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Management of Urolithiasis in Pregnancy: Study From A Rural Centre

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Abstract

Introduction: Kidney stones are very common and do not spare the pregnant population. Pathological and physiological changes occur in the pregnancy which alter the risk for development of urolithiasis. Urological emergencies that occur during pregnancy are associated with severe risks to both mother and the fetus. Diagnosis is challenging as imaging options without radiation are limited especially in the rural settings. Management of urolithiasis in the pregnant females is unique and requires utmost care. We share our experience of managing the urolithiasis in pregnant females at our rural centre. **Materials and Methods:** All the patients who came to the casualty and the outpatient department of Tambe hospital, Sangamner, Maharashtra from August 2016 to July 2019 were included in the study. A total of 39 patients were included and studied. The records of the patients were reviewed to collect data that included age, symptoms, the laterality of renal colic, sizes and locations of urolithiasis, trimester of diagnosis, pain before and after treatment and pregnancy complications. **Results:** Based on clinical and sonological diagnoses, 13 patients had urolithiasis, and 13 patients had hydronephrosis without definite evidence of calculi. Conservative treatments were successful in 25 patients. Among these treatments, antibiotics were used in 15 patients, and the remaining patients received only hydration and analgesics without antibiotics. Urological interventions were required in 14 patients. The most common intervention was double J stenting, which was performed in 13 patients to treat hydronephrosis or urolithiasis. Percutaneous nephrostomy was done in only one patient. No complications were noted. **Conclusion:** Urolithiasis during pregnancy is more complex than urolithiasis in general population. Diagnosis is challenging. Conservative management is first-line of treatment. If it fails, then both diversion and definitive treatment are acceptable management options. Patient and surgeon's preferences, along with clinical variables and available resources, guide decision-making.

Keywords: Urolithiasis, pregnancy; Double J stent; Percutaneous nephrostomy; Renal colic.

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Introduction

Urolithiasis associated with pregnancy has an incidence of 1:1500.¹ It can be as high as 1:200.² It is more frequent in multiparous patients. It is a

risk factor for preterm labour in more than 40%. Renal/ureteric colic secondary to urolithiasis is the leading non-obstetric cause of hospitalization in the pregnant patient.³

During pregnancy the mother undergoes

many physiologic changes that add many simple and complex problems in stone management. The kidneys increase in size by 1–1.5 cm during pregnancy and volume increases by up to 30% due to increase in renal vascular and interstitial volume.⁴ The total number of nephrons remains constant but the glomerular filtration rate (GFR) is raised approximately by 40–50%.⁵ There is physiological hydronephrosis and hydroureter because of smooth muscle relaxing effect of progesterone. Mechanical compression of the ureters by the gravid uterus at the pelvic brim is another reason for the dilated system specially on the right side due to physiological dextrorotation of gravid uterus and engorged right ovarian vein draining into renal vein on the right side.⁶ The left side is protected from dilation by the loaded sigmoid colon.⁷ These changes are visualized on ultrasound examination by as early as 6 weeks of gestation and get obvious by the mid-second trimester. It takes around 4–6 weeks for resolving in postpartum period. Serial sonological measurements demonstrate that the incidence of hydronephrosis is maximally reached at 28 weeks which contributes 60–80% of overall incidence.⁸ The urinary system is dilated in its entire length and it consists of increased amount of approximately 200–300 mL urine. This excess urine and the physiological dilatation are responsible for urinary stasis. All this leads to 40% increased risk for developing urinary tract infection (UTI) in pregnant women as compared to non-pregnant women⁶. The management depends on the coexisting renal conditions such as stone, pyelonephritis, UTI, pre-existing diabetes, hypertension and any other intrinsic renal disease.

The fetus is also at risk due to the disease, diagnostic investigations, and the treatment modalities. Renal colic has been associated with preterm labour, preterm delivery, premature rupture of membranes, recurrent pregnancy losses, and mild preeclampsia, but data are somewhat mixed.^{9–16} It is therefore, important that urologists must know the best treatment practices in order to provide the optimum care to both the mother and the fetus in utero.

Materials and Methods

All the patients who came to the causality and the outpatient department of Tambe hospital, Taluka – Sangamner, District- Ahmednagar, Maharashtra from August 2016 to July 2019 were included in the study. The data was collected retrospectively for all the patients. The records of the patients were reviewed. Age, symptoms, side of renal colic, sizes

and locations of calculi, trimester of diagnosis, pain before and after treatment and pregnancy complications were recorded. The pregnancy complications included preterm labour, preterm premature membrane rupture, and pre-eclampsia. A total of 39 patients were included and studied in this retrospective study.

The diagnoses of urolithiasis in the pregnant women were based on the clinical presentation, the presence of microscopic haematuria on urinalysis and transabdominal ultrasonography.

Cases with hydronephrosis, hydroureterosis and no evidence of urolithiasis were classified as colic due to physiological changes in pregnancy. Microscopic haematuria was defined as >5 red blood cells/high power field (RBCs/HPF), and pyuria was diagnosed when >5 white blood cells/high power field (WBCs/HPF) were observed.

Expectant management included observation with hydrating the patient, provide proper analgesics and if bacterial infections suspected then starting proper antibiotics covering the urinary pathogens. A sample for urine culture and sensitivity was always send prior to starting the antibiotics.

The urological interventions done were double J stent insertion, percutaneous nephrostomy (PCN), and ureteroscopic stone fragmentation. These were done when conservative treatment failed, there was sepsis, or a solitary kidney need to be saved. The follow-up data included the pregnancy outcome, condition of the infant and requirement of any additional procedures.

Results

Of the total 39 patients with renal colic, 27 patients (74.4%) were in the second trimester, 4 (10.2%) were in the first trimester, and 8 patients (20.4%) were in the third trimester.

The mean patient age at presentation was 30.49 ± 3.24 years. 25 renal colic patients (64.1%) had right-sided colic, and 14 patients (35.9%) had left-sided colic.

The clinical features included visible haematuria in six patients (15.4%), pyrexia in five patients (12.8%), and urinary frequency in one patient (2.56%).

The laboratory tests showed microscopic haematuria in 10 patients (25.6%) and gross pus cells in 12 patients (30.8%). Asymptomatic urinary tract infections were found in 8 patients (20.5%),

and pyelonephritis was observed in seven patients (17.9%). one patient (2.56%) had solitary kidney (Table 1).

Table 1: Clinical presentation of urolithiasis during pregnancy

| | No. of pregnancy (%) |
|--------------------------------------|----------------------|
| Trimester | |
| First | 4 (10.2) |
| Second | 27 (74.4) |
| Third | 8 (20.4) |
| Laterality | |
| Left | 14 (35.9) |
| Right | 25 (64.1) |
| Symptoms & signs | |
| Haematuria | |
| Gross | 6 (15.4) |
| Microscopic | 10 (25.6) |
| Fever | 5 (12.8) |
| Frequency of urine | 1 (2.56) |
| Pyuria | 12 (30.8) |
| Asymptomatic urinary tract infection | 8 (20.5) |
| Pyelonephritis | 7 (17.9) |
| Solitary kidney | 1 (2.56) |

Based on ultrasonography results, 13 patients (33.3%) were diagnosed with urinary stones, and 13 patients (33.3%) were diagnosed with hydronephrosis without definite evidence of urolithiasis. Among the patients with urolithiasis, the sizes of the calculi varied from 2 mm to 10 mm. Lower ureteric calculi were seen in seven patients, upper ureteral calculi were seen in six patients, and renal calculi were observed in three patients. One patient had upper ureteric and renal calculi, and another one had upper ureteric, lower ureteric and renal calculi. Management was initially conservative for all patients. Expectant management was successful in 25 patients (64.1%). Expectant management given was proper hydration, and analgesics and urinary pathogen specific antibiotics, if bacterial infections suspected. A urine sample was send for culture and sensitivity prior to starting the antibiotics. Of all, antibiotics were used in 15 patients (38.5%), and the remaining patients received only hydration and analgesics. Fourteen patients (35.9%) needed interventions due to continuous pain, infection, hydronephrosis, and calculi. The most common intervention was double J stent insertion, performed in 13 patients (33.3%). All patients were relieved of pain after the interventions. Only one patient (2.56%) underwent PCN due to pyonephrosis (Table 2).

Table 2: Treatment of urolithiasis during pregnancy

| Treatment | No. of pregnancy (%) |
|--------------------------------|----------------------|
| <i>Conservative management</i> | |
| With antibiotics | 15 (38.5) |
| Without antibiotics | 10 (25.6) |
| <i>Surgical intervention</i> | |
| Double J stent insertion | 13 (33.3) |
| Percutaneous nephrostomy | 1 (2.56) |

We divided renal colic patients by gestational trimesters at presentation. There were four patients (10.3%) in the first trimester, 27 patients (69.2%) in the second trimester, and eight patients (20.5%) in the third trimester. All patients who were in first trimester were successfully managed conservatively. Eight patients were successfully treated expectantly in the second trimester. Double J stent insertion was done in eight patients and the rest were managed by PCN. Among the eight third trimester patients, three patients were treated with expectant management and five patients by double J stent insertion (Table 3).

Table 3: Treatment of urolithiasis in different trimesters

| Trimester (n = 78) | No. of pregnancy (%) |
|--------------------------|----------------------|
| <i>First</i> | |
| Conservative management | 4 (10.2) |
| <i>Second</i> | |
| Conservative | 18 (46.1) |
| Double J stenting | 8 (20.5) |
| Percutaneous nephrostomy | 1 (2.56) |
| <i>Third</i> | |
| Conservative | 3 (7.69) |
| Double J stenting | 5 (12.8) |

No ureteroscopic stone removal or open surgery was done. There was no pregnancy complication, and all babies were delivered safely without any complication.

Discussion

Urolithiasis is a common cause of non-obstetric abdominal pain in pregnancy and subsequent hospitalization during pregnancy.^{3,17} Management is challenging. It is difficult to differentiate between physiological and pathological changes. Abdominal sonography is the radiological investigation of choice. Treatment options for this condition are very limited. Care of the pregnant woman should be optimal, taking care of the potential risks to the fetus and mother.

The diagnosis of renal and ureteric colic

in pregnancy is based on history, physical examination and radiographic imaging results. The use of different imaging modalities for these conditions in pregnancy remains doubtful due to the teratogenicity, carcinogenicity, and mutagenic nature.

Ultrasound (US) is the diagnostic investigation of choice in pregnant women with abdominal pain. It is easily available at low cost with lack of ionizing radiation.¹⁸

MRI is very good in evaluating specific causes of abdominal and pelvic pain in pregnancy. It is the investigation of choice when ultrasound is inconclusive. It also lacks risk of ionizing radiation.¹⁸ Specifically, magnetic resonance urography (MRU) without contrast can be used a second-line test when US is not able to find the cause of abdominal pain during pregnancy more so when symptoms persist despite conservative treatment.¹⁹⁻²²

Low-dose computed tomography (CT) is a very sensitive and specific in detecting stones, but is not utilised due to the radiation risk. It can be considered as a last-line modality to detect urolithiasis during pregnancy.²³⁻²⁵

Patient of renal colic presents with flank pain that may or may not radiate to the groin²⁶ with or without nausea and vomiting. Dysuria and frequency are present when the stone is present in the lower urinary tract or if infection is present. Haematuria is also present and renal angle tenderness can be elicited on clinical examination.

Abdominal pain, usually, flank is the most common presentation, in the pregnancy affecting 89-100% of women. Haematuria, microscopic or gross is seen in 75-95% of cases.^{11,12,27} In our study also all patients presented with the typical colic and 41% patients had haematuria.

The treatment of renal or ureteric colic during pregnancy is principally conservative. Approximately 70-80% of women with symptomatic hydronephrosis or urolithiasis during pregnancy can be sufficiently treated with hydration, analgesics and antibiotics.^{16,28} Additional medical treatment is needed in 20-30% of women.

Hydration helps decreasing the stasis by increasing urinary flow and output, thus, ease the passage of the calculus. Opioids are generally prescribed to treat acute renal colic and may be used safely in pregnancy. Non-steroidal anti-inflammatory drugs (NSAIDs) are generally avoided in pregnancy due to risk of adverse effects on the fetal kidney, oligohydramnios, and premature

closure of ductus arteriosus.²⁹ Nifedipine is safe in pregnancy to control hypertension, for tocolysis, as well as for expulsion of the lower ureteric calculus in the dose of 20 mg. We also adopted the same line of conservative management in 64% of the patients.

Active intervention was needed in cases of persistent pain, vomiting, septicaemia, obstruction of a solitary kidney, transplanted kidney, obstruction on both sides, impending renal failure, stones >1 cm, and obstetric complications such as premature onset of labour.^{2,30-31} Around 25-40% of patients required active intervention.^{10,11,16,27,33} In our study also 35.8% of the patients required intervention.

In pregnant women, double J stent insertion and percutaneous nephrostomy (PCN) are used to treat renal colic. These are minimally invasive and are established gold standard for the treatment of renal or ureteric colic during pregnancy. They can be done under local anaesthesia. The goal is to de-obstruct the system and prevent further decrease in renal function. PCN is effective but can cause bleeding. The inconvenience of external drainage is always there.

Double J stent insertion is performed through ureterorenoscopy in pregnancy and the location of the double J stent is confirmed by US. Double J stent insertion is as effective as PCN and considered to be a safe and effective first-line intervention for later stage pregnant patients with hydronephrosis or urolithiasis.³³ Both double J stent and PCN therapies should be exchanged periodically to avoid encrustation.

Additionally, ureterorenoscopic stone fragmentation during pregnancy is a safe procedure that can be performed with a rigid, semi-rigid, or flexible instrument.³⁴ Ureteroscopic stone removal requires general anaesthesia and has the possibility of ureteral perforation and sepsis. Due to compression of the urinary bladder by the gravid uterus in the third trimester ureterorenoscopic stone removal should be avoided.³⁵ Johnson et al. and Lifshitz and Lingeman found that there is no statistically significant risk of obstetric complication following ureterorenoscopic stone removal in pregnancy.^{36,37}

In the pregnant patients, percutaneous nephrolithotomy (PCNL) is not advised. There are two case reports in which successful PCNLs were done in early pregnancy.^{38,439} Extracorporeal shockwave lithotripsy is contraindicated in pregnancy due to the effects of the shockwave on the fetus, which can cause abortion⁴⁰.

In our study, we tried conservative management. Double J stent insertion and PCN are safe procedures. We did double J stent insertion mainly to prevent bleeding and the inconvenience of the PCN catheter and the bag. Thirteen patients were treated by double J stent insertion. There were no pregnancy complications. All of the fetuses were delivered without any complications. So, in this study we can suggest double J stent insertion is very safe and effective procedure in the treatment in renal or ureteric colic in pregnancy without leading to complications.

Further prospective studies with a follow-up are needed to compare the distinctions between double J stent insertion and PCN.

Conclusion

Urolithiasis during pregnancy is an important health issue. It can increase the morbidity for the woman. It also increases the risk of obstetric complications. Management of renal stones during pregnancy is challenging because of inability to differentiate the physiological and pathological changes. Type of intervention needed depends upon the surgeon and patients' decision. In our view it is better to go conservative till it is possible. Intervention should only be done when it is absolutely necessary. Even when intervention is done, we should try to do as minimal intervention as possible because there are always chances of abortion in all the above conditions. All the pregnancies are precious as far as the parents are concerned. A multidisciplinary team consisting of obstetricians, urologists, radiologists, anaesthetists, and neonatologists should be the correct approach.

Conflicts of Interest: NIL

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