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Case report

MINOCA following accidental nitrogen inhalation: diagnosis by Cardiac Magnetic Resonance and Coronary Computed Tomography

Giulia Pontecorboli, Giulia Grazzini, Miroslava Stolcova, Linda Calisti, Manlio Acquafresca, Chiara Bucciarelli-Ducci, Stefano Colagrande, Carlo Di Mario

1- Cardiovascular and Thoracic Department, Careggi University Hospital, Florence, Italy; Department of Experimental and Clinical Biomedical Sciences, University of Florence, Italy
2- Department of Experimental and Clinical Biomedical Sciences, University of Florence, Italy; Radiodiagnostic Unit n. 2, Careggi University Hospital, Florence, Italy.
3- Structural and Interventional Cardiology, Careggi University Hospital, Florence, Italy.
4- Radiology Unit, Careggi University Hospital, Florence, Italy.
5- Bristol Heart Institute, Bristol NIHR Biomedical Research Centre, University of Bristol, Bristol, UK

Corresponding author: Giulia Pontecorboli. Email: giuliaponte@hotmail.com tel +39 3495339651. +39 055411666
Nitrogen is the major constituent of the Earth atmosphere and a gas used in a variety of industries and manufacturing. It is known as the “silent killer” because it is an invisible, tasteless and odourless gas that can be toxic since it displaces oxygen thereby causing asphyxia\(^1\). We report a case of a 44-year-old male, who was accidentally exposed to nitrogen inhalation in his workplace and subsequently developed a silent non-ST segment elevation myocardial infarction with non-obstructed coronary arteries (MINOCA). Diagnosis was performed by means of non-invasive advanced cardiovascular imaging techniques as Coronary Computed Tomography (CT) and Cardiac-MRI (CMR).

A 44-year-old winery worker was referred to our hospital following inadvertent nitrogen inhalation in the workplace. According to his colleagues he accidentally connected his air-respirator to nitrogen instead of oxygen while he was performing a sandblasting of an underground wine tank. After 1-2 minutes his colleagues found him unconscious and they promptly removed him from the tank, disconnected him from the air-respirator and alerted the health emergency service. As he was found comatose with a Glasgow Coma Scale (GCS) score of 3, he was emergently intubated on scene and transferred to hospital. On initial assessment in the emergency department he was unresponsive, with GCS 9 during sedation, but his vital signs were normal. During the hospitalization he presented a complete neurological recovery and he was extubated on the first day post-admission. On the same day laboratory tests revealed a transient mild increase of serum troponin I (0.17>0.24 ng/ml) with a normal ECG. The patient denied chest pain or any cardiac symptom during the hospitalization but he had retrograde amnesia of the event. The echocardiogram showed good biventricular function without evident regional wall motion abnormalities. A CMR was performed using a 1.5 T MR scanner. On the post-contrast images (10 minutes after administration of gadobutrol 0.1 mmol/L) there was a focal area of almost transmural late gadolinium enhancement of the basal inferolateral wall involving the subendocardial layer, consistent with a recent small myocardial infarction (Fig. A). A repeated ECG performed in the
same day (6th post-admission) showed a T-wave inversion in the lateral leads (V4-V6, DI and aVL). Laboratory tests showed an ischemic-like curve of the troponin I measurements (peak 0.30 ng/ml).

Subsequently, a coronary CT angiogram described a dominant right coronary artery with a relatively small left circumflex and did not reveal any coronary stenosis (Fig. B). The patient was discharged on day 8 in good general conditions in therapy with low-dose aspirin and statin with indication to follow up.

Little is known about the consequences of acute gas-induced asphyxia on the heart\textsuperscript{2-4} and there is a complete lack of information about the specific mechanisms of nitrogen-induced myocardial damage. CMR and CT findings may be used for speculating on the pathological mechanisms underlying the myocardial injury in this setting. Given the presence of a focal almost transmural fibrosis and smooth coronary arteries, the occurrence of air embolism, local vasospasm or microvascular dysfunction can be hypothesized whereas a generalized tissue ischemia due to hypoxemia appears less probable. A direct nitrogen-related cellular toxicity independent from hypoxia cannot be excluded but the underlying mechanisms are still unknown.

**References**


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Figure: A) CMR-LGE sequence: short axis image (left) and 3-chamber long axis image (right) of the left ventricle showed a focal almost transmural area of LGE of the basal inferolateral wall, compatible with a recent myocardial infarction; B) Coronary CT angiogram showed no significant stenosis in the three coronary territories: left anterior descending artery (LAD) left circumflex artery (CX) right coronary artery (RCA) with 3-D reconstruction of coronary circulation.