RIGID URETEROSCOPY FOR DIAGNOSIS AND TREATMENT OF URETERAL CALCULI DURING PREGNANCY

GUSTAVO C. LEMOS, OMAR R. EL HAYEK, MARCELO APEZZATO

Albert Einstein Jewish Hospital, São Paulo, SP, Brazil

ABSTRACT

Objective: To evaluate ureteroscopy as a treatment option for women presenting ureteral calculi during pregnancy.

Materials and Methods: Eighteen pregnant patients presenting renal colic and indication of surgical treatment for ureteral calculi were analyzed. Patients were 20 to 34 years old (medium = 28), and the gestation period ranged from 12 to 34 weeks (medium = 18). Lumbar pain was present in 14 patients, and 4 had diffuse abdominal pain. Four patients were febrile in the occasion of the examination. Thirteen patients presented microscopic hematuria, 8 leucocituria, and 4 positive urine culture. The stone was detected by ultrasonography (US) in 12 patients. Magnetic resonance imaging (MRI) was performed in 2 cases, and did not demonstrate calculi. The stone location was: 1 in the superior ureter (pregnancy of 15 weeks), 4 in the medium ureter (pregnancy of 12, 15, 18 and 20 weeks), 12 in the inferior ureter, and 1 was not determined. The surgical indication was difficult pain control, fever, and presence of uterine contractions.

Results: Double-J insertion, as single treatment, was possible in 4 patients and it was kept in place for up to 2 weeks after delivery. Among the patients submitted to ureteroscopy, the calculi retrieval was always possible, except in 1 case where the calculus was not located by US, MRI or ureteroscopy. In 2 patients, the ultrasonic lithotriptor was used and in 11 the stone was removed intact with a basket. There were no complications due to the procedure and all pregnancies were carried to full term.

Conclusion: Rigid ureteroscopy for extraction of ureteral calculi during pregnancy is efficient and safe.

Key words: ureter; ureteral obstruction; calculus; pregnancy; ureteroscopy
Int Braz J Urol. 2002; 28: 311-6

INTRODUCTION

The incidence of urolithiasis in pregnant women varies from 0.026 to 0.531% (1). Symptomatic calculi appear in 1:1,500 pregnancies and is a predetermining factor of premature delivery (2). Calculi occur most frequently in multiparous women, are usually present in the second and third trimesters and are equally frequent in both sides (3,4).

Pregnancy does not predispose to calculi formation, but the dilation of the superior urinary tract caused by the ureteral compression does facilitate the movement of pre-existent kidney calculi. The diagnosis of urolithiasis during pregnancy is more difficult, because the symptoms are misdiagnosed for the common pain of this period, besides the fact that the colic is of low intensity. From 65 to 85% of the ureteral calculi in pregnant women are spontaneously eliminated with the use of analgesics, hydration and infection control, when present (5). Aggravating factors, such as fever, infection and uncontrolled pain, indicate interventionist treatment.

The less aggressive method for ureteral drainage is the simple introduction of a double-J catheter under ultrasonographic control and its use until the end of the pregnancy. The extracorporeal lithotripsy is not indicated during pregnancy due to the risks of abortion and teratogeny (1,6). Ureteroscopy in pregnant woman looks difficult at first sight due to the anatomic distortions caused by the size of the uterus. In practice, these difficulties do not occur and the high rate of success and safety of this procedure is making it one of the best surgical options for the definite treatment of ureteral calculi (7). The calculus can be removed with the Dormia basket or fragmented with ultrasonic, ballistic or laser lithotriptors. The electrohydraulic lithotriptor should be avoided because of the higher risk of ureteral lesion (7).

MATERIALS AND METHODS

Eighteen pregnant patients from 20 to 34 years of age (median = 28), suffering from renal colic and with indication for ureteral drainage were studied. The gestational period varied from 12 to 34 weeks (median = 18). Fourteen patients reported lumbar pain, and 4 reported diffuse abdominal pain. Four patients presented with fever in the examination. Nine had previous history of renal colic due to lithiasis.

Analgesia was performed with 20 mg of hyoscine and 2 ml of intravenous dipirone. In the emergency room, patients were submitted to abdominal ultrasonography, urine sediment analysis, urine culture and antibiogram.

Microscopic hematuria was present in 13 patients, leukocytosis in 8 and positive urine culture in 4. Three patients had Escherichia coli and 1 Klebisiela sp. They were the patients with fever. It was possible to locate the calculus with ultrasound (US) in 12 patients. In the other 6, the presumptive diagnosis was done by the signs and symptoms. Magnetic resonance imaging (MRI) was performed in 2 patients and did not locate the calculus in any of them (Figure-1 and 2). Ureteroscopy was performed in 14 patients, establishing the diagnosis in 13. The calculi dimension on the US varied from 4 to 12 mm, median of 6 mm.

As for location, 1 calculus was in the superior ureter (pregnancy of 15 weeks), 4 in the mid-ureter (pregnancy of 12, 15, 18 and 20 weeks), 12 in the inferior ureter, and in 1 patient the calculus was not located. Ten calculi were on the right side and 8 on the left side.

The difficulty to control the pain, the fever, and the increase in the number of uterine contractions were the factors which led to the indication of surgical intervention. The technique of choice was ureteroscopy with complete removal of the calculus.
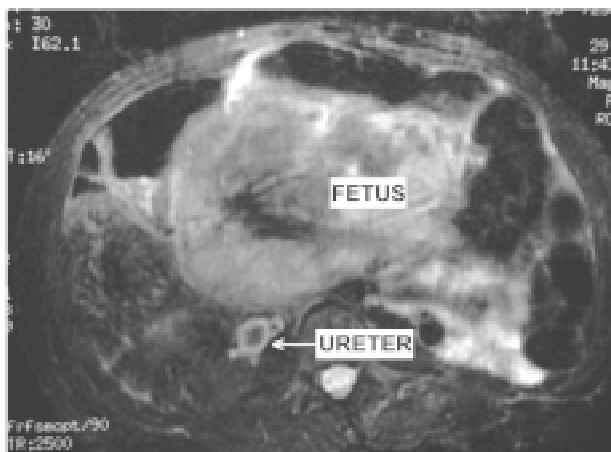
Figure 1 - Abdominal magnetic resonance imaging enhanced with gadolinium shows the fetus and the dilated right ureter. The stone was not identified.

Figure 2 - Magnetic resonance imaging demonstrating the terminal ureter compression by the fetus on the 32nd week of gestation.

The decision to introduce or not a double-J stent at the end of the procedure depended on the lesion to the ureteral mucosa caused by calculi fragmentation or removal. The double-J stent introduced after ureteroscopy was kept in place for 10 days. In the cases of fever, the calculi were not manipulated, double-J stents were introduced and kept in place until the end of pregnancy, without any further manipulation.

The anesthesia used was the epidural associated to midazolam sedation. The surgical procedure consisted of cystoscopy with introduction of a safety guide-wire in the ureter up to kidney or until resistance. After removing the cytoscope, the 7F or 10F ureteroscope was placed with a second guide-wire in its working channel. This second guide-wire was introduced only some centimeters over the optic, and the ureteroscope was placed under direct vision until the calculus. Dilation of ureteral meatus was not necessary in any patient. After visualization of the calculus, the working guide-wire was substituted by the extracting basket which, appropriately placed, allowed the apprehension and removal of the calculus under direct vision. In the cases of larger calculi, in which removal was impossible without fragmentation, the basket was unassembled, the ureteroscope removed from the ureter and reintroduced by the side of the basket and by the safety guide-wire. The ultrasonic lithotriptor was introduced through the working channel and the calculus was fragmented inside the basket. All fragments were removed from the ureter with extracting stent. The safety guide-wire was placed into the renal pelvis under direct vision to allow safe introduction of a double-J catheter.

In 2 patients with calculi in the mid-ureter, and 2 with calculi the inferior ureter, presenting with leucocituria and fever, the treatment was only the introduction of a silicone double-J catheter which was kept in place until the end of the pregnancy, without no further manipulation. The other 14 patients were submitted to ureteroscopy, and a double-J ureteral stent was placed at the end of the procedure in 8 of them. In the vesical extremity of the catheter, a nylon 3-0 was tied and exteriorized through the urethra to allow its ambulatory removal after 10 days.

In 2 patients the placement of the double-J stent was monitored with ultrasound, in 1 patient with fluoroscopy, and in the others no image control was used. The fluoroscopy was used in 1 patient due to an ureteral fold which impaired the guide-wire introduction and consequently the access to the calculus. Thirty-six seconds of fluoroscopy were used in a pregnancy of 32 weeks.

RESULTS

The introduction of a double-J stent, as a single treatment, was possible in the 4 patients in which it was indicated. The fever disappeared 24 hours after intervention and the stent was kept in place until 2 weeks after delivery.

Among the 14 patients submitted to ureteroscopy, it was possible to determine a lithiasic etiology of the obstruction in 13 cases. In these cases of calculus, its removal was always possible. In one patient the diagnosis of renal colic was clinical, and this woman presented with intense colic abdominal pain, large dilation of the right superior ureter and hydronephrosis, but no calculus was located by the US, MRI or ureteroscopy. During caesarian in this patient, a large adherence of the right tube and ovary to the abdominal wall was seen. The uterine growth probably determined the stretch of these structures with pain simulating renal colic. In 2 patients, the calculus was fragmented with ultrasonic lithotriptor, and in 11 it was removed intact by using extracting baskets. The double-J catheter was removed in the physician's office on the 10th postoperative day by pulling the nylon wire.

There were no complications in any of the patients and all gestations were carried on till the end.

DISCUSSION

During pregnancy, the renal physiology and urinary tract anatomy are altered. Uretero-hydronephrosis occurs in up to 90% of the pregnant women, and the renal colic is the major non-obstetric cause of hospitalization (6,8). This dilation is due to ureteral compression by the uterus, iliac vessels and dilated ovarian veins, which appear on the second trimester and disappear 1 month after the birth. The ureteral compression is very evident in MRI. Gener-

ally the dilation is non-symptomatic, nevertheless it may cause colic pain which improve when the patient lies down on the pain contralateral side (9).

The causes of nephrolitiasis during pregnancy are idiopathic hypercalciuria in 42%, hyperuricosuria in 13%, struvite calculus in 13%, hyperparatireoidism in 10%, cystine calculus in 3%, and idiopathic in 19% (10).

The diagnosis of renal colic by lithiasis in pregnant women is very difficult due to the different causes of pain during pregnancy. The lumbar pain is the most frequent symptom in the pregnant woman, and it can be intermittent or continuous, irradiated to the abdomen inferior and anterior quadrant (5). Lumbar pain secondary to overweigh of the spinal column, pubic pain because of the disjunction of the symphysis at the end of the pregnancy, urinary infection, and dilation of the urinary tract by ureter compression are very common. Location of the pain is very altered by uterine growth which dislocates organs and alters irradiations (8). The pain is generally accompanied by nausea, vomiting, increase in urinary frequency and urgency.

Hematuria, both macro and microscopic, is a frequent sign, but is not specific (5,8,11). Urinary infection is present in 20 to 45% of the cases of calculus during pregnancy (1,10,12). Ultrasonography is the main diagnostic method in these cases, because besides its non-invasive nature, it does not use radiation, and is universally available (4,8). Its sensibility in the diagnosis of ureteral calculus during pregnancy reaches 95% (6).

In exceptional cases of diagnostic difficulties and persistent obstruction, patients can be submitted to intravenous urography with 3 plain films; 1 simple, 1 after 5 minutes of contrast medium injection, and another after 15 minutes. The fetus will be exposed to 0,2 radiation, dose which after the 17th week of pregnancy does not increase significantly the risk of malformations (1,4,8). Sometimes the use of the X-Ray is necessary and cannot be substituted by the US. In these cases, the benefits surpass the potential risks to the fetus (13). The exposure of the fetus to radiation can be minimized diminishing to the minimum the time of fluoroscopy, use of collimation devices, lead aprons, and few number of exposures (13-15).

The intravenous urography by magnetic resonance imaging (MRI) with gadolinium is a new and very promising method (16). The calculus is not visible by resonance, being detected by indirect signs, such as the inverted calyx sign. The MRI is only useful in cases of moderate to large dilation of the excretory system. Unfortunately, it is an expensive procedure and is not available in all centers (16).

Ureteroscopy as a method for diagnosing ureteral obstruction during pregnancy is very efficient, but is also aggressive. In our series, it has been indicated to 6 patients with clinical diagnosis of renal colic, dilation of excretory system and indication of drainage. In 5 of these cases, the cause of the obstruction could be identified and corrected. We do not support the isolated diagnostic ureteroscopy during pregnancy. There are cases of intense renal colic of difficult clinical control which cause increase of uterine contractions and, therefore, lead to the risk of premature delivery. In these cases, even without confirmation of ureteral calculus by imaging examination, and only with clinical evidences and indirect signs, 6 patients were submitted to ureteroscopy. In 5 patients there was a calculus which was removed.

Most ureteral calculi during pregnancy are eliminated with analgesia, rest and hydration (1,5,17). When an interventionist treatment is necessary, the options are the introduction of a double-J ureteral catheter, ureteroscopy and open ureterolithotomy (1,4,5,8). The extracorporeal lithotripsy is not indicated during pregnancy due to the risk of placenta detachment, lesion to the fetal pulmonary parenchyma and possible risks of malformation, still unknown (1,8).

Pregnant patients with ureteral calculus and fever should be treated with antibiotics and drainage of the urinary system. The introduction of a double-J catheter is an efficient and low invasive method. These patients should not be submitted to ureteroscopy because ureteral manipulation and liquid injection under pressure in the excretory system may lead to bacteriuria and dissemination of the infection. The disadvantage of the treatment with double-J stent isolated is the need for catheter permanence until the end of pregnancy, which can be a predisposing factor to infections and may cause vesical discomfort in most patients (18).

Ureteroscopy in pregnant woman follows the usual rules, except for the use of fluoroscopy. Ureteroscopy appeared in the beginning of the 80's, and the first studies published on ureteroscopy in pregnant women were of 1996 (7,19). It was supposed that anatomic distortions caused by the fetal presence would not allow the introduction of the rigid ureteroscope and that this surgery could be of high risk to the pregnancy. The natural ureteral dilation in pregnancy facilitates the introduction of the ureteroscope (19). In the present series, we have used the 7F and 10F ureteroscope, without need of dilating the ureteral meatus in any of the cases. In fact, this procedure is simpler than it was supposed in the past.

CONCLUSION

Ureteroscopy for diagnosis and removal of ureteral calculi during pregnancy is an efficient and safe method. We cannot support the method only for diagnosis, but it can be useful as a single procedure, associating diagnosis and treatment, in difficult cases.

REFERENCES

1. Hendricks SK, Ross SO, Krieger JN: An algorithm for diagnosis and therapy of management and complications of urolithiasis during pregnancy. Surg Gynecol Obstet. 1991; 172: 49-54.
2. Drago, JR, Rohner, TJJr, Chetz, RA: Management of urinary calculi in pregnancy. Urology. 1982; 20: 578-81.
3. Maikranz P, Coe FL, Parks J: Nephrolithiasis in pregnancy. Am J Kidney Dis. 1987; 9: 354-8.
4. Maikranz P, Lindheimer M, Coe F: Nephrolithiasis in pregnancy. Bailliere's Clin Obstet Gynaecol. 1994; 8: 375-86.
5. Stothers, L, Lee, LM: Renal colic in pregnancy. J Urol. 1992; 148: 1383-7.
6. Swanson SK, Heilman RK, Eversman WG: Urinary tract stones in pregnancy. Surg Clin North Am. 1995; 75: 123-42.
7. Carringer,M, Swartz R, Johansson JE: Management of ureteric calculi during pregnancy by ureteroscopy and laser lithotripsy. Br J Urol. 1996; 77: 17-20.
8. Parulkar BG, Hopkins TB, Wollin MR, Howard PJ Jr, Lal A: Renal colic during pregnancy: a case for conservative treatment. J Urol. 1998; 159: 365-68.
9. Rasmussen PE, Nielsen FR: Hydronephrosis during pregnancy: A literature survey. Eur J Obstet Gynecol Reprod Biol. 1988; 27: 249-59.
10. Coe FL, Parks JH, Lindheimer MD: Nephrolithiasis during pregnancy. N Engl J Med. 1978; 298: 324-6.
11. Epstein FB: Acute abdominal pain in pregnancy. Emerg Med Clin North Am. 1994; 12: 151-65.
12. Kammerer WS: Nonobstetric surgery in pregnancy. Med Clin North Am. 1987; 71: 551-60.
13. Gray JE: Safety (Risk) of Diagnostic Radiology Exposures. In: Janower ML, Linton OW (eds.): Radiation Risk: A Primer. American College of Radiology, Commission on Physics and Radiation Safety, Committee on Radiologic Units, Standards and Protection, 1996, pp. 15-32.
14. Gibbs SJ: Basic Mechanisms of Radiation Injury Somatic and Genetic. In: Janower ML, Linton OW (eds.): Radiation Risk: A Primer. American College of Radiology, Commission on Physics and Radiation Safety, Committee on Radiologic Units, Standards and Protection, 1996, pp. 5-15.
15. Wyte CD: Diagnostic modalities in the pregnant patient. Emerg Med Clin North Am. 1994; 12: 9-17.
16. Spencer JA, Tomlinson AJ, Weston MJ, Lloyd SN: Early report: comparison of breath-hold MR excretory urography, Doppler ultrasound and isotope renography in evaluation of symptomatic hydronephrosis in pregnancy. Clin Radiol. 2000; 55: 446-53,
17. Cass AS, Smith CS, Gleich P: Management of urinary calculi in pregnancy. Urology. 1986; 28: 370-2.
18. Delakas D, Karyotis I, Loumbakis P, Daskalopoulos G, Kazanis J, Cranidis A: Ureteral drainage by double-J-catheters during pregnancy. Clin Exp Obstet Gynecol. 2000; 27: 200-2,
19. Scarpa, RM, de Lisa A, Usai E: Diagnosis and treatment of ureteral calculi during pregnancy with rigid ureteroscopes. J Urol. 1996; 155: 875-7.

Correspondence address:
Dr. Gustavo Caserta Lemos
Av. Albert Einstein, 623 / sala 1313
05651-901, São Paulo, SP, Brazil
Fax: + 55 11 3845-1118
E-mail: gclemos@ajato.com.br

EDITORIAL COMMENT

Pregnant patients who present with renal colic present many difficulties for their physicians and this paper by Lemos and colleagues outlines some of the problems. The diagnosis may be difficult to make in many individuals owing to the necessity to avoid ionizing radiation and when the diagnosis is made, the treatment of the patient may be unsatisfactory. In the past, double-J stents have been placed as a procedure of first choice in the hope of unobstructing the kidney and relieving the patient's discomfort. The stent, however, often causes seemingly as many problems as the original stone and at least in some patients the stent may become calcified and present significant difficulties in its removal after pregnancy has run its course.

The authors present a good case for ureteroscopic extraction of stones as primary treatment in pregnancy and I certainly, in general terms, support this concept. Certainly in an era of small flexible and rigid instruments, if the stone can be seen, it can almost always be destroyed by methods of intracorporeal lithotripsy.

I think, however, a number of caveats need to be recognized. If the patient is febrile, or has other signs of infection, double-J stent drainage for a few days to stabilize the patient, reduce the fever, and have an opportunity to treat infection is certainly preferable to an attempt at ureteroscopic removal of the stone. The authors recommend engaging the stone in a basket and removing it if possible and if not, breaking the stone up within the basket. I really believe that I would not intentionally engage in a basket a stone that I knew I could not extract and would vastly prefer to use an intracorporeal lithotripsy to fragment the stone and then extract the fragments. This would obviate the very difficult situation if the basket and stone were truly unable to be extracted. As to what the preferred method of stone destruction should be, I think it really is a matter of personal preference, although in the United States currently the Holmium laser is the preferred instrument for this. I realize that some authors have counseled against the use of electrohydraulic lithotrite, but I think if that is what one has one should use that and it certainly can be used safely to minimize the risk of perforation of the ureter. While it is true that pregnancy does not itself predispose to calculus formation, the urinary stasis of pregnancy can certainly precipitate stones in women who have a previous mild or more overt metabolic stone forming diathesis. Often such patients have pre-existing stones and if these stones can be identified prior to conception, it may be possible to prophylactically remove some of these stones or to investigate the patient metabolically and see if there is a stone forming diathesis present. Recently, Lingeman and colleagues reported a series of patients in the Journal of Endourology making a point similar to those made in this fine article.

I do think that endoscopic management of these should be a matter of first consideration in the absence of signs of infection or sepsis and congratulate the authors on a nice contribution.

Dr. Joseph W. Segura
Carl Rosen Professor of Urology
Mayo Medical School
Rochester, Minnesota, USA