

The Spot-on Purple Nuisance-Purple Urine Bag Syndrome

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Abstract

Purple Urine Bag Syndrome (PUBS) is a rare and often overlooked condition, marked by the purple discoloration of urine, primarily seen in patients with urinary catheterization. We present two cases of PUBS, involving elderly, bed-bound patients with permanent urethra catheters who presented to the Emergency Department with urinary tract infections. Both cases were managed effectively with broad-spectrum antibiotics. The condition arises due to bacterial production of phosphatase and sulfatase, leading to the formation of purple pigment in the urine. While the slight of purple urine may be alarming, PUBS often responds well to prompt diagnosis and proper treatment, leading to favourable outcomes.

Keywords: Prolonged Bladder Catheterisation, Purple Urine, Purple Urine Bag Syndrome, Urinary Tract Infection

Introduction

Purple Urine Bag Syndrome (PUBS) is a rare but significant complication associated with urinary tract infection, primarily occurring in patients with urinary catheterization. This syndrome is characterised by the striking purple discoloration of urine, which can serve as a distinctive indicator for medical professionals. Despite its diagnostic potential, PUBS remains under-recognized, often leading to unnecessary anxiety to the caregivers and families. This is particularly critical in elderly patients with multiple comorbidities, who may not exhibit typical symptoms of urinary tract infection, and may be unable to effectively communicate their discomfort or symptoms. Thus, increasing awareness and understanding of PUBS is essential to ensure timely diagnosis and appropriate management, ultimately alleviating distress for both patients and their caregivers.

Case Reports

Case-1

A 67 years old gentleman, with medical history of hypertension, degenerative spine disease, advanced chronic obstructive pulmonary disease, and congestive heart failure presented to the Emergency Department (ED) after being bedbound for eight years and was dependent on a urinary

catheter for past eight months due toneurogenic bladder. For the past ten days, he experienced purple discoloration in his urine bag (Figure-1) and reported coffee ground vomitus



Figure 1. Shows purple discoloration of urine in the urine bag

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for three days. He denied any urinary symptom. Urinalysis revealed a pH of 9, leucocyte 3+ and erythrocyte 3+. Physical examination reviewed grade four sacral sore, measuring 5cmx5cm with necrotic edge with tendon exposed, while other physical examinations were unremarkable. His blood investigation reviewed hyperchloremic non anion gap metabolic acidosis (pH 7.252, bicarbonate 11mmol/L, base excess -16.9mmol/L, anion gap 8, delta ratio 0.3); leucocytosis (white cell count $23.5 \times 10^9/L$); severe anaemia (haemoglobin 5g/dL) with worsening kidney function (urea 29.2 mmol/L, creatinine 334.6mmol/L). He was treated for severe anaemia, PUBS with urinary tract infection and infected sacral sore. His urinary catheter was changed, transfusion done and he was admitted for broad spectrum antibiotics infusion.

Case-2

An 84-year-old female with a history of hypertension, diabetes mellitus, and ischemic stroke had presented to the ED with atwo day history of shortness of breath, diarrhea, and vomiting, along with a striking purple urine in her urinary bag. She had been bedbound for the past two months due to recurrent ischemic strokes and required a Ryle's tube and urinary catheter, both changed biweekly. Upon examination, she appeared lethargic, tachypnoeic, with dry mucosa. Her blood pressure 76/61 mmHg, pulse rate 140 bpm with weak pulse volume, and oxygen saturation 88% on room air, which improved to 100% under a high-flow mask. She was afebrile with a random blood glucose of 9.2 mmol/L. Physical examination revealed generalized crepitations over the lungs, a soft but palpable bladder mass in the lower abdomen, and a grade 1 sacral sore, while the urinary bag contained purple-stained urine (Figure-2). During catheter exchange, foul-smelling pus was drained along with purple urine, leading to resolution of the bladder mass.

Blood investigations revealed leucocytosis (white cell count $16.5 \times 10^9/L$), metabolic/lactic acidosis, and type 1 respiratory failure (pH 7.140, bicarbonate 13 mmol/L, base excess -13.9 mmol/L, PaO₂ 63 mmHg, PaCO₂ 20.3 mmHg, lactate 12.8 mmol/L), hyponatremia (sodium 123 mmol/L),



Figure 2. Shows purple discoloration of urine in the urine bag

and acute kidney injury (urea 9.4 mmol/L, creatinine 163 mmol/L). Urinalysis showed positive nitrites and leukocytes at 3+. An electrocardiogram revealed atrial fibrillation with a rapid ventricular response, and a chest X-ray showed consolidation in the right middle and lower zones.

The patient was diagnosed with PUBS associated with catheter-associated urinary tract infection and orthostatic pneumonia in septic shock. She was started on inotropic support after fluid boluses and broad-spectrum antibiotics.

Discussion

PUBS is an uncommon condition, first reported in 1978, and it is the only known cause of purple coloured urine (1). PUBS usually involves female gender, constipation, alkaline urine, bed-ridden, and institutionalised patients with long-term urinary catheter (2-5).

A study done in 2005 revealed that the purple discoloration of urine originated not from the intraurethral portion of the catheter itself but rather from the urine bag and tubing connected to it (2). The purple discoloration is caused by a combination of indigo, which contributes its blue colour and indirubin, which contributes its red colour. Indigo and Indirubin are both metabolites of the dietary protein, tryptophan. Tryptophan is initially metabolised in the gastrointestinal tract by gut bacteria into indole, which is then conjugated by liver into indoxyl sulphate. Normally, indoxyl sulphate is colourless and excreted in the urine, but in the presence of bacteria colonisers in the urinary catheter, that produce indoxyl sulphatase and phosphatase enzymes, indoxyl sulphate is converted to indoxyl and indirubin, resulting in the distinctive purple hue (2-7). Interestingly, this phenomenon is more likely to occur in alkaline urine (6).

Besides, PUBS is not only limited to urinary catheterisation. Recently, in January 2022, a case reported in India, where purple pleural fluid was drained after four days of chest tube insertion (8). This was the first reporting of PUBS outside urinary tract.

Despite its striking presentation, PUBS is usually benign and asymptomatic (7). PUBS are associated with urinary tract infection (UTI) caused by bacteria that produces sulphatase and phosphatase. The bacteria are mainly the Enterobacter species, like Escherichia coli, Klebsiella pneumoniae, Proteus, Enterococcus species, Pseudomonas aeruginosa, Providencia stuartii and so on (9). Urinalysis and cultures can be done to confirm UTI. All patients should have their urinary catheters replaced, along with appropriate antibiotics therapy. Asymptomatic patients should not be treated aggressively. Instead, control of urological sanitisation, decrease catheterisation duration, good catheter care and management of predisposing factor for PUBS like constipation should be the mainstay of treatment (2, 4, 5).

Conclusion

PUBS is a reflection of UTI in catheterised patients, typically resulting from suboptimal catheter care and poor urogenital hygiene. To effectively manage PUBS, it is crucial to treat the UTI, replace the catheter and maintain good urogenital hygiene. Additionally, proper education on PUBS prevention should be given to both patients and relatives to minimize the risk of recurring episodes.

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