

# MANAGEMENT OF SYMPTOMATIC UROLITHIASIS DURING PREGNANCY

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Urinary calculi during pregnancy present not only a diagnostic challenge but also a management dilemma. In this retrospective study, we describe our experience with diagnosis and management of symptomatic urolithiasis in pregnant women. A total of 18 pregnant women were treated for urolithiasis at the Department of Urology, Kaohsiung Municipal Hsiao-Kang Hospital, between 1999 and 2004. The incidence of symptomatic urolithiasis during pregnancy was 0.35%. Of the 20 stones found, nine were on the right side and 11 were on the left, and two patients had bilateral urinary stones. Most urolithiasis cases during pregnancy (55.5%) occurred in the third trimester. Flank pain (94.4%) was the most common clinical presentation. Conservative management was successful in 10 patients until the end of pregnancy and then definite treatment was performed. In four patients, a double-J stent was inserted successfully for persistent pain. In three cases with persistent pain, failure of double-J stent placement was treated with ureteroscopic lithotripsy under epidural anesthesia. One patient received percutaneous nephrostomy for persistent renal colic and pyonephrosis. Ultrasonographic evaluation of pregnant women with suspected renal colic is a reasonable diagnostic procedure. Ureteroscopy is another choice when conservative treatment fails.

**Key Words:** pregnancy, ureteroscopic lithotripsy, urolithiasis  
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Generally, the incidence of calculi in the urinary system is infrequent during pregnancy. The reported incidence of symptomatic nephrolithiasis during pregnancy varies widely from 1 in 244 pregnancies to 1 in 1,240 pregnancies [1,2]. The occurrence of urolithiasis during pregnancy is a risk not only to the mother but also to the fetus and may be a contributing factor in premature birth [2]. Diagnosis of stone disease during pregnancy is difficult because of limitations on the

use of X-rays, the common pain in this period, and physiologic hydronephrosis during pregnancy.

Urinary calculi during pregnancy present not only a diagnostic challenge but also a management dilemma. Conservative management will result in spontaneous stone passage in about 70-80% of pregnant women [2,3]. In cases where invasive treatment is required, double-J stents or percutaneous nephrostomy are the preferred less invasive techniques for urinary drainage. Insertion of a double-J catheter can be achieved under ultrasonographic control until the end of pregnancy. Placement of percutaneous nephrostomy can also be achieved with local anesthesia under ultrasound guidance without bladder irritation. Extracorporeal shock wave lithotripsy may affect the fetus and may provoke premature birth or miscarriage.

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Other management such as ureterorenoscopy or percutaneous nephrolitholapaxy (PCNL) may be difficult due to anatomic distortion and may also provoke uterine contractions and abortion.

In this retrospective study, we describe our experience with the diagnosis and management of symptomatic nephrolithiasis in pregnant women. By assessing the clinical data and reviewing the literature, we have tried to set up a diagnostic and management modality for patients with urinary stones during pregnancy.

## MATERIALS AND METHODS

In this retrospective study, we reviewed 18 cases of pregnant women who had been treated for urolithiasis at the Department of Urology, Kaohsiung Municipal Hsiao-Kang Hospital, between 1999 and 2004. Charts of the patients were retrospectively reviewed and observations included age, presenting symptoms, diagnostic methods, urologic intervention, calculi location, stone size, trimester of diagnosis, and postpartum treatment. The diagnosis of urolithiasis in pregnancy was made on the basis of the clinical presentation, the presence of microscopic hematuria in urinalysis, and transabdominal ultrasonography (US), including renal and bladder US. We carefully examined the kidney and ureter for the presence of urinary stones. If the stone could not be visualized by US, only those cases where the postpartum X-ray confirmed urolithiasis were enrolled in this retrospective study. Fetal status was evaluated by obstetric examinations. Pregnancy complications including preterm labor, preterm premature rupture of membrane, and pre-eclampsia were reviewed and the types of delivery were recorded. Follow-up information included the outcome of the infant and the further procedures required after the temporary procedures.

## RESULTS

Eighteen pregnant women with a total of 20 urinary stones were included. During the same period, a total of 5,042 deliveries took place in the Department of Gynecology and Obstetrics at Kaohsiung Municipal Hsiao-Kang Hospital, and thus the incidence was 0.35%. The patients' ages ranged from 23 to 39 years (mean, 30.11 years) and six patients had a history of

stone disease. The diagnosis of urolithiasis was two (11.1%) in the first trimester, six (33.3%) in the second trimester, and 10 women (55.5%) in the third trimester. The demographic characteristics are shown in Table 1. Of the 20 stones, nine were on the right side and 11 were on the left; two patients had bilateral urinary stones detected.

The clinical presentations of these patients are shown in Table 2. Flank pain was the most common clinical presentation in 17 women, gross hematuria in five, fever in four, and urinary frequency in one patient. In laboratory tests, microscopic hematuria was found in 10 cases, pyuria in six, and leukocytosis (leukocyte cell count >10,000/mm<sup>3</sup>) in five. Diagnostic imaging was based on transabdominal US. In 14 cases, renal or ureteral stones were detected by US. The other four patients had hydronephrosis on US without definite detection of the ureteral stones. All these four patients

**Table 1.** General characteristics of patients

	n (%)
History of urolithiasis	
Yes	6 (33.3)
No	12 (66.7)
Gestational trimester at presentation	
First	2 (11.1)
Second	6 (33.3)
Third	10 (55.5)
Mode of delivery	
Cesarean section	7 (38.9)
Vaginal delivery	11 (61.1)
Laterality	
Right side	9 (45)
Left side	11 (55)

**Table 2.** Clinical presentation in symptomatic urolithiasis during pregnancy

Symptoms and laboratory tests	n (%)
Symptoms	
Flank pain	17 (94.4)
Gross hematuria	5 (27.7)
Fever	4 (22.2)
Frequency	1 (5.5)
Urinalysis	
Hematuria	10 (55.5)
Pyuria	6 (33.3)
Leukocytosis (white blood cell count >10,000/mm <sup>3</sup> )	5 (27.7)

**Table 3.** Management of pregnant women with stone disease

Initial management	Patients, <i>n</i>	Postpartum management	Patients, <i>n</i>
Conservative treatment	10	Spontaneous expulsion	7
		ESWL	2
		PCNL	1
Double-J stent insertion	4	Spontaneous expulsion	2
Percutaneous nephrostomy	1	ESWL	2
		ESWL	1
Ureteroscopic stone removal	3		

ESWL = extracorporeal shock wave lithotripsy; PCNL = percutaneous nephrolitholapaxy.

underwent postpartum X-ray which confirmed the presence of the stone.

Management was initially conservative in all patients. In four patients, a double-J stent was inserted for persistent pain or urinary tract infection. In three of these fever patients, the failure of double-J stent placement was then treated with ureteroscopic lithotripsy under epidural anesthesia. We used a semirigid (6F) ureteroscope without ureteral dilatation and no intracorporeal lithotripsy was needed in any of the cases. One patient received percutaneous nephrostomy for persistent renal colic and pyonephrosis. This patient underwent extracorporeal shock wave lithotripsy (ESWL) in the postpartum period. Of the 10 conservatively treated patients, seven expelled the stone spontaneously, two underwent ESWL, and one received percutaneous nephrolithotomy after successful delivery (Table 3).

One patient had paroxysmal supraventricular tachycardia at the time of presentation. Of the 18 patients, 11 had normal vaginal delivery, and seven had an uncomplicated cesarean section. All the fetuses were delivered without complications.

## DISCUSSION

The diagnosis of urolithiasis in pregnancy was based on clinical presentation, the presence of hematuria, and the findings of various radiographic imaging modalities. Excretory urography and nonenhanced computed tomography will result in a significant radiation dose to the fetus. A single-shot intravenous pyelography, in which a single radiograph is obtained 30 minutes after introduction of contrast medium, was considered to be confirmatory in up to 96% of patients [4]. A single X-ray delivers only about 50 mrem to the fetus, while a series of excretory urography

procedures exposes the patient to a radiation dose of 500–4,000 mrem [5]. This imaging technique may be reserved as a second line diagnostic tool but cannot be entirely disregarded.

The diagnostic tools of choice in pregnancy are US and magnetic resonance urography (MRU). Most of the stones in our cases were detected by conventional renal and bladder US. Renal grayscale US was usually the initial study performed when examining a pregnant woman with abdominal pain. However, the false negative rate is high [4] and the sensitivity of US in detecting stones in pregnant women varies from 34% to 47% [2,6]. To improve the value of US, the evaluation of the dilated collecting system must include the entire ureter. McNeily et al [7] reported that the lumbar ureters could be visualized in 77% of hydronephrotic kidneys in asymptomatic pregnant women. The gravid fetus, with placenta and amniotic fluid, provide a perfect acoustic window and the ureters can be easily detected. Stones located in the pelvic ureter or terminal portion of the ureter may require anterior transabdominal or endovaginal approaches. Laing et al [8] have shown that the endovaginal approach may improve the sensitivity of detection of small calculi in the terminal portion of the ureter.

Doppler US with measurement of the renal vascular resistive index (RI) has been introduced recently for the diagnosis of obstructive nephropathy [9]. The RI of the hydronephrotic kidney and the difference between the RI of the corresponding and contralateral kidney ( $\Delta$ RI) were considered positive for obstruction with a value  $\geq 0.70$  and  $\geq 0.05$  [10]. Assessment of ureteral jets by Doppler US was also introduced to detect ureteral obstruction [11]. The use of Doppler US may potentiate the value of US in the diagnosis of ureteral obstruction.

Our study showed that the incidence of ureteral stones was the same in both sides, which was

comparable with previous observations [12,13], despite the predominance of pregnant physiologic hydronephrosis on the right side in 80% of cases [14]. This physiologic hydronephrosis may occur at the end of the first trimester and increase in severity as pregnancy advances. This physiologic dilatation is caused by a combination of hormonal and mechanical effects. The high levels of progesterone and gonadotropin are responsible for smooth muscle relaxation and produce a hypotonia of the renal pelvis and ureter. The mechanical compression of the ureter by the fetus, or engorged ovarian vein is the main effect of physiologic hydronephrosis.

The actual incidence of urolithiasis during pregnancy is hard to estimate because some silent stones do not attack during pregnancy. However, the reported incidence of symptomatic calculi is infrequent. Since 70–80% of pregnant women with symptomatic calculi spontaneously pass the stone [6], the initial management should be conservative with hydration, rest, analgesia, and antibiotics, if necessary. Most of our patients (55.5%) could be managed conservatively until delivery and definite management followed if indicated.

If conservative management fails, and there is presence of infection, obstructed solitary kidney or pain refractory to analgesia, then temporary urinary diversion is indicated. The introduction of a double-J stent is a less invasive and efficient method. In most situations, the double-J stent can be placed under ultrasonic guidance without the risk of radiation [15]. We placed a double-J stent in four patients and their locations were confirmed by US. As most of our patients were in the third trimester, the external appliance and tubing was quite bothersome in these heavy gravid patients. In one patient, double-J stent insertion was not successful and we chose percutaneous nephrostomy for urine drainage. The procedure can be done under ultrasonic guidance and has the advantage of rapid decompression of the obstructed kidney, high success rate, and absence of bladder irritation.

As a result of the innovation through smaller instruments allowing easier access to the ureteral orifice, ureteroscopy has been used as an initial diagnosis and treatment modality for urolithiasis during pregnancy [16–18]. Using a 6F semirigid ureteroscope in three patients, we easily removed stones with stone baskets. In late gestations, the flexible ureteroscope is easier to manipulate in a tortuous ureter, reducing the risk of perforation. Intracorporeal lithotripsy devices, such

as the holmium laser, pulsed dye laser, or pneumatic lithotripter, can be used safely and effectively [17]. Electrohydraulic lithotripsy, which generates high peak pressure and has a narrow safety margin [19], is not advocated in the treatment of pregnant women.

Diagnosis and management of pregnant women with urolithiasis remains a clinical challenge. Ultrasonographic evaluation of a pregnant woman with suspected renal colic is a reasonable diagnostic procedure with high sensitivity. Conservative treatment is still the first choice because most patients with symptomatic calculi will spontaneously pass the stone. If conservative treatment fails, a double-J stent insertion will relieve the majority of symptoms until definite treatment can take place after delivery. Ureteroscopy is another choice when definite intervention is required and the patient is refractory to conservative treatment.

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# 懷孕時有症狀的泌尿道結石治療

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懷孕時合併尿路結石，不只對於診斷是相當大的挑戰，在治療上也是個難題。在這個回溯性的研究，我們提出對於診斷與治療懷孕時合併尿路結石的經驗。從 1999 年至 2004 年，一共有 18 位懷孕婦女因為尿路結石而在高雄市立小港醫院泌尿科接受治療。懷孕時有症狀的結石發生率為 0.35%；在 20 個結石中，右側的有 9 個，左側的有 11 個，其中有兩位同時有雙側的結石。大部分診斷出結石時都在妊娠的第三期 (55.5%)，腹痛 (94.4%) 是最常見的症狀。十位患者以保守性處置而成功的等到生產後再做確切的治療，有四位患者因持續疼痛而放置雙 J 導管，有三位患者因持續疼痛且放置雙 J 導管失敗而接受輸尿管鏡取石術，一位患者則因持續疼痛以及腎盂積膿而接受經皮腎造瘻管引流。利用超音波來診斷懷孕時合併尿路結石是相當合理且準確的方法。輸尿管鏡取石手術對於保守性處置失敗且需要確切泌尿道處置的患者提供另一個選擇。

**關鍵詞：**懷孕，輸尿管鏡碎石，尿路結石

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