

Purple Urine Bag Syndrome in a Paraplegic Woman with a Long-Term Indwelling Catheter and Asymptomatic Urinary Tract Infection: A Case Report

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ABSTRACT

Objectives: To report on points of concern in a paraplegic patient with a neurogenic bladder who presented with purple urine in a urine bag.

Study design: A case report.

Setting: Department of Rehabilitation Medicine, Maharat Nakhon Ratchasima Hospital, Thailand.

Subjects: A 32-year-old paraplegic woman with long-term use of an indwelling catheter.

Methods: The patient's medical record, including demographic data, clinical presentation and laboratory results as well as urologic ultrasonography, treatment, and outcome were reviewed.

Results: A patient with an indwelling transurethral catheter presented with a second episode of smelly purple urine for three days. She had no fever. She remained in bed due to an undiagnosed right hip fracture, a pressure ulcer, and chronic osteomyelitis of the right greater trochanter. A urine strip showed positive nitrite and a culture showed the presence of *E. coli*. Ultrasonography showed no renal or bladder stones. After three days of intravenous antibiotic treatment, the purple urine completely resolved.

Conclusions: Paraplegic patients with a long-term indwelling catheter, asymptomatic urinary tract infection with purple urine should receive prompt and appropriate antibiotic therapy.

Keywords: purple urine, urinary tract infection, urinary catheter, indwelling catheter, paraplegia

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Introduction

Purple urine bag syndrome (PUBS) is an occasional phenomenon characterized by discoloration of urine. The condition was firstly described by Barlow and Dickson in 1978.¹ The prevalence of PUBS has been variously reported in different series, ranging from 8.3 to 42.1% of patients with an indwelling catheter.² Purple urine results from an accumu-

lation of indigo and indirubin from bacteria-mediated tryptophan conversion.³ PUBS is commonly associated with urinary tract infection (UTI) caused by enzymatic degradation of urinary indoxyl sulfate by *Providencia stuartii* and *Klebsiella pneumoniae* bacteria which produce indigo and indirubin, particularly in alkaline urine.⁴⁻⁷ Reported risk factors for this syndrome include advanced age, female gender, constipation, dementia, a bedridden situation, institutionalization or hospitalization, end-stage renal disease, dehydration, chronic urinary catheterization, use of a polyvinyl chloride urinary catheter and/or urine bag, recurrent UTI, high urinary bacterial counts, and alkaline urine.⁶ Abnormal color of urine in the urine bag might be a source of worry for the patient as well as healthcare providers, although it appears to be a benign condition.^{6,8} There has been one case report of PUBS in a patient with spinal cord injury (SCI), incomplete tetraplegia and five years of use of a suprapubic catheter,⁹ but there have been no reports of this syndrome among patients with SCI in Thailand.

The objective of reporting this case was to raise awareness that atypical urine color related to asymptomatic UTI requires appropriate antibiotic therapy to cure the underlying infection and to prevent serious complications.

Case presentation

The patient was a 32-year-old female who presented with a complete T10 vertebral injury and flaccid paraplegia, the result of a traffic accident in 2006. After rehabilitation, she was a wheelchair user but also practiced therapeutic walking with bilateral knee-ankle-foot orthoses (KAFO) for 20 minutes twice daily. Although her spinal cord injury lesion was complete, including flaccid paralysis of both legs, the bulbocavernosus reflex was positive indicating a neurogenic bladder with supra-sacral lesion. She was able to void 200-300 mL of urine with a post-void residual of less than 50 ml and reported no incontinence. She performed manual evacuation for

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bowel care every other day. Six months after the injury, vesicoureteral reflux (VUR) was detected and treated with oxybutynin (5 mg) 2 tablets twice daily and an indwelling catheter. In 2007 the VUR resolved at which time she removed the catheter and continued voluntary voiding.

In 2013, an ulcer appeared at the right greater trochanter which was suspected to have been caused by a pressure injury from the upper thigh band of the KAFO. In 2016, the pressure ulcer still persisted, and she started having chronic low-grade fever of unknown origin (FUO), forcing her to rest in bed. Initial investigation could not find the cause of the fever, delaying diagnosis of osteomyelitis at the undiagnosed broken right hip, the same side as the pressure ulcer. After the osteomyelitis was diagnosed, the right femoral head was removed (Figure 1), a colostomy was performed, and an indwelling catheter was inserted to prevent contamination from diapers.

In May 2020, this patient reported two episodes of purplish discoloration of the urine in the urine bag within a month (Figure 2). The first episode resolved after a few days of oral antibiotics prescribed by a district hospital doctor. She noticed

that initially the urine in the bag contained crumbled sediment with a consistency of coarse sand. Later, the sediment changed color, starting from a light purple color and becoming a dark purple, and the urine smelled like ammonia. She usually drank less than 2 liters of water per day. The Foley catheter and urine bag were changed every month. Her regular medication was oxybutynin but not amitriptyline. When the second episode of purple urine occurred, she again went to the district hospital, but this time the doctor started an intravenous antibiotic therapy with ceftriaxone (third-generation cephalosporin). Due to concern about the recurrence of purple urine, she consulted the author, a physiatrist, who treated her neurogenic bladder.

After completing a 3-day intravenous antibiotic therapy, she was afebrile with mild dehydration. Her heart rate was 112 beats per minute, she complained of thirst and her body weight was down from 45 kg to 43 kg. Her urine was yellowish and clear in the urine bag tube, but the urine bag itself was stained purple (Figure 2). Investigation revealed a hemoglobin level of 11.5 g/dL with 9,000 WBCs per micro-liter. Her blood urea was 34 mg/dL and serum creatinine was 0.9 mg/

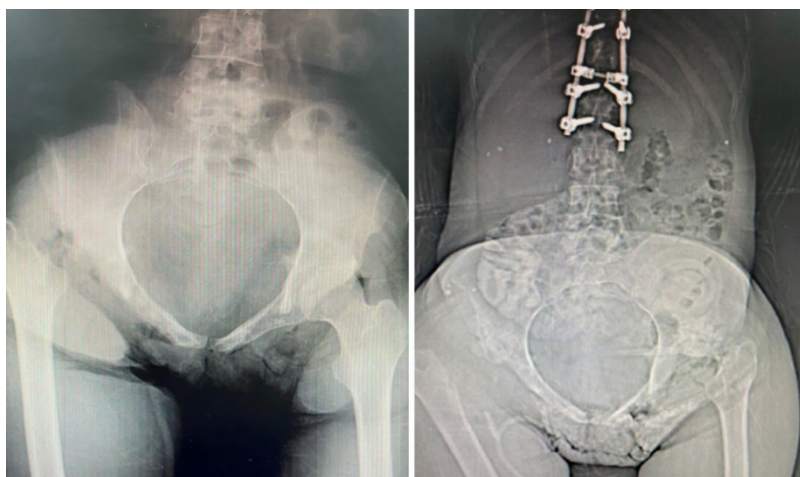


Figure 1. X-ray films of pelvis and hip in antero-posterior view. Left: the undiagnosed right hip fracture. Right: the hip after the right femoral head resection and colostomy.



Figure 2. The urine bag was stained purple, but the urine in the urine bag tube changed to a light yellow color following 3 days of intravenous antibiotic therapy

dL. The urine strip showed a pH of 7.0, a specific gravity of 1.020, and was positive for nitrite. Urine microscopy revealed 4-6 leucocytes per high power field and 3-5 red blood cells per high power field with triple phosphate crystals. Ultrasonography detected no hydronephrosis and no kidney or bladder stones. A urine culture was done before initiating intravenous antibiotic therapy. The culture grew greater than 10⁵ colony-forming units of *Escherichia coli* which were sensitive to ceftriaxone. The author then prescribed 10 days of oral ciprofloxacin after which she had no recurrence of purple urine.

Discussion

The present case was a middle-aged woman with chronic flaccid paraplegia and suprasacral neurogenic bladder and bowel resulting from a traumatic spinal cord injury. Initially, she voided voluntarily with low post-void residue, but later used indwelling transurethral catheters for 4 years to prevent contamination of a chronic unhealed pressure ulcer at the right greater trochanter and osteomyelitis of an undiagnosed fracture of the right hip. These complications caused her to become less physically active. She reported no fever during two recent episodes within one month of purple and smelly urine in the urine bag. The second episode was immediately treated with a 3-day intravenous antibiotic course. Urine culture later confirmed significant bacteriuria, but her clinical presentation was asymptomatic UTI.

It should be noted that discoloration of urine can be the result of various factors such as orange color caused by rifampicin, blue green caused by indomethacin, amitriptyline and *Pseudomonas*, and tea color caused by hemolysis.⁵ Purple urine is an atypical occurrence. Interestingly, PUBS was firstly reported in the nineteenth century; a famous historical figure (the English King George III who reigned from 1760 to 1820) was believed to have had this condition.¹ Urine bags turning purple or blue have been commonly reported in individuals with long-term use of an indwelling urinary catheter.³ It is believed that bacterial enzymes such as sulfatase and phosphatase, especially in alkaline urine, form two pigments, indirubin (red) and indigo (blue), and that the mixture of these pigments is responsible for converting the urine to a purple color.³ Additionally, renal failure is associated with a decrease in indoxyl sulfate clearance which causes bacteria present in the urinary bladder to produce more indigo and indirubin.^{2,3,7}

UTI presenting with purple urine can be easily detected but is often neglected because most cases are asymptomatic.⁵ According to a previous report, only 11.8% of cases present with fever or hypotension.⁴ In the present case, the patient had asymptomatic UTI with purple urine which completely resolved after a short course of intravenous antibiotic therapy. Using the Cockcroft-Gault equation, her estimated creatinine clearance was 61 mg/dL, indicating a mild de-

crease in renal function.¹⁰ Delayed treatment of UTI can result in serious complications and even death: the overall mortality rate in patients with PUBS has been reported to be 6.8%.⁴ Significant risk factors for mortality following PUBS include female gender, diabetes, leukocytosis, uremia, and shock.^{2,4}

Presently, long-term use of an indwelling catheter is not recommended in patients with chronic SCI and neurogenic bladder.¹¹ However, in Thailand many patients with chronic SCI chose indwelling catheters because of the convenience.¹² Antibiotic therapy is considered only for SCI patients with symptomatic UTI.¹¹ Asymptomatic UTI should initially managed by drinking more fluids and more frequent changes of the catheter and urine bag. In the case of this patient, drinking less than 2 liters of fluids daily and changing the Foley catheter and urine bag only monthly increased the risk of UTI. To prevent recurrent UTI, patients should be encouraged to have the catheter and urine bag changed more frequently, perhaps every two weeks, and to increase their intake of liquids to help keep the urine color clear as well as to facilitate defecation.

In SCI patients, constipation is usually due to prolonged colonic transit time and rectal sphincter dyssynergia.¹³ A study of Thai patients with chronic SCI revealed that constipation was common and that drinking less than 2 liters of liquid per day was significantly related to hard and lumpy stools.¹⁴ In the present case, although the patient had had a colostomy to eliminate contamination of a chronic pressure ulcer, the urine still became infected with *E. coli*, an organism commonly found in the large bowel. It has been demonstrated that the common microbial organisms *E. coli* as well as *Enterobacters* and *Proteus* spp. can cause catheter-associated UTI and PUBS.⁴ Additionally, chronic constipation can lead to bacterial overgrowth resulting from reduced gut motility and prolonged transit time. Prolonged tryptophan transit and the resulting increase in the level of indoxyl sulfate in the urine have been hypothesized to be the mechanism of action.⁴

In addition to long-term use of an indwelling catheter and constipation, immobilization and being a female are also risk factors for PUBS.^{2,3,7,8} The present case was a paraplegic who had become less active following an undiagnosed hip fracture and resulting chronic pressure ulcer. Being female is considered to be a risk factor for UTI because of a relatively short urethra.² However, a systematic review of PUBS reported between 1980 and 2016 found that of 116 patients, the number of male cases was almost equal to that of female cases.⁴

Conclusions

Reporting this first case of a Thai SCI patient with long-term indwelling catheter and PUBS should increase awareness of healthcare providers in Thailand and other countries regarding the importance of prompt and proper antibiotic

treatment of patients with asymptomatic UTI who have purple urine as a means of preventing serious life-threatening complications. Patients with long-term use of a transurethral indwelling catheter should be periodically reminded to properly care for the catheter and the urine bag to prevent chronic or recurrent UTI.

Disclosure

The author declares no potential conflicts of interest.

Acknowledgements

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