

CASE SERIES

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Purple urine bag syndrome: An unusual presentation of urinary tract infection

Abdul-Subulr Yakubu, Atiku Adam, Dzifa Ahadzi

ABSTRACT

Introduction: Purple urine bag syndrome is a rare clinical entity characterized by purple discoloration of the urinary catheter and urinary drainage bag in chronically catheterized patients. Though it can be alarming to patients and clinicians, it is considered benign but can indicate an underlying urinary tract infection.

Case Series: The first case was a 68-year-old woman with multiple comorbidities who was admitted to the orthopedic ward with a close fracture of the neck of the right femur. She was bedridden and had an indwelling urethral catheter. Her urine bag was noticed to stain purplish 22 days after bladder catheterization. Urine culture showed a heavy mixed growth. A change of urinary catheter and drainage bag led to a resolution of the condition. The second case was a 58-year-old male who was admitted on account of decompensated liver cirrhosis from chronic hepatitis C virus infection. He also had quadriparesis due to a traumatic cervical spine injury, urine retention, and constipation. On day 24 of his admission, his urine bag was stained with a purplish hue. A urine culture grew *Klebsiella oxytoca*. The urine bag remained clear and contained amber-colored urine after catheter changes and antibiotic treatment for cystitis.

Conclusion: Purple urine bag syndrome can be alarming to the patient and caregiver who need to be reassured of its benign nature. Urine culture would identify any associated infection. Good catheter care, control of risk factors including constipation and antibiotic treatment for symptomatic urinary tract infection leads to the resolution of the discoloration.

Keywords: Ghana, Indigo, Indirubin, Purple urine

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INTRODUCTION

Purple urine bag syndrome (PUBS) is a rare clinical entity characterized by purple discoloration of urinary catheters and drainage bags in chronically catheterized patients [1]. The color is produced by the metabolites of tryptophan, which are found in high levels in the gut of constipated patients [2–4]. It is considered benign but could be alarming to patients and clinicians and can indicate urinary tract infection (UTI) caused by bacteria containing sulfatase and phosphatase enzymes [5–7]. We present two cases of PUBS in patients with multiple comorbidities and long-term indwelling urethral catheterization to shed light on this rare entity that can be a source of confusion and baffle the patient, caregivers, and the unsuspecting clinician.

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CASE SERIES

Case 1

A 68-year-old woman was admitted to the orthopedic ward of Korle Bu Teaching Hospital with a close fracture of the neck of the right femur and had been on admission for eleven weeks. Her past medical history included hypertension, stage IV chronic kidney disease, and hypertensive heart disease. She had been catheterized while on admission (because of mobility constraints) to monitor her fluid balance. Her urine bag was noticed to stain purplish 22 days after bladder catheterization. On physical examination, the patient was afebrile, had conjunctival pallor and her vital signs were within normal limits. Her jugular venous pressure was raised and the cardiac apex was displaced to the sixth intercostal space. Her chest and abdominal examination were unremarkable. Her right leg was shortened and mildly edematous. Purple-colored urine was noted in her urine catheter bag and tubing (Figure 1).

The patient's urine catheter was changed, and a urine sample was collected into a clean sample container at the time of catheter change through the new catheter and transported immediately to the laboratory. The urine dipstick showed 4+ protein, 1+ blood, and 1+ leucocytes. Glucose, ketones, and nitrite were absent. The urine pH was 8.5 and microscopy showed pus cells of 18 per high power field (HPF), red blood cells of 13/HPF, and epithelial cells of 4/HPF. Triple phosphate (Magnesium ammonium phosphate) crystals were present. There were no casts. Urine culture showed a heavy mixed growth. She was mildly anemic with a hemoglobin level of 10.6 g/dL. The rest of her full blood count indices were within normal limits. Serum creatinine and urea levels were elevated at 319 $\mu\text{mol/L}$ and 11.8 mmol/L respectively. She had an estimated glomerular filtration rate of 16 mL/min/1.73 m². Serum electrolytes were within normal limits. The rest of her workup included an electrocardiogram that



Figure 1: Urine bag and tubing stained purple after 22 days of catheterization.

showed left ventricular hypertrophy and a chest X-ray that showed cardiomegaly.

A broad-spectrum antibiotic (intravenous ceftriaxone 2 g daily, which she received for two weeks) was started for a presumed UTI. Fluid balance was carefully maintained. She was also receiving intravenous furosemide and oral bisoprolol 5 mg daily for heart failure. Her other medications included atorvastatin (10 mg daily), soluble aspirin (75 mg daily), oral paracetamol and prophylactic doses of subcutaneous dalteparin. She was also being managed non-surgically by the orthopedic team. There was a gradual clearance of the purple hue from the urine and by the fourteenth week of admission, the purple color had cleared and the urine was uniformly amber (Figure 2). Her clinical course was complicated by a deep vein thrombosis. She made a good recovery and there was an improvement in her urine output from 200 mL to about 1000 mL per day (while on diuretics). Her condition remained stable, and she was discharged home on the 17th of June 2016, after 14 weeks on admission, and scheduled for outpatient reviews.



Figure 2: Purple color cleared three weeks later leaving amber-colored urine.

Case 2

The patient was a 58-year-old male who was admitted to the medical ward of Tamale Teaching Hospital with the diagnosis of decompensated liver cirrhosis from chronic hepatitis C virus infection. He also had quadriparesis due to a traumatic cervical spine injury (following a road traffic accident), urine retention for which he was catheterized, constipation, and decubitus ulcers. His medication included sofosbuvir/velpatasvir,

spironolactone, furosemide, rivaroxaban, oral lactulose, doxycycline, cefpodoxime, and multivitamin tablets. On day 24 of his admission, his urine bag (which was in situ since admission) was stained with a purplish hue (Figure 3).

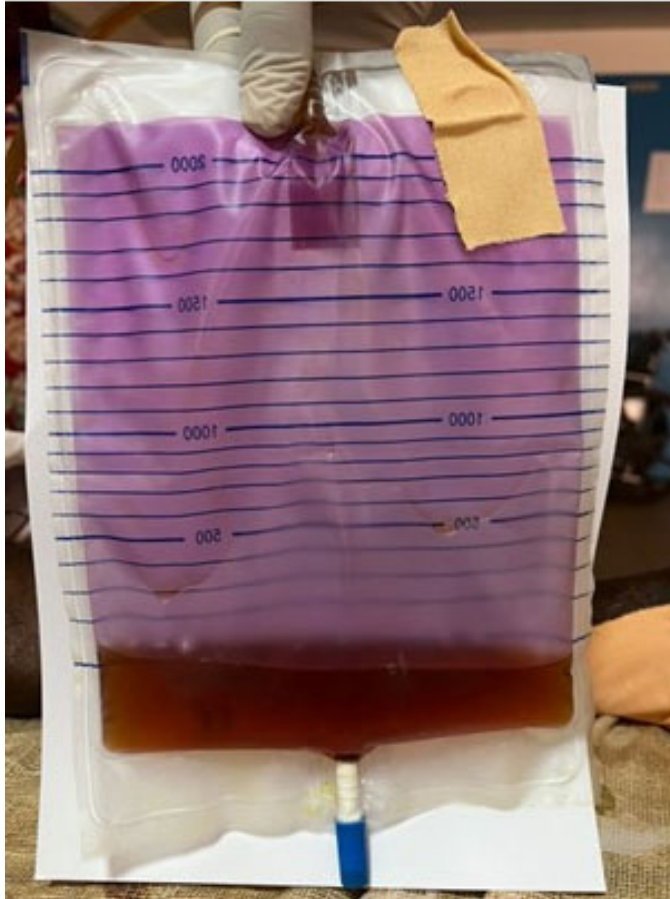


Figure 3: Purplish discoloration of urine bag noticed on 24th day of admission.

On examination, he was chronically ill-looking and pale. He was anicteric and afebrile but had bilateral pedal edema. He was conscious and alert. He had reduced breath sounds at the lung bases. His respiratory rate was 18 cycles per minute and oxygen saturation was 97% on room air. His blood pressure was 90/63 mmHg and heart sounds were normal. He had mild ascites, and the abdomen was slightly tender in the epigastric and suprapubic regions. A urine culture grew *Klebsiella oxytoca* which was sensitive to meropenem and amikacin. He was treated with intravenous meropenem for seven days and the urine catheter and bag were changed. The urine bag remained clear and contained amber-colored urine till the patient was discharged home after 32 days of admission (Figure 4).



Figure 4: Urine bag contains concentrated urine with no return of purplish hue.

DISCUSSION

Historically, PUBS is believed to date back to 1812 when King George III was noted to have a bluish discoloration of his urine and the urinary catheter and bag [8]. Since it was first reported in 1978, PUBS has been increasingly reported in patients on long-term urinary catheterization [1]. People with PUBS usually do not complain of any symptoms apart from the discovery of a blue or purple discoloration of the urine which is often a cause for concern to the patient, their caregivers, and the unsuspecting physician. It is generally considered a benign condition, although it may herald the presence of a UTI [9]. Bhattarai et al. reported a case of PUBS in an elderly female who died after vancomycin-resistant *Enterococci* and *Pseudomonas aeruginosa* was isolated from her urine, suggesting that it may not always be benign and should be approached on a case-by-case basis to identify those associated with difficult-to-treat UTIs [7].

Women are more frequently affected by PUBS; however, as in our second case, several male cases have been reported [6, 10]. Purple urine bag syndrome is associated with UTI caused by bacteria that produce sulfatase or phosphatase enzymes [2]. Female gender, constipation, UTI (especially with a high urinary bacterial

count), alkaline urine, and dementia are associated with PUBS [7, 8]. As in the two cases presented, almost all patients with purple urine bag syndrome are catheterized due to significant disability. Constipation is believed to promote bacterial metabolism of tryptophan to indole, resulting in high levels of indigo and indirubin in the urine [4]. Purple urine bag syndrome has been reported in patients with acidic urine [11].

Both cases presented had the typical characteristics of the patient with PUBS: elderly with multiple comorbidities and long-term indwelling urinary catheterization. The heavy bacterial load and alkaline urine in the first case are additional factors that favored the development of the condition. The response to catheter changes and antibiotics for symptomatic UTI (second case) was also typical of PUBS. A prevalence of PUBS as high as 9.9% was reported in institutionalized women with long-term indwelling urinary catheters [3].

The purple color is due to the compounds indigo and indirubin, which are metabolic degradation products of tryptophan [2, 6]. The pathogenesis is believed to begin with the conversion of dietary tryptophan to indole by gut bacteria. This undergoes liver metabolism to indoxyl sulfate which is then excreted in the urine. In the urine, indoxyl sulfate can be converted by bacteria colonizing the urinary catheter to indoxyl, which is further converted to indigo (blue) and indirubin (red) [2]. These pigments result in a deep purple color after interaction with the plastic tubing. The bacteria most commonly associated with PUBS are *Escherichia coli*, *Klebsiella pneumoniae*, *Providencia* species, *Pseudomonas aeruginosa*, *Proteus mirabilis*, *Enterococcus* species, *Streptococcus* species, and *Staphylococcus* species [2, 5, 12–14].

Generally, there is no specific recommended approach for diagnosing PUBS [15]. Visual identification of the purple urine in bag and tubing and simple microbiology (urinalysis, urine culture) and biochemistry tests usually suffice. Purple urine bag syndrome is a sign of colonization of the urinary catheter system; hence, antibiotic therapy may only be indicated in patients with symptomatic UTI and is not recommended for asymptomatic bacteriuria [16]. For asymptomatic patients, treatment of underlying risk factors (including control of constipation) and good catheter care usually suffice [12, 16]. Even though both of our cases were treated with antibiotics, merely changing the catheters and drainage bags might have sufficed. The presence of suprapubic tenderness suggestive of cystitis might have justified the use of antibiotics in the second case. The mainstay of preventing purple urine bag syndrome is regular changing of indwelling catheters and ensuring prompt removal of urinary catheters once they are no longer needed. The clinical need for bladder catheterization needs to be reviewed regularly and the catheter removed as soon as possible. Adequate fluid intake, catheter hygiene and avoidance of constipation are essential parts of catheter care best practice [16]. The cases presented highlight the importance of proper care of indwelling urethral catheters and the need to have

and adhere to institutional protocols for proper care of urinary catheters.

CONCLUSION

We presented two cases of PUBS in hospitalized patients with multiple comorbidities and long-term indwelling urethral catheters. Purple urine bag syndrome can be diagnosed by visual identification of purple discoloration of the urinary bag and catheter tubing. It can be alarming to the patient and caregiver who need to be reassured of its benign nature. The management of PUBS is directed at good catheter care and control of risk factors including constipation. Antibiotic treatment is recommended for underlying symptomatic UTI.

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Author Contributions

Abdul-Subulr Yakubu – Conception of the work, Acquisition of data, Drafting the work, Revising the work critically for important intellectual content, Final approval of the version to be published, Agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved

Atiku Adam – Design of the work, Revising the work critically for important intellectual content, Final approval of the version to be published, Agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved

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Guarantor of Submission

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Conflict of Interest

Authors declare no conflict of interest.

Data Availability

All relevant data are within the paper and its Supporting Information files.

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