



## Covert postpartum urinary retention, is there a place for routine bladder ultrasound in postpartum care?

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### Abstract

Postpartum urinary retention (PUR) is defined as inability to void after six hours from delivery or having abnormal post-void residual volume after delivery (PVRV). Overt PUR is easily detectable condition but covert PUR usually remains undiagnosed. We aim to investigate the incidence of covert PUR and identify the risk factors. A retrospective analysis of the postpartum women was undertaken between January-July 2016. PVRV of the patients either delivered vaginally or cesarean section were assessed with ultrasound after first micturition. All the ultrasound scans were made by experienced gynecologist. PVRV of more than 150 mL was defined as covert PUR. Maternal age, parity, BMI, type of delivery, episiotomy, first urination time, fetal head circumference, labor augmentation and fetal birth weight were investigated as possible risk factors for covert PUR. The characteristics of the patients with or without covert PUR were compared. Of the 450 women included, 67 (17.49%) were diagnosed as covert PUR. Birth weight ( $p=0.001$ ), head circumference ( $p=0.043$ ), vaginal delivery ( $p=0.001$ ) and need for episiotomy ( $p=0.003$ ) were statistically different between patients with PVRV under 150 mL and above 150 mL. Fetal head circumference appeared as the only independent risk factor for covert PUR (95% CI for OR=1.11-1.127,  $p=0.04$ ). Although covert PUR is a common problem after delivery, risk factors and treatment have not been established. Until risk factors are identified clearly with larger studies, postpartum routine PVRV evaluation may be beneficial for preventing long-term voiding dysfunction problems.

**Keywords:** Voiding dysfunction, vaginal delivery, cesarean section, urinary retention

### 1. Introduction

Postpartum urinary retention (PUR) is defined as being unable to void completely after delivery (Yip et al., 1997; Buchanan and Beckmann, 2014). The estimated prevalence of the PUR varies between 1.5 % and 45 % (Hee et al., 1992; Zaki et al., 2004; Kekre et al., 2011; Polat et al., 2018). PUR was divided to two categories as overt and covert PUR by Yip et al (Yip et al., 1997). Overt PUR is defined as “the inability to void spontaneously within six hours after vaginal delivery or six hours after removal of an indwelling bladder catheter after cesarean section, requiring catheterization”. Whereas covert PUR is described as “a post void residual bladder volume (PVRV) of  $\geq 150$  mL after spontaneous micturition, verified by ultrasound or catheterization” (Kekre et al., 2011). Although prevalence of overt and covert PUR varies a lot between studies, prevalence of overt PUR was reported to range from 0.3 % the 4.7 %, and prevalence of covert PUR was as high as 45 % (Andolf et al., 1994). PUR

pathophysiology has not been well established but it is known that hormonal changes due to the pregnancy and vaginal delivery related pelvic muscles damage may cause bladder insensibility (Groutz et al., 2004; Kekre et al., 2011). It is suggested that PUR is not an innocent condition, may have serious long-term complications (Mulder et al., 2012). Even a single episode of over-distension of bladder may ensue long-term voiding difficulties, recurrent urinary tract infections and renal dysfunction (Bross et al., 1999; Mustonen et al., 2001; Lewis et al., 2012). Post-void residual volume screening for covert PUR should be done for the women at risk to prevent long term complications. This cross-sectional study was carried out to assess the prevalence of covert PUR and identify possible risk factors and management.

### 2. Materials and methods

This study was conducted between January 2016- July 2016 in a tertiary university-based center in Ankara. 450 women

from 470 patients delivered within this period were recruited for this study. Informed consent was taken from all the patients. Women who had high risk pregnancy, overt PUR, incontinence surgery history and postpartum complications were excluded. None of the patients had epidural analgesia. Ethical approval was taken from Ethical Committee of Ankara University (21-1409-18).

First micturition time and post void bladder volume (PVBV) after 30 minutes from the first micturition were evaluated PVBV was measured with a non-invasive abdominal ultrasound device by the attending physician (USG, Logiq 5 Pro, General Electric Company, Fairfield, CT, USA) (4 MHz convex transabdominal probe was used). Bladder volume was automatically calculated by measuring maximal longitudinal diameter (height), maximal anteroposterior diameter (depth) in the sagittal plane and maximal transverse diameter of the bladder in the transverse plane (Poston et al., 1983).

Demographic characteristics of the patients (age, gestational age, parity, BMI, birth weight, fetal head circumference), use of labor induction, episiotomy, postpartum urinary symptoms were recorded. Women with overt PUR were excluded, and patients with covert PUR were instructed to repeat micturition timely and they were followed until their PVBV was normal.

Data were analyzed using SPSS (IBM Statistics, version 20), with univariate regression analysis. A value of  $\geq 150$  mL was selected as the cut-off PVRV (Glavind and Bjork, 2003; Rizvi et al., 2005). The normal distribution of the variables was analyzed by the Kolmogorov-Smirnov test. Continuous variables with normal distribution are presented as mean  $\pm$  standard deviation. Median (minimum-maximum) value was used where a normal distribution was absent. Quantitative variables are given as number (percentage). Statistical comparison was carried out by chi-square ( $\chi^2$ ), Mann-Whitney U- and independent sample t-tests where appropriate. Logistic regression model was performed to analyze risk factors for PPUR.  $P < 0.05$  was considered statistically significant. Associations between potential predictors and outcome are reported as odds ratios with 95 % confidence intervals.

### 3. Results

450 women were recruited for this study and 18 women were excluded because of having high risk pregnancies and two women were excluded because of overt PUR. Patient characteristics are summarized in Table 1. The mean age of the women was  $28.1 \pm 5.3$  years, their median parity was two (1-6), and 37.3% (168/450) of the patients had cesarean section. First micturition time was  $120.2 \pm 113.5$  minutes and the median PVRV was  $75 \pm 115.5$  mL.

**Table 1.** Characteristics of the study population

Characteristics	Value
Maternal age (years), mean (SD)	28.1 $\pm$ 5.3
Parity, median (range)	2 (1-6)
BMI (kg/m <sup>2</sup> ), mean (SD)	26.6 $\pm$ 3.2
Vaginal delivery, n (%)	282 (62.7%)
Cesarean section, n (%)	168 (37.3%)
Episiotomy, n (%)	154 (54.6%)
First urination time (minutes), mean (range)	120.2 $\pm$ 113.5
Fetal head circumference (cm) mean (SD)	34.6 $\pm$ 4.9
Post voiding residual volume (mL)	75.75 $\pm$ 115.5
Birth weight (gr)	3176.82 $\pm$ 528.82

No difference was detected regarding maternal age, first urination time, maternal age, induction, gestational age and parity between patients with PVRV  $< 150$  mL and PVRV  $\geq 150$  mL. On the other hand, mean birth weight ( $p=0.001$ ), head circumference ( $p=0.043$ ), type of delivery (vaginal delivery and cesarean section,  $p=0.001$ ) and episiotomy ( $p=0.003$ ) were statistically different between groups (Table 2).

In Table 3, univariate regression analysis was shown using a cut-off value of 150 mL for PVRV. Maternal age, BMI, parity, duration of labor, duration of second stage, augmentation, birth weight, episiotomy and first urination time were not significantly associated with covert PUR, however fetal head circumference was significantly correlated with covert PUR in univariate regression analysis (OR=1.31, 95% CI for OR=1.11-1.27,  $p=0.004$ ). Women with PUR were advised to void timely and had ultrasound scan repeated on the second day. Patient with ongoing retention or unable to feel urge to void had indwelling catheter replaced. All the patient's retention had resolved.

**Table 2.** Comparing the characteristics of the population according to the residual bladder volume

	Residual Volume $< 150$ mL Mean (SD)	Residual volume $\geq 150$ mL Mean (SD)	P
Birth weight (g)	3157.41 $\pm$ 554.0	3291.7 $\pm$ 323.0	0.001*
First urination time (min)	118.3 $\pm$ 114.8	136.2 $\pm$ 102.3	0.490
Age (years)	28.2 $\pm$ 5.3	27.4 $\pm$ 4.92	0.611
Head Circumference (cm)	33.3 $\pm$ 4.8	36.3 $\pm$ 4.6	0.043*
	n	n	
Augmentation -	149	22	0.490
Augmentation +	22	33	
Nulliparity-	271	53	0.160
Nulliparity+	112	14	

**4. Discussion**

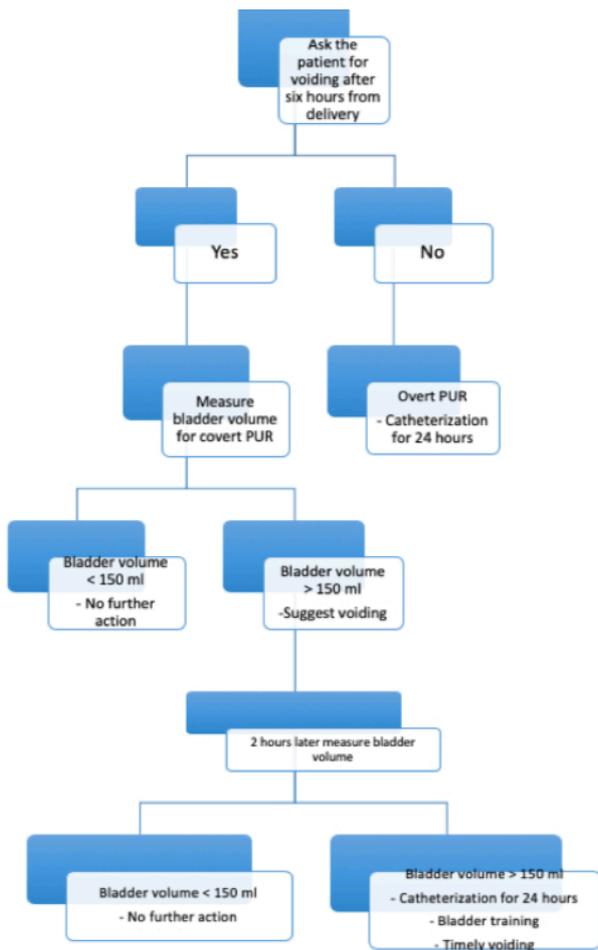
In this study the incidence of PUR was found to be 17.49% in accordance with the literature (Buchanan and Beckmann, 2014; Carley et al., 2002; Liang et al., 2007). It is estimated that the real incidence is higher but it seems like covert PUR is underdiagnosed due to its asymptomatic nature. There are several incidences about postpartum urinary retention in the literature. Kekre et al. showed that PUR incidence is 10.9% after vaginal delivery, on the other hand Liang et al. studied PUR incidence after cesarean delivery and found 24.1% (Kekre et al., 2011). Cavkaytar et al. conducted a study in Ankara and found 8.1% of PUR incidence after vaginal delivery similar to the literature (Cavkaytar et al., 2014). For covert PUR incidence in the studies is higher, Mulder et al. showed covert PUR as 47% in accordance with literature (Mulder et al., 2012). In a recent study Polat et al. found that 22.1% of the patients had PUR similar to our data (Polat et al., 2018).

We found that higher birth weight, fetal head circumference, vaginal birth and episiotomy were common among women with covert PUR in accordance with the literature (Buchanan and Beckmann, 2014).

mL and 500 mL, respectively (Mulder et al., 2012). We identified that larger fetal head circumference, vaginal delivery and episiotomy were risk factors for covert PUR. It is shown that vaginal delivery can directly traumatize pelvic floor muscles and innervations, besides it causes obstruction via periurethral and vulvar edema (Mulder et al., 2012). In our study first urination time was not a risk factor for covert PUR similar with literature (Lim, 2010). Age also was not different between the patients with covert PUR and normal PVRV in unison with literature (Buchanan and Beckmann, 2014).

**Table 3.** Univariate regression analysis for the risk factors for covert PUR

Clinical factor	PVRV $\geq$ 150 mL		p
	OR	95 % CI	
Maternal age (per year)	0.94	0.85-1.04	0.94
BMI (per kg/m <sup>2</sup> )	0.97	0.81-1.21	0.37
Primiparous (yes/no)	1.86	0.44-7.71	0.39
Duration of labor (per minute)	1.21	0.78-1.42	0.52
Duration of second stage (per minute)	1.51	0.43-2.32	0.64
Augmentation (yes/no)	1.30	0.42-3.99	0.39
Birth weight	0.99	0.99-1.1	0.29
Type of delivery	1.1	0.90-1.13	0.98
Episiotomy (yes/no)	0.98	0.30-3.14	0.97
First urination time (minutes)	1.00	0.99-1.05	0.96
Fetal head circumference (cm)	1.31	1.11-1.27	0.04



**Fig. 1.** Algorithm for management of covert PUR

We found that birthweight was associated with covert PUR. Similarly, Mulder et al. reported that each increase of 100 g of fetal birth weight increases PVRV  $\geq$  150 mL, 250

The ages of the women within the study were similar so we did not have enough number of patients with different ages to clarify the effect. The long-term effects of covert PUR were not studied with long-term prospective studies. In the recent literature, it is concluded that covert PUR does not seem to cause any micturition problems after one year from delivery (Routine Postnatal Care of Women and their Babies, NIH Guideline, 2006). On the other hand, in a recent review, it is suggested that covert PUR should not be evaluated as a physiological condition (Mulder et al., 2012). Although long term effects of the covert PUR have not been studied comprehensively, denervation of bladder may end up with voiding problems (Mustonen et al., 2001). In the literature some studies suggest that PUR would resolve completely after delivery on the other hand; some studies emphasize that even a single overdilatation of the bladder may lead to persistent voiding problems (Yip et al., 1997; Kekre et al., 2011). Routine postpartum scan has not been suggested,

NICE guideline on Postpartum Care and WHO Technical Consultation on Postpartum and Postnatal Care has concluded that bladder volume should be measured if patient did not void after six hours after delivery (NIH Guideline, 2006; World Health Organization. World Health Organization Technical Consultation on Postpartum and Postnatal Care, WHO, 2010; Routine Postnatal Care of Women and their Babies). Treatment for PUR also has not been established, if voiding has not been occurred after delivery, fluid intake should be questioned and followed (Buchanan and Beckmann, 2014).

If patient did not feel urge to void, timely voiding and urine analysis should be suggested. Patient should be observed for 24 hours, if problem persists bladder volume should be evaluated and indwelling catheter should be inserted if bladder volume is above 150 mL (Buchanan and Beckmann, 2014). It is shown that after recognizing covert PUR and proper treatment, covert PUR does not seem to associate with long-term problems (Routine Postnatal Care of Women and their Babies. NIH Guideline, 2006). But it is not known whether it would be concluded if we do not make intervention. Urinary incontinence is a common problem in older ages and most of the risk factors are unchangeable regarding pregnancy and labor. So regardless of the risk factors routine bladder ultrasound scan should be a part of postpartum care until risk factors and treatment are clearly established. Here we suggest an algorithm for management of postpartum covert PUR (Fig. 1). The strength of the study is based on having measurement done by gynecologist who took care of the patient. On the other hand, this present study has some limitations due to its retrospective nature. We could not reach patient's history of voiding problems before pregnancy. As a result, we cannot correlate all the retention cases to delivery.

In conclusion, covert PUR is relatively common problem which can lead to permanent voiding dysfunction. Risk factors have not been established, so use of routine postpartum scanning for covert PUR may be offered as it is a non-invasive procedure and may prevent the bladder dysfunction. Future prospective studies are needed to support this approach and clarify the risk factors and long-term effects of the covert PUR.

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#### Declaration of interest

The authors declare no conflict of interest.

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