



## Purple Urinary Bag Syndrome (PUBS) in Benign Prostate Hyperplasia (BPH) with long-term indwelling urinary catheter use: a case report and literature review

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### ABSTRACT

**Background:** PUBS is one of the clinical manifestations of urinary tract infection. This condition often leads patients, patients' families, and medical workers to worrisome. Metabolism of tryptophan and infection of sulfatase and phosphatase - producing bacteria is the most acceptable pathogenesis explaining PUBS. Many risk factors are underlying this condition, including long-term use of indwelling urinary catheters, constipation, dementia, chronic kidney disease, and bedridden patients. This case study aims to evaluate the recent treatment of supporting factors in treating the underlying urinary infection.

**Case Presentation:** We presented a case report of a 67-year-old man with Benign Prostate Hyperplasia (BPH) and long-term

use of indwelling urinary catheter who complained of purple discoloration of urine a day prior to Transurethral Resection of the Prostate (TURP) surgery. The patient complained of no fever and pain while urinating and having no history of the same complaint and other diseases. In addition, the patient has diagnosed with BPH and Urinary Tract Infection. The administration of Cefazolin 2 grams dosage was given before the TURP procedure, and the following procedure continued.

**Conclusion:** PUBS is a rare clinical course alarming the urinary tract infection. Appropriate treatment by Cefazolin 2 grams dosage following by TURP shows a favorable outcome in this case study.

**Keywords:** Purple Urine Bag Syndrome, Benign Prostate Hyperplasia, TURP, Urinary Catheter.

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### INTRODUCTION

Purple Urinary Bag Syndrome (PUBS) is a condition in which purple urine discoloration occurs in patients with urinary catheters following hours or days of urinary catheterization, such as Benign Prostate Hyperplasia (BPH) condition.<sup>1</sup> PUBS is often a manifestation of urinary tract infection.<sup>1</sup> PUBS is a rare urinary disorder that was first characterized in 1978 and is signified by purple discoloration of the urine usually seen in women and chronically debilitated patients with long term indwelling urinary catheters.<sup>2,3</sup> This phenomenon results from indoxyl sulfate's bacterial fermentation (indican) to indigo and indirubin, which then dissolve in the urine bags plastic.<sup>3,4</sup>

This condition somehow can lead patients and their families, even for medical workers, to be overly concerned.<sup>5</sup> Understanding risk factors that may induce PUBS occurrence and comprehensive explanation regarding this condition are expected

to give better information to the patients and their families and prevent unnecessary examination and treatment given to the patient for this relatively benign condition. Based on those mentioned above, this case study aims to evaluate further the PUBS in BPH patients with long-term indwelling urinary catheter use.

### CASE REPORT

A 67-year-old man with Benign Prostate Hyperplasia (BPH) was diagnosed eight months ago. He routinely came to the hospital to have an indwelling urinary catheter (IUC) replaced every fourteen days as scheduled. He was then scheduled for Transurethral Resection of the Prostate (TURP) procedure. However, one day prior to the surgery, the patient complained of his urine turning purple in the urine catheter drainage tube and collection bag, as seen in [Figure 1](#).

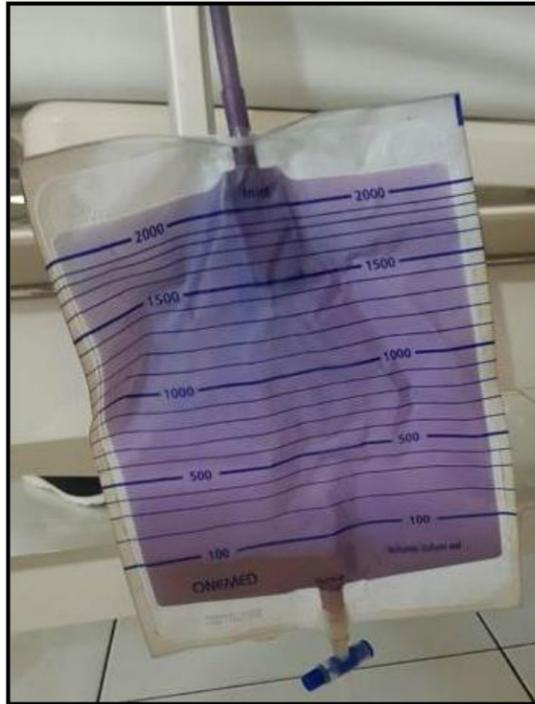
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**Figure 1.** Purple colored urine in catheter drainage tube and collection bag made up of Polyvinyl Chloride (PVC)

The patient complained of no fever and pain while urinating and having no history of the same complaint and other diseases. His vital signs showed Blood Pressure of 130/80 mmHg, Heart Rate of 63 times/minutes, Respiratory Rate of 18 times/minutes, axilla temperature 36°C, and Visual Analogue Scale (VAS) score was 0. Laboratory result showed Leukocyte 15.38x10<sup>3</sup>/uL, Hemoglobin 12.9 g/dL, Thrombocyte 232x10<sup>3</sup> uL, Natrium 138.2 mmol/L, Kalium 3.96 mmol/L, Chloride 100.9mmol/L, Blood Ureum 20.2 mg/dL, Blood Creatinin 1.0 mg/dL, N Urea 9.4mg/dL. The urinalysis result showed urine appears Cloudy macroscopically, with pH 8.0, Leukocyte Esterase (+3), Nitrite (+1), Protein (+1), Blood (+3), Urine Sediment RBC 75-80/hpf, WBC 45-50/hpf, Cylinder Erythrocyte (+), Epithelial Cell (+1), Bacteria (+1). Urine culture showed isolation of *Providencia rettgeri* pathogen. The patient has then diagnosed with BPH and Urinary Tract Infection. About 2 grams dosage of Cefazolin was given before the TURP procedure and the following procedure continued. After the surgery, the catheter was replaced and the color of urine returned to normal. After three days of hospitalization, the patient was discharged with an indwelling catheter. One week after surgery patient complained of no urine discoloration and the urine catheter was finally removed.

## DISCUSSION

Discoloration of urine indicates a clinical sign which is often found in daily practice. Red-colored urine usually indicates macroscopic hematuria.<sup>6</sup> Brown colored urine usually signifies a condition of biliary tract obstruction or hepatocellular disease.<sup>6</sup> PUBS is one of the urinary tract infection complications in which drainage tube and urinary bag turn purple.<sup>7</sup> This condition rarely occurs, with the prevalence of about 9.8% and 16.7% based on a cohort study in patients with a long-term indwelling urinary catheter.<sup>8</sup>

The most accepted pathogenesis of the PUBS mechanism so far is related to tryptophan metabolism, in which it is metabolized by gut bacteria to form indole.<sup>9,10</sup> Indole will be absorbed by the intestine and enter portal circulation, which then will be conjugated by the liver to become indicant (indoxyl sulfate).<sup>10-13</sup> Indicant will be excreted by kidneys and changed into indigo (blue) and indirubin (red) by the indole sulfatase and indole phosphatase - producing bacteria. In the alkaline or base condition of urine, both pigments will be oxidized and react with synthetic urine catheter material, eventually producing a purple discoloration.<sup>13</sup>

Based on the above pathogenesis, some conditions might induce the PUBS mechanism. Women often have this condition due to short urethra anatomy and its close distance to the anus, making it easier for women to contract urinary tract infections mainly by *Escherichia coli*.<sup>11</sup> Besides, zinc produced by the prostate gland acts as a potent antibacterial agent to prevent men from infection. Alkaline urine might induce PUBS because it facilitates indoxyl oxidation, as presented in this case report.<sup>13,14</sup> However, in other case reports, it is showed that PUBS could occur in acidic urine.<sup>14</sup> Patients with long-term bedridden and dementia are susceptible to having PUBS because, in this population, constipation is often found, a moreover indwelling urinary catheter is mostly used in this population.<sup>14</sup> While in a constipated patient, the gut motility will become slower, increasing the transit time and making overgrowth of gut bacteria. This condition results in an increased level of tryptophan changed into Indole.

Chronic kidney disease also aggravates PUBS's condition due to the declination of glomerulus capability, which increases the level of indicant (indoxyl sulphate) in blood serum and urine.<sup>15</sup> Additionally, indoxyl sulphate is highly attached to the albumin making indicant in patients with routine hemodialysis cannot be secreted completely, making this population highly susceptible to PUBS.<sup>15</sup>

Isolation of *Providencia Rettgeri* pathogen in urine culture in this patient supports the findings of literature that found negative gram bacteria is the most etiology of PUBS.<sup>16</sup> Bacteria such as *Providencia stuartii*, *Klebsiella pneumonia*, *Proteus species*, *Escherichia coli*, *Enterococcus species*, *Morganellamarganii*, and *Pseudomonas aeruginosa* can also cause PUBS.<sup>16</sup> Other pathogens that are reported to relate to PUBS are *Citrobacter spp.*, *Staphylococcus spp.*, and even *Methicillin-Resistant Staphylococcus aureus*.<sup>16</sup> The point that should be kept in mind is that not all pathogens can cause PUBS, and therefore, it explains why PUBS incidents are less prevalent.

In this case report, the patient was in long-term use of an indwelling urinary catheter made up of PVC material. Purple discoloration of urine occurs due to oxidized pigment that reacts with synthetic urine catheter material.<sup>17</sup> Without indigo, indirubin, and PVC material, the urine itself will not turn its color into purple but instead seems blackish-brown and cloudy, just like a common urine infection.<sup>17</sup>

Apart from the clinical manifestation of PUBS that is considered mild, patients with the underlying immunocompromised condition need more attention comprehensively. A previous study reported of PUBS with immunocompromised condition undergoes worsening condition and falls into Fournier's gangrene.<sup>8</sup> That is why PUBS can never be underestimated, mainly in the setting of the immunocompromised condition.

Discoloration of urine is often an alarm of underlying pathological conditions. Discoloration of urine into purple indicates a urinary tract infection which is caused by a particular organism.<sup>11</sup> The treatment of PUBS should be in accordance with the underlying urinary infection.<sup>11</sup> The aggressive use of antibiotics in PUBS is still debated regarding its mild natural mechanism. However, at some point, it might be severe in the setting of the immunocompromised condition. Other considerations in which the use of antibiotics is prioritized are in the case of symptomatic urinary infection, clinical signs of sepsis, and continuing PUBS. Despite the absence of guidelines in PUBS management, the management of PUBS still depends on each case and cause of infection. Besides, for more comprehensive management, the risk factors that predispose to PUBS should be treated, for instance, constipation and routine urinary catheter replacement. The use of a non-plastic urine bag might be an alternative. Another critical thing to regard is PUBS management's explanation and its natural mechanism to the patients, their families, and other medical co-workers who treat the patients. This condition often

leads them to be overly concerned and perform unnecessary examination and treatment.

## CONCLUSION

PUBS is a rare clinical course alarming the urinary tract infection. Although the condition is relatively mild, PUBS can fall into a serious condition like Fournier's gangrene and even sepsis, especially in patients with the immunocompromised condition. By understanding PUBS comprehensively, it is expected that PUBS can be adequately treated without performing an unnecessary supporting examination and resulting in any further complications.

## CONFLICT OF INTEREST

The authors declare there is no conflict of interest in this case report.

## INFORMED CONSENT

Informed consent was obtained verbally from the patient. However, the authors sure that this case report is sufficiently anonymized.

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The author did not receive any funding related to this manuscript

## AUTHOR'S CONTRIBUTION

MKYW obtained the case presented and wrote the manuscript, MKYW and PDW obtained reference and revised the manuscript, ESH supervised the process and revised the manuscript. The manuscript was read and approved by all authors

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