CASE REPORT

A unilateral purple urine bag syndrome in a patient with bilateral nephrostomy tubes

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SUMMARY

A change in the colour of urine is always of clinical significance, and a source of concern for the patient and his physician. Among the different urine colours observed, purple is the least common. Although purple discolouration of a catheter and a urine bag is an uncommon finding, it was reported in the literature as early as 1978, by Barlow and Dickson. We present a unique case of purple urine bag syndrome in a patient with bilateral nephrostomy tubes (NT) and associated urine bags (UB) with only the left nephrostomy tube and urine bag exhibiting the purple colour, which resolved with a course of appropriate antibiotics eradicating the causative bacterial pathogen, and change of NT and UB.

BACKGROUND

Although there have been few reported cases of purple urine bag syndrome (PUBS) in the medical literature, our case is truly fascinating in the sense that the patient had bilateral nephrostomy tubes (NT) and urine bags (UB), yet only the left tube and urine bag turned purple. Positive culture for the ipsilateral NT and UB for *Pseudomonas aeruginosa* made the case even more interesting. It provided possible evidence of the infective aetiology. Moreover, response to the antibiotics as evident by clearing of the urine colour reinforced the role of infection as a possible contributing factor. Meanwhile, the right continued to have normal coloured urine with urine culture growing non-pathogenic bacteria (*Staphylococcus epidermidis*), which is a frequent contaminant of specimens.

CASE PRESENTATION

An 83-year-old Caucasian man, a nursing home resident, with a medical history significant for mild Alzheimer dementia with intact decision-making capacity, myelodysplastic syndrome and bladder cancer involving the trigon, had bilateral distal obstruction of the ureters by a large bladder tumour extending to both ureteric orifices. This was in addition to fibrosis, which was secondary to intravesical BCG, chemotherapy and radiotherapy received a few years ago. Thus, both ureters and kidneys had secondary hydronephrosis and hydroureters. For this, bilateral NT with UB were used to drain both kidneys. Nephrostomy tubes were changed 2 months prior to this admission.

Other comorbid conditions are: chronic obstructive pulmonary disease, hypothyroidism, osteoarthritis, gastro-oesophageal reflux disease, hiatus hernia and chronic constipation.

The patient was brought to the emergency department (ED) because of a 1-week history of cloudy urine in the left nephrostomy tube and urine bag; he was discharged on levofloxacin, pending urine culture result. After 2 days, the patient was called back to the ED on a reported positive urine culture. At this ED visit, purple urine was noticed in the left nephrostomy tube and urine bag that had been started 3 days earlier (figure 1).

On admission, the patient was confused and anorexic, but had no fever, chills, flank pain, nausea or vomiting.

His medications included allopurinol, aspirin, clonazepam, docusate sodium, escitalopram, levofloxacin, levothyroxine, memantine, multivitamin, omeprazole, rivastigmine, simvastatin, solifenacin and tramadol.

On examination, the patient was confused, disoriented and mildly dehydrated, but not in pain and not with acute distress. Respiratory rate, blood pressure, pulse and temperature were within normal limits, and lung and heart examination was normal; bowel sounds were present while the abdomen was soft without tenderness or costovertebral angle tenderness. Nephrostomy tubes were in position; the nephrostomy openings showed no signs of inflammation, the left NT and UB contained purple urine, while the right NT and UB showed normal coloured urine.

Cultures were taken from both NT and urinary bags, and from the urinary bladder, through straight catheterisation. Samples obtained from the left NT and UB were positive for *P. aeruginosa*, while the right NT and UB samples were positive for *S. epidermidis*.

Figure 1 Picture of the patient's bilateral NT and UB—left NT and UB showing the colour purple. NT, nephrostomy tubes; UB, urine bags.

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Figure 2 Left side purple colour in NT and UB starting to resolve. NT, nephrostomy tubes; UB, urine bags.

The patient was treated with intravenous cefepime; after a few doses his urine began to gradually clear (figure 2). On the second day of treatment, the urine was a lighter purple. On the third day, the purple discolouration had almost completely disappeared. Both NT and UB were exchanged by the interventional radiologist on the third day of admission. After that no purple colour was observed (figure 3).

INVESTIGATIONS

Laboratory investigations revealed white cell's count of $11.6 \times 10^9/L$ on the day of admission, which improved 4 days later to $8.6 \times 10^9/L$, blood urea nitrogen 32 mg/dL, serum creatinine 1.2 mg/dL. Urinalysis from the urine obtained by straight catheterisation and from left NT and UB demonstrated alkaline urine with a PH of 7.5, leucocytes esterase (3+), nitrite positive, red blood cells 0–1/HPF, pus cells of 40–60/HPF and (3+) bacteria.

Urine cultures: the samples obtained from straight catheterisation of the bladder, left nephrostomy tube and urine bag were positive for 100 000 CFU/mL *P. aeruginosa*. While the right NT and UB samples were positive for *S. epidermidis*. A sensitivity report showed that *P. aeruginosa* was susceptible to gentamicin, imipenem, piperacillin/tazobactam and cefepime, while it was resistant to ciprofloxacin and ceftriaxone.

Figure 3 Clear urine in both NT and UB after nephrostomy tubes were changed. NT, nephrostomy tubes; UB, urine bags.

Two sets of blood cultures that were obtained on the day of admission remained negative after 5 days.

DIFFERENTIAL DIAGNOSIS

Purple discolouration of urine is a rare finding.

Our differential diagnosis included haematuria due to urinary tract infection (UTI), renal stone or neoplastic process.

Other less frequent causes include consumption of food such as blackberries, beetroots, carrots and fava beans, and oral aloe therapy.

Medications that can cause urine discolouration include rifampin, ibuprofen, phenytoin, phenazopyridine, propofol and L-dopa.

Rare metabolic conditions such as porphyria and alkaptonuria can also cause it.

We reviewed the patient's medications and found none to have caused purple urine.

Solifenacin was listed among his home medications. It was not given to the patient during his hospital stay; however, solifenacin may produce bloody or cloudy urine, but it is not known to produce purple urine. Also, this would have caused bilateral rather than unilateral urine discolouration.

TREATMENT

The patient was started on intravenous cefepime. After receiving three doses, the urine started clearing out (figure 2). The purple urine almost completely resolved on the 3rd day of antibiotic treatment. On the same day, the nephrostomy tube was exchanged by interventional radiology. After that no more purple urine was observed (figure 3). The patient received a 1-week course of antibiotics.

OUTCOME AND FOLLOW-UP

On the patient's 2-week follow-up visit, his symptoms had resolved and both NTs and UBs contained normal coloured urine.

DISCUSSION

PUBS is an uncommon condition characterised by purple discolouration of urine in the urine bag typically seen in patients with chronic debilitation with a history of long-term indwelling urinary catheter or NT.^{1–4} The prevalence of PUBS reported globally varies (8.3% to 9.8%) among hospitalised patients.⁵ Among patients with prolonged catheter use for months, as those in nursing homes for the elderly, the prevalence is higher and ranges from 16.7% to 42.1%.^{6,7}

The pathogenesis of this discolouration is associated with tryptophan's metabolism as intestinal bacteria metabolise tryptophan in food to indole and later convert it to indican by the liver. Indican, in turn, is excreted and broken down in the urine into indirubin (red) and indigo (blue) in an alkaline environment by sulfatase or phosphatase-producing bacteria, such as *Providencia stuartii*, *Providencia rettgeri*, *Proteus mirabilis*, *Klebsiella pneumoniae* and *Escherichia coli*.⁸

The discolouration is most commonly described in the tubing and drainage bags,⁹ however, the urine may have a purple discolouration as well.¹⁰ It is not fully understood and has not been described whether the chemical composition of the collection system is part of the reaction, though it is a possibility; it has been noted that a polyvinyl indwelling catheter is more likely than a silicone indwelling catheter, to harbour microorganisms associated with the development of PUBS.⁵

Although PUBS is usually a benign condition, and the discolouration gradually disappears after antibiotic treatment and

urological sanitation, it is alarming for the patient as well as the physician, stimulating further investigation to find an explanation for the unusual urine colour, and in this way a UTI is usually discovered.¹¹ Interestingly, replacement of the urinary catheter prior to complete resolution of infection may result in recurrence of the purple urine.¹²

In a study of 10 case reports including elderly patients with PUBS from two nursing homes,⁷ findings showed that PUBS can probably occur in any patient with the right elements, namely UTI with bacteria possessing sulfatase or phosphatase enzymes, diet with enough tryptophan, and being chronically catheterised

(averaging 35.9 months). Associations with a bed-bound state, dementia due to Alzheimer's disease or other causes and end stage renal disease due to diabetic nephropathy, put patients at higher risk for UTI, with subsequent PUBS in as many as 42.1% of cases.⁷ Decrease in the duration of catheterisation, improving catheter care and deploying technological advances designed for prevention, especially in the elderly cared for in nursing homes, are important prevention strategies.⁷

Competing interests None declared.

Patient consent Obtained.

Provenance and peer review Not commissioned; externally peer reviewed.

Learning points

- ▶ This case of purple urine bag syndrome (PUBS) demonstrates that it is closely related to chronic use of indwelling catheters and bags, not only for urinary bladder, but also for nephrostomy tubes when used for a long time.
- ▶ The case also suggests that purple coloured urine in the nephrostomy tube and urine bag is probably related to urinary tract infection (UTI), as it occurred only on the infected side of a bilateral nephrostomy patient (unilateral PUBS).
- ▶ In our case, *Pseudomonas aeruginosa*, which is rarely reported as a pathogen in the published cases of PUBS, was isolated.
- ▶ The case reaffirms the reversibility and clearance of purple coloured urine within a short time after the control of the UTI; the purple colour in itself, though alarming, is harmless and benign.
- ▶ Chronic constipation could be a contributing factor in our demented patient, as it had resulted in prolonged exposure of tryptophan in bowel residue to the action of bacteria.

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