Evaluation of Cardioprotective Effect of Nigella Sativa Oil in Daunorubicin Induced Cardiotoxicity in Albino Rats

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ABSTRACT

Aim: The main objective of the present study was to see the cardioprotective effect of nigella sativa oil (N.S oil) in daunorubicin (DNR) induced cardiotoxicity in albino rats.

Materials and Methods: The effect of nigella sativa oil in daunorubicin induced cardiotoxicity was studied in albino rats. The animals were divided into 4 groups with 6 rats in each group. Group I served as vehicle control, Group II animals were given only Nigella sativa oil 1ml/kg body weight/day orally for 21 days, Group III animals were given 6 doses of daunorubicin 3mg/kg body weight intraperitoneally on alternate days and Group IV animals were given Nigella sativa oil 1ml/kg body weight/day orally for 21 days + daunorubicin 3mg/kg 6 doses intraperitoneally on alternate days. The animals were sacrificed on 22nd day and heart was subjected to histopathological examination.

Results: Daunorubicin provoked cardiotoxicity was evident from histopathological changes. Supplementation of nigella sativa oil has shown improvement in histopathological changes in heart.

Conclusion: The present study showed that Nigella Sativa oil has protective effect on daunorubicin induced cardiotoxicity in albino rats.

Keywords: Nigella sativa oil, daunorubicin, cardiotoxicity

INTRODUCTION

Daunorubicin, an anthracycline antibiotic, is one of the most frequently used antineoplastic agents for treatment of leukaemias and solid tumors[1]. However, clinical use of anthracycline is limited by various unwanted effects (eg; nausea, myelosupression, etc). Severe complications can also occur, such as cardiotoxicity, including congestive heart failure, increased interstitial myocardial fibrosis and myocarditis/ pericarditis[2].

However, the mechanism by which anthracyclines causes irreversible myocardial injury remains unclear. Data have been presented that implicate free radical formation, lipid peroxidation, mitochondrial impairment, alterations in calcium handling and direct suppression of muscle specific gene expression[3]. Therefore approaches to prevention of anthracycline induced cardiac injury have centered on the use of antioxidants to minimize the generation of free radicals.

Nigella sativa seeds have been used traditionally for centuries for the treatment of many diseases, its active constituents posses many pharmacological properties, including antioxidant, anti inflammatory, analgesic, antipyretic, antiasthmatic, antihypertensive, antimicrobial and antineoplastic[4].

Nigella sativa Linn is an annual herbaceous plant of the Ranunculaceae family and grows in countries bordering the Mediterranean sea, Pakistan, India and Iran. It's main active component thymoquinone, has a strong antioxidant potential due to scavenging activity towards free radicals[5]. Therefore, this study was initiated to investigate the possible cardioprotective effects of Nigella sativa oil in Daunorubicin induced cardiotoxicity in albino rats.

MATERIALS AND METHODS

The protocol for the study was approved by Institutional Animal Ethics Committee. The experiment was carried out in postgraduate lab of pharmacology department. This study included 24 male wistar rats weighing 150-
200gms were obtained from central animal house of CAIMS, Karimnagar. The animals were housed in cages and kept on a 12hr dark: light cycle environment with constant temperature and received a standard diet and water ad libitum. Nigella sativa oil was obtained from Mohammedi company, Karimnagar, Telangana State-505001, a GMP product having the strength of 91mg/100ml.

**Group I:** Control group (No treatment)

**Group II:** Each animal was given Nigella sativa oil 1ml/kg body weight/day orally for 21 days.

**Group III:** Each animal was given Daunorubicin 3mg/kg body weight intraperitoneally. The drug was administered in 6 doses on days 1, 3, 5, 7, 9 and 11 to achieve cardiotoxicity.

**Group IV:** Each animal was given Daunorubicin 3mg/kg body weight intraperitoneally, 6 doses on alternate days & Nigella Sativa oil was given 1ml/kg body weight/day orally for 21 days.

After the end of the study period (3 weeks) rats were sacrificed with cervical dislocation and the hearts were subjected to histopathological examination.

**RESULTS**

In general, extent of cardiac damage is assessed by histopathological examination.

**Histopathological Examination of Heart**

**Group I:** The Hematoxylin and Eosin stained heart
sections revealed that normal muscle fibres of the heart consisting intercalated disc with centrally placed nucleus and thin rim of cytoplasm and there were no histopathological changes seen. [Fig. 1]

**Group II:** Nigella Sativa oil treated group rats heart were showing muscle fibres arranged orderly and each muscle fibre made by myocyte. Myocytes were arranged regularly and have normal nucleus with proportionate cytoplasm. The cells are not exhibiting any kind of necrosis and pleomorphism. No edema seen in muscle fibres. No inflammation was noticed and there were no histopathological changes seen. [Fig. 2]

**Group III:** Daunorubicin treated group rats heart were showing bundles of heart muscle fibres arranged irregularly with edematous appearance. The cells of each muscle shows slight big nucleus with scanty cytoplasm. Few areas show marked inflammation and the muscle fibres were elongated. This represents daunorubicin induced cardiotoxicity in rat hearts. [Fig. 3]

**Group IV:** Daunorubicin and Nigella Sativa oil treated group rats heart were showing smooth and regular arrangement of muscle fibres. Muscle fibres shown centrally placed nucleus with thin rim of cytoplasm. Few areas show inflammatory cells infiltration. The blood vessels of heart show normal luminal surface. No abnormality detected in the rat heart muscle. These features suggest that Nigella Sativa oil was having cardioprotective activity in daunorubicin induced cardiotoxicity in rats. [Fig. 4]

**DISCUSSION**

Every drug has side effects. While giving therapy we always consider risk benefit ratio. Anthracycline antibiotics, despite their potential cardiotoxicity are often used in the treatment of a wide range of human malignancies. In biological systems daunorubicin is known to produce highly reactive free radicals and antioxidant enzymes play a critical role in inactivation of these radicals. It is well known that cardiomyocytes are particularly susceptible to free radicals. Glutathione absent in cardiomyocytes, because of this activity of antioxidant defense mechanisms is lower than in other tissues[1].

The present study demonstrates the protective effect of thymoquinone against daunorubicin induced cardiotoxicity. In the daunorubicin treated group, the muscle fibres were irregularly arranged and edematous. Few areas showing marked inflammation. Nigella Sativa oil and daunorubicin treated group, showing no histopathological changes.

It is now believed that the formation of superoxide radical from daunorubicin is a crucial factor in the pathogenesis of daunorubicin cardiotoxicity. An important finding in this study is that thymoquinone shows a superoxide radical scavenging activity[6].

Further studies will be required to evaluate the possible cardioprotective effect of Nigella Sativa oil which is traditionally used as a medicine for many diseases and complaints[9].

**CONCLUSION**

Data from this study suggest that Nigella Sativa oil supplementation attenuates daunorubicin induced cardiotoxicity by mechanisms related. At least in part, to its ability to decrease the proinflammatory cytokines, oxidative stress and cardiac tissue damage and preserve the activity of antioxidant enzymes and the cardioprotective effect.

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**CONFLICT OF INTEREST**

The authors declared no conflict of interest.

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**REFERENCES**


