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| RESEARCH ARTICLE

Acute Ischemic Stroke and STEMI in A 78-Year-Old Female: A Case Report of Dual Life-Threatening Events and Complicated Recovery

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| ABSTRACT

Ischemic stroke and ST-elevation myocardial infarction (STEMI) occurring at the same time, are very rare conditions that cause major difficulties in management and present high mortality rates. This manuscript brings into focus a 78-year-old woman who had known diabetes mellitus (DM), hypertension (HTN), dyslipidemia, and ischemic strokes in the past, who presented with focal neurological deficits in the form of sudden onset slurring of speech and facial asymmetry which on investigation revealed a large left middle cerebral artery (MCA) infarction. Few hours later she developed STEMI with ECG changes and raised troponin levels. The patient experienced respiratory difficulty for which the patient was intubated. A percutaneous intervention (PCI) was attempted with moderate results. Complications included heart failure, atrial fibrillation (AF), and septic shock due to a urinary tract infection (UTI) that delayed her discharge from the hospital. Nevertheless, the effective treatment and cooperation between cardiologists and neurologists, stabilized her condition. This case shows the challenges of managing dual pathology (stroke and STEMI simultaneously); therefore, early diagnosis and multidisciplinary management offer the best prognosis to realize optimal outcomes.

| KEYWORDS

Atrial fibrillation, stroke, diabetes mellitus, heart failure, percutaneous coronary intervention

| ARTICLE INFORMATION

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1. Introduction

Two of the most critical cardiovascular emergencies that can affect individuals are acute ischemic stroke and ST elevation myocardial infarction (STEMI). The two diseases are fatal on their own and are well known to cause severe morbidities or death when they are not well addressed by medical professionals. Ischemic stroke occurs, when blood supply to a certain area of the brain is cut off and brain tissue is damaged. STEMI is a form of heart attack that occurs when one of the main arteries, that supplies the heart is blocked causing a large amount of the heart muscle to be damaged. It becomes a more critical problem to handle when both conditions occur at the same time.

Treatment approaches for ischemic stroke and STEMI maybe contradictory and incompatible with each other. For instance, while thrombolytic therapy is used to dissolve clots in the case of ischemic stroke, it raises the risk of bleeding [1], and can be

detrimental particularly to patients with STEMI, who may require anticoagulation or some other interventions in heart disease[2]. This conflict may alter the clinical decision-making process for the two diseases and may lead to delays in the treatment of either one . When these two pathologies coexist, decisions should be made by multidisciplinary team, primarily cardiologists and neurologists.

Patients affected by both stroke and STEMI are usually elderly having cardiovascular risk factors like hypertension (HTN), diabetes mellitus (DM) or dyslipidemia. These conditions put patients in a vulnerable position of developing atherosclerosis that affects both the brain and heart. They are complex to handle because they can develop more complications like heart failure, recurrent strokes or bleeding. Also, a majority of such patients have other health complications that make their treatment and recovery process, even more challenging [3,4].

Patients with such coexisting pathologies should be treated with a balance between aggressive treatment and avoiding complications. Early diagnosis and management can improve the survival rate and recovery of such patients. The choice of treatment should be made based on the patient's history, the severity of the stroke and STEMI and the potential benefits and harms of each treatment. Even today, with better medical care, stroke and STEMI patients have high mortality, undergo long hospitalizations, and suffer complex disabilities when both incidents occur simultaneously [5,6].

Globally, stroke and heart disease are among the major causes of mortality (30% of all deaths) and morbidity [7]. Researches conducted in USA, European and Asian countries has revealed that patients suffering from Ischemic stroke and STEMI have high incidence and prevalence, especially for the elderly population. For example, in the USA, about 795,000 people have a stroke each year, with 87% cases of ischemic stroke [8]. Likewise, STEMI is one of the major proportions of heart attacks counting globally [9]. Despite the work in literature that investigates incident rates of stroke and STEMI separately, co-incidence of these two conditions is less documented.

To the best of our knowledge there is a gap in literature that focuses on patients who present with both ischemic stroke and STEMI. These two conditions are often studied individually, and few literatures addrees their coexistence. This case report will add to the existing information by explaining the clinical presentation, management, and prognosis of an individual who develops both ischemic stroke and STEMI on the same day.

2. Case Presentation

This case involves a 78-year-old female with a significant medical history of Diabetes Mellitus (DM), Hypertension (HTN), dyslipidemia, and three previous cerebrovascular accidents with residual right-sided weakness. Despite being fully dependent on physical care, she was mentally healthy.

2.1 Initial Presentation

On August 28, the patient was in her usual state of health when she suddenly developed slurred speech and facial asymmetry, but she maintained consciousness. There was no increase in her pre-existing weakness, new onset numbness, bulbar symptoms or diplopia. There were no signs of chest pain or shortness of breath (SOB). Vital signs showed a pulse rate of 64 beats per minute, oxygen saturation of 99% on room air, blood pressure (BP) of 182/90 mmHg, and a respiratory rate of 22 breaths per minute. She was unable to speak clearly, but her chest, cardiovascular, lower limb and abdominal examinations were unremarkable.

2.2 Diagnostic Findings

Initial investigations revealed a troponin level of 1.1 and an electrocardiogram (ECG), that showed some ischemic changes **(Figure 1).** A venous blood gas (VBG) indicated a pH of 7.42, HCO3 30 mmol/L, CO2 51.5 mmHg, and lactic acid 1.2 mmol/L. Chest X-ray which was completely normal **(Figure 2)**. Computed tomography (CT) scan of the head revealed an acute left middle cerebral artery (MCA) territory infarction with cortical and subcortical hypodensity in the left parietotemporal lobes, and minimal sulcal effacement **(Figure 3)**. Due to the patient being outside the therapeutic window, thrombolysis (tPA) was not administered.

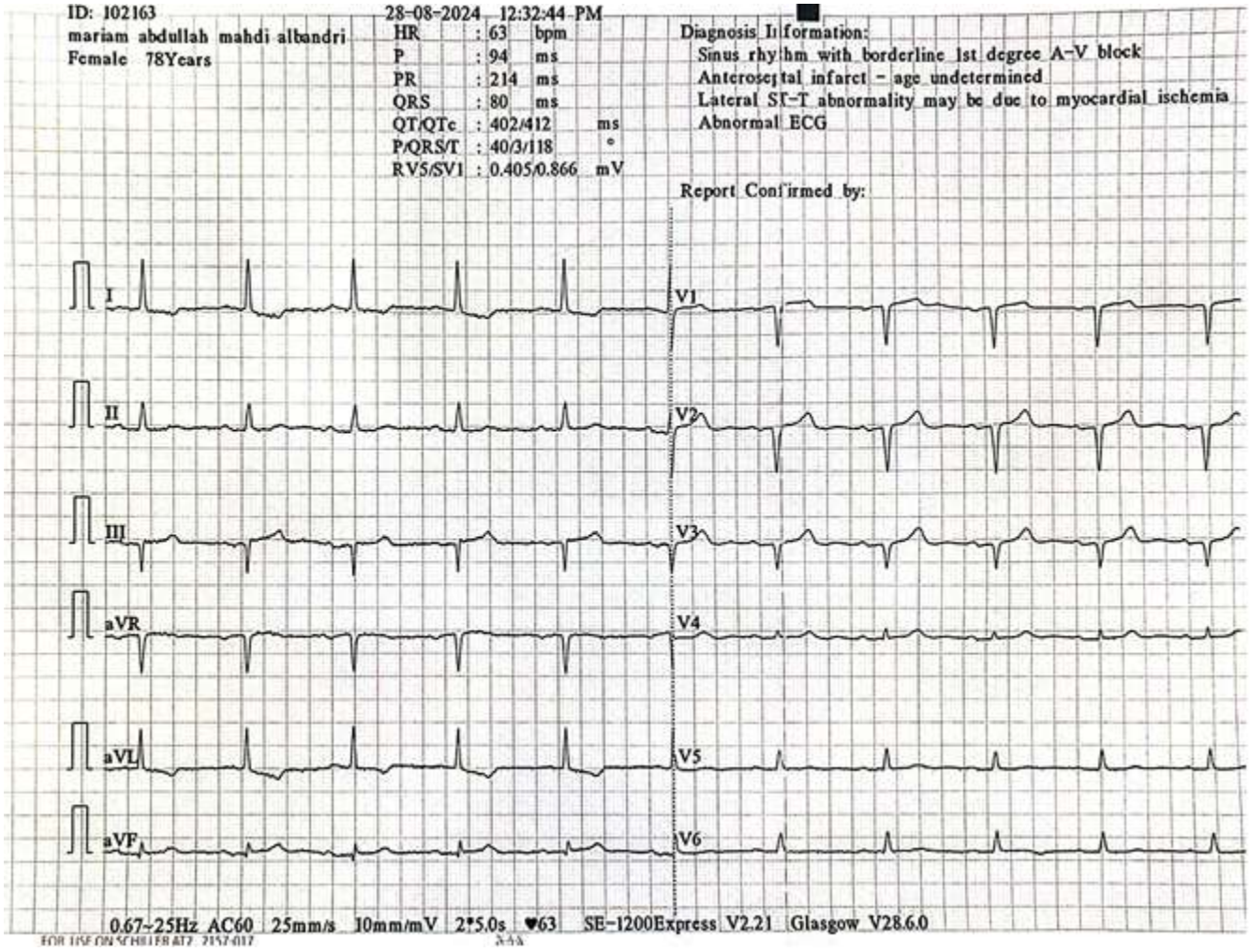

Figure 1. Sinus rhythm ECG showing subtle ST depression in lead I and aVL, flattened T wave in V5-V6, subtle ST elevation in lead III and aVF, borderline first degree heart block and Qs in anterior leads.

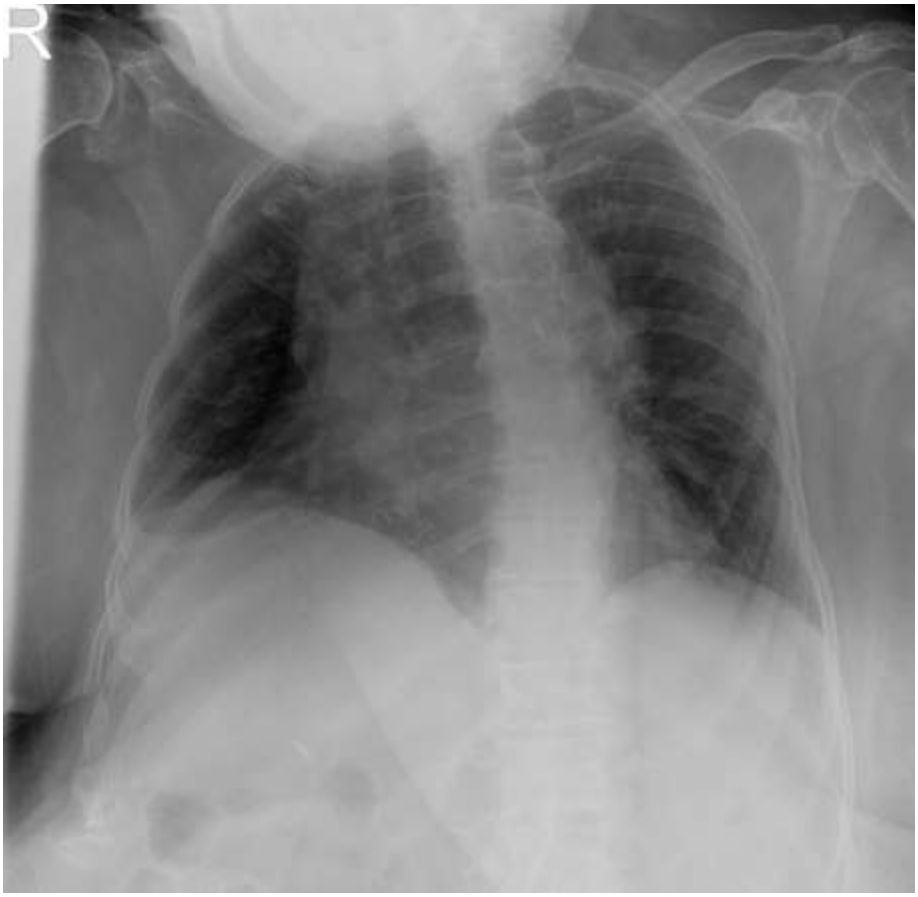

Figure 2. Initial chest X-ray done at presentation, showing no abnormal findings except for mild right pleural effusion.

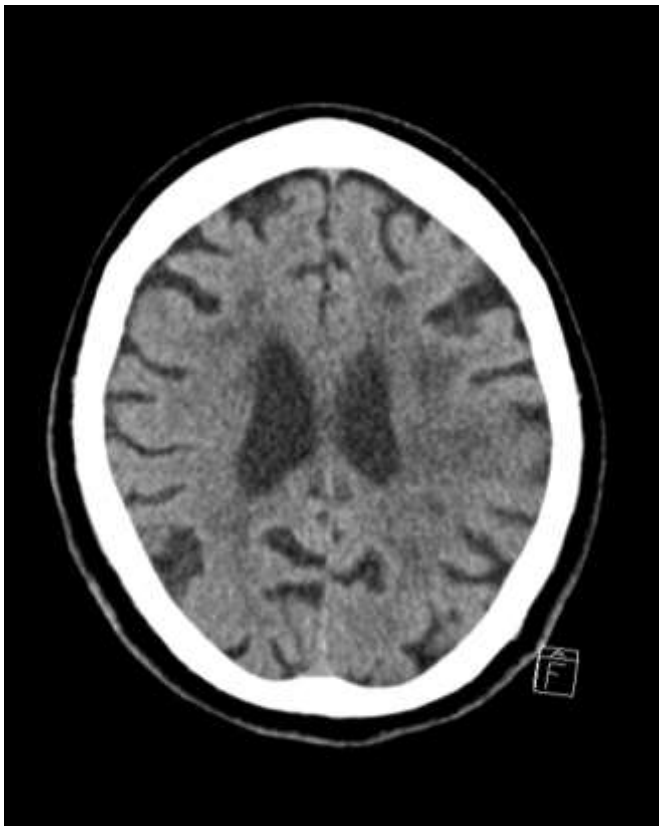

Figure 3. CT brain, arrows showing acute Left MCA territory infarction

2.3 Rapid Deterioration

A few hours later, the patient experienced a sudden loss of consciousness with a Glasgow Coma Scale (GCS) score of 7/15 and desaturation to 79% (which improved to 86% on 15L O2 mask). Also she became in respiratory distress, and a chest examination revealed coarse crepitations bilaterally. A repeat VBG showed severe mixed lactic and respiratory acidosis (lactic acid 14 mmol/L, pH 7.00, CO2 108 mmHg, HCO3 15 mmol/L). ECG now showed ST-elevation myocardial infarction (STEMI) in leads II, III, aVF, V5, and V6, along with ST depression in V1 to V6 **(Figure 4).** Troponin levels were further elevated. A Portable chest X-ray was done and showed severe congestion secondary to acute pulmonary edema **(Figure 5)**.

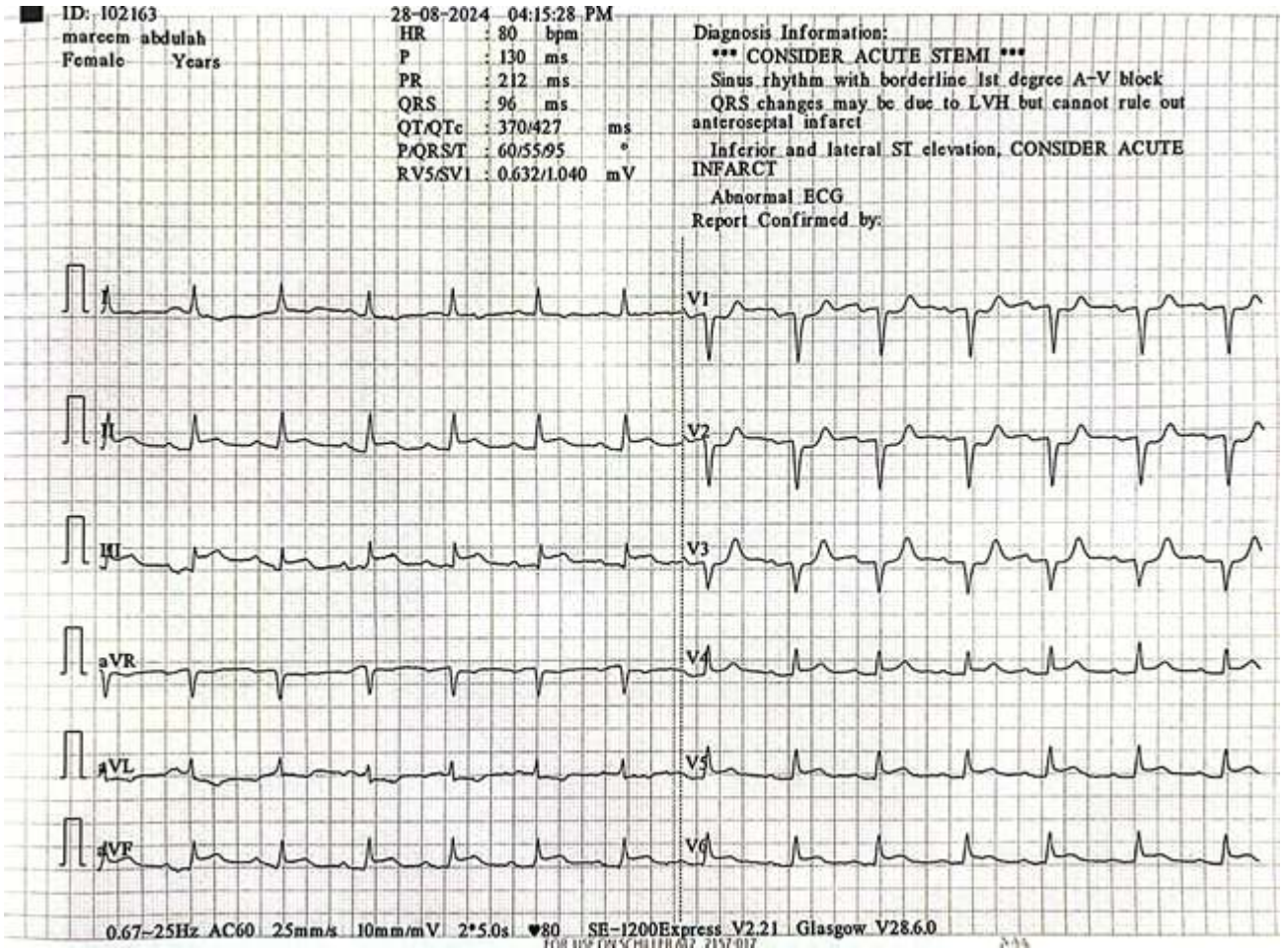

Figure 4. ECG showing ST-elevation myocardial infarction (STEMI) in leads II, III, aVF, V5 and V6. ST depression is also noted in V1 to V6 in addition to reciprocal ST depression in V3. There findings correspond to inferior-lateral wall myocardial infarction.

Figure 5. Portable chest X ray showing severe congestion secondary to acute pulmonary edema

2.4. Intervention and Management

The patient was intubated using rapid-sequence induction (RSI), which was performed without complications. After intubation, VBG improved slightly (pH 7.28, CO2 46.6 mmHg, lactic acid 4.6 mmol/L, HCO3 20 mmol/L). Chest X-ray showed acute pulmonary edema, and a bedside echocardiogram revealed poor contractility with left ventricular dysfunction and an ejection fraction (EF) of 35-40%. There was no evidence of a left ventricular thrombus, in addition to that the aortic valve was heavily calcified. After explaining all the possible complications high risk consent was taken from the family to refer the patient for PCI since she will be in high risk of intracranial bleeding which might cause mortality.

The patient was transferred to a percutaneous intervention (PCI) center where a percutaneous transluminal coronary angioplasty (PTCA) was performed **(Figure 6-9)**. The Patient was given loading dose of both Aspirin and Clopidogrel before PCI. A successful PTCA was done on the obtuse marginal (OM) artery, achieving thrombolysis in myocardial infarction (TIMI) 2-3 flow, but there was a failed attempt on the right coronary artery (RCA) and a significant mid-left anterior descending (LAD) lesion that was left for stages PCI in 4-6 weeks after stabilization.

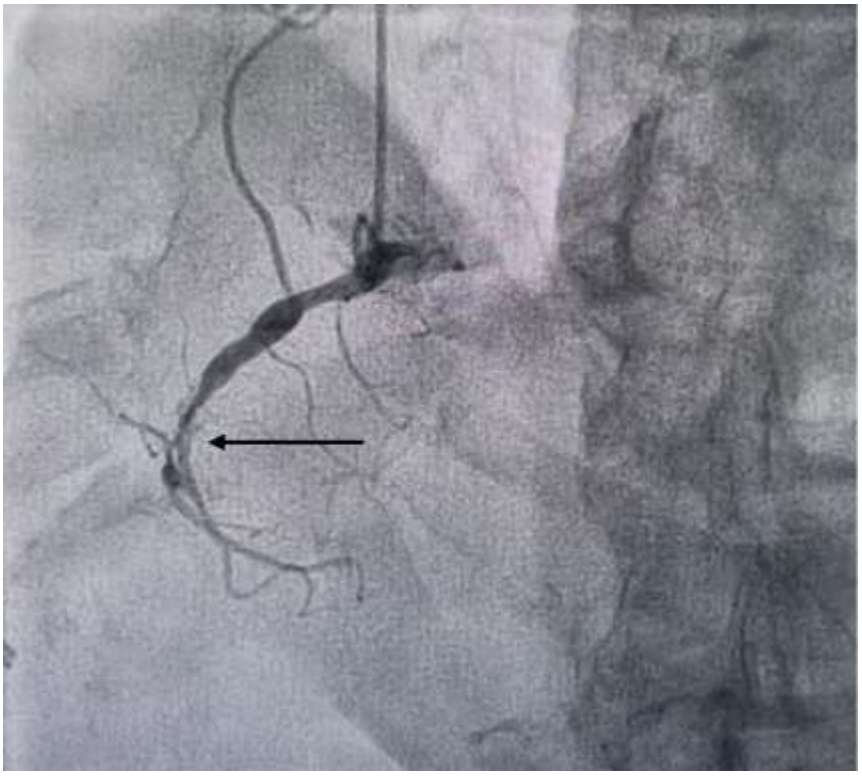

Figure 6. Right coronary artery with mid-segment chronic total occlusion and good retrograde filling from the left system.

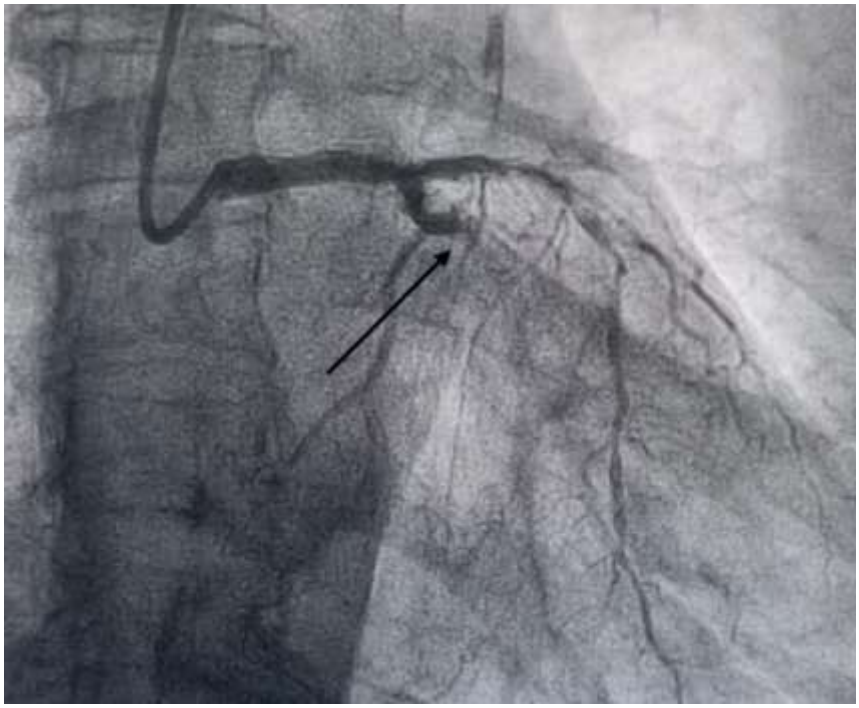

Figure 7. Large obtuse marginal branch with total occlusion (the culprit).

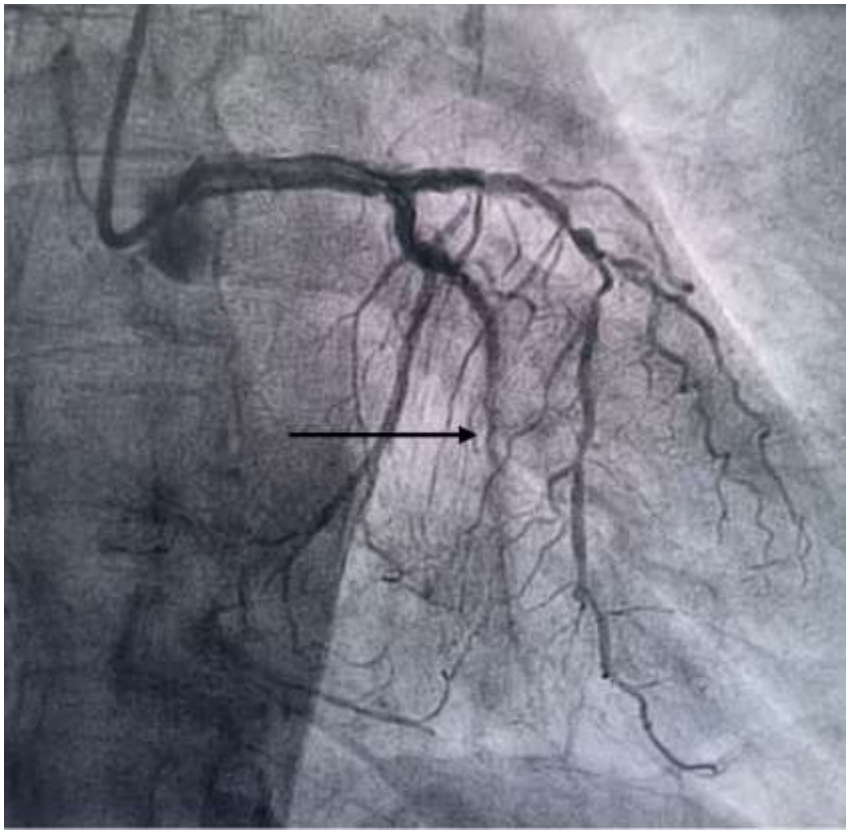

Figure 8. After ballooning (PTCA) of the obtuse marginal with restoration of TIMI II-III flow. Decided not to place a stent due to the potential risk of stent underexpansion and the coexisting acute CVA.

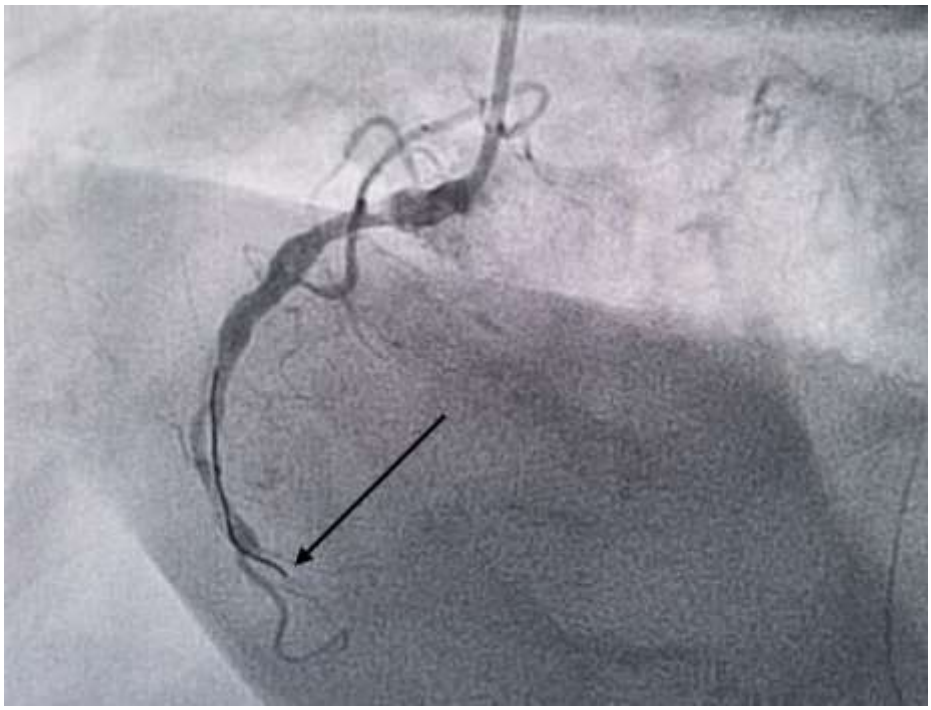

Figure 9. BMW guide wire failed to cross the right coronary artery lesion despite the use of small balloon denoting its chronic occlusion.

2.5 Ongoing Management and Complications

Management included antiplatelet therapy with Aspirin 324 mg, clopidogrel 300 mg STAT, atorvastatin, enoxaparin, omeprazole, and insulin infusion according to intensive care unit (ICU) protocol. Given the patient's high bleeding risk. As the patient developed new onset Atrial Fibrillation with a high score of HAS-BLED in addition a very high score of CHA_2DS_2-VASc, after discussion with neurology team we elected to keep her only on aspirin and prophylactic dose of Enoxaparin. A follow-up CT the next day showed no evidence of hemorrhagic transformation, and plans were made to repeat CT scans and serial ECGs.

By the third day, a CT scan revealed petechial hemorrhage **(Figure 10)**. Mannitol, which had been started as part of hyperosmolar therapy, was switched to hypertonic saline after two days. The patient remained hemodynamically stable in the ICU without inotropes, and her GCS score dropped to 6 under fentanyl sedation.

Figure 10. CT Brain, arrow showing petechial hemorrhage

The patient developed complications during her ICU stay, including multiple episodes of atrial fibrillation (AF), which failed to be managed with beta blocker and digoxin but responded to amiodarone. During her ICU stay she became hypotensive and Blood cultures were positive for gram-positive diplococci, and urine and endotracheal cultures grew Klebsiella pneumonia, so that was indicating that she was in septic shock secondary to urinary tract infection (UTI). She was treated with piperacillin-tazobactam , vancomycin, and ceftriaxone and required norepinephrine support for hypotension.

2.6 Recovery and Follow-Up

After several days, the patient's condition stabilized, and a tracheostomy was performed due to prolonged mechanical ventilation. A repeat echocardiogram 11 days after admission showed improvement in EF to 45%. Therapeutic anticoagulation with enoxaparin was started after 14 days to minimize stroke risk. A head CT scan done 11 days later and another done after one month showed progressive recovery without significant new findings. Additionally, a portable chest X-ray taken in the ICU demonstrated significant improvement in lung congestion, reflecting the patient's overall clinical progress **(Figure 11).**

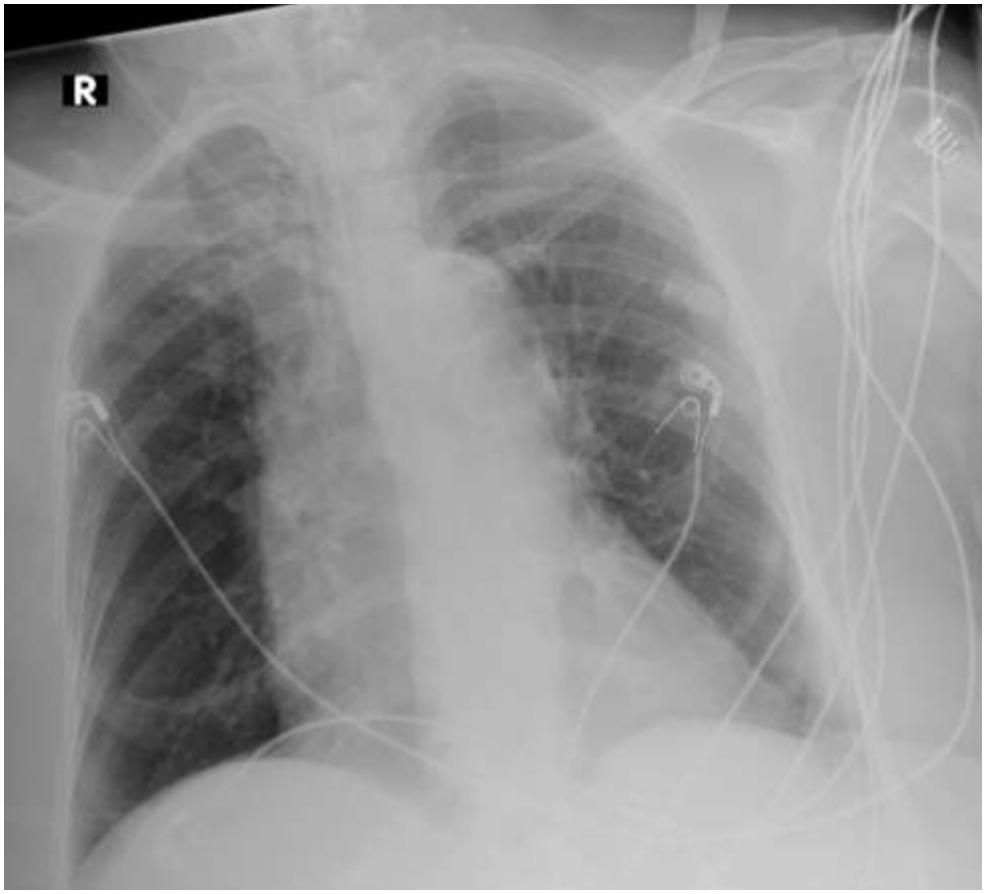

Figure 11. Portable chest X ray, done in the ICU showing the improvement in her lung congestion.

2.7 Outcome

The patient remained aphasic and required long-term tracheostomy care. The combination of a stroke and STEMI on the same day led to prolonged hospitalization, mechanical ventilation, and significant complications including septic shock secondary to UTI and newly diagnosed atrial fibrillation. Despite the absence of thrombi on echocardiograms, the case highlights the challenge of managing dual life-threatening conditions in a single patient.

3 Discussion

This case study presents a rare and challenging scenario where an elderly patient suffered both an acute ischemic stroke and STEMI on the same day. The presence of both of these two major events in the same patient warrants an extended hospital stay, multidisciplinary management, and may also lead to several complications. Both stroke and STEMI are medical emergencies that require different, and sometimes conflicting, treatment. Managing both conditions side by side, complicates decision-making and increases the risks associated with each intervention. Researchers have shown that it is difficult to manage these two conditions at the same time, and it can also lead to increased mortality and longer recovery periods among patients with both diseases [10,11]. That's why, the patient in our study required ICU admission, mechanical ventilation, and eventually a tracheostomy due to the severity of her condition.

Mechanical ventilation is required for patients, mostly in cases of severe respiratory failure. In this case, the patient condition became worse clinically, manifested by an abrupt drop in oxygen saturation level and the neurological condition of the patient required mechanical ventilation through intubation. The duration of mechanical ventilation in such patients is prolonged because of associated comorbidities such as congestive heart failure, recurrent arrhythmias, and neurologic deficit [12,13], as observed in present case. This led to the requirement of performing a tracheostomy to deliver mechanical ventilation, and this reduces the side effects associated with prolonged endotracheal tube intubation. This further increases the patient's hospital duration and brought forward other risk factors such as infection and complications to the airway in patients who have tracheostomy.

A major problem experienced by this patient was septic shock due to UTI at the time this patient was in the ICU. UTIs are common causes of sepsis in sick patients, and are more common among the elderly, immobile, and catheterized patients [14]. In

this patient, the UTI progressed to bacteremia and septic shock, which leads to antibiotic therapy and vasopressor use. Septic shock made the patient's overall condition even worse and delayed the recovery. Studies have shown that, infections such as UTIs and pneumonia, are common in stroke and cardiac patients and are associated with increased mortality and longer length of stay in the ICU [15]. Since sepsis is known to be more lethal for vulnerable patients, it should be identified and managed as early as possible.

Another important finding in this case involved the development of AF, which started after the patient's admission to the ICU. Study by Campora et al., has shown that, AF increases the risk of stroke and myocardial infarction, as it can cause blood clot formation in the heart that can go to the brain or coronary artery [16]. However, in this case, the two echocardiograms showed no thrombi. Nevertheless, this does not rule out systemic embolization, and it may suggest that the event was related to previously unrecognized cardiovascular disease or comorbidities such as atherosclerosis, diabetes mellitus, and hypertension. This finding shows that AF can also occur after a stroke or a MI rather than just a cause of these two diseases. It also emphasizes the role of management for cardiovascular risk factors in such patients, to prevent recurrence of such events.

This case emphasizes the importance of multidisciplinary approach in managing patients with both stroke and MI. The decision to treat the patient with aspirin while stopping clopidogrel to minimize the risk of bleeding shows the balance required in managing such cases. Antiplatelet and anticoagulant therapies, while essential for treating MI, can increase the risk of hemorrhagic transformation in stroke patients, especially in those patients, with large infarcts or other risk factors for bleeding [6]. Coordination between cardiologists and neurologists was critical in this case to reduce thrombotic risk while minimizing bleeding complications.

4.1 Study Limitations

The management strategy and complications discussed in this case report are specific to this patient, who had a unique clinical presentation, comorbidities, and distinct ethnicity. This patient's multiple pre-existing conditions likely influenced both the presentation and the course of management. The case may not represent the full spectrum of potential complications that could arise in other patients with similar dual life-threatening events. Additionally, some diagnostic tools such as a posterior ECG, transesophageal echocardiography (TEE), and continuous Holter monitoring were not employed during the patient's management. Using such diagnostic modalities may have provided more detailed insight into the patient's cardiac function and the potential rhythm disturbances

4.2 Suggestions for Future Research

A case involving concurrent illnesses of ischemic stroke and STEMI is rare; therefore it requires a comprehensive treatment plan. In order to build up a standardized approach to achieve optimal recovery outcomes and reduce complications, an extensive multicenter cohort research study is essential. Studies may highlight the benefits of implementing other diagnostic tools, such as posterior ECG, holter monitor and TEE, which were not used in this case, to optimize treatment. Additionally, studies could explore how distinct ethnicities and genetic factors contribute to the development of severe complications in certain populations compared to others. Such exploration will aid in reducing future complications and ensure improved management.

5 Conclusion

This case study describes the simultaneous occurrence of ischemic stroke and STEMI in elderly patient with numerous comorbidities. It was challenging to manage both pathologies, as well as managing the risk of bleeding vs the risk of thrombosis which needed a close collaboration with cardiology and neurology departments. Other challenges that made the patient's progress even harder include atrial fibrillation, heart failure and septic shock. Such problems require early treatment, proper dosing of medicines, and other necessary care to achieve stabilization of the patient. This case emphasizes the need to diagnose and treat both life threatening events as early as possible and underscores the benefit of a multidisciplinary approach for treating such patients.

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