Abstract

Introduction:
It has been reported that ketamine is a cardiotoxic agent in mammals and can deplete ATP in cardiomyocytes through mitochondrial dysfunction in cardiac mitochondria. Due to the high-energy demand of the heart, alterations in mitochondrial function contribute to oxidative stress, inflammation, cardiomyocytes dysfunction and cardiotoxicity. Therefore, natural compounds with mitochondrial protective and antioxidant properties can probably play an effective role in reducing the cardiotoxicity of ketamine related to mitochondrial dysfunction. In the current study, we investigated the effects of gallic acid in ketamine-induced cardiotoxicity in rats.

Materials and Methods:
A total of 24 male Wistar rats were randomly divided into four groups, each group has six rats. Group 1 (control): rats were given normal saline intraperitoneally for 14 days. Group 2 (ketamine): on the fourteenth day of the study, 60 mg/kg ketamine was administered intraperitoneally. Then, 60 mg/kg ketamine was administered intraperitoneally every 10 min for 3 h. Group 3 (gallic acid + ketamine): rats were given 15 mg/kg/day gallic acid by intraperitoneal injection for 14 days. Group 4 (gallic acid): rats were given only 15 mg/kg/day gallic acid by intraperitoneal injection for 14 days. Serum cardiac marker (creatine kinase, lactate dehydrogenase and troponin), cardiac tissue oxidative stress markers (glutathione and malondialdehyde), histopathological analysis and mitochondrial toxicity parameters (succinate dehydrogenase activity, mitochondrial swelling, reactive oxygen species production and collapse of mitochondria membrane potential) in isolated mitochondria were measured.

Results:
The results showed that ketamine administration increased serum cardiac markers, oxidative stress parameters, histopathological alterations and mitochondrial dysfunction in cardiac tissue. Gallic acid administration in presence of ketamine was observed to decrease serum cardiac markers, oxidative stress parameters, histopathological alterations and mitochondrial dysfunction in cardiac tissue.

Discussion and Conclusions:
The obtained results suggest that gallic acid exert cardioprotection via mitochondrial protection, antioxidant properties and ultimately improving mitochondrial function and cardiac function.

Key Words: Cardiotoxicity; Mitochondrial Dysfunction; Natural compounds; Illicit Drug