CASE REPORT

Acute inferior myocardial infarction with right ventricular involvement and several clinical-electrocardiographic markers of poor prognosis

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Abstract

Right ventricular involvement in inferior myocardial infarction is a marker of poor prognosis. We present a case of a 62-year-old man with very recent onset of acute chest pain and cardiac shock with the triad of elevated jugular venous pressure, distension of the jugular veins on inspiration, and clear lung fields. In addition, the admission electrocardiogram showed a slurring J wave or lambda-like wave and conspicuous ST segment depression in several leads, predominantly in the lateral precordial (V4–V6), all clinical-electrocardiographic features of ominous prognosis.

KEYWORDS

lambda-like wave, reciprocal changes, right ventricular infarction, slurring J wave

1 | CASE REPORT

A 62-year-old Caucasian man was admitted to our emergency room complaining of typical retrosternal oppressive pain that had started 30 min earlier followed by cold sweating and vomiting.

Smoker, hypertension, type 2 diabetes, and dyslipidemia are the personal history of the patient.

The presence of an elevated jugular venous pressure and distension of the jugular veins on inspiration (Kussmaul's sign), blood pressure of 85/50 mmHg, and clear lung fields were examined.

An ECG was requested (Figures 1 and 2).

2 | DISCUSSION

Isolated RV infarction rarely occurs, while RV ischemia complicates up to 50% of inferior MIs. Although the RV shows good

long-term recovery, in the short-term, RV involvement portends a worse prognosis compared to uncomplicated inferior MI, with hemodynamic and electrophysiologic complications increasing in-hospital morbidity and mortality. Acute RV shock has an equally high mortality to LV shock. Identification of RV involvement, particularly in the setting of hypotension, elevated jugular venous pressure, and a distension of the jugular vein on inspiration can anticipate and prevent complications and has important management implications, which are distinct from the management of patients presenting with LV infarction. The present case has the clinical triad of hypotension, clear lung fields, and elevated jugular venous pressure considered as a marker of RV infarction in patients with inferior wall MI (Dell'Italia, Starling, & O'Rourke, 1983). In addition, cardiogenic shock is rare in isolated acute inferior MI, but there is a relationship of cardiogenic shock with inferior MI when associated with RV infarction (Bari, Roy, Islam, Aditya, & Bhuiyan, 2015).

FIGURE 1 ECG at admission. Minimal PR interval prolongation, very prolonged R-wave peak time in V1–V2 (110 ms), very wide QRS interval (170 ms), prominent anterior QRS forces (PAF; $R = 19$ mm in V1 and 25 mm in V2) indicating lateral (previously named dorsal) myocardial infarction, large lambda wave (λ) or slurring J wave, prolonged QT/QTc interval (555/595 ms), and biphasic T wave. In addition, V3R/V4R shows monophasic positive QRS complex indicative of right ventricular MI (RVMI). The prolongation of the R-wave peak time, QRS duration, and QT/QTc intervals indicates severe nonspecific intraventricular block in acute MI. Despite the PAF in the presence of lateral infarction, left septal fascicular block is ruled out. Also, there are reciprocal changes in the lateral leads (I, aVL, V4–V6) which, associated with the lambda-like wave, constitute markers of poor prognosis. At last, ST elevation in III>II shows that the injury vector points at $\approx +120^\circ$, characteristic of proximal obstruction of the right coronary artery (Figure 2)

FIGURE 2 Characteristics of the ECG in the frontal plane in proximal obstruction of the right coronary artery. The injury vector (arrow) points to $\approx +120^\circ$, hence $STE_{III} > STE_{II}$. In tandem, a deep ST segment depression is registered in I and aVL because the injury vector moves away from these leads. (SA: sinoatrial; RCA: right coronary artery; Ac Mg: acute marginal; PD: posterior descending; AV-N: AV nodal branch; LV: left ventricle; RV: right ventricle)

FIGURE 3 New definition of early repolarization. End QRS slur (J wave) or notch on the downslope of a prominent R wave with and without STE. (a) Slurring J wave or lambda-like wave: The first point of inflection of the R-wave descendent ramp is considered the real J point. In these cases, the “tangent line” method is ideal for determining the end of the QRS complex. The lambda aspect is a marker of fatal arrhythmias in both channelopathies and acute coronary syndrome. (b) Notching J wave

The J-wave augmentations are caused by myocardial ischemia during coronary spasm. The presence and augmentation of J waves, especially prominent slurring J waves with the characteristic ST elevation (STE) pattern, are associated with ventricular fibrillation (VF; Sato et al., 2012; Yamaki et al., 2012; Figure 3).

Note: Early repolarization syndrome is diagnosed in patients, who display the early repolarization pattern in the inferior and/or lateral leads with horizontal/descending ST segment presenting with aborted cardiac arrest, documented VF, or polymorphic VT. Early repolarization pattern is recognized if: (a) there is an end QRS notch (J wave) or slur on the downslope of a prominent R wave with and without STE; (b) the peak of the notch or J wave is ≥ 0.1 mV in ≥ 2 contiguous leads of the 12-lead ECG, excluding leads V1–V3; and (c) QRS duration (measured in leads in which a notch or slur is absent) < 120 ms. As a consequence, this case does not meet this criterion because the QRS duration is 170 ms (Macfarlane et al., 2015).

In the recent past, the triangular QRS-ST-T waveform (TW) ECG pattern was presented (Cipriani A et al. JECG in press) and consists of a unique, giant wave resulting from the fusion of the QRS complex, the ST segment, and the T wave and showing a “triangular” morphology with a positive polarity in the leads exploring the ischemic region. The TW pattern was previously referred to as a “lambda-like” pattern (Kukla, Jastrzebski, Sacha, & Bryniarski, 2008) and was associated with the development of ventricular fibrillation during the acute phase of MI (Aizawa et al., 2012; Kukla et al., 2008). The TW pattern is an uncommon ECG finding, which reflects the presence of a large area of transmural myocardial ischemia and predicts cardiogenic shock associated with high in-hospital mortality. When present, this ECG pattern should prompt aggressive therapeutic strategies, including mechanical support of circulation.

Reciprocal changes, namely ST segment depression, are of prognostic significance in the assessment of the clinical course of acute coronary syndrome especially when it persists for more than one day. The patients demonstrated a reduction in the LV ejection fraction. Moreover, in this group of patients, a greater number of cases with multiple lesions of the coronary vessels were recorded. The reciprocal changes correlated well with the size of myocardial injury (Charchoghlian, Golikov, Zingerman, & Levshunov, 1989). Lateral

involvement should be strongly considered in the presence of precordial ST segment depression in association with transmural inferior AMI (Pierard, Sprynger, Gilis, & Carlier, 1986).

In patients with inferior wall acute MI, maximal precordial ST segment depression in leads V4–V6, such as in the present case, is suggestive of severe coronary artery disease involving the left anterior descending coronary artery and/or its diagonal branch (Hasdai, Birnbaum, Porter, & Sclarovsky, 1997). By bad luck, in the present case, it was not possible to determine the culprit artery because the patient died suddenly before the cardiac catheterization.

3 | CONCLUSION

We present a case of acute lateral MI with RV involvement associated with numerous clinical-electrocardiographic markers of poor prognosis: cardiogenic shock, elevated jugular venous pressure and a distension of the jugular vein on inspiration (Kussmaul's sign), clear lung fields, lambda-like wave, and ST segment depression mainly from V4–V6 as expression of mirror image or reciprocal changes.

CONFLICT OF INTEREST

None.

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