

ESTIMATION OF METALLIC RELEASE AND CONCENTRATION IN BLOOD SERUM DUE TO USE OF COPPER - T

S. GUPTA ● A. JAMAL ● J. S. KACHHAWA ● K. K. GUPTA

SUMMARY

The intrauterine device, Copper-T, is one of the most widely accepted contraceptives because of its high rate of effectiveness, low failure rate, low side effects and easy withdrawal as and when desired. A small amount of Copper in ionic form is released continuously from Copper-T which make fertilization impossible. It is therefore, necessary to estimate the metallic release of Copper and its concentration in blood serum with a view to correlate with the efficacy of the device and to study its ill effects if any, on the health of the wearer.

In this paper, the methodology developed to estimate the released amount of Copper with the aid of Atomic Absorption spectrometer is described. The presence of other metallic substances as detected in the deposit formed on the Copper during use are also mentioned. The investigation was conducted on 15 patients within the age group of 18-45. The data is analyzed statistically and presented graphically.

It is observed that average daily release of Copper varies from 18.06 μg m to 31.40 μg m. There is no appreciable increase in Copper and Zinc level of blood serum in the wearers. Copper-T is quite effective upto 3 years and even upto 6 years in some cases.

INTRODUCTION

The intrauterine device as a contra-

*Dept. of Obst. & Gyn. Inst. & Technology B. H. U.,
Varanasi.*

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ceptive device for women was first introduced by a German Physician Richard Richter in 1909. The first medicated device was developed by Jaime Zipper

and Howard Tatum and Zipper in 1969. Presently Copper-T of 200 sq mm surface area and of 120-240 mg weight are in use throughout the world. The latest model Nova-T consists of a hard silver core with Copper on surface for longer and safe use.

The efficacy of the device depends upon continuous release of Copper in ionic form which interferes with transport of sperms in genital tract. It damages sperms and ova and makes fertilization impossible. In order to study the effectiveness of the device and its side effects, it is essential to monitor the release of Copper and other metallic substances, if any and their concentration in the uterine secretions and blood serum.

The present study is limited to estimation of daily release of Copper and variations of Copper and other metals in a group of 10 women, using Copper-T. The variations of concentration of metallic substances in blood serum in a group of 15 women is also reported.

PROCEDURE

The withdrawn Copper-T after usual clinical washing was put in a beaker containing liquid nitrogen. 2 ml Conc. HCl was added and stirred for 20 minutes with occasional addition of liquid nitrogen. Liquid nitrogen does not allow an oxide layer to be formed on the Copper wire after the deposit is dissolved in HCl. One ml of nitric acid was added and the Copper wire was washed in twice distilled water and the solution was diluted to 100 ml accurately. The washed Copper wire was lustrous in appearance. The wire was dried and placed in desiccator. The wire was then weighed in a scale with

least count of 1 ugm. The solution containing deposit removed from Copper-T was examined under Atomic Absorption Spectrometer for Copper, Zinc, Lead and Magnesium.

The loss of Copper i.e. Copper released during the period of use was computed by subtracting the Copper remaining in Copper-T and in deposit solution from the original weight of Copper-T. The levels of Copper and Zinc were also determined by Atomic Absorption Spectrometer in blood serum of 5 women at the time of insertion of Copper-T. Blood serum of 10 women was also examined after withdrawn of Copper-T.

RESULTS

The results of estimation of average daily release of Copper in 10 women are shown in Fig. 1 and 2. The range is 18.06 ugm/daily to 31.40 ugm/daily, with mean values 22.323 and standard deviation 5.117.

The data for Copper and Zinc levels in blood of 5 women on date of insertion is presented in Fig. 3. The statistical

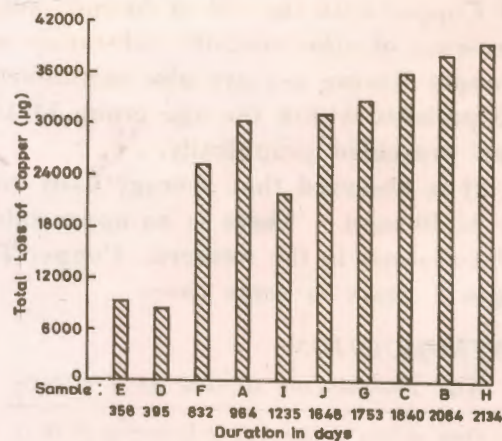


Figure 1 Total Loss of Copper from Copper-T devices

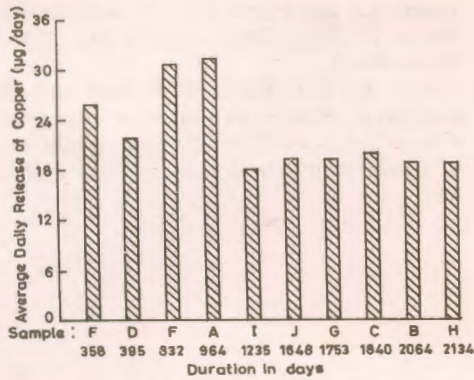


Figure 2 Daily Release of Copper from Copper-T devices.

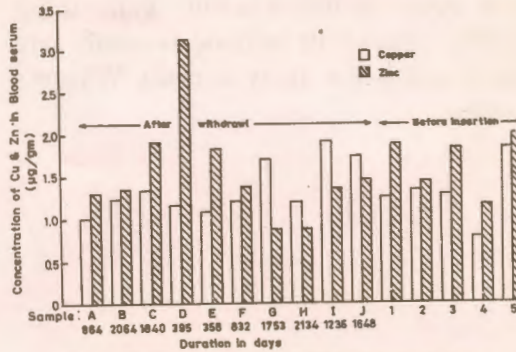


Figure 3 Variation in Concentration of Cu and Zn in female Blood serum before and after withdrawal of Copper-T.

analysis shows the range for Copper as 0.795 µgm/gm to 1.3275 with mean value of 1.2 µgm and standard deviation as 0.3709. The range for zinc is 1.17 to 32.01 with 1.6638 as mean all 0.3491 as standard deviation.

The corresponding values after withdrawal of Copper-T is depicted in Fig. 3. The chemical analysis of foreign deposit solution was also done to find the presence of Cu, Zn and Mg. The amount of Copper was included in the total loss of Copper. The values

obtained for Mg are presented in Fig. 4. Concentration of Lead was nil.

DISCUSSION

The average daily Copper release of 18.06 µgm to 31.40 tallies with the findings of similar researches in other parts of the world. The Copper level in blood serum 0.795-1.3275 µgm/gm in women on the day of insertion was detected. However, no figures for comparative evaluation were available. The Copper level in blood serum after use of Copper for a specific period did not show an increasing trend. The washing of foreign deposit showed no presence of Lead.

CONCLUSION

There is sufficient amount of Copper release from Copper-T in ionic form to prevent chances of conception in females under study. Average daily release of Copper is around 21-25 µgm in first year, with three years use it is around 30 µgm and 6 years use between 18-20. The Copper-T was found effective even in wearers with duration of 6 years. There

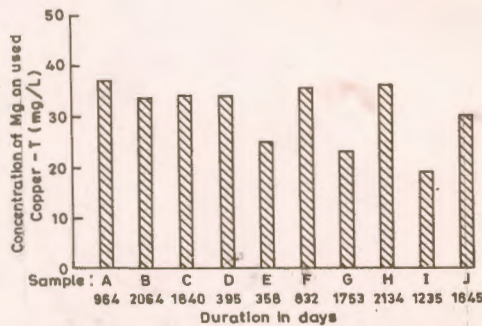


Figure 4 Concentration Variation of Mg in foreign deposit on Copper-T.

is no appreciable increase in Copper and Zinc level in blood serum while using IUDS. This small increase is within safe limits and is not likely to cause Wilson's disease.

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