Role of fuziline in ameliorating cardiac damage

Eurasian Clinical and Analytical Medicine Rewiev

Cardiac damage and fuziline

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Abstract

Modifiable and non-modifiable factors play a role in the occurrence of cardiovascular diseases, as well as free radicals. Free radicals are caused by a decrease in the antioxidant level or an increase in the amount of oxidant in the cells. In the studies, it has been suggested that the consumption of vegetables, fruits and foods with high antioxidant content is effective in preventing many diseases, especially phenolic compounds with antioxidant effect prevent diseases. Phenolic compounds are essential compounds for living things and form an important part of antioxidants. Many drugs and antioxidants are being tested for the treatment of cardiac damage. Fuzi (Radix Aconiti Lateralis Preparata), one of these antioxidant substances, is defined as a Chinese herb. It is a derived form of Aconitum carmichaelii Debx. Scientific studies on Fuzi; hypolipidemic activity, kidney protection, cardiotonic activity, immune system improvement, anti-arrhythmia, anti-aging and antineoplastic activity, etc. made for its features. Our aim in this review is to present the cardiovascular, neuropharmacological, antidepressant, anticancer, anti-inflammatory and analgesic effects of fuzi, which has antioxidant properties.

Keywords

fuziline, dobutamine, antioxidant, cardiovascular diseases, myocardial damage

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Introduction

Many factors play a role in the formation of cardiovascular diseases (CVD). These negative factors are; obesity, hypertension, diabetes etc. It consists of modifiable and non-modifiable factors such as genetic predisposition, age, and gender.[1] CVD that can result in death includes heart attack, heart failure, coronary heart disease, etc. It is possible to count heart diseases.[2] Also CVD, cancer etc. It is known that free radicals cause many diseases. Under optimal conditions, the harmony that exists between antioxidants and oxidants is disrupted by a decrease in the antioxidant level or an increase in the amount of oxidant.[3] The increase in free radical synthesis under deteriorated optimal conditions causes oxidative stress. It has been stated that oxidative stress is a serious factor in the pathophysiology of cardiac remodeling, which causes the formation and progression of heart failure (HF).[4] Positive inotropic agent support is recommended to maintain endorgan activity and systemic perfusion in patients admitted to hospitals due to heart disease.[5] Agents that cause an increase in cardiac output by increasing the contractility of the heart muscle are called (positive) inotropic agents.[6] Dobutamine is widely used as a positive inotropic agent. Created from isoproterenol (ISO), it has less vascular and arrhythmogenic effects than other positive inotropic agents.[7] Today, various studies are carried out to investigate the effects in the diagnosis and treatment of CVD. In these studies, animal models that reflect the pathophysiology of CVD in humans are carried out. In CVD models created with dobutamine, it has been observed that oxidative stress generally increases and dobutamine creates immunosuppression on the immune system. Studies have suggested that phenolic compounds with antioxidant effects prevent diseases.[8] Traditional Chinese medicine has historically been accepted as an alternative therapeutic method with less cost and less toxic effects against heart diseases and other diseases.[9]

Phenolic Compounds

Phenolic compounds are essential compounds for animals and humans and form an important part of antioxidants.[10] Phenolic compounds are named according to their constituent parts and ring forms.[11] In some studies, it has been reported that phenolic compound supplementation has efficacy in reducing or preventing the occurrence of oxidative stress-related diseases such as diabetes and CVD. It has also been found to play a role in preventing oxidative stress, increasing lipolysis, inhibiting adipocyte exchange and development, and reducing lipogenesis and inflammatory responses.[12] Phenolic compounds are divided into different groups as flavonoids, tocopherols and phenolic acids.[13] The largest group of phenolic compounds is flavonoids and ranks first in researches.[14]

Flavonoids

Flavonoids have efficacy to reduce fibrosis or tissue damage and inhibit certain enzymes involved in inflammation. In vivo and in vitro studies have shown that flavonoids can stop the formation and progression of inflammatory disorders.[15] In addition, they have protective effects on CVD by suppressing lipoprotein oxidation.[16] Both phenolic and flavonoid compounds have vasodilator, antithrombotic, antiallergic, anti-inflammatory, antimicrobial, antidiabetic properties. It is known that they exhibit antioxidant behaviors in preventing the formation of many diseases, especially CVD, cancer and Alzheimer's.[17]

Fuziline

Molecular Formula: C24H39NO7 Molecular Weight: 453.27g/mol

Plant Origin

Aconitum carmichaeli debx.[18]

Fuzi (Radix Aconiti Lateralis Preparata),[19] identified as a Chinese herb, is a derived form of Aconitum carmichaelii Debx.[20] Fuzi; Chinese wolfsbane, Chinese aconite, monkweed, Bushi in Japan and Kyeong-Po Buja in Korea etc. known by names.[21] Products derived from Fuzi are Yan - Fuzi, Heishunpian and Baifupian and their pharmacological effect has been accepted. There are 211 of the aconitum varieties in China. Among these, there are relatively 400 species in the northern temperate are.[19] Fuzi has 122 chemical components (Figure 1), mainly flavonoids, alkaloids, fatty acids and saponins.[21] Fuziline, one of the components of Fuzi; When compared with mesaconite, aconite and hypaconite diterpenoids in terms of negative effects, it has been seen that it has less negative effects and safer use.[22] To date, research on Fuzi modules has focused on the carbohydrate molecules of both aconitum alkaloids and this herbal medicine.[23] Recently, there has been research on the neuropharmacological activities of some of the substances in Fuzi.[24] Many researchers have investigated fuzi's pharmacological efficacy, detoxification methods and mechanisms, toxicity, etc. They have worked on the subject.[25]

Ethics Approval

Not applicable.

Statistical Analysis

Reporting Guidelines

Not applicable.

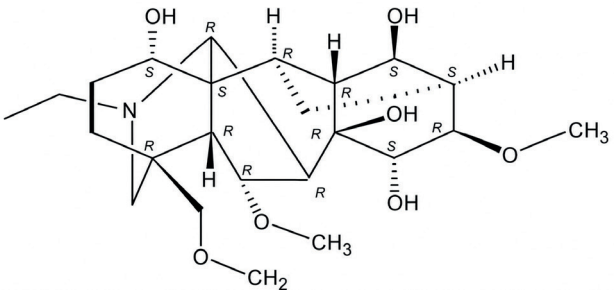

Figure 1. Chemical Form of Fuziline[18]

Discussion

Intensive scientific studies on fuzi; hypolipidemic activity, kidney protection, cardiotonic activity, immune system improvement, antiarrhythmia, anti-aging and antineoplastic activity, etc. was made for its properties.[26] In the literature review, many studies on the subject were found. Zhao et al. in their research on aconitum carmichaelii; Important analgesic effects of fuziline, hypaconitine, mesaconitine and neoline were determined. In the same study, apart from fuziline in mice; It has been determined that neoline, mesaconit and hypoconit have serious side effects. This situation revealed the reliability of fuziline. In addition, the maximum application dose of fuziline was stated as 1 g/kg . Considering this efficacy of Fuziline, the idea that it could be developed as an analgesic drug has emerged.[27] Liu et al. in a study on mice, they investigated the antidepressant properties of fuzi total alkaloid and showed that fuzi total alkaloid may have antidepressant properties in mice with ovaries removed.[28] Xu et al. in a study by Sprague-Dawley on rats, AWA (Aconite water-soluble alkaloid extract and its content: fuziline, mesaconine, karakoline, hypaconine, neoline and songorine are active components of Fuzi and its side effects are low.[29] evaluated its effects on congestive heart failure due to upper abdominal aortic coarctation surgery. During this evaluation, hypertrophic effects including increased serum ANP, NT-pro BNP, TNF-α and IL-6 levels were detected in the model group, and it was reported that improvement was observed with AWA treatment.[30] Zhang et al. in their study on floppy-eared white rabbits in 2006, the effects on gastrointestinal microcirculation were investigated by preserving myocardial functions after myocardial ischemia reperfusion injury by using Shenfu injection consisting of shenfu and fuzi pharmaceutical compounds. At the end of the study, it was seen that Shenfu injection supports gastrointestinal microcirculation.[31] Fan et al. in their study, AST, lactate dehydrogenase (LDH), CK and CK-MB levels were examined in male Sprague Dawley rats in order to determine the myocardial damage caused by ISO in male Sprague Dawley rats, and these parameters were found to be higher in the ISO group and lower in the fuziline and metoprolol groups. The protection of fuziline against myocardial

damage has been clearly demonstrated and the idea that it can be used therapeutically has emerged.[32] Storch et al. demonstrated that fuzi alkaloids regulate cellular metabolism by acting on the electron transport system in mitochondria.[33] Lu et al. They suggested that Fuzi alkaloids could inhibit tumor formation by suppressing central carbon metabolism, HIF-1 and the PI3K/AKT/mTOR pathway.[34] Zhang et al. demonstrated that fuzi extract attenuated the amount of Treg, IL-10 and TGF-β synthesized in association with radiation, modulating immunity and inhibiting tumor development.[35] Li et al. reported in their study with network pharmacology analysis that anti-inflammatory activation by fuzicontaining Shenfu injection (SFI) could occur in a way associated with NF-κB. Three compounds (including benzoyl-mesaconine, fuziline, and neoline) were the first SFI compounds reported to have NF-κB inhibitory activity.[36] Sun et al. According to the pharmacokinetic studies on Sprague-Dawley rats by hydrophilic interaction liquid chromatography-electrospray ionization mass spectrometry method, fuziline was successfully administered and the clearance rate, half-life and bioavailability rate of fuziline were determined by oral administration of 4mg/kg in rats.[22] Gong et al. Pharmacokinetic study of fuziline by oral and intravenous administration in Beagle dog by UPLC-Q-TOF-MS method and it was reported that fuziline has acceptable accuracy and precision values.[37]

Limitations

This review is limited by the availability and heterogeneity of published studies related to fuziline.

Conclusion

According to the information obtained in researches on fuziline, its protective and supportive importance against CVDs, its antiinflammatory, anticancer, analgesic and antidepressant properties come to the fore. Additional research on its biochemical activity and bioactive components is needed to better understand these effects. This review can be a resource for further basic research and clinical applications on fuziline.

Declarations

Ethics Declarations: The authors declare that this manuscript was prepared in accordance with ethical publication standards.

Animal and Human Rights Statement: No human participants or animals were involved in this review article. All cited studies were conducted in accordance with relevant institutional and international ethical standards, including the 1964 Helsinki Declaration and its later amendments or comparable ethical standards where applicable.

Informed Consent: Informed consent was not required because this review article did not include human participants or patient data.

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Scientific Responsibility Statement

The authors of this article declare that they are responsible for the scientific content of the article, including the design of the study, data collection, analysis and interpretation, writing, preparation and scientific review of some or all content of the main line and approval of the final version.

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Abbreviations

ANP: Atrial natriuretic peptide
AST: Aspartate aminotransferase
AWA: Aconite water-soluble alkaloid extract
CK: Creatine kinase
CK-MB: Creatine kinase myocardial band
CVD: Cardiovascular disease
HF: Heart failure
HIF-1: Hypoxia-inducible factor 1
IL-6: Interleukin 6
IL-10: Interleukin 10
ISO: Isoproterenol
LDH: Lactate dehydrogenase
NF-κB: Nuclear factor kappa b
NT-proBNP: N-terminal pro-b-type natriuretic peptide
PI3K/AKT/mTOR: Phosphatidylinositol 3-kinase/protein kinase b/mechanistic target of rapamycin
ROS: Reactive oxygen species
SFI: Shenfu injection
TGF-β: Transforming growth factor beta
TNF-α: Tumor necrosis factor alpha

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