

The Toxicological Impact of Copper in Uterine Leiomyomas and its Influence on the Hormonal Activity in Indian Women

SM. Nair and HK. Bagla

Department of Nuclear and Radiochemistry, Kishinchand Chellaram College, Dinshaw Wachha Road, Churchgate, Mumbai, Maharashtra, India.

ABSTRACT

Copper (Cu) is an essential trace metal that is necessary for most animals including humans. Cu is closely related to estrogen metabolism, and Cu toxicity in women is often found to be related to estrogen dominance. The aim of the present research work is to investigate the contribution of Cu in the initiation and progression of uterine leiomyomas (UL) and its influence on the altering hormonal activity. The Cu levels in 148 uterine tissues which includes 98 leiomyoma samples (intramural and subserosal leiomyoma) and 50 control samples of premenopausal women aged 20-50 years were analysed by Inductively Coupled Plasma – Atomic Emission Spectroscopy (ICP-AES) method. The blood samples drawn from the above subjects were analyzed by Chemiluminescent Microparticle Immunoassay (CMIA) technology to estimate E2 level. The patient categorisation was done on BMI basis which showed a positive relationship with occurrence of disease. The results of analysed samples show significantly higher levels of Cu in the leiomyoma tissues than in normal samples. The statistical results obtained revealed that obese women showed higher Cu and E2 concentration than their counterparts. A positive correlation was found between the E2 level of the subjects and the Cu concentration in UL and control samples. A case – control study was conducted to further evaluate the sociodemographic data obtained from patients. The elevated Cu levels may suggest an independent, positive association with risk for clinically detected uterine leiomyomas.

Keywords: Uterine Leiomyomas, Copper, Estrogen, ICP-AES, CMIA.

INTRODUCTION

Copper Toxicity is a condition that is increasingly common in this day and age, due to the widespread occurrence of Cu in our food, hot water pipes, along with the common nutritional deficiencies in zinc, manganese and other trace minerals that keep levels of Cu from getting too high. Although of paramount importance in normal homeostasis, especially with regard to haemoglobin, Cu is necessary only in minute amounts in comparison with other minerals such as iron and zinc. Although the role of Cu in tumor formation has yet to be adequately explained, elevated Cu is related to cancer, either as a possible cause or as a sign of malignancy. A physiological feature of many tumor tissues and cells is the tendency to accumulate high concentrations of Cu. Researchers detected a

significant increase in serum Cu in patients suffering from certain cancers¹.

Estrogen and Cu are succinctly related. Cu tends to raise estrogen in the body, and estrogen tends to cause Cu to rise. Both Cu and estrogen tend to feed one another. The use of birth control pills increases a woman's risk of having a Cu toxicity condition due to estrogen's effect of increasing Cu retention in the kidneys². Estrogen overstimulates Aldosterone receptors in the kidneys, increasing sodium, copper and water retention. Both estrogen and Cu tend to raise the blood pressure by increasing water retention, raising the blood volume. Cu builds up first in the liver and disrupts the liver's ability to detoxify the blood in general. This Cu toxicity in the liver therefore disrupts the Liver's ability to detoxify excess estrogen and other toxic heavy metals from the body by blocking zinc