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A Case of a False-Positive Urine Pregnancy Test and Delayed Diagnosis of Obstructive Pyelonephritis

Authors' Contribution:

Study Design A
Data Collection B
Statistical Analysis C
Data Interpretation D
Manuscript Preparation E
Literature Search F
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Patient: Female, 28-year-old
Final Diagnosis: Obstructive pyelonephritis
Symptoms: Dysuria • epigastric pain • flank pain
Medication: —
Clinical Procedure: —
Specialty: General and Internal Medicine

Objective: Unusual clinical course

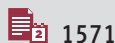
Background: Urine pregnancy tests are usually performed by women at home and also by healthcare professionals. However, there are several conditions that may cause a false-positive urine pregnancy test, including trophoblast tumors, malignancy, nephrotic syndrome, adenomyosis, tubo-ovarian abscess, and paraneoplastic syndromes. A case is presented of a false-positive urine pregnancy test in a 28-year-old woman with a history of tubal ligation, who had a delayed diagnosis of obstructive pyelonephritis due to renal calculus.

Case Report: A 28-year-old woman had previously been sterilized by tubal ligation. She presented with acute pyelonephritis associated with a left staghorn renal calculus and was found to have a false-positive urine pregnancy test, which delayed the diagnosis and management of her acute pyelonephritis. On follow-up, she had a negative serum pregnancy test. Abdominal computed tomography (CT) identified a left-sided staghorn calculus resulting in partial ureteric obstruction and hydronephrosis. She was treated with antibiotics, including cefazoline, and a left nephrostomy tube was sited to treat her hydronephrosis. Her pain was initially managed with acetaminophen and hydrocodone. Four days after her initial hospital admission, the patient was stable enough to go home on oral levofloxacin and pain medication.

Conclusions: This case of a false-positive urine pregnancy test in a 28-year-old woman with a history of tubal ligation highlights that this association may result in the delay in the diagnosis and treatment of acute pyelonephritis.

MeSH Keywords: Female Urogenital Diseases • Pregnancy Tests • Pyelonephritis

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Background

Urine pregnancy tests are usually performed by women at home and also by healthcare professionals. A positive result may be welcome or may lead to psychological distress if the pregnancy is unplanned. Pregnancy tests are also performed for women of childbearing age before undergoing medical procedures or invasive tests. However, there are several conditions that may cause a false-positive urine pregnancy test, including trophoblast tumors, malignancy, nephrotic syndrome, adenomyosis, tubo-ovarian abscess, and paraneoplastic syndromes. In this setting, a positive pregnancy test can lead to a delay in treatment or increase costs due to the need for further testing. Therefore, a false-positive pregnancy test may result in psychological and medical challenges, leading to a delay in diagnosis, patient distress, and increased costs of medical care [1].

A case is presented of a false-positive urine pregnancy test in a 28-year-old woman with a history of tubal ligation, who had a delayed diagnosis of obstructive pyelonephritis due to renal calculus.

Case Report

A 28-year-old African-American woman (gravida 2, para 2) presented to the emergency room complaining of nausea and flank pain. She stated that three days before admission, she began to experience epigastric pain and pain in her left flank. The patient initially rated the pain as a 5/10 in severity, but in the 24 hours before admission, the pain increased to 10/10, which was the reason for attending the emergency room. Her associated symptoms included dysuria and increased urinary urgency and a two-week history of diarrhea without blood. She also reported feeling feverish on hospital admission, and her temperature was measured at 37.4°C. Physical examination identified abdominal tenderness and guarding, and bilateral flank pain on light palpation.

A positive urine pregnancy test was obtained in the emergency department on the night of admission. The patient was certain that she was not pregnant, which was confirmed by a negative serum pregnancy test.

The patient had a known medical history of a previous tubal ligation and left renal staghorn calculus. She was scheduled for percutaneous nephrolithotomy approximately one month from her admission date. She had previous positive urine cultures for *Proteus mirabilis*, and was taking an antibiotic regimen with prophylactic cephalexin before her planned surgery.

Laboratory investigations included urinalysis and urine culture, blood cultures, a complete blood count (CBC), a complete

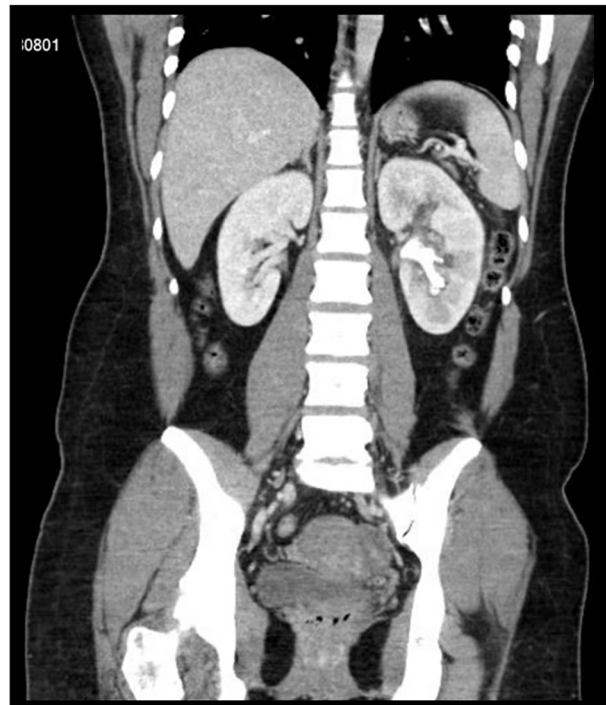


Figure 1. Abdominal computed tomography (CT) imaging in a 28-year-old woman with tubal ligation and obstructive pyelonephritis due to renal calculus with a false-positive urine pregnancy test. Abdomen CT imaging shows a left-sided staghorn calculus resulting in partial ureteric obstruction and hydronephrosis.

metabolic panel, lipase, amylase, and pregnancy testing. Computed tomography (CT) imaging of the abdomen and pelvis was performed. Her white blood cell (WBC) count was raised ($17.6 \times 10^9/L$), but her remaining blood test results were within normal limits. Blood cultures were negative, but urine cultures were positive for *Proteus mirabilis* species. CT imaging of the abdomen showed a left-sided staghorn calculus resulting in partial ureteric obstruction leading to hydronephrosis (Figure 1). Given her mildly increased temperature, leukocytosis, and clinical symptoms, the patient was diagnosed with pyelonephritis and was initially treated empirically on ceftriaxone, due to her prior history of susceptibility to *Proteus* infection.

A urology consultation was made. The patient slowly improved over the course of her hospital stay. After urine microbiology susceptibility testing was completed, her antibiotics were changed from ceftriaxone to cefazolin. Three days after admission, a left nephrostomy tube was sited due to her hydronephrosis. Her pain was initially controlled with acetaminophen and hydrocodone, but this was later changed to acetaminophen and oxycodone due to her symptoms of nausea. The patient did not have any further episodes of diarrhea during her hospital stay, and testing for *Clostridium difficile* and stool pathogens was not performed. Her previous episodes of diarrhea were thought to

have been due to previous antibiotic use, and the patient was placed on a probiotic regimen that included *Lactobacillus*. Four days after admission, the patient was stable enough to go home on oral levofloxacin and pain medication.

Discussion

Urine and serum pregnancy tests that are based on an enzyme-linked immunosorbent assay (ELISA) are qualitative tests that use monoclonal antibodies to detect levels of the 145 amino acid beta-subunit of human chorionic gonadotropin (hCG). Beta-hCG is also expressed by trophoblastic tumors [1,2]. The 92 amino acid alpha-subunit of hCG is common to thyroid-stimulating hormone (TSH), luteinizing hormone (LH), and follicle-stimulating hormone (FSH) [3]. The beta-subunit of hCG can also be produced in the testis, lung, liver, colon, or stomach [4,5]. ELISA results can be positive within the first eight to 14 days after the first missed period in pregnancy [5]. At our institution, the Sure-Vue® Urine hCG Strip (25 mIU/mL) (Fisher Scientific, Hampton, NH, USA) is used to test urine and serum, with a detection level of 25 mIU/mL for beta-hCG [6]. This test uses monoclonal and polyclonal antibodies, which does not cross-react with FSH, LH, or TSH at high physiologic levels [6]. Kamer et al. evaluated this diagnostic test and found a sensitivity of approximately 99% and a specificity of approximately 95% [7].

Even with sensitive and specific urine pregnancy tests, there are several causes of a false-positive result. False-positive results are associated with germ cell ovarian tumors, gestational trophoblastic tumors, and placental site trophoblastic tumors [8], ectopic pregnancy [8], paraneoplastic syndromes [8–10], urothelial bladder carcinoma with choriocarcinoma differentiation [11], lung carcinoma [3], urogenital anatomical malformations [12], tubo-ovarian abscess [2], adenomyosis [13], metastatic melanoma [14], treatment with selective serotonin reuptake inhibitor (SSRI) antidepressants [15], nephrotic syndrome [16,17], following blood transfusions [18], and in perimenopausal and postmenopausal states [19]. These false-positives can cause psychological distress for patients who believe that they may be pregnant, and can also lead to delays in medical procedures and tests for underlying diseases [1].

When a pregnancy test result is suspected to be a false-positive, lung cancer is the most common non-gestational malignancy known to be associated with ectopic beta-hCG production [3]. Congenital anomalies of kidney and urinary tract that require treatment with enteroplasty are also associated with false-positive test results, possibly associated with the presence of excess amounts of acidic mucin production in enteroplasty reservoir of these patients [12]. Also, adenomyosis is a condition that is associated with hemoglobinuria and has been

reported to have an association with a false-positive test [13]. The false-positive findings in a patient with metastatic melanoma raised the possibility that beta-hCG may be a biomarker for monitoring treatment response in patients with melanoma [14]. Selvaraj et al. described a case in which a patient treated with the SSRI, escitalopram, had a false-positive urinary pregnancy test [15]. SSRI antidepressants are frequently prescribed, and so recognition of the association with false-positive pregnancy testing is an important factor for patients and physicians to be aware of [15].

In nephrotic syndrome, proteinuria can lead to a false-positive pregnancy test, depending on the quantity and quality of protein in the urine [5,17]. Usually, patients need to have a 4+ proteinuria to have a false-positive urine pregnancy test, and in this clinical setting, a serum pregnancy test would be advised [17]. Proteinuria in patients with nephrotic syndrome can be due to rheumatoid factor in the urine and can result in a false-positive pregnancy test result [16], [20,21]. In the perimenopausal and postmenopausal woman, the pituitary gland may produce hCG in low levels, and false-positive pregnancy test in this patient population may be assumed to indicate malignancy, when none exists [19]. Red blood cell transfusion from a pregnant woman has also been reported to result in the passive transfer of beta-hCG, resulting in a false-positive pregnancy test [18].

Healthcare professionals should be aware of the physiologic situations that have the potential to lead to false-positive urine pregnancy test results. In this case report, the patient had a false-positive urine pregnancy test, which led to a delay in diagnostic imaging and urologic treatment. The results of a serum test were required before definitive treatment could begin. However, awareness of the conditions associated with a false urine pregnancy test might help speed up the process of obtaining a definitive serum result. Furthermore, in some populations, a false-positive urine pregnancy test might result in further unnecessary invasive diagnostic tests to identify a malignant etiology.

While serum pregnancy test can be performed to confirm a urine pregnancy test, for every positive urine pregnancy test done, this would mean increased cost and diagnostic delay. In a prospective study of patients attending the emergency room in Calgary, Canada, urine pregnancy tests were compared with serum pregnancy tests to compare their validity, turnaround times, and cost [22]. In this study, urine pregnancy tests performed in the emergency room achieved results with a mean time of 7.6 minutes when compared with 67.4 minutes for a laboratory-based serum pregnancy test [22]. Also, a urine pregnancy test cost \$1.65, compared with \$10 for a serum pregnancy test [22]. This difference in 60 minutes and \$8 represents a significant increase in healthcare time and

cost burden [22]. Finally, this case report presented a cases of obstructive pyelonephritis associated with renal calculus and highlights that urinary tract infections (UTIs) are common in women of reproductive age, with a lifetime incidence in the US of up to 60.4% [23]

Conclusions

This case report showed that a false-positive urine pregnancy test might delay the diagnosis of a treatable condition, such

as obstructive pyelonephritis associated with renal calculus. To our knowledge, this is the first report of a case of a false-positive pregnancy test leading to a delay in the diagnosis of acute pyelonephritis. However, it may be important to investigate the prevalence of false-positive pregnancy tests and both the psychological impact and the effect on the delay in the management of underlying medical conditions.

Conflict of interest

None.

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