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Case report

Acute myocardial infarction with Aslanger pattern

Infarto agudo do miocárdio com padrão de Aslanger

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ABSTRACT

The diagnosis of ST-segment elevation myocardial infarction (STEMI) requires well-defined electrocardiographic criteria, however there are cases without the typical change on the electrocardiogram yet presenting acute coronary occlusion. We report a case of ST-segment elevation myocardial infarction with Aslanger pattern, characterized by the following findings: ST-segment elevation in DIII but not in other inferior leads, ST-segment depression in any of leads V4 to V6 (but not in V2) with a positive or terminally positive T-wave, ST-segment in lead V1 higher than ST-segment in V2. The diagnostic difficulty resulted in a longer delay than recommended until coronary reperfusion therapy. Coronary angiography showed severe obstructive lesions in the circumflex artery and right posterior descending branch, which made the case even more challenging. The patient presented good clinical evolution after primary percutaneous coronary intervention, being discharged from hospital within 48 hours. Atypical myocardial infarction cases with borderline electrocardiographic criteria require knowledge and adequate preparation from medical teams, enabling timely treatment and mortality reduction.

Keywords: Myocardial infarction; Electrocardiography; Percutaneous coronary intervention; Diagnosis; Coronary reperfusion

RESUMO

O diagnóstico do infarto agudo do miocárdio com supradesnivelamento do segmento ST exige critérios eletrocardiográficos bem definidos, porém há casos sem a alteração típica ao eletrocardiograma, mas que apresentam oclusão coronária aguda. Relatamos um caso de infarto agudo do miocárdio com padrão de Aslanger, caracterizado pelos seguintes achados: supradesnivelamento do segmento ST em D3, mas nenhuma outra derivação inferior; infradesnivelamento do segmento ST em qualquer derivação de V4 a V6 (mas não em V2) com uma onda T positiva (pelo menos positiva na porção terminal); segmento ST em V1 mais elevado que o segmento ST em V2. A dificuldade diagnóstica resultou em retardo maior do que o preconizado até a terapia de reperfusão coronária. A cineangiocoronariografia evidenciou lesões obstrutivas graves em artéria circunflexa e ramo descendente posterior direito, o que tornou o caso ainda mais desafiador. A paciente apresentou boa evolução clínica após intervenção coronária percutânea primária, recebendo alta hospitalar dentro de 48 horas. Casos de infarto agudo do miocárdio atípicos e com critérios eletrocardiográficos limítrofes exigem conhecimento e preparo adequado das equipes médicas, possibilitando tratamento em tempo oportuno e redução de mortalidade.

Descritores: Infarto do miocárdio; Eletrocardiografia; Intervenção coronária percutânea; Diagnóstico; Reperfusão miocárdica

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INTRODUCTION

The classification of ST-segment elevation myocardial infarction (STEMI) requires a clinical presentation consistent with acute coronary syndrome (ACS), presence of ST elevation (STE) ≥ 1.0 mm in two or more contiguous leads, except V2 and V3, or a new left bundle branch block.[1] In patients with STEMI, both thrombolytic therapy and percutaneous coronary intervention (PCI) aim to restore adequate coronary perfusion, preventing irreversible myocardial damage and reducing mortality.[2] Coronary reperfusion therapy in STEMI represents one of the most successful achievements in modern medicine.[3]

Although the criteria for identifying STEMI are well defined, this electrocardiographic parameter may neglect a group of patients with acute coronary occlusion, since other findings may identify acute myocardial infarction (AMI) due to occlusion earlier and more accurately.[4] For example, the de Winter pattern, which has the potential to predict critical stenosis or occlusion of the left anterior descending coronary artery (LAD), is strongly associated with occluded culprit artery (OCA), a term that is considered more recent and precise. In turn, the Wellens' syndrome points to a proximal critical stenosis in the LAD artery,[5,6] and also represents a life-threatening presentation, although most frequently with non-occluded culprit artery (NOCA). Both situations correspond to highly severe ACS and benefit from urgent coronary angiography, but do not meet the diagnostic criteria for STEMI.

Recently, the Aslanger pattern was identified, which is specific to AMI with critical stenoses in coronary arteries, mainly the left circumflex artery (LCx), but without the STE criterion in two or more contiguous leads. This electrocardiogram (ECG) pattern is composed of three criteria: STE in DIII but not in other inferior leads, ST depression in any of leads V4 to V6 (but not in V2) with a positive or terminally positive T-wave, ST in lead V1 higher than ST in V2. It indicates an acute atherothrombotic event, with occlusion or subocclusion of the LCx being more frequent than of the right coronary artery (RCA), and also with stenosis of at least one of the arteries not related to the inferior AMI.7 This electrocardiographic pattern can be subtle and requires knowledge on the part of the medical team in order not to delay optimal assistance.

We report a case of AMI with Aslanger pattern that was successfully treated, despite the diagnostic challenge related to ECG and coronary angiography. This study was approved by the Research Ethics Committee of the institution under the number 6,825,631, CAAE 79439624.2.0000.5065. All ethical principles regarding studies involving humans were followed, according to the Declaration of Helsinki.

CASE REPORT

Female patient, 57 years old, hypertensive, non-insulin dependent diabetic and with a history of stroke 6 months ago, was admitted to the emergency room via regulation by the Mobile Emergency Care Service. She was transferred urgently, presenting tight, intermittent chest pain at rest, radiating to the back, without worsening factors and with partial relief after simple analgesia, starting 5 hours ago. She reported having felt similar pain 2 days ago, lasting 10 minutes, with spontaneous relief. In the first care service, serial measurements of quantitative cardiac troponin were performed, with values < 0.1 ng/mL, 0.12 ng/mL and 0.16 ng/mL (reference value < 0.16 ng/mL). The ECG showed STE in DIII and V1 (**Figure 1**). In the contact made by the Mobile Emergency Care Service with the reference service, the Aslanger pattern was recognized under discussion with the Interventional Cardiology Department and the patient was immediately transferred. Urgent coronary angiography via the right radial artery was performed. A 99% subocclusive stenosis was observed in the posterior descending branch from the RCA and a 90% stenosis in the LCx artery.

Primary PCI was performed with implantation of a sirolimus-eluting stent (Supraflex Cruz,

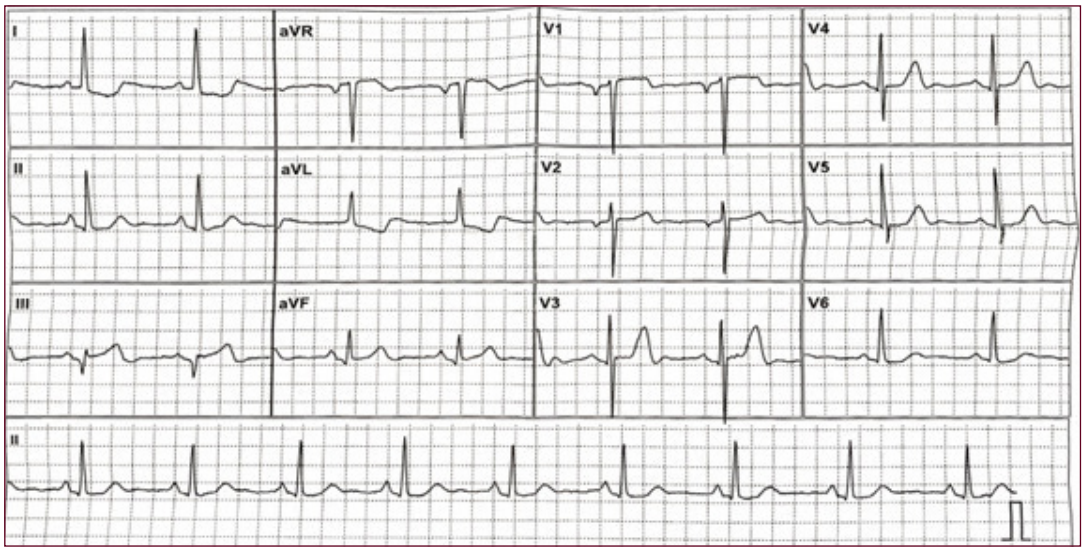

Figure 1. Electrocardiogram showing Aslanger pattern (ST elevation in DIII but not in other inferior leads, ST depression in any of leads V4 to V6 (but not in V2) with a positive or terminally positive T-wave, ST in lead V1 higher than ST in V2).

SMT, Surat, India) in each artery, successfully and uneventfully, achieving *Thrombolysis* in Myocardial Infarction (TIMI) III flow after the procedure (**Figure 2**). ECG performed 30 minutes after the primary PCI demonstrated a reduction in STE.

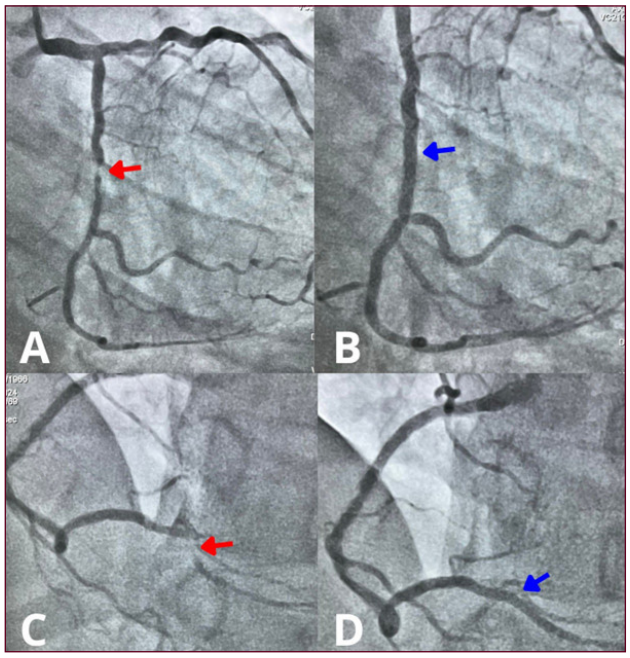

Figure 2. Coronary angiography and primary percutaneous coronary intervention. (A) Severe stenosis in the left circumflex artery compromising 90% of the lumen. (B) Left circumflex artery after primary percutaneous coronary intervention, with *Thrombolysis* in Myocardial Infarction III flow. (C) Subocclusive stenosis in the posterior descending branch from the right coronary artery compromising 99% of the lumen. (D) Posterior descending branch from the right coronary artery after primary percutaneous coronary intervention, with *Thrombolysis* in Myocardial Infarction III flow.

The patient progressed well after primary PCI, with no symptoms or clinical complications. The following day, a transthoracic echocardiogram showed a left ventricular ejection fraction of 55% using the Simpson method, with hypokinesia of the basal segment of the inferior and inferolateral wall, in addition to a slight enlargement of the left atrium, eccentric hypertrophy of the left ventricle and mild diastolic dysfunction, with E/E' ratio estimated at 17.2.

The patient was discharged 48 hours after admission, with guidance on changing her lifestyle and referred to the service's outpatient clinic for post-discharge follow-up, using atorvastatin 40 mg once a day, enalapril 10 mg twice a day, acetylsalicylic acid 100mg once a day, clopidogrel 75mg once a day and metoprolol succinate 50mg twice a day.

DISCUSSION

The reported case presents an ECG pattern that poses diagnostic challenges in an AMI scenario, with the characteristics of the Aslanger pattern. Unfortunately, it is common to observe delays in care related to diagnostic difficulties, as occurred in the present case, where troponins were measured serially, before reperfusion therapy was considered. On coronary cineangiography, a severe

stenosis was visualized in the LCx artery and a subocclusive stenosis in the right posterior branch from the RCA, with both territories possibly being responsible for the electrocardiographic presentation. This fact imposes additional difficulties for decision-making, making the case even more challenging.

The pattern discussed and proposed by Aslanger et al. is recent,[7] which demonstrates the scarcity on the topic in the literature. The theoretical explanation for this pattern is justified by the vector of ischemia and injury on the ECG, since the combination of vectors pointing to the right causes elevation of the ST segment only in DIII and aVR, with depression of the ST segment in DI and DII and, as this vector is perpendicular to aVF, this derivation is usually isoelectric. There is also depression of the ST segment in V4, V5 and/or V6, since the vector of ischemia is opposite to the lateral wall.[8]

In the original publication, this electrocardiographic pattern was observed in 6.3% of non-STEMI cases and in 13.3% of inferior wall STEMI cases. Multiple coronary lesions and a larger infarct area were observed in association with the Aslanger pattern. The most commonly affected coronary arteries are the LCx and the RCA, with concomitant involvement of both territories and also other arteries being common.[7,8] In the case reported, the peculiarity of finding severe obstructive lesions in both coronary territories imposed an additional challenge. We decided to perform PCI on both arteries, since it was not possible to angiographically distinguish an artery clearly associated with the AMI. This proved to be the best strategy, promoting complete myocardial revascularization in a shorter time and reducing the extent of the infarcted area.

National and international STEMI treatment guidelines recommend that coronary reperfusion therapy be instituted as soon as possible, whenever there is diagnostic confirmation by ECG, without the need to wait for laboratory confirmation through serum troponin measurement.[9] The recommended door-to-balloon time is less than 120 minutes in cases that require transfer to perform coronary angiography and primary PCI.[10] Although the delay time from the first care to primary PCI was prolonged, we had a quick recognition of this new standard, with correct indication of the appropriate treatment, thus avoiding even more extensive tissue loss. The reality of care in Brazil and other developing countries can be even worse, with health teams that are poorly prepared and with many losses of therapeutic opportunities.[11]

Although the patient's global systolic ventricular function was preserved, the echocardiogram demonstrated left atrial enlargement, diastolic dysfunction and eccentric left ventricular hypertrophy. These findings were probably present before the ACS event as a chronic adaptation, and predict possible negative remodeling and ventricular dilation in the future.[12] Since the Aslanger pattern is commonly associated with multivessel coronary disease, this fact reinforces the potential to reduce damage and cardiac sequelae in AMI, through connected and trained care professionals, with the installation of protocols, early treatment and results monitoring.[13,14]

It is worth highlighting that the diagnostic paradigm of STEMI or non-STEMI means that at least a quarter of cases of acute coronary occlusion are not promptly identified. On the other hand, cases with STE of non-ischemic origin are eventually referred for unnecessary coronary angiography.[14] Therefore, the electrocardiographic definition does not encompass all patterns of AMI with acute coronary occlusion, and constant attention and training must be maintained to increase the diagnostic accuracy.[15] Electrocardiographic patterns such as Aslanger's are not uncommon and, in these cases, adequate initial care has the potential to shorten the time to coronary reperfusion and, thus, reduce mortality. The OCA-NOCA terminology model advocates a more comprehensive understanding of the underlying mechanisms of ACS, leading to individualized treatment plans.[16] The Aslanger pattern showed

54% of coronary occlusion in its original publication.[7] This balanced distribution raises caution when one intends to affirm that this pattern is always related to OCA. In our case, the slightly elevated troponin value after three dosages suggests NOCA, even though the coronary angiogram should have been done earlier.

In conclusion, the Aslanger pattern, described in 2020, should be recognized as a dangerous ACS presentation that demands immediate attention and medical care. It must be considered as a possible OCA situation, much similar to inferior wall STEMI, and requires careful electrocardiographic interpretation and adequate medical training in the Emergency Department. Knowledge and rapid diagnosis provide early coronary reperfusion therapy and a better prognosis. Unfortunately, many cases do not receive the appropriate diagnosis and are seen as an innocent non-STE myocardial infarction. We report a case of AMI with Aslanger pattern that received timely interventional treatment and early hospital discharge, without serious impairment of left ventricular function.

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