

Abstract

Introduction : Ketamine is a widely used drug in anesthesia protocols that also has anesthetic and sedative effects. Due to its effects, it is abused by young people today. Ketamine can cause cardiotoxicity by increasing catecholamines, increasing oxygen consumption in heart tissue, disrupting mitochondrial function, and increasing free radicals. Hence, we set out to evaluate and test a combination to reduce cardiotoxicity caused by ketamine. In this study, we investigated the protective effects of mangiferin on ketamine-induced cardiotoxicity in male rats.

Materials and Methods

A total of 18 male Wistar albino rats were included in the study and were randomly divided into three groups of six. Group 1 (control) was administered intraperitoneally with mangiferin solvent for 6 days, group 2 (ketamine) was administered 60 mg/kg of ketamine intraperitoneally every 10 minutes for 3 hours on the sixth day of the study. Group 3 (mangiferin + ketamine) was injected 20 mg/kg of mangiferin to mice intraperitoneally for 6 days. In addition, on the sixth day of the experiment, 60 mg/kg of ketamine was administered intraperitoneally every 10 minutes for 3 hours. At the end of three hours, the animals were anesthetized, sacrificed, blood and tissue samples were separated, and finally, mitochondrial toxicity parameters (mitochondrial swelling, mitochondrial membrane potential (MMP) fall, production of reactive oxygen species (ROS), succinate dehydrogenase activity) and Also, tissue oxidative stress parameters (glutathione and malondialdehyde) and histopathological damage of heart tissue were evaluated using biochemical and flow cytometry methods.

Results

The results of our study showed that administration of 60 mg/kg of ketamine every 10 minutes for 3 hours intraperitoneally causes cardiac toxicity by disrupting the structure and function of mitochondria in myocytes. In a group of rats that received ketamine, this drug was able to cause mitochondrial swelling, drop in mitochondrial membrane potential, increased production of reactive oxygen species, increased lipid peroxidation, increased GSSG levels, and decreased GSH levels. Also, the results of this study showed that the consumption of 20 mg/kg mangiferin before ketamine injection can restore the changed levels of cellular and mitochondrial parameters to some extent, thus reducing the fall of the membrane potential, reducing the production of reactive oxygen species, reducing the level of GSSG and increase the level of GSH and thereby improve the cardiotoxicity caused by ketamine.

Discussion

The data obtained from this research showed that mangiferin, having strong antioxidant properties, can protect mitochondria against oxidative damage and show the effects of preventing cardiotoxicity and improving cardiac function.

Key words: ketamine, cardiotoxicity, mitochondria, mangiferin, oxidative stress, antioxidant