

EFFECT OF SILVER LEAF ON CIRCULATING LIPIDS AND CARDIAC AND HEPATIC ENZYMES

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Abstract : About 50 mg of silver leaf (metallic silver) was given daily by mouth to 30 healthy volunteers for 20 days. A statistically significant hypophospholipidemic, hypotriglyceridemic, hypocholesterolemic and hypoglycemic effect was observed. This was accompanied by a less marked fall in total lipids and significant rise in HDL-cholesterol. In addition, a decrease in plasma enzymes - alkaline phosphatase (ALP), glutamate oxaloacetate transaminase (GOT), glutamate pyruvate transaminase (GPT), creatine phosphokinase (CPK), gamma glutamyl transpeptidase (GGT) and lactate dehydrogenase (LDH) was noted. This was statistically significant for all enzymes except CPK. The safety of ingested silver foil is indicated by absence of pathology in urine and unaltered levels of protein and albumin in the plasma. These observations suggest that silver could be beneficial in conditions like diabetes mellitus, obesity and atherosclerosis.

Key words : silver lipids cholesterol
enzymes sugar cardiac

INTRODUCTION

Silver foil or leaf (Varak) has been used for centuries in sweets and betels in India and in cakes and confectionery in the west (1) but it is not clear if it has some medicinal value.

Ayurvedic system of medicine, describes silver as a general tonic and aphrodisiac, and good for the heart (2). The scientific proof of this belief is however lacking. The present study was carried out to see the effect of silver foil on blood lipids, heart and liver specific enzymes, in healthy volunteers.

METHODS

The subjects were healthy staff, students and technician trainees, working in the Department of Biochemistry, S.M.S Medical College, Jaipur. A written informed consent was obtained. At the time of the study, all subjects were free from infection or febrile diseases and were not taking any medicine or tonic. The body weight, pulse rate and blood pressure were recorded at the outset and, a fasting blood sample was taken for determination of baseline values.

One pure silver leaf (50 mg) wrapped around a small piece (10 g) of mawa sweet

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(milk cake) was given daily to each volunteer, for 20 days. Thus each volunteer received about 1.0 g of silver. On the completion of study, fasting blood sample and random urine collection was done and the different physiological and biochemical parameters measured again. The foil was chemically analyzed for its silver content by Volhard's method after dissolution in nitric acid (3) and was found to be 99.5% pure.

The blood samples before and after trial were immediately analyzed in autoanalyzer (Merck, Selectra) for the following parameters : serum lipid profile (total lipids, phospholipids, triglycerides, total cholesterol and HDL-cholesterol), sugar, heart and liver specific enzymes - creatine phosphokinase

(CPK), glutamate oxaloacetate transaminase (GOT), glutamate pyruvate transaminase (GPT) and heart specific CPK fraction (CPK-MB). Total protein and albumin were also measured. These analyses were made using Merck's Kits (4).

Statistical Analysis

All the individual post-drug values of each volunteer were compared with his/her pre-drug value and the difference was statistically evaluated by paired 't' test (5).

RESULTS

The pre and post-silver treatment values of various blood parameters in 30 healthy

TABLE I: Blood values before and after silver foil administration.

Parameter	Pre-treatment value	Post-treatment value
Total lipids [®]	494.9 ± 61.7	488.1 ± 56.9
Phospholipids [®]	184.7 ± 21.6	177.3 ± 17.8*
Triglycerides [®]	83.6 ± 38.8	75.4 ± 29.0*
Total cholesterol [®]	162.8 ± 22.1	156.3 ± 21.0**
HDL-cholesterol [®]	43.1 ± 7.9	44.6 ± 6.8*
CPK [*]	112.3 ± 51.5	111.6 ± 47.7
CPK-MB [*]	11.2 ± 5.1	9.5 ± 4.1**
GOT [*]	28.7 ± 12.4	25.1 ± 6.8*
GPT [*]	29.7 ± 15.7	24.4 ± 11.4*
LDH [*]	340.8 ± 77.1	290.7 ± 61.2**
ALP [*]	230.0 ± 66.5	217.5 ± 50.8*
GGT [*]	18.8 ± 7.7	17.0 ± 5.1**
Sugar (Fasting) [®]	85.9 ± 12.8	78.8 ± 10.4**
Total Protein [‡]	6.88 ± 0.36	6.82 ± 0.26
Albumin [‡]	4.59 ± 0.33	4.63 ± 0.23

Data represented as Mean ± S.D.

*P<0.05 **P<0.001

[®]Expressed as mg/dl

^{*}Expressed as U/L

[‡]Expressed as g/dl

volunteers (25 males and 5 females) is given in Table I. Average total body weight of the volunteers was 55.7 ± 9.0 kg. It can be seen that there was a fall in values for all the parameters studied, except HDL-cholesterol and plasma albumin. The fall was statistically significant for phospholipids, triglycerides, total cholesterol, sugar and all the enzymes except CPK. The rise in plasma albumin was insignificant but significant in HDL-cholesterol. No abnormality was present in urine before or after silver therapy.

DISCUSSION

The silver leaf was well tolerated and there was no side-effect. It appears to be perfectly safe in the administered dose (50 mg daily or 1.0 g cumulative). Heavy metals are considered toxic to kidney, but in this case no damage was caused as reflected in urine examination. Similarly, the possibility of toxicity to liver, heart, muscle, bone and erythrocytes is remote as indicated by decrease in post-treatment value of the enzymes originating from these organs and unaltered albumin and total protein level. The safety of pancreas is indicated by normal blood sugar level after giving silver for so many days.

The circulating blood lipids decreased, except HDL-cholesterol which actually rose significantly by silver treatment. The increase in HDL-cholesterol and decrease in CPK-MB is good for the heart. The second finding is, a fall in all plasma enzymes after silver administration because it may denote reduction in their rate of liberation from organs, or increase in inhibition/excretion (6). If it was due to the former cause, it is

beneficial as it may denote reduced wear and tear, or increased half-life of cells. However, the inhibition of enzymatic activity is also a possibility which can not be overlooked as heavy metals, including silver, are non-specific enzyme inhibitors. The third finding is a highly significant hypoglycemic effect exhibited by silver. The fasting blood sugar level of even normoglycemic persons registered an average fall of about 8.3%.

Nothing is known of the metabolism of metallic silver. Gastric HCl may create trace amounts of silver chloride in the stomach by its action on silver leaf (7). In addition, silver may complex with other constituents of diet or gastric, pancreatic and intestinal secretions or digestion products, like amino acids and fatty acids and get absorbed. Once absorbed, silver compounds may slowly release silver ions (7, 8).

Although Ayurvedic physicians are known to prescribe silver *bhasm* (oxide of silver in mixtures) in doses as high as 50–100 mg two-to-three times a day for as many as 2-3 months (personal communication), we refrained from using higher doses and longer treatment duration.

Though this is the first scientific study of silver foil (metallic silver), there is need for further work, using higher doses of silver foil, for longer periods, in patients in whom reduction of levels of lipids, cholesterol and/or glucose is desired.

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