

# Intraoperative Change in Urine Color: Be Cautious for a Clinical Entity!

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*A change in urine color is an unusual intraoperative occurrence, which can be distressing for the anesthesia provider. Abnormal changes in color are generally benign effects of medications and foods; however, a change in urine color may be a sign of an underlying pathologic condition. Methylene blue, a nonpathogenic, water-soluble, commonly used dye for diagnostic tests, has on rare occasions, been reported*

*to discolor urine green intraoperatively or postoperatively. We report on a patient who produced green discoloration of urine intraoperatively after methylene blue administration, which was benign and resolved spontaneously.*

**Keywords:** Anesthesia, green urine, methylene blue, side effects.

Urine color is an indicator of many clinical situations and helps in suspicion of a clinical diagnosis warranting further assessment. The intraoperative period is a dynamic situation, and urine output is considered one of the important monitoring tools by the anesthesia provider. The urine color is an indicator of clinical situations such as high color urine (hypovolemia), dark yellow urine (increased bilirubin levels), pink to red-brown urine (hematuria), brown urine (myoglobinuria), or orange urine (drugs like rifampicin).<sup>1</sup> Any sudden change in urine color intraoperatively signifies the need for evaluation of an underlying etiology to prevent an untoward event.

## Case Summary

We report a case of green urine in a 33-year-old, 70-kg, female patient with breast carcinoma undergoing bilateral skin-sparing mastectomy with implant insertion. The patient was ASA physical status 1. Preoperative assessment did not reveal any comorbidities. In the operating room, standard monitors were attached, and intravenous access was secured. Anesthesia was induced with intravenous morphine, 6 mg, and propofol, 140 mg. Tracheal intubation was facilitated by intravenous rocuronium, 40 mg. Anesthesia was maintained with 1% to 3% sevoflurane in an air-oxygen mixture and ventilated with volume-controlled mode to keep the end-tidal carbon dioxide values between 35 and 40 mm Hg.

Intraoperatively, 2 mL of methylene blue dye was administered at the periareolar region for sentinel lymph node mapping.<sup>2</sup> Three hours later during surgery, the urine color changed to green (Figure 1). Before this episode the hourly urine output was being measured and was normal in volume and color. The patient remained hemodynamically stable, and the urine output volume was within normal limits. The intraoperative period was

otherwise uneventful. The surgery lasted for 5 hours. No other medication was given during the intraoperative period except intravenous paracetamol (1 g). During the intraoperative course, total blood loss was 50 mL, total volume of fluid given was 1,200 mL, and urine output was 500 mL. At the end of the surgery, residual neuromuscular block was reversed with neostigmine and glycopyrrolate.

The patient was kept under observation. She was reevaluated, and all medications were reviewed. Renal function test, liver function test, and urine analyses were ordered, and results were normal. The postoperative period was unremarkable, with a normal volume of urine output. None of the medications that the patient was receiving was found to have the side effect of causing green urine. The patient's urine color was monitored, and the green urine gradually became lighter and finally returned to a normal color about 10 hours postoperatively (Figure 2).

## Discussion

Methylene blue is a nonpathogenic, water-soluble dye. It is used intraoperatively for diagnostic tests and identification of parathyroid glands, for assessing patency of fallopian tubes, and mapping of lymph nodes for nodal status in patients with breast cancer during surgery. Methylene blue is metabolized in the body to leucomethylene blue, which is excreted primarily in the urine. There was a report of green urine due to methenamine, salicylate, methylene blue, benzoic acid atropine, and hyoscyamine (Prosed DS)—an oral analgesic, antiseptic, and antispasmodic medication that contains methylene blue—in a patient with bladder carcinoma.<sup>3</sup>

Light of wavelengths 550 to 700 nm is absorbed by methylene blue, with preferential maximum absorbance at 660 nm and 609 nm, which can be detected in urine by spectrophotometry.<sup>4</sup> The presence of these 2 peaks in



**Figure 1.** Urine Color Changed to Green Three Hours After Start of Surgery



**Figure 2.** Urine, Which Returned to Normal Color, 10 Hours Postoperatively

Category	Cause
Infections	<i>Pseudomonas</i>
Medications	Propofol
	Methocarbamol
	Amitriptyline
	Metoclopramide
	Promethazine
	Cimetidine
	Indomethacin
	Flupirtine
	ALSO Breath mints (Clorets, Cadbury Adams)
	Dyes
Indigo blue	
Biliverdin	
Food colorings	

**Table.** Causes of Green Urine

a green urine sample confirms the presence of methylene blue. In a patient with normal renal function, methylene blue appears in urine within a few minutes after intravenous administration and 2 to 6 hours after oral administration.<sup>5</sup> It may remain detectable after 24 hours. In our case, however, green urine appeared 3 hours after intravenous use of methylene blue and lasted for 10 hours. The later-than-usual color change may result from delayed absorption from periareolar tissue of the breast.

Vigilance and assessment for the underlying possible causes of change in urine color are required during surgery. Green urine is associated with other medications. It can be seen with medicines containing phenol groups (promethazine, thymol, cimetidine, and propofol). These are conjugated in the liver and get excreted by the kidneys as green urine (Table).<sup>6,7</sup> Nonphenolic medications producing green urine are metoclopramide, amitriptyline, and indomethacin. The presence of biliverdin in urine can give a green hue in patients with chronic obstructive

jaundice. Urinary tract infections caused by *Pseudomonas* organisms can turn urine green because of pyocyanin and pyoverdin pigments produced by bacteria.<sup>6,7</sup>

As mentioned earlier, propofol infusion can cause greenish urine. The mechanism is thought to be 4-sulfate and 1- or 4-glucuronide conjugates of 2,6-diisopropyl-1,4-quinol.<sup>8</sup> Green discoloration of the urine from propofol infusion is dose dependent. Overflow of the extrahepatic elimination may result in dark green discoloration of the urine. The exact frequency of this phenomenon is not known but appears to be rare, which may be related to interindividual variability in hepatic and extrahepatic propofol elimination capacity.<sup>8,9</sup> Its metabolites are biologically inactive substances, and therefore green urine associated with propofol is benign and reversible.

To conclude, green urine is an unusual intraoperative occurrence. However, it is clinically insignificant and requires no treatment unless it is secondary to an infectious pathology. It is important to obtain a comprehensive patient history and maintain clinician awareness in these cases. Prompt recognition of this phenomenon by the anesthesia provider may limit unnecessary laboratory tests and anxiety among caregivers.

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## **DISCLOSURES**

The authors have declared no financial relationships with any commercial entity related to the content of this article. The authors did not discuss off-label use within the article.