

# Management of symptomatic ureteral calculi during pregnancy: Experience of 23 cases

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## Abstract

**Purpose:** To present our experience in the management of symptomatic ureteral calculi during pregnancy.

**Materials and Methods:** Twenty-three pregnant women, aged between 19 and 28 years presented to the obstetric and urology departments with renal colic (17 cases, 73.9%) and fever and renal pain (6 cases, 26.1%); suggesting ureteric stones. The diagnosis was established by ultrasonography (abdominal and transvaginal). Outpatient follow-up consisted of clinical assessment and abdominal ultrasonography. Follow-up by X-ray of the kidneys, ureter, and bladder (KUB), or intravenous urography (IVU) was done in the postpartum period.

**Results:** Double J (DJ) stent was inserted in six women (26%) with persistent fever followed by extracorporeal shock wave lithotripsy (ESWL) one month post-partum. Ureteroscopic procedure and pneumatic lithotripsy were performed for 17 women (distal ureteric stone in 10, middle ureter in 5, and upper ureteric stone in 2). Stone-free rate was 100%. No urologic, anesthetic, or obstetric complications were encountered.

**Conclusions:** Ureteroscopy, pneumatic lithotripsy, and DJ insertion could be a definitive and safe option for the treatment of obstructive ureteric stones during pregnancy.

**Key Words:** Pregnancy, ureteral calculi, ureteroscopy

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Received: 07.05.2012, Accepted: 31.12.2012

## INTRODUCTION

Urolithiasis during pregnancy is reported to occur in about 1/1,500 (0.07%) patients. Factors promoting urolithiasis during pregnancy are urinary tract dilatation by the effect of progesterone, obstruction by gravid uterus, and infection.<sup>[1]</sup> Increased levels of urinary sodium, uric acid, and calcium during pregnancy are countered by increased urinary excretion of stone-forming inhibitors such as citrate, magnesium, and

glycoproteins; so, both pregnant and nonpregnant women have the same risk of urolithiasis.<sup>[1]</sup> Stones are mainly ureteric rather than renal pelvic stones.<sup>[2]</sup>

Clinical presentation for urolithiasis during pregnancy is mainly after 20 weeks of gestation; with renal colic, dull aching pain, tenderness, fever, and hematuria. These conditions have been associated with increased risk of spontaneous abortion, premature labor, and low-birth weight infants.<sup>[2]</sup>

Patients with failed initial conservative treatment can be subjected to treatment either by percutaneous nephrostomy (PCN) or insertion of double J (DJ) stent till definitive treatment in the postpartum period. Technical advancement in endoscopes and lithotripters (especially laser and pneumatic) offers the urologist a novel treatment option for urolithiasis during pregnancy.<sup>[3]</sup>

Access this article online	
Quick Response Code:	Website: <a href="http://www.urologyannals.com">www.urologyannals.com</a>
	DOI: 10.4103/0974-7796.120294

In this retrospective study, we present our experience in the management of symptomatic ureteral calculi during pregnancy.

## MATERIALS AND METHODS

In the period between April 2008 and March 2011, 23 pregnant women aged between 19 and 28 (mean: 23 years) presented at the obstetric department with symptoms suggestive of ureteral calculi. The gestational period at presentation was between 16 and 35 weeks (mean: 25 weeks). Patients were evaluated by history, obstetric examination, and fetal biophysical profile (nonstress test, fetal breathing, fetal movement, fetal tone, and amniotic fluid volume) to exclude any obstetric causes, and then they were referred to the urology department. The complaint was renal colic in 17 patients (73.9%), and dull renal pain and fever in six patients (26.1%). All the patients were evaluated by laboratory investigations such as complete blood count, blood glucose, blood urea, serum creatinine, and urine analysis and culture. The diagnosis of ureteral calculi relied on the clinical presentation and ultrasonography (abdominal and transvaginal) which showed dilatation of the pelvicalyceal system and ureter and determined the site and size of the stone. Magnetic resonance imaging (MRI) was required in 3 patients with middle ureteric stones to confirm ultrasound findings. No KUB, IVU, or non-contrast computed tomography (NCCT) was done for any patient to avoid fetal hazards.

All patients were admitted. Intervention was indicated in 17 patients with refractory renal colic not responding to analgesics or antispasmodics, and in six patients with persistent high -grade fever (renal dilatation with internal echoes inside by ultrasonography), not controlled by intravenous antibiotics and anti-pyretics.

Urological procedures to relieve renal obstruction/urosepsis were carried out under spinal anesthesia. Patients were put on the operating table in an oblique lithotomy position, with elevation of the right side to decrease the pressure of the pregnant uterus on the inferior vena cava. A broad-spectrum antibiotic and tocolytic drugs were given before induction of anaesthesia. Ultrasonography and tococardiographic monitoring of fetal heart sounds were performed by the obstetrician throughout the procedures.

For the 6 cases with urosepsis, silicon DJ was inserted, while ureteroscopy was done for the remaining cases using 7.3/8 Fr semirigid ureteroscope (Storz) with a 3.6 Fr working channel and 6/7.5 Fr semirigid ureteroscope (Wolf) with a 4.2 × 4.6 Fr working channel.

For those (17 patients) who underwent ureteroscopic procedures, 7 Fr. balloon dilators of the ureteric orifice

were available when needed. Procedures were done under renal ultrasound monitoring with no fluoroscopy. Disintegration of stone was done as needed with a pneumatic lithoclast. Upper ureteric stones were trapped in the dormia basket during disintegration to avoid retropulsion. DJ stent was inserted at the end of the procedure.

Postoperative care was directed toward obstetric care of mother by clinical observation of vital signs, abdominal cramp and vaginal discharge in addition to fetal monitoring by ultrasonographic evaluation and continuous tococardiography with printed chart to be compared with the preoperative one. The patient was discharged according to the clinical status and fetal well-being.

Outpatient urological care included patient follow-up by clinical assessment, abdominal ultrasonography, and urine culture and sensitivity. Radiographic imaging with KUB was done in the postpartum period. Postpartum IVU was required in the 6 patients for whom urgent DJ stents were inserted during pregnancy to relieve urosepsis.

## RESULTS

For a total of 23 stones, the distribution of stones was 10 in distal ureter, five in middle one-third ureter, and eight in the upper one-third ureter. Left sided ureteric stones were encountered in 13 patients. The size of the stones ranged from 1.2 to 2.1 cm (mean: 1.7 cm) as estimated by abdominal or transvaginal ultrasonography [Table 1].

DJ stent (silicon type) was inserted in six women (26.1%) and revealed severe pyuria. Fever and renal pain subsided dramatically after drainage. In the postpartum period, re-evaluation of these patients by KUB and IVU showed impacted pelvi-ureteric junction (PUJ) stone in two patients and upper ureteric stone in the other four patients; all were managed by single session of extracorporeal shock wave lithotripsy (ESWL) one month after delivery. The DJ stent was removed after complete clearance of gravels as evidenced by ultrasonography and KUB [Table 2].

**Table 1: Patients characteristics**

Characteristic	Value
Patients (n)	23
Age	19–28 (mean: 23 years)
Gestation age	16–35 (mean: 25 weeks)
Clinical presentation (%)	
Renal colic	17 (73.9)
Fever and renal pain	6 (26.1)
Stone distribution (%)	
Distal	10/23 (43.5)
Middle	5/23 (21.7)
Upper	8/23 (34.8)
Stone size	1.2–2.1 (mean: 1.7 cm)

**Table 2: Procedures and results**

Procedure	Result
DJ stent insertion (n=6/23, 26.1%) ESWL one month post partum (4 upper ureteric and 2 PUJ stones)	Complete disintegration
Ureteroscopy and pneumatic lithotripsy (n=17/23, 73.1%) Dormia extraction: 4/17 (23.5%) Pneumatic disintegration: 13/17 (76.5%)	100% stone-free rate

DJ: Double J, ESWL: Extracorporeal shock wave lithotripsy, PUJ: Pelvi-ureteric junction

Ureteroscopic procedures were performed for 17 women (10 in the distal ureter, five in the middle ureter, and two in the upper ureter), and confirmed the site and size of ureteric stones. The mean operative time was 35 minutes (30-45). Direct ureteroscopy without dilatation of ureteric orifice was done for 13 cases with the guide wire was inserted under direct vision, while balloon dilatation of the ureteric orifice was needed in four patients. Extraction of stone by dormia was done in four patients with distal ureteric stones, while pneumatic lithotripsy and dormia extraction of fragments was performed successfully in the rest; the stone-free rate was 100%. The DJ stent was left for 1-2 weeks and then removed (under local anesthesia in the outpatient clinic). No urologic, anesthetic, or obstetric complications were encountered. All patients delivered at term, without adverse fetal outcomes [Table 2].

## DISCUSSION

The anatomical and physiological changes occurring during pregnancy affect the whole urinary tract. Accentuation of such changes can become pathological, alter renal function, and produce different urological diseases that can be life threatening to both the mother and fetus. In normal pregnancy, renal pelvis and ureteral dilatation can be encountered as early as seven weeks of gestation. This dilatation is thought to be resulting from the relaxing effect of progesterone and mechanical obstruction of the dextro-rotated gravid uterus, especially on the right side.<sup>[4]</sup> An increased glomerular filtration rate of 30-50% during pregnancy leads to the elevation of the levels of urinary sodium, uric acid, and calcium. Also, there is elevated gastrointestinal absorption of calcium during pregnancy due to the suppression of parathyroid hormone and increased level of active vitamin D, hence promoting the formation of stone. However, dilatation of the upper urinary tract facilitates the passage of stones into the ureter, complicating the pregnancy.<sup>[5]</sup>

Persistent renal colic and urosepsis are true urological emergencies during pregnancy. Thorough urological, gynaecological and general surgical evaluation is needed to exclude other surgical emergencies as acute appendicitis and twisted ovarian cyst.<sup>[6]</sup>

Despite the fact that plain X-ray, IVU and NCCT are convenient and conclusive methods of diagnosis in

nonpregnant urologic patients, they are not used routinely in symptomized pregnant women; so, the challenge here is to make optimal use of remaining options (e.g. ultrasonography) and to bridge the time till delivery and then perform definitive treatment (endoscopy or surgery).<sup>[7]</sup> Ionizing radiation is potentially teratogenic, whose dependent action has not been well defined. During pregnancy, the effects of ionizing radiation depend on the gestational age during exposure, besides absorbed fetal dose. Fetal exposure to radiation of less than 1 rad is safe. The risk of anomalies is considered negligible at 5 rad [0.05 gray (Gy)] or less, and increased only at doses above 15 rad (0.15 Gy).<sup>[8]</sup>

Abdominal ultrasonography was the initial and principal diagnostic tool in our study. For improvement of the value of ultrasonography, the evaluation of the dilated collecting system must include the entire ureters to exclude physiological hydronephrosis. The lumbar ureters can be visualized in 77% of the hydronephrotic kidneys, because the fetus with the placenta and amniotic fluid provide a perfect acoustic window.<sup>[9]</sup> Transvaginal ultrasonography is a tolerable outpatient maneuver. It was very useful in diagnosis of distal ureteric stones in 10 women in the present study. Some authors reported that three-dimensional transvaginal sonography confirmed the presence of distal ureteral calculi in all 62 patients of their study (sensitivity and specificity: 100%); such results exceeded the diagnostic sensitivity of both IVU and abdominal sonography diagnostic sensitivity for the same group of patients.<sup>[10,11]</sup>

Although most ureteric stones (70-80%) can pass with conservative treatment, those not passing may initiate renal colic and urinary tract infection which can cause life-threatening urosepsis endangering the life of the mother and fetus.<sup>[2]</sup> There are many challenges encountered by urologists in the management of symptomatic ureteric calculi with pregnancy including the potential hazards of radiation, anesthesia, or surgery.

The physiologic dilatation of the ureter facilitates the use of ureteroscope in pregnant women. The recent mini-ureteroscopes and stone fragmentation tools and safe anesthesia during pregnancy has made it possible to successfully access and treat any stone within the upper tract in a relatively atraumatic way.<sup>[12]</sup> The ideal lithotripter must have the ability to deliver energy to an extremely localized area with minimal or no collateral damage and must be able to be delivered through a flexible or semirigid ureteroscope. Both Holmium lasers and pneumatic lithotripsy fulfill these criteria.<sup>[13]</sup> We found the pneumatic lithoclast to be safe and effective for the patient and fetus. Many reports showed safety and high success rate (up to 90%) of ureteroscopy during pregnancy.<sup>[3,14-16]</sup>

The use of DJ stent to bypass urinary obstruction in pregnant women has been documented in several series.<sup>[5,17]</sup> Increased rate of DJ stent encrustation during pregnancy is due to gestational hyperuricosuria and hypercalcuria; so, the stent should be changed every 4-6 weeks to avoid such complication.<sup>[18]</sup> Therefore, in this study, we used silicon DJ stents only in six pregnant women with persistent fever; with the removal of these stents one month after delivery, no encrustation was noticed. Our approach recommended direct ureteroscopy for those without urosepsis to avoid the potential complications of DJ stents.

ESWL was done successfully in postpartum period for 6 of our patients. ESWL is contraindicated during pregnancy because of the traumatic effects of the shock waves on the fetus which may lead to fetal death.<sup>[19]</sup>

Some authors recommended PCN for drainage of infected hydronephrosis. Such approach was not used in our study. Disadvantages of PCN include tubal obstruction by debris mandating frequent change, bacteriuria and pyuria, use of external urine bag, urine leakage, frequent dislodgment, erosion, and bleeding. Because of such complications, many authors suggested that the use of PCN be discontinued.<sup>[13]</sup>

## CONCLUSIONS

The clinical presentation of urinary tract obstruction during pregnancy presents a diagnostic challenge. Clinical examination and ultrasonography (abdominal and transvaginal) constitute the main method of diagnostic evaluation of symptomatic ureteric stones. Ureteroscopy and pneumatic lithotripsy and insertion of DJ stent could be a definitive and safe treatment option of obstructive ureteric stones during pregnancy provided that exposure to radiation is avoided during the procedure and there is concomitant good obstetric and anesthetic care.

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**How to cite this article:** Abdel-Kader MS, Tamam A, Elderwy AA, Gad M, El-Gamal MA, Kurkar A, Safwat AS. Management of symptomatic ureteral calculi during pregnancy: Experience of 23 cases. *Urol Ann* 2013;5:241-4.

**Source of Support:** Nil, **Conflict of Interest:** None.