

# Spontaneous Hepatic Hemorrhage Following Whipple's Procedure: A Report of Two Cases

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## ABSTRACT

Whipple procedure, also known as pancreaticoduodenectomy, is a complex surgical operation performed for various pancreatic and periampullary pathologies. While the procedure has undergone significant refinements, it remains associated with significant morbidity and mortality. Spontaneous hepatic hemorrhage/rupture is a rare but potentially life-threatening complication that has been reported in the literature.

We present two rare cases of spontaneous hepatic rupture following Whipple procedure. A 79-year-old male underwent Whipple procedure for periampullary carcinoma. On postoperative day 19, he suddenly developed epigastric pain, nausea and vomiting. Imaging revealed a spontaneous hepatic rupture. Similarly a 67 years old female for suspected periampullary underwent Whipple's procedure. On postoperative day 14, she presented to emergency department with complaint of right hypochondrial pain, continuous in nature and severe in intensity and was also diagnosed with spontaneous hepatic rupture. Surprisingly, the early postoperative CT of both patients did not reveal any evidence of hepatic injury or hematoma and there was no history of trauma. Both the patients were managed conservatively and were vitally stable on discharge and follow up.

**Keywords:** Preampullary Carcinoma, Spontaneous Hepatic Rupture, Subcapsular Hematoma, Whipple's Procedure.

### Authors' Contribution:

<sup>1,2</sup>Conception; Literature research; manuscript design and drafting; <sup>2,3</sup>Critical analysis and manuscript review; <sup>5,6</sup>Data analysis; Manuscript Editing.

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## Introduction

Periampullary masses are mostly managed by the hepatobiliary team using the whipple procedure, however it poses high morbidity and mortality rates.<sup>1-3</sup> Pancreatic fistulas are the most common complication seen after Whipple procedure.<sup>4</sup> The incidence of postoperative hemorrhage has been reported between 5% and 16% in the literature.<sup>5-6</sup> Whipple procedure is considered as one of the most difficult and complex surgery carrying a high rate of multiple complications including bleeding, fistula formation or collections. Karim et al

mentioned hematoma formation to be seen in 12.2% of the patient's being the most seldom seen complication<sup>7</sup>. Multiple factors assist in this post-operative hemorrhage like ongoing sepsis etc. Spontaneous hepatic hemorrhage/rupture is a rare complication that has been reported in the literature following various surgical procedures, including the Whipple procedure. The exact pathophysiology of this complication remains unclear, but possible contributing factors include:

1. Liver trauma: Direct injury to the liver during surgery.

2. Hepatic artery thrombosis: Thrombosis of the hepatic artery, leading to liver ischemia and rupture.

3. Coagulopathy: Postoperative coagulopathy, leading to uncontrolled bleeding.

Rarely, it can happen alone, but it can also happen in conjunction with other liver diseases, like coagulopathy, HELLP syndrome (haemolysis, elevated liver enzymes and low platelet count). The diagnosis is challenging, and the fact that there are so many proposed treatments for this ailment makes matters more complicated. Because it causes intra-abdominal bleeding that can lead to hemorrhagic shock and death if left untreated, it is considered an emergent surgical emergency. We report two cases in whom spontaneous liver rupture occurred post Whipple procedure.

## Case Presentation

### CASE. 1

A 79 years old male patient presented to Gastroenterology department of Shifa International Hospital with complaint of discomfort/burning and occasional blood in stool. There was no history of weight loss. Outside facility ultrasound showed dilated CBD with dilated intrahepatic ducts and fatty liver. Patient also had History of hemorrhoids.



Figure 1 A: Coronal post contrast CT scan of abdomen and pelvis showing moderate intrahepatic biliary dilatation as shown by blue arrow and extra hepatic dilatation as shown by red arrow.

## Diagnosis

He came to our Diagnostic Radiology department for CT liver dynamic on 21/09/24 which showed moderate intra and extrahepatic biliary dilatation with a 14 mm segment of abrupt narrowing in mid common bile duct approximately 27 mm proximal ampulla with shouldering and tight stricturing as shown in Figure 1 A and B . Findings were concerning for malignant stricture and further evaluation with ERCP was suggested.

His endoscopic retrograde cholangio pancreatography (ERCP) on 25/09/2024 showed normal 1cm distal CBD and about 2cm tight stricture in pancreatic head area with proximal biliary dilatation. Intraductal biopsy was obtained with pediatric biopsy forceps, followed by CRE balloon dilatation up to 7mm & stenting. Biopsy was consistent with moderately differentiated adenocarcinoma. His CT chest was also performed on 02/10/24 to rule out pulmonary metastasis which was negative.

## Management and outcome:

He was a candidate for Whipple's procedure which was performed on 09/10/24. The surgery was uneventful and post procedure he was shifted to surgical ICU. After one day he was shifted to surgical HDU and subsequently to floor.



Figure 1B: Coronal post contrast CT scan of abdomen and pelvis showing abrupt narrowing in mid common bile duct with shouldering and tight stricturing

He remained hemodynamically and vitally stable on floor. After tolerating orally, being mobilized and pain free he was discharged on 16/10/24. On 28/10/24, the patient again presented with epigastric pain, nausea and vomiting. There was no history of trauma. Ct abdomen and pelvis with contrast was performed which showed interval development of a large subcapsular hepatic collection with internal differential densities concerning for hemorrhage causing scalloping of

the hepatic margins (figure 2A,2B ad 2C). Multiple hypodensities in segment VI and VII communicating with the aforementioned collection/hematoma were see concerning for laceration (figure2B red arrow and 2C blue arrow). The posterior division of right portal vein was in close approximation with these changes. Overall findings were concerning for spontaneous hepatic rupture with subcapsular hematoma.

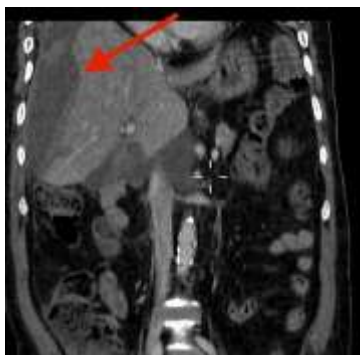


Figure 2A: Coronal plane of CT abdomen showing a large subcapsular hematoma causing scalloping of hepatic margin as shown by red arrow.



Figure 2B: Coronal plane of CT abdomen showing multiple linear hypodensities in segment VI and VII communicating with the hematoma concerning for laceration as shown by red arrow.

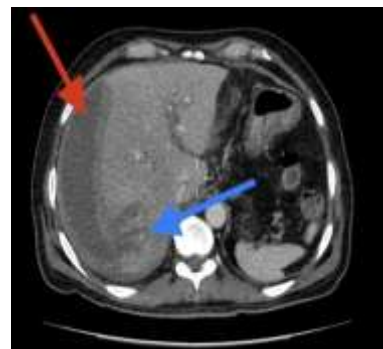


Figure 2C: Axial slice of post contrast CT abdomen showing hepatic sub capsular hematoma as shown by red arrow and hepatic lacerations as shown by blue arrow.

Table I. Serial Complete Blood Picture Results (CASE 1)

Parameters	11/10/24	18/10/24	28/10/24	29/10/24	Reference range
WBC Total	6340 / $\mu$ L	18670/ $\mu$ L	19030/ $\mu$ L	17730/ $\mu$ L	(4000 – 10500/ $\mu$ L)
RBC Total	5.23 m / $\mu$ L	3.29 m / $\mu$ L	3.43 m / $\mu$ L	3.11m / $\mu$ L	(4.5 – 6.5 m/ $\mu$ L)
Hemoglobin	16.2 g/Dl	10.0 g/dL	10.3 g/dL	9.5 g/Dl	(12.5 – 16.1 g/dL)
HCT	49.3 %	30.7 %	32 %	29.3 %	(36 – 47 % )
MCV	94.3 fL	93.3 fL	94 fL	94.2 fL	(78 – 95 fL)
MCH	31.0 pg	30.4 pg	30 pg	30 pg	(26 – 32 pg)
MCHC	32.9 g/dL	32.6 g/dL	31 g/dL	32 g/dL	(32 – 36 g/dL)
Platelet count	295000 / $\mu$ L	457000 / $\mu$ L	658000 / $\mu$ L	525000 / $\mu$ L	(150000 – 400000 / $\mu$ L)
Neutrophils	40 %	90%	90%	84%	(50 – 60 % )
Lymphocytes	43 %	6%	5%	10%	(35 – 40 % )
Monocytes	9 %	3%	4%	6%	(1 – 4 % )
Eosinophils	7 %	1%	1%	0%	(1– 2 % )

Table II. Showing serial PT/INR of the patient					
LABS	Results 11/10/24	12/10/24	13/10/24	28/10/24	Reference range
PT	01140 M:Sec	01300	01140	01720	(9.5 – 11.7)
INR	0.93	1.20	1.05	1.58	(0.8 – 1.3)
CA 19-9	188U/mL				Upto 34 U/ mL

Follow up ultrasound on 29/10/24 showed redemonstration of large sub-capsular hepatic collection with debris layering its dependent part. Multiple hypodensities in segment VI and VII seen in CT scan could not be adequately visualized on ultrasound. Another follow up ultrasound on 30/10/24 showed Interval decrease in large subcapsular hepatic collection with layering debris having a volume of 280 ml as compared with prior measurement of 418 ml.

The patient was admitted for observation and conservative management. After four days, the patient was active, alert, hemodynamically and vitally stable and discharged on 1/11/24 after counselling regarding home care, medications, red flags, warning signs and follow-up. Significant Medications during hospitalization: Bofalgan Toradol Minocycline Linezolid Meropenem Her ERCP on 03/05/2024 showed floppy ampulla and about 2.5cm tight stricture in distal CBD with proximal dilation. (Figure 2A). Standard sphincterotomy performed. 10Fr x 10cm plastic stent placed (Figure 2B). Biopsy was also taken from ampulla at time of ERCP that showed fragments of benign pancreatic and biliary epithelium with mild acute on chronic inflammation ; negative for dysplasia or malignancy Pertinent Diagnostics on Discharge: Hb : 8.7mg/dl WBC : 12140 u/l Platelets : 250000 u/l HCT : 25.8%. Condition on Discharge: Stable.

### CASE. 2

A 67 years old female diabetic and hypertensive presented to Gastroenterology department of Shifa International Hospital with complains of progressively worsening jaundice associated with weight loss from 70kg to 59kgs in 2 months. Family history of patient was negative for any malignancy.

### Diagnosis

CT abdomen and pelvis was performed on 27/04/2024 showed double duct sign (CBD 12 mm and PD 4.5 mm) having moderate intra and extrahepatic biliary dilatation with mildly dilated pancreatic duct up to the ampulla where an ill-defined area of soft tissue fullness was seen (Figure 1 A). Few prominent but subcentimeter porta hepatis and peripancreatic lymph nodes were also noted. Findings were concerning for ampullary / periampullary lesion and further evaluation with ERCP was suggested.

Her ERCP on 03/05/2024 showed floppy ampulla and about 2.5cm tight stricture in distal CBD with proximal dilation. (Figure 2A). Standard sphincterotomy performed. 10Fr x 10cm plastic stent placed (Figure 2B). Biopsy was also taken from ampulla at time of ERCP that showed fragments of benign pancreatic and biliary epithelium with mild acute on chronic inflammation; negative for dysplasia or malignancy.

### Management and outcome:

Patient was assessed and case was further discussed in multidisciplinary team meeting on 6/5/2024 where Whipples procedure was advised as definitive management. So she underwent Whipples procedure on 25/5/2024 under general anesthesia that went uneventful. Postoperatively patient remained hemodynamically and vitally stable however her catheter C/S developed Proteus Mirabilis and Ecoli (XDR) and Body fluid C/S developed growth of E.coli and V.R. Enterococcus SPP for which infectious disease department was taken on board. CT abdomen with contrast was performed on 7<sup>th</sup> post-operative day that shows post-surgical changes with trace pneumoperitoneum likely post-surgical.

LABS	26/05/24	02/06/24	08/06/24	09/06/24	10/06/24	Reference range
WBC Total	9260 / $\mu$ L	14910/ $\mu$ L	24460/ $\mu$ L	23200/ $\mu$ L	17530/ $\mu$ L	(4000 – 10500/ $\mu$ L)
RBC Total	4.69 m / $\mu$ L	3.56 m / $\mu$ L	3.33m / $\mu$ L	3.21m / $\mu$ L	2.73m / $\mu$ L	(4.5 – 6.5 m/ $\mu$ L)
Hemoglobin	12.1 g/dL	9.4 g/dL	8.8 g/dL	8.2 g/dL	7.1 g/dL	(12.5 – 16.1 g/dL)
HCT	37.6 %	28.3 %	28.6 %	26.3 %	21.7 %	(36 – 47 % )
MCV	80.2 fL	79.5 fL	85.9 fL	81.9 fL	79.5 fL	(78 – 95 fL)
MCH	25.8 pg	26.4 pg	26.4 pg	25.5 pg	26 pg	(26 – 32 pg)
MCHC	32.2 g/dL	33.2 g/dL	30.8 g/dL	31.2 g/dL	32.7 g/dl	(32 – 36 g/dL)
Platelet count	200000 / $\mu$ L	370000 / $\mu$ L	836000 / $\mu$ L	642000 / $\mu$ L	443000 / $\mu$ L	(150000 – 400000 / $\mu$ L)
Neutrophils	87 %	78%	84%	88%	78%	(50 – 60 % )
Lymphocytes	8 %	13%	9%	6%	11%	(35 – 40 % )
Monocytes	5 %	6%	6%	6%	11%	(1 – 4 % )
Eosinophils	0 %	3%	1%	0%	0%	(1– 2 % )

LABS	Results 26/05/24	01/06/24	09/06/24	10/06/24	Reference range
PT	13.5M:Sec	13.2	12.6	14.3	(9.5 – 11.7)
INR	1.24	1.22	1.16	1.32	(0.8 – 1.3)

The hepaticojejunostomy, gastrojejunostomy and pancreaticojejunostomy sites are patent. (Figure 3. No walled off collections. After tolerating orally, being mobilized and pain free he was discharged on 02/06/24 on antibiotics as suggested by infectious diseases department. He had following medications during his stay in hospital:

Injection Colistin, Injection Bofalgan, Injection Ruling, Injection Maxolone, Tab. Concor and Tab Zeegab.

Discharge medications were: InjColistin, InjRocephin, Tab panadol, Tab concor, Tab ruling, Tab minocycline, Tab zeegap.

On 08/06/2024 patient again presented in emergency department with complaint of right hypochondrial pain, continuous in nature and severe in intensity. There was no history of vomiting/constipation or any trauma. CT abdomen and pelvis with contrast was performed which showed heterogeneously hypodense appearing hepatic parenchyma in segment VIII/IVA with

differential /high density perihepatic fluid scalloping the liver margins having CT attenuation ranging from 8-73 HU(Figure 4A). Heterogenous collection at the site of pancreaticojejunostomy was seen with density ranging up to 57HU, suggestive of hemorrhage (Figure 4B). Significant surrounding strandy changes, reaction, fluid in the surgical bed with patent patent hepaticojejunostomy, gastrojejunostomy and pancreatic jejunostomy sites. Overall findings were concerning for spontaneous hepatic rupture with subcapsular hematoma. Further evaluation by CT mesenteric angiography was suggested.

CT mesenteric angiography performed on same date 08/06/2024 showed redemonstration of large subcapsular hepatic hematoma with maximum thickness of approximately 4 cm, grossly unchanged with prior examination(Figure 5A and B). Redemonstration of hematoma in the region of pancreatic head at pancreato-jejunostomy site also unchanged. No definite evidence of active arterial

contrast extravasation, pooling on venous and delayed phase to suggest active bleed. She was admitted on floor and conservative management was done. Interventional radiology was taken on-board for collections and hematoma. CT guided drain was placed in pelvic collection. She remained hemodynamically stable. She experienced fever for which antibiotics were given. Antibiotics were further adjusted by Infectious disease department and plan was given. She discharged in stable condition on 13-06-2024 after counseling regarding home care, medication, red flags, warning signs and follow-up.

Significant Medications during hospitalization: Inj. Colistin 4.5 IU Tramal 50 mg, Ruling 40 mg, Zeegap 50 mg, Rocephin 2g and RCCs transfusion.

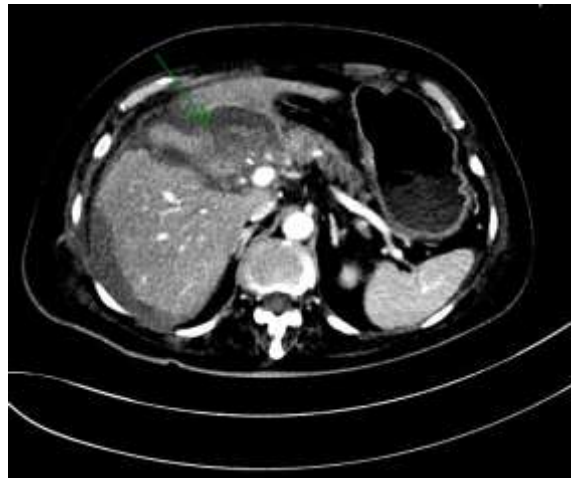
Diagnostics on Discharge: Hb: 8.6 mg/dl WBC: 12920 u/l Platelets: 305000 u/l HCT: 26.6%.

Condition on Discharge: STABLE.

She came for follow up on 21/06/2024, condition was stable. Follow up ultrasound on 21/06/2024 shows large subcapsular collection with internal echogenic strands with maximum thickness of 44 mm causing scalloping of underlying liver margins, consistent with aging hematoma, when compared to prior.



**Figure 3:** Axial post contrast CT scan of abdomen and pelvis showing dilated CBD and pancreatic duct giving double duct sign (green arrows)



**Figure 4B:** CT abdomen coronal view showing high heterogenous collection suggesting hematoma at the site of pancreaticojejunostomy (green arrow)



**Figure 4A:** CT abdomen coronal view showing high density perihepatic fluid scalloping the liver margins suggesting subcapsular hematoma (green arrow)

## Discussion

Whipple procedure is often performed for the tumor involving the head of pancreas. The procedure involves resection of the head of pancreas along with removal of the stomach (distal third), duodenum, proximal jejunum, and distal CBD. Different biliary, pancreatic and hepatic anastomosis occur with the jejunum resulting in pancreaticojejunostomy, hepaticojejunostomy and gastrojejunostomy. The sites should be patent for a successful Whipple procedure. However multiple complications are seen in the literature including anastomotic leak, hemorrhage, fistula formation,

peritonitis, pancreatitis and sepsis. With the advances made in surgical techniques and patient care, early mortality rates of pancreaticoduodenectomy have fallen from 30-40% to <5% in high-volume centres<sup>8,9</sup>. The data from developing countries, are extremely limited<sup>10</sup>.

An uncommon disorder known as spontaneous hepatic hemorrhage (SHH) is caused by a rupture in the hepatic parenchyma that happens on its own without any outside intervention. It is a severe surgical emergency that will lead to hemorrhagic shock and death if left untreated. Rapid diagnosis and treatment, which frequently involves a variety of treatments including interventional radiology, hepatology, and surgery, are necessary since the clinical presentation is frequently non-specific yet urgent. Acute treatment can be difficult and might lead to unfavorable results. Notwithstanding these problems, SHH has never been thoroughly examined, perhaps due to its rarity, the possibility of a broad variety of underlying diseases, and the fact that the majority of the literature in the field consists of case reports or short series of fewer than five individuals<sup>11</sup>.

It is challenging to diagnose, and the fact that there are so many different therapy choices for this ailment makes matters more complicated<sup>12</sup>. Considering epidemiology, in the past, spontaneous hepatic haemorrhage was not well recognized and was seldom identified in individuals who presented with shock. However, according to recent statistics, 1% of patients admitted to specialized liver units have SHH<sup>13</sup>. Although the exact pathogenesis and cause of SHH is unknown, it is most likely complex. SHH can occur in people with connective tissue illness when weak or poorly supported tissue is exposed to a physiological event, such as a change in systolic blood pressure<sup>14</sup>. SHH is linked to a wide range of disorders ranging from tumours like HCC to conditions like HELLP syndrome and even vomiting or warfarin therapy, but they are all distinguished by compromised hepatic parenchymal and vascular integrity. Very rarely,

hepatic rupture can occur in the absence of underlying pathology.

In the aforementioned cases, there are following possibilities of spontaneous hepatic hemorrhage:

1. Idiopathic/spontaneous.
2. Due to coagulopathy in post operative period.
3. Underlying malignancy
4. Trauma to liver due to surgery.

Hepatic rupture is typically preceded by subcapsular hemorrhage and hemorrhage. A biphasic presentation was described by Henny and associates. About a month prior to rupture, a pre-acute phase may manifest as lethargy and nebulous stomach pain. Glisson's capsule tears during the acute phase, causing vascular collapse and worsening discomfort.

Patient with stable hemodynamic condition should undergo multiphasic dynamic CT to look for any active contrast extravasation to represent active bleed or pooling of contrast on subsequent venous/delayed phases. The CT should be determined when there is suspicion of active bleed because the sensitivity would be highest. Delay in imaging reduces the positive predictive value. CT angiography shows the cause, site and the type of bleed (arterial/venous)<sup>11</sup>.

Inadequate intraoperative hemostasis is typically the cause of early bleeding, which is primarily treated with relaparotomy. If the liver capsule is intact and the patient's condition is stable, conservative treatment can be suitable as seen in our aforementioned cases. Treatment should be tailored to the individual case to obtain the best outcome.

## Conclusion

Spontaneous hepatic hemorrhage/rupture is a rare but potentially life-threatening complication that may occur following Whipple's procedure, however as the name indicates, it can occur without underlying cause. Prompt recognition and

management of this complication are crucial to prevent mortality. A high index of suspicion, combined with emergent imaging and intervention, can significantly improve patient outcomes. Depending upon the patient's vital condition, a variety of management options are available ranging from emergent surgical to conservative.

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