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Unilateral Purple Urine Bag Syndrome: A Case Report on a Nephrostomy Patient and Review of Literature

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Abstract

Purple Urine Bag Syndrome (PUBS) is a rare manifestation of Urinary Tract Infection (UTI) amongst patients with chronic nephrostomy tube or catheter. It occurs as an interaction between 2 pigments indigo and indirubin produced by bacteria causing UTI, and the polyvinyl chloride material of the tube and bag in an alkaline environment. It is an early manifestation of UTI in these patients, and if treated promptly will prevent life-threatening sequelae. In this concise review, we report a patient who developed this interesting phenomenon and the pathophysiology behind it.

Keywords: Nephrostomy tube; Purple urinary bag; Purple urine; Urinary tract infection

Introduction

Purple Urine Bag Syndrome is an infrequent finding, which can be distressing to the patient and family members. It is a manifestation of Urinary Tract Infections (UTIs) in patients with long-standing indwelling catheter, or a nephrostomy tube [1]. PUBS is a simple spot diagnosis characterized by distinct purple color urine in the nephrostomy tube and urinary bag along with its discoloration. Though easy to identify, it is often misdiagnosed for other urinary pigment causal factors, which may result in delay of treatment. In this article, we describe a rare case of unilateral PUBS in a patient with long-standing indwelling bilateral nephrostomy tube.

Case Presentation

A 66 years old male, with Chronic Kidney Disease stage 3 presented to the Nephrology clinic for a regular follow up visit. He has a past medical history positive for stage 2 colorectal cancer, which was managed with resection and chemotherapy, along with pelvic radiation 7 years ago. Over the years he developed bilateral ureteral obstruction requiring stent placement. Moreover, two years ago the patient experienced intermittent hematuria along with urine outflow obstruction in the presence of nephroureteral stents, resulting in bilateral hydronephrosis. During admission, the medical team sought a cystoscopic biopsy of the bladder to provide further insight. Results from the biopsy revealed radiation cystitis. The patient was placed on bilateral nephrostomy tube per the medical team assessment and advice to help overcome the obstruction. As the encounter visit with the nephrologist proceeded, the patient denied constipation or any complaints of urinary tract infection including fever, abdominal pain, or foul urine odor. Purple discoloration of the left nephrostomy tube and urinary bag over the past month was his sole chief complaint.

On examination, patient was afebrile, nephrostomy insertion site on both sides appeared normal without redness, tenderness, or other signs of infection. It was observed that the left nephrostomy tube and bag were discolored containing purple colored urine while the right nephrostomy tube and bag contained straw colored urine (Figure 1).

Figure 1: Purple discoloration of the left nephrostomy tube and urinary bag.

A spot diagnosis of Purple Urinary Bag Syndrome was made, and urine was sent for culture. The urine culture grew sensitive strain of *Klebsiella pneumoniae* more than 100,000 Colony-Forming Units (CFU) per ml of urine.

The patient was started on oral ciprofloxacin 500 mg bid for 10 days and observed for the return of normal colored urine. He was also counselled on the importance of hygiene, catheter care, and endorsing appropriate diet intake to prevent constipation in avoidance of future occurrence (Figure 2).

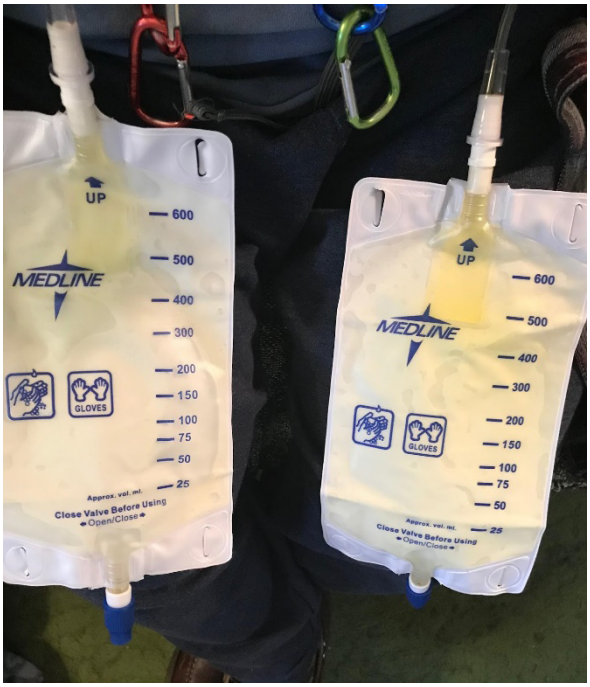

Figure 2: Clearance of the Nephrostomy tube and urinary bag after treatment.

Discussion

PUBS is a rare phenomenon and it indicates an underlying UTI. Elderly patients are at high risk of UTI and it gets higher with chronic catheter or nephrostomy tube usage [2-4]. Though quite a number of PUBS were reported on prolonged urinary catheterised patients, available reports on nephrostomy tube patients are very few.

It is hypothesized that the pathophysiology behind the PUBS starts with the normal gastrointestinal bacterial flora deaminating tryptophan to form indole in the gut. This indole is absorbed at the gastrointestinal brush border and is rapidly transported by the portal circulation to the liver where it is conjugated to form indoxyl sulphate. The latter is then excreted into urine where it is converted into indoxyl by the sulphatases and phosphatases produced by certain bacteria in the urinary tract. Indoxyl is further converted to indigo (a blue pigment) and indirubin (a red pigment) in the presence of alkaline urine. The combination of these pigments reacting with the catheter tube and bag made of polyvinyl chloride produce a distinct purple hue. This interaction between the pigments and the polyvinylchloride of the urinary bag along with a high bacterial load plays an important role [5-7].

Therefore, factors associated with PUBS include long-term urinary catheter or nephrostomy tube use, constipation, alkaline urine, increased dietary tryptophan, high urinary bacterial overload. Several bacteria, predominantly gram negative are associated with PUBS [1,8]. These include Proteus species, *Escherichia coli*, *Klebsiella pneumoniae*, *Enterococcus* species, *Pseudomonas aeruginosa*, *Morganella morgani*, *Citrobacter* species, and Group B Streptococci [1]. Additionally, key assessment and laboratory findings include visual inspection of the urine, urinary pH ≥7, and positive urine culture for the causative organism [9].

Though it is a spot diagnosis with distinct color, there is a wide scope for misdiagnosis. This is due to many factors contributing to abnormal urine pigmentation, including food dyes, porphyria, haemoglobinuria, and medications like indomethacin, flutamide, and mitoxantrone [10]. In turn, emphasizing the importance of a thorough history with review of medication and diet as advisable.

PUBS is considered a benign manifestation of UTI, however, there are a number of case reports, which highlight adverse outcomes if not treated promptly. For instance, urosepsis leading to septic shock and multiorgan damage, and ultimately death in rare occasions [11,12]. Evidently, illustrating the importance of identification of PUBS and initiation of prompt treatment.

Currently there are no guidelines regarding management of PUBS, leaving the clinician with the choice of prescribing antibiotics for resolution in addition to addressing any underlying conditions, such as constipation [1,13]. Adequate catheter management including changing them regularly are preferable in prevention and resolution of PUBS [1,14].

The provider and I identified our patient in the early asymptomatic stage. We treated him with antibiotics appropriately, clearing his infection evident by normalization of his urine color appearance.

Conclusion

PUBS is an uncommon yet striking manifestation of UTI in patients with prolonged catheterization, especially in elderly individuals who are at high risk for infections. This phenomenon must alarm the physician of an underlying UTI and its pathogenesis while considering treatment. Though it is mostly a benign manifestation, it can cause significant anxiety for patients and their family members. Hence, clinicians should educate patients about long-term catheter management, and risk factors it poses for development of PUBS. This aids in timely diagnosis, and initiation of treatment, thereby preventing further morbidity.

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