Correlational study of body mass index, abdominal perimeter and prostate gland volume in patients with obstructive urinary symptomatology due to prostate growth

Aguilar-Barradas J,1 García-Irigoyen C,2 Manzanilla-García HA,3 Castro-Ibarra M,4 Martínez-Hernández MC,5 Acevedo-García C.1

ABSTRACT

Background: Benign prostatic hyperplasia is a disease that is clinically characterized by a series of lower urinary tract signs and symptoms (LUTS) due to growth of the prostate. Obesity is excessive accumulation of body fat; general adipose tissue hypertrophy.

Objective: To determine whether or not there is a relationship between body mass index, abdominal perimeter and prostate gland volume obtained by transrectal ultrasound.

Methods: A cross-sectional analytical study was carried out on 123 patients from June to December 2008. Medical history was taken, anthropometric measurements were made and transrectal ultrasound was done. Patients were divided into 3 groups according to body mass index (BMI): normal < 24.9 kg/m²; overweight 25.0 to 29.9 kg/m²; and obese: > 30.0 kg/m². They were divided into 2

RESUMEN

Antecedentes: La hiperplasia prostática benigna es una enfermedad que se caracteriza desde el punto de vista clínico por una serie de signos y síntomas del tracto urinario bajo (LUTS, por sus siglas en inglés) debido al crecimiento de la próstata. La obesidad es la acumulación excesiva de grasa en el cuerpo; hipertrofia general del tejido adiposo.

Objetivo: Determinar si existe alguna relación entre índice de masa corporal, el perímetro abdominal y el volumen de la glándula prostática por ultrasonido transrectal.

Métodos: Estudio transversal y analítico. Se incluyeron 123 pacientes durante el periodo de junio a diciembre de 2008. Se tomó: Historia Clínica, medidas antropométricas y ultrasonido transrectal. Los pacientes se agruparon: Por índice de masa corporal (IMC), en tres grupos: normal: < 24.9 kg/m²; sobrepeso: 25.0 a 29.9 kg/m²; y

1Urology Service Resident.
2Urology Service Technical Consultant.
3Head of Urology Service.
4Radiology Service Staff Physician.
5Outpatient Consultation Nurse.
Urology Unit 105, Hospital General de México.

Corresponding author: Dr. Jacinto Aguilar Barradas. Dirección: Dr. Jiménez No. 240, Colonia Doctores, Delegación Cuauhtémoc. México D.F. C.P. 06720. Telephone: 04455-4346-3717. Email: j_barra-das14sep@hotmail.com
INTRODUCTION

From a clinical point of view, benign prostatic hyperplasia (BPH) is a disease that is characterized by a series of lower urinary tract signs and symptoms (LUTS) caused by growth of the prostate. Hyperplasia is defined as abnormal multiplication of tissue elements. BPH is related to aging and represents a significant public health problem. Even though its socioeconomic impact has not been clearly established, it is known to be the principal reason for urological consultation in Mexico. BPH prevalence increases from the fourth decade of life and reaches 100% in the ninth decade. Its etiology is not completely known. It is calculated that approximately 40% of men over 60 years of age will present with symptoms related to prostate growth and around 35% of them will need some kind of treatment between 70-80 years of age. The three principal aspects determining BPH clinical profile are: symptomatology, prostate growth and infravesical obstruction. Obesity is the excessive accumulation of fat in the body; general adipose tissue hypertrophy. According to the World Health Organization (WHO), 60 million Americans are obese. Obesity prevalence in 2001 showed 32.4% in men and 29.4% in women. Obesity is on the rise in some developing countries with a very
notable increase in the last decade. It reached 31% for men in the United States.

Men between the ages of 25-35 years who present with morbid obesity have a mortality rate that is 12 times higher than their peers. Obesity is a common problem in the young adult while 50% of men over 50 years of age are overweight and their body mass index (BMI) increases with age. Seventeen percent of children and adults are overweight. Obesity plays an important role in diseases such as diabetes, high blood pressure and heart disease. It also plays an important role in prostate cancer (CaP).

Growth of the prostate gland is a common problem in older adults in Mexico and obesity has increased importantly due to changes in hygienic-dietary habits and urban growth. International studies have established a relation between prostate growth and obesity. There is still no uniformity in criteria establishing a direct or inversely proportional relation between BMI and abdominal circumference with prostate volume. Therefore the objective of the present study was to a) determine the relation between BMI and prostate gland volume obtained by means of transrectal ultrasound (TRUS) and b) determine the relation between abdominal circumference and prostate gland volume obtained by means of TRUS.

Table 1. Descriptive statistics.

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Typical deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>98</td>
<td>43</td>
<td>84</td>
<td>62.94</td>
<td>10.256</td>
</tr>
<tr>
<td>Weight</td>
<td>98</td>
<td>37</td>
<td>99</td>
<td>70.44</td>
<td>13.450</td>
</tr>
<tr>
<td>Height</td>
<td>98</td>
<td>1.38</td>
<td>1.82</td>
<td>1.6180</td>
<td>.07099</td>
</tr>
<tr>
<td>AP</td>
<td>98</td>
<td>67</td>
<td>116</td>
<td>94.56</td>
<td>10.242</td>
</tr>
<tr>
<td>BMI</td>
<td>98</td>
<td>17.79</td>
<td>34.49</td>
<td>26.7340</td>
<td>3.99781</td>
</tr>
<tr>
<td>PV</td>
<td>98</td>
<td>12.70</td>
<td>136.40</td>
<td>55.0298</td>
<td>34.80066</td>
</tr>
</tbody>
</table>

An AUT MOD D.G.N. 2412 scale with stadiometer to determine weight and height of each patient was used. A fiberglass 150 cm and 60 inch measuring tape was used to determine abdominal circumference.

TRUS that was carried out at the Radiology Service of the Hospital General de México, with Siemens Acuson Antares ultrasound equipment for determining prostate volume.

The majority of authors use BMI (or Chalet index) to diagnose obesity which is calculated by dividing the person’s body weight in kilograms by height in square meters with the following formula: BMI = weight in kg/ height in m². Patients are classified in relation to BMI obesity into three groups: normal < 24.9 kg/m²; overweight 25.0-29.9 kg/m²; and obese: > 30.0 kg/m². Obesity has also been characterized in two groups according to abdominal circumference: normal waist (≤ 90 cm) and central obesity (> 90 cm) based on Pacific Asian obesity criteria. Abdominal perimeter (AP) is classified into two groups: normal patients (AP< de 90 cm) and obese patients (AP > 90 cm).

Prostate volume determination by means of TRUS is a clinically common procedure. Various methods have been used to determine prostate volume: the ellipsoid formula (weight by width by height by π/6) is the most common formula used in clinical practice since it is fast and easy to carry out with planimetry and shows its high correlation with actual prostate volume coefficient.

Total prostate volume and volume of the transitional zone can be determined by means of magnetic resonance or by TRUS.

Population and sample size: The study included 123 patients attended to for the first time in urology outpatient consultation at the Hospital General de México, from June to December 2008 by a single medical resident. Of that total, 18 patients were excluded from the study for not going to their control consultation, 5 were excluded due to elevated prostate specific antigen (PSA) for which they underwent biopsy that resulted in prostate adenocarcinoma.

All variables were registered in the format designed for that purpose by the researcher.

Statistical analysis: Statistical analysis was carried out with the Windows SPSS 15.0 program. Pearson correlation coefficient was used.

RESULTS

Descriptive statistics: The study was carried out on a population of 98 male patients with an age distribution between 43 and 84 years (mean 62.94 years). Mean weight was 70.44 kg (37-99 kg range). Height varied
between 1.38 m and 1.82 m, with a mean 1.61 m. AP ranged between 67 and 166 cm with a mean 94.56 cm. Mean BMI was 26.73 kg/m² and mean prostate volume was 55.02 cc (Table 1).

Relation between BMI and prostate volume: Table 2 shows there was no relation between BMI and prostate volume variables, given that the correlation coefficient was practically null (.061) and the significance level was .554, allowing the authors to state that there was no relation between BMI and prostate volume.

Relation between abdominal perimeter and prostate volume: Table 3 shows there was a relation between abdominal perimeter and prostate volume variables with a significance level of 0.089, allowing the authors to state that there was a relation between abdominal circumference and prostate volume.

● DISCUSSION

In a study on BMI, prostate weight and transrectal ultrasound (TRUS) of the prostate precision, Sajadi et al established that TRUS exactness has clinical importance, for both prostate growth determination and CaP staging. However, their study lacked sufficient evidence to detect whether extreme obesity had an effect on TRUS precision. 12

According to Giovannucci et al, abdominal obesity increases the estrogen-androgen relation as well as sympathetic nervous system activity since both have an influence on BPH development and on the severity of obstructive urinary symptoms. Abdominal obesity in men can increase frequency and severity of obstructive urinary symptoms. 3 Based on the observations of Freeland, obesity has been associated with the most aggressive forms of CaP 13 and with the worst prognosis 3 and Soygur et al have concluded that obesity is a risk factor for prostate growth.

In a study by Lee et al, prostate volume was positively correlated with BMI and AP. In addition, volume was significantly greater in men with BMI above 25 kg/m² compared with those with a lower index and was greater in men with abdominal circumference above 90 cm. Lee arrived at the conclusion that BMI and AP were positively correlated with prostate volume and that it was greater in patients with BMI > 25 kg/m² and AP > 90 cm.14

As in studies described earlier, the present study also used TRUS to determine prostate volume with greater precision. However, in the joint variable analysis no relation was found between BMI and prostate volume, even though a positive linear relation was established between AP and prostate volume as had been concluded in Lee’s study. Although this positive correlation was evident, the authors believe sample size and participant age stratification were not sufficient and that neither patient weight nor height had a relation with prostate volume.

● CONCLUSIONS

According to analysis of present study results:
1. No relation was found between BMI and prostate gland volume.
2. AP had a positive linear relation with prostate gland size in both individual analysis and group analysis, concurring with results established in the literature. However, even though there was a positive linear relation, the result was not statistically significant due to sample size.
3. Patient weight is not related with prostate gland volume.
4. Patient height is not related with prostate gland volume.
5. There was no relation between normal BMI and prostate volume.
6. There was negative linear correlation between BMI of overweight patients and prostate volume that was not statistically significant: $r = .322$.
7. There was negative linear correlation between BMI of obese patients and prostate volume that was not statistically significant: $r = .069$.
8. There was positive linear correlation between abdominal circumference of non-obese patients and prostate volume that was not statistically significant: $P = 0.51$.
9. There was positive linear correlation between AP of obese patients and prostate volume that was not statistically significant: $r = .141$.

Even though there was correlation between study variables there was no statistical significance. A greater number of patients need to be included in future studies so that statistically significant relations can be established.

BIBLIOGRAPHY