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The Clearance of Ag^{111} From Plasma and Liver of Cirrhotic and Non-Cirrhotic Patients

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San Francisco

INTRODUCTION

The extremely rapid clearance of carrier free radiosilver (Ag^{111}) from the blood and liver of the rat and the extreme sensitivity of this clearance mechanism to experimentally induced liver damage has been described by Scott and Hamilton (1). The simplicity and reliability of isotopic tracer techniques makes them of great value as diagnostic aids, as in the case with I^{131} labeled Rose Bengal which has been used as a liver function test (2). We have compared the turnover of radiosilver in cirrhotic and non-cirrhotic patients in order to determine if this element might be used to measure liver function.

MATERIALS AND METHODS

Radiosilver was obtained as $AgNO_3$ from the Oak Ridge National Laboratories. This was prepared from Pd^{110} (n,γ) to form Pd^{111} which decays by Beta emission to Ag^{111}. The Ag^{111} is supplied as a carrier free solution in that no inert silver was added in the radiochemical separation of the silver from the palladium. Any inert silver in the palladium target material would be present in the Ag^{111} supplied. However, this was extremely small. It was necessary to store this material at pH 1 to keep in solution the relatively few silver atoms present, since 1 μc of Ag^{111} represents about 6.5 x 10^{-6} micrograms. Immediately prior to its use the pH of 10-30 μc of the Ag^{111} solution was increased to 5 with 0.1 N NaOH. The solution was then sterilized by autoclaving at 15 p.s.i. for 20 minutes and after cooling was incubated with autogenous plasma for one-half hour at 37° to form a protein silver complex.

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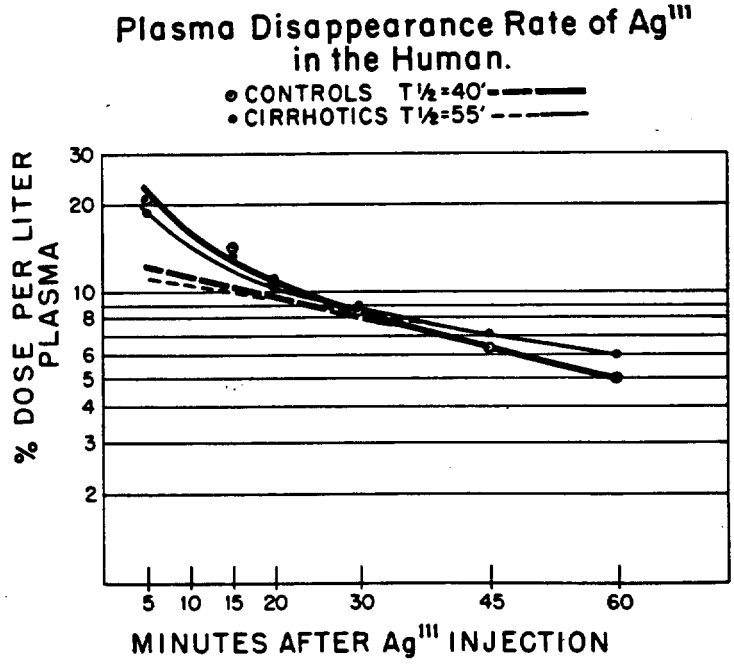

Fig. 1.

An aliquot of this preparation was taken for a standard reference and the remainder injected intravenously into the subject. The clearance of silver from the plasma was determined by using a Geiger Muller counter to assay the serial plasma samples obtained over periods of 5 to 60 minutes post injection. The distribution of radiosilver in the body was determined from autopsy specimens obtained from patients who were previously seeded with Ag^{111}. These specimens were ashed in a muffle furnace at 500° C and the ash was counted with an end window Geiger-Muller Counter. Appropriate self absorption corrections were made. The accumulation of the radiosilver in the liver was determined by external counting over the liver with a 2-inch NaI Th activated crystal recessed 1.5 inches in a straight bore collimator 3 inches in diameter.

Control subjects were selected from the medical and surgical wards of the hospital on the criteria of normal history, physical examination; and in most cases bromsulphalein, thymol turbidity, and cephalin flocculation tests for liver function were performed. The cirrhotic subjects were selected from the medical wards on the basis of cirrhosis, diagnosed by the usual clinical appraisal and laboratory tests. For purposes of comparison, the liver function of the cirrhotic patients was graded as follows: Values of 0 for normal and 1, 2, 3, and 4 for increasing severity were assigned on the basis of deviation from normal in the

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Ag^{111} plasma half-time, B.S.P., cephalin flocculation and thymol turbidity tests. In comparing the various tests with the clinical status of the patient, numbers which were 66 per cent of, or closer to, each other were considered to have good correlation.

RESULTS

When the Ag^{111} plasma disappearance time was compared to the clinical appraisal of the degree of cirrhosis, 12 out of the 24 patients studied gave a 66 percent or better correlation. Similar results were obtained with B.S.P. in which 12 out of 18, or 66 percent correlated well. Five out of 11 (45 percent) and 4 out of 20 (20 percent) correlated well on the basis of the cephalin flocculation test and the thymol turbidity test, respectively.

Figure 1 is a composite graph of the average disappearance of radiosilver from the plasma of cirrhotic and control patients. After complete mixing of the radiosilver in the blood the half time in the control patients was shorter than that observed in the cirrhotic group and was 40 and 55 minutes respectively. There was considerable overlap in the half time of disappearance of silver from the plasma, ranging in the normal from 23-90 minutes and in the cirrhotics from 25-130 minutes. However, a comparison of the mean values of the percentage of Ag^{111} remaining at one hour demonstrates a significant difference between the two groups of subjects studied. (P value of .01).

Figure 2 shows the clearance of radiosilver from the liver. Following maximal uptake the half-time in the non-cirrhotic was about 11 days and in the cirrhotic 20 days. Ag^{111} assays of liver, kidney, lung, spleen, and heart, from autopsy specimens of seven terminal patients showed that the liver had by far the greatest amount and averaged 89 percent of the radiosilver administered. The approximate percentage uptake of other organs was: lung and spleen each, 4.5; kidney, 1.5; skin, 1.1; and heart, 0.5.

One subject who had received radiosilver eight days before death had 99.6 percent of the administered dose in the liver.

DISCUSSION

It is evident from the results of this study that the liver of the human handles this element qualitatively much as does the liver of the rat. There does, however, seem to be appreciable quantitative difference in this mechanism in the two species. In the rat, radiosilver was found to be quantitatively excreted in 24 hours from liver to feces. The rate of elimination in feces by the humans was markedly longer; human kidney excreted very little.

While we have demonstrated a significant difference in the rate of clearance of Ag^{111} from the plasma and liver of cirrhotic and non-cirrhotic subjects, the practicality of this procedure as a routine liver function test is doubtful. While there is statistical significance between the rates of clearance of this material from the plasma of the two groups studied, and there is good correlation of the relative time of the $t^{\frac{1}{2}}$ of clearance of silver from the plasma with the degree of cirrhosis based on medical history, the difficulty of preparing this material for use and its long period of retention in the liver are properties that may discourage its use.

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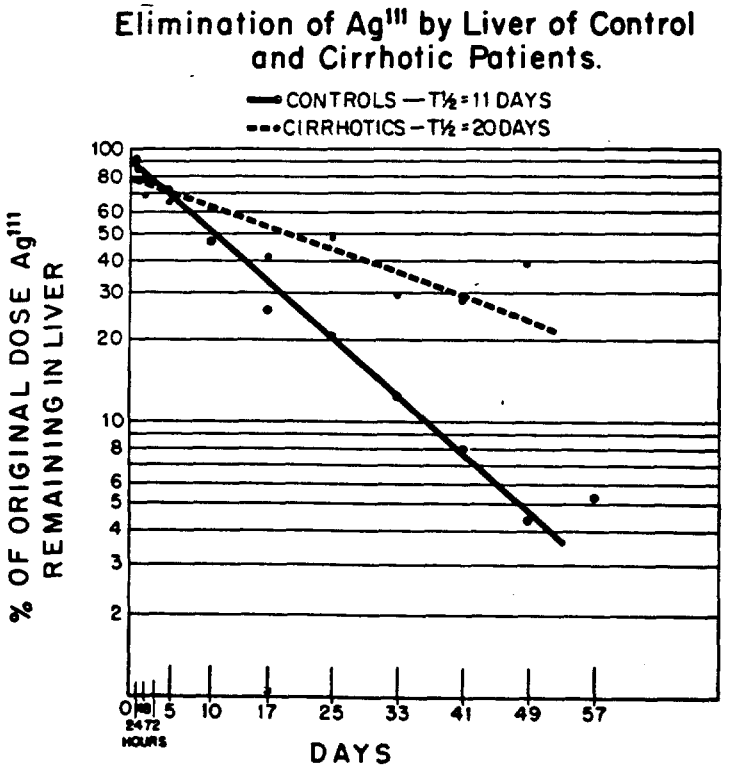

Fig. 2.

SUMMARY

The metabolism of radiosilver has been studied in the human. It has been found that radiosilver incubated with autogenous plasma and introduced into the subject by intravenous injection will be removed from the plasma principally by the liver. The rate of this removal is less in the cirrhotic subject than in the non-cirrhotic. Silver accumulated in the liver is excreted from that organ with a normal half-time value of approximately 11 days; this function is also retarded in the cirrhotic liver where the half time value is approximately 20 days.

REFERENCES

1. Scott, K. G., and Hamilton, J. G., The Metabolism of Silver in the Man with Radiosilver Used as an Indicator, University Press, Berkeley and Los Angeles, 1950.
2. Taplin, G. V., Meredith, O. M., Jr., Winter, C. G., and Johnson, D., Rose Bengal and Iodopyracet as Radiodiagnostic Agents in Liver and Kidney Diseases, Ann. of the New York Acad. of Sci., 78:872, July, 1959.

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