SPECIAL ARTICLE

Cocaine and Cocaine Base Paste in Cardiology. A matter to Consider

Cocaína y paco en cardiología. Un tema que considerar

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INTRODUCTION

Twenty years ago, we published in this journal a typical case of cocaine-induced dilated cardiomyopathy. Cocaine (benzoylmethylecgonine) is a natural alkaloid extracted from the leaves of the Erythroxylum coca bush. (1) This condition is frequently observed in persons addicted to cocaine, and in that case report we demonstrated the presence of baseline hypokinesia that responded to dobutamine stress echocardiography, with angiographically normal coronary arteries and pathognomonic anatomo-pathological study. We found loss of the sarcomeric structure coupled with deep mitochondrial abnormalities and increased interstitial fibrosis without lymphocyte infiltration. (1) Coronary artery spasm and sudden cardiac death are common complications of cocaine abuse. By that time, we called the attention of the press to the effects of the "damned cocaine". (5)

Drug abuse is an extremely serious problem worldwide. The 2013 World Drug Report of the United Nations Office on Drugs and Crime (UNODC) places Argentina among the countries where cocaine use among the population between 15 and 64 years is between 0.51% and 1%. Furthermore, trends in cocaine users by annual prevalence in Latin America and the Caribbean increased from 15% to 21% between 2004-2005 and 2011. (6)

A recent report by the Drug Abuse Prevention and Fight against Drug Trafficking Programming Secretariat (Secretaría de Programación para la Prevención de Drogadicción y Lucha contra el Narcotráfico, SEDRONAR) in 2017 through the Argentine Drug Observatory National Directory (Dirección Nacional del Observatorio Argentino de Drogas, DNOAD) indicates that 5.3% of the population between 12 and 65 years old has used cocaine at some time in their lives, representing more than one million people. (7) In addition, out of the 292,052 persons who used cocaine during the period 2016-2017, 105,028 presented drug dependence. An alarming data is that among them, 2,165 were children and adolescents. (8)

In turn, in 2007, the SEDRONAR had already reported an increase of more than 200% in the use of cocaine base paste or paco in our country. (9)

Effectively, cocaine base paste, known by its acronym paco ("PAsta base de COcaína"), is a relatively new drug. Cocaine base paste is the intermediate product in the process of extraction and purification of cocaine hydrochloride, in which organic solvents as toluene or kerosene and other products, as sulfuric acid, potassium permanganate or hydrochloric acid are used. (10)

Cocaine base paste is a "smokable cocaine". It is smoked alone or mixed with tobacco, marijuana or both.

The product obtained is then adulterated by "retailers". (11) Inactive adulterants as talc or lactose are usually added as fillers and active adulterants can also be used to increase or mimic the effect of the drug. Stimulants as caffeine or amphetamines are mixed with cocaine to increase addiction, or with compounds with anesthetic effect, as lidocaine, etc.

The quality of cocaine base paste varies according to the substances used to obtain the drug and to the adulterants, dissimilar substances with diverse toxic effects, all included under the term "paco".

Analytical data

In our country, the chair of Toxicology and Legal Chemistry, Analytical Toxicology Advise Laboratory (CENATOXA), (12-16) has extensive experience in the determination of abuse drugs, especially cocaine. The laboratory has developed analytical methods for the investigation of these drugs, both by immunological methods or gas chromatography combined or not with mass spectrometry (GC-MS). Twenty-five samples of cocaine commercialized as cocaine base paste were analyzed in this laboratory. A qualitative analysis was carried out following a similar protocol to that recommended by the United Nations.

The content of cocaine showed great variability even though the average purity was > 50% in most of

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the samples. Cocaine was the basic drug found in all the samples analyzed with relative concentrations between 28.7% and 89.0% of purity (mean purity 66.24% and median purity 64.6%).

The analytical data revealed the presence of different alkaloids, either natural or those obtained during the process of cocaine production or by cocaine degradation or hydrolysis. The alkaloids found, expressed as a percentage of samples, were cocaine (100%), cis/trans-cinnamoylcocaine (100%), tropacocaine (100%), anhydromethylecgonine (100%), methylecgonine (100%), norcocaine (100%) and benzoylecgonine (32%).

Caffeine was the only adulterant found, with relative concentrations between 21.7% and 23.4%. In another study carried out by SEDRONAR in 2016 to analyze the composition of cocaine base paste in samples seized in Argentina, lidocaine and phenacetin were found in 32% and 29% of the samples, respectively, in addition to caffeine. (17) The presence of these adulterants demonstrates that cocaine base paste users are exposed to more than one stimulant and addictive substance. (18)

At the same time, the CENOTOXA laboratory detected the presence of Diuron [3-(3,4-dichlorophenyl)-1,1-dimethylurea] in 28% of the samples, a urea-derived herbicide used to spray the coca leaves. The presence of this herbicide demonstrates that other substances capable of affecting health can be present in cocaine base paste.

It is necessary to continue research to accurately determine the composition of the product commercialized as paco to contribute to a better evaluation of the nature of the emerging problem in health, social and control areas.

Effects of cocaine base paste

Cocaine base paste contains highly liposoluble alkaloids that quickly pass the blood-brain barrier and reach the central nervous system in five seconds. This is one of the reasons for its great addictive power.

The effects of cocaine base paste are categorized in the following stages: (11)

1. Euphoria: sense of wellbeing, lessening of inhibition, sense of pleasure, ecstasy, changes in attention levels, hyperexcitability, sense of competence and capability, accelerated thinking processes, lessening of hunger and fatigue, hypervigilance, and increased blood pressure, body temperature and respiratory rate.
2. Dysphoria: anxiety, depression and instability, uncontrollable desire to continue smoking, sadness, apathy and sexual indifference.
3. Uninterrupted use, even with blood levels enough to prevent the stage of dysphoria.
4. Psychosis and hallucinations: psychosis or loss of contact with reality, which can occur after several days or weeks of frequent smoking. This stage can last weeks or months. Hallucinations can be visual, auditory, olfactory or tactile.

Other effects of chronic use of cocaine base paste are hypertension, tachycardia, weight loss, pallor, insomnia, verbiage, mydriasis, nausea or vomiting, dry mouth, tremor, lack of coordination, headache, dizziness and itching. (11)

When use is stopped, a severe withdrawal syndrome develops, characterized by severe depression, irritability and suicidal ideation.

In spite of being an intermediate product of cocaine and that many of its effects are related to cocaine content, the clinical manifestations of cocaine base paste are different from those observed with cocaine hydrochloride, possibly due to the impurity of this drug. (11) However, considering that users usually use two drugs or more, cardiovascular involvement cannot be ruled out. In this sense, an adequate cardiological examination cannot be absent.

Main contributions of the bibliography

There are few experimental scientific publications in the international literature about cocaine base paste (19) and they mention that the different solvents and adulterants determine different "qualities" of the drug called paco, which can contain very different products with different toxic effects.

The most encountered respiratory symptoms include cough productive of black pigmented-sputum, dyspnea and bronchospasm. Chest X-rays have shown bilateral radiopaque perihilar infiltrates and, in some cases, nodular airspace opacities with areas of air trapping. (21)

Pulmonary lesions due to cocaine base paste are well documented, and include pneumomediastinum, (22), pulmonary edema (23-26), pulmonary dysfunction (27) and decreased diffusing capacity. (28)

Electrocardiographic abnormalities are common with cocaine base paste and have been reported in 60% of users, with 41% long QTc cases. Other abnormalities include incomplete right bundle branch block, junctional rhythm, and signs of ischemia or necrosis that were more common than in the control group. (29)

Previgliano et al. (30) demonstrated global cerebral hypoperfusion associated with increased vascular resistance in the anterior cerebral circulation in chronic users, which could be attributed to the sympathomimetic properties of cocaine. (31)

Furthermore, although there are post-mortem specimens of drug abusers, the findings are contaminated by the coexistence of multiple toxic agents (paco, alcohol, cocaine, marijuana, tobacco, sedatives, hypnotics, etc.) in the same patient. That is why it is extremely important to know the effects on health of cocaine base paste in the absence of other toxic substances. For this reason, studies have been conducted on animal models. As we have previously mentioned, there are not many scientific publications on the matter, and in such investigations the drug was administered using different routes than those used by drug

users; thus, the results obtained cannot be extrapolated to humans.

CONCLUSION

In spite of being an intermediate product of cocaine and that many of its effects are related to cocaine content, the clinical manifestations of cocaine base paste are different from those observed with cocaine hydrochloride, probably due to the impurity of this drug. Although there are post-mortem specimens of drug abusers, the findings are contaminated by the coexistence of multiple toxic agents in the same patient. Despite the great social impact produced by the use of this drug, little is known about its chemical composition, chronic effects on the different organs or pathophysiology. The creation of multidisciplinary groups, with modern technology and adequate economic support is urgent to deal with this extremely serious scourge. In that sense, the cardiological approach in these patients cannot be absent.

Conflicts of interest

None declared.

(See authors' conflicts of interest forms on the website/ Supplementary material)

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Ethical considerations:

Not applicable

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