

Case Report

Purple urine bag syndrome in an elderly patient from Colombia

Alvaro Mondragón-Cardona^{1,2}, Carlos Eduardo Jiménez-Canizales^{1,3}, Verónica Alzate-Carvajal¹, Fabricio Bastidas-Rivera^{4,5}, Juan Carlos Sepúlveda-Arias¹

¹ Departamento de Ciencias Básicas, Grupo infección e Inmunidad, Facultad de Ciencias de la Salud, Universidad Tecnológica de Pereira. Pereira, Colombia

² Residente de Medicina Interna, Universidad Surcolombiana, Neiva, Colombia

³ Hospital Santa Bárbara, Venadillo, Tolima, Colombia

⁴ Facultad de Ciencias de la Salud, Universidad Tecnológica de Pereira, Pereira, Colombia

⁵ Hospital San José de Belalcázar, Belalcázar-Caldas, Colombia

Abstract

A 71-year-old woman in a nursing home, with indwelling urinary catheter, bedridden, presented with a purple urine collector bag. The purple urine bag syndrome is a rare condition associated with the metabolism of tryptophan by overgrowth of intestinal bacteria. The purple color is formed by a combination of indigo and indirubin produced as a result of phosphatase and sulfatase enzymatic activity of bacteria on indoxyl sulfate, under alkaline pH of the urine. We present the second case of this syndrome reported in Colombia detailing the management of this rare syndrome associated with urinary tract infection. Several conditions should be considered in the differential diagnose of diseases that cause discoloration of the urine.

Key words: Urinary tract infection; urine; urinary catheterization; purple urine bag syndrome.

J Infect Dev Ctries 2015; 9(7):792-795. doi:10.3855/jidc.6251

(Received 11 November 2014 – Accepted 28 March 2015)

Copyright © 2015 Mondragón-Cardona *et al.* This is an open-access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Introduction

Since 1812, when Dr. W. N. Arnold hypothesized that the acute intermittent porphyria observed in King George III, was associated with a diet rich in tryptophan, cases of intestinal stasis and urinary tract infection that present with bright purple colored urine have been infrequently documented [1]. The purple urine bag syndrome (PUBS) was described for the first time in 1978 by Barlow and Dickson [2,3]. They observed patients with a urine stasis condition or intestinal infection with a purple coloration in the urine bag collector. Indigo was identified in the urinary sediment by electroscopic analysis suggesting that this purple coloration results from the bacterial breakdown of tryptophan to indoxyl sulfate in the intestinal lumen. When excreted in the urine, indoxyl sulfate is converted to indoxyl by bacterial phosphatases and sulfatases present in the urine. Indoxyl is subsequently converted by alkaline urine to indigo and indirubin (Figure 1). Indigo and indirubin, also known as indicans, react with the inner lining of the urine bag and the Foley catheter to give the purple color typical of this syndrome [2,3].

PUBS is a benign condition, whose physiopathology, treatment and evolution, have not changed much since its first description. This syndrome has been described mostly in elderly women with diseases that cause some degree of gastrointestinal stasis (usually bedridden) and have long-term urinary catheters in the presence of a urinary tract infection and alkaline urine [4-8]. Different studies have reported that the prevalence of this condition in people with indwelling urinary catheter varies from 8.3% to 42.1% [5,7-9].

Essentially, ingested dietary tryptophan is transformed into indole products by intestinal bacteria (*Escherichia coli* and *Bifidobacteria spp.*). In conditions of bacterial overgrowth associated with decreased intestinal motility, indole metabolites are absorbed via the portal circulation to subsequently be excreted in the urine. Indigo and indirubin generate a blue and red color respectively and the combination of these two compounds generates a purple color [8,10,11].

The available literature shows a single case of PUBS reported in Colombia [12]. We present the

second case reported in this country, including the management given to the patient.

Case report

A 71-year-old woman from Belalcázar, Caldas (population of 12,000 inhabitants, located in Western Colombia) was institutionalized in a charity nursing home. The patient had a personal history of hypertension and had an ischemic stroke eight years ago with neurologic sequelae (right hemiplegia and urinary incontinence). She remains bedridden, with an indwelling urinary catheter, severe cognitive impairment (mini-mental test 3/30), dependent in all functions according to the Katz grade scale, with physical disability (Barthel index: 5/100), taking hydrochlorothiazide 12.5 mg daily, losartan 100 mg daily, amitriptyline 25 mg daily and acetylsalicylic acid 100 mg daily.

Caregivers noticed a change in the urine color (purple) of the collection bag and tubing (Figure 2A) four months before medical consultation. The patient did not receive pharmacological treatment at that time due to the absence of clinical signs and symptoms.

Blood analysis showed a mild normochromic normocytic anaemia. The urine specimen was amber and cloudy. The urinalysis revealed a density of 1010, pH 9.0, presence of nitrites, leukocytes 7-10 per field and bacteria (++++). In the urine culture, the growth of *Escherichia coli* (more than 100,000 CFU / mL), *Proteus mirabilis* (more than 100,000 CFU / mL) and *Enterococcus faecalis* (more than 100,000 CFU / mL) was observed. The patient was treated with ciprofloxacin (500mg BID) during 14 days. The urinary catheter and the collection bag were changed, without improvement in the purple coloring. For that reason, the patient was next managed with dietary changes, hydration, stimulant laxatives such as bisacodyl, removal of bladder catheter during 20 days and administration of amikacin 250 mg BID for 7 days. With this regimen the PUBS disappeared (Figure 2B) and the urinalysis returned to normal values.

Discussion

Abnormal coloration of the urine is an unusual clinical finding that alarms patients, health staff and caregivers, as was the case with the patient described in this report. However, there are different conditions that generate changes in urine color such as food intake and metabolic degradation of dietary substrates (amino acids), generating a clinical challenge when defining whether a benign process or a pathological condition are responsible for the PUBS [13-14].

Figure 1. Metabolic route to generate purple urine. Prepared with Online Molecular Editor (<http://www.webqc.org/moleculareditor2.php>).

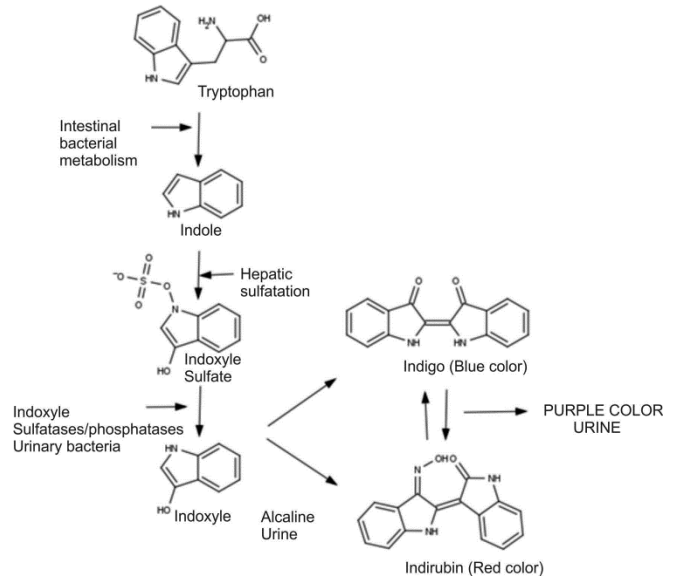


Figure 2. Urine Bag Collection Before and After Treatment. **A.** Initial purple urine bag observed before treatment **B.** Amber coloration in urine bag after antibiotic treatment.



The diagnostic approach to study the abnormal coloration of the urine begins with an exhaustive medical history to identify additional conditions that provide clinical semiological tools to guide patient’s diagnosis toward a specific disease such as urinary tract infection, porphyria or acute intravascular hemolysis [9,14,15]. At the same time, it is crucial to describe urine’s color to identify the probable etiology, followed by a urinalysis and an antibiogram [16].

PUBS mainly affects women using urinary catheters, with average age of 79 ± 10.9 years, Barthel score ≤ 7, and chronic constipation. However, the study of Shiao *et al* [11] only found statistical associations between gender, the prolonged use of a urinary catheter, and those patients who feed on their

own and prepare their own food. No associations were found between other variables that the literature describes as risk factors for PUBS. However, our patient had other risk factors for PUBS including alkaline urine and the presence of bacteria in urine [5,11,14].

The bacterial flora described in the literature associated with PUBS include: *Klebsiella pneumoniae*, *Pseudomonas aeruginosa*, *Providencia spp*, *Enterobacter spp*, *Faecal streptococci*, *Morganella morganii*, *Escherichia coli*, *Proteus spp*, *Enterococcus spp* and *Citrobacter spp*. The less common bacteria responsible for this phenomenon include *Staphylococcus spp*, *Streptococcus spp*, and *Methicillin Resistant Staphylococcus aureus*, among others [5,9,16-18].

Several host factors, including age, diabetes, spinal cord injury and catheterization, have a significant impact on the etiology of urinary tract infections (UTIs). In the elderly, the etiology of UTIs depends on their overall health status. Polymicrobial infections are common in the elderly and affect up to one-third of patients [19]. In addition, up to 86% of the catheter-associated UTIs are polymicrobial [20]. Although the presence of polymicrobial infection in UTIs can be considered as contamination, the microbiological criteria for determination of contamination versus true bacteriuria is arbitrary and a common criterion for defining significant bacteriuria is a colony count $\geq 10^4$ CFU/mL [21]. It is important to remark that mixed infections of the urinary tract with high bacterial counts are common in patients with PUBS [5].

Conclusion

Although PUBS is considered a benign process, the literature has described cases of urinary sepsis, malignancies, intussusception, and Fourier syndrome, among others, that should be considered in the diagnostic spectrum of PUBS. The management of this disease is based on guided antibiotic susceptibility testing, good hygiene and replacement of the bladder catheter.

Acknowledgements

The authors want to acknowledge Vicerrectoría de Investigaciones, Innovación y Extensión, Universidad Tecnológica de Pereira, and Hospital San José de Belalcázar for technical support.

References

1. Arnold WN (1996) King George III's urine and indigo blue. *Lancet* 347:1811-1813.
2. Barlow GB, Dickson JAS (1978) Purple urine bags. *Lancet* 311: 220-221.
3. Sammons HG, Skinner C, Fields J, Payne B, Grant A (1978) Purple urine bags. *Lancet* 311: 502.
4. Gautam G, Kothari A, Kumar R, Dogra PN (2007) Purple urine bag syndrome: a rare clinical entity in patients with long term indwelling catheters. *Int Urol Nephrol* 39: 155-156.
5. Mantani N, Ochiai H, Imanishi N, Kogure T, Terasawa K, Tamura JI (2003) A case-control study of purple urine bag syndrome in geriatric wards. *J Infect Chemother* 9: 53-57.
6. Tasi YM, Huang MS, Yang CJ, Yeh SM, Liu CC (2009) Purple urine bag syndrome, not always a benign process. *Am J Emerg Med* 27: 895-897.
7. Bocrie OJ, Bouchoir E, Camus A, Popitean L, Manckoundia P (2012) Purple urine bag syndrome in an elderly subject. *Braz J Infect Dis* 16:597-598.
8. Bar-Or D, Rael LT, Bar-Or R, Craun ML, Statz J, Garrett RE (2007) Mass spectrometry analysis of urine and catheter of a patient with purple urinary bag syndrome. *Clin Chim Acta* 378: 216-218.
9. Yaqub S, Mohkum S, Mukhtar KN (2013) Purple urine bag syndrome: A case report and review of literature. *Indian J Nephrol* 23: 140-142.
10. Pillai RN, Clavijo J, Narayanan M, Zaman K (2007) An Association of Purple Urine Bag Syndrome with Intussusception. *Urology* 70: 812.e1-e2.
11. Shiao CC, Weng CY, Chuang JC, Huang MS, Chen ZY (2008) Purple urine bag syndrome: a community-based study and literature review. *Nephrology (Carlton)*. 13:554-559.
12. Campbell SE, Izquierdo A, Campbell S, Erazo L, Calderón C (2011) Síndrome de la bolsa de orina púrpura. *Acta Med Colomb* 36: 38-40.
13. Aycock RD, Kass DA (2012) Abnormal urine color. *South Med J* 105: 43-47.
14. Robinson J (2003) Purple urinary bag syndrome: a harmless but alarming problem. *Br J Community Nurs* 8: 263-266.
15. Mohamad Z, Chong VH (2013) Purple urine bag: think of urinary tract infection. *The Am J Emerg Med* 31: 265 e5-6.
16. Koh KS, Chong VH (2013) Purple Urine Bag Syndrome (PUBS): An Unusual and Rare Manifestation of a Common Condition. *Ann Acad Med Singapore* 42: 700-701.
17. Su YJ, Lai YC, Chang WH (2007) Purple urine bag syndrome in a dead-on-arrival patient: case report and articles reviews. *Am J Emerg Med* 25: 861 e5-6.
18. Vallejo-Manzur F, Mireles-Cabodevila E, Varon J (2005) Purple urine bag syndrome. *Am J Emerg Med* 23: 521-524.
19. Ronald A (2002) The etiology of urinary tract infection: traditional and emerging pathogens. *Am J Med* 113: 14S-19S.
20. Armbruster CE, Smith SN, Yep A, Mobley HLT (2014) Increased incidence of urolithiasis and bacteremia during *Proteus mirabilis* and *Providencia stuartii* coinfection due to synergistic induction of urease activity. *J Infect Dis* 209: 1524-1532.

21. Wilson ML, Gaido L (2004) Laboratory diagnosis of urinary tract infections in adult patients. *Clin Infect Dis* 38: 1150–1158.

Corresponding author

Juan C. Sepúlveda-Arias, MD, PhD
Departamento de Ciencias Básicas
Facultad de Ciencias de la Salud
Universidad Tecnológica de Pereira
Pereira – Risaralda
Colombia.
Phone: +57-6-3137127
Fax: +57-6-3216252
Email: jcsepulv@utp.edu.co

Conflict of interests: No conflict of interests is declared.