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A Pilot Study on Anti-Diabetic Effect of Vestibular Stimulation in Alloxan Induced Diabetic Model of Wistar Albino Rats.

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ABSTRACT

The present study was undertaken to observe efficacy of vestibular stimulation in diabetes care. Diabetes was induced in the rats by injecting alloxan intraperitoneally (I.P) in a single dose of 150mg/kg of body weight. Vestibular stimulation was performed for 60 days by caloric vestibular stimulation, by instilling warm (40°C) and cold water (30°C) into the external auditory meatus for group 3 and 4 respectively. The temperature difference sets up convection currents in the endolymph, with consequent motion of the cupula. Blood glucose estimation was performed by using one touch glucometer. In our pilot study we didn't observe significant effect of hot water vestibular stimulation on blood glucose levels. However cold water vestibular stimulation significantly decreased blood glucose levels on 30th and 40th day in alloxan induced diabetes rats. Cold water vestibular stimulation may be effective for diabetic patients. Major limitation of our study was low sample size. Hence we suggest further detailed study with more parameters to explore the effectiveness of vestibular stimulation in diabetic care.

Keywords: diabetic, alloxan, vestibular stimulation.

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INTRODUCTION

Inability to produce insulin or defect in its utilization results in diabetes mellitus. The incidence of diabetes mellitus in the human population has reached epidemic proportions worldwide and it is increasing at a rapid rate. International Diabetes Federation predicts as many as 438 million will have diabetes by 2030. Ninety percent of the present cases are type 2 diabetes [1]. The vestibular apparatus within the inner ear detects head motion and position and transduces this information to a neural signal. Vestibular stimulation may potentially prevent/delay development/progression of diabetes by increasing insulin secretion, by regulating food intake, by inhibiting hypothalamo-pituitary-adrenal (HPA) axis and by promoting sleep [2]. However the studies on anti diabetic effect by vestibular stimulation are meager. Thus we devised present study to observe efficacy of vestibular stimulation in diabetes care.

MATERIALS AND METHODS

Animals and grouping

This experimental research was done during 2014 in Little Flower Medical Research Centre (LFMRC), Angamaly, Kerala, according to ethical committee guidelines and all the protocols of animal experiments have been approved by institution's Animal Ethical Committee. (NO EC/1/2014) In this study, 24 adult male Wistar albino rats, were used. The animals were maintained at the animal house under controlled conditions including 12 hours light and dark cycle, 22-24⁰C temperature and 50% relative humidity with laboratory chow and water provided *ad libitum*.

The animals were divided into 4 groups randomly (n=6 in each group) as follows:

- Group-1: Control group (neither Alloxan nor vestibular stimulation was given)
- Group-2: Alloxan induced diabetic group
- Group-3: Alloxan induced diabetic group treated with bilateral caloric vestibular stimulate with hot water for 60 days
- Group-4: Alloxan induced diabetic group treated with bilateral caloric vestibular stimulation with cold water for 60 days.

Alloxan induced diabetic model

Diabetes was induced in the rats by injecting alloxan intraperitoneally (I.P) in a single dose of 150mg/kg of body weight [5].

Vestibular stimulation

Vestibular stimulation was performed for 60 days by caloric vestibular stimulation, by instilling warm (40⁰c) and cold water (30⁰c) into the external auditory meatus for group 3 and 4 respectively. The temperature difference sets up convection currents in the endolymph, with consequent motion of the cupula [3, 4].

Blood glucose estimation

Blood glucose estimation was performed by using one touch glucometer. Blood samples are collected from the caudal vein, using butterfly needle to reduce the infection and hemorrhage [5]. Alloxan was administered to 2, 3, 4 group rats to induce diabetes. Blood glucose was estimated before administration of Alloxan and after 48 hours of administration. Then, blood glucose was estimated after 10, 20,30,40,50 and 60 days of caloric vestibular stimulation.

Statistical analysis

The data were expressed as Mean±SD and analyzes by using ANOVA followed by Bonferroni posttest.

RESULTS

Results were presented in fig no:1.

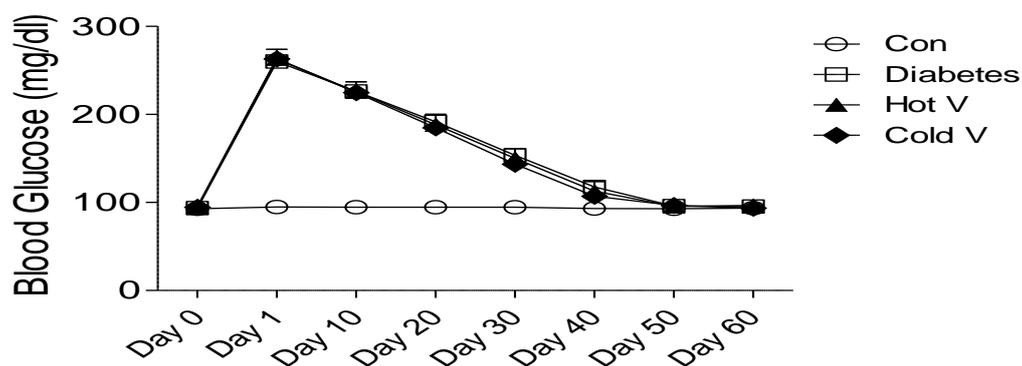


Figure 1: Blood glucose levels

Blood glucose levels were maximum on day 1 and then decreased gradually. On 60th day blood glucose levels reached to baseline values in alloxan induced diabetes rats and hot water vestibular stimulation groups. Blood glucose levels were significantly lower on day 30 and day 40 when compared to alloxan induced diabetic group.

DISCUSSION

The incidence of diabetes is increasing in India. We hypothesized that vestibular stimulation prevent/delay development of diabetes by modulating autonomic activity, through sympathetic inhibition, by regulating food intake, by inhibiting hypothalamo-pituitary-adrenal axis, by promoting sleep [8]. Vestibular stimulation can also be applied as an intervention for learning disability ,to relieve stress, cancer pain, to promote sleep to improve immunity [6,7].

In our pilot study we didn't observe significant effect of hot water vestibular stimulation on blood glucose levels . However cold water vestibular stimulation significantly decreased blood glucose levels on 30th and 40th day in alloxan induced diabetes rats. Cold water vestibular stimulation may be effective for diabetic patients. Major limitation of our study was low sample size. Hence we suggest further detailed study with more parameters to explore the effectiveness of vestibular stimulation in diabetic care.

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