UIJ UroToday International Journal®

www.urotodayinternationaljournal.com
Volume 4 - October 2011

The Link Between Female Obesity and Urinary Stress Incontinence

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Submitted May 27, 2011 - Accepted for Publication July 25, 2011

ABSTRACT

Background: Stress urinary incontinence (SUI) has an observed prevalence of between 4 and 35%. Aging, obesity, and smoking have consistent causal relationships with the condition.

Objective: To elucidate the relationship between obesity and urinary incontinence in women and a possible explanation of this relationship by ultrasound of the urethrovesical angle and bladder neck descent.

Material and Methods: This prospective, comparative study was conducted in Tanta University Hospital from January 2006 to July 2010, and it included 100 obese women compared to 100 normal-weight control women regarding symptoms of SUI, ultrasonographic examination of the bladder neck, and bladder neck descent during straining for the detection of SUI.

Results: In the obese group, 70% of patients had symptoms of SUI, whereas in the normal-weight group, 17% of patients had symptoms of SUI, denoting a significant increase among the obese. Ultrasonographic examination revealed that in obese women, the urethrovesical angle is nearly at a right angle with an empty urinary bladder at rest and becomes obtuse at straining; but when the bladder was full, this angle became obtuse at rest and during straining. In normal-weight women, the urethrovesical angle was acute at rest and nearly at a right angle at straining while the bladder was empty, and it became a right angle with a full bladder at rest and slightly obtuse at straining with a full urinary bladder. In obese women, the average bladder neck descent during straining was 10±3.5 mm compared with a mean of 3±1.2 mm in the normal weight group, with a significant difference between the 2 groups.

Conclusion: Female obesity is an important risk factor for the occurrence of SUI.

INTRODUCTION

The prevalence of obesity is increasing worldwide and has lately reached epidemic proportions in many countries. Epidemiological studies have consistently shown that both increased weight and obesity are important risk factors for the development of various female pelvic floor disorders, including urinary incontinence [1].

KEYWORDS: Obesity; Female stress incontinence

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CITATION: *UroToday Int J.* 2011 Oct;4(5):art 63. doi:10.3834/uij.1944-5784.2011.10.5

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UIJ UroToday International Journal®
original study

The Link Between Female Obesity and Urinary Stress Incontinence

Stress urinary incontinence (SUI) is defined as a loss of urine with exertion or an increase in abdominal pressure that occurs with activities such as coughing, sneezing, walking, and bending [2]. SUI is estimated to affect between 4 and 35% of adult women. This is due to the difference in epidemiological research and population studies, as well as the difference in the definition of SUI used by the investigators [3]. There are many risk factors, such as aging, pregnancy, route of delivery, previous pelvic operations, smoking, obesity, diabetes, and others.

Strong associations between obesity and SUI in women have been frequently reported in urogynecologic literature [1]. The aim of this work was to elucidate the true relationship between obesity and stress incontinence in women and a possible explanation of this relationship by ultrasound of the urethrovesical angle and bladder neck descent.

PATIENTS

- Participants of this investigation were recruited and studied during their visits to the outpatient clinics in Tanta University Hospital. The study was carried out during the period of January 2006 to July 2010. The study included 100 obese women (with a body-mass index of ≥30) (group I) and 100 normal-weight control women (with a body-mass index of 19.8 to 26) (group II).
- Patients enrolled in this study after learning the aim of the investigation, and written consent was signed from every woman.
- The inclusion criteria were married women aged 20 to 45 years with fair general condition. The exclusion criteria were virginal and menopausal women, the presence of urinary fistula and/or a history of previous anti-incontinence surgery (not recurrent), DM, and neurologic problems.

METHODS

For each patient, the following was done:

- History taking with stress on urinary complaints was performed. (The patient was asked whether she leaked urine when she coughed, sneezed, laughed, or exercised.) A complete general examination, a genital examination for the detection of pelvic organ prolapse, and for the detection of SUI, if any, was performed.
- A complete urine analysis was performed.

Figure 1. Transvaginal ultrasonographic picture of the bladder neck with an empty bladder.

doi: 10.3834/uij.1944-5784.2011.10.5f1

- A standardized 1-hour pad-weighing test and cough stress test with a full bladder (300 mL) were done.
- The posterior urethrovesical angle (PUVA) of each case was measured at rest and during straining by transvaginal 7.5 Mhz and transperineal ultrasonographic 3.5 Mhz examinations with an empty and full urinary bladder. We measured the descent of the bladder neck during straining (Figures 1-3) [4].
- All data was collected, and a statistical analysis of the data using the mean, standard deviation, and unpaired t-test was developed.

RESULTS

- Regarding age, it ranged from 23 to 45 years old with a mean of 29 + 4.8 years for members of group I, whereas the corresponding values ranged from 22 to 46 years with a mean of 31 + 5.2 years in members of the normal-weight group.
- Concerning parity, in members of the obese group, it ranged between nullipara to 7 para with a mean of 3 ± 1, while in members of the normal-weight group, it ranged between para I to para 8 with a mean of 4 ± 1.
- With reference to body-mass index, it ranged between 32 to 40 kg/m^2 with a mean of 34 + 2.5 kg/m^2 in members

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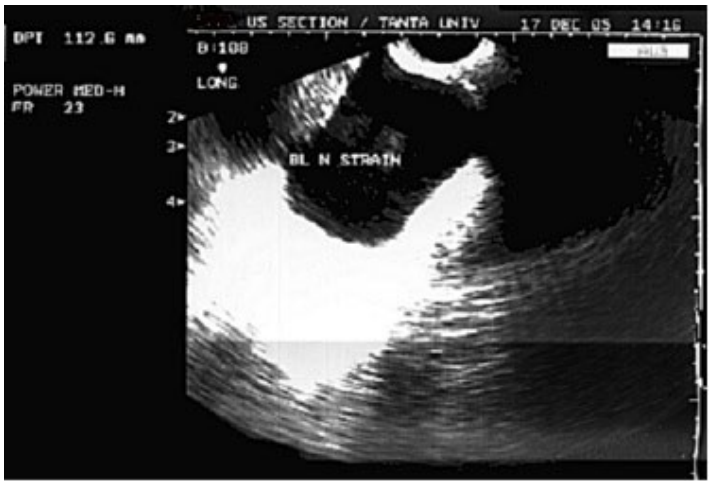
Figure 2. Transvaginal ultrasonographic picture of the bladder neck with a full bladder at rest.
doi: 10.3834/uij.1944-5784.2011.10.5f2

Figure 3. Transvaginal ultrasonographic picture of the bladder neck with a full bladder with straining.
doi: 10.3834/uij.1944-5784.2011.10.5f3



of the obese group; meanwhile, it ranged between 19 to 24 kg/m^2 with a mean of 23 + 2.7 kg/m^2 in members of the normal-weight group. There was a significant difference between both groups.

- In the obese group, 70% of cases had symptoms of SUI, whereas only 17% of women had symptoms of SUI in the normal-weight group. The difference between the 2 groups was statistically significant.
- In the obese group, 85% of women had an objective loss of urine that was established during examination while in the normal-weight group, only 24% of the women had an objective loss of urine during examination with a significant difference between both groups.
- Urge incontinence was present in 23% of members of the obese group and in 18% in the normal-weight group (Figure 4).
- Regarding the ultrasonographic evaluation of the urethrovesical angle: In the obese group, this angle was nearly right with an empty urinary bladder at rest and became obtuse during straining, but when the bladder was full, this angle was obtuse at rest and during straining. In the normal-weight group, the urethrovesical angle was acute at rest and nearly right during straining while the bladder was empty, and it became a right angle with a full bladder at rest and slightly obtuse during straining with a full urinary bladder.
- The bladder neck descent in members of the obese group ranged from 7 to 13 mm with a mean of 10 + 3.5 mm during straining. Meanwhile, the bladder neck descent ranged from 2 to 6 mm with a mean of 3 + 1.2 mm in the normal-weight group. The variation between both groups was significant (Tables 1 and 2).

DISCUSSION

According to the recently standardized terminology of the International Continence Society (ICS), urinary incontinence (UI) is defined as the complaint of any involuntary leakage of urine [5]. Several types of UI have been described in literature. The most common subtypes of UI are [5] stress urinary incontinence (SUI) [6], urge urinary incontinence (UUI), and mixed urinary incontinence (MUI) [7].

SUI is characterized by the complaint of involuntary leakage upon effort or exertion, or when sneezing or coughing [5]. In SUI, the intra-abdominal and, therefore, the intravesical pressure exceeded the maximal closure pressure of the urethra in the absence of involuntary detrusor contractions (IDCs). This implies a failure in the urethral closure capacity. This may be due to an alteration of "sphincterial mechanisms" of the urethra wall (collagen, smooth muscle, arterial anastomosis, endothelium, etc.) that produces a low urethral closure pressure due to intrinsic sphincter deficiency. A hypermobile bladder neck or urethra, which is displaced during a sudden increase in

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Table 1. Transvaginal US of the urethrovesical angle on empty urinary bladder at rest and during straining.
doi: 10.3834/uij.1944-5784.2011.10.5t1

US parameters empty bladder	Obese group	Control Group	Significant difference
Urethrovesical angle at rest:			
Acute			P<0.05
Right	10%	20%	
Obtuse	90%	80%	
Urethrovesical angle at straining:			
Acute			P<0.05
Right	40%	70%	
Obtuse	60%	30%	
Range of bladder neck descent during straining in mm	7–13	2–6	P<0.05
Mean of bladder neck descent during straining in mm	10 ±	3 ± 1.2	

Table 2. Transvaginal US of the urethrovesical angle on full urinary bladder at rest and during straining.
doi: 10.3834/uij.1944-5784.2011.10.5t2

US parameters full bladder	Obese group	Control group	Significant difference
Urethrovesical angle at rest:			
Acute		20%	P<0.05
Right	10%	80%	
Obtuse	90%		
Urethrovesical angle at straining:			
Acute		30%	P<0.05
Right		60%	
Obtuse	100%	10%	

intra-abdominal pressure, may also lead to SUI due to pelvic-floor weakness or injury [8, 9]. Both of these conditions may coexist in the same female. The urodynamic observation of IDCs during the filling phase, either spontaneous or provoked, distinguishes this condition from SUI [9].

Obesity is common among women in developed countries, with an incidence of 33% [10], and may contribute to SUI [11]. The present study demonstrates that urinary stress incontinence is an important concomitant of obesity in women. We found that 70% of obese women have subjective symptoms of SUI compared with only 17% among normal-weight women. Obviously, the difference is a significant one. This conforms to the conclusion of numerous studies stating that obesity is a strong risk factor for incontinence [12-14]. Richter et al. reported that the prevalence of urinary and anal incontinence is high in morbidly obese women compared to the general population, depending on subjective symptoms only [15]. In addition, several studies have suggested that weight loss may reduce the frequency of urinary incontinence [16].

Obese women are at risk for the development of SUI. However, the reasons for this have not been completely elucidated. One difficulty in understanding the contribution of obesity to SUI is that many obese women with the condition also have other risk factors, such as multiparty estrogen deficiency and pelvic operations. Nevertheless, epidemiologically, obesity has been associated with urinary incontinence of all types [17].

One of the explanations is that obesity leads to increased intra-abdominal pressure and increased pressure on the bladder. In women with UI, body-mass index correlates with both intravesical and intra-abdominal pressure [18]. Chronic pressure leads to chronic straining and tension on the muscles, connective tissues, and the pudendal nerve supplying the pelvic support structures resulting in nerve injuries and pelvic floor dysfunction [19]. This typically leads to stress UI due to the loss of support of urethrovesical junction [20] and, to a lesser extent, to urge UI from detrusor muscle overactivity [21].

The other explanation is that the chronically increased abdominal pressure stressed the pelvic floor and thus contributed to SUI. That theory melds well with epidemiological studies from the UK [22] and Egypt [23], which suggested an association between obesity and urogenital prolapse, although Peacock [24] suggested that this correlation might not apply to other ethnic groups.

There is evidence that a subset of women with elevated body-mass indexes and urge incontinence may have a ß3-adrenergic receptor mutation that simultaneously affects both insulin sensitivity and ß3-mediated detrusor muscle relaxation

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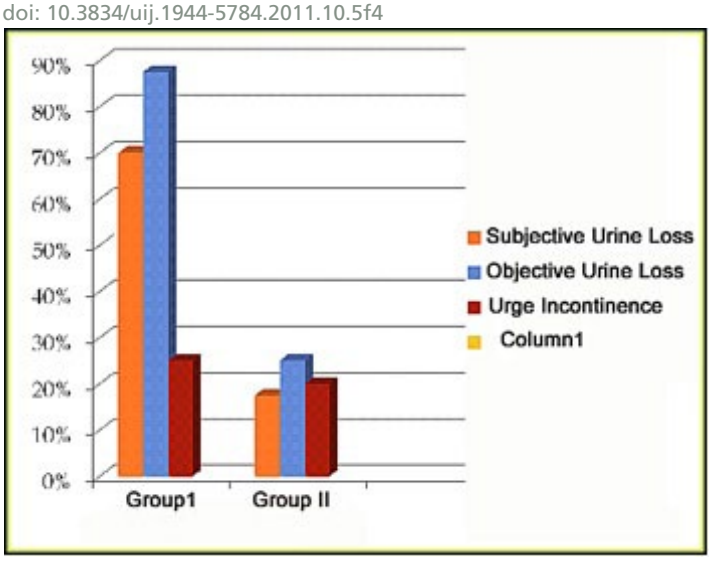
Figure 4. Incontinence symptoms, subjective urine loss, and objective urine loss (the clinical detection of incontinence).

doi: 10.3834/uij.1944-5784.2011.10.5f4



that causes increased detrusor tone and high resting vesical pressure [25].

The contemporary study also demonstrates that objective urine loss found in 85% of obese women compared with only 24% in the normal-weight control. In addition, urge incontinence was present in 23% of the obese patients and in 18% in the normal-weight group.

Ultrasonography, whether introital, perineal, or transvaginal, is an easy, noninvasive modality that provides information on both mobility of the bladder neck and morphologic data of the bladder neck and proximal urethra [26-29].

In SUI, many criteria have been accepted as ultrasonographic signs of anatomic defects (i.e., bladder neck mobility and the posterior vesicouretheral angle) [30-33].

Some investigators have studied the relationship between posterior vesicouretheral angle and SUI and found that this angle measured by ultrasonography is significantly increased and is positively correlated with the severity of SUI [34, 35].

As regards the use of ultrasound in evaluation of bladder neck mobility, some authors found a lower mean bladder neck descent in continent women than in incontinent women during straining [36, 37].

In our study, ultrasonographic assessment of the urethrovesical junction revealed that the urethrovesical angle was more obtuse with a full bladder and right-angled with an empty bladder in obese women than in normal-weight counterparts.

Furthermore, the bladder neck descent measured by ultrasound was more marked in the obese compared with the normal-weight group, and all these findings suggest the presence of anatomical defects in these obese patients.

We conclude that female obesity is an important risk factor for the occurrence of SUI that can be explained by our ultrasonographic finding of anatomical defects in obese patients; therefore, we suggest future studies on a large number of obese women undergoing weight control to clarify the effects of weight loss on SUI.

REFERENCES

1. Subak LL, Richter HE, Hunskaar S. Obesity and urinary incontinence: epidemiology and clinical research update. *J Urol*. 2009;182(6)(suppl):S2–S7. PubMed ; CrossRef

2. Nitti VW. The state of urinary incontinence in women. *Rev Urol*. 2004;6(suppl 3):S1–S2.

3. Thom D. Variation in estimates of urinary incontinence prevalence in the community: effects of differences in definition, population characteristics, and study type. *J Am Geriatr Soc*. 1998;46(4):473–480. PubMed

4. Elhawary T, Shehab A, Eltatawy H. Anatomical and ultrasonographic (transvaginal and transperineal) assessment of the urethrovesical junction in continent volunteer women: a prospective study. *Tanta Med Sci J*. 2007;2(1):105–116.

5. Abrams P, Cardozo L, Fall M, et al; Standardisation Sub-Committee of the International Continence Society. The standardisation of terminology in lower urinary tract function: report from the standardisation sub-committee of the International Continence Society. *Urology*. 2003;61(1):37–49. PubMed ; CrossRef

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6. Bernasconi F, Grasso M, Mantovani M, Luccini E, Arienti S, Cerri C. Social cost of female urinary Incontinence: Epidemiology, cost of illness and cost/ effectiveness. *Urogynaecologia Int J*. 2003;17(1):9–46.

7. Hannestad YS, Rortveit G, Sandvik H, Hunskaar S; Norwegian EPINCONT study. Epidemiology of Incontinence in the County of Nord-Trøndelag. A community-based epidemiological survey of female urinary incontinence: The Norwegian EPINCONT Study. *J Clin Epidemiol*. 2000;53(11):1150–1157. PubMed ; CrossRef

8. van der Vaart CH, van der Bom JG, de Leeuw JR, Roovers JPWR, Heintz APM. The contribution of hysterectomy to the occurrence of urge and stress urinary incontinence symptoms. *BJOG: An International Journal of Obstetrics and Gynaecology*. 2002;109(2):149–154. PubMed

9. Viktrup L. Female stress and urge incontinence in family practice: insight into the lower urinary tract. *Int J Clin Pract*. 2002;56(9):694–700. PubMed

10. Foreyt JP, Poston WS II. Obesity: a never-ending cycle? *Int J Fertil Womens Med*. 1998;43(2):111–116. PubMed

11. Ouslander JG. Lower urinary tract disorders in the elderly female. In: Raz S, ed. *Female Urology*, 2nd ed. New York: WB Saunders, 1996;219–230.

12. Melville JL, Katon W, Delaney K, Newton K. Urinary incontinence in US women: a population-based study. *Arch Intern Med*. 2005;165(5):537–542. PubMed ; CrossRef

13. Danforth KN, Townsend MK, Lifford K, Curhan GC, Resnick NM, Grodstein F. Risk factors for urinary incontinence among middle-aged women. *Am J Obstet Gynecol*. 2006;194(2):339–345. PubMed ; CrossRef

14. Waetjen LE, Liao S, Johnson WO, et al. Factors associated with prevalent and incident urinary incontinence in a cohort of midlife women: a longitudinal analysis of data: study of women's health across the nation. *Am J Epidemiol*. 2006;165(3):309–318. PubMed ; CrossRef

15. Richter HE, Burgio KL, Clements RH, Goode PS, Redden DT, Varner RE. Urinary and anal incontinence in morbidly obese women considering weight loss surgery. *Obstet Gynecol*. 2005;106(6):1272–1277. PubMed ; CrossRef

16. Wing RR, Creasman JM, West DS, et al; Program to Reduce Incontinence by Diet and Exercise. Improving urinary incontinence in overweight and obese women through modest weight loss. *Obstet Gynecol*. 2010;116(2, Part 1): 284–292. PubMed ; CrossRef

17. Cummings JM, Rodning CB. Urinary Stress Incontinence among obese women: Review of Pathophysiology Therapy. *Int Urogynecol J Pelvic Floor Dysfunct*. 2000;11(1):41–44. CrossRef

18. Noblett KL, Jensen JK, Ostergard DR. The relationship of body mass index to intra-abdominal pressure as measured by multichannel cystometry. *Int Urogynecol J Pelvic Floor Dysfunct*. 1997;8(6):323–326. PubMed ; CrossRef

19. Cummings JM, Rodning CB. Urinary stress incontinence among obese women: review of pathophysiology therapy. *Int Urogynecol J Pelvic Floor Dysfunct*. 2000;11(1):41–44.

20. Nygaard IE, Heit M. Stress urinary incontinence. *Obstet Gynecol*. 2004;104(3):607–620. PubMed ; CrossRef

21. Freeman RM, Adekanmi OA. Overactive bladder. *Best Pract Res Clin Obstet Gynaecol*. 2005;19(6):829–841. PubMed ; CrossRef

22. Mant J, Painter R, Vessey M. Epidemiology of genital prolapse: observations from the Oxford Family Planning Association study. *BJOG: An International Journal of Obstetrics and Gynaecology*. 1997;104(5):579–585. PubMed ; CrossRef

23. Younis N, Khattab H, Zurayk H, El-Mouelhy M, Amin MF, Farag AM. A community study of gynecological and related morbidities in rural Egypt. *Stud Fam Plann*. 1993;24(3):175–186. PubMed ; CrossRef

24. Peacock LM, Wiskind AK, Wall LL. Clinical features of urinary incontinence and urogenital prolapse in a black inner-city population. *Am J Obstet Gynecol*. 1994;171(6):1464–1469, discussion 1469–1471. PubMed

25. Yamaguchi O. Beta3-adrenoceptors in human detrusor muscle. *Urology*. 2002;59(5)(suppl):25–29. PubMed ; CrossRef

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26. Tunn R, Petri E. Introital and transvaginal ultrasound as the main tool in the assessment of urogenital and pelvic floor dysfunction: an imaging panel and practical approach. *Ultrasound Obstet Gynecol*. 2003;22(2):205–213. PubMed ; CrossRef

27. Demirci F, Fine PM. Ultrasonography in stress urinary incontinence. *Int Urogynecol J Pelvic Floor Dysfunct*. 1996;7(3):125–132. PubMed ; CrossRef

28. Dietz HP. Ultrasound imaging of the pelvic floor. Part I: two-dimensional aspects. *Ultrasound Obstet Gynecol*. 2004;23(1):80–92. PubMed ; CrossRef

29. Viereck V, Pauer HU, Bader W, et al. Introital ultrasound of the lower genital tract before and after colposuspension: a 4-year objective follow-up. *Ultrasound Obstet Gynecol*. 2004;23(3):277–283. PubMed ; CrossRef

30. Schär G, Kölbl H, Voigt R, et al. Empfehlungen der Arbeitsgemeinschaft Urogynäkologie zur Sonographie des unteren Harntraktes im Rahmen der urogynäkologischen Funktionsdiagnostik [Recommendations by the Urogynecology Working Group for sonography of the lower urinary tract within the scope of urogynecologic functional diagnosis]. *Ultraschall Med–European Journal of Ultrasound*. 1996;17(01):38–41. PubMed ; CrossRef

31. Koelbl H, Bernaschek G, Deutinger J. Assessment of female urinary incontinence by introital sonography. *J Clin Ultrasound*. 1990;18(4):370–374. PubMed ; CrossRef

32. Bader W, Degenhardt F, Kauffels W, Nehls K, Schneider J. Sonomorphologische Parameter der weiblichen Streßharninkontinenz [Ultrasound morphologic parameters of female stress incontinence]. *Ultraschall Med – European Journal of Ultrasound*. 1995;16(04):180–185. PubMed ; CrossRef

33. Dietz HP, Wilson PD. Anatomical assessment of the bladder outlet and proximal urethra using ultrasound and videocystourethrography. *Int Urogynecol J Pelvic Floor Dysfunct*. 1998;9(6):365–369. PubMed ; CrossRef

34. Pregazzi R, Sartore A, Bortoli P, Grimaldi E, Troiano L, Guaschino S. Perineal ultrasound evaluation of urethral angle and bladder neck mobility in women with stress urinary incontinence. *BJOG: An International Journal of Obstetrics and Gynaecology*. 2002;109(7):821–827. PubMed ; CrossRef

35. Lu JH, Li Q, Zhu H, et al. Diagnosis of stress urinary incontinence using poster urethrovesical angel measured by ultrasonography. *Zhonghua Fu Chan Ke Za Zhi*. 2010;45(5):338–341. PubMed

36. Cassadó J, Pessarrodona A, Tulleuda R, et al. Introital ultrasonography: a comparison of women with stress incontinence due to urethral hypermobility and continent women. *BJU Int*. 2006;98(4):822–828. PubMed ; CrossRef

37. Kil PJ, Hoekstra JW, van der Meijden AP, Smans AJ, Theeuwes AG, Schreinemachers LM. Transvaginal ultrasonography and urodynamic evaluation after suspension operations: comparison among the Gittes, Stamey and Burch suspensions. *J Urol*. 1991;146(1): 132–136. PubMed

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