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Original Article

Voiding dysfunction in women following cesarean delivery

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ABSTRACT

Objective: This study was conducted to investigate the prevalence of *postpartum* voiding difficulty (PVD) in women after cesarean delivery that required urethral catheterization, and to illustrate its relationship with various relevant obstetric factors.**Material and methods:** For this observational study, 489 pregnant women who had cesarean delivery at ≥ 36 gestational weeks were recruited in a tertiary hospital. Urethral catheterization was implemented in women who could not void spontaneously after cesarean delivery. Patient characteristics, obstetric parameters, and incidences of obstructive voiding symptoms at 3 months *postpartum* were compared between women who had PVD and no PVD.**Results:** Fifty-six cesarean deliveries (11.5%) resulted in PVD. Maternal age > 35 years, emergency cesarean delivery, operation time > 60 minutes, and postoperative analgesia were significantly different between women with and without PVD. Logistic regression demonstrated that emergency cesarean delivery (odds ratio = 5.031, $p < 0.001$), operation time > 60 minutes (odds ratio = 2.918, $p = 0.002$), and postoperative analgesia (odds ratio = 7.610, $p = 0.007$) were independent risk factors of PVD. Nonetheless, all women had resolution of PVD by the time of hospital dismissal. At 3-month postoperative follow-up, three women (5.4%) had symptoms of straining and/or incomplete emptying.**Conclusion:** Our results showed that emergency cesarean delivery, prolonged operation time and postoperative analgesia are the main contributing factors of PVD after cesarean delivery. If urinary retention can be detected in time, transient PVD is not detrimental to urinary function and does not subsequently lead to voiding problems.

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Introduction

Urinary retention after vaginal delivery is a relatively common occurrence, with the reported incidence ranging from 1.7% to 17.9% [1,2]. Several clinical studies have demonstrated that *postpartum* urinary retention (PUR) is associated with various obstetric factors, including the use of epidural analgesia, primiparity, instrument-assisted vaginal delivery, long labor, and perineal trauma [3]. Experimental study revealed that urinary retention after vaginal

delivery is related to the plasma progesterone level change and the expression of caveolin, caveolae, and nerve growth factor in bladder muscle cells [4], but its pathophysiology is still poorly understood. The diagnosis of PUR always relies on accurate estimation of the postvoid residual bladder volumes (PVRBV) by using bladder ultrasound [5–8]; however, there has been no consensus reached yet on a standardized definition of PUR. Actually, PUR does not reflect women who have inability to void after delivery because two-thirds of women with PUR had elevated PVRBV without urinary symptoms [9].

Although previous studies have suggested that the prevalence of retention of urine after cesarean delivery was higher than that after vaginal delivery [10], the relationships between cesarean delivery and PVD remains elusive. The role of cesarean delivery in PUR is difficult to delineate due to the effects of anesthesia and operation

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both complicating *postpartum* bladder changes [10–12]. If urinary retention after cesarean delivery could be detected in time, appropriate catheterization may prevent long-term urinary problems. The objectives of this study were to assess the prevalence of *postpartum* voiding difficulty (PVD) after cesarean delivery and to demonstrate the relationships between various obstetric factors and PVD.

Materials and methods

In recent years, we have conducted a prospective study to evaluate the connection between various obstetric parameters and the urinary incontinence in pregnancy [13]. In the current study, we used the same cohort of women retrospectively to analyze the relationships between various obstetric factors and PVD after cesarean delivery. The Ethics Committee of Chang Gung Memorial Hospital in Taiwan approved the study protocol (No. 103-2986B). Inclusion criteria included all pregnant women who underwent cesarean delivery at ≥ 36 gestational weeks in our institution, a tertiary care hospital, between June 2005 and March 2006. Exclusion criteria were: (1) vaginal delivery; (2) multiple pregnancies; (3) previous surgeries for uterovaginal prolapse or urinary incontinence; (4) severe cardiopulmonary diseases or renal diseases; (5) preeclampsia; and (6) insulin-dependent diabetes mellitus. Indications for cesarean delivery included uterine scar, abnormal presentation of fetus, placenta previa, placental abruption, cephalopelvic disproportion, and emergency cesarean delivery (arrest of dilatation or descent and abnormality of fetal heart rate).

A 14-Charriere indwelling Foley catheter was inserted prior to cesarean delivery and then removed 24 hours after surgery. Postoperative analgesia was given for 24 hours by means of either an epidurally administered bolus of morphine (1.5 mg morphine with normal saline 5 mL every 12 hours) or patient-controlled epidural analgesia with 2.5 $\mu\text{g}/\text{mL}$ fentanyl (Janssen, Cologno Monzese, Italy) and 0.067% ropivacaine (AstraZeneca, Södertälje, Sweden) 5 mL/h in those women requesting pain relief. According to the protocol, management of urinary retention after cesarean delivery in this study was repeated intermittent urethral catheterization every 6 hours after removal on Day 1 of the indwelling catheter in those women who had persistent PVD. The PVRBV of women with PVD were measured with a Bladder scan BVI 3000 (Diagnostic Ultrasound Corporation, IJsselstein, The Netherlands). If PVD or the PVRBV ≥ 150 mL persisted into Day 2, an indwelling catheter was placed for 24 hours, and then intermittent urethral catheterization was performed again on Day 3. Except for those with serious *postpartum* complications, all patients with PVD were discharged from the hospital on Day 4 and instructed to perform intermittent self-catheterization at home. PVD was defined as no spontaneous micturition within 6 hours after the removal of an indwelling catheter (> 24 hours after cesarean delivery) [2]. Resolution of PVD was defined by the ability to resume spontaneous micturition and the PVRBV < 150 mL.

To ascertain whether women diagnosed with PVD subsequently developed obstructive voiding symptoms in the immediate *postpartum* period, all women were requested to complete the Liang et al [14] lower urinary tract symptoms questionnaire via a telephone interview by a research nurse at 3 months *postpartum*. The questionnaire includes eight questions that describes symptoms of nocturia, diurnal frequency of micturition, urgency, stress urinary incontinence, urgency urinary incontinence, incomplete emptying, voiding difficulty, and straining. All participating women answered the questions dichotomously, with yes or no responses. The focus stayed on the obstructive voiding symptoms in this study including straining, incomplete emptying, and voiding difficulty.

The data are summarized as means \pm standard deviations or percentages, as appropriate. Student *t* 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 PVD. A *p* value < 0.05 was considered significant. Statistical analysis was performed with SPSS version 15.0 for Windows (SPSS, Inc., Chicago, IL, USA).

Results

A total of 489 women with cesarean delivery were eligible. The overall prevalence of PVD after cesarean delivery was 11.5%. Table 1 summarizes the demographic, obstetric and fetal characteristics of the two groups of women, with PVD ($n = 56$) and without PVD ($n = 433$). There was no significant difference in PVD rate, whether general anesthesia or regional anesthesia was performed (2/19 vs. 54/471, $p > 0.05$), but postoperative analgesia increased the PVD rate after cesarean delivery (54/56 vs. 341/432, $p = 0.001$). Women receiving epidural anesthesia had a higher PVD rate than those receiving patient-controlled analgesia (36/195 vs. 18/200, $p = 0.017$). Of the 56 women who received intermittent urethral catheterization to relieve PVD, 49 (87.5%) experienced resolution of PVD within 24 hours after removal of the indwelling catheter, with intermittent catheterization performed once in 33 (58.9%), twice in 16 (28.6%) and more than three times in seven (12.5%). Owing to an inability to void spontaneously, four women (7.1%) required an indwelling catheter re-inserted, but all of these women recovered from PVD by the time of hospital dismissal.

When comparing the obstetric and fetal characteristics of women with and without PVD, maternal age > 35 years, emergency cesarean delivery, operation time > 60 minutes, and postoperative analgesia were found to be significantly different between the two groups (Table 1). Multivariable logistic regression showed that emergency cesarean delivery (odds ratio = 5.031, $p < 0.001$), operation time > 60 minutes (odds ratio = 2.918, $p = 0.002$), and postoperative analgesia (odds ratio = 7.610, $p = 0.007$) were associated with PVD after cesarean delivery (Table 2).

Table 1
Comparison of various obstetric and fetal characteristics between PVD and non-PVD groups.

Variable	PVD ($n = 56$)	Non-PVD ($n = 433$)	<i>p</i> ^a
Maternal age (y)	30.7 \pm 4.15	31.7 \pm 4.52	0.951
Parity	1.48 \pm 1.3	1.61 \pm 1.4	0.116
BMI at delivery (kg/m^2)	27.4 \pm 4.25	29.8 \pm 18.73	0.328
Blood loss (mL)	460.7 \pm 198.2	515.3 \pm 258.3	0.128
Operation time (min)	49.3 \pm 10.8	48.5 \pm 12.7	0.632
Newborn birth weight (g)	3116.4 \pm 399.2	3163.5 \pm 468.5	0.473
HC of newborn (cm)	33.9 \pm 1.4	34.3 \pm 1.5	0.207
Hospital stay (d)	4.7 \pm 4.3	4.9 \pm 4.6	0.176
Age > 35 y	8 (14.3)	123 (28.4)	0.035
BMI > 30 kg/m^2	20 (35.7)	138 (31.9)	0.548
Nulliparity	29 (51.8)	202 (46.7)	0.481
Emergency cesarean	21 (37.5)	41 (9.5)	< 0.001
General anesthesia	2 (3.6)	21 (4.8)	1.0
Blood loss > 500 mL	10 (17.9)	85 (19.6)	0.859
Operation time > 60 min	17 (30.4)	62 (14.3)	0.006
Postoperative analgesia	54 (96.4)	341 (78.8)	0.001
Newborn birth weight > 3500 g	14 (25)	94 (21.7)	0.608
HC of newborn > 36 cm	10 (17.9)	77 (17.8)	1.0

Data are presented as mean \pm standard deviation or *n* (%). BMI = body mass index; HC = head circumference; PVD = *postpartum* voiding difficulty.

^a Calculated by Student *t* test or χ^2 test.

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