THE EFFECT OF GINSENG ON BLOOD PRESSURE IN SPONTANEOUSLY HYPERTENSIVE RAT AND ESSENTIAL HYPERTENSION

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Abstract

To investigate the effect of ginseng on blood pressure (B.P.) in spontaneously hypertensive rat (SHR) and essential hypertension ginseng extract was given per se daily in 58 SHR and 35 essential hypertensive patients. SHR were divided into 5 groups according to the dosage of ginseng. In essential hypertension 1,000mg of ginseng extract was given. The B.P. in SHR was measured by tail cuff method. In essential hypertension side effect and changes in various laboratory examinations were evaluated. In SHR ginseng appeared to have hypertensive effect when it is given in small amount(10mg/kg). However, when it is given 60mg/kg/day or more difinite B.P. lowering effect was observed. The hypotensive effect was dosedependant and it lasted for 37days of observation. In essential hypertension in 12 (80%) among 15 patients hypotensive effect was seen with ginseng administration along and the effect lasted for 12 weeks. In the rest of hypertensive patients it is required addition of diuretics of other antihypertensive drugs to decrease B.P., no appreciable side effect was seen. In laboratory examinations no significant changes were seen except for serum cholesterol, α-and β-lipoprotein, and hematocrit. There was some evidence of relationship between plasma renin activity (PRA) and ginseng in hypotensive action.

Introduction

Korean ginseng has been used for many years in orient as a tonic folk medicine for a variety of disorders. There are two controversial opinions in regards to the effect of ginseng on blood pressure. Many people considered that ginseng was unfavorable for hypertensive patients because of its tonic property which will probably stimulate the patient to elevate the blood pressure and accordingly endanger the patient, However, some other people thought that ginseng has the blood pressure lowering effect in hypertension and it can be used safely without any danger and even expected its use as on antihypertensive medicine. There has been several experimented reports concerning the effect of ginseng on blood pressure. But the animal used for the study was normal, non-hypertensive animal in most of the reports. About 80–90% of human hypertention is essential hypertension. In 1960 Okamoto of Japan developed SHR as an Experimental model animal for the study of hypertension. Although the pathogenesis of essential hypertension in man and SHR is not fully understood, the resemblance of clinical picture is clearly proved in man and SHR, and

thus SHR are considered the most suitable animal model to observe the effect of ginseng on blood pressure.

The purpose of the present study is to evaluate and confirm the controversial opinion of ginseng whether it has the blood pressure elevating or lowering effect in SHR and human essential hypertension. At the same time plasma renin activity, body weight and other clinical parameters were measured and observed and the relationship between the effect of ginseng on blood pressure, PRA and other parameters was evaluated.

Materials and Methods

39 SHR for ginseng administration by intraperitoneal injection and 8 SHR as control were used for the first study. In the second study for the oral administation 43(18 male and 25 female) SHR were used and 15 SHR were used as control.

SHR has three phases of developing hypertensive. In the first 9–10 weeks after birth SHR do not develope hypertensive. In the most 10–19 weeks blood pressure starts to going up gradually and after 19–20 weeks blood pressure shows stable elevation.

Prehypertensive stage, labile hypertensive stage and established hypertensive stages could be clearly classified and in this study SHR of late labile hypertensive or early established hypertensive stage were used for experiment.

Ginseng extract was injected intraperitoneal as 1cc normal saline solution containing 5mg/kg, 10mg/kg, 50mg/kg and 100mg/kg in 5 groups in the first study. In control group 1cc of normal saline was injected. In the second study 10mg/kg, 20mg/kg, 60mg/kg, 100mg/kg and 200mg/kg in 1cc of water was given by mouth and in control group plain water was given by mouth.

In human essential hypertension 1000mg of ginseng extract was given evenly by mouth.

The ginseng was given daily in the morning for 6 weeks. Blood pressure was meassured by tail cuff method in animal. PRA was measured by radioimmunoassay technique and it was done prior to, 1st and 4th weeks after ginseng administration.

Results

Study 1: An Animal Experimental study of the effect of ginseng on blood pressure and plasma renin activity in spontaneously hypertensive rat.

To investigate the effect of Korean ginseng to the blood pressure and plasma renin activity (PRA) in spontaneously hypertensive rat (SHR) ginseng extract was daily injected intraperitoneally. SHR were divided into 5 groups according to the dose of ginseng (5 mg/kg, 10mg/kg, 30mg/kg, 50mg/kg, and 100mg/kg). Ginseng has hypertensive instead of hypotensive effect when it is given with small amount and to obtain hypotensive effect relatively large amount of ginseng is required. However, the effect lasts only temporalily and when administration is continued, it acts as hypertensive instead of hypotensive agent.

PRA after administration of ginseng showed significant decrease at the end of one week. Preinjection PRA was 6.2 ± 1.6 ng/ml/hr in female in one week ($p < 0.005$). The decrease of PRA was observed in all 5 group 2 and 3.

The relation between the decrease of PRA and blood pressure after administration of ginseng appears to exist but further study is required for confirmation.

Study 2: The experimental study on the effect of Korean ginseng on body weight and blood pressure in spontaneously hypertensive rat with oral administration

According to our previous study ginseng was proved to have hypertensive instead of hypotensive effect when it is given with small amount and to obtain hypotensive effect relatively large amount of ginseng is required, and the hypotensive effect was dose-dependant.

However, the hypotensive effect lasted for only one week when ginseng was given intraperitoneally as physiological sodium solution. The purpose of present study is to evaluate the effect of Korean ginseng to the blood pressure and body weight when it is given by oral administration method as water solution. SHR was divided into 5 groups according to the dose of ginseng administered per se (10mg/kg, 20mg/kg, 60mg/kg,

100mg/kg, and 200mg/kg) in addition to the control group.

The mode of action of ginseng to blood pressure by oral administration was same as seen by intraperitoneal injection: When small amount of ginseng was given orally hypertensive instead of hypotensive effect was seen and the hypotensive effect was obtained when large amount of ginseng was given and the hypotensive effect was dose-dependant. The larger amount of ginseng was given, the greater and more prominant hypotensive effect was observed. When ginseng was administered intraperitoneally, the hypotensive effect lasted for long 1 week. However, when it was given per se, the effect lasted during the total period of observation of 37 days with gradually increasing marked hypotensive action. The body weight after administration of ginseng showed gradual increase day by day and the larger the amount of ginseng the greater the increase of body weight was observed. This increase of body weight was also dose-dependant.

Study 3: The effect of Korean ginseng on blood pressure in essential hypertension by oral administration 1,000mg of ginseng extract perday was administrated to 35 patients with essential hypertension to evaluate the effect on blood pressure, side effect and the changes in laboratory examination, so that the possibility of usefulness of ginseng as antihypertensive agent.

The Korean ginseng, when it was given alone, was effective to lower blood pressure in 13 patients among 15 patients (79.9%). The hypotensive action appeared relatively rapidly within one week after oral administration and lasted for 12 weeks. When ginseng alone did not show any hypotensive effect, diuretics and other antihypertensive agents were added to obtain satisfactory hypotensive effect.

There was no appreciable side effect was seen. Serum cholesterol showed decrease after ginseng administration but serum triglyceride showed increase. Other laboratory studies, such as SGOT, SGPT, alkaline phosphatase, uric acid, serum electrolyte and platelet count did not show any remarkable change by ginseng administration. However, hemoglobin and hematocrit showed increase after ginseng administration.

Further investigation with different amount of ginseng administration is required before the possibility and usefulness of ginseng as antihypertensive agent is to be determined.

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