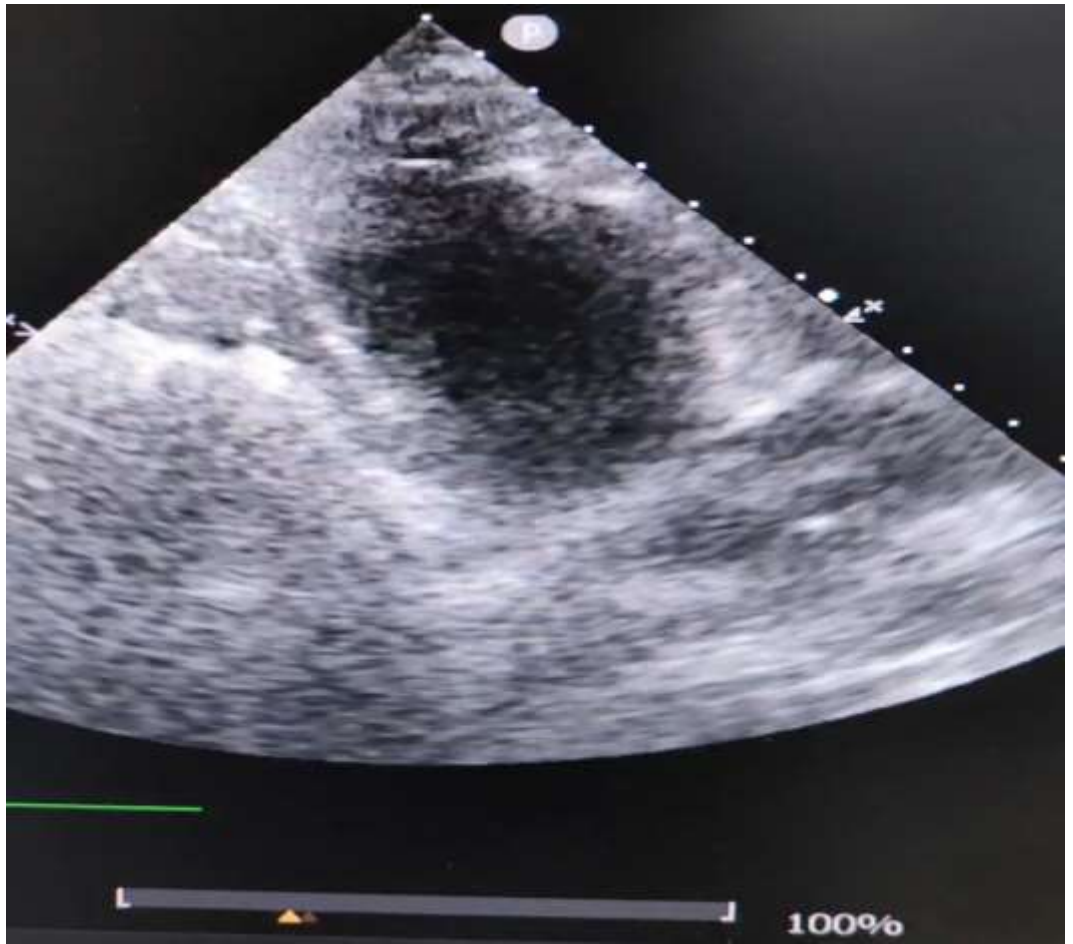
- CVS Examination: Grade 3/6 holosystolic murmur at left para sternal area in 3^{rd} and 4^{th} intercostals space.

- **ECG:**
- S/O Normal sinus rhythm with qRBBB in V1,V2,V3,V4.



Echocardiography

- Revealed Large Ventricular Septal Defect Near Mid Septum With Left To Right Shunt.



MANAGEMENT

- As patient was stable hemodynamically and he did not require any ionotropic or other hemodynamic support he was treated conservatively .
- On 35th day of myocardial infarction he was operated for ventricular septal defect surgical repair .
- SVG graft to LAD was given along with VSR repair.
- Post operatively patient is stable and doing well now on follow up visits.

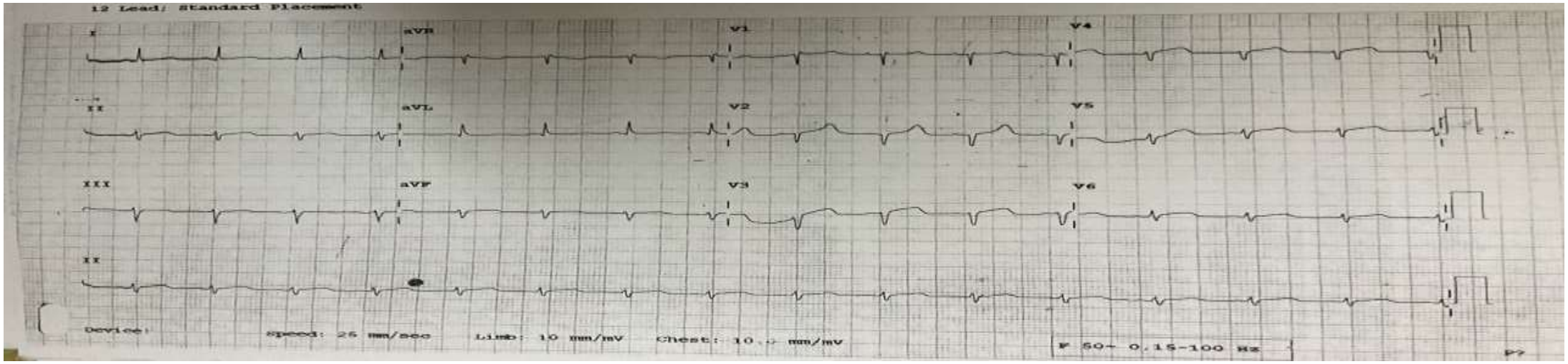
CASE 2

- 65 years old female,
- K/C/O Hypertention and Diabetes Mellitus
- Recent history of anterior wall myocardial infarction.
- She underwent coronary angiography followed by PCI to LAD (infarct related artery).
- She was discharged with stable hemodynamics without any complaints.
- After a week of discharge she started complaining of sudden onset chest pain and acute shortness of breath associated with perspiration and palpitation

- **On clinical examination :**
- She had hypotention with SBP of 80 mmHg,
- Cold extremities.
- Spo2 was 86 % at room air, 97% on 02 by Mask @ 6L/min

- CVS Examination: S/O Grade 4/6 Pan Systolic Murmur Heard At Left Para Sternal Area With Thrill.

- **ECG** s/o Evolved anterior wall myocardial infarction changes



Echocardiography

- Ventricular septal rupture(apical to mid septum) with significant left to right shunt.

MANAGEMENT

- In view of cardiogenic shock and pulmonary edema, heart team discussion was done and she was taken for surgical closure of VSR.
- Patient was not maintaining stable hemodynamics post operative.
- She had persistent hypotension even with high ionotropic support and IABP support.
- On post operative day 3, patient developed ventricular arrhythmia, sudden cardiac arrest from which she could not be revived.

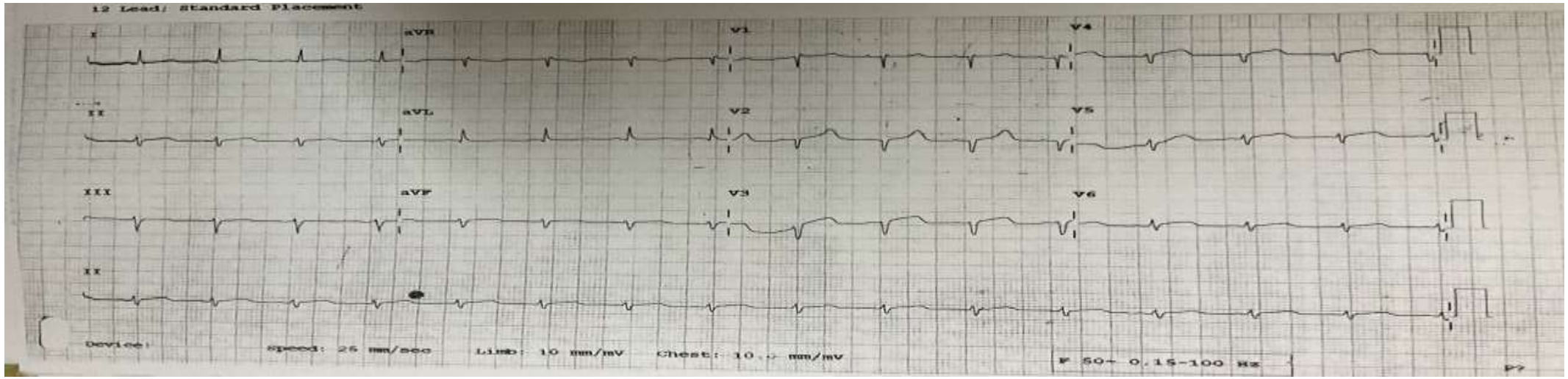
CASE 3

- 82 years old female presented with c/o typical chest pain and palpitation.
- She was diagnosed with ST segment elevated anterior wall myocardial infarction and thrombolysed successfully with Tenecteplase(outside).
- After thrombolysis, patient was hemodynamically stable but after 4 hours of thrombolysis complained of shortness of breath.
- She was transferred to our center for further evaluation and management.

- On clinical examination she was in cardiogenic shock and pulmonary edema.

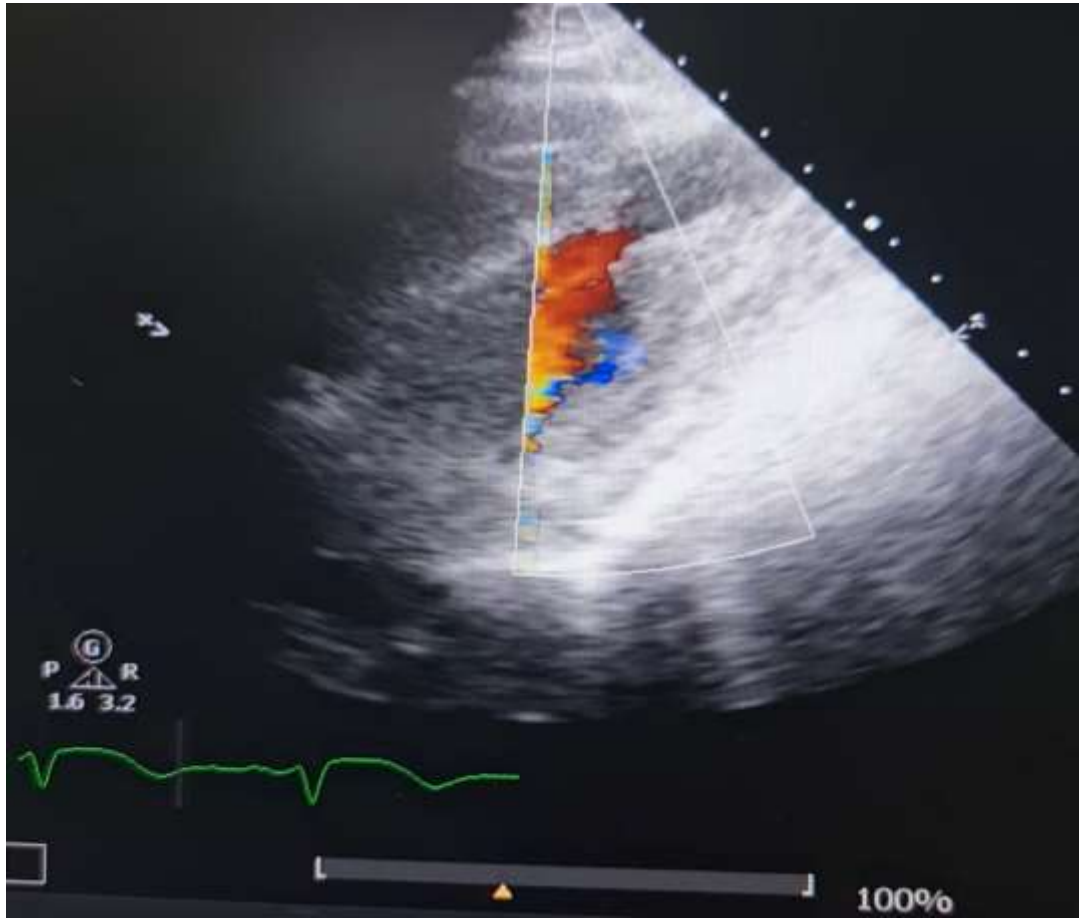
- CVS : Examination: Grade 5/6 Pan Systolic Murmur Heard At Left 4th Intercostal Space.
- RS – B/L Crepitations till the Mid Zone.

- **ECG** s/o Evolved Anterior Wall MI.



Echocardiography

- Severe Left Ventricular Systolic Dysfunction With Akinetic Anterior Wall And Aneurysmal Apex.
- Ventricular Septal Rupture(apical) With Significant Left To Right Shunt With Defect Of 6mm



MANAGEMENT

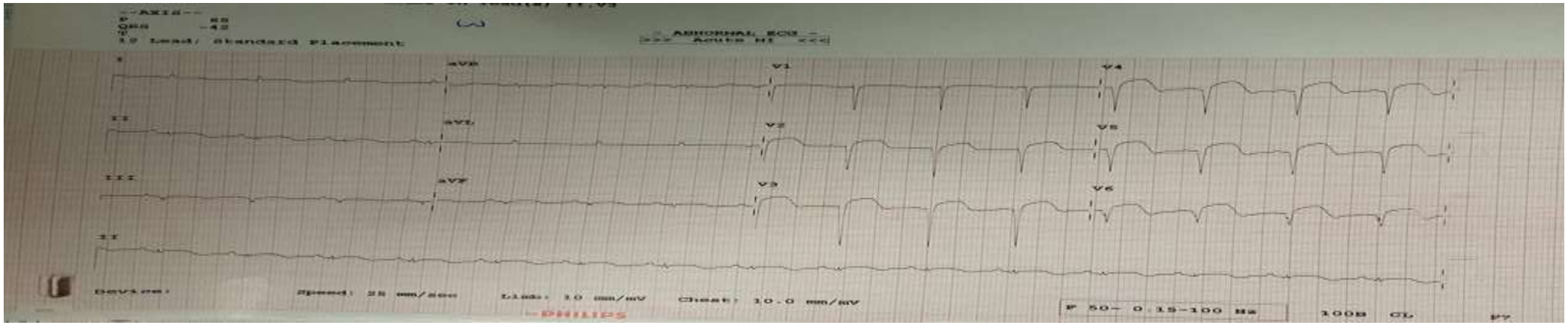
- She was transferred to cathlab for coronary angiography and Intra aortic balloon pump as a mechanical circulatory support.
- Coronary angiography revealed critical double vessel disease with stenotic lesion in ostio proximal left anterior descending artery and ostio proximal left circumflex coronary artery.
- She was put on IABP and intravenous ionotropic support with mechanical ventilatory support.
- However, she did not improve and unfortunately died after 4 hours.

CASE 4

- 76 years old male patient admitted with c/o chest pain and dyspnoea since last 6 hours.
- k/c/o of Hypertension and Diabetes Mellitus
- On examination:
- The patient was conscious, oriented and hemodynamically stable:
  - BP- 140/80 mm Hg
  - PR- 84 / min
  - Spo2 was 96 % at room air.

- His 12 leads ECG was suggestive of ST elevation in V2 to V6 s/o of Anterior Wall Myocardial Infarction.

- He was thrombolysed with injection streptokinase 15MIU



- Echocardiography at the time of presentation suggestive of RWMA in LAD territory with LVEF of 30%.

- Patient was hemodynamically stable and shifted to cardiac care unit for further management.

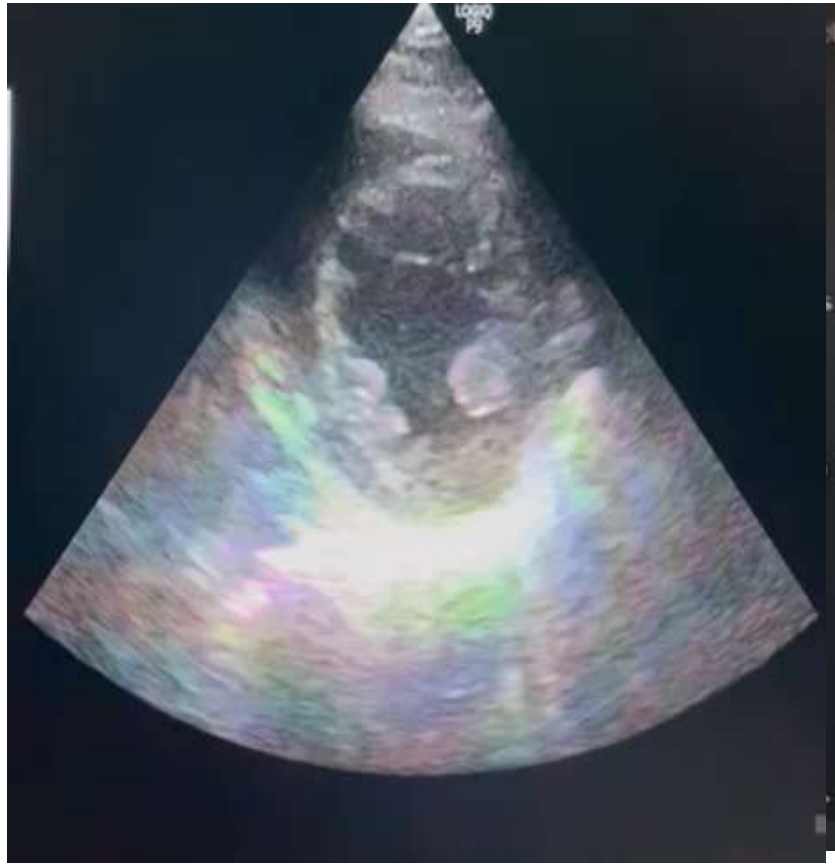
- Coronary angiography revealed critical triple vessel disease and hence he was advised for early CABG.

- On the same night patient had recurrence of chest pain associated with palpitation and perspiration.

- On Examination:
- HR : 120 bpm
- Blood pressure: 80/50 mmHg.
- Spo2: 86% on Room Air and 95% on 02 by mask @ 8L/min.

- CVS : Examination: Grade 4/6 Pan Systolic Murmur Heard At Left 4^{th} Intercostal Space.
- RS – B/L Crepitations till the Mid Zone.

- **Echocardiography :**
- Ventricular Septal Defect With Left To Right Shunt With Severe LV Dysfunction.



MANAGEMENT

- Patient was advised for IABP support and surgical repair of VSR.
- Because of financial constraints patient was managed medically.
- Patient was maintaining stable hemodynamics for next 3 days with gradually tapering of Inotropic supports.
- On 4^{th} day patient deteriorated suddenly, developed cardiogenic shock and could not be revived.

DATA

- In the last 2 years, 12 cases of (11-VSR ,1 - LV FREE WALL RUPTURE) were admitted.
- Out of the 12, 4 cases were surgically operated.
- Out of the 4 surgically managed cases, 2 patients survived and are on regular follow up.

DISCUSSION

- Ventricular septal rupture is one of the rare mechanical complication of acute myocardial infarction which if missed carries a poor prognosis.

- With early revascularization incidence of this mechanical complication has been reduced significantly, as early PCI leads to good flow in the culprit vessel and that leads to myocardial salvage.

- Hence PCI reduce the incidence of VSR compared to thrombolysis.

- In the pre-thrombolysis era, VSR complicated 1–3% of all acute myocardial infarctions.

- However, since the introduction of reperfusion therapy, the incidence of VSR has decreased complicating 0.17–0.31% of acute myocardial infarctions.

- Cardiac free wall rupture and ventricular septum rupture after myocardial infarction are similar regarding pathological characteristics. There is a pathological classification regarding free wall rupture, which we can use for VSR as proposed by Becker.

- There are three types which are as follows:

1. Type I: Sudden in onset, slit-like tear, within 24 hours

2. Type II: Subacute, erosion of infarcted myocardium

3. Type III: Late presentation, aneurysm formation, and rupture, associated with older infarcts

- After establishing the new connection between the right and left ventricle due to VSR, oxygenated blood shunts from the high-pressure left ventricle to the low-pressure right ventricle and there is also volume overload in right sided chambers and reduced forward flow.

- There are many known risk factors which are associated with this complication e.g.
- 1)Old age,
- 2)Female sex,
- 3) No h/o of IHD
- 4)Anterior wall MI.

- . In previous studies, Left Anterior Descending(LAD) and Right Coronary Arteries(RCA) are the most common culprit lesions leading to VSR.

- Associated comorbidities like diabetes mellitus, hypertension, smoking are less common in patients developing post MI VSR.

- Inferior or basal septal VSR associated with higher mortality and morbidity as compared to apical septal VSR.

- Prognosis of VSR not only depends on the site of the VSR but also depends on many other factors like size of the defect, timing of the VSR, presence of cardiogenic shock, pulmonary edema, chronic kidney disease, left ventricular function and also on management strategies.

- The treatment of VSR in post myocardial infarction is a debatable topic and it varies from patient to patient as per heart team approach and institutional protocol.

- Early v/s Late surgical repair of the VSR is a topic of discussion as there are many benefits of late surgical repair if patient is stable hemodynamically and can be managed medically till that time.

- Non-surgical management is only a temporary solution and involves afterload reduction with intravenous vasodilators, diuretics and intra-aortic balloon pump to reduce left-right shunt and improve forward flow.

- Despite a high morbidity and mortality, the best curative treatment is the surgical repair of the VSR. However, the optimal timing remains uncertain and challenging.

- Surgery remains **the gold standard** treatment for post-MI VSR.

- Before surgical repair, it is important to restore the circulation in the diseased artery to decrease the hypoxic burden in the infarcted area, especially with involvement of Right Ventricle.

- Surgery should only be delayed in the following cases:

- No evidence of cardiogenic shock
- Patient having good perfusion and cardiac output
- Minimal or no signs of congestive heart failure
- Minimal use of vasopressors
- No retention of fluid
- Normal kidney function

- More recently, percutaneous closure of VSR emerged as a potential alternative to surgery in selected cases.

- Percutaneous Transcatheter Septal Closure (TSC) has become a valuable alternative in patients with high surgical risk, with a high rate of procedural success (>75%), especially in **defects<15 mm**, although the mortality rate remains high.

- TSC also plays a role as a rescue therapy for residual defects following initial surgical repair.

- Percutaneous closure devices and mechanical circulatory supports (MCS) may offer alternative or synergistic strategies to treat the patients, both pre-operatively and postoperatively.

- In developing countries the cost is also hurdle for optimum management of VSR.

TAKE HOME MESSAGE

- VSR is the very rare and fatal complication of myocardial infarction and its associated with high mortality and morbidity.
- It is important to identify this lethal complication as early as possible and managed aggressively with heart team approach.
- It is advisable to go for early surgical repair if patient is unstable, in cardiogenic shock or having pulmonary edema although late surgical repair is associated with better prognosis.
- Proactive monitoring and early detection is important to mitigate the catastrophic outcomes associated with this fatal complication.

Thank you!!