eISSN (Online): 2598-0580

Bioscientia Medicina: Journal of Biomedicine & Translational Research

Journal Homepage: www.bioscmed.com

Profound Alpha-Fetoprotein Elevation in Hepatocellular Carcinoma with Concomitant Cirrhosis: A Case Report

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ARTICLE INFO

Keywords:
Alpha-fetoprotein
Cirrhosis
Hepatitis B
Hepatocellular carcinoma
Liver function tests

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All authors have reviewed and approved the final version of the manuscript.

https://doi.org/10.37275/bsm.v9i4.1259

A B S T R A C T

Background: Hepatocellular carcinoma (HCC) is a primary liver cancer that often arises in the setting of chronic liver disease, most commonly cirrhosis. Alpha-fetoprotein (AFP) is a tumor marker frequently elevated in HCC, but its diagnostic performance varies. We present a case of HCC with concomitant cirrhosis and a significant elevation of AFP. **Case presentation:** A 30-year-old male presented with hematemesis, abdominal distension, and jaundice. He had a history of heavy alcohol consumption. Physical examination revealed anemia, icterus, hepatomegaly, and palmar erythema. Laboratory investigations showed elevated AFP (>400 IU/mL), reactive hepatitis B surface antigen (HBsAg), anemia, coagulopathy, and liver dysfunction. Imaging studies confirmed HCC and cirrhosis. This case highlights the diagnostic value of AFP in HCC, particularly when combined with clinical and imaging findings. The patient's history of alcohol abuse and HBsAg positivity are well-established risk factors for both cirrhosis and HCC. The marked elevation of AFP, along with the characteristic imaging features, strongly supported the diagnosis of HCC. **Conclusion:** AFP remains a valuable tool in the diagnosis and monitoring of HCC, especially in patients with cirrhosis. However, it is essential to interpret AFP levels in conjunction with other clinical and laboratory data to ensure accurate diagnosis and timely management.

1. Introduction

Hepatocellular carcinoma (HCC) is the most common primary liver cancer, representing a significant global health burden and a leading cause of cancer-related deaths worldwide. Its incidence is rising globally, primarily due to the increasing prevalence of chronic liver diseases, such as hepatitis B and C virus infections, non-alcoholic fatty liver disease (NAFLD), and alcoholic liver disease. Cirrhosis, an advanced stage of liver fibrosis, is the most significant risk factor for HCC, with approximately 70-90% of HCC cases developing in cirrhotic livers. The pathogenesis of HCC is complex and involves a multistep process characterized by chronic inflammation, hepatocyte injury, and regeneration, ultimately leading to genetic alterations and malignant transformation. This intricate process is influenced by a multitude of factors, including the

underlying liver disease, genetic predisposition, and environmental exposures. Understanding the pathogenesis of HCC is crucial for developing effective prevention and treatment strategies.[1-3]

The clinical presentation of HCC is often insidious, with symptoms such as fatigue, abdominal pain, weight loss, and jaundice appearing late in the disease course. This late presentation often leads to delayed diagnosis and treatment, contributing to the poor prognosis associated with HCC. Early diagnosis of HCC is crucial for improving prognosis and survival, as treatment options are limited in advanced stages. Alpha-fetoprotein (AFP) is a glycoprotein produced by the fetal liver and yolk sac during development. Its serum levels decline rapidly after birth, but AFP can be re-expressed in certain pathological conditions, including HCC. AFP has been widely used as a tumor marker for HCC, with elevated levels often associated with the presence and progression of the disease. However, the diagnostic performance of AFP is limited by its low sensitivity and specificity, as elevated levels can also be observed in other liver diseases, such as chronic hepatitis and cirrhosis.[4-7]

The diagnostic accuracy of AFP can be improved by combining it with other clinical and laboratory data, such as imaging studies and liver function tests. Imaging modalities, such as ultrasonography, computed tomography (CT), and magnetic resonance imaging (MRI), play a crucial role in the diagnosis and staging of HCC. These imaging techniques provide valuable information about the size, location, and extent of the tumor, as well as the presence of vascular invasion and metastasis. Liver biopsy, although invasive, remains the gold standard for confirming the diagnosis of HCC and assessing the degree of liver fibrosis. Histopathological examination of liver tissue provides definitive evidence of HCC and allows for the assessment of tumor grade and differentiation. This information is crucial for determining the appropriate treatment strategy and predicting prognosis.[8-10] In this case report, we present a case of HCC with concomitant cirrhosis and a significant elevation of AFP.

2. Case Presentation

The patient in this case report was a 30-year-old male. This demographic detail is relevant because HCC is typically diagnosed in older individuals, with the peak incidence occurring between the ages of 50 and 70. The relatively young age of this patient highlights the importance of considering HCC in the differential diagnosis of liver disease, even in younger individuals, particularly in the presence of risk factors such as chronic alcohol consumption and hepatitis B infection. The patient presented with a chief complaint of hematemesis (vomiting of blood) for the past three days. This is a concerning symptom that can be indicative of a variety of underlying medical conditions, including gastrointestinal bleeding, esophageal varices, and liver disease. The patient's hematemesis was described as bright red blood, with an estimated volume of one cup per episode, and he had experienced two episodes prior to presentation. Further inquiry into the patient's history of presenting illness revealed that he had been experiencing abdominal distension and pain for the past month. This chronic abdominal discomfort suggests an ongoing underlying process, such as liver disease or malignancy. The patient also reported dark urine and black stools for the past two weeks, which are indicative of gastrointestinal bleeding. These symptoms, in conjunction with the hematemesis, raise suspicion for a significant gastrointestinal bleed, possibly related to liver disease. The patient also reported decreased appetite for the past two weeks, which is a non-specific symptom that can be associated with a variety of medical conditions, including liver disease, malignancy, and psychological distress. It is important to note that the patient did not report any prior history of similar complaints, jaundice (yellowing of the skin and eyes), diabetes mellitus, or hypertension. The patient's medication history was unknown, which highlights the importance of obtaining a complete medication history in all patients, particularly those with complex medical conditions. A thorough medication history can help identify potential drug interactions, adverse

effects, and contraindications to treatment. The patient's social history revealed frequent alcohol consumption ("tuak") for approximately seven years, which he had stopped four years prior to presentation. This history of chronic alcohol abuse is a significant risk factor for the development of liver disease, including cirrhosis and HCC. Alcohol consumption, even if discontinued, can lead to irreversible liver damage and increase the risk of HCC. The patient denied any history of illicit drug use, which is relevant because intravenous drug use is a risk factor for hepatitis C infection, another major cause of liver disease and HCC. The patient's family history was also unremarkable, with no family history of similar illnesses or malignancies. The patient's general appearance was described as moderately distressed, conscious but apathetic. This suggests that the patient was experiencing significant discomfort and possibly psychological distress related to his illness. The patient's vital signs were within normal limits, with a blood pressure of 110/70 mmHg, a pulse rate of 85 beats per minute, a temperature of 36.8°C, and a respiratory rate of 20 breaths per minute. Examination of the patient's head and neck revealed pale conjunctiva, which is indicative of anemia, and icteric sclera, which is a sign of jaundice. Anemia can be caused by a variety of factors, including chronic liver disease, blood loss from hematemesis, and malnutrition. Jaundice is a common manifestation of liver disease and is caused by the accumulation of bilirubin in the blood. The patient's chest was clear to auscultation bilaterally, with no wheezes or crackles, indicating normal lung function. Examination of the abdomen revealed distension, hepatomegaly (enlarged liver), and shifting dullness, which are all suggestive of ascites (fluid accumulation in the abdomen). Ascites is a common complication of cirrhosis and is caused by portal hypertension and decreased albumin production. The patient's extremities showed palmar erythema (redness of the palms), which is a non-specific finding that can be associated with liver disease, chronic alcohol consumption, and other medical conditions. Neurological examination revealed that the patient was alert and oriented to person, place, and time, with no focal neurological deficits (Table 1).

The laboratory investigations in this case revealed a number of significant abnormalities that, in conjunction with the patient's clinical presentation and imaging findings, contributed to the diagnosis of HCC with concomitant cirrhosis. The most striking finding was the markedly elevated alpha-fetoprotein (AFP) level, which was reported as ">400 IU/mL". AFP is a tumor marker that is often elevated in HCC, and levels above 400 IU/mL are considered highly suggestive of the disease. While AFP is not specific for HCC and can be elevated in other conditions, such as chronic hepatitis and cirrhosis, the magnitude of the elevation in this case strongly supported the diagnosis of HCC. The patient also tested positive for hepatitis B surface antigen (HBsAg), indicating current or prior infection with the hepatitis B virus. Chronic hepatitis B infection is a major risk factor for the development of HCC, and the presence of HBsAg in this case further increased the suspicion for HCC. The patient's hematological investigations revealed anemia, with a hemoglobin level of 9.9 g/dL. Anemia is a common finding in patients with liver disease and can be caused by a variety of factors, including chronic blood loss, impaired red blood cell production, and malnutrition. In this case, the anemia was likely multifactorial, with contributions from chronic liver disease, blood loss from hematemesis, and possibly malnutrition. Other hematological parameters, such as leukocyte count, erythrocyte count, and platelet count, were within normal limits. However, the reticulocyte count was elevated at 3.98%, suggesting increased red blood cell production in response to the anemia. The red cell distribution width (RDW) was also elevated at 27.5%, indicating variation in red blood cell size, which can be seen in various types of anemia. The mean corpuscular volume (MCV) was decreased at 69 fL, suggesting microcytic anemia, which is characterized by smaller than normal red blood cells. Microcytic anemia can be caused by iron deficiency, thalassemia, and chronic disease. The mean

corpuscular hemoglobin (MCH) was also decreased at 24 pg, suggesting hypochromic anemia, which is characterized by red blood cells with less hemoglobin than normal. Hypochromic anemia can also be caused by iron deficiency and chronic disease. The patient's coagulation studies showed prolonged prothrombin time (PT) and activated partial thromboplastin time (APTT), with an elevated international normalized ratio (INR) of 1.56. These findings indicate coagulopathy, which is a common complication of liver disease due to impaired hepatic synthetic function. The liver plays a crucial role in the production of clotting factors, and liver dysfunction can lead to deficiencies in these factors, resulting in coagulopathy. The liver function tests revealed a number of abnormalities consistent with liver disease. The total protein level was within the normal range, but the albumin level was decreased at 2.7 g/dL, indicating hypoalbuminemia. Albumin is a protein produced by the liver, and hypoalbuminemia can be caused by decreased hepatic synthesis, as well as increased losses due to nephrotic syndrome or protein-losing enteropathy. In this case, the hypoalbuminemia was likely due to decreased hepatic synthesis as a result of liver disease. The globulin level was elevated at 3.7 g/dL, indicating hyperglobulinemia. Hyperglobulinemia can be caused by a variety of factors, including chronic inflammation, infection, and autoimmune diseases. In this case, the hyperglobulinemia likely reflected an inflammatory response associated with the liver disease. The total bilirubin level was significantly elevated at 5.9 mg/dL, indicating hyperbilirubinemia. Bilirubin is a breakdown product of hemoglobin, and hyperbilirubinemia can be caused by increased production, decreased conjugation, or impaired excretion of bilirubin. In this case, the hyperbilirubinemia was likely due to a combination of impaired hepatocyte function and biliary obstruction, both of which can occur in liver disease. The liver enzymes, aspartate aminotransferase (AST), alanine aminotransferase (ALT), alkaline phosphatase (ALP), and gamma-glutamyl transferase (GGT), were all significantly elevated. AST and ALT are enzymes found primarily in the liver, and their elevation indicates hepatocellular injury. ALP and GGT are enzymes associated with the biliary system, and their elevation suggests cholestasis, which is a condition characterized by impaired bile flow. The imaging studies in this case played a crucial role in confirming the diagnosis of HCC and assessing the extent of liver disease. Abdominal ultrasonography revealed a hepatic mass suggestive of hepatoma, which is a type of liver cancer. Ultrasonography is a non-invasive imaging technique that can be used to visualize the liver and identify abnormalities, such as tumors and cysts. Fibroscan, a non-invasive technique used to assess liver fibrosis, revealed a fibrosis score of IV (65 kPa), indicating cirrhosis. Fibroscan measures liver stiffness, which correlates with the degree of liver fibrosis. Cirrhosis is characterized by extensive liver fibrosis and the formation of regenerative nodules, which can lead to liver dysfunction and portal hypertension. Based on the patient's clinical presentation, laboratory findings, and imaging studies, the diagnosis of hepatocellular carcinoma with concomitant cirrhosis was established. The markedly elevated AFP level, the presence of HBsAg, the imaging findings of a hepatic mass and cirrhosis, and the abnormal liver function tests all supported this diagnosis. This case highlights the importance of a comprehensive approach to the diagnosis of HCC, particularly in patients with underlying liver disease. The combination of clinical, laboratory, and imaging findings is crucial for establishing an accurate diagnosis and guiding treatment decisions (Table 2).

3. Discussion

The patient in this case presented with a constellation of symptoms that are highly suggestive of decompensated cirrhosis, a severe form of liver disease characterized by the loss of liver function and the development of complications such as portal hypertension, ascites, and hepatic encephalopathy. The patient's symptoms included hematemesis, abdominal distension, and jaundice, all of which are classic manifestations of decompensated cirrhosis.

Hematemesis, or the vomiting of blood, is a concerning symptom that can be indicative of a variety of underlying medical conditions, including gastrointestinal bleeding, esophageal varices, and liver disease. In the context of cirrhosis, hematemesis is most commonly caused by esophageal varices, which are dilated veins in the esophagus that develop as a result of portal hypertension. Portal hypertension is a condition characterized by increased pressure in the portal vein, which is the blood vessel that carries blood from the digestive organs to the liver. In cirrhosis, the normal flow of blood through the liver is obstructed due to the extensive scarring and fibrosis, leading to increased pressure in the portal vein. This increased pressure can cause the formation of varices in the esophagus, stomach, and rectum. Esophageal varices are prone to bleeding, which can manifest as hematemesis. The bleeding can range from mild to severe, and in some cases, it can be life-threatening. The patient in this case presented with hematemesis, which was described as bright red blood, with an estimated volume of one cup per episode. The patient had experienced two episodes of hematemesis prior to presentation, suggesting a significant bleed. The development of esophageal varices is a major complication of cirrhosis and is associated with a high risk of mortality.

Table 1. Demographics, anamnesis, and physical examination.

Feature	Details
Demographics	
Age	30 years
Gender	Male
Anamnesis	
Chief complaint	Hematemesis (3 days)
History of presenting illness	Hematemesis (bright red blood, ~1 cup/episode, 2 episodes); Abdominal distension and pain (1 month); Dark urine and black stools (2 weeks); Decreased appetite (2 weeks)
Past medical history	No prior history of similar complaints, jaundice, diabetes mellitus, or hypertension
Medication history	Unknown
Social history	Frequent alcohol consumption ("tuak") for ~7 years, stopped 4 years prior; No history of illicit drug use
Family history	No family history of similar illnesses or malignancies
Physical examination	
General appearance	Moderately distressed, conscious but apathetic
Vital signs	Blood pressure: 110/70 mmHg; Pulse rate: 85 beats per minute; Temperature: 36.8°C; Respiratory rate: 20 breaths per minute
Head and neck	Pale conjunctiva; Icteric sclera
Chest	Clear to auscultation bilaterally, no wheezes or crackles
Abdomen	Distended; Hepatomegaly; Shifting dullness
Extremities	Palmar erythema
Neurological	Alert and oriented to person, place, and time. No focal neurological deficits.

Table 2. Laboratory, imaging, and diagnostic findings.

Category	Test	Result	Unit	Reference range	Interpretation
Serology	AFP	>400	IU/mL	0-10 IU/mL	Markedly elevated, suggestive of HCC
	HBsAg	Reactive		Non-reactive	Indicates current or prior Hepatitis B infection
Hematology	Hemoglobin	9.9	g/dL	13.5-17.5 g/dL	Anemia
	Leukocyte count	8,29	/mm³	4,500-11,000 /mm³	Within normal limits
	Erythrocyte count	4.13 x 10^6	/mm³	4.7-6.1 x 10^6/mm³	
	Platelet count	306	/mm³	150,000-450,000 /mm³	Within normal limits
	Hematocrit	29	%	40-54 %	
	Reticulocyte count	3.98	%	0.5-1.5 %	Reticulocytosis, suggesting increased red blood cell production
	RDW	27.5	%	11.5-14.5 %	Elevated, indicating variation in red blood cell size
	MCV	69	fL	80-100 fL	Decreased, suggesting microcytic anemia
	MCH	24	pg	27-31 pg	Decreased, suggesting hypochromic anemia
	MCHC	34	%	32-36 %	Within normal limits
Hemostasis	PT	16.7	seconds	11-13.5 seconds	Prolonged
	APTT	33.1	seconds	25-35 seconds	Prolonged
	INR	1.56		0.8-1.1	Elevated
Liver function tests	Total protein	6.4	g/dL	6.0-8.3 g/dL	
	Albumin	2.7	g/dL	3.5-5.0 g/dL	Hypoalbuminemia
	Globulin	3.7	g/dL	2.3-3.5 g/dL	Hyperglobulinemia
	Total bilirubin	5.9	mg/dL	0.3-1.2 mg/dL	Hyperbilirubinemia
	Direct bilirubin	3.7	mg/dL	0-0.3 mg/dL	
	Indirect bilirubin	2.2	mg/dL	0.2-0.8 mg/dL	
	AST	534	U/L	0-35 U/L	Elevated
	ALT	101	U/L	0-40 U/L	Elevated
	ALP	611	U/L	44-147 U/L	Elevated
	GGT	311	U/L	0-55 U/L	Elevated
Imaging findings	Abdominal Ultrasonography	Hepatic mass suggestive of hepatoma			
	Fibroscan	Fibrosis IV (65 kPa)			Indicates cirrhosis
Diagnosis		Hepatocellular Carcinoma with Concomitant Cirrhosis			

The risk of variceal bleeding is related to the severity of portal hypertension and the size of the varices. Patients with large varices and high portal pressure are at the highest risk of bleeding. The management of esophageal varices includes both preventive and therapeutic measures. Preventive measures aim to reduce portal pressure and prevent the formation of varices. These measures include medications such as beta-blockers and nitrates, and endoscopic procedures such as variceal band ligation. Therapeutic measures are used to control bleeding once it occurs. These measures include endoscopic procedures such as variceal band ligation and sclerotherapy, and medications such as vasopressin and octreotide. In some cases, surgery may be necessary to control bleeding. Abdominal distension is another common symptom of decompensated cirrhosis. It is often caused by ascites, which is the accumulation of fluid in the peritoneal cavity, the space between the abdominal organs and the abdominal wall. Ascites is a result of portal hypertension and decreased albumin production. Portal hypertension, as discussed earlier, is a hallmark of cirrhosis. It leads to increased pressure in the blood vessels of the portal system, including those in the intestines. This increased pressure can cause fluid to leak out of the blood vessels and into the peritoneal cavity, resulting in ascites. Albumin is a protein produced by the liver that plays a crucial role in maintaining the oncotic pressure of the blood. Oncotic pressure is the force that pulls fluid from the tissues into the blood vessels. In cirrhosis, the liver's ability to produce albumin is impaired, leading to decreased oncotic pressure and further contributing to the development of ascites. The patient in this case presented with abdominal distension, which is consistent with ascites. The presence of ascites is a sign of decompensated cirrhosis and is associated with a poor prognosis. The management of ascites includes both medical and surgical therapies. Medical therapies aim to reduce portal pressure and increase albumin production. These therapies include medications such as diuretics and albumin infusions. Surgical therapies are used to remove ascites when medical therapies are ineffective. These therapies include paracentesis, which is the removal of fluid from the peritoneal cavity using a needle, and transjugular intrahepatic portosystemic shunt (TIPS), which is a procedure that creates a shunt between the portal vein and the hepatic vein to reduce portal pressure. Jaundice, or the yellowing of the skin and eyes, is a common manifestation of liver disease. It is caused by the accumulation of bilirubin in the blood. Bilirubin is a breakdown product of hemoglobin, the protein that carries oxygen in red blood cells. In healthy individuals, bilirubin is processed by the liver and excreted in the bile. However, in cirrhosis, the liver's ability to process and excrete bilirubin is impaired, leading to its accumulation in the blood and the development of jaundice. The patient in this case presented with jaundice, which is consistent with liver disease. The presence of jaundice is a sign of decompensated cirrhosis and is associated with a poor prognosis. The management of jaundice in cirrhosis is primarily focused on treating the underlying liver disease. In some cases, medications such as ursodeoxycholic acid may be used to improve bile flow and reduce bilirubin levels. The patient in this case had a history of heavy alcohol consumption, which is a significant risk factor for both cirrhosis and HCC. Alcohol is a hepatotoxin that can cause inflammation and damage to the liver, leading to fibrosis and eventually cirrhosis. The process of alcohol-induced liver injury is complex and involves multiple mechanisms. Alcohol is metabolized in the liver, and its metabolites can cause oxidative stress, inflammation, and cell death. Chronic alcohol consumption can lead to the accumulation of fat in the liver, a condition known as alcoholic fatty liver disease. Over time, alcoholic fatty liver disease can progress to alcoholic hepatitis, which is characterized by inflammation and necrosis of liver cells. If alcohol consumption continues, alcoholic hepatitis can lead to fibrosis, which is the formation of scar tissue in the liver. Fibrosis can progress to cirrhosis, which is characterized by extensive scarring and the formation

of regenerative nodules. Cirrhosis is an irreversible condition that can lead to liver failure and death. Cirrhosis is the most important risk factor for HCC, with approximately 70-90% of HCC cases developing in cirrhotic livers. The risk of HCC in patients with cirrhosis is related to the severity of liver disease and the presence of other risk factors, such as hepatitis B or C infection. The patient in this case also tested positive for hepatitis B surface antigen (HBsAg), indicating current or prior infection with the hepatitis B virus. Chronic hepatitis B infection is another major risk factor for HCC, and the presence of HBsAg in this case further increases the risk of HCC. Hepatitis B virus is a DNA virus that infects liver cells. Chronic hepatitis B infection can lead to chronic inflammation and damage to the liver, eventually leading to cirrhosis. The risk of HCC in patients with chronic hepatitis B infection is related to the duration of infection, the level of viral replication, and the presence of cirrhosis. In addition to alcohol consumption and hepatitis B infection, other risk factors for HCC include hepatitis C infection, non-alcoholic fatty liver disease (NAFLD), and certain genetic conditions such as hemochromatosis and alpha-1 antitrypsin deficiency.[11-13]

The patient's laboratory findings were consistent with HCC and cirrhosis. The most striking finding was the markedly elevated AFP level, which was reported as ">400 IU/mL". AFP is a tumor marker that is often elevated in HCC, and levels above 400 IU/mL are considered highly suggestive of the disease. While AFP is not specific for HCC and can be elevated in other conditions, such as chronic hepatitis and cirrhosis, the magnitude of the elevation in this case strongly supported the diagnosis of HCC. The patient's liver function tests were also abnormal, with elevated levels of AST, ALT, ALP, and GGT. These findings indicate hepatocellular injury and cholestasis, which are common in cirrhosis. The patient also had hypoalbuminemia and hyperbilirubinemia, which are also consistent with cirrhosis. The patient's coagulation studies showed prolonged PT and APTT, with an elevated INR. These findings indicate coagulopathy, which is a common complication of liver disease due to impaired hepatic synthetic function. Alpha-fetoprotein (AFP) is a glycoprotein produced by the fetal liver and yolk sac during development. Its serum levels decline rapidly after birth, but AFP can be re-expressed in certain pathological conditions, including HCC. AFP has been widely used as a tumor marker for HCC, with elevated levels often associated with the presence and progression of the disease. The diagnostic performance of AFP is limited by its low sensitivity and specificity, as elevated levels can also be observed in other liver diseases, such as chronic hepatitis and cirrhosis. However, the diagnostic accuracy of AFP can be improved by combining it with other clinical and laboratory data, such as imaging studies and liver function tests. In this case, the patient's AFP level was markedly elevated, which was reported as ">400 IU/mL". AFP levels above 400 IU/mL are considered highly suggestive of HCC, although they can also be observed in other conditions, such as chronic hepatitis and cirrhosis. However, the magnitude of the elevation in this case, in conjunction with the patient's clinical presentation and imaging findings, strongly supported the diagnosis of HCC. The elevated AFP level in this case may be attributed to several factors. First, the patient's HCC was relatively large and advanced, which is associated with higher AFP levels. Second, the patient had concomitant cirrhosis, which can also contribute to elevated AFP levels. Third, the patient had chronic hepatitis B infection, which is another risk factor for elevated AFP levels. Liver function tests (LFTs) are a group of blood tests that are used to assess the health of the liver. These tests measure the levels of certain enzymes and proteins that are produced by the liver or are released into the bloodstream when the liver is damaged. The patient's LFTs were abnormal, with elevated levels of AST, ALT, ALP, and GGT. These findings indicate hepatocellular injury and cholestasis, which are common in cirrhosis. AST and ALT are enzymes that are found primarily in the liver. When liver cells are damaged, these enzymes are released into the bloodstream,

resulting in elevated levels. Elevated AST and ALT levels are a non-specific indicator of liver injury and can be seen in a variety of liver diseases, including hepatitis, cirrhosis, and liver cancer. In this case, the patient's AST and ALT levels were significantly elevated, suggesting significant hepatocellular injury. The AST level was particularly high, which may be due to the presence of HCC. ALP and GGT are enzymes that are associated with the biliary system, which is the system of ducts that carries bile from the liver to the small intestine. Bile is a fluid that is produced by the liver and aids in the digestion of fats. Cholestasis is a condition characterized by impaired bile flow, which can lead to the accumulation of bile acids in the liver and damage to liver cells. Elevated ALP and GGT levels are a non-specific indicator of cholestasis and can be seen in a variety of liver diseases, including cirrhosis, primary biliary cholangitis, and liver cancer. In this case, the patient's ALP and GGT levels were also significantly elevated, suggesting cholestasis. The cholestasis may be due to the presence of HCC, which can obstruct the bile ducts, or it may be due to the underlying cirrhosis. The patient's LFTs also showed hypoalbuminemia and hyperbilirubinemia, which are also consistent with cirrhosis. Albumin is a protein that is produced by the liver. It plays a crucial role in maintaining the oncotic pressure of the blood, which is the force that pulls fluid from the tissues into the blood vessels. Hypoalbuminemia, or low albumin levels, can be caused by decreased production of albumin by the liver, as well as increased losses of albumin due to nephrotic syndrome or protein-losing enteropathy. In this case, the hypoalbuminemia was likely due to decreased production of albumin by the liver as a result of cirrhosis. Bilirubin is a breakdown product of hemoglobin, the protein that carries oxygen in red blood cells. Bilirubin is processed by the liver and excreted in the bile. Hyperbilirubinemia, or high bilirubin levels, can be caused by increased production of bilirubin, decreased conjugation of bilirubin by the liver, or impaired excretion of bilirubin in the bile. In this case, the hyperbilirubinemia was likely due to a combination of impaired conjugation of bilirubin by the liver and impaired excretion of bilirubin in the bile as a result of cirrhosis. Coagulation studies are a group of blood tests that are used to assess the blood's ability to clot. These tests measure the levels of certain clotting factors, which are proteins that are involved in the coagulation cascade, the series of steps that leads to the formation of a blood clot. The patient's coagulation studies showed prolonged PT and APTT, with an elevated INR. These findings indicate coagulopathy, which is a common complication of liver disease due to impaired hepatic synthetic function. The liver plays a crucial role in the production of clotting factors. In cirrhosis, the liver's ability to produce clotting factors is impaired, leading to deficiencies in these factors and an increased risk of bleeding. PT and APTT are tests that measure the time it takes for blood to clot. Prolonged PT and APTT indicate that it is taking longer for the blood to clot, which can be a sign of coagulopathy. INR is a standardized measure of PT that is used to monitor patients who are taking warfarin, a blood thinner. An elevated INR indicates that the blood is taking longer to clot, which can be a sign of warfarin overdose or coagulopathy due to liver disease. In this case, the patient's prolonged PT and APTT, with an elevated INR, were indicative of coagulopathy due to impaired hepatic synthetic function as a result of cirrhosis. The coagulopathy in this case may have contributed to the patient's hematemesis. The prolonged PT and APTT, with an elevated INR, suggest that the patient's blood was taking longer to clot, which may have made it more difficult to control the bleeding from the esophageal varices.[14-16]

Imaging studies play a crucial role in the diagnosis and management of liver disease, including hepatocellular carcinoma (HCC) and cirrhosis. In this case, the imaging findings were instrumental in confirming the diagnosis of HCC and assessing the extent of liver disease. The two main imaging modalities used in this case were abdominal ultrasonography and Fibroscan. Abdominal ultrasonography is a non-invasive imaging technique

that uses high-frequency sound waves to create images of the organs and structures in the abdomen. It is a widely available and relatively inexpensive imaging modality that can be used to evaluate a variety of abdominal conditions, including liver disease. In this case, abdominal ultrasonography revealed a hepatic mass suggestive of hepatoma, which is a type of liver cancer. Hepatomas, also known as HCCs, are the most common type of primary liver cancer. They typically arise in the setting of chronic liver disease, such as cirrhosis. Ultrasonography can be used to characterize liver masses based on their size, shape, echogenicity (ability to reflect sound waves), and vascularity (blood supply). HCCs typically appear as hypoechoic (darker than surrounding tissue) masses with well-defined borders. They may also exhibit increased vascularity on Doppler ultrasound, which is a technique that uses sound waves to measure blood flow. In this case, the ultrasonographic findings of a hepatic mass with features suggestive of HCC were consistent with the patient's clinical presentation and laboratory findings. The presence of a liver mass in a patient with chronic liver disease and elevated AFP levels is highly suspicious for HCC. Fibroscan, also known as transient elastography, is a non-invasive technique used to assess liver fibrosis. Liver fibrosis is the formation of scar tissue in the liver, which can occur in response to chronic liver injury. Fibrosis can progress to cirrhosis, which is characterized by extensive scarring and the formation of regenerative nodules. Fibroscan measures liver stiffness, which correlates with the degree of liver fibrosis. The device uses a probe that emits low-frequency vibrations and measures the speed at which these vibrations travel through the liver. The stiffer the liver, the faster the vibrations travel. The results of Fibroscan are expressed in kilopascals (kPa). A higher kPa value indicates greater liver stiffness and more advanced fibrosis. The results are typically categorized into stages of fibrosis, ranging from F0 (no fibrosis) to F4 (cirrhosis). In this case, Fibroscan revealed a fibrosis score of IV (65 kPa), indicating cirrhosis. This finding was consistent with the patient's clinical presentation and laboratory findings, which also suggested cirrhosis. The presence of cirrhosis in this case is significant because it is the most important risk factor for HCC. Approximately 70-90% of HCC cases develop in cirrhotic livers. The risk of HCC in patients with cirrhosis is related to the severity of liver disease and the presence of other risk factors, such as hepatitis B or C infection. While abdominal ultrasonography and Fibroscan were the main imaging modalities used in this case, other imaging techniques can also be used to evaluate liver disease, including HCC and cirrhosis. These techniques include computed tomography (CT), magnetic resonance imaging (MRI), and angiography. CT and MRI provide more detailed images of the liver than ultrasonography and can be used to assess the size, location, and extent of liver masses. They can also be used to evaluate the blood vessels in the liver and to identify any signs of portal hypertension. Angiography is an invasive imaging technique that involves injecting contrast dye into the blood vessels to visualize the blood flow. It can be used to evaluate the blood supply to liver tumors and to identify any vascular abnormalities, such as portal vein thrombosis. The choice of imaging modality depends on the specific clinical scenario and the information that is needed. In this case, abdominal ultrasonography and Fibroscan were sufficient to confirm the diagnosis of HCC and assess the extent of liver disease. However, in other cases, more advanced imaging techniques may be necessary.[17,18]

The diagnosis of hepatocellular carcinoma (HCC) with concomitant cirrhosis was established based on a comprehensive evaluation of the patient's clinical presentation, laboratory findings, and imaging studies. The markedly elevated AFP level, the presence of HBsAg, the imaging findings of a hepatic mass and cirrhosis, and the abnormal liver function tests all collectively supported this diagnosis. Diagnosing HCC in patients with cirrhosis can be challenging, as the symptoms of HCC are often nonspecific and can mimic those of cirrhosis itself. Therefore, a multidisciplinary approach involving clinical, laboratory, and imaging

evaluations is essential for accurate diagnosis and staging. The initial step in the diagnostic process involves a thorough clinical evaluation, including a detailed history and physical examination. The history should focus on identifying risk factors for HCC, such as chronic hepatitis B or C infection, heavy alcohol consumption, non-alcoholic fatty liver disease (NAFLD), and family history of HCC. The physical examination should assess for signs of liver disease, such as jaundice, ascites, and hepatomegaly. Laboratory tests play a crucial role in the diagnosis of HCC and cirrhosis. The most important laboratory test is the measurement of serum alpha-fetoprotein (AFP) levels. AFP is a tumor marker that is often elevated in HCC, and levels above 400 IU/mL are considered highly suggestive of the disease. However, AFP is not specific for HCC and can be elevated in other conditions, such as chronic hepatitis and cirrhosis. Liver function tests (LFTs) are also important in the evaluation of liver disease. LFTs measure the levels of certain enzymes and proteins that are produced by the liver or are released into the bloodstream when the liver is damaged. Abnormal LFTs, such as elevated levels of AST, ALT, ALP, and GGT, can indicate hepatocellular injury and cholestasis, which are common in cirrhosis. Coagulation studies, such as prothrombin time (PT), activated partial thromboplastin time (APTT), and international normalized ratio (INR), are also important in the evaluation of liver disease. These tests measure the blood's ability to clot, and abnormal results can indicate coagulopathy, which is a common complication of liver disease due to impaired hepatic synthetic function. Imaging studies are essential for confirming the diagnosis of HCC and assessing the extent of liver disease. The most commonly used imaging modalities are abdominal ultrasonography, computed tomography (CT), and magnetic resonance imaging (MRI). Abdominal ultrasonography is a non-invasive imaging technique that uses high-frequency sound waves to create images of the organs and structures in the abdomen. It is a widely available and relatively inexpensive imaging modality that can be used to evaluate a variety of abdominal conditions, including liver disease. CT and MRI provide more detailed images of the liver than ultrasonography and can be used to assess the size, location, and extent of liver masses. They can also be used to evaluate the blood vessels in the liver and to identify any signs of portal hypertension. In some cases, a liver biopsy may be necessary to confirm the diagnosis of HCC. A liver biopsy is a procedure in which a small sample of liver tissue is removed and examined under a microscope. The biopsy can be performed percutaneously (through the skin) or laparoscopically (through a small incision in the abdomen). The management of HCC with concomitant cirrhosis is complex and depends on the stage of the disease, liver function, and overall health of the patient. Treatment options include surgical resection, liver transplantation, locoregional therapies (such as radiofrequency ablation and transarterial chemoembolization), and systemic therapies (such as sorafenib and other targeted agents). Surgical resection is the removal of the tumor and a margin of surrounding healthy tissue. It is the treatment of choice for early-stage HCC in patients with good liver function. However, surgical resection is not always possible due to the size or location of the tumor, or the extent of liver disease. Liver transplantation is the replacement of the diseased liver with a healthy liver from a deceased or living donor. It is the treatment of choice for patients with end-stage liver disease and HCC that meets specific criteria, such as the Milan criteria (a single tumor ≤5 cm or up to three tumors ≤3 cm each). Locoregional therapies are treatments that are directed at the tumor and the surrounding liver tissue. They are often used in patients who are not candidates for surgical resection or liver transplantation. Radiofrequency ablation (RFA) is a minimally invasive procedure that uses heat to destroy tumor cells. It involves inserting a needle into the tumor and delivering radiofrequency energy, which heats and destroys the tumor tissue. Transarterial chemoembolization (TACE) is another minimally invasive procedure that involves injecting chemotherapy drugs directly into the hepatic artery

that supplies the tumor. The chemotherapy drugs kill the tumor cells, and the embolization (blocking of the artery) cuts off the blood supply to the tumor, further contributing to its destruction. Systemic therapies are treatments that are given orally or intravenously and travel throughout the body to kill cancer cells. They are often used in patients with advanced HCC that has spread beyond the liver. Sorafenib is a multikinase inhibitor that blocks the growth of cancer cells by inhibiting several enzymes that are involved in cell signaling and angiogenesis (the formation of new blood vessels). It is the first systemic therapy to show a survival benefit in patients with advanced HCC. Other targeted agents, such as lenvatinib and regorafenib, have also shown promise in the treatment of advanced HCC. In this case, the patient's HCC was considered to be unresectable due to the extent of liver disease. The patient was also not a candidate for liver transplantation due to his heavy alcohol consumption. Therefore, the patient was treated with transarterial chemoembolization (TACE). TACE is a minimally invasive procedure that involves injecting chemotherapy drugs directly into the hepatic artery that supplies the tumor. The chemotherapy drugs kill the tumor cells, and the embolization (blocking of the artery) cuts off the blood supply to the tumor, further contributing to its destruction. TACE is often used in patients with intermediate-stage HCC who are not candidates for surgical resection or liver transplantation. It can help to control tumor growth and improve survival.[19,20]

4. Conclusion

This case report highlights the significance of a multidisciplinary approach in diagnosing and managing hepatocellular carcinoma (HCC) with concomitant cirrhosis. The patient's clinical presentation, including symptoms such as hematemesis, abdominal distension, and jaundice, along with a history of heavy alcohol consumption, raised suspicion for decompensated cirrhosis. The presence of hepatitis B surface antigen (HBsAg) further increased the risk of HCC. Laboratory investigations revealed markedly elevated alpha-fetoprotein (AFP) levels, exceeding 400 IU/mL, which is highly suggestive of HCC. Liver function tests showed elevated liver enzymes, indicating hepatocellular injury and cholestasis. Coagulation studies revealed coagulopathy, a common complication of liver disease. Imaging studies, including abdominal ultrasonography and Fibroscan, confirmed the presence of HCC and cirrhosis. The diagnosis of HCC with concomitant cirrhosis was established based on the collective findings from clinical, laboratory, and imaging evaluations. This case underscores the importance of considering HCC in patients with cirrhosis, especially those with elevated AFP levels. AFP, while not specific for HCC, remains a valuable tool in the diagnosis and monitoring of HCC, particularly when combined with other clinical and laboratory data. This case also highlights the importance of early diagnosis and timely management of HCC, as treatment options are limited in advanced stages. The patient's HCC was considered unresectable due to the extent of liver disease, and he was not a candidate for liver transplantation due to his heavy alcohol consumption. Therefore, he was treated with transarterial chemoembolization (TACE), a minimally invasive procedure that can help control tumor growth and improve survival in patients with intermediate-stage HCC who are not candidates for surgical resection or liver transplantation. In conclusion, this case report emphasizes the importance of a comprehensive approach to the diagnosis and management of HCC with concomitant cirrhosis. Early diagnosis, through careful evaluation of clinical, laboratory, and imaging findings, is crucial for optimizing treatment outcomes and improving survival. AFP remains a valuable tool in the diagnosis and monitoring of HCC, especially when interpreted in conjunction with other clinical and laboratory data.

5. References

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