

Urolithiasis in pregnancy - Obstetric and urologic complications

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Abstract

Objective: Urolithiasis in pregnancy, though unusual, is a common non obstetric cause of acute abdomen requiring hospitalization. It often presents a unique challenge in diagnosis and management, since presence of a gravid uterus masks or alters the clinical presentation and limits the imaging modalities that can be used for diagnosis, along with restricting the treatment options. When diagnosed during pregnancy renal stones can affect the course of pregnancy and its outcome. The objective of present study was to highlight these problems and discuss the management options. **Methods:** Antenatal women, diagnosed as urolithiasis were studied prospectively for their clinical course, investigated and treated conservatively.

Results: All women displayed complete range of symptoms from asymptomatic bacteriuria, pyuria, hydronephrosis, hydroureter, to renal failure. Obstetric complications were premature rupture of membranes, preterm labor and IUGR. All except two patients benefitted by non surgical treatment. **Conclusion:** When encountered in pregnancy urolithiasis can be a diagnostic challenge. Ultrasonography is a safer modality for diagnosis though a limited urography can be done if necessary. Conservative treatment works well for most patients, progesterone helps in aiding spontaneous expulsion of calculi. Percutaneous nephrostomy or double J stenting of ureters can be done to temporarily relieve ureteric obstruction.

Key Words: Pregnancy, Urolithiasis, obstetric outcome, urologic complications

INTRODUCTION

Although occurrence of urolithiasis in pregnancy is not usual, the incidence being 1:200 to 1:2000 pregnancies,^[1, 2, 8, 10] its presentations and the treatment often challenges the obstetrician. When encountered for the first time in pregnancy it poses lot of diagnostic and management problems along with complicating the course and outcome of pregnancy and puts the urinary tract at an added risk of repeated infections, sometimes compromising the renal function by obstructing the urinary tract. Physiologic and anatomic changes in urinary tract in pregnancy like raised progesterone levels and mechanical pressure of the gravid uterus may cause ureteric, pelvicalyceal dilation and hydronephrosis making the diagnosis difficult by mimicking the symptoms of urinary calculi.^[1,2] Recurrent urinary infections, ureteric obstruction, hydronephrosis, hydroureter, pyelonephritis, obstructive uropathy and renal failure are some of the renal problems, while IUGR, preterm labor, preterm premature rupture of membranes can occur in a pregnancy complicated by renal calculi.^[3,8-10]

An acute attack of ureteric colic (which is the way most of these patients present) has to be clinically differentiated from ectopic pregnancy, acute appendicitis, diverticulitis, twisted ovarian cysts and other causes of acute abdomen. Although many patients may be asymptomatic and urinary stones are diagnosed incidentally during an ultra-sonographic examination.^[3] Coincident pregnancy complicates the clinical picture by masking some of the signs and symptoms and limits the imaging modalities that can be used for diagnosis, along with restricting the treatment options.^[2]

Aim of the present study was to share our experience in diagnosis and management of urolithiasis with pregnancy and to review the literature available on management in similar

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situations and discuss diagnostic modalities and treatment options.

MATERIALS AND METHODS

The study included pregnant women with confirmed diagnosis of urolithiasis (with their full consent) presenting in SGRR medical college and SMI hospital during the year 2011-2012. Basis of diagnosis was the clinical presentation and ultrasonography. All patients initially presented with acute abdominal pain, were admitted to the hospital and investigated with complete blood counts, urine routine, urine culture, blood glucose, blood urea and serum creatinine, along with ultrasonography to confirm the diagnosis and to ascertain fetal well being. These women were followed prospectively for their clinical course.

After hospitalization all patients were given conservative treatment with antispasmodics, analgesics, appropriate antibiotic, hydration and injectable progesterone (we used medroxy progesterone caproate depot injections). There were nine cases of proven renal stones, out of which we present three representative cases of urolithiasis in pregnancies with different clinical course and management, each case elaborating a variety of urologic and obstetric complications, traditionally associated with urolithiasis in pregnancy.

Case no 1: Mrs. D.G. a 24 year old primigravida presented in outpatient with amenorrhea of 28 weeks, severe pain in flanks, dysuria, and frequency of micturition, and fever. She was previously treated for asymptomatic bacteriuria at 12 weeks gestation. Her lab tests showed moderate leukocytosis, positive urinary culture and normal kidney function. Her ultrasound examination showed a live 28 week fetus, with bilateral dilated ureters, hydronephrosis and bilateral ureteric calculi. Since calculi were small, she was treated conservatively with hydration antibiotics, antispasmodics, progesterone and two doses of betamethasone for fetal lung maturity. Patient had repeated attacks of ureteric colic during her pregnancy. At 36 weeks patient was admitted to the hospital with ruptured membranes, after which she went into spontaneous preterm labor and delivered a

male child weighing 2300 Grams. Ultrasound six weeks later revealed bilateral mildly dilated ureters and hydronephroses.

Case no 2: Mrs. A, a 20 year old 2nd gravida presented in the casualty with history of eight weeks pregnancy and severe colicky pain in left iliac fossa, radiating to left flanks with vomiting, on examination she was afebrile, her vital parameters were stable, on abdominal examination there was marked tenderness in left iliac fossa, her ultrasonography revealed an eight weeks intrauterine pregnancy and 10 mm echo dense calculus at left ureterovascular junction, with dilated left ureter. She had normal total and differential count. Urine culture was positive, KFT was normal. After admission patient was treated conservatively and was given injectable progesterone. Next day morning the calculus was expelled spontaneously. Patient's rest of the pregnancy and delivery was uneventful, except for the birth of a low birth weight baby.

Case no 3: Mrs. N.K. a 21 year old primigravida presented in the emergency with 20 weeks amenorrhea and severe colicky pain in right flanks, fever and vomiting. On examination patient was febrile, dehydrated with tachycardia and normal blood pressure. Abdominal examination revealed a gravid uterus corresponding to 20 weeks gestation, tenderness in right lumbar region and renal angle tenderness. Her blood tests showed leucocytes, raised blood urea and ceratinine, urine culture was positive Ultrasonography revealed a gravid uterus with 20.2 weeks live fetus. Right ureter was markedly dilated with right hydronephrosis, and a large 3x5 cm calculus in lower one third of right ureter. Left kidney was smaller in size. Patient was put on conservative treatment with antibiotics, and antispasmodics and progesterone, over next three days her blood urea and ceratinine

kept rising and a decision about cystoscopic ureteric stenting to relieve ureteric obstruction was done. Cystoscopy revealed an inflamed bladder, markedly dilated right ureteric orifice. There was a 5 x 8 cm calcareous stone in urinary bladder, apparently dislodged from ureter. Cystoscopic pneumatic lithotripsy was done and stone removed in fragments by cystoscopic loop and bladder was irrigated. Post operatively bladder was catheterized for four days over which time hematuria and urinary turbidity cleared gradually.

Post operative blood urea and creatinine showed a falling trend till they were within normal limits by fifth post operative day, after which patient went in a diuretic phase needed correction of hydration and electrolytes. Rest of the antenatal period was uneventful patient had preterm premature rupture of membranes at 34 weeks of pregnancy and delivered a female child vaginally weighing 2030Grams. Post partum kidney functions suggested chronic renal failure. Subsequently patient was managed by the nephrologist.

RESULTS

Incidence of symptomatic urolithiasis in pregnancy in our experience was 1 in 300 pregnancies. The Patient details, diagnosis and Treatment details are shown in Table-1 below. The Mean age of patients was 28years and presented in their first or second pregnancy. All except one patients presented in second and third trimester [13 to 33 weeks] one presented in first trimester. Patients were diagnosed of urinary calculi for the first time during the course of pregnancy, presented clinically with ureteric colics, symptomatic or asymptomatic bacteriuria. Diagnosis was done by clinical findings and ultrasonography. Their pregnancies were complicated with repeated hospital admission for urinary

Table-1: Clinical presentation and course of pregnancy with urolithiasis

Case	Age	Parity	GA Wks	Presentation	USG	Treatment	Pregnancy outcome	Urologic complication	Postpartum
1	24 DG	G1	28	Flank pain, fever, dysuria	B/LHU,HN, multiple small calculi	conservative	PROM,ND	Recurrent UTI	persistent HN,HU
2	22 AD	G2A1	8	RIF pain, dysuria	8.5 mm calculus, U-V -J,HU	Conservative	ND,SFD	Recurrent UTI, Spontaneous expulsion	HU resolved
3	20 CH	G1	26	Lt flank pain, Fever, dysuria	B/L HN,HU,Lt ureteral stone 10mm	Conservative	ND	Ureteric colics, Spontaneous expulsion	persistent HU
4	31 PO	G2P1L1	13	Lt lumbar pain	9.5 mm calculus in Lt mid ureter,HU	Conservative	LSCS, obstetric indication	Recurrent UTI	Persistent stone,HU
5	23 NK	G1	19	RT flank pain, fever, dysuria	Marked HU,HN,3.5cm stone in Rt lower ureter	Con +surgical +dialysis	PROM,PML,SFD	Obstructive uropathy, ARF	ARF followed by CRF_pt on dialysis
6	29 SR	G2P1L1	15	RT ureteric colic	B/L HU,RT pevicaleceal stones	Conservative	PROM +VBAC	Spontaneous expulsion	
7	25 DE	G2P1L1	29	Back pain, fever	B/L calculi	Conservative	ND	asymptomatic	Persistent stone
8	25 BA	G1P1L1	18	APN,FEVER,pain	Small Lt kid,Rt mid ureteric stone,RT HU,HN	Conservative followed by dialysis	Spontaneous abortion	ARF, followed by CRF	CRF
9	32 RN	G2P1L1	26	Repeated UTI,Ureteric colics	RT ureteric calculus 2.5cm,HU,HN.,Lt HU, HN	Conservative +DBJ stent	LSCS at 37 weeks [obstetric indication]	ARF,UTI	Persistent HU,HN, DBJ removed at 6 wks PP

UTI - Urinary Tract Infection, HU – Hydrourater, HN – Hydronephrosis, APN – Acute Pylonephritis, PROM – Premature Rupture Of Membrane, PML – Premature Labour, SFD – Small For Date, ARF – Acute Renal Failure, CRF – Chronic Renal Failure, DBJ – Double J Stent, PP – Post Partum

infection, except two cases the kidney function tests were within normal limits. All patients benefitted with conservative treatment except one patient who needed surgical intervention. Two patients had acute renal failure, due to obstructive uropathy were subsequently managed by nephrologists. Obstetric complications included preterm premature rupture of membranes, IUGR and preterm labor.

DISCUSSION

Urolithiasis during pregnancy is an unusual occurrence, but it is also a major cause of non-obstetric acute abdominal pain requiring hospitalization.^[1,7] Above account of three cases illustrates the spectrum of clinical presentation ranging from asymptomatic bacteriuria to frank pyuria, from ureteric colic to obstructive uropathy and renal failure. Incidence of urolithiasis in the literature varies greatly from 1 in 200 to 1 in 2000 deliveries.^[1,2,8-10] some authors quote incidence of Urolithiasis during pregnancy as rare as 0.03 to 0.06%.^[1] Urinary stones during pregnancy are composed mainly of calcium phosphate (hydroxyapatite) in 74% of cases and calcium oxalate in the remaining 26%.^[4] Difficulties arise in diagnosis because symptomatology with which patients present can be confusing,^[2,3] necessitating it to be differentiated from various other causes of acute abdomen. Presence of gravid uterus adds to the confusion by masking or altering the symptoms, pain due to renal calculi and urinary infection can induce preterm labor and uterine contractions also cause extra pain.

Traditionally urinary stones are diagnosed by KUB X-rays, IVP, Ultrasonography, MRI, spiral CT scans etc, In pregnancy however all these modalities cannot be used due to fear of X-ray exposure to unborn fetus., There is reported increased incidence of malignancies in fetuses exposed to radiation [2, 10], making imaging modalities that do not use ionizing radiation (i.e., ultrasonography and magnetic resonance imaging) preferable for pregnant patients.^[5] though some authors believe one X-ray KUB [5mGy], one limited IVP [5mGy] -means that the first film is taken 30-60 minutes after injection of contrast medium, and third exposure, if required, may be taken at 90-minute interval, if still non-diagnostic, a fourth film may be taken 3 hours later - does not offer more than - 5.5mGy- radiation which is not harmful to fetus in second and third trimester and can be used as a diagnostic tool if necessary since many of urinary calculi may not be visible on USG alone.

It is suggested that the human embryo is sensitive to the leukaemogenic effects of radiation, and an exposure as little as 10-20 mGY was associated a slight increase in childhood cancers, and the greatest risk of radiation for the fetus is in the first trimester, a period of rapid cell division.^[6] Although a theoretical risk of carcinogenesis exists, there are no known risks for development of congenital malformations or mental retardation in a fetus exposed to ionizing radiation at the levels typically used for diagnostic imaging.^[10]

Ultrasonography therefore enjoys the position of undisputedly safer means of diagnosis of renal Stones in pregnancy, which along fetal biometry and well being it also gives a full picture of kidney, ureter and bladder, with size, nature and location of calculus and an arbitrary idea of kidney function. However artefacts present can make renal stone to be over diagnosed or underdiagnosed by missing some of the calculi though we were able to diagnose urinary calculi by USG alone there is a possibility that some stones may have eluded detection. .

Ultrasound also has limitation in detecting ureteral calculi. Laitng *et al.*^[10] detected stones in only 2 of 20 patients by trans-abdominal approach. Recent use of trans-vaginal ultrasound has improved the detection rate of calculi at the ureterovesical junction.

Recently, Doppler sonography has evolved as an invaluable tool in the armamentarium of radiologists facing this challenging problem. In experienced hands, the diagnosis of urolithiasis in pregnancy can be made confidently using Doppler sonography and when necessary, excretory urography.^[7]

Kidney stones in pregnancy may remain totally asymptomatic or cause repeated urinary infections, attacks of ureteric colics, hydronephrosis there is rise in incidence of IUGR, preterm premature rupture of membranes and preterm labor.^[11] Starvos *et al* quote a 40 % incidence of preterm labor in pregnancies complicated with urinary stones. Lewis DF, *et al* found incidence of premature rupture of membranes to be 7 % higher.^[12] All our patients showed moderate to severe hydronephroses and hydroureters. Physiologic pelvi-calaceal and ureteric dilatation may occur in as high as 90 % of pregnant women beginning after 8 to 10 weeks of pregnancy, which resolves spontaneously by six weeks postpartum and is due to hormonal and pressure changes by gravid uterus.^[5] Women with preexisting silent renal calculi may become symptomatic when calculi slide into the ureter due to physiological dilatation in pregnancy or may get spontaneously expelled due to muscle relaxing actions of progesterone, though ureteric dilatation may persist, making the diagnosis confusing when only dilated ureters are seen without stones.^[2,8]

Treatment options for renal calculi in pregnancy are again limited due to concerns for adverse effects on the unborn fetus of radiation, anesthesia, and invasive surgery and they have to be weighed against the benefits.^[2] Most patients will benefit from conservative treatment as the first line management, comprising hydration, antibiotics, antispasmodics and progesterone- which by virtue of being a smooth muscle relaxant, relaxes ureteric musculature thereby reducing the pain and help the natural passage of calculus, we found Use of progesterone beneficial in all patients and in some cases it helped expulsion of the calculus.^[2,5,6,9] Burgess KL Gettman MT in their study of 117 patients of urolithiasis in pregnancy quotes a 48 % spontaneous expulsion rate after conservative treatment.^[3] Illya Brody, Nabil Makiad states that 70 to 80 % of symptomatic calculi pass spontaneously with non-surgical treatment,^[4] we found conservative treatment effective in all but one case, which showed signs of obstructive uropathy and needed surgical intervention.

Surgery for calculus is needed sometimes for larger stones causing ureteric obstruction and renal failure by back pressure. Cystoscopy and ureteroscopy with lithotripsy, ureteroscopic baskets for removal of stones, are semi invasive procedures that can be performed in patients requiring relief of obstructive uropathy, or failure of conservative treatment,^[1] but it is difficult to pass the endoscope beyond the pelvic brim during the third trimester of pregnancy, surgical interventions are safest in the second trimester. Extra corporeal shock wave lithotripsy [ECSWL] and percutaneous nephrolithotomy should be avoided in pregnancy because of potential prolonged operating times, fluoroscopic exposures, and unknown effects of shockwave energy on the gravid uterus and developing fetus.^[11,1]

Alternatively percutaneous nephrostomy or double J stenting of the ureters, can be done as a temporary measure and definitive surgical treatment may be postponed until after

delivery. Ureteric stents can help bypass the obstruction till the time definitive surgery can be planned, though they cannot be maintained for more than three to six months^[2, 6] and are not without the risks of infection and concretion formation. Exact protocols for ureteric stents are not available some authors believe they should not be kept for more than four to eight weeks.^[1, 12] In our experience two patients needed surgical management; to relieve ureteric obstruction. Cysto-uretero scopy was done in one patient for removal of the calculus, second needed DBJ stent. Three patients had preterm premature rupture of membranes and preterm delivery. Lewis, Robichaux AG in their study of 86 confirmed cases of renal stones complicating pregnancies found a 3 to 7 fold rise in the incidence of premature rupture of membranes increase in incidence [12]. All neonates had mild to moderate IUGR.

CONCLUSION

Urolithiasis may be diagnosed for the first time in pregnancy when patients present with ureteric colics, obstetricians should be aware of symptoms, consequences, diagnostic and treatment modalities for renal calculi in pregnancy, in many instances co-operation of urologist and nephrologist may be needed. Ultrasonography with addition of TVS scans and Doppler can diagnose most of the calculi. Conservative treatment works well as the first line treatment, use of progesterone is beneficial, some patients however need surgery during pregnancy. Percutaneous nephrostomy and DBJ stents can be performed in case of obstructive uropathy to improve kidney function. There is an increased incidence of repeated urinary infections, PROM and preterm labor, and IUGR.

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