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## CASE REPORT

# Cola-Colored Dialysate as a Gastrointestinal Sequelae of Cardiac Surgery in a Patient Who Underwent Peritoneal Dialysis

Eng-Kian Ling, Bing-Shi Lin, Shou-Shan Chiang and Ming-Hsien Tsai

*Division of Nephrology, Department of Internal Medicine, Shin-Kong Wu Ho-Su Memorial Hospital, Taipei, Taiwan*

## Abstract

The discoloration of effluent peritoneal dialysate, which is transparent in origin, is seen in some particular conditions including chyloperitoneum, calcium channel blocker usage, hemoperitoneum, perforated cholecystitis, iron administration, and hemorrhagic pancreatitis. We report a case of a 60-year-old woman who underwent peritoneal dialysis for 3 years and presented with conspicuous cola-colored (brownish-black) dialysate after a cardiac surgery. The findings of the dialysate analysis and the abdominal computed tomography showed that this discoloration could be due to the presence of methemalbumin caused by pancreatitis (not hemorrhagic) combined with intra-abdominal bleeding—both of which are rare gastrointestinal complications of cardiac surgery. She eventually died of pulseless electrical activity due to severe sepsis with profound shock. Therefore, the rare event of cola-colored peritoneal dialysate could present as severe gastrointestinal sequelae of cardiac surgery and may indicate a poor prognosis.

**Keywords:** discoloration, peritoneal dialysis, cardiac surgery, methemalbumin, pancreatitis

## INTRODUCTION

Generally, peritoneal dialysate is transparent and faintly yellow; however, discoloration can be seen in some special conditions. Generally, a cloudy dialysate indicates peritonitis, but not all instances of cloudy dialysate are due to infection. There have been reports of different colored dialysates: a milky-colored dialysate can be due to a chyloperitoneum or lercanidipine (a novel dihydropyridine calcium channel antagonist), red discoloration can be due to hemoperitoneum, rusty dialysate can be due to iron administration and a green dialysate can be due to perforated cholecystitis.<sup>1–5</sup> The cola-colored (brownish-black) dialysate is rarely seen and has been proposed to be caused by hemorrhagic pancreatitis due to the presence of methemalbumin.<sup>6</sup>

We describe a patient treated with peritoneal dialysis who had a striking cola-colored dialysate after a cardiac surgery with the similar mechanism of hemorrhagic pancreatitis but different red blood cells (RBCs) source.

## CASE REPORT

A 60-year-old woman with a Chinese herb nephropathy was commenced on automated peritoneal dialysis for 3

years. She presented with chest tightness, which she had for several months, and cardioangiography revealed single-vessel disease (left anterior descending artery: proximal 80% stenosis). Because of the technical difficulty of stenting the narrow lesion, a mini coronary artery bypass graft was performed. However, profound shock needing vasopressor and intra-aortic balloon pump (IABP) support were noted at day 1 after the operation. The serum laboratory examination revealed a white blood cell (WBC) count of 24,700/ $\mu$ L with 20% band neutrophils, hemoglobin level of 6.4 gm/dL (8.4 gm/dL before surgery), C-reactive protein level of 13.5 mg/dL, sodium level of 140 meq/L, potassium level of 7.2 meq/L, chloride level of 101 meq/L, pH 7.2, pCO<sub>2</sub> 19.3 mmHg, bicarbonate level of 7.7 meq/L, anion gap 31.3, lactate level of 233 mg/dL, aspartate aminotransferase (AST) level of 18390 U/L, alanine aminotransferase (ALT) level of 3851 U/L, total bilirubin level of 3.1 mg/dL, amylase level of 1432 U/L, lipase level of 4950 U/L, and creatine phosphokinase (CPK) level of 4355 U/L.

Since the patient was diagnosed with severe lactic acidosis with hyperkalemia and shock liver after cardiac surgery, we changed the dialysis mode to continuous venovenous hemofiltration without heparinization.

Address correspondence to Ming-Hsien Tsai, Division of Nephrology, Department of Internal Medicine, Shin-Kong Wu Ho-Su Memorial Hospital, 95, Wen-Chang Rd, Shih-Lin, Taipei 111, Taiwan. Fax: +886-2-28389335; E-mail: M007358@ms.skf.org.tw

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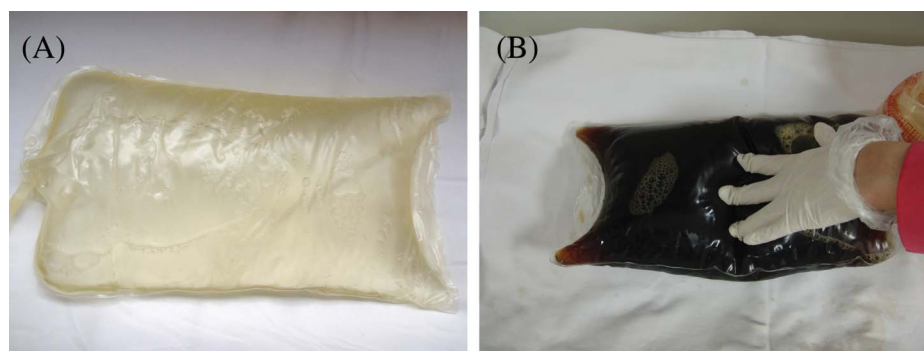


Figure 1. Peritoneal dialysate. (A) clear dialysate. (B) Cola-colored (brownish-black) peritoneal effluent.

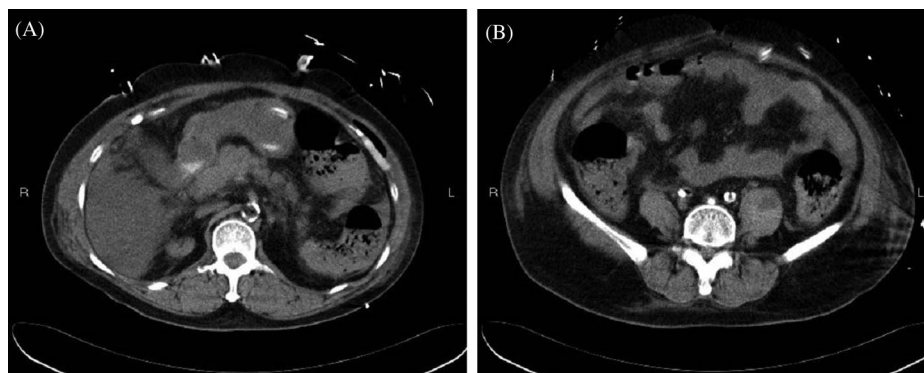


Figure 2. Non-contrast abdominal CT scan. (A) Acute pancreatitis (not hemorrhagic), which was evidenced by increased infiltration around the pancreas with minimal peripancreatic infiltration but without a hyperdense lesion. (B) Left psoas muscle hemorrhage diagnosed by swelling of the left psoas muscle with mixed hyperdense and hypodense cystic foci.

Concurrently, we found that the effluent peritoneal dialysate, which was clear prior to surgery, became cola-colored (Figure 1). The laboratory analysis of the effluent dialysate yielded the following findings: WBC count of  $3/\mu\text{L}$ , RBC count of  $1805/\mu\text{L}$ , amylase level of  $1258 \text{ U/L}$ , lipase level of  $1216 \text{ U/L}$ , total bilirubin level of  $0.3 \text{ mg/dL}$ , hemoglobin level of  $0.2 \text{ gm/dL}$ , and absence of bacteria in gram staining analysis. Abdominal CT was performed to identify the possible intra-abdominal lesion, and it revealed acute pancreatitis (not hemorrhagic), left psoas muscle hemorrhage, and colonic infarction with a suspicion of microperforation (Figure 2). Although broad-spectrum antibiotics were prescribed, the patient eventually died of pulseless electrical activity associated with septic shock (WBC count of  $9000/\mu\text{L}$  with 31% band neutrophils) and severe metabolic acidosis 3 days later.

## DISCUSSION

Brownish-black peritoneal dialysate due to methemalbumin has been reported in patients with hemorrhagic pancreatitis. The proteolytic enzymes from the pancreas cause destruction of the RBCs, thus providing free hemoglobin that combines with albumin to subsequently

form methemalbumin.<sup>6</sup> Rhabdomyolysis is another possible cause of cola-colored dialysate,<sup>7</sup> in which myoglobin may replace hemoglobin because of their similar heme structures. Intravascular hemolysis is the most common cause of methemalbumin in the serum, and it also occurs in ruptured ectopic pregnancy, postoperative intraperitoneal bleeding, ischemic bowel disease, and hemorrhagic pancreatitis,<sup>8</sup> but it is rarely seen in the peritoneal dialysate.

Gastrointestinal complications occur on an average after 1.21% of cardiac operations, and they result in a high mortality of 34.1%. They include gastrointestinal bleeding, peptic ulcer, ischemic bowel, pancreatitis, acute cholecystitis, diverticulitis, and liver failure. The most common risk factors identified include the age of more than 70 years, low cardiac output, peripheral vascular disease, reoperative surgery, chronic renal insufficiency, increased number of blood transfusions, prolonged cardiopulmonary bypass time, arrhythmias, and the use of an IABP.<sup>9</sup> Furthermore, psoas muscle hematoma is a complication of anticoagulant therapy after cardiac surgery.<sup>10</sup>

In our case, the patient presented with profound shock and cola-colored dialysate after cardiac surgery. Initially, she was diagnosed with hemorrhagic

Table 1. Comparison of patients with cola-colored effluent peritoneal dialysate in the literature review.

Reference	A.A. Connacher et al. <sup>6</sup>		M.Y. Lai et al. <sup>7</sup>	This case
Case no.	1	2	3	4
Age	32	37	62	60
Sex	F	F	F	F
Serum				
Amylase (U/L)	1910	500	n/a	1432
CPK (U/L)	n/a	n/a	55620	4355
PD effluent				
Mb ( $\mu$ g/L)	n/a	n/a	20405.5	n/a
Hb (mg/dL)	n/a	n/a	n/a	0.2
WBC ( $/\mu$ L)	700	n/a	1	3
RBC ( $/\mu$ L)	n/a	n/a	26	1805
Diagnosis	Hemorrhagic pancreatitis	Hemorrhagic pancreatitis	Rhabdomyolysis	Pancreatitis with hemoperitoneum
Prognosis	Dead	Dead	Dead	Dead

Note: CPK, creatine phosphokinase; PD, peritoneal dialysis; Mb, myoglobin; Hb, hemoglobin; RBC, red blood cell; n/a, not available.

pancreatitis, but the abdominal echo findings showed no obvious fluid accumulation in the peripancreatic space, thereby not supporting this diagnosis. A non-contrast abdominal CT scan revealed colonic infarction, acute pancreatitis (not hemorrhagic), and psoas muscle bleeding, which are potential gastrointestinal complications of cardiac surgery. We thought that the discoloration of the effluent dialysate was due to acute pancreatitis plus intra-abdominal bleeding, which is similar to that seen in hemorrhagic pancreatitis, but with a different RBC source. The hemoglobin value in the dialysate was 0.2 mg/dL, thereby indicating some bleeding into the abdominal cavity, which may be related to coagulopathy due to sepsis or heparin usage after cardiac surgery. Bowel ischemia and micro-perforation seem unlikely to contribute to the discolored peritoneal dialysate because initial peritoneal WBC count was only  $3/\mu$ L, meaning no existence of peritonitis. Rhabdomyolysis played a minor role in our patient initially, because the serum CPK level on day 1 was not extremely high compared to that in the patient reported by M.Y. Lai et al. (7; Table 1)

In conclusion, the cola-colored peritoneal dialysate can present as a gastrointestinal consequence after cardiac surgery, and it may be an indicator of poor prognosis because all the cases described in the literature with such colored peritoneal effluents eventually died (as presented in the literature review, Table 1). However, this hypothesis needs more clinical observations for the confirmation because it is only based on a small number of case reports.

**Declaration of interest:** The authors report no conflicts of interest. The authors alone are responsible for the content and writing of this article.

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