

Cloudy Urine after Propofol Anesthesia; A Rare Occurrence after a Routine Anesthetic

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Abstract

A 27-year old man with a history of achalasia presented for an elective laparoscopic pylorotomy under general anesthesia. He was well with no significant comorbidities nor risk factors for hyperuricemia. The patient underwent routine preoperative screening and preparation. He was intubated and a urinary catheter was inserted prior to the start of surgery. A total intravenous anesthesia technique with neuromuscular blockade was used. Propofol and remifentanyl were infused to maintain anesthesia. After completion of the surgical procedure, anesthesia was stopped with cessation of the respective infusions and reversal of neuromuscular blockade. It was then observed that there was cloudy urine in the urinary bag. A sample of the urine was sent for further analysis and uric acid crystals were visualized under microscopy, causing the urine to take on a cloudy white appearance. The patient continued to be monitored in the post-operative care unit where the urine returned to being clear after an hour. The patient was followed up to the point of discharge. He was able to micturate normally and produced clear urine. Subsequent postoperative urinalysis did not show the presence of uric acid crystals.

Keywords: Cloudy urine; Propofol infusion

Case Report

A 27-year old man with no known medical problems presented electively for laparoscopic pylorotomy for achalasia. Achalasia is a primary esophageal motility disorder characterized by the absence of esophageal peristalsis and impaired relaxation of the Lower Esophageal Sphincter (LES) in response to swallowing. The surgical treatment involves weakening the lower esophageal sphincter by cutting the muscle fibers. The patient had neither history of hyperuricemia nor predisposing factors for nephrolithiasis. In addition, he had a normal BMI of 19.6 (height 1.78 m, weight 67 kg). Routine preoperative bloods; including a full blood count, renal panel as well as electrocardiogram and chest radiograph were normal. There were no serum uric acid levels done prior to surgery as the patient had no history suggestive of hyperuricemia or gout.

Upon admission the day before surgery, the patient was fasted from midnight and a maintenance drip of dextrose saline was started at 40 ml/hr. A total of 320 ml of dextrose saline was infused prior to surgery.

The anesthetic plan was for total intravenous anesthesia with target controlled infusion of propofol and remifentanyl as well as neuromuscular blockade. No inhalational anesthetic agent was used. Patient was mechanically ventilated with volume control ventilation with tidal volumes of 8 ml/kg. Propofol was infused with an effect site target concentration of 4 to 5 mcg/ml titrated to a bispectral index value of 40-60. Remifentanyl was infused at 0.05-0.20 mcg/kg/min. Atracurium was used for neuromuscular blockade; an intubating dose of 50 mg was given, followed by intermittent maintenance boluses of 10 mg every 20 minutes. The patient was fully reversed with 2.5 mg of neostigmine and 0.9 mg of atropine. Total dose of morphine for analgesia was 10 mg given in titrated aliquots over 3 hours of surgical time. The total volume of intravenous fluids used intraoperatively was 2 litres of Hartmann's solution. The duration of the operation lasted a total of 3 hours, after which the propofol infusion was stopped completely towards the end of the operation. Total dose of propofol used was 2350 mg.

A urinary catheter was inserted after induction of anesthesia and

clear yellow urine was drained from the catheter. At the end of the operation, when the urine bag was checked again, it was discovered that the urine had taken on a cloudy appearance. Total volume of urine collected was 650 ml. The patient was then monitored in the post anesthesia care unit after the operation and a sample of the cloudy urine was obtained and sent for further analysis. Figure 1 within an hour of being in the post anesthesia care unit, the urine had returned back to being clear.

Investigations showed a normal microscopic examination, with presence of a few red blood cells consistent with catheterization. However, there were crystals visible under the microscope (Figure 2). These



Figure 1: Clear urine emptied out into bottle before the start of the operation. Cloudy urine in urinary bag occurring after propofol anesthesia.

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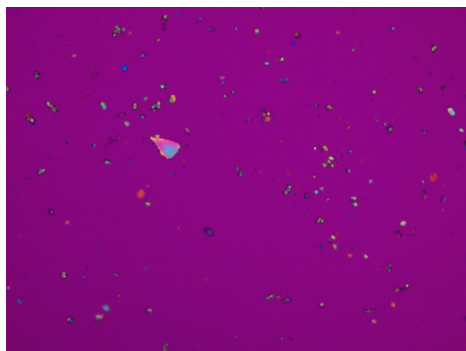


Figure 2: Uric acid crystals seen under microscopic examination of the patient's urine.

were small and had a rhomboid appearance, which was consistent with uric acid crystallization. Urine cultures were negative for infection. On the second post-operative day, urinalysis was repeated and there were no longer crystals present in the urine. Serum uric acid levels were done and they were normal 0.28 mmol/L (normal range 0.27-0.47 mmol/L). Renal panel was normal as well. The patient was asymptomatic; he did not have dysuria and was able to micturate normally.

Discussion

This patient developed cloudy urine after total intravenous anesthesia with propofol infusion. This was confirmed to be due to uric acid crystallization upon further investigations. Cloudy urine after propofol anesthesia has rarely been reported [1], although propofol is known to cause green colored urine after prolonged infusions due to the presence of phenolic green compounds [2].

Uric acid is known to precipitate with an acidic urine pH, yet this patient had an alkaline urine pH of 7.0. We suspect that this could have been due to a mixture of the previously normal urine. Propofol has been reported to be uricosuric. The mechanism by which it increases uric acid excretion has been postulated to be due to its structural similarity to probenecid; both drugs encompass a benzene ring [3]. Probenecid competes with uric acid at the anion transport exchanger at the renal tubules, inhibiting the reabsorption of uric acid. Hence, it is postulated that propofol or one of its metabolites competes at the same anion transport exchanger. It is unknown which of the metabolites of propofol have a uricosuric effect. Some authors have reported presence of pink urine after propofol administration in obese patients with hyperuricemia [4]. This has been hypothesized to be due to an acidic pH and underlying high serum uric acid levels which predispose to uric acid crystal formation.

Differentials considered in this patient included; urinary tract infection increased excretion of phosphate crystals as well as iatrogenic causes such drugs or dyes. Urinary tract infection can give rise to a cloudy appearance in the urine due to pyuria. The patient did not have a urinary tract infection; urine cultures were negative and he did not exhibit any symptoms post operatively. Microscopic examination of the exam did not show any infection. Phosphate crystals can precipitate in alkaline urine giving it a milky white appearance. However, this is more common in patients with hyperparathyroidism, which this patient did not have.

The patient was not on any long-term medication, which could have accounted for the colour of the urine. Such medications include antibiotic drugs such as rifampicin as well as anticoagulants such as

warfarin and heparin. Intraoperatively, there was also no use of specific dyes such as methylene blue, which may account for discolored urine. Methylene blue is a dye commonly used in surgical procedures. It can cause a bluish discoloration of the urine. Among the drugs used during anesthesia, it seemed that propofol was the likely case. In this case, the cloudy urine was due to uric acid crystallization evidenced by the microscopic examination.

Risk factors for uric acid precipitation with propofol anesthesia include low urinary pH, hyperuricemia, low urinary volume as well as obesity [5]. We hypothesize that in our patient, preoperative fasting could have contributed to hyperuricemia from increased muscle catabolism and low urinary volume from dehydration. As a result, even in the absence of obesity and known hyperuricemia, uric acid crystals can be precipitated transiently during propofol-based anesthesia.

With the increasing popularity of propofol use for total intravenous anesthesia, sedation for procedures and in the intensive care unit, it is possible that cloudy urine might be observed more frequently. We hope to increase the awareness of this likely benign and rarely seen side effect of propofol use. Potential benefits could include use in patients with hyperuricemia. As observed in our patient, this phenomenon appears to be transient and self-resolving, with no acute detrimental effects on renal function. Currently there is no literature on long-term effects of this phenomenon.

Conclusion

Propofol has gained increasing popularity in the recent years; both in the field of anesthesia as well as critical care medicine. Green discoloration of the urine occurring with propofol infusion is a well-known phenomenon. Our report illustrates a rare urinary side effect of propofol infusion during anesthesia; cloudy white urine. The appearance of cloudy urine with propofol anesthesia is likely due to the precipitation of uric acid crystals. This effect is transient and resolves spontaneously. With increased awareness, we can avoid unnecessary investigations. This could potentially benefit patients with hyperuricemia by renal elimination of uric acid crystals.

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