This is the peer reviewd version of the followng article:

Energy drinks and atrial fibrillation in young adults / Mattioli, Anna Vittoria; Pennella, Sonia; Farinetti, Alberto; Manenti, Antonio. - In: CLINICAL NUTRITION. - ISSN 0261-5614. - 37:3(2018), pp. 1073-1074. [10.1016/j.clnu.2017.05.002]

Terms of use:

The terms and conditions for the reuse of this version of the manuscript are specified in the publishing policy. For all terms of use and more information see the publisher's website.

12/10/2024 09:42

(Article begins on next page)

Accepted Manuscript

Energy drinks and atrial fibrillation in young adults

Anna Vittoria Mattioli, MD PhD, Sonia Pennella, PhD, Alberto Farinetti, MD, Antonio Manenti, MD

PII: S0261-5614(17)30162-0

DOI: 10.1016/j.clnu.2017.05.002

Reference: YCLNU 3126

To appear in: *Clinical Nutrition*

Received Date: 19 January 2016

Revised Date: 24 April 2017

Accepted Date: 1 May 2017

Please cite this article as: Mattioli AV, Pennella S, Farinetti A, Manenti A, Energy drinks and atrial fibrillation in young adults, *Clinical Nutrition* (2017), doi: 10.1016/j.clnu.2017.05.002.

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

ACCEPTED MANUSCRIPT

Energy drinks and atrial fibrillation in young adults

Anna Vittoria Mattioli MD PhD (a);. Sonia Pennella PhD (b), Alberto Farinetti MD (c); Antonio Manenti MD (c)

a Surgical, Medical and Dental Department of Morphological Sciences related to Transplant, Oncology and Regenerative Medicine University of Modena and Reggio Emilia, Modena, (Italy)

b Istituto Nazionale per le ricerche cardiovascolari, U.O. University of Modena and Reggio Emilia, Modena, (Italy)

c Section of Surgery, University of Modena and Reggio Emilia, Modena (Italy)

Total word count: 917 (excl ref)

No conflict of interest

Address for correspondence:

Anna Vittoria Mattioli, MDSurgical, Medical and Dental Department of Morphological Sciences related to Transplant, Oncology and Regenerative Medicine

University of Modena and Reggio Emilia

Via del pozzo, 71

41100 Modena (Italy)

email:annavittoria.mattioli@unimore.it

ACCEPTED MANUSCRIPT

Abstract

The present paper evaluates the association between energy Drinks (EDs) and occurrence of atrial fibrillation (AF) in young people. Data from three clinical cases of AF after EDs consumption are reported. All patients presented with palpitations, nausea and anxiety. ECG showed AF with high ventricular response (135-170 bpm range frequency). Anamnestic record reported a high consumption of EDs during the previous eight hours from the onset of AF. In one case ED was associated with a moderate quantity of alcohol. Patients were successfully cardioverted both spontaneously and after pharmacological treatment. After cardioversion: the ECG and echocardiogram appeared normal in all patients; the toxicological tests and the laboratory analyses resulted negative.

Our experience suggests that larger consumption of EDs, especially when combined with alcoholic beverages, could act as a trigger in the development of AF in young patients. This action may be caused by the synergic effect of caffeine and other substances present in EDs. Following the increasing consumption of EDs in young people, we suggest a careful attention to cardiac complications.

Key words: atrial fibrillation; energy drinks; caffeine; young patients

ACCEPTED MANUSCRIPT

Introduction

Today the consumption of Energy Drinks (EDs) spreads mostly among young people, who often consider the ingestion of large amount of such substances harmless [1]. Their adverse effects, not yet completely known, are usually considered secondary to an high concentration of caffeine. Here we focus on a particular acute cardiac complication of EDs overconsumption: the high rate atrial fibrillation (AF). Our experience, even if limited to three cases, can be considered a typical example of this condition.

Clinical experience

Case #1

A 22-year-old man, with a negative family, personal, and pharmacological history, was referred to our emergency department for a precordial oppressive sensation, palpitations, increasing anxiety, and nausea. Three hours before, he has consumed 750ml of ED. At admission, blood pressure was 110/65, with an accelerated and arrhythmic pulse rate. No other thoracic or abdominal physical signs were present. An ECG revealed a high rate atrial fibrillation at 135 bpm. The laboratory tests of thyroid, renal, hepatic, and pancreatic functions were normal; the hypoxia, metabolic acidosis, calcium, and other electrolytes imbalance, osmal or anion gap alterations and troponin increase were excluded; the toxicological results were negative; the urinary catecholamines were in a normal range. Transthoracic echocardiogram excluded presence of cardiac disease, the left atrium was slightly dilated, as expected. According to guidelines [2] patient was treated with propafenone and recovered a normal sinus rhythm. Patient was discharged after 8 hours recommending abstinence from caffeinated beverages specially EDs. Follow–up at 12 months was negative for recurrences.

Case n#2

A 23 years old man, without previous cardiac disease or pharmacological treatment and with a negative family history, had a recent increase in caffeine intake, about 400 mg per day. One hour

after drinking 600 ml of ED developed palpitations associated with a high level of anxiety. Referred to emergency department, the diagnosis was AF as shown by an increased pulse rate, and the ECG that demonstrated a high rate AF at 150 bpm. Laboratory and toxicological tests were normal. Echo was normal. A spontaneous conversion to sinus rhythm was reported. The patient was discharged, advising no further use of ED and a strict limitation of caffeine. The subsequent follow-up at 12 month was negative.

Case #3

A 26 years old man, without any pharmacological, familiar and personal history, 2 hours after consumption of an alcoholic beverage, corresponding to 30 g of alcohol, associated to 600 ml of EDs, presented anxiety, nausea and increasing precordial discomfort with palpitations. Laboratory, and toxicological tests were normal. The echo performed at admission showed a slightly dilated left atrial volume. The control echo performed 1 month after the event was normal and we reported a reduction in left atrial maximal volume. The alcoholemic level was 70 mg/dL. The ECG demonstrated a high rate AF at a 170 bpm. A pharmacological cardioversion with flecainide was planned but the patient converted to sinus rhythm within few minutes during saline infusion; the patient was discharged, recommending abstinence from EDs and a strong limitation of the alcohol consumption. The follow-up after 12 months was negative.

Discussion

We have reported a common feature in all 3 cases: a rapid consumption of a big amount of EDs. These beverages contain 50 mg/100 ml of caffeine, taurine, carnitine and herbal extracts such as ginseng, ginkgo biloba, and guaranà (containing caffeine plus teobromine and theophylline). The toxicity of the EDs abuse was enhanced in case #2 by a recent increase in caffeine consumption, and in case #3 by a sporadic ingestion of alcohol.

In all cases a sign was predominant: the paroxysmal atrial fibrillation at high rate. The clinical diagnosis was based on a triad: recent ingestion of a large amount of EDs, paroxysmal AF at a high rate without underlying cardiac disease, and absence of laboratory abnormalities, indicating concomitant dysfunctions of other organs. Test for amphetamine, cocaine and other opioids were negative. Cocaine effects on cardiovascular system are well known and we want to exclude this trigger for arrhythmias. [3] A direct pathogenetic link between abuse of EDs and acute onset of high-rate AF is supported by the absence of recurrence of this complication after a complete abstinence from this beverage [4-7]. We consider EDs toxicity as quantity-related, first to their total caffeine content, but also to other components, not completely known. In fact, caffeine acts as a competitive antagonist of adenosine receptor A_1 and A_{2A} in the central nervous system and in the myocardium. However there is no demonstration that caffeine alone increases the risk of AF [5], on the contrary, few information is available on the risk of AF related to other substances (i.e. taurine, maltodextrin, inositol, carnitine, creatine; and plants and herbs such as: guarana, ginseng, and ginkgo biloba) included in EDs.

Our experience, even if limited, specifically indicates cardiac arrhythmia as the more specific complication of ED overuse, even if enhanced by other substances as alcohol. We cannot exclude more serious complications in case of associated poisoning or overdose with other drugs, or of a latent cardiac disease, such as channelopathies or hypertrophic cardiomyopathy [7-10].

More serious cardiac complications are rare: the onset of an acute cardiac ischemia appearing as a Tako-Tsubo myocardiopathy, or an acute coronary thrombosis can be referred to an acute endothelial dysfunction and to an increased platelet aggregation [9,10].

Addiction to EDs consumption has never been reported yet; however, we underline that even occasional abuse can be dangerous, especially if associated to alcohol. [11]

Acknowledgements

We would like to thank Doctor Matteo Ballerini Puviani for his support in reviewing the article.

ACCEPTED MANUSCRIPT

ACCEPTED MANUSCRIPT

REFERENCES

1. Emond JA, Gilbert-Diamond D, Tanski SE, Sargent JD. Energy drink consumption and the risk of alcohol use disorder among a national sample of adolescents and young adults. J Pediatr 2014; 165: 1194-1200.
2. 2016 ESC Guidelines for the management of atrial fibrillation developed in collaboration with EACTS. The Task Force for the management of atrial fibrillation of the European Society of Cardiology (ESC). European Heart Journal 2016 doi:10.1093/eurheartj/ehw210
3. Merigian KS. Cocaine-induced ventricular arrhythmias and rapid atrial fibrillation temporally related to naloxone administration. Am J Emerg Med. 1993;11(1):96-7
4. Sanchis-Gomar F, Pareja-Galeano H, Cervellin G, Lippi G, Earnest CP. Energy drink overconsumption in adolescents: implications for arrhythmias and other cardiovascular events. Can J Cardiol 2015;31: 572-575.
5. Mattioli AV. Caffeine and atrial fibrillation. In: V Preedy Coffee in Health and Disease prevention; Elsevier Eds 2014, pp 691-697
6. Mattioli AV, Pennella S, Manenti A, Farinetti A. Energy drink overconsumption can trigger atrial fibrillation. J Cardiovasc Med 2016;17:902-904
7. Avci S, Sarikaya R, Buyukcam F. Death of a young man after overuse of energy drink. Am J Emerg Med 2013; 31: 1624.e3-4
8. Berger AJ, Alford K. Cardiac arrest in a young man following excess consumption of caffeinated “energy drinks”. Med J Aust 2009; 190: 41–3.
9. Kaoukis A, Panagopoulou V, Mojibian HR, Jacoby D. Reverse Takotsubo cardiomyopathy associated with the consumption of an energy drink. Circulation 2012;125: 1584–1585.

10. Benjo AM, Pineda AM, Nascimento FO, Zamora C, Lamas GA, Escolar E. Left main coronary artery acute thrombosis related to energy drink intake. Circulation 2012;125: 1447–1448.

11. Glatter KA, Myers R, Chiamvimonvat N. Recommendations regarding dietary intake and caffeine and alcohol consumption in patients with cardiac arrhythmias: what do you tell your patients to do or not to do? Curr Treat Options Cardiovasc Med 2012; 14: 529-535.

ACCEPTED MANUSCRIPT