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Purple urine bag syndrome caused by *Klebsiella oxytoca* and *Pseudomonas aeruginosa*

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Abstract
Purple urine bag syndrome is a rare phenomenon causing discoloration of urinary bag and catheter. It is an infrequent condition seen mainly in patients with constipation, bedridden status, chronic urinary catheterization, alkaline urine and Urinary tract infection. The common causative organisms of PUBS are *Escherichia coli*, *Proteus mirabilis*, *Klebsiella pneumonia*, *Enterococcus spp.*, *Pseudomonas aeruginosa* and *Citrobacter frundii*. We describe the case of a 72-year-old male patient who got admitted in hospital for the treatment of Cerebrovascular accident. He was bedridden and catheterized. During hospitalization, he developed fever and a purplish discoloration of urine was noted in the urinary bag and tubing. Urine culture report showed a significant growth of *Klebsiella oxytoca and Pseudomonas aeruginosa*. His fever subsided and purple colored urine was disappeared after the antibiotic therapy and change of the urine bag.

Keywords: Purple urine bag syndrome, *Klebsiella oxytoca, Pseudomonas aeruginosa*

Introduction
Purple urine bag syndrome (PUBS) is a subtle and striking manifestation associated with urinary tract infection involving vivid purple discoloration of the lining and tubing of urinary catheter bag. It can be usually perceived in chronically debilitated patients with long-term intrinsic urinary catheters. PUBS may be abandoned due to its unawareness among the treating physicians. Untreated or delayed treatment may lead to significant morbidity and mortality because of its progression to generalized septicemia. High prevalence of PUBS reported in female and in patients with alkaline urine. [1] To the best of our knowledge, this is the first case of PUBS reported in our region.

Case History
A 72-year-old male, with the past history of Cerebrovascular Accident (CVA) and Chronic Obstructive Pulmonary Disease (COPD), presented to us in the emergency department with complaints of difficulty in moving left upper and lower limb. When he came to the department, he was hemodynamically stable and afebrile. He also had a history of recurrent Urinary Tract Infection (UTI) and constipation. His daily activity was limited and bedridden hence catheterized with Foley catheter. On the 59th day of admission, the patient developed a fever. A purplish discoloration of urine was noted in the urinary bag and tubing. The change in colour was consistent throughout the bag and extended to the urinary catheter. The urine from the bag contained sediment sent for further investigations.
The urinalysis showed alkaline urination with the presence of albumin (Trace), occult blood (+++) and urinary sediment contained 12-14 pus cells, red blood cells, epithelial cells and cast. The patient was empirically started with injection cefotaxime 1g through intravenous (IV) route twice daily. Urine culture yielded *Klebsiella oxytoca and Pseudomonas aeuroginosa*. The antibiotic therapy was then changed to ofloxacin 200 mg by oral route twice daily, as per the antibiotic sensitivity pattern. Syrup magnesium hydroxide + liquid paraffin 15ml once daily was given to treat constipation. The Foley catheter was changed and fever subsided within 2 days. The purplish discoloration of urine was disappeared by the following days. The further urine sample showed no bacterial growth. He was hemodynamically stable and discharged on the 80th day.

Fig 1: Image of the urinary catheter bag showing normal coloured urine and purple coloured urine

Discussion
The first case of PUBS was reported by Barlow and Dickson in 1978. PUBS is a rare phenomenon in which the urinary bag and catheter turn purple on long-term catheterization [2].
In normal healthy subjects, bacterial flora deaminates tryptophan to indole in GIT. Indole enters into portal

circulation reaches liver which was conjugated to indoxyl sulphate and excreted in urine. In PUBS indoxyl sulphate is then oxidized by sulfatase/phosphatase containing bacteria colonizing the urinary catheter system to the pigment Indigo (blue) and Indirubin (red). Oxidation of indoxyl sulphate is facilitated by alkaline urine. When these pigments get in contact with a plastic urine bag or tubing, it produces a purple discoloration of the urine bag [3].

PUBS have been associated with bedridden states, constipation, chronic urinary catheterization, alkaline urine, UTI and kidney failure [4]. In our present case, the patient had some similar risk factors of this rare syndrome such as bedridden state, alkaline urine, chronic catheterization, severe constipation, and UTI. So this may be the reason for his PUBS.

Constipation is considered to be a predisposing factor in PUBS due to the increased time it elicits for bacterial deamination [5]. In our present case study, the patient was chronically constipated because of the bedridden status and hence decreased physical movements. This may also be the reason for his current condition.

Most PUBS cases are due to monomicrobial infections caused by *Proteobacteria*, mainly *Escherichia coli* and *Proteus mirabilis*. Other reported microorganisms include *Klebsiella pneumoniae, Providencia stuartii, Providencia rettgeri, Enterococcus spp., Morganella morganii, Candida albicans, Serratia marcescens and Pseudomonas aeruginosa, Citrobacter frundii* [6]. In our present case, the patient had recurrent UTI and urine culture report shows the growth of *Pseudomonas aeruginosa* and *Klebsiella oxytoca* which may be a cause for UTI and PUBS.

Hamza Sule et al reported the study which investigated the Prevalence of *Klebsiella* species among patients suspected of UTI. The speciation of *Klebsiella* species isolated showed that 14(7.0%) were *Klebsiella pneumoniae* and 2(1.0%) were *Klebsiella oxytoca*. The antimicrobial susceptibility pattern of Klebsiella species isolated in the study revealed ofloxacin and nitrofurantoin to be the most promising drug of choice for the treatment of UTI [7].

Shiu-Dong Chunga et al reported a case of an 85-year-old gentleman, with the history of paraplegic, Chronic Kidney Disease, old CVA, chronic constipation, hypertension, and the requirement for a chronic indwelling urinary catheter. He reported having purplish discoloration of urine. His urine culture grew *Pseudomonas aeruginosa and Enterobacter cloacae*. He was diagnosed to have complicated urinary tract infection and PUBS. The patient was treated with 500 mg oral ciprofloxacin twice daily for 14 days. After receiving antibiotic treatment, his urine bag did not become purple again [8].

In our present case study, based on the antibiotic sensitivity pattern both the meropenem and ofloxacin were found to be sensitive. The zone of inhibition was higher for meropenem than ofloxacin. Even though we have chosen the lower antibiotic which was fluoroquinolone derivative, because of the increased resistance rate for *Klebsiella oxytoca* and many of the above case reports showed better results with fluoroquinolones. Hence, ofloxacin 200 mg once daily by oral route was given as the treatment for PUBS. Surprisingly, the patient had improved from the symptoms. His fever reduced and the urine color changed by the following days.

PUBS is usually harmless without any serious consequences. The literature review revealed that patients who have had chronic constipation, recurrent UTI, bedridden state and most importantly long-term catheterized patients developed PUBS. So, Good care on urinary catheter will prevent both PUBS and Catheter-related UTIs [5, 6, 9, 10].

Medical management of purple urine bag syndrome does not require any special treatment apart from changing the catheter and administering appropriate antimicrobial therapy to treat the underlying bacterial infection. In conclusion, even lower antibiotics may also be used for the treatment of PUBS.

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