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CLINICAL ARTICLE

Postpartum urinary retention after cesarean delivery

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Abstract

Objective: To investigate the incidence of postpartum urinary retention (PUR) after cesarean delivery and determine which obstetric factors contribute to this problem. *Method:* A prospective study recruited 605 pregnant women who had a cesarean delivery. Each patient's postvoid residual bladder volume (PVRBV) was estimated with an ultrasound scan after first micturition. The women were divided into 2 groups: PUR (PVRBV $\geq$150 mL) and normal. Patients' characteristics, obstetric parameters, and prevalence of lower urinary tract symptoms at 3 months postpartum were compared. *Result:* The overall incidence of PUR was 24.1%. The incidence of overt and covert PUR was 7.4% and 16.7%, respectively. Morphine-related postoperative analgesia, multiple pregnancy, and low body mass index were significantly associated with PUR. At 3-month follow-up, 5.0% of patients had obstructive voiding symptoms and 9.1% had irritative voiding symptoms. *Conclusion:* Our results revealed PUR was a common phenomenon in patients who had a cesarean delivery, and morphine-related postoperative analgesia was the main contributing factor.
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1. Introduction

Postpartum urinary retention (PUR) after vaginal delivery is a relatively common event, with the reported incidence ranging from 1.7% to 17.9% [1,2]. However, the precise role of cesarean delivery in PUR is difficult to determine because the effects of the operation and anesthesia complicate postpartum bladder changes [3,4]. Furthermore, although the diagnosis of PUR relies on an accurate estimation of the postvoid residual bladder volume (PVRBV) [5], consensus on a standardized definition of PUR has not been reached. Ultrasound is becoming more widely used for detection of postpartum or postoperative urinary retention because it is non-invasive and readily available in most obstetric and gynecology units [6–11]. A PVRBV of 150 mL is the volume definition most commonly used for research purposes [2]; in the present study PUR was based on this value using a bladder scan. The objectives of this

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study were to assess the incidence of PUR after cesarean delivery and analyze the obstetric factors associated with its occurrence.

2. Materials and methods

This prospective study included all pregnant women who had a cesarean delivery in our institution between September 2005 and April 2006. Indications for cesarean delivery included previous uterine scar, abnormal presentation of fetus, placenta previa, placental abruption, cephalopelvic disproportion (CPD), multiple pregnancy, arrest of dilation or descent, and abnormality of fetal heart rate. Informed consent was obtained from all patients prior to participation in the study. The ethics committee of this university hospital approved the study protocol.

A size 14 Charriere (Ch) indwelling Foley catheter was inserted prior to cesarean delivery and then removed 24 h after surgery. An epidural catheter was placed into the epidural space between lumbar 2 to lumbar 5 before surgery. Epidural anesthesia was achieved using mixture increments of lidocaine 1.73%, fentanyl 2.5–5 μg/mL, 0.5–1.0 mEq/mL sodium bicarbonate, and epinephrine 1:200,000. For patients who experienced CPD in labor and had already received epidural pain control, anesthetic agents were directly infused through the epidural catheter. Before completion of the operation, patients were given either epidurally administered bolus of morphine (EBM) or patient-controlled epidural analgesia (PCEA) for postoperative pain relief.

Postoperative analgesia of each patient was given for 24 h by means of one of the following 3 methods: EBM (1.5 mg morphine with 5 mL normal saline every 12 h); PCEA with 2.5 μg/mL fentanyl and 0.067% ropivacaine (5 mL/h); or intramuscular meperidine (50 mg every 6 h). After removal of the epidural catheter the patients' PVRBV was assessed by a bladder scan. Senior research nurses took 2 measurements of PVRBV from each patient within 5 min of the first micturition, and the largest volume was recorded.

Table 1 Characteristics and bladder condition of patients[a]

Variable	PUR ($n=146$)	Normal ($n=459$)	P value
Age, years	31.2 ± 4.7	31.6 ± 4.5	0.418[c]
BMI, kg/m^2	27.5 ± 4.3	28.5 ± 4.3	0.012[c]
Previous pelvic surgery	17 (11)	50 (10.9)	0.99[d]
Time to first void, min[b]	276 ± 82	245 ± 113	0.537[c]
PVRBV	385.3 ± 243.4	69.3 ± 43.3	<0.001[c]
≥500 mL	46 (31)	0	<0.001[d]
150–499 mL	100 (68.5)	0	<0.001[d]
Catheterization	65 (44.5)	0	<0.001[d]

Abbreviations: PUR, postpartum urinary retention; BMI, body mass index; PVRBV, postvoid residual bladder volume.
[a] Values given as mean ± SD and number (percentage) unless otherwise indicated.
[b] Interval between removals of the catheter to first void.
[c] Student t test.
[d] χ^2 test.

Table 2 Comparison of various obstetric characteristics between the urinary retention group and normal group[a]

Variable	PUR ($n=146$)	Normal ($n=459$)	P value
Parity	1 (1–4)	2 (1–5)	0.19
Primipara	71	210	0.236
Multipara	75	249	0.236
Obstetric complication			
Anemia (Hb<10 g/L	18 (12.3)	49 (10.7)	0.579
Pre-eclampsia/ eclampsia	11 (7.5)	32 (7.0)	0.818
DM/GDM	1 (0.7)	6 (1.3)	0.540
Cesarean indication			
Elective[b]	104 (72.2)	348 (75.8)	0.545
Multiple pregnancy	18 (12.3)	30 (6.5)	0.024
Arrest of labor	8 (5.5)	33 (7.2)	0.474
Abnormal FHB	16 (10.9)	48 (10.5)	0.913
Gestational age, weeks	36.6 ± 3.0	37.1 ± 2.7	0.16
Birth weight, g	2909 ± 714	3010 ± 680	0.14

Abbreviations: PUR, postpartum urinary retention; PVRBV, postvoid residual bladder volume; GDM, gestational diabetes mellitus; FHB, fetal heart beat.
[a] Values given as number, number (percentage) and mean ± SD.
[b] Indications included uterine scar, abnormal presentation, placenta previa, placental abruption, and cephalopelvic disproportion.

The patients were divided 2 groups: (1) PUR postvoid bladder scan volume ≥150 mL; and (2) postvoid bladder scan volume <150 mL. Group 1 was further divided into overt and covert PUR groups. Overt PUR was diagnosed if postvoid bladder scan volume was ≥150 mL and there was absence of spontaneous micturition at 6 h after removal of the catheter, and appearance of symptomatic obstructive voiding problems like incomplete emptying, straining, and voiding difficulty. Covert PUR was defined as postvoid bladder scan volume ≥150 mL but without associated urinary symptoms. According to protocol, PUR was managed by repeated intermittent urethral catheterization every 6 h on day 1 in those patients who had overt PUR or the postvoid bladder scan volume was ≥500 mL. When bladder volume was ≥150 mL we performed another ultrasound scan every 6 h until bladder volume was <150 mL. If overt PUR or a postvoid bladder scan volume ≥500 mL persisted into day 2, an indwelling Foley catheter was placed for 24 h and then intermittent urethral catheterization was performed again on day 3. Except for the patients with serious postpartum complications, those with voiding difficulty were discharged from hospital on day 4 and instructed to perform intermittent self-catheterization. All patients were requested to complete a questionnaire via a telephone interview regarding obstructive voiding symptoms and irritative voiding problems at 3-month postpartum [12]. Patients with obstructive voiding symptoms were asked to return to the outpatient department for further evaluation of bladder function.

Statistical analysis was conducted with SPSS software (version 11.0 for Windows; SPSS, Chicago, IL, USA). The Student t or Mann–Whitney test was used for statistical comparisons involving quantitative data. For comparisons involving qualitative data, χ^2 analysis was used. Logistic regression was applied to determine the

covariates associated with PUR. A P value of <0.05 was considered statistically significant.

3. Results

Eleven patients were excluded because their indwelling catheters were in place longer than 24 h after cesarean delivery for reasons unrelated to PUR, such as severe pre-eclampsia/eclampsia ($n=9$) or postpartum hemorrhage ($n=2$). Owing to a stable postoperative condition, 43 patients with pre-eclampsia/eclampsia who received 1–2 g/h of magnesium sulfate ($MgSO_4$) before surgery and discontinued it 24 h postoperatively were included. A total of 605 women were eligible. The overall incidence of PUR after cesarean delivery was 24.1% ($n=146$). The incidence of overt and covert PUR was 7.4% ($n=45$) and 16.7% ($n=101$), respectively. Table 1 summarizes the demographic and clinical characteristics of the patients with and without PUR. Both groups were similar except for body mass index (BMI) at delivery, and PVRBV. Of the 65 patients who received intermittent urethral catheterization to relieve PUR, 58 (89.2%) had resolution of PUR within 24 h after removal of the indwelling catheter; intermittent catheterization was performed once in 42 (64.6%) patients, twice in 15 (23.1%) patients, and 3 times in 1 (1.5%) patient. Seven patients (10.8%) needed an indwelling catheter to resolve PUR, but all of these patients had resolution of PUR by the time of hospital discharge.

Table 2 compares the obstetric characteristics of patients with and without PUR. Cesarean delivery for multiple pregnancy ($P=0.024$) was the only obstetric factor that was significantly different between the 2 groups. However, analysis of postoperative analgesia methods revealed a significantly higher incidence of PUR in patients who received epidural morphine (30.1%) compared with methods of patient-controlled epidural analgesia (16.3%) and intramuscular meperidine (16.8%) [$P<0.01$].

To identify independent risk factors for PUR obstetric parameters were used as covariates by logistic regression. The results showed that morphine-related postoperative analgesia, BMI at delivery, and cesarean for multiple pregnancy were positively correlated with PUR ($P<0.05$; Table 3). Of 30 patients (5.0%) with obstructive voiding symptoms, 12 (2.0%) had postvoid bladder scan volume ≥ 150 mL at 3-month postoperative follow-up. Fifty-five patients (9.1%) had irritative voiding problems. No significant difference in the percentage of voiding problems was found between the PUR group and the normal group.

Table 3 Logistic regression analysis of risk factors for postpartum urinary retention (odds ratio of residual volume ≥ 150 mL)

Risk factor	OR	95% CI	P value
Morphine-related postoperative analgesia, yes vs no	2.240	1.493–3.360	<0.001
BMI at delivery, kg/cm^2	0.978	0.960–0.996	0.015
Multiple pregnancy, yes vs no	2.324	1.227–4.400	0.010

Abbreviations: OR, odds ration; CI, confidence interval; BMI, body mass index.

4. Discussion

In this series 65 (10.7%) patients needed catheterization to resolve their voiding problems during the immediate postpartum period. Fortunately, a transient PUR did not indicate persistent voiding problems, and 42 (64.6%) of these patients resumed spontaneous micturition after one episode of intermittent catheterization and all had recovered from urinary retention at the time of hospital discharge. Only 5% of patients had obstructive voiding symptoms at 3-month postpartum follow-up. Viktrup and Lose [13] prospectively studied a group of primiparous women 5 years after the first delivery and found that women with stress urinary incontinence at 3 months after their first delivery carried a 92% risk of having stress urinary incontinence 5 years later. Special attention can be paid to those at increased likelihood of developing subsequent urinary problems.

The analyses of our data showed that PUR correlated with 3 parameters, namely postoperative analgesia, maternal BMI at delivery, and cesarean delivery for multiple pregnancy. At present, published data are limited to the relationship between postoperative analgesia after cesarean delivery and PUR. Evron et al. [3] investigated PUR in 120 women undergoing cesarean delivery under epidural anesthesia who also received either epidural morphine, epidural methadone, or non-opiate drugs for postoperative pain relief [3]. They found the highest incidence of urinary disturbances occurred after postoperative epidural morphine analgesia as exemplified by the low volumes of urine voided and the prolonged time to first micturition. In their study 57.5% of patients who received postoperative epidural morphine needed urethral catheterization due to micturition difficulty [3]. The mechanism underlying the high incidence of urinary disturbances occurring after postoperative epidural morphine is unknown; many factors are involved in the act of micturition, such as elastic tension of the bladder wall, its nervous control, tonicity of the smooth muscle of the bladder neck and of the abdominal muscle wall, and nervous system control [14].

The mean BMI was significantly higher in the normal group than in the PUR group. In addition, a fixed dosage of epidural bolus morphine was given to patients in the epidural morphine group. Therefore, it might be possible that patients with lower BMI were more likely to develop PUR compared to patients with higher BMI because they received a relatively higher concentration of analgesic drugs. Because patients with multiple pregnancy lost much more body weight after cesarean delivery than patients with a single pregnancy, the resulting BMI decrease may also have led to increased risk of urinary problems in this group. Therefore, BMI at and after delivery should be taken into consideration to avoid adverse effects associated with higher dosages of morphine.

In conclusion, our study found that nearly one fourth of patients (24.1%) had PUR after cesarean delivery and the main contributory obstetric parameter to this problem was morphine-related postoperative analgesia. Transient PUR, when detected in a timely fashion, was neither detrimental to urinary function nor associated with development of subsequent voiding problems.

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