TOXICITY STUDIES ON VANGA BHASMA
(Part I – with special reference to G. I. T. Liver and Pancreas)

NAGARAJU.V., JOSHI D. AND ARYYA N. C.

Institute of Medical Sciences, Banaras Hindu University, Varanasi-221 005, India

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ABSTRACT: Vangabhasma is a popular and effective dosage form prepared from tin metal in Ayurvedic practice. Since modern literature attributes certain toxicity to tin salts, an attempt is made to screen the acute and sub-acute toxicity of Vangabhasma in the form, dose and route as is in the practice or Ayurveda. In this paper, dose-effect relation of Vangabhasma on Digestive system (G. I. T., Liver and Pancreas) has been presented. But for local irritation, no significant toxicity attributable to Vangabhasma has been observed even in eight times higher dose than therapeutic dose, on exposure to the drug for ten days.

Introduction

“Heavy metals cause toxicity to biological system” – current time contends. “Bhasmas and Sinduras prepared from the same heavy metals, which involve specialized pharmaceutical techniques are not only nontoxic but also very much beneficial to human body.”- Ayurveda proclaims, a fact, tested by time but hesitation still prevails in accepting the same due to lack of systematic enquiry. It is the duty of the contemporary researchers of Ayurveda to humiliate on and to probe into the controversy. Hence it is contemplated to screen the toxicity of ‘Vanga Bhasma’ as is used in the practice.

Review of modern literature reveals toxic changes of tin such as degeneration and necrosis of tissues, lowering of haemoglobin, retarded growth, changes in CNS, Gastric Irritation etc., following the ingestion of tin in various forms, dose and duration in experimental animals, albeit no toxic changes were reported in some references. No specific toxicity attributable to tin in man except that of local irritation to G. I. T. is found in the hitherto literature. It is interesting to note from the Ayurvedic review that ingestion of ‘Vangabhasma’ which is not properly prepared, produces certain toxic effects in human beings. However, to screen the toxicity of properly prepared Bhasmas present study has been planned in experimental animals.

Materials and Methods

To screen the toxic effects of Vangabhasma, on G. I. T., pancreas and Liver, an animal experimental study was carried out for a 10 days duration. Vangabhasma, Gum acacia powder and 30 albino rats constituted the materials for the study. The experiment was carried out as follows:

Vangabhasma, the test drug was prepared as per the classical methods. On chemical analysis the drug was found to contain mainly tin 74.29% and traces of Fe, Al. and Mg.

Thirty adult albino rats of either sex weighing 170 ± 20g. Each were divided into
five groups at random and kept on standard lab diet and water. Following acclimatization to the lab environment, the drug in reference was administered to the animals of different groups in the following doses.

| Group | Drug            | Dose     |
|-------|-----------------|----------|
| I     | Gum acacia 15% Soln. | 10ml/kg. |
| II    | Vangabhasma     | 125mg/kg.|
| III   | -do-            | 250 mg/kg.|
| IV    | -do-            | 500 mg/kg.|
| V     | -do-            | 1000 mg/kg.|

Vangabhasma was suspended in 15% solution of gum acacia and administered to each animal of all groups as per their weight and dose as mentioned above. The drug suspension was administered by oral route through a rubber tube (No. 3 catheter) for a period of 10 days.

Every day all the animals were closely observed for any behavioral changes. On the 12<sup>th</sup> day all the animals were sacrificed by decapitation method. The entire gastrointestinal tract, liver and pancreas were dissected out cleaned and fixed in 10% Formalin. After noting the gross and macroscopic appearance, multiple sections (minimum of two) were taken from the tissues and following their processing, paraffin embedded tissue blocks were prepared, which were sectioned and stained with Haematoxyline and eosin. Reticulin and PAS stains were carried out in selected cases. Standard lab techniques were employed for histopathology studies. Histopathological changes observed in G. I. T. pancreas and Liver have been presented.

**Observation and Result**

All the animals on careful observation did not show any behavioral change. Macroscopic examination of G. I. T. liver and pancreas showed no significant change. The histopathologic findings observed in G. I. T., Liver and Pancreas were as follows:
Superficial focal necrosis of gastric mucosa (fig. I) was noted in 3 animals i.e. one in group IV and two in group V; administered with doses of 500 and 1000 mg/kg. b. wt. of Vangabhasma respectively. Other coats of the stomach, in these animals were normal looking. Stomach, in other animals was normal in appearance.

Liver tissue in majority of the animals including those of control group showed sinusoidal dilatation. In one animal belonging to group IV administered with 500mg/kg of Vangabhasma revealed fine fatty vacuoles (Fig. II). Fatty change was local and did not show any clear cut zonal distribution. No significant changes were observed in portal tract and Kupfer’s cells in animals of all groups. Different layers of stomach, oesophagus small and large intestines and components of Pancreas of all the animals of all groups were found normal looking on careful histopathologic examination.

Pathologic changes that were observed in this experimental study were mild in nature and were confined to the stomach of 3 animals and liver of one animal in group IV & V, where the dose is 4 and 8 times higher than therapeutic dose.

Discussion

Vangabhasma is used in ayurvedic practice for the treatment of prameha group of disease (diseases related with Urogenital tract). It is a preparation of tin processed by Ayurvedic method, which renders the metal into bhasma and minimizes the toxic effects of tin. Vangabhasma prepared by the authors in their lab, when subjected for conventional chemical analysis is found to
contain tin as a major constituent with traces of Iron, Aluminium and Magnesium.

The idea of administration of the schedule of dosage in this experiment is based on the calculation of animal dose according to the therapeutic dose employed in Ayurvedic practice. Calculation of dose and administering much higher doses in the experimental animals are in compliance with the guidelines described in pharmacology text books.6

Since no behavioural changes were observed in any of the animals during the experiment, acute toxicity was ruled out. Macroscopic appearance of the organs in reference remained normal, while microscopic examination revealed superficial focal necrosis of gastric mucosa in one animal of group IV and two animals of group V and fine fatty vacuoles in liver in an animal in group IV. Oesophagus, small and large intestines and pancreas showed no abnormality in any of the animals of all groups. In group IV, 16.5% of the animals showed mild pathologic changes (superficial focal necrosis of mucosa) in stomach and (fine fatty vacuoles) in liver. These animals received four times higher dose than therapeutic dose. In group V only a few animals, i.e. 33.3% showed the same pathologic change in stomach. This group received eight time higher than the therapeutic dose. The pathologic change observed in higher dose-receipient group may be accounted for mechanical irritation due to high doses. Incidence in group V is in two animals whereas in group IV is in one animal. Inorganic tin salts are relatively less absorbable than organotin derivatives possibly due to their poor absorption and rapid tissue turn over.7

The pathologic change observed in liver of an animal in group IV may be due to the undetected disease or individual susceptibility of the animal, as no such pathologic change was found in group V, where higher dose than group IV was administered.

Conclusion

From this experiment it may be said that Vangabhasma has got no acute toxic effects on G. I. T., Pancreas and Liver even in 1gm/kg dose. Where the drug administration was continued for a period of 10 days, no sub-acute toxic effects on G. I. T, Pancreas and Liver in doses ranging from 125-250 mg/kg. body weight were observed. Even in higher doses significant toxicity may not be attributable to Vangabhasma. However, further study with larger groups of animals may prove conclusive.

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