CASE REPORT

Single case of purple urine bag syndrome in an elderly woman with stroke

James Richardson-May

Poole Hospital NHS Foundation Trust, Poole, UK

Correspondence to

Dr James Richardson-May,
james.richardson-may@poole.nhs.uk

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SUMMARY

Purple urine bag syndrome is an unusual condition that heralds an underlying urinary tract infection, in which certain bacteria produce a purple discolouration within the catheter bag of affected cases. It is most often seen in elderly women with constipation. While alarming, it can be resolved by treating the infection causing it. This report presents an elderly patient who developed the condition while an inpatient, and discusses the pathogenesis behind the condition.

BACKGROUND

Purple urine bag syndrome is an unusual condition that is not often encountered in clinical practice, but one that is easily treated once identified. The pathogenesis underlying the condition relates clearly to the presenting features and would be of interest to readers in specialties that deal with catheterised patients. The condition can be alarming to patients, their families and indeed healthcare providers attending to the patient; reassurance that this is a peculiar manifestation of a urinary tract infection can allay these concerns.

CASE PRESENTATION

A 94-year-old woman with a medical history of stroke, sinusitis, haemorrhoids and age-related macular degeneration was admitted with benign paroxysmal positional vertigo and underwent the Epley manoeuvre. During her stay, she was noted to have an iron-deficiency anaemia; endoscopy and non-contrast enhanced CT scan revealed no cause for this anaemia, but a virtual CT colonoscopy showed a polypoidal ileocaecal valve tumour. The decision was made to treat this palliatively following a colorectal multidisciplinary team meeting. She had very little appetite, a low oral fluid intake and required a number of treatments for constipation. During her admission, she developed right-sided arm weakness and was found to have new left frontal and parietal infarcts on an unenhanced CT scan of her brain. Given the history of iron-deficiency anaemia, she was initially treated with 75 mg aspirin for the stroke; later on, all medications not offering symptomatic relief were halted in line with her palliative care plan.

On the week of her discharge, she was noted to have a purple discolouration in her urinary catheter bag with some sediment within the catheter tubing (see [figure 1](#)). She had no urinary symptoms, abdominal pain or discomfort and was systemically well. Her inflammatory markers were normal. She was on no medications aside from laxatives as they

had been ceased 2 weeks prior to this finding; she was not requiring analgesia. Her catheter had been inserted for urinary retention 1 week beforehand. The urine itself, while dark, was not coloured purple and had a pH of 8 on dipstick with 1.0 g/L protein; the assay did not assess for leucocytes. A urine specimen was sent for microscopy, culture and sensitivity, which revealed the presence of Gram-negative coliforms, amorphous debris and triple phosphate crystals. The bacteria were sensitive to a number of antimicrobials, including trimethoprim, nitrofurantoin and cefalexin. Unfortunately, a more detailed analysis to determine the exact species of bacteria was unavailable.

INVESTIGATIONS

This patient had a urine dipstick test that revealed a pH 8 with protein 1.0 g/L. A further urinalysis (microscopy, culture and sensitivity) showed the presence of Gram-negative coliforms, amorphous debris and triple phosphate crystals. The bacteria were sensitive to trimethoprim, nitrofurantoin and cephalixin.

DIFFERENTIAL DIAGNOSIS

The differential diagnosis for a patient presenting with purple urine in a catheter bag is somewhat narrow, including other causes of urinary discolouration such as medication (eg, rifampicin) or diet-induced causes (eg, beetroot consumption).

TREATMENT

This condition can be treated by changing the urinary catheter bag, alongside antibiotics if the patient is symptomatic with the urinary tract infection or has other indications for treatment—for example, immunocompromise. Broad spectrum antibiotics should be used initially, until sensitivities reveal a more specific choice.

OUTCOME AND FOLLOW-UP

As she was asymptomatic with a palliative treatment plan, this patient did not receive antibiotics; she had the catheter bag changed and the catheter itself removed prior to discharge. She was discharged to a nursing home with palliative care input, and unfortunately died 4 weeks later from her colorectal cancer.

DISCUSSION

Purple colourisation of urine in a catheter bag—referred to as ‘purple urine bag syndrome’ (PUBS)—is a rare phenomenon that can herald urinary tract infections in catheterised patients.¹ First

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Figure 1 The patient's urinary catheter bag, demonstrating the purple discoloration arising from pigments produced by the pathogenic bacteria.

reported in 1978,² it is usually found in plastic, polyvinyl chloride urinary bags containing urine that is alkaline in nature. Affected patients are often elderly women with constipation.³ Dehydration is a further risk factor, and patients with PUBS often have significant comorbidity.⁴ There are a number of organisms that have been implicated in the pathogenesis of the condition; among these are *Proteus mirabilis*, *Klebsiella pneumoniae*, *Providencia* species, *Pseudomonas* species and *Escherichia coli*.⁵ The presence of coliforms in our patient's urine would correlate with a number of these organisms.

Tryptophan has long been thought to play a key role in the development of PUBS. The metabolism of this molecule by gut bacteria produces indole; this is then converted to indoxyl sulfate in the liver and excreted in the urine.⁶ The pathogenic organisms in the urine use the enzymes indoxyl phosphatase/sulfatase (bacteria may have one or both of these enzymes⁷) to convert indoxyl sulfate into indirubin and indigo. These compounds are red and blue, respectively, and mix in the catheter bag to create the purple colouration.⁶ Some bacteria within the species may not possess the necessary enzymes and so would be unable to produce these coloured pigments.⁸ Constipation prolongs the transit time of tryptophan, leading to higher urinary indoxyl sulfate levels.⁸ The provocative organisms show increased growth in alkaline urine,⁹ although cases of PUBS in acidic urine have also been reported.¹⁰ Interestingly, despite PUBS being reported mostly in patients with long-term urinary catheters,¹¹ our patient developed the condition only 1 week after insertion. This may be because of the extended period of constipation she had prior to catheter insertion, allowing for extensive metabolism of tryptophan and production of the compounds required for the development of the purple colour

within the bag. It might indicate a more virulent organism within the catheter bag.

While alarming, PUBS simply suggests an underlying urinary tract infection and can be managed with specific antibiotic therapy and changing of the urinary catheter bag—though changing the bag may not always be effective.⁸ One study has found a 2-month period prevalence of 16.7% in chronically catheterised patients;¹² a previous study found prevalence to be 9.8% on long-term wards.¹³ It has a higher predilection for elderly patients with comorbidities, and recognition of the condition can prompt early treatment of the infection causing the unexpected discolouration.

Learning points

- ▶ Purple urinary bag syndrome is an unusual condition that heralds an underlying urinary tract infection.
- ▶ It usually occurs in alkaline urine, in elderly female patients with constipation.
- ▶ Causative organisms include *Proteus mirabilis*, *Klebsiella pneumoniae*, *Providencia* species, *Pseudomonas* species and *Escherichia coli*.
- ▶ It is thought to be linked to the metabolism of tryptophan in the gut, which leads to the production of indoxyl sulfate; this is converted into the red and blue compounds indirubin and indigo, producing the purple colour in the catheter bag.
- ▶ The condition can be treated by giving antibiotics and changing the catheter bag.

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