



Research Article

PURPLE URINE BAG SYNDROME- AN INTERESTING AND RARE PHENOMENON

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Abstract- Purple urine bag syndrome (PUBS) is a unique disease entity characterized by an alarming purple discoloration of the urine secondary to recurrent urinary tract infections with indigo- and indirubin-producing bacteria. It is usually associated with prolonged urinary catheterization and chronic debilitated states. We present this interesting phenomenon of purple urine in an elderly bedridden female who was on prolonged urinary catheterization. The urine culture was positive for *E.coli* and constipation was an added risk factor for the purple urine. The urinary catheter and tubing was changed along with a course of antibiotics which lead to the normalization of the urine colour.

Keywords- Purple urine bag syndrome, Tryptophan, Catheterization, Antibiotic therapy

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Introduction

Macroscopic or visual inspection of the urine is an inherent part of clinical medicine and diagnostic microbiology. Discoloration of urine usually draws the attention of any health care personnel and it is very distressing to patient and relatives. Purple urine bag syndrome (PUBS) is an uncommon entity characterized by purple discoloration of the urine drainage bag. It is typically seen in elderly bedridden patients with chronic indwelling urinary catheters and is associated with urinary tract infection (UTI) [1]. PUBS occur when bacteria containing indoxyl sulphatase and phosphatase enzymes break down tryptophan metabolites in urine. As a result, there is a production of indigo, blue in colour and indirubin, red in colour, both of which combine to give a purple appearance [1]. We present an interesting case of an elderly lady who developed purple-coloured urine and will briefly discuss its pathophysiology and relevance for clinical practice.

Case Report-

A 81 years old bed ridden female, with a history of chronic bilateral knee joint osteoarthritis and stricture urethra who had an indwelling urinary catheter in place for last 5 years, (Initially Folley's catheter for one year changed periodically at every 3 weeks and then after silicon catheter was used which was changed regularly at 6 weeks) presented in the emergency department with the complaints of nausea, vomiting, decreased oral intake and chronic constipation. She was haemodynamically stable. The patient was afebrile, denied chills and on physical examination revealed mild pallor. Her urine bag was filled with purple colored urine along with purplish discoloration of the tubing and the bag, although the urine in the measuring container was dark brownish color. Discolouration was present for four days without any symptoms of lower UTI [Fig-1]. She was not on any medications which might have caused urine discoloration. Investigations revealed a haemoglobin of 7.8 gm/dl and total leukocyte count of 14800/mm³. Her blood urea was 46 mg/dl, serum creatinine 1.4 mg/dl, serum sodium 138 mEq/L, potassium 3.07 mEq/L, serum protein 5.9 gm/dl with albumin 1.4 gm/ dl. Urine analysis showed alkaline pH 8.0 (4.80-7.80) along with marked pyuria and bacteriuria. Urine was positive for nitrates. Urine culture yielded more than 10⁵ colony-forming units of *Escherichia coli* [Fig-2]. Diagnosis of PUBS was made.

Patient was put on a new urinary catheter and 7 days of intravenous Ceftriaxone as per antibiotic sensitivity report. She responded well to treatment with disappearance of purple urine colour.

Discussion

Historically PUBS is known since 1812 when physicians looking after King George III made note of bluish discoloration in his urine and the urinary catheter and bag [2]. In the literature PUBS was first reported in 1978 by Barlow & Dickson, from the London Hospital for sick children. In this first communication, they proposed insoluble indigo as the direct cause of this discoloration, and intestinal obstruction and constipation as risk factors [3]. The prevalence of PUBS has been reported variably in different studies, ranging from 8.3% [4] to 42.1% [5]. Most of the published literature on PUBS is based on case reports only and any published data on the prevalence of this rare condition in the Indian subcontinent was not found. Risk factors associated with PUBS are specifically female gender, constipation, chronic catheterization, high urinary bacterial load, renal failure, the use of a polyvinylchloride (PVC) plastic catheter, alkaline urine and increased dietary tryptophan [6]. Female urinary anatomy unfortunately predisposes them to UTIs. A significant bacteriuria during a UTI increases bacterial enzymes which cause conversion of indoxyl sulphate to indigo and indirubin [7]. Increased intake of tryptophan in diet, is known to cause an increase in the substrate for the PUBS-causing bacteria to metabolize and produce red and blue pigments. Alkaline urine is known to cause oxidation of indoxyl sulphate to indigo and indirubin and thus producing striking purple colour [8]. Although alkaline urine appears a key factor in PUBS, it is not always necessary, as evidenced by a case report of PUBS in acidic urine [9,10]. Gastrointestinal conditions such as constipation, obstruction, intussusceptions and ileal diversions can also increase PUBS, presumably because the bacteria are allowed more time to grow and deaminate tryptophan [6]. Dehydration increases the serum concentration of indigo and indirubin, hence purple urine is more likely. In renal failure, there is impaired clearance of indoxyl sulphate providing the urinary bacteria more substrate to produce the red and blue pigments. The bacteria most commonly associated with this condition include: *Providencia stuartii*, *Providencia rettgeri*, *Proteus mirabilis*,

Pseudomonas aeruginosa, *Klebsiella pneumoniae*, *Escherichia coli*, *Morganella morganii*, *Enterobacter* spp, *Citrobacter* spp, Methicillin resistant *Staphylococcus aureus* and *Enterococcus* spp [11,12]. The postulated hypothesis regarding aetiopathogenesis of PUBS is believed to be related to metabolites of dietary tryptophan [Fig-3]. The normal flora in the intestine metabolizes tryptophan to indole which is absorbed into the portal circulation. Liver conjugates indole into indoxylsulphate which is excreted in urine. Urinary bacteria produce an enzyme indoxylsulphatase, breaking down the indoxyl sulphate into indoxyl. Then indoxyl turns into indigo (blue in colour) and indirubin (red in colour) [9,11].



Fig-1 Purple coloured urine along with purplish discoloration of the tubing and the bag



Fig-2 Significant growth of *E. coli* on MacConkey agar

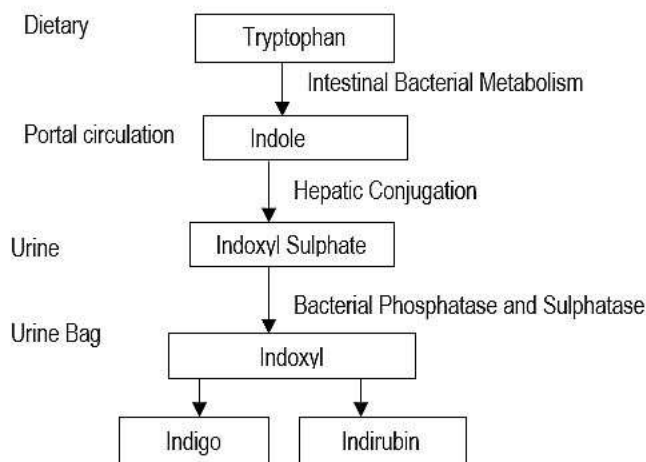


Fig-3 Pathogenesis of Purple Urine Bag Syndrome

The urine itself is not discolored red, blue or purple. Precipitations of indigo and indirubin pigments as well as reaction with the synthetic materials of the catheter and urine bag produce purple discoloration of urine. It is interesting to note that

despite the common occurrence of UTI in patients with risk factors for PUBS, it is rarely encountered. This might be due to the fact that numerous risk factors must be present simultaneously and if any key risk factor is not present, an appreciable amount of purple urine discoloration will not be produced [13]. Furthermore, a certain concentration of the pigments may be required for the precipitations to become visible. PUBS is more common following PVC plastic catheterization; PUBS following long term use of silicon based catheter also has been reported but is very rare suggesting that alkaline urine and type of materials used for urinary catheter and bag may be important factors. Treatment is generally directed at the underlying UTI as well as control of constipation and good urologic sanitation. Good care of the urinary catheters will prevent UTIs and hence this phenomenon as well. Though PUBS has been described as relatively benign, couple of cases of PUBS which progressed to Fournier's gangrenes requiring aggressive debridement are reported [14]. PUBS is generally a benign process though it is distressing. Except for the alarming nature of the purple colour of the urine, the patients with PUBS are usually asymptomatic. Complications are usually not seen in patients with PUBS. PUBS is also associated generally with higher incidence of morbidity and mortality than UTIs alone without this occurrence. PUBS was detected incidentally in our patient and she was asymptomatic without any complications which is concurrent with the reported cases. However, physicians should be aware that PUBS signals underlying UTIs, due to improper care of the urinary catheters and sanitation.

Conclusion

PUBS is concerning for patients, families, and clinicians. It is a complication of mixed growth UTIs whereby the causal bacteria metabolize tryptophan to produce pigments that turn catheter bags purple. It tends to occur in elderly, immobile females with long-term indwelling catheters who might be constipated or in renal failure. This is a spot diagnosis but can be confirmed by history, examination and urinary investigations. It can be managed with regular catheter changes and sanitation and possible treatment of UTIs and constipation depending on patient circumstances.

Application of research: Association of co-morbid conditions may lead PUBS to a life-threatening septic condition thus watchful surveillance is essential. Clinical correlation must be made for timely prevention and correct management as PUBS is usually resolves uneventfully.

Research Category: Clinical Microbiology, Medicine

Abbreviations:

PUBS: Purple urine bag syndrome
UTI: Urinary tract infection
PVC: Polyvinylchloride

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References

- [1] Khan F., Chaudhry M.A., Qureshi N., Cowley B. (2011) *Int J Nephrol*, 2011, 419213.
- [2] Arnold W.N. (1996) *Lancet*, 347, 1811-3.
- [3] Barlow G.B., Dickson J.A. (1978) *Lancet*, 311, 220-1.
- [4] Su Y.J., Lai Y.C., Chang W.H. (2007) *Am J Emerg Med*, 25(861), e5-6.
- [5] Su F.H., Chung S.Y., Chen M.H., Sheng M.L., Chen C.H., Chen Y.J., et al. (2005) *Chang Gung Med J*, 28, 636-42.
- [6] Kalsi D.S., Ward J., Lee R., Handa A. (2017) *Disease Markers*, Article ID 9131872.
- [7] Shiao C.C., Weng C.Y., Chuang J.C., Huang M.S., Chen Z.Y. (2008) *Nephrology*, 13(7), 554-59.
- [8] Umeki S. (1993) *Kansenshogaku Zasshi*, 67(12), 1172-1177.
- [9] Chung S.D., Liao C.H., Sun H.D. (2008) *Int Infect Dis*, 12, 526-7.
- [10] Ficher K.N., Neves A.A., Gomes S., Lins P.R.G., Silva M.J., Góis A.F. (2016) *Brazilian J Nephrol*, 38(4), 470- 472.
- [11] Hadano Y., Shimizu T., Takada S., Inoue T., Sorano S. (2012) *Int J Gen Med*, 5, 707-10.
- [12] Weaver J.C., Rajakunjaram R.K., Gunawardena I.A.A. (2018) *Int J Case Rep Images*, 9(1), 63-65.
- [13] Pillai B.P., Chong V.H., Yong A.M. (2009) *Singapore Med J*, 50(5), e193-4.
- [14] Gebrmichael T., Feleke F., Ahmed W., Urella M., Teka S. (2017) *Marshall J Med*, 3(3), Article 6.