Journal of Experimental and Clinical Medicine
https://dergipark.org.tr/omujecm

Research Article

J Exp Clin Med
2022; 39(1): 160-163
doi: 10.52142/omujecm.39.1.32

Changes in pelvic floor mobility in uncomplicated pregnant women over 28 gestational week and its relation with subjective urinary incontinence complaints

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Received: 27.07.2021 • **Accepted/Published Online:** 31.08.2021 • **Final Version:** 01.01.2022

Abstract

To describe the mobility of the anterior pelvic compartment and hiatal enlargement measures in pregnancy with urinary stress incontinence complaints and their relation to the perceived subjective urinary incontinence severity. Forty-six pregnant women were included in this observational prospective cohort study, the ultrasonographic parameters of the pelvic anterior compartment including hiatal anteroposterior (AP) diameter, retrovesical angle (RVA), bladder neck descent (BND), urethral rotation angle (URA) and cystocele level were compared with the subjective urinary complaints in healthy third trimester pregnant women. Hiatal AP diameter, RVA and BND on Valsalva did not significantly correlate with gestational week (p=0.292, r=0.096; p=0.079, r=0.159; p=0.901, r=0.011, respectively). Urethral rotation angle was significantly increased in women after 39th gestational week (p=0.037, t=-2.17). Hiatal AP diameter, BND and RVA on maximal Valsalva did not differ with estimated fetal weight above and below 3000 gr. Total severity and bother scores of the M-ISI scale was found as similar among women with open (>1400) RVA and intact (<1400) RVA (p=0.556 and p=0.779, respectively). Only nocturia frequency (β=.379, t=4.035, p=.000) positively predicted the incontinence severity score. The pelvic floor ultrasound parameters of the anterior compartment may not predict the subjective urinary incontinence severity in third trimester of pregnancy. Nocturia was found to contribute for subjective impaired urinary function. The idea of being pregnant may suppress the general complaints related with changes in pelvic floor mobility.

Keywords: pelvic floor ultrasound, urinary incontinence, cystocele, pregnancy

1. Introduction

Urinary incontinence during pregnancy is very common, affecting more than half of pregnant women (1). The prevalence of any urinary incontinence increases substantially during pregnancy with a doubling when compared to pre-pregnancy (2). Vaginal childbirth and pregnancy itself were known to have detrimental effect on levator hiatus, ligamentous structures of pelvic floor and pelvic floor function (3,4). Urinary incontinence during pregnancy has 3.5 times increased risk for persistent incontinence at 6 months of postpartum period compared with those who were continent antenatally regardless of the mode of delivery (5, 6).

Pelvic floor ultrasound (PFU) is promising and efficient method to dynamically assess functional anatomy with ease. PFU was shown to successfully describe the significant changes due to the affected pelvic organ mobility/prolapse following vaginal childbirth resulted in highly significant changes to all parameters used to describe pelvic organ mobility (7).

Changes in mobility of anterior compartment regarding pregnancy and its subjective effects is scarce in the literature. The burden of urinary incontinence in pregnancy and its impact on the quality of life is controversial (8-11). This study aimed to describe the mobility of the anterior pelvic compartment and hiatal enlargement measures in pregnancy and their relation to the perceived subjective urinary incontinence severity.

2. Patients and Methods

Pregnant women with singleton and cephalic fetus over 28 gestational week who has complaint of any urinary incontinence was included to this observational prospective cohort study. Pregnant women in their first trimester, who were in active labour phase or with progressive cervical dilatation and with clinically visible pelvic organ prolapse were excluded. Vaginal digital examination was not performed to any women. This study was approved by the local Institutional Scientific Researches Ethical Board (No.21/73). The results of preliminary analysis have been presented in the 6th International Urogynaecology Congress, Istanbul, 2018.

Transperineal ultrasound was performed to all women with

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a 3D probe of Mindray Diagnostic Ultrasound System DC-8 PRQ model (Shenzhen Mindray Bio-medical Electronics Co. Ltd., China) in a standardized fashion according to the method described by Shek and Dietz (12). All examinations were performed by two obstetricians who were experienced in pelvic floor ultrasonography. Third senior obstetrician was involved in cases of controversy. The inferior margin of the pubic symphysis was taken as the line of reference (13). Uretral rotation angle (URA), retrovesical angle (RVA), bladder neck descent (BND) and hiatal anteroposterior (AP) diameter were measured on maximal Valsalva lasted for at least 6 seconds to avoid levator co-activation. URA was defined by the angle between the proximal urethra at rest and on Valsalva. Cystocele of at least 10 mm below the pubic symphysis at maximum Valsalva were regarded as significant (12, 13). RVA was defined by the angle of the proximal urethra and trigonal surface of bladder on Valsalva maneuver (14). Patients with a RVA of more than or below 140° were classified as Green Type II and III, respectively. RVA was discriminated by 140 degree as open RVA (over 1400) and intact RVA (below 1400). Position of the bladder neck determined relative to the posterior inferior margin of the symphysis pubis (SP) was measured, the difference between the measurements on maximal Valsalva and at rest was defined as BND with a numerical value. The hiatal AP (AP) diameter which indicates hiatal ballooning was measured on maximal Valsalva as the shortest distance from the posteroinferior margin of the pubic symphysis to the anterior margin of the most central aspect of the puborectalis muscle in the midsagittal view.

A validated into Turkish language version of Michigan Incontinence Severity Index (M-ISI) was used to assess the quality of life related to the incontinence (15). M-ISI has ten items, consisting of a total M-ISI domain (the sum of items 1-8) and a distinct Bother domain (the sum of items 9 and 10). The total M-ISI score consists of three subdomains (items 1-3 for stress urinary incontinence [SUI], items 4-6 for UUI, and items 7 and 8 for PU).

The responses for each item range from 0 to 4 on a Likert-type scale, with higher values representing greater symptoms and greater bother. The minimally important difference has been determined for the following domains/subdomains: total M-ISI (4 points), SUI (2 points), UUI (2 points), and PU (1 point) (16).

Nocturia was defined as the episodes of involuntarily micturition reflex during sleep. The severity of nocturia was assessed by the clinician using a non-validated Likert type scale (0 – 3) (17). Nocturia was scored as follows: 0 no, 1=one episode, 2=two to three episodes, 3=four or more episodes.

The primary clinical hypothesis was that the subjective incontinence severity can be predicted by several possible factors consisting of maternal, obstetric and ultrasonographic variables including age, parity, gestational week, fetal biometry, nocturia frequency, EFW, RVA, Cystocele degree, URA, Hiatal AP diameter and BND. Multiple linear regression analysis was used to test this hypothesis. SPSS-22 software was used for data analysis. The Kolmogorov-Smirnov test was used to assess normality. Paired T test was performed to compare normally distributed variables. Parameters were given as mean ± standard deviation (SD), minimum, maximum and median. A p-value of less than 0.05 was considered significant.

3. Results

Forty-six pregnant women were included in this study. One pregnant woman was excluded from the study due to painless cervical dilatation. Seven women were excluded from the statistical analysis, 4 out of those was due to low image quality and three women was excluded due to observed levator co-activation. A total of 38 women was included to the final statistical analysis.

Mean age was 26.37 ± 5.8 and gestational week was 37.2 ± 3.5 (Min = 28, Max = 41). Median parity was found to be 1 with an interquartile range of 2 (Range = 0-5). Mean BMI (kg/m2) was 29.32 ± 5. Descriptive statistics were given in Table 1.

Table 1. Demographic and obstetric outcomes, pelvic floor ultrasound results and subjective scale measures

	Min	Max	Mean	SE	SD
Age (year)	17	39	26.37	.94	5.79
Parity (n)	0	5	1.11	.20	1.23
Gestational week	28	41	37.26	.58	3.55
BMI (kg / m^2)	18.37	41.55	29.32	.81	5
BPD (mm)	73.0	96.3	88.45	.92	5.67
HC (mm)	260.3	347.2	317.95	3.23	19.92
EFW (gr)	1356.0	3962.0	2972.16	104.20	642.36
Nocturia (n)	0	3	1.90	.12	.76
Hiatal AP-Rest (mm)	36.6	77.9	54.10	1.39	8.57
Hiatal AP-Valsalva (mm)	37.4	83.0	58.30	1.57	9.71
Cystocele (mm)	-25.1	2.1	-11.97	1.17	7.17
Urethral rotation (degree)	2.0	67.0	26.79	2.72	16.80
Retrovesical angle (degree)	66.0	174.0	129.18	4.88	30.90
Bladder neck descent (mm)	.30	22.40	6.75	.85	5.22
SUI	0	12.00	2.68	.58	3.61
UUI	0	12.00	3.31	.62	3.83
PAD	0	8.00	1.52	.36	2.20
BOTHER	0	6.00	.87	.22	1.36
Total M-ISI SCORE	0	29.00	7.53	1.33	8.20

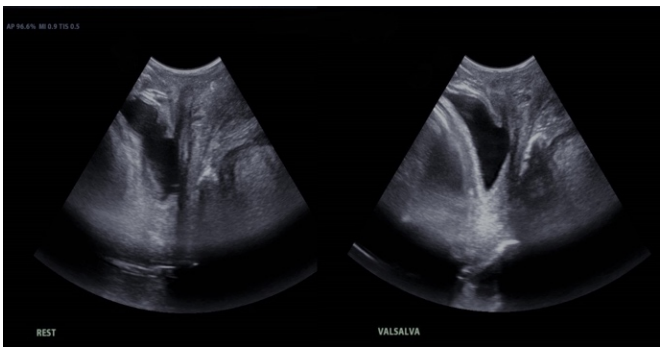

Fig. 1. Changes in pelvic floor mobility of a pregnant women at rest and on Valsalva

Hiatal AP diameter, RVA and BND on Valsalva did not significantly correlate with gestational week ($p = 0.292$, $r = 0.096$; $p = 0.079$, $r = 0.159$; $p = 0.901$, $r = 0.011$, respectively). Hiatal AP diameter, RVA and BND on Valsalva did not differ regarding gestational week in women over and below 39 weeks ($p = 0.378$, $p = 0.176$ and $p = 0.874$, respectively). UR angle, Hiatal AP diameter, BND and RVA on maximal Valsalva did not differ with estimated fetal weight above and below 3000 gr ($p = 0.258$, $p = 0.824$, $p = 0.499$ and $p = 0.822$, respectively).

URA was significantly increased in women after 39th gestational week ($p = 0.037$, $t = -2.17$). BND was positively correlated with URA and also the extent of the cystocele ($p = 0.031$, $r = 0.351$; $p = 0.014$, $r = 0.222$, respectively). Both URA and BND did not show a significant correlation with subjective scores (SUI domain: p=0.571 and p=0.615, r=0.052 and r=0.046, respectively; Bother domain: p=0.390 and p=0.912, r=0.078 and r=0.010).

Total severity and bother scores of the M-ISI scale was found as similar among women with open (>1400) RVA and intact (<1400) RVA ($p = 0.556$ and $p = 0.779$, respectively). Total severity score of M-ISI was not statistically significant regarding urethral and bladder neck mobility measures, gestational week, biparietal diameter (BPD) of the fetus, estimated fetal weight, extent of cystocele over symphysis pubis ($p > 0.05$). Nocturia episodes was significantly related with M-ISI severity score ($p = 0.008$, $t = -2.833$). Multiple regression analysis showed a significant effect on the subjective incontinence severity ($F(13,108) = 1.967$), $p < .001$), with $R2=0.191$ suggesting that 19.1% of the variation was predicted by the possible factors. Standard residual and Cooks' distance were between -1.85 to 2.89 and 0 to 0.169, respectively. Looking at the unique individual contributions of the predictors, the results showed that only nocturia frequency ($\beta=.379$, $t=4.035$, $p=.000$) positively predicted the incontinence severity score (Part correlation: 0.349).

4. Discussion

The findings of this study showed that the pelvic floor ultrasound parameters of the anterior compartment did not predict the subjective urinary incontinence severity of women in their third trimester of pregnancy. The measured parameters did not show significant correlation as gestational week changes. Subjective incontinence severity scores did not change with anterior prolapse, gestational week, fetal weight and fetal BPD. Nocturia was found to contribute for subjective impaired urinary function.

Female urinary incontinence is a common but neglected issue during pregnancy. However, the quality of life of pregnant women barely gets affected by urinary incontinence (11). A cross-sectional study showed that the urinary incontinence is not uncommon in women even during their first pregnancy (8). While stress urinary incontinence was the most common type among others with 65%, more than half of the women included in the study in their third trimester reported that their daily activities were not affected from urinary incontinence (8). Another cross-sectional study comparing the prevalence and severity of urinary incontinence in between first and third trimester showed that the incidence of urinary incontinence is doubled in third trimester comparing with the first trimester of pregnancy (19% vs. 39.8%, $p = 0.008$) (18). Half of the women reported to have stress incontinence without significant effect on their daily life activities, however their quality of life was found to be changed in particular domains including physical, mental and social. Interestingly, urinary frequency affected the four of every ten women and caused distress in seven of every ten women (18). Similarly, nocturia frequency was significantly related with incontinence severity scores in the current study, moreover it positively predicted the incontinence severity score. We believe that the idea of being pregnant may suppress the general complaints related with changes in pelvic floor mobility.

Dietz et al showed that higher degrees in URA and BND level was correlated with the anterior vaginal wall relaxation (19). This relation was also significant in the current study with a moderate correlation between the degree of cystocele and BND level. Another study of Dietz et al showed that the bladder and urethral mobility increase as pregnancy progresses when compared the non-pregnant women with women in their third trimester of pregnancy, but not with the first trimester.3 Similar to Dietz, Chan et al showed significant descent in bladder neck, apex and anorectal junction as the pregnancy progresses (20). In contrary, the current study did not support the Dietz's hypothesis with no significant relation in between the gestational week and anterior compartment mobility. These different findings may be caused by relatively a small number of cohort. However, a prospective longitudinal study conducted in Norway showed that the majority of the vaginal POP-Q measures made a cranial shift from mid to late pregnancy (21). They interpreted that the larger uterus fills the bony pelvis, pends anteriorly over the rim of the bony pelvis, and therefore pulls the cervix and vagina in a cranial direction, in accordance with the literature (22). Our findings that shows a non-significant relation of anterior compartment mobility with the gestational week can be interpreted as in accordance with Reimers et al.

The strengths of this study are its prospective nature and the use of pelvic floor ultrasound in transperineally approach. It is known that pregnant women find the transperineal ultrasound more comfortable than digital examination (23). This approach may become more common in the research settings, and therefore should be studied more extensively. The logistic regression model that showed the nocturia as the only factor in predicting the subjective urinary incontinence severity can be considered as the other strength of the study.

A limitation of this study is the lack of an a priori power analysis. Furthermore, the size of the study is relatively small, potentially giving rise to bias in showing the change of anterior compartment mobility parameters as the pregnancy progress. Another limitation is the lack of detailed POP-Q data.

The pelvic floor ultrasound parameters of the anterior compartment may not predict the subjective urinary incontinence severity in third trimester of pregnancy. Nocturia episodes was the only determinant of impaired subjective urinary dysfunction. Urethral and bladder mobility and levator hiatus measures did not significantly differ with regard to neither gestational week nor estimated fetal weight and BPD.

Conflict of interest

None to declare.

Acknowledgments

None to declare.

References

1. Eason E, Labrecque M, Marcoux S, Mondor M. Effects of carrying a pregnancy and of method of delivery on urinary incontinence: a prospective cohort study. BMC pregnancy and childbirth. 2004;4(1):1-6.
2. Wesnes SL, Rortveit G, Bø K, Hunskaar S. Urinary incontinence during pregnancy. Obstetrics & Gynecology. 2007;109(4):922-928.
3. Dietz HP, Eldridge A, Grace M, Clarke B. Does pregnancy affect pelvic organ mobility? Australian and New Zealand Journal of Obstetrics and Gynaecology. 2004;44(6):517-520.
4. Huebner M, Antolic A, Tunn R. The impact of pregnancy and vaginal delivery on urinary incontinence. International Journal of Gynecology & Obstetrics. 2010;110(3):249-251.
5. Wesnes SL, Hunskår S, Bo K, Rortveit G. The effect of urinary incontinence status during pregnancy and delivery mode on incontinence postpartum. A cohort study. BJOG: An International Journal of Obstetrics & Gynaecology. 2009;116(5):700-707.
6. Çırpan T, Akercan F, Akman L, İtil İM, Askar N. Postpartum Incontinence in a Young Women: Report of a Case and Review of the Literatüre. Turk J Obstet Gynecol. 2005;2(3):246-248.
7. Dietz HP, Steensma AB. Which women are most affected by delivery-related changes in pelvic organ mobility? European Journal of Obstetrics & Gynecology and Reproductive Biology. 2003;111(1):15-18.
8. Abdullah B, Ayub S, Zahid AM, Noorneza A, Isa MR, Ng P. Urinary incontinence in primigravida: the neglected pregnancy predicament. European Journal of Obstetrics & Gynecology and Reproductive Biology. 2016;198:110-115.
9. Akkus Y, Pinar G. Evaluation of the prevalence, type, severity, and risk factors of urinary incontinence and its impact on quality of life among women in Turkey. International urogynecology journal. 2016;27(6):887-893.
10. Dolan LM, Walsh D, Hamilton S, Marshall K, Thompson K, Ashe RG. A study of quality of life in primigravidae with urinary incontinence. International Urogynecology Journal. 2004;15(3):160-164.
11. Kocaöz S, Talas MS, Atabekoğlu CS. Urinary incontinence in pregnant women and their quality of life. Journal of clinical nursing. 2010;19(23-24):3314-3323.
12. Shek K, Dietz HP. Assessment of pelvic organ prolapse: a review. Ultrasound Obstet Gynecol. 2016;48(6):681-692.
13. Dietz H, Lekskulchai O. Ultrasound assessment of pelvic organ prolapse: the relationship between prolapse severity and symptoms. Ultrasound in Obstetrics and Gynecology: The Official Journal of the International Society of Ultrasound in Obstetrics and Gynecology. 2007;29(6):688-691.
14. Chantarasorn V, Dietz H. Diagnosis of cystocele type by clinical examination and pelvic floor ultrasound. Ultrasound in obstetrics & gynecology. 2012;39(6):710-714.
15. Sargın MA, Yassa M, Taymur BD, Ergun E, Akca G, Tug N. Adaptation and validation of the Michigan incontinence severity index in a Turkish population. Patient preference and adherence. 2016;10:929.
16. Suskind AM, Dunn RL, Morgan DM, DeLancey JO, McGuire EJ, Wei JT. The Michigan incontinence symptom index (M-ISI): A clinical measure for type, severity, and bother related to urinary incontinence. Neurourology and urodynamics. 2014;33(7):1128-1134.
17. Yassa M, Tug N. Uterus-preserving laparoscopic lateral suspension with mesh operation in pelvic organ prolapse: initial experience in a single tertiary center with a median 24-month follow-up. Geburtshilfe und Frauenheilkunde. 2019;79(9):983.
18. Franco EM, Parés D, Colomé NL, Paredes JRM, Tardiu LA. Urinary incontinence during pregnancy. Is there a difference between first and third trimester? European Journal of Obstetrics & Gynecology and Reproductive Biology. 2014;182:86-90.
19. Dietz HP, Moore KH, Steensma AB. Antenatal pelvic organ mobility is associated with delivery mode. Australian and New Zealand Journal of Obstetrics and Gynaecology. 2003;43(1):70-74.
20. Chan S, Cheung R, Yiu K, Lee L, Leung T, Chung T. Pelvic floor biometry during a first singleton pregnancy and the relationship with symptoms of pelvic floor disorders: a prospective observational study. BJOG: An International Journal of Obstetrics & Gynaecology. 2014;121(1):121-129.
21. Reimers C, Stær-Jensen J, Siafarikas F, Saltyte-Benth J, Bø K, Ellström Engh M. Change in pelvic organ support during pregnancy and the first year postpartum: a longitudinal study. BJOG: An International Journal of Obstetrics & Gynaecology. 2016;123(5):821-829.
22. Horowitz E, Yogev Y, Hod M, Kaplan B. Prolapse and elongation of the cervix during pregnancy. International Journal of Gynaecology and Obstetrics. 2002;77(2):147-148.
23. Wiafe YA, Whitehead B, Venables H, Dassah ET. Acceptability of intrapartum ultrasound by mothers in an African population. Journal of ultrasound. 2020;23(1):55-59.