

## Purple Urine Bag Syndrome (PUBS): An Unusual and Rare Manifestation of a Common Condition

### Introduction

A 67-year-old lady with background history of type II diabetes mellitus, hypertension, dyslipidaemia and left middle cerebral artery infarction presented to the endoscopy unit with percutaneous endoscopic gastrostomy (PEG) tube dysfunction. The PEG was inserted a year previously after her cerebrovascular accident. She had been fully dependent with her activities of daily living and had been on Ensure feeding supplemented with pureed food made by the family. She was taking glicazide, metformin, enteric coated aspirin, amlodipine and atorvastatin for her conditions. The carer has also noted that her bowel had been infrequent and often small amount and recently had a self-limiting fever. Incidentally, it was noted that her urine and urinary catheter bag was discoloured as shown in Figure 1. The family denied giving her any medications or foods other than what she had been given for the previous few months. The family also mentioned that 1 month previously, this had happened and the catheter and urine bag was changed by the home-based nursing when they visited for the scheduled nasogastric tube change.

What is the cause of the discolouration?

- A. Haematuria
- B. Food or food dye
- C. Urinary tract infection
- D. Medications
- E. Porphyria

### Discussion

Purple urine bag syndrome (PUBS) is a relatively rare but interesting phenomenon where the urinary bag is discoloured purple. The catheter tubing may also be discoloured purple and occasionally blue. The urine itself is not purple but the typical colour of infected urine. It is interesting to note that despite the common use of long-term urinary catheters, the number of cases encountered are few. PUBS essentially indicates that the patient has an underlying urinary tract infection.



Fig. 1. The urinary catheter bag (arrow) and catheter tubing (arrowhead) showing purple discolouration.

Answer: C

The discolouration is attributed to the precipitations of 2 pigments, namely indigo (blue) and indirubin (red) that react with the polyvinylchloride materials of the urinary bag and catheter.<sup>1</sup> These 2 pigments are formed from a series of biochemical conversion reactions of tryptophan.<sup>1,2</sup> The pathway begins with deamination of dietary tryptophan to indole by gut bacteria. This metabolite is then absorbed and undergoes hepatic conjugation to give indoxyl sulphate (indican) which is excreted in the urine. In the presence of indoxyl sulphatase and phosphatase in the urine, typically alkaline urine, indican is catalysed to indoxyl which, when oxidised results in the formation of the 2 pigments, indigo and indirubin.

Bacterial floras that have been implicated in the pathogenesis of this unique condition usually have indoxyl phosphatase and sulphatase activity. Interestingly, these enzymes may not be present even in bacteria of the same species. Bacteria most commonly associated with PUBS include *Providencia stuartii* and *rettgeri*, *Proteus mirabilis*, *Pseudomonas aeruginosa*, *Klebsiella pneumoniae*, *Escherichia coli*, *Morganella*, and *citrobacter* species, *Enterococci*, and Group B *Streptococci*.<sup>2,3</sup> Even methicillin resistant *Staphylococcus aureus* has been reported to be associated with PUBS.

The risk factors contributing to PUBS can be divided into patients' and microbial factors. Patients' factor is essentially similar to risk factors for urinary tract infections (female gender, chronic constipation and being chronically catheterised) but in the setting of adequate tryptophan level in the gut. Constipation leads to bowel stasis, bacterial overgrowth and prolonged tryptophan transit time. These factors promote both tryptophan accumulation and its breakdown or conversion to indole, resulting in a rise in urinary indican levels.<sup>3</sup> Microbial factor is the requirement of sulphatase and phosphatase activities. The types of catheter are also important. Therefore, the typical characteristics of patient at risk for PUBS are female who are institutionalised, bed bound, constipated and chronically catheterised.

Most patients with PUBS have no symptoms or are mildly symptomatic with low grade fever or some deterioration of condition. However, presentations with septic shock can also occur. Management is aimed at treatment of the underlying urinary tract infection and replacement of the urinary bag and catheter. Associated constipation should also be treated.<sup>1-3</sup> Particular attention should be given to good sanitation practice and catheter hygiene. Although PUBS is generally a benign and easily treatable condition, it can be associated with high incidence of morbidity and mortality given that these affected patients already have poor premorbid status.<sup>2</sup> Unless recognised, the underlying urine infection may not be suspected and adequately treated resulting in recurrence or progression of sepsis. Therefore,

awareness of this rare and interesting syndrome can assist physicians in recognising early and institute appropriate treatment without delay.

#### REFERENCES

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