



Kementerian Kesihatan Malaysia

# ST ELEVATION IN aVR: NOT JUST A SIMPLE ACS!!

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## Introduction

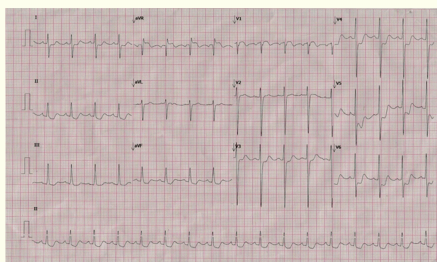
Electrocardiogram (ECG) has become an important tool in assessment of patient presented with chest pain especially in diagnosing acute coronary syndrome and cardiac arrhythmias.

Traditionally, lead aVR is often overlooked despite its multiple clinical uses. Lead aVR is one of the augmented limb leads in ECG. It is oriented to 'look' at the right upper side of the heart, thus provide specific information about the right ventricle outflow tract and basal part of the septum. It also displays reciprocal information covered by leads aVL, II, V5 and V6. On the other hand, ST elevation in aVR with ST-segment depression in multiple other leads was a strong predictor for acute coronary syndrome. However, ST elevation in aVR can be associated with many different conditions, not just ACS! Here, we are reporting a case of possible thoracic aortic dissection which was initially mistreated as high risk NSTEMI.

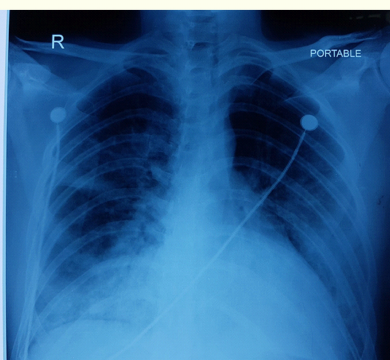
## Case Report

A 31 years old gentleman, ex-smoker with no known medical illness, presented with chest pain for the past one week, which worsening during the day of presentation. He describe the pain as central chest pain, heaviness in nature with pain score 9/10. The pain radiate to the back, associated with difficulty in breathing and profuse sweating. Clinically, patient was alert, conscious, tachypneic, with vitals BP 104/65, PR 76, SPO2 90%, T 37c. Lungs generalized crepitation up to the midzone. First ECG showed ST elevation in lead aVR with multiple ST depression at lead I, II, III, aVF, V4-V6. Patient initially was treated as acute coronary syndrome with acute pulmonary oedema (ACS with APO). The patient was put on non-invasive ventilation (CPAP) and been managed accordingly based on the ACS guideline. He was referred to cardiology team for further evaluation and admission.

During cardiology team review at the emergency department, noted that CXR cardiomegaly, overload features with possible widened mediastinum. Serum creatinine kinase 1085. Bedside echo by cardiologist show aortic root dilatation with intimal flap. Impression was revised TRO aortic dissection and ACS treatment was withheld. The patient was then planned for CTA thorax but unfortunately, patient asystole at the emergency department and succumbed to death despite aggressive resuscitation.



ECG show ST elevation in lead aVR with multiple ST depression at lead I, II, III, aVF, V4-V6.



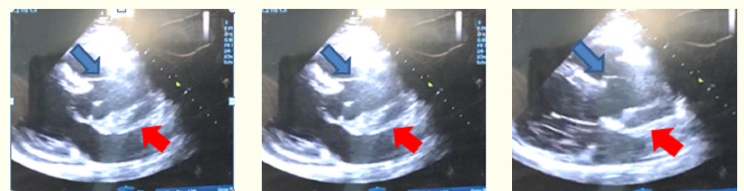
CXR showing cardiomegaly, overload features, with possible widened mediastinum.

## Discussion

ST-segment elevation in aVR with ST-segment depression in multiple other leads reflects global subendocardial ischaemia of left ventricle, often associated with proximal lesion or multiple-vessel disease in patients with symptoms of cardiac ischaemia. In a patient presented with signs and symptoms of acute cardiac ischaemia as in this patient, ST elevation in aVR often indicates left main coronary artery (LMCA) stenosis/occlusion, proximal left anterior descending (LAD) occlusion and severe triple vessel disease (3VD). However, any cause of severe generalised global ischaemia can show similar ECG pattern. These include severe anaemia, type A dissection, massive PE, sodium channel blocker toxicity, severe hypokalaemia and early post arrest.

STE in aVR (>1-1.5 mm) differential diagnosis

- **Sick ACS patients (signs and symptoms of acute cardiac ischemia)**
  - o LMCA stenosis/occlusion
  - o Proximal LAD
  - o Triple vessel disease
- **Any cause of severe generalized global ischemia (Other sick non-ACS patients)**
  - o Severe anemia (e.g. GI Bleeding)
  - o Type A dissection
  - o Massive PE
  - o Na+channel blocker toxicity (TCA, Hyperkalemia, Brugada, etc.)
  - o Severe hypokalemia
  - o Early post-arrest (within 15 mins of epinephrine or defibrillation)
- **Normal variants**
  - o LVH with strain pattern (severe HTN)
  - o SVT's (esp. AVRT), rapid atrial fibrillation
  - o LBBB, pacemakers



Bedside echo show aortic root dilatation (blue arrow) with intimal flap (red arrow).

## Conclusion

History, physical examination, ecg and bedside echo plays an important role in dealing with differential diagnosis of ST-segment elevation in aVR. In this case, we believe that patient was having type A thoracic aortic dissection based on bedside echo finding and ecg pattern. Emergency physician must broaden their differentials, as STE in lead aVR is associated with many other different conditions. Failure to identify the correct diagnosis might lead to morbidity and mortality.

## References

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