European Journal of Obstetrics & Gynecology and Reproductive Biology 152 (2010) 13–17

Contents lists available at ScienceDirect

European Journal of Obstetrics & Gynecology and Reproductive Biology

journal homepage: www.elsevier.com/locate/ejogrb

Review

Maternal urological problems in pregnancy

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ARTICLE INFO

Article history:
Received 25 March 2009
Received in revised form 5 April 2010
Accepted 26 April 2010

Keywords:
Asymptomatic bacteriuria
Pyelonephritis
Calculi
Urinary incontinence
Fistulae

ABSTRACT

Urological conditions in pregnancy represent a major diagnostic and therapeutic challenge. During pregnancy the urinary tract undergoes some anatomical and physiological changes that may result in many symptoms and pathological conditions affecting both the mother and fetus. With prompt evaluation and expeditious treatment, the prognosis is good. Fear of causing harm is unfounded. This article describes urological problems in pregnancy, specifically infection, calculus, renal failure, renal tumour, lower urinary tract symptoms and trauma and their management.

Contents

1. Introduction

The many anatomical and physiological changes occurring during pregnancy affect the entire urinary tract. Accentuation of these changes can become pathological, alter renal function and induce various urological diseases which can be life-threatening to fetus and/or mother. Some changes can persist postpartum. Physiological hydronephrosis is the most significant renal alteration during pregnancy, occurring in about 90% of pregnant women by the third trimester.

Frequency and urgency of micturition are common in pregnancy and are mostly due to increased urine output but may be associated with urinary tract infection requiring treatment in 4% of pregnancies. Urgency occurs in 60% of pregnancies, with 5.9% of women developing urge urinary incontinence in the third trimester [1]. Urodynamic studies have shown that 8% of pregnant

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0301-2115/$ – see front matter
doi:10.1016/j.ejogrb.2010.04.013

women may develop detrusor overactivity, with 31% showing decreased compliance [2]. Stress urinary incontinence (SUI) is common during pregnancy and may persist after delivery.

Asymptomatic bacteriuria occurs in 2–8% of pregnancies. Investigation and treatment will prevent about 40% of pyelonephritis and a two-fold higher premature delivery rate [3]. Urolithiasis with similar symptoms to acute pyelonephritis complicates 1:200 to 1:2000 pregnancies [4].

1.1. Anatomical and physiological changes

In normal pregnancy dilatation of the renal pelvis and hydroureter can be seen as early as 7 weeks of gestation. They are thought to be secondary to the muscle-relaxant effect of progesterone and, later in pregnancy, to mechanical obstruction from the dextro-rotated gravid uterus; more marked on the right than the left side. There is a 40–50% increase in glomerular filtration rate (GFR) and a 60–80% increase in the effective renal blood flow [5], resulting in lower serum levels of creatinine, urea and urate when compared to the non-pregnant state. The bladder is drawn upwards anteriorly as the uterus enlarges, becoming more of an abdominal than a pelvic organ by the third trimester. Radiological studies in pregnancy show that the bladder is distorted by the uterine fundus, and in labour the bladder neck is displaced forwards and becomes funnelled [6].

2. Upper urinary tract

2.1. Hydronephrosis

Mild hydronephrosis is considered a normal phenomenon and may be present in up to 90% of pregnancies [7,8]. Increased diuresis, small stones or other unrecognized obstruction may cause decompensation of ureteral function, progressing to symptomatic acute hydronephrosis [9]. Acute hydronephrosis left untreated can progress to life-threatening infection, which may endanger the life of mother and the fetus. Symptomatic hydronephrosis occurs in $<3\%$ cases [10]. The main symptoms are flank and loin pain, as in acute pyelonephritis. Investigation should include urinalysis, urine culture, renal function and renal sonography. Perinatal outcome is very good as $>90\%$ of cases will resolve with conservative treatment—analgesia, intravenous (IV) fluid and IV antibiotics on signs of infection [9,11].

On failure of conservative measures (non-resolving signs of renal infection after 48 h, deteriorating renal function and worsening loin/flank pain), surgical drainage with a double pigtail ureteric stent is recommended. Other surgical techniques include percutaneous nephrostomy [12,13].

2.2. Urinary tract infection (UTI)

Bacteriuria is defined as more than 100,000 bacteria of the same species/ml urine; though counts far lower than this can represent infection in pregnancy [14]. *Escherichia coli* are the most common infecting organisms, responsible for 75–90% of bacteriuria during pregnancy; but *Klebsiella*, *Proteus* and *Pseudomonas* are not uncommon.

Asymptomatic bacteriuria occurs in 2–8% of pregnancies and risk factors include diabetes, previous UTI, lower socioeconomic class, multiparity, and sickle cell disease. Though the prevalence is the same as in the non-pregnant population, there is a three- to four-fold higher progression rate leading to pyelonephritis in 30% of patients [15]. The recommended antibiotics for use in pregnancy for asymptomatic bacteriuria include amoxicillin, oral cephalosporin, nitrofurantoin and nalidixic acid.

It is advisable that all pregnant women should be screened regularly in pregnancy for asymptomatic bacteriuria and if positive treated because of the associated maternal and fetal morbidity and mortality.

Acute pyelonephritis complicates 1–2% of pregnancies, making it the commonest renal complication in pregnancy [16]. Risk factors include those of asymptomatic bacteriuria, cystitis, urinary tract malformation and calculi. It typically presents with fever, loin pain, and cystitis symptoms, feeling systemically unwell and preterm labour. Management involves midstream urine examination for culture and sensitivity and also blood culture in severely febrile patients. Treatment should be aggressive, consisting of rehydration, intravenous antibiotics (e.g. cefuroxime) and analgesia.

Three or more bacteriologically confirmed urinary tract infections are regarded as recurrent UTI and investigated with ultrasound of the renal tract and a postpartum intravenous urogram. This group of women should be considered for long-term antibiotic prophylaxis after appropriate full-course treatment. Initial treatment should be based on culture and sensitivity results, or alternatively a 3-day course of trimethoprim or a 5-day course of beta-lactam or nitrofurantoin [17]. Prophylaxis should be for the duration of the pregnancy but may need to be continued postdelivery if congenital anomalies are suspected to be the predisposing factor. Trimethoprim is the commonest prophylactic agent used.

Postpartum bacteriuria is twice as common in women who have been catheterized in labour (9.1% vs. 4.7%) and the risk increases to 25% when an indwelling catheter is used, so women should ideally be encouraged to void spontaneously in labour [18].

2.3. Calculus disease causing pain

This is the most common cause of non-obstetric abdominal pain requiring hospitalisation [19]. Despite the theoretically increased risk of urinary calculi in pregnancy because of increased urinary stasis, obstruction and infection, the incidence is 0.03–0.5% and no different from the non-pregnant woman [19]. Other risk factors are a diet high in calcium, sodium and red meat, obesity and age (third to fifth decades). Caucasians are more commonly predisposed to renal calculi [20]. These stones are mainly composed of calcium, with an increase in struvite stones also reported. Symptomatic stones are found in the ureter twice as often as in the renal pelvis and affect both ureters with equal frequency.

Presentation is usually after 20 weeks' gestation when ureteric dilatation is most marked. They may present with pain and tenderness, mimicking acute pyelonephritis, but without fever. Haematuria and colic may be absent. Urolithiasis presents a clinical challenge to the obstetrician, the urologist and the radiologist for multiple reasons. First, many signs and symptoms can be found in normal pregnancy. Secondly, the potential adverse effects of radiation, anaesthesia and surgery often complicate traditional diagnostic and treatment modalities. Finally, although most stones (64–84%) pass spontaneously with conservative treatment [21], those that do not may initiate premature labour or cause urosepsis.

Ultrasonography, renal function assessment and urine microscopy should be undertaken and occasionally a plain abdominal X-ray may be required. Initial management should be conservative as 60% of stones will pass spontaneously. If conservative management fails, ureteral stent insertion or a placement of percutaneous nephrostomy tube may be appropriate. Ureteroscopy with stone manipulation for distal ureteral stone during pregnancy has been reported [17]. Extracorporeal shockwave lithotripsy is contraindicated in pregnancy because of the effect of the shockwave on the fetus potentially resulting in fetal death [22]. Open surgery is