Zinc, Copper & Protein measurement in heavy smokers with Benign Prostatic Hyperplasia (BPH):

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Abstract:
In this study (124) males were selected and divided in three groups. The first group include (64) tobacco smoking patients with BPH while (30) represent BPH patients , the remainder (30) considered as healthy subjects (control). The mean ages ± standard error of these groups are (64.906± 0.922, 65.566± 1.446, 64± 1.548) respectively. Serum total proteins, albumin & globulin were estimated by gel electrophoresis method as well as two trace elements (zinc & copper) were determined by using flame atomic absorption spectroscopy technique.

The results appear that the level of serum zinc is decreased significantly in concomitant with increased copper when compared heavy smokers who suffered from benign prostatic hyperplasia with control or BPH disease alone groups, the total protein shows increment significantly in both diseased groups with or without heavy smokers. While the albumin & globulin appears increasing their levels in heavy smokers with disease in comparison with control.

In conclusion the tobacco smoking BPH patients show low concentration of zinc however copper, total protein, albumin and globulin demonstrates high blood level more than other two groups when made comparison between them.

Key words: zinc, copper, protein, benign prostate hyperplasia.

Introduction:
Benign prostatic hyperplasia (BPH) has been variably defined as prostate enlargement, histological hyperplasia, lower urinary tract symptoms, diminished uroflow or urodynamic measurements or it has been viewed as an indication for prostatic surgery (1). From 40 years of age the prostate increases in volume by 2.4 cm3/ year on average. Associated symptoms are common from 60 yrs of age, and some 50% of men over 80yrs will have lower urinary tract symptoms associated with BPH (2). Relatively little is known about growth regulation of the prostate and the mechanisms involved in BPH. The mechanisms underlying the development of BPH seem to be similar to those responsible for normal growth (3). Increase in age and an intact androgen supply seem to be prerequisites for BPH development. Apart from that, no other risk factors have been identified uncontroversibly (4). The initial lesion of BPH seems to be a stromal nodule in the transition zone of the prostate that induces proliferation and organization of epithelial cells into new acini (5). The etiology of BPH is multifactorial. Currently, there is no strong evidence that smoking, vasectomy, obesity or high alcohol intake is risk factors in the development of clinical BPH (6). Zinc is a homeostatically regulated essential mineral (7). Circumstantial evidence indicates that zinc may have an important role in prostate. Total zinc levels in the prostate are 10 times higher than in other soft tissues (8). The concentration of zinc in whole prostate tissue appears to increase with increasing distance from the bladder (9). Zinc is important in maintenance of proper immune response (10). The complete role of zinc in maintaining prostate health is not known, however the cancerous prostates have lower tissue stores of zinc compared to healthy prostates and that the symptoms of BPH disappear in some men upon supplementing with zinc (11). Copper is a transition element in periodic table, the divalent copper forms complexes with proteins, many of which are enzymes. A group of these constitute copper metalic enzymes with oxidized activity (12), such as ceruloplasmine, cytochrome oxidase, tyrosinase and monoamine oxidase (13). Excess copper as with excess iron can cause free radicals production and damage, also deficiency copper results in poor collagen integrity with resultant blood vessel rupture (14,15). Protein initiate all cell functions and pathways, identifying differentially expressed proteins between normal and pathological state, leading to a better understanding of the cellular mechanisms involved in disease. Some proteins are down-regulated and others are up-regulated with the onset of disease, depending on a protein’s specific function, undergoing disease-specific posttranslational modifications (16).

Materials and Methods:
A Shimadzu model AA-6200 Flame Atomic Absorption Spectrophotometer (FAAS) and Graphic Furnace Shimadzu Flameless Atomic Absorption (GFA-6200) were used for analysis of blood serum samples. Standard
of both Zn and Cu are obtained from analytical reagent using solution (Aldrich, 1000μ /L) for each metal, the wave lengths used for zinc and copper are (213.9& 324.8) nm respectively (17).

The analysis of total protein, albumin and globulin are done by electrophoresis technique (Gel electrophoresis: 6640 Shandon apparatus. Model: Vokam / Engl.) in Central Teaching Laboratory (Biochemistry Department) (18).

The samples were collected from (124) men which divided into:
1- (30) healthy male as control, their mean age ± standard error (SE) are (64 ± 1.548) years.
2- (30) benign prostatic hyperplasia male, their mean age ± SE are (65.566± 1.446) years.
3- (64) heavy smokers male (who smoke more than one cigarette packet for more than 10 years) with benign prostatic hyperplasia, their mean age ± SE are (64.906±0.922) years.

The patients were selected from out-patients in Baghdad Teaching Hospital (Urological Department) from March to September 2011 and diagnosed according to AUA score (19).

Exclusion Criteria:
1. Patients with vascular diseases such as (Myocardial infarction, Angina pectoris, Hypertension ...).
2. Those with chronic renal failure.
3. Those with liver diseases.
4. Those using any medicaments for the cases that referred above.

The statistical analysis was done by using (SPSS) program version (18) while the (P value) was estimated by (ANOVA).

Results:

Table (1): Mean ±SE levels of serum zinc, copper, total protein, albumin and globulin in non-smoker patients with BPH, smoker patients with BPH and control.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Control</th>
<th>BPH non-smokers</th>
<th>BPH smokers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zn (μg/dl)</td>
<td>95.56±2.56ª</td>
<td>90.53±2.66ª</td>
<td>57.4±1.35ª</td>
</tr>
<tr>
<td>Cu (μg/dl)</td>
<td>101.36±1.64ª</td>
<td>120.13±2.95ª</td>
<td>132.57±3.07ª</td>
</tr>
<tr>
<td>T. protein(g/dl)</td>
<td>7.42±0.083ª</td>
<td>8.01±0.79ª</td>
<td>8.76±0.09ª</td>
</tr>
<tr>
<td>Albumin(g/dl)</td>
<td>4.19±0.068ª</td>
<td>4.26±0.97ª</td>
<td>4.62±0.06ª</td>
</tr>
<tr>
<td>Globulin(g/dl)</td>
<td>3.2±0.068ª</td>
<td>3.72±0.1ª</td>
<td>4.1±0.79ª</td>
</tr>
</tbody>
</table>

Different letters are significant difference between different group (P<0.05)

(Table-1) demonstrated that there was a significant difference (P<0.05) in serum levels of Zn and Cu in BHP smoker patients compared with non-smoker patients with BPH and control group but no significant difference between non-smoker patients with BPH and control group. Serum levels of total protein are different significantly between BPH smokers and non-smoker patients with BPH, and between serum levels of BPH non-smoker patients compared with control. There was significant difference between serum levels of albumin in BPH smokers compared with BPH non-smokers and control group. However there was no significant difference in serum albumin between non-smoker patients with BPH and control group. Serum levels of globulin are different significantly between smoker patients have BPH compare with BPH only and control group. A significant difference in serum globulin levels between non-smoker patients with BPH and control group.

Discussion:
This study shows that serum zinc levels in smoker patients with BPH decrease significantly compared with non-smoker patients with BPH and control group (table1). This finding is in confliction with some previous studies which indicate that lower serum zinc concentrations in patients with prostate cancer compared with men without prostatic disease or benign prostatic hyperplasia (20,21). Zinc may act as antioxidant through stabilizing membranes in some cell types (22). Smoking seems the most powerful factor in depletion of serum zinc levels in smoker patients with BPH. The cigarette tobacco compositions may play a role in decreasing the serum zinc levels in smoker patients with BPH. However, PH of the smoke may affect on the degree of zinc absorption. Zinc may affect the amount of both testosterone and dihydrotestosterone (DHT) in prostate which play a role in the development of BPH (23).

Serum electrophoresis helps in diagnosis of different diseases like paraproteinemia, haemoglobinopathies. It is also important in the diagnosis of chronic liver disease and malignancies together

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with other investigations. In multiple myeloma, it helped in monitoring treatment. In present study there is an elevation of serum total protein and globulin significantly for smoker and non-smoker patients with BPH compared with the control. Serum albumin of smoker patients elevated significantly compared with control group. These changes of major protein fractions in patient with BPH may indicate the presence of some immunological background which may participate in the development of prostatic hyperplasia. The significant elevation of major serum protein fractions in smoker patients more than non-smoker patients with BPH may be due to smoke constituents, so the smoking could be a risk factor to accelerate the BPH. These changes in major protein fraction may provide a primitive findings to confirm the presence of BPH.

This study revealed that there is no significant difference in levels of serum copper of non-smoker patients with BPH compared with control group. The levels of serum copper in smoker patients with BPH elevated significantly compared with control group and non-smoker patients with BPH, this difference could be attributed to cigarette smoking. Low levels of serum zinc in BPH smoker patients may participate in elevation of serum levels of copper in the same Patients where the zinc acts as copper antagonist inhibiting intestinal absorption of copper. Some researchers detected a significant increase of copper in patients suffering from certain cancers. The essential role copper in angiogenesis is not so well known, but nonetheless the researcher in this area dates back two decades. It was shown that mild copper deficiency reduce the angiogenic responses in the cornea to known angiogenic stimulants. The smoker patients in this study although they have benign prostate hyperplasia, but the smoking may accelerate cellular changes towards cancer. This postulation needs further study by following smoker patients with BPH for longer time.

Conclusion:
This study demonstrates the significant decrease in serum zinc level of smokers BPH patients when compare with other groups while the concentration of copper shows the opposite result. The total protein, albumin and globulin increases significantly in smoker BPH patients more than non smokers who have disease, or when made a comparison between BPH patients & control.

References: