

Purple Urine Bag Syndrome : A Case Report and Review of the Literature

Hsuan-Hwai Lin, Sheng-Jiun Li, Kao-Bin Su, and Lian-Shan Wu

Department of internal medicine, Army Forces Hualien General Hospital

Abstract

Purple urine bag syndrome (PUBS) is a rare phenomenon associated with alkaline urine as well as urinary tract infections induced by some species of bacteria with indoxyl sulfatase/phosphatase. The purple material is found to be a mixture of indirubin and indigo. It is most observed in chronically catheterized and constipated women. We report a case of PUBS who is a man suffering diarrhea. Gender or constipation is not the absolute criteria of PUBS. PUBS is one of catheter-associated urinary tract infection. It is almost asymptomatic and infrequently causes bloodstream infection. Although our patient died of sepsis, the infection did not originate from urine. Urine culture revealed *Klebsiella pneumoniae* that was different from blood culture. Most authors believed that it is unnecessary to treat patients with PUBS aggressively. Frequent evacuation of urine bag and urological sanitation are important in these patients. (*J Intern Med Taiwan* 2002;13:209-212)

Key Words : Purple urine bag syndrome , Indigo , Indirubin , Indican

Introduction

The purple urine bag syndrome is an infrequent happening. Urinary catheterized patient has a purple colored urine bag following urinary catheterization for hours to days 1,2,3. This phenomenon is known to occur with alkaline urine as well as urinary tract infection induced by some species of bacteria with indoxyl sulfatase/phosphatase. It is most observed in chronically catheterized and constipated women 1. Several bacterial species have been reported in association with PUBS including *Providencia stuartii*, *Providencia rettgeri*, *Klebsiella pneumoniae*, *Proteus mirabilis*, *Escherichia coli*, *Morganella morganii*, and *Pseudomonas aeruginosa* 1,3,4,6-9. Although the definite chemical substrate is unknown, most of authors believe that it is a mixture of indigo and indirubin 1,3,4,5,7,8. However, there were some cases who presented the purple urine bag without indicanuria and the violet pigment may be either a steroidal or bile acid conjugate 2,6.

Case report

A 79-year-old male was admitted to our hospital because of aspiration pneumonia

with acute re-respiratory failure. The patient had been well and was living in a nursing home until one week before admission. After admission, urine catheterization was performed to monitor his urine output due to sepsis. Intravenous antibiotic was prescribed. Unfortunately his condition was unstable and ventilator-dependent. Three months later, his urine bag turned purple (Fig.1) even though we had changed a new one. And diarrhea was noted concurrently. Urinalysis revealed pH of 8.0, negative nitrate test and numerous WBC. *Klebsiella pneumoniae* was isolated from the urine. There was no trace of intake of medication, food coloring, or special food items that might alter the urine color during the hospitalization. Unfortunately, the patient died of sepsis with multiple organ failure after the purple urine bag had presented for one week.

Discussion

The etiology of PUBS is still a controversial issue. Most authors believe that indigo and indirubin are the mixture of the purple color and those derived from mammalian metabolism¹ (Fig.2). Tryptophan is metabolized at gastrointestinal tract by gut bacteria and it produces indole that is absorbed into portal circulation. Indole is converted into indoxyl sulphate after a series of detoxication transformations in the liver. Indoxyl sulphate is excessively excreted into urine and is digested into indoxyl by sulphatase/phosphatase produced by some bacteria such as *Providencia stuartii*, *Providencia rettgeri*, *Klebsiella pneumoniae*, *Proteus mirabilis*, *Escherichia coli*, *Morganella morganii*, *Pseudomonas aeruginosa*, etc. Indoxyl turned into indigo and indirubin in alkaline urine. Indigo is blue and indirubin is red. While they mix together, the color becomes purple.

The plastic urinary catheter drainage bags occasionally turn purple hours or days after catheterization. The longer the same drainage system leaves in place, the more intense the color becomes. The phenomenon was first reported in 1978 as purple urine bag syndrome⁹. It was known to occur with bacterial infection of the urinary tract with chronic constipation. Chronic constipation is commonly associated with bacterial overgrowth in the colon in which tryptophan has been converted to indol.

We summarized the published literatures on the purple urine bag syndrome.

Twenty-one patients were identified from eight articles selected by computer generated searching of MEDLINE (1966 through 2001 Dec.) and CINAHL database 1-8. Twelve patients were female (12/21) and the others were not mentioned about their gender (9/21) in these articles. No male case was presented definitely in these eight articles. According to a prospective study of 1497 catheterized patients by Tambyah et al.¹⁰, the incidence of catheter-associated urinary tract infection (CAUTI) was much higher in women than in men. Their mean age was 56.0. There were 244 CAUTIs in 1497 catheterized patients (16.3%); 147 were female (66%) and 77 were

male (34%; relative risk, 1.7; 95% confidence interval, 1.6-2.0; $P < 0.001$). So purple urine bag syndrome that is also one of CAUTIs happened in those old age women compares reasonable with this prospective study. Although most of authors thought that the majority of PUBS occurred in elder, female, bedridden and constipated patients, our case was an old man and suffered from diarrhea while the purple urine bag was noted. So gender or constipation was not the absolute criteria of PUBS. We analyzed those bacterial species that were isolated from the urine of purple urine bags reported in eight articles. Five of urine bags were *Providencia stuartii* 1; four were *Proteus mirabilis* 4; four were *Pseudomonas aeruginosa* 2,6; two were *Klebsiella*

pneumoniae 1,6; one was *Providencia rettgeri* 3; one was *Escherichia coli* 8; one was *Morganella morganii* 8. Our bacterial culture of urine revealed *Klebsiella pneumoniae*. Dealler SF et al.¹ had designed an experiment that bacteria were tested for their ability to produce indigo on agar containing indoxyl sulfate. Besides these species mentioned above, there are some species of bacteria (*Enterobacter agglomerans*, *Yersinia enterocolitidis*, *Providencia alcalifaciens* and *Staphylococcus aureus*, etc.) could produce blue colony on agar following incubation for 48 hours, because those species also could generate sulphatase/phosphatase.

According to the reported articles, most of patients which presented PUBS were asymptomatic. Even some authors advocated that it is unnecessary to treat patient aggressively⁴. Although our patient died ultimately, catheter-associated urinary tract infection was not the prime cause of death because CAUTI infrequently induced bloodstream infection¹⁰.

In conclusion, PUBS is associated with alkaline urine as well as CAUTI induced by some species of bacteria produced indoxyl sulfatase/phosphatase. When we deal with this syndrome, it is unnecessary to perform tests other than microbiology and biochemistry. PUBS is like CAUTI rarely symptomatic and infrequently causes bloodstream infection. However, nosocomial CAUTIs comprise a huge silent reservoir of antibiotic-resistant bacteria and yeasts¹⁰. Thus, efforts to prevent CAUTIs by improved catheter care and deployment of technologic advances designed for prevention must continue to receive high priority in institutional infection control program.

References

1. Dealler SF, Hawkey PM, Millar MR. Enzymatic degradation of urinary indoxyl sulfate by *Providencia stuartii* and *Klebsiella pneumoniae* causes the purple urine bag syndrome. *J Clin Microbiol* 1988;26:2152-6.
2. Stott A, Khan M, Roberts C, Galpin IJ. Purple urine bag syndrome. *Ann Clin*

Biochem 1978;24:185-8.

3.Al-Jubouri MA, Vardhan MS. A case of purple urine bag syndrome associated with *Providencia rettgeri*. J Clin Pathol 2001;54:412.

4.Ishiha T, Ogura S, Kawakami Y. Five cases of purple urine bag syndrome in a geriatric ward. Nippon Ronen Igakkai Zasshi 1999;36:826-9.

5.Nakayama T, Kanmatsuse K. Serum levels of amino acid in patients with purple urine bag syndrome. Nippon Jinzo Gakkai Shi 1997;39:470-3.

6.Nobukuni K, Kawahara S, Nagare H, Fujita Y. Study on purple pigmentation in five cases with purple urine bag syndrome. Kansenshogaku Zasshi 1995;69:1269-71.

7.Umeki S. Purple urine bag syndrome associated with strong alkaline urine. Kansenshogaku Zasshi 1993;67:1172-7.

8.Matsuo H, Ishibashi T, Araki C, et al. Report of three cases of purple urine bag syndrome which occurred with a combination of both *E. coli* and *M. morgnii*. Kansenshogaku Zasshi 1993;67:487-90.

9.Barlow GB, Dickson JAS. Purple urine bags. Lancet 1978;i:220-1.

10.Tambyah PA, Maki DG. Catheter-associated urinary tract infection is rarely symptomatic: a prospective study of 1497 catheterized patients. Arch Intern Med 2000;160:678-82.

紫色尿袋症候群：一病例報告及文獻回顧

林火宜 李昇駿 蘇高賓 吳蓮山

國軍花蓮總醫院 內科部

摘 要

紫色尿袋症候群是一種少見的病例，其為導尿管合併之泌尿道感染且此一細菌可產生氧靛基質硫酸鹽酵素（*indoxyl sulfatase*）並在鹼性的尿液中作用產生靛紅質（*indirubin*）與靛質（*indigo*），而這兩種物質混在一起即形成紫色。此一症候群大多發生於長期使用導尿管且合併有便秘的女性，而我們在此提出一腹瀉的男性出現紫色尿袋，因此可知性別及便秘並非診斷之必要條件。它通常是無症狀的也不常造成菌血症。雖然本院的個案最後死於敗血症但其來源並非泌尿道，尿液培養的結果為克雷白氏肺炎桿菌（*Klebsiella pneumoniae*）。多數的專家認為並不需要特別針對此症候群積極治療，只要保持泌尿道的清潔即可。

