

# Severe hyponatraemia due to high output external biliary drainage corrected with bile refeeding: A case report

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## Abstract

Hyponatraemia is an uncommon complication of external biliary drainage. We report on a 62-year-old male with hilar cholangiocarcinoma who developed refractory severe hyponatraemia despite sodium replacement during preoperative external biliary drainage. Nasojejunal bile refeeding restored sodium levels to normal.

## Keywords

Bile refeeding, hyponatraemia, external biliary drainage

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## Introduction

Hyponatraemia, the most common electrolyte imbalance encountered in clinical practice, is seen in up to 30% of hospitalized patients.<sup>1</sup> Clinical manifestation is variable ranging from subclinical to severe or even life-threatening neurological manifestations such as seizures and coma<sup>2</sup> in severe hyponatraemia below 120 mmol/L. Furthermore, hyponatraemia is an important negative prognostic and predictive factor in patients with biliary tract malignancies.<sup>3</sup> Malignancy-associated hyponatraemia occurs mostly due to a syndrome of inappropriate ADH (SIADH) either as a paraneoplastic manifestation or after chemotherapy. Other causes include pseudohyponatraemia due to paraproteinaemia, adrenal insufficiency due to metastatic infiltration, liver or cardiac failure, gastrointestinal losses from vomiting or diarrhoea, solute loss due to cerebral or renal salt wasting and excessive third space loss.<sup>4</sup>

Bile has a sodium concentration of 141–165 mmol/L.<sup>5</sup> Excessive losses during biliary drainage for obstructive jaundice may cause fluid and electrolyte depletion, malabsorption, diarrhoea and acute kidney injury. Enteral refeeding with drained bile is a physiological and low-cost method of replenishment with the potential to reverse these derangements<sup>6</sup> though literature on this is sparse.<sup>7–9</sup> We present a patient with refractory severe hyponatraemia following

external biliary drainage whose hyponatraemia was corrected with refeeding of bile.

## Case presentation

A 62-year-old male was investigated for jaundice, anorexia and weight loss of 3 months duration. He had well-controlled diabetes, dyslipidaemia and a BMI of 19.2 kgm<sup>-2</sup>. The total bilirubin (15.9 mg/dL), GGT (1396 U/L) and ALP (786 U/L) were elevated with severe hypoalbuminemia of 1.9 g/dL. His serum creatinine was normal (0.7 mg/dL) and baseline serum sodium was 126 mmol/L. Abdominal CT (Figure 1) revealed a potentially resectable mass-forming hilar cholangiocarcinoma.

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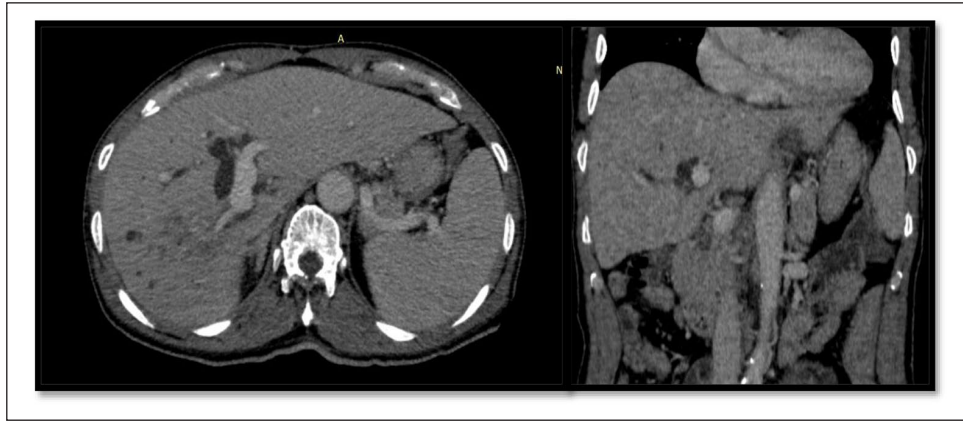
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**Figure 1.** CT liver-depicting mass forming hilar tumour with right lobar atrophy and right portal vein thrombosis and central intrahepatic biliary dilatation.



**Figure 2.** Cholangiogram via external biliary drain (EBD) tube.

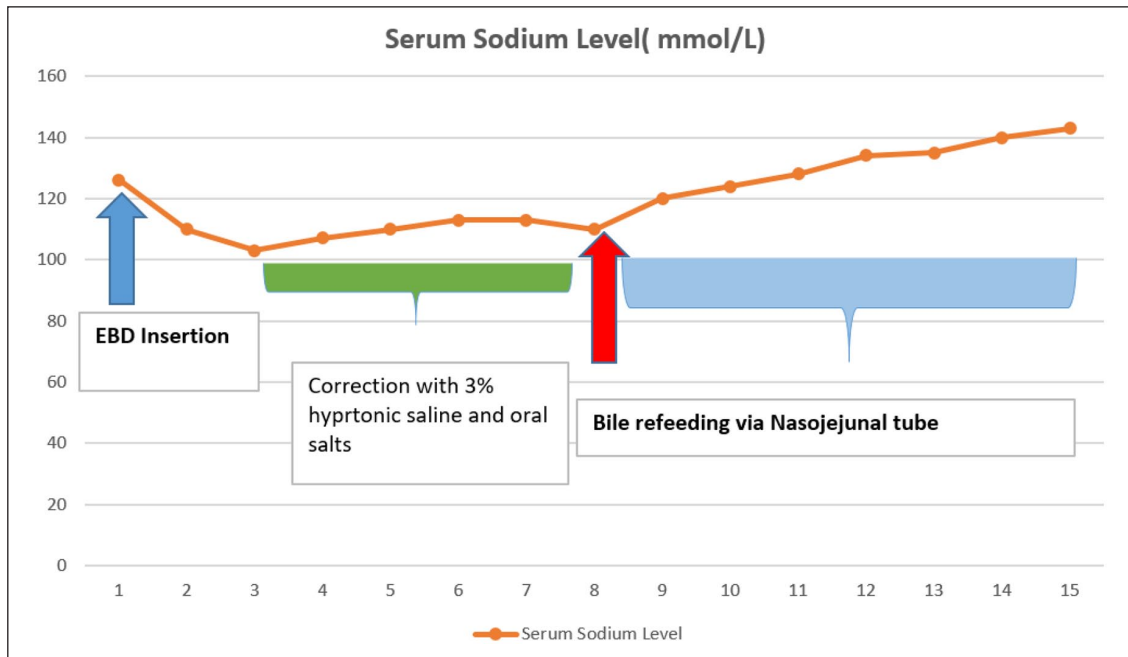
External biliary drainage (EBD) (Figure 2) was performed with a view of prehabilitation and followed by curative resection. Internal stenting failed due to a tight stricture at the biliary confluence. Post-EBD day 2, he developed a high output biliary drain averaging 2500 mL per day, severe hyponatraemia (Na 103 mmol/L) (Figure 3) and hyperkalaemia (K 6.4 mmol/L). He complained of intermittent calf muscle cramps. However, he was alert and orientated and maintained a urine output of 1–1.5 mL/kg/h. His serum osmolality was low (238 mosm/kg water), and urine osmolality was normal (603 msom/kg water). Urine sodium was 18 mmol/L, while the bile from the EBD had a sodium of 162 mmol/L, suggesting biliary Na loss as the cause of hyponatraemia. Octreotide was commenced to reduce biliary drainage. Initially, intravenous hypertonic (3%) saline boluses followed by infusion were administered to correct acute severe hyponatraemia. Despite further treatment with hypertonic saline and replacement of biliary loss with oral and intravenous fluids, serum Na

remained low. Given the refractory hyponatraemia, refeeding of bile was commenced through an endoscopically placed nasojejunal tube as the replacement fluid following which the hyponatraemia resolved. He had muscle cramps during the period of hyponatraemia which was symptomatically improved with bile refeeding. He subsequently underwent an extended right hepatectomy, extrahepatic bile duct resection and Roux-en-Y hepaticojejunostomy (Figures 4 and 5) but unfortunately succumbed to post-hepatectomy liver failure and sepsis.

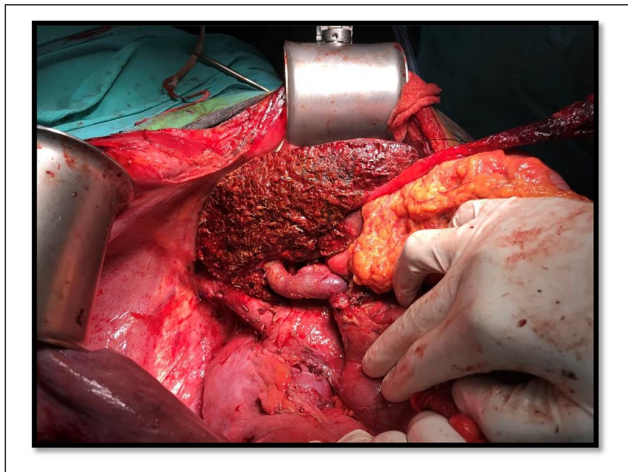
## Discussion

Hyponatraemia resulting from EBD results from high volume loss of sodium-rich bile. Malabsorption-induced diarrhoea due to the lack of bile in the gut may also be a contributing factor. Post-choledochostomy acidotic syndrome characterized by high volume biliary drainage, hyponatraemia and metabolic acidosis has been described with external diversion of bile.<sup>7</sup> Bile refeeding has shown variable results with sparse evidence restricted to a few case reports.<sup>7,10,11</sup>

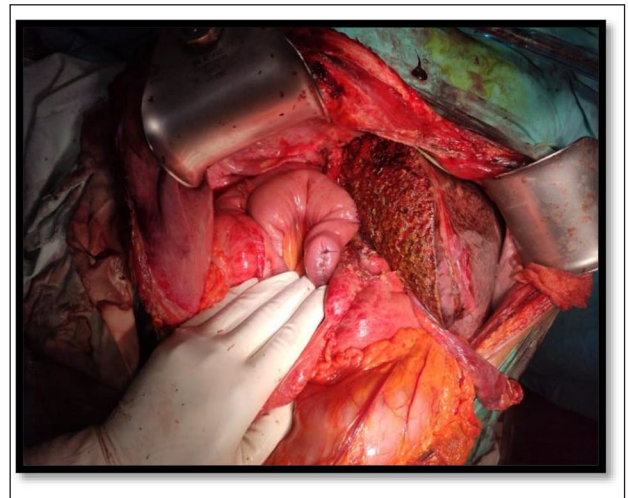
Low baseline serum sodium levels are not uncommon in the elderly, especially in the background of malignancy. While, in most instances, patients are asymptomatic or show mild symptoms, rapidly developing and severe hyponatraemia may lead to life-threatening cerebral oedema with seizures and coma. The low serum osmolality (238 mosm/kg water) with normal urine osmolality (603 msom/kg water) and urine sodium (18 mmol/L) are indicative of hypotonic hyponatraemia. In the context of normal renal function and GFR and absence of diuretic therapy, this suggests intravascular volume depletion due to the high output bile drain.<sup>1</sup> Hypotonic hyponatraemia occurs in SIADH, adrenal insufficiency and cerebral or renal salt wasting, though these appear less likely here. SIADH though often reported in small-cell lung cancer is rarely described in biliary malignancies.



**Figure 3.** Fluctuating serum sodium level in the patient.



**Figure 4.** Intraoperative view after extended right hemihepatectomy, segmental portal vein resection and reconstruction.



**Figure 5.** Reconstruction with Roux-en-Y hepaticojejunostomy.

The efficacy and safety of biliary drainage with bile refeeding<sup>7</sup> in malignant jaundice has been reported in terms of improved resection rates<sup>10</sup> and the recovery of hepatic function and visceral proteins.<sup>11</sup> The use of drained bile is more cost-effective and reno-protective than the administration of exogenous bile salts.<sup>6</sup> Importantly, in addition to the physiological repletion of fluid and electrolytes, refeed bile is likely to exert a trophic effect on the intestinal mucosa, thereby strengthening the gut barrier function. The main challenge to bile refeeding is that it is not palatable and induces nausea and

vomiting when taken orally. Strategies to overcome this include nasogastric feeding as was done in this patient and mixing with flavoured fizzy drinks.<sup>6</sup> This patient was awaiting major liver resection for hilar cholangiocarcinoma. Therefore, correction of hypernatraemia is one of the most important aspects during preoperative optimization which is different to patients with hyponatraemia in the medical ward set up clearly. This case illustrates and provides evidence for the correction of hyponatraemia due to high output biliary drain following external biliary drainage with bile refeeding.

## Conclusion

This case highlights one of the rare consequences of preoperative biliary drainage in malignant jaundice. Clinicians should be aware of the potential for severe hyponatraemia and its life-threatening effects. Bile refeeding is a physiological, safe, low-cost and effective method of rectifying fluid and electrolyte derangements in these patients.

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## Author's contribution

DS and PD design the case. DS, PD and RJ wrote the case. SS and SP critically analysed the case. DS, SS and VD are involved in surgical management. DS, VD, SS, SP and PD are involved in patient's preoperative and postoperative management.

## Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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## Ethics approval

Ethics approval is not necessary for the publication of case reports in our institution.

## Informed consent

Informed written consent was obtained from the patient and his family during the preoperative period for the publication of this case report and accompanying images.

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