

RELATIONSHIP OF XIPHO-PUBIC DISTANCE, WEIGHT, HEIGHT AND BODY MASS INDEX TO BASELINE INTRAVESICAL AND ABDOMINAL PRESSURES IN THE SITTING POSITION

Hypothesis / Aims of the Study:

While performing urodynamics the tester always begins by evaluating whether the urodynamic test values are plausible. When standard are followed, with the transducers zeros set to atmospheric pressure and placed at the level of the upper edge of the symphysis pubis, typical range for initial resting pressure values for intravesical pressure (p_{ves}) and abdominal pressure (p_{abd}) depends on the patients position [1]. If we consider the abdomen to be a semi-aqueous compartment and the thorax to be an air compartment, it is possible that the distance between xiphoid process and symphysis pubis (xipho-pubic distance) could be a determinant of baseline p_{ves} and p_{abd} , and serve as an individual quality control measure. Further, body mass index has been shown to correlate with abdominal pressure and urinary incontinence in women [2, 3]. The aim of the study was to evaluate the relationship of xipho-pubic distance, weight, height, and body mass index to p_{ves} and p_{abd} in sitting position, and compare these pressures to the typical range values (between 15 and 40 cm H₂O) [1].

Study design, material and methods:

One hundred consecutive women with lower urinary tract symptoms candidates for urodynamic study were enrolled in a prospective descriptive study. Xipho-pubic distance, weight and height were measured, and body mass index was calculated [weight (kg) / height² (m)]. Conventional cystometry following "Good urodynamic practices" was done in the sitting position [1]. Baseline p_{ves} , p_{abd} and p_{det} were recorded blinded to previous data, after an equal cough signal and a live trace signal were confirmed. The relationship of xipho-pubic distance, weight, height and body mass index to p_{ves} and p_{abd} was studied using linear regression (with Pearson correlation coefficient calculation) and Student's t-test. Statistical significance was defined as $p < 0.05$.

Results:

One hundred women age 59.2 ± 13.3 (range: 15 – 81), parity 2.9 ± 1.6 (range: 0 – 10) were analyzed. Table 1 shows the general results of the variables evaluated. There was a significant correlation between p_{ves} and xipho-pubic distance ($p < 0.0001$, $r = 0.50$), weight ($p < 0.0001$, $r = 0.61$) and body mass index ($p < 0.0001$, $r = 0.59$) and no correlation with height (Figure 1). Table 2 shows the results of p_{ves} categorizing the variables. Only 3 patients had baseline p_{ves} out of the typical range values in sitting position of 11, 12 and 41 cm H₂O respectively (xipho-pubic distance of 31, 23.5 and 34.5 cm; weight of 49.1, 41 and 97.5 kg; body mass index of 18.48, 18.72 and 35.81 kg/m², respectively). The difference between p_{ves} and xipho-pubic distance was 3.8 ± 4.9 (range: -6.5 – 20). There was also a significant correlation between p_{abd} and xipho-pubic distance ($p < 0.0001$, $r = 0.45$), weight ($p < 0.0001$, $r = 0.56$) and body mass index ($p < 0.0001$, $r = 0.58$) and no correlation with height (Figure 2). Only 2 patients had baseline p_{abd} out of the typical range values of 9 and 9 cm of H₂O respectively (the first same two patients with p_{ves} out of the range values).

TABLE 1
XIPHO-PUBIC DISTANCE, WEIGHT, HEIGHT, BODY MASS INDEX AND BASELINE P_{VES} , P_{ABD} AND P_{DET} IN 100 WOMEN WITH LOWER URINARY TRACT SYMPTOMS

	Mean \pm SD	Range	Median
Xipho-pubic distance (cm)	31.97 \pm 3.40	23 – 40.5	32
Weight (Kg)	69.8 \pm 11.9	41 – 103	69
Height (m)	1.56 \pm 0.06	1.42 – 1.68	1.56
Body mass index	28.59 \pm 4.46	18.48 – 42.57	28.33
Baseline p_{ves} (cm H ₂ O)	28.16 \pm 5.30	11 – 41	28
Baseline p_{abd} (cm H ₂ O)	27.01 \pm 5.59	9 – 38	27
Baseline p_{det} (cm H ₂ O)	1.13 \pm 2.61	-5 – 8	1

TABLE 2
INTRAVESICAL PRESSURE (P_{VES}) CHANGES BETWEEN CATEGORIES OF XIPHO-PUBIC DISTANCE, WEIGHT, HEIGHT, AND BODY MASS INDEX

	n	P_{ves} (Mean \pm SD)	p value*
Xipho-pubic distance (cm)			
≤ 30	32	25.43 \pm 4.47	
30.1 – 34.9	49	28.53 \pm 5.19	0.0036
≥ 35	19	31.79 \pm 4.56	0.0097
Weight (Kg)			
≤ 65	32	24.93 \pm 5.22	
65.1 – 74.9	41	28.63 \pm 4.28	0.0007
≥ 75	27	31.25 \pm 4.82	0.0108
Height (m)			
≤ 1.50	17	27.94 \pm 6.30	
1.51 – 1.59	49	28.14 \pm 4.55	0.4430
≥ 1.60	34	28.29 \pm 5.91	0.4470
Body mass index			
≤ 25	15	22.93 \pm 5.71	
25.1 – 30 (overweight)	50	28.06 \pm 4.23	0.0002
> 30 (obese)	35	30.54 \pm 4.97	0.0077

* Calculated in relation to the upper category

Interpretation of results:

A clear relationship of p_{ves} and p_{abd} to xipho-pubic distance, weight and body mass index was demonstrated. Due to the wide range of difference between p_{ves} and xipho-pubic distance, xipho-pubic distance can't be used as an individual quality control measure before urodynamic testing. Differences in intestinal gas content could explain this result at least partially. Patients having p_{ves} and p_{abd} out of the typical range values are either underweight (or near) or severely obese. Moreover, obesity results in increased intravesical and abdominal pressures which can lead to weakening of the pelvic support structures, placing patients at higher risk for developing stress urinary incontinence.

Concluding message: There is a relationship of xipho-pubic distance, weight and body mass index to p_{ves} and p_{abd} . Out of range values of p_{ves} and p_{abd} occur in underweight (or near) or severely obese patients.

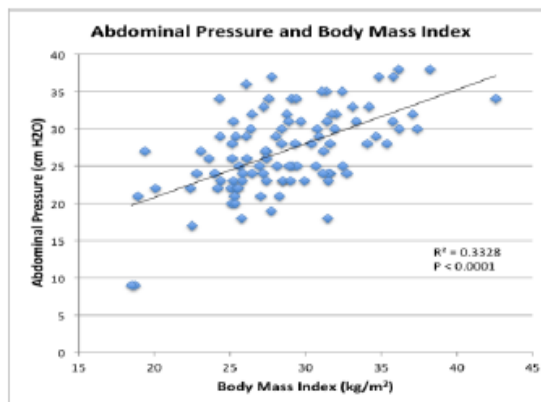
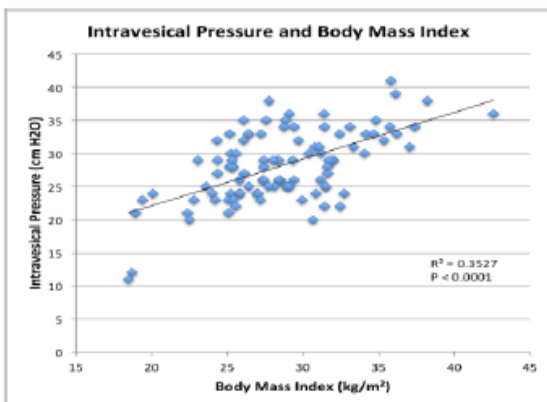
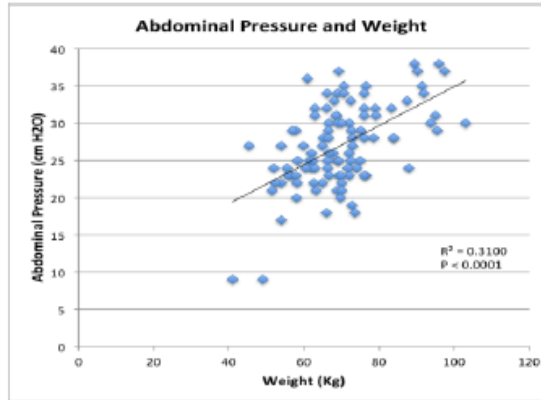
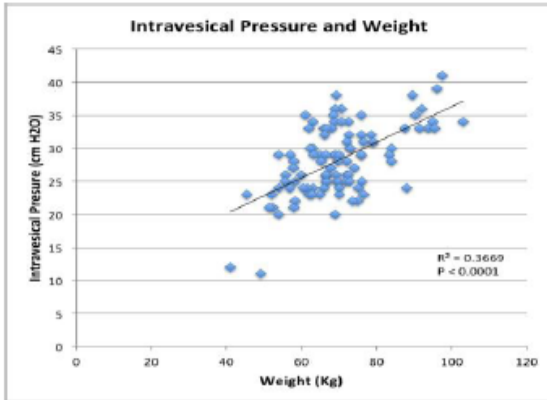
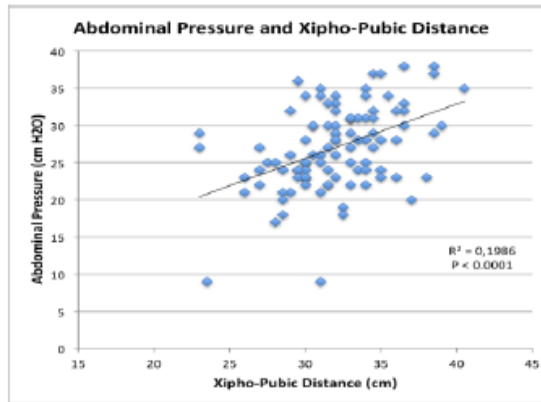
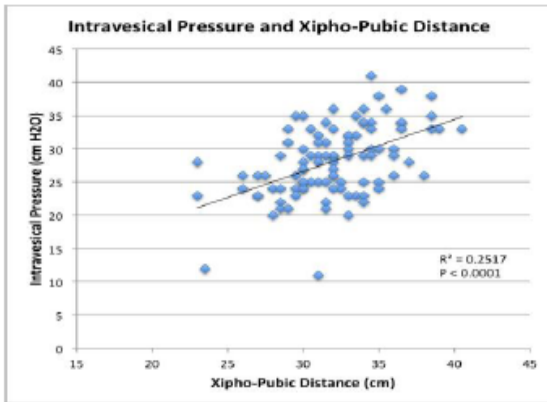


Figure 1. Correlation of intravesical pressure to xipho-pubic distance, weight and body mass index

Figure 2. Correlation of abdominal pressure to xipho-pubic distance, weight and body mass index

References

1. Schäfer W, Abrams P, Liao L, et al. Neurourol Urodyn 2002; 21: 261.
2. Noblett KL, Jensen JK, Ostergard DR. Int Urogynecol J 1997; 8: 323.
3. Hunskaar S. Neurourol Urodyn 2008; 27: 749

Disclosures

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