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Vajinal Doğumun Stres Üriner İnkontinans ve Mesane Boynu Hareketliliğine Etkisi: Transperineal Ultrasonografi Değerlendirmesi

The Effect of Vaginal Delivery on Stress Urinary Incontinence and Bladder Neck Mobility: Transperineal Ultrasound Evaluation.

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ÖZ

Giriş: Üriner inkontinans; her yaşta görülebilen, kadınların yaşamını olumsuz etkileyen, depresyon ve toplumdan soyutlanmaya neden olan hijyenik ve sosyal bir problemdir. %15 ila 52 lik prevalans oranı ile stres üriner inkontinans en sık karşılaşılan inkontinans tipidir. Gerek stres gerekse mikst tip üriner inkontinans gebelik esnasında görülebilmekle birlikte, vajinal doğumun pelvik tabanda yol açtığı travmayla ilişkili olan tipin stres üriner inkontinans olduğu kabul edilmektedir. Artan paritenin stres üriner inkontinans etyolojisindeki önemi hala tartışmalıdır. Çalışmamızın amacı, pelvik taban morfolojisi ve fonksiyonu üzerine vajinal doğumun etkisini, perineal ultrasonografi kullanarak araştırmak ve sezaryan ile doğum yapan kadınlarla kıyaslamaktır.

Materyal ve Metod: Hastalar, 32-39 uncu gebelik haftaları arasında ve doğum sonrası 9 uncu haftada olmak üzere iki kez değerlendirildi. Üriner inkontinans varlığı, antenatal ve postpartum olmak üzere her iki incelemede sorgulandı. Mesane boynunun lokalizasyonu Schaer ve arkadaşlarının tanımladığı x-y koordinat sistemi kullanılarak yapıldı. Gerek doğum öncesi, gerekse doğum sonrası mesane boynunun valsalva ile sefalokaudal, ventrodorsal ve vektörel olmak üzere üç boyutlu hareketi perineal ultrasonografi ile incelendi.

Bulgular: Ölçümler multipar grupta primipar ve sezaryan grubuna göre istatistiksel olarak anlamlı düzeyde yüksek olarak bulundu. Aynı hareketler için primipar grup sezaryan grubu ile kıyaslandığında ise ölçümler primipar grupta istatistiksel olarak anlamlı ölçüde yüksek idi. Doğum sonrasında stres üriner inkontinansı olan olgular değerlendirildiğinde ise, mesane boynunun, hem doğum öncesi hem de doğum sonrası sefalokaudal, ventrodorsal ve vektörel yöndeki hareketi, inkontinans negatif olgulara göre pozitif olanlarda anlamlı oranda yüksek bulundu. Mesane boynu ve üretranın anatomik desteğinin, vajinal doğumdan etkilendiği bu çalışmada açık bir şekilde görülmektedir. Doğum öncesinde mesane boynu mobilitesi, hiç doğum yapmayan primigravida ve sezaryen grubu olgularda farklılık göstermezken, en az bir vajinal doğum yapmış olan olgularda artmıştır. Doğum sonrasında ise, vajinal doğum yapmış olgularda, hiç vajinal doğum geçirmemiş sezaryan grubu olgulara göre mobilite yüksek olarak bulunmuştur. GSİ doğum öncesi %33 iken doğum sonrası 9. haftada %51 olarak bulunmuş olup, postpartum de novo inkontinans % 47 oranındadır.

Sonuçlar: İleri anne yaşı, artmış bebek doğum ağırlığı ve paritenin postpartum inkontinans için risk oluşturduğu sonucuna varılmıştır.

Anahtar Kelimeler: Doğum, stres üriner inkonitnans, transperineal ultrasonografi, mesane boynu mobilitesi

ABSTRACT

Introduction: Stress urinary incontinence (SUI), the complaint of involuntary leakage of urine on effort or exertion, or on sneezing or coughing is the most common type of urinary incontinence, which causes depression and social problems in women. The most common type of incontinence is stress urinary incontinence with % 15-52 prevelance. Pelvic floor damage caused by vaginal delivery is one of the main causes of strss urinary incontinence. Increased parity as a cause of incontinence is still a matter of debate.

Methods: Patients were first evaluated in 32-39 weeks of pregnancy, and later postpartum 9'th week. Urinary incontinence symptoms were questioned antenatally and postnatally. Bladder neck position was evaluated according to X-Y coordinate system described by Schaer et al. The cephalocaudal, ventrodorsal and vectorial three-dimensional movements of the bladder neck were measured with perineal ultrasonography before delivery and after delivery.

Results: Bladder neck movement measurements were higher in the multiparous group, compared to primiparous delivery and elective cesarean delivery group respectively. There was a statistically significant difference between primiparous and cesarean group. Stress urinary incontinence positive group had significantly higher cephalocaudal, ventrodorsal and vectorial mobility both before and after birth evaluation, compared to stress incontinence negative group. The urethral support and pelvic floor strength may be damaged by vaginal delivery. Before delivery, bladder neck mobility was higher in multiparous group, compared to the other two groups. After delivery the mobility was found to be higher in vaginal delivery group compared to cesarean group. Genuine stress incontinence was %31 before delivery and %51 after delivery at 9'th week, so postpartum de novo incontinence was %47.

Conclusion: Increased maternal age, increased parity and birth weight and existence of incontinence symptoms during pregnancy are risk factors for stress urinary incontinence.

Keywords: Delivery, stress urinary incontinence, transperineal ultrasonography, bladder neck mobility

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INTRODUCTION

Stress urinary incontinence (SUI), the complaint of involuntary leakage of urine on effort or exertion, or on sneezing or coughing is the most common type of urinary incontinence seen in pregnant and postpartum women.(1) In the clinical assessment, the signs of SUI observed during examination and symptoms elicited on history taking or diagnostic investigations like urodynamic evaluations, are used.The pathophysiology of of SUI, which was first described in 1994 by DeLancey, is currently based on the hypothesis of the suburethral hammock.(2) The urethra lies on a supportive layer composed of endopelvic fascia and anterior vaginal wall which are attached to the levator ani muscle. If abdominal pressure is increased, continence can be preserved only if the urethra is compressed by the adjacent structures. Damage to these structures which works as the hammock, leads to urethral hypermobility, increasing the risk of SUI. Petros and Ulmsten, who observed that pubococcygeal subdivision of the levator ani muscle contracts just before a cough or a sneeze to stiffen the pelvic fascia and project the urethra forward. (3) Classifying SUI often relies on distinguishing between intrinsic sphincter deficiency (ISD), and urethral malposition or hypermobility, although this potentially an over-simplification. (4) In the McGuire classification system, type 1 and type 2 stress incontinence occur because of urethral hypermobility and type 3 because of intrinsic sphincter deficiency. (5)

Both pregnancy and delivery can damage muscular, fascial and neural mechanisms of urinary continence (6) SUI is known to have detrimental affects on quality of life in %54.3 of all pregnant women in four domains: physical activity, travel, social relationships, and emotional health.(7) According to Van Brummen et al. the bother of lower urinary tract symptoms occurred most frequently at 36 weeks of gestation and were still a bother at 1 year after pregnancy.(8) The trauma during delivery, is one of the main causes of neuromuscular injury of the pelvic floor. During childbirth, the pudendal nerve might be damaged by compression or by traction within Alcock's canal. Snooks et al. using pudendal nervelatency and single fibre EMG of the external anal sphincter found evidence of denervation following vaginal delivery which persisted two months after delivery. (9) Also, the hormonal changes during pregnancy or abnormal modelling of collagen may also be an important factor in the development of postpartum SUI.(10)

From the type of delivery perspective, it is shown that vaginal delivery causes more damage to the pelvic floor than cesarean section, due to a higher number of levator ani muscle injuries, puborectalis defects, increased bladder neck mobility and enlargement of the hiatal area proved with ultrasound evaluation.(11) Although bladder neck and urethral mobility increased from pregnancy to four years postpartum irrespective of delivery mode, women with levator ani muscle injury had larger increase in bladder neck mobility, suggesting that the delivery mode is important in the pathogenesis of bladder neck mobility and could lead to pelvic floor dysfunction in the long term.(12)

Pelvic floor ultrasound is becoming increasingly more popular in urogynecology. The measurements of small pelvis structures with ultrasonography showed good reproducibility (6). Dietz et al. showed that the ultrasound perineal evaluation of bladder neck mobility performed with a transabdominal probe has a good reproducibility, even if repeated 32-122 days after the first test. (13) Therefore ultrasound measurements of urethral mobility is an attractive approach to directly visualize bladder neck mobility which is associated with stress urinary incontinence severity. Compared to other diagnostic methods for stress urinary incontinence, pelvic floor ultrasound has many advantages, like being cheap, non-invasive and allowing real time visualization and multiple repetitions.

The aim of this study is to evaluate, the effect of vaginal delivery on bladder neck mobility which increases the risk of postpartum stress incontinence by performing transperineal ultrasonography, a noninvasive and well tolerated diagnostic method.

MATERIALS AND METHODS

The analysis was based on the ultrasound imaging results of 42 nulliparous, 58 primipar and multipar patients who agreed to participate in the study two times, first at their 32-39'th (mean 36,58± 1,49) gestational weeks and secondly postpartum 9'th weeks.The study was conducted over a two year period between 2004-2006 at Goztepe Educational and Research Hospital in İstanbul, Turkey. This study was approved by the Instutitional Review Board.

This was a prospective, observational analytic study. To homogenize the participants, vaginally delivered patients without episiotomy, and complicated labors with forceps and vacuum extractions, patients having pregnancy complications (multiple pregnancies, macrosomia, intrauterine growth retardation, gestational diabetes etc.) or patients who had urinary tract infections during pregnancy and gynecologic or incontinence surgery history were excluded from the study. In the vaginally delivered group, all the babies were in vertex position and the control group delivered with elective cesarean section. The patients were stratified in three groups, primiparous vaginal delivery group, multiparous vaginal delivery group and elective cesarean group.

Postpartum evaluation involved, type of delivery, episitomy required in vaginal deliveries, duration of second stage of labour, birth weight of the baby. The limits of second stage of labor was calculated according to criterias described in ACOG in 1989 as, 2 hours in nulliparous, 1 hour in multiparous women. Urinary incontinence existence was questioned two times, antenatally at 32-39 weeks of gestation and postnatally at 9'th week.

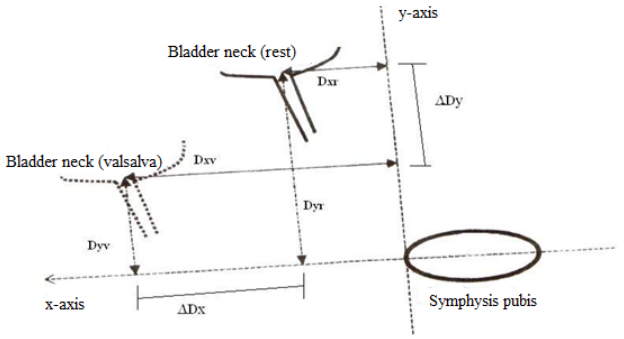
To degree incontinence İngelmann- Sundberg classification was used.(14)

1.Degree: incontinence during coughing, sneezing and laughing

2.Degree: incontinence during walking, running,climbing and bouncing

Perineal ultrasonographic examination was performed with3,5 mHz convex probe with General Electric Logic 200 proseries, with a bladder volume of 100-300 ml to visualize bladder base and neck, urethra and symphysis pubis at a transsaggital imaging. The bladder neck was studied by examining its relationshipwith an anatomical landmarkrepresented by the inferior margin of the pubic symphysis. Once the inferior edge of the symphysis pubis, the bladder,urethrovesical junction and the urethra were visualized during rest, the image was frozen and placed on one side of the screen. Next step was performed by when patients were visualized with Valsalva maneuver. The new image was frozen and placed on the other half of the screen (15). The position of the bladder neck was analyzed according to an XY-coordinate system, a reproducible method (16) The X-axis was a vertical line tangent to the inferior margin of the symphysis pubis, and the Y-axis was perpendicular to the X-axis. The screenplay and image acquisition were standardized among patients, so that the transducer appeared at the top, and the left side was represented by the ventral aspect of the patient.

Figure 1. Comparative transperineal landmarks, pubic symphysis and bladder neck at rest and on Valsalva maneuver.



The distance between the bladder neck and Y-axis (Dxr), showed ventrodorsal movement. The distance between the bladder neck and X-axis (Dyr) showed cephalocaudal movement. Substraction values of Dyr and Dyv showed bladder neck cephalocaudal mobility (ΔDy)

Substraction values of Dxr and Dxy showed bladder neck ventrodorsal mobility (ΔDx)

Bladder neck mobility was calculated as a vectorial distance by a formula:

Mobility (M) = $\sqrt{\{ (xv-xr)^2 + (yr-yv)^2\}}$

Vectorial distance was compared before and after birth in each patient. Values before birth were defined as (ΔDx1,ΔDy1,M1), values after birth were (ΔDx2,ΔDy2,M2).

Substraction values of after birth measures and before birth measures showed differences.

Patients were asked not to perform pelvic floor muscle training after delivery until 9 weeks postpartum.

STATISTICAL ANALYSIS

SPSS (Statistical Package for Social Sciences) for Windows 10.0 was used for analysis of the data. While evaluating the study data, descriptive statistical methods (mean, standard deviation) as well as Oneway Anova test in the comparison of groups of parameters with normal distribution in quantitative data comparisons, Tukey HSD test as Post Hoc and student t test in the comparison of two groups were used. Kruskal Wallis test was used to evaluate

cases, in terms of three groups which did not show normal distribution, two groups evaluations was conducted with Mann Whitney U test.Ki-square test and Mc Nemar test was used to compare qualitative data. Result were evaluated in 95% confidence interval, p<0.05 significance level.

RESULTS

According to the patients'demographic characteristics presented in Table 1, statistically significant differences were documented betweenthe age, and the existence of urinary incontinence during pregnancy in the multiparous patients and primiparous patients along with cesarean group (p=0.015; p<0.05 and p=0.002; p<0.01) In the primiparous group, presence of incontinence during pregnancy was significantly lower,compared to both multiparous vaginal delivery and cesarean delivery group (Table 1).

Table 1. Evaluations according to the way of labour

				Way of Labour		
		Primiparous		Multiparous	CS	*p*
			(n=18)	(n=39)	(n=43)	
Age(year)		26.38 ± 4.61		29.97 ± 5.53	26.76 ± 5.78	*0.015**
Birth weight(kg)		3643.8	± 422.7	3390.0 ±404.6	3191.1 ± 580.9	*0.005**
Parity		0.00	± 0.00	1.60 ± 0.77	0.69 ± 0.74	*0.001***
Pregnancy Week During Measurements		35.83	± 1.57	36.76 ± 1.11	36.72 ± 1.69	*0.063*
Incontinence in Pregnancy n(%)	(+)	1(5.6%)		20(51.3%)	12(27.9%)	*0.87*
	(-)	17(94.4%) 19(48.7%)		31(72.1%)	*0.002***	

*p<0.05 significant **p<0.01 highly significant (Oneway Anova Test was used) (Parity: evaluated by Kruskal Wallis Test)

Bladder neck three-dimensional mobility was calculated as ventrodorsal (ΔDx), cephalocaudal (ΔDy) and vectorial (M) distances measured before delivery and after delivery. Substracted differences between these measures (ΔDx difference, ΔDy difference, M difference),were not statistically significant in the multiparous vaginaldelivery group and the primiparous vaginal delivery group.(ΔDx: p=0.790; p>0,05, ΔDy: p=0.870; p>0.05, M: p=0.385; p>0.05). In the cesarean delivery group, a significant difference was observed when compared with both the primiparous and multiparous vaginaldelivery group in which both groups pooled together(p<0.01).

Table 2: Evaluation of ultrasonographic parameters before and after labour according to the way of labour

After labour incontinence	Before Labour			After Labour		
	ΔDx Mean ± SD	ΔDy Mean+ SD	M Mean ±SD	ΔDx Mean ± SD	ΔDy Mean+	M Mean ±SD
Primar (n=18)	6.86± 0.37	13.43± 1.06	15.06± 0.95	7.97± 0.85	14.77± 1.37	16.74± 1.37
Multipar(n=39)	8.01± 2.71	16.64± 2.79	18.60± 2.92	9.67± 2.49	17.80± 2.98	20.31± 3.37
CS(n=43)	5.55± 1.98	11.79± 2.39	13.12± 2.47	5.82± 1.21	11.75± 2.95	13.10± 3.00
p	*0.001***	*0.001***	*0.001***	*0.001***	*0.001***	*0.001***

**p<0.01 highly significant (Oneway Anova Test was used)

Table 3: Evaluation of ultrasound parameters according to the way of labour,

			Way of Labour		
	Primiparous		Multiparous	CS	*p*
		(n=18)	(n=39)	(n=43)	
ΔDx difference (after-before)	1.10	± 1.00	1.65 ± 2.47	0.27 ± 1.72	*0.79*
ΔDy difference (after-before)	1.33	± 1.60	1.15 ± 0.79	-0.04 ± 0.94	*0.87*
M difference (after-before)	1.68	± 1.64	1.71 ± 0.96	-0.01 ± 0.90	*0.385*
	(Kruskal Wallis test)				

Existence of stress urinary incontinence symptoms, after delivery was found to be significantly related to age, (p<0.01), baby's birth weight (p<0.05), and increasing parity (p<0.01) of the patients. After delivery incontinence was detected in 51% of patients, from incontinent patients 21.6% were in primiparous group, 66.7% were in multiparous group and 11.8% were in cesarean group. In multiparous group, ratio of existence of symptoms were 87.2%, which was significantly different from the other two groups (p<0.01).

In order to understand the role of episiotomy in the development of stress urinary incontinence, patients with vaginal delivery with episiotomy were investigated. In 45 patients with episiotomy, 34 (%75.6) and, 12 patients without episiotomy 11 had positive incontinence symptoms (%93.3). After delivery stress incontinence and episiotomy existence did not have a significant correlation (p=0.224). Prolongation of the second stage of labour and stress incontinence also did not have a statistical significance (p>0.05) (Table 3).

Table 4: Episiotomy assessment according to incontinence status after labour

Episiotomy	Incontinence after labour		*p*
	Positive n(%)	Negative n(%)	
Positive (n=45)	34(%75.6)	11(%91.7)	*0.224*
Negative (n=45)	11(%24.4)	11(%8.3)	
Length of the second stage of labor	31.58± 18.34	38.33 ± 8.32	*0.074*
	(Ki-square test)		

When antepartum and postpartum stress urinary incontinence evaluated according to the way of delivery,both primiparous and multiparous vaginally delivered group, postpartum incontinence was found significantly higher than antepartum examination. Conversely, in cesarean group, postpartum incontinence was significantly lower than the antepartum period. (p<0.01 and p<0.05).

Table 5: Evalutaion of before labour and after labour incontinence according to the way of labour

	Before labour incontinence	After labour incontinence		*p*
		Positive n(%)	Negative n(%)	
Primipar (n=18)	Positive	1(% 5.6)	-	*0.002***
	Negative	10(% 55.6)	7 (% 38.9)	
Multipar (n=39)	Positive	20(% 51.3)	-	*0.001***
	Negative	14(% 35.9)	5 (% 12.8)	
CS (n=43)	Positive	6 (% 14.0)	6 (% 14.0)	*0.031**
	Negative	-	31 (% 72.1)	

***p<0.01 highly significant *p<0.05 significant (Mc Nemar test)

Stress urinary incontinence symptoms positive group after delivery, had significant correlation with either before and after delivery measurements of bladder neck mobility. The cephalocaudal, ventrodorsal and vectorial movements were significantly higher compared to incontinence symptoms negative group (p<0.01).

Table 6: Evaluation of ultasonographic parameters before and after labour according to incontinence symptoms' presence.

After labour incontinence	Before Labour			After Labour		
	ΔDx Mean ± SD	ΔDy Mean+ SD	M Mean ±SD	ΔDx Mean ± SD	ΔDy Mean+	M Mean ±SD
Positive (n=51)	7.79± 2.42	15.94± 2.90	17.84± 3.04	9.46± 2.19	17.37± 2.83	19.80± 3.14
Negative(n=49)	5.66± 1.85	11.94± 2.15	13.28± 2.22	5.89± 1.08	11.83± 2.57	13.21± 2.58
p	*0.001***	*0.001***	*0.001***	*0.001***	*0.001***	*0.001***

***p<0.01 highly significant (Student test was used)*

DISCUSSION

Pregnancy and delivery which can damage muscular. fascial and neural mechanisms of pelvic floor. is one of the main risk factors for the development of stress urinary incontinence in young women (17.18)Physiological changes during pregnancy. such as increasing pressure of the growing fetus and fetal weight on the pelvic floor muscle throughout pregnancy. together with pregnancy related hormonal changes such as increased progesterone. decreased relaxin and collagen levels. may lead to reduced strength and supportive and sphincteric function of pelvic floor muscle. However. the exact cause of pregnancy and parity related urinary incontinence remain unclear. The prevalence of stress urinary incontinence ranged from 18.6% to 75% and increased with gestational age.(19) One important issue is the diagnosis of stress incontinence. Ideally urodynamic assessment should be performed to make this diagnosis most accurately. We accept that patients with the sole symptom of stress incontinence may still have detrusor instability or other urodynamic diagnosis. but our study was designed to be non invasive and

we therefore relied only on symptom analysis excluding any women with urge incontinence. Previous studies showed that positive predictive value of stress incontinence for genuine stress incontinence. in the absence of urge incontinence. is up to 87%.

Bladder neck mobility is not synonymous with stress incontinence however they frequently co-exist and may have the same aetiology. Bladder neck mobility and anatomical support of the urethra may be likely be disturbed by vaginal delivery. This fact leads to stress urinary incontinence.due to pelvic floor dysfunction. Whether cesarean section delivery may prevent such injury is questionable. Groutz A. et al showed that prevalence of postpartum SUI is similar following spontaneous vaginal delivery and cesarean section performed for obstructed labor. It is quite possible that pelvic floor injury in such cases is already too extensive to be prevented by surgical intervention. Conversely. elective cesarean section. with no trial of labor. was found to be associated with a significantly lower prevalence of postpartum SUI (20). Nygaard I et al. Also stated that.after the first delivery. women delivered vaginally have twofold more incontinence than those delivered by cesarean.(21) In our study. we concluded that elective cesarean section protects against increased bladder neck mobility after labor which leads to symptoms of urinary incontinence compared to both first and multiple vaginal deliveries. Moreover there was a significant difference among primiparous and multiparous vaginally delivered subgroups in terms of increased mobility measurements.

Transperineal ultrasonograhy may be used for morphological dynamic assesment of the bladder neck and urethra and allows reproducible quantitative measurements.especially in pregnancy. It is simple. noninvasive and well tolerated. Bladder neck's position and mobility can be assessed by transperineal ultrasound with a high degree of reliability (22). On Valsalva bladder neck may be displaced in a more caudal and dorsal position. There is no specific 'definition of normal' for this displacement. although cut-offs between 15-25 mm have been proposed to define hypermobility (23). We used bidirectional XY-coordinate system to achieve a high accuracy. In our study. ventrodorsal and cephalocaudal mobility was significantly higher in the vaginally delivered group (both primiparous and multiparous) than the elective cesarean group. One limitation was that median age of the groups were not matched and cesarean section patients were significantly younger.According to Peshers et al. vaginal delivery causes pevic floor damage and disturbes the innervation. however following deliveries causes lower injury potentials(24) which supports our findings of significant differences of bladder neck mobility between multiparous and primiparous groups due to pelvic floor damage caused by increased number of deliveries.

In postpartum SUI positive cases. both antenatally and postnatally vectorial bladder neck movement measurements were higher than the negative group. Similarly. postpartum SUI positive group had higher postnatal levels than antenatally recorded measurements. However mobility measurement differences calculated postpartum and antepartum were not significant in postpartum SUI negative group. In contrast to our study. King et al. declared that the increase in bladder neck mobility postpartum above the antenatal levels was similar in the continent and incontinent groups. suggesting that delivery did not cause greater tissue trauma/weakness in the incontinent group. They also stated that the development SUI cannot solely be explained by a woman's obstetric experience and there appears to be a constitutional susceptibility. The increased antenatal bladder neck movement seen in those women subsequently incontinent could be explained by a preexisting collagen deficiency exacerbated by increased collagen remodelling during pregnancy (25).

In terms of labour and delivery variables. episiotomy existence and prolongation of second stage of labour. a cause of pelvic floor denervation of did not appear to be an important factor causing postpartum incontinence. Therefore the most important risk factor for postpartum SUI. was thought to be the presence of antenatal incontinence. which was 53% in our study.

After the first delivery. women delivered vaginally have two fold more incontinence than those delivered by cesarean (21) Studies investigating the relationship between SUİ. the mode of delivery and increased number of parity. found that elective cesarean has a protective affect on incontinence due to its rescue affect of pudendal nerve damage(26). Wilson et al. Showed that delivery of more than four babies also caused significantly more increased rates of incontinence. supporting the fact that pelvic floor damage increses exponentially.(27) Although parturition is thought to cause damage to the structure and function of the pelvic organs. according to some authors incontinence generally disappears within three months postpartum (28.29) Wijma et al. Showed a marked reduction in the incidence of urinary incontinence 6 weeks after delivery. as compared with 38 weeks of gestation. This holds for the reported as well as for the objectively measured incontinence by the 24 hour pad test. Unlike our study. they stated that incontinence during pregnancy therefore might represent a different entity than urinary incontinence postpartum. The temporary incontinence in pregnancy might be a result of interaction between predisposing hereditary factors and uterine pressure upon the bladder. in combination with hormonal effects upon the suspension ligamentsof the urethra (30). These contrary results may be because of diagnosis of SUI was based on patients' subjective history of incontinence in our study.

In conclusion. vaginal delivery cuases an increase in two dimesional and vectorial bladder neck mobility with valsalva maneuvar. when compared to elective cesarean delivery which was found to be associated with a significantly lower prevalence of postpartum SUI. Whether the prevention of pelvic floor injury causing SUI postpartum. should be an indication for elective cesarean section is yet to be established. Transperineal ultrasound appears to be an appropriate approach for assesing bladder neck mobility and pelvic floor contraction. This technique may help to detect incontinence during pregnancy . which is one of the major risk factors of postpartum incontinence.

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