Can CS gas induce myocardial infarction?
Le gaz CS peut induire un infarctus du myocarde?

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RÉSUMÉ

"2-chlorobenzylidene malononitrile" également appelé gaz CS est l'agent chimique de lutte antiémeute le plus utilisé dans le monde. Sa réputation en tant que gaz lacrymogène le moins toxique explique sa grande utilisation par les différentes autorités. L'exposition au gaz CS induit une irritation visuelle, des réactions cutanées avec une augmentation de la sécrétion de mucus.

Cependant, les études prouvant son innocuité sont très limitées et de graves complications pourraient se voir après une forte exposition, comme la perte de conscience, un laryngospasme, œdème pulmonaire ou une hémorragie ...

Nous rapportons le cas d'un jeune homme ayant eu un infarctus du myocarde aigu suite à une exposition à des gaz lacrymogènes. À notre connaissance, ceci est le second cas depuis quarante ans dans la littérature qui relie directement l'infarctus du myocarde à une exposition au gaz CS.

Mots-clés

Syndrome coronarien aigu; gaz lacrymogène; infarctus du myocarde

SUMMARY

"2-chlorobenzylidene malononitrile" also named CS gas is the most used riot-control agent in the world. Its reputation as the least toxic tear gas explains its large use by different authorities. Early exposure to CS spray commonly induces visual irritation, skin reactions, with increased mucous secretion in order to temporarily incapacitate targeted people.

However, there is a large agreement that safety data of this product is limited and further studies need to be performed since serious problems could occur after heavy exposure such as loss of consciousness, laryngospasm, pulmonary edema and hemorrhage...

Herein, we report a case of a young man who had acute myocardial infarction with serious cardiac sequelae after exposure to tear gas. To our knowledge, this is the second case since forty years in the literature that directly links documented acute heart infarction to CS gas exposure.

Key-words

Acute coronary syndrome; tear gas; myocardial infarction

Tear gases are largely used by police agents as a “safe” weapon to separate social protests. Even if their “safety” had been potently doubted by many authors, it’s an almost daily accepted practice witch exposes human beings to chemical weapons (1,2). Herein, we report a case of a healthy young man who had acute myocardial infarction with serious cardiac sequelae after exposure to tear gas.

CASE REPORT

A 24-year-old male student at school academy, with no particular history, presented with acute chest pain, dyspnea and vomiting four hours after direct exposure to CS gas. He was exposed twice in ten minutes in a daily training session. Physical examination revealed respiratory distress with diffuse crackles on pulmonary auscultation. His blood pressure was 90/70 mmHg and heart rate 130 beats/min. Electrocardiogram showed ST-elevation on the anterior territory. Laboratory tests showed troponin-I high levels (pic at 97ng/ml) with acute renal insufficiency (creatinin=116 µmol/L). Thrombophilia profile of the patient was normal. Multiple confluent opacities were noted on chest X-ray and pulmonary CT-scan revealed alveolo-interstitial edema. Transthoracic Echocardiography (TTE) found akinesia of infero-septal and antero-lateral walls, with altered left ventricular ejection fraction at 32% and an apical thrombus. Coronarography revealed left anterior descending artery thrombosis (Figure 1). Cardiac magnetic resonance (CMR) confirmed the diagnosis of myocardial infarction with an intra-ventricular thrombus (Figure2). The patient was treated with corticosteroids and triple antithrombotic therapy. Clinical evolution was favorable, but a TTE at forty days showed persistent wall akinesia with severe left ventricular systolic dysfunction.

Figure 1 : Coronarography: Left descending artery thrombosis

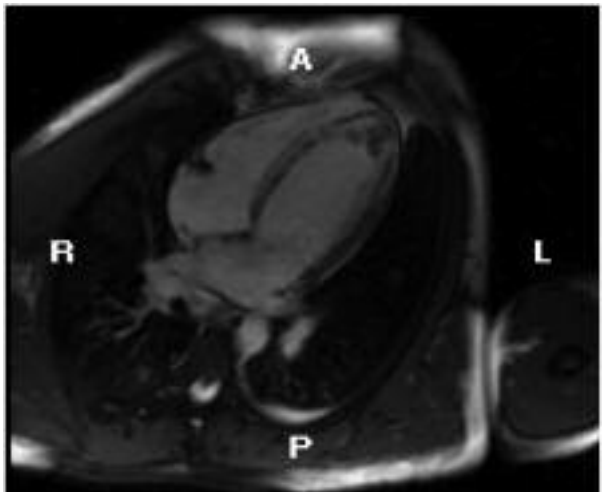

Figure 2 : CMR: Subendocardial late enhancement and apical thrombus

DISCUSSION

In our case, tear gas had induced a myocardial infarction in a young healthy male. To our knowledge, this is the second case since forty years in the literature that directly links documented acute heart infarction to CS gas exposure (3).

The best known example of highly effective irritants employed in military conflicts is the mass use of the CS agent in the Vietnam War (4). This gas, the “2-chlorobenzylidene malononitrile”, was first synthetized in 1928 by Corson and Stoughton (CS). In the fifties, it was developed as particulate spray successfully used in controlling riots, since it was reputed as the safest of tear gases (2,5). Nowadays, CS gas is the most used tear gas in the world despite of the important lack of medical evidence on its safety data (1,5). Irritant symptoms have been largely reported: lacrimation, rhinorrhea, coughing and tightness of the chest appear progressively twenty seconds after exposure. All of these noxious effects could be transitory since the half-life of this molecule in human blood doesn’t exceed five seconds (2,5). However, prolonged exposure could lead to vomiting, laryngospasm, pulmonary edema, hemorrhage and severe biphasic changes of blood pressure.

Our patient developed a myocardial infarction due to left anterior descending artery thrombosis, four hours after heavy exposure to CS gas. The association with intraventricular thrombus in a young patient suggests a thrombogenic disorder but no thrombogenic risk factor was identified. Except for bradycardia, arrhythmia and biphasic changes of blood pressure, experiments on this gas showed no significant specific myocardial toxicity unlike the other sprays (6) but there is a general agreement that there is a huge lack of data on CS gas safety which could be explained firstly by social and

political reasons unlimiting its use; secondly by its partial restriction to military medical research classifying it as secret.

CONCLUSION

Our observation suggests that CS gas is not as safe as it seems. By encouraging follow-up collection data after every case of exposure and deeply exploring its real toxicity on innocent people, further complications could be detected to make the authorities aware of its potential danger in order to limit its use and avoid undesirable disabilities.

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