

World Journal of *Clinical Cases*

World J Clin Cases 2020 May 26; 8(10): 1756-2065



GUIDELINES

- 1756 French Spine Surgery Society guidelines for management of spinal surgeries during COVID-19 pandemic
Prost S, Charles YP, Allain J, Barat JL, d'Astorg H, Delhaye M, Eap C, Zairi F, Guigui P, Ilharreborde B, Meyblum J, Le Huec JC, Lonjon N, Lot G, Hamel O, Riouallon G, Litrico S, Tropiano P, Blondel B, the French Spine Surgery Society

OPINION REVIEW

- 1763 Needs and concerns of patients in isolation care units - learnings from COVID-19: A reflection
Fan PEM, Aloweni F, Lim SH, Ang SY, Perera K, Quek AH, Quek HKS, Ayre TC

REVIEW

- 1767 Prophylactic and therapeutic roles of oleanolic acid and its derivatives in several diseases
Sen A
- 1793 Macrophage regulation of graft-vs-host disease
Hong YQ, Wan B, Li XF

MINIREVIEWS

- 1806 Antiphospholipid syndrome and its role in pediatric cerebrovascular diseases: A literature review
Sarecka-Hujar B, Kopyta I
- 1818 Remotely monitored telerehabilitation for cardiac patients: A review of the current situation
Batalik L, Filakova K, Batalikova K, Dosbaba F
- 1832 Keystone design perforator island flap in facial defect reconstruction
Lim SY, Yoon CS, Lee HG, Kim KN

ORIGINAL ARTICLE**Clinical and Translational Research**

- 1848 Cross electro-nape-acupuncture ameliorates cerebral hemorrhage-induced brain damage by inhibiting necroptosis
Cai GF, Sun ZR, Zhuang Z, Zhou HC, Gao S, Liu K, Shang LL, Jia KP, Wang XZ, Zhao H, Cai GL, Song WL, Xu SN

Retrospective Study

- 1859 Evaluation of ischemic lesions after carotid artery stenting with diffusion-weighted imaging
Beyhan M, Acu B, Gökçe E, Firat MM
- 1871 Transjugular intrahepatic portosystemic shunt and splenectomy are more effective than endoscopic therapy for recurrent variceal bleeding in patients with idiopathic noncirrhotic portal hypertension
He FL, Qi RZ, Zhang YN, Zhang K, Zhu-Ge YZ, Wang M, Wang Y, Jia JD, Liu FQ

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Zhang J, Du YL, Zhang H, Sui H, Hou WK
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Tian Y, Wang L, Ye JW, Zhang Y, Zheng HC, Shen HD, Li F, Liu BH, Tong WD
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Zhou H, Xu Q, Liu Y, Guo LT
- Observational Study**
- 1916** Serum von Willebrand factor for early diagnosis of lung adenocarcinoma in patients with type 2 diabetes mellitus
Zhou YY, Du X, Tang JL, Wang QP, Chen K, Shi BM
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Yan LN, Zhang X, Xu F, Fan YY, Ge B, Guo H, Li ZL

CASE REPORT

- 1932** Isolated colonic neurofibroma, a rare tumor: A case report and review of literature
Ghoneim S, Sandhu S, Sandhu D
- 1939** Helmet-based noninvasive ventilation for acute exacerbation of chronic obstructive pulmonary disease: A case report
Park MH, Kim MJ, Kim AJ, Lee MJ, Kim JS
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Lee CC, Yeo CM, Ng WK, Verma A, Tey JC
- 1958** Lumbar disc rehydration in the bridged segment using the BioFlex dynamic stabilization system: A case report and literature review
Li YC, Feng XF, Pang XD, Tan J, Peng BG
- 1966** Traditional investigation and management for recurrent hemarthrosis after total knee arthroplasty: A case report
Geng X, Li Y, He X, Tian H

- 1973** Positron emission tomography/computed tomography findings of multiple cystic lymphangiomas in an adult: A case report
Sun MM, Shen J
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Xiong Y, Yue X, Jin DD, Wang XY
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Su N, Chen C, Zhou X, Ma GD, Chen RL, Tian C
- 1995** Tuberous sclerosis complex presenting as primary intestinal lymphangiectasia: A case report
Lin WH, Zhang ZH, Wang HL, Ren L, Geng LL
- 2001** Gilbert's syndrome coexisting with hereditary spherocytosis might not be rare: Six case reports
Kang LL, Liu ZL, Zhang HD
- 2009** Effective combined therapy for pulmonary epithelioid hemangioendothelioma: A case report
Zhang XQ, Chen H, Song S, Qin Y, Cai LM, Zhang F
- 2016** Unexplained huge liver infarction presenting as a tumor with bleeding: A case report
Wang FH, Yang NN, Liu F, Tian H
- 2023** Rare recurrent gallstone ileus: A case report
Jiang H, Jin C, Mo JG, Wang LZ, Ma L, Wang KP
- 2028** Treating severe periodontitis with staged load applied implant restoration: A case report
Wang SH, Ni WC, Wang RF
- 2038** Cryptococcal pneumonia in a human immunodeficiency virus-negative patient: A case report
Jiang XQ, Zhang YB
- 2044** Ileocecal intussusception caused by two different tumors - which is the culprit lesion? A case report
Fan WF, Ma G, Li GC, Long J, Xu YH, Guo KJ, Liu Z
- 2050** Robot-assisted retroperitoneal laparoscopic excision of perirenal vascular tumor: A case report
Zhang C, Fu B, Xu S, Zhou XC, Cheng XF, Fu WQ, Wang GX
- 2056** Successful use of plasma exchange in fulminant lupus myocarditis coexisting with pneumonia: A case report
Xing ZX, Yu K, Yang H, Liu GY, Chen N, Wang Y, Chen M

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Unexplained huge liver infarction presenting as a tumor with bleeding: A case report

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Abstract

BACKGROUND

Liver infarction is a rare necrotic lesion due to the dual blood supply consisting of the hepatic artery and portal vein. The absence of specific clinical manifestations and imaging appearances usually leads to misdiagnosis and poor prognosis. Thus, the precise diagnosis of liver infarction always requires imaging studies, serum studies, and possible liver biopsy.

CASE SUMMARY

We report a case of 31-year-old man who developed a huge liver infarction. Persistent right upper abdominal pain and intermittent fever were the main symptoms in this patient. Computed tomography revealed a huge irregular lesion with a maximum diameter of 12.7 cm in the right lobe of the liver. Three-dimensional reconstruction was performed and no significant interruption of the main hepatic vessels was observed. The lesion was initially considered to be a malignant tumor with internal bleeding. Laparoscopic right hepatectomy was performed, and pathology indicated a rare liver infarction. The patient recovered well and was discharged on postoperative day 21. No fever or abnormal liver function were reported in the subsequent 6 mo.

CONCLUSION

In patients with a huge liver infarction, early surgical intervention may be beneficial.

Key words: Liver infarction; Liver lesions; Surgery; Imaging; Diagnosis; Case report

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Core tip: We report a case of liver infarction that was initially considered to be a tumor with bleeding based on computed tomography. Liver infarction is caused by the

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obstruction of hepatic vessels, and a huge liver infarction is very rare due to the dual hepatic blood supply. The clinical manifestations and imaging appearances of liver infarction are nonspecific. The precise diagnosis always requires multiple imaging methods, serum studies, and pathological examination. In addition to conservative treatment, early surgical intervention is beneficial in patients with a huge liver infarction. This case report provides a valuable reference for the diagnosis and treatment of this disease.

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INTRODUCTION

Primary liver cancer is one of the most common malignant tumors, and ranks third with respect to tumor mortality worldwide. The incidence of primary liver cancer is much higher in China due to hepatitis B infection^[1]. The precise diagnosis of liver lesions is helpful for the application of targeted therapeutic options and a good prognosis, while misdiagnosis is sometimes inevitable due to the similar imaging appearances of liver cancer and other benign lesions. We describe a patient with a huge liver infarction and bleeding that was initially considered to be liver cancer with bleeding. A review of the literature on liver infarction was also performed.

CASE PRESENTATION

Chief complaints

A 31-year-old man was admitted with persistent right upper abdominal pain, fever, and anorexia for 6 d.

History of present and past illness

He was healthy without a history of personal or family tumors. Abdominal ultrasound revealed fatty liver and mixed echoes in the right lobe of the liver, and a non-enhanced computed tomography (CT) scan of the abdomen also suggested a huge lesion in the right lobe of the liver with mixed density. Antibiotics had been administered in a local hospital to help relieve the patient's symptoms.

Physical examination upon admission

Upon admission, his intermittent fever peaked at 38.5 °C without symptoms of respiratory infection. Percussion pain in the liver area was detected with no other abnormalities upon physical examination.

Laboratory examinations

Laboratory studies excluded hepatitis B and C infection, but showed leukocytosis, neutrophilia, elevated aspartate aminotransferase at 76 U/L, and alanine transaminase at 477.4 U/L. The triglyceride, total cholesterol, carcinoembryonic antigen, alpha-fetoprotein, and carbohydrate antigen-199 levels were in the normal range.

Imaging examinations

An enhanced CT scan indicated fatty liver, and a huge irregular lesion with a maximum diameter of 12.7 cm was observed in the right lobe of the liver. On non-enhanced CT, a slightly high density was also found in the lesion (Figure 1A), which was consistent with previous CT images. The entire tumor was not enhanced, and the peripheral tissues were delayed enhanced (Figure 1B and D). The typical CT image of hepatocellular carcinoma was enhanced at the early stage and with peripheral vascular contrast enhancement. However, for some unusual hepatic tumors, the image feature was delayed enhanced, such as liver metastasis from gastric cancer. The imaging findings suggested a malignant liver tumor with bleeding. Three-dimensional reconstruction was performed to identify the relationship between the lesion and adjacent hepatic vessels. No significant interruption of the main liver artery

and portal vein was observed (Figure 2A-C).

FINAL DIAGNOSIS

The surgical specimen showed a huge necrotic lesion, and multiple adipose lesions were also observed (Figure 3A). Pathological examination indicated a rare liver infarction (Figure 3B-D).

TREATMENT

The antibiotics ceftriaxone sodium and levofloxacin, as well as hepatoprotective drugs, were administered to control the fever and improve liver function.

OUTCOME AND FOLLOW-UP

On the 9th day after admission, the patient underwent laparoscopic right hepatectomy. He recovered well following treatment with antibiotics, nutritional support, and human albumin, and was discharged on postoperative day 21. No fever or abnormal liver function were subsequently reported.

DISCUSSION

Liver infarction is a type of hepatic necrosis caused by the obstruction of vessels, which is rare due to the hepatic dual blood supply, the tolerance of hepatocytes to low oxygen, and the immediate opening of collateral vessels within the liver^[2,3]. Simultaneous occlusion of the hepatic artery and portal vein is sometimes considered to be essential in a huge liver infarction^[4]; however, the abrupt truncation of a single hepatic artery can also lead to severe liver infarction and even death^[5]. Liver infarction is usually reported at autopsy. Seeley *et al*^[6] investigated 19 autopsies of patients with hepatic infarcts, and found that ten autopsies showed arterial occlusion, four showed only portal vein thrombosis, and no vascular occlusion was found in the other five patients. In our case, we found no obvious hepatic vessel lesions on the CT scan and three-dimensional reconstruction of the liver. In a subsequent study, Saegusa *et al*^[7] reported 20 cases of hepatic infarction and 17 had circulatory failure. Furthermore, 15 had portal vein thrombosis, which indicated the importance of portal vein disturbance in the development of liver infarction. Based on these reports, simultaneous or single occlusion of the hepatic artery and portal vein appears to be the anatomical basis of hepatic infarction.

The early diagnosis of liver infarction is difficult due to its rarity and absence of typical symptoms. It can initially present as chest or right upper abdominal pain, fever, or with associated nausea and vomiting^[8-10]. In addition, related laboratory studies for hematological and biochemical markers are not specific, which makes the diagnosis challenging^[11,12]. In our report, the patient had right upper abdominal pain and fever, and related serum tests showed leukocytosis, neutrophilia, and elevated aspartate aminotransferase and alanine transaminase, but it is difficult to differentiate between liver abscess or a tumor with bleeding or infection. Thus, a CT scan was performed, which indicated the areas of liver infarction with low attenuation that were circumscribed and wedge-shaped, and extended to the periphery of the liver^[11]. The CT images in our patient showed an irregular lesion with an inside of slightly high density, which was considered to be bleeding. It was reported that gadophrin-2 displayed a persistent necrosis-specific contrast enhancement on magnetic resonance imaging, and was considered useful for diagnosis in a rat model of reperfused liver infarction^[13]. Hepatobiliary scintigraphy is also considered to be a sensitive method for detecting early hepatic infarction even before ultrasonographic changes occur, which is helpful in improving prognosis^[14].

The causes of liver infarction are diverse, although primary lesions in hepatic vessels are rare. It has been suggested that liver infarction may be secondary to circulatory shock, sepsis, anesthesia, or biliary disease^[8,10]. We reviewed the literature on liver infarction (Table 1) and concluded that the common causes of this disorder are as follows: (1) Iatrogenic injury of hepatic vessels, mainly the hepatic artery. In normal liver, approximately 75% of the blood supply is from the portal vein, and 25% is from the hepatic artery. An anatomical abnormality of the hepatic artery is frequently observed, such as the right hepatic artery that can be derived from the

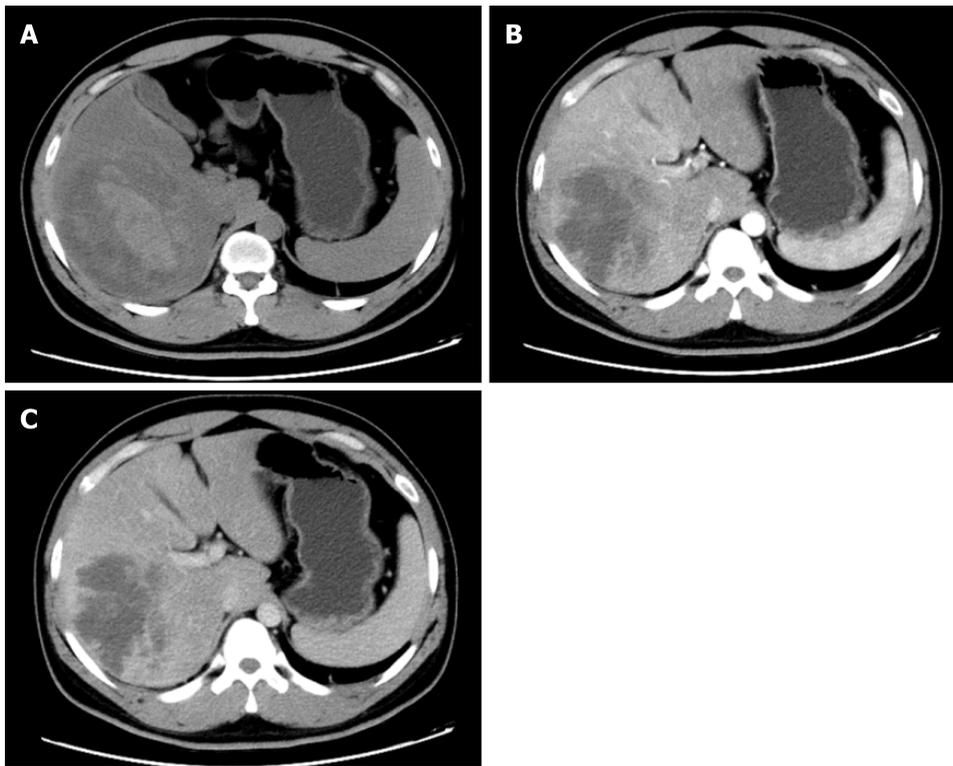


Figure 1 Computed tomography imaging of liver infarction. A: Plain scan phase of computed tomography (CT) detected an irregular lesion in the right lobe of the liver; B: Arterial phase of CT showed no obvious enhancement; C: Venous phase of CT showed no obvious enhancement.

proper or common hepatic artery or superior mesenteric artery. Wong *et al*^[15] reported liver infarction due to injury to the right hepatic artery and portal vein during laparoscopic cholecystectomy. Surgeons should avoid hepatic vessel injuries during gallbladder, bile duct, liver, and pancreas surgery. (2) Systemic diseases: Churg-Strauss syndrome is characterized by granulomatous vasculitis of multiple organ systems, which can lead to irregular narrowing of hepatic arteries and even liver infarction^[3]. In pregnant or postpartum woman, antiphospholipid syndrome (APS) and systemic lupus erythematosus (SLE) are also considered causes of liver infarction due to multiple thromboses *in vivo*^[11,16,17]. Related serum studies on anti-nuclear antibodies, anti-double-stranded DNA, anti-cardiolipin antibodies, and lupus anticoagulant are useful for the diagnosis of APS and SLE^[18]. In the present report, the above markers were investigated and found to be in the normal range. A hypercoagulable state, such as disseminated intravascular coagulation caused by severe postpartum hemorrhage, can induce thrombosis formation in hepatic vessels, hepatic infarction, and even acute hepatic failure^[19,20]. (3) Treatment of liver diseases includes transarterial chemoembolization (TACE) and transjugular intrahepatic portosystemic shunt (TIPS). TIPS is performed for the treatment of variceal bleeding and refractory ascites in patients with portal hypertension^[21], while TACE is used for the treatment of liver cancer, liver bleeding, or for diagnostic purposes^[22]. TIPS can induce hepatic hypoperfusion in the portal vein, while TACE interrupts liver artery blood flow. Therefore, the risk of liver infarction due to TACE is increased by TIPS^[9,23]. Before TACE or TIPS is undertaken, it is important to evaluate the condition of the hepatic artery and portal vein for a better prognosis. And (4) Other causes: Ashida *et al*^[2] reported a case of liver infarction due to liver abscess, without the occlusion of hepatic vessels. In our case, liver infarction was not due to the above three common causes; however, the patient had fatty liver and severe fatty degeneration of hepatocytes. Whether this was the origin of liver infarction requires further investigation.

CONCLUSION

The causes of liver infarction are complex with an outcome that is sometimes systemic, and can even be fatal. Simple imaging, such as ultrasound, CT scan, or magnetic resonance imaging, is sometimes insufficient, and at least two imaging

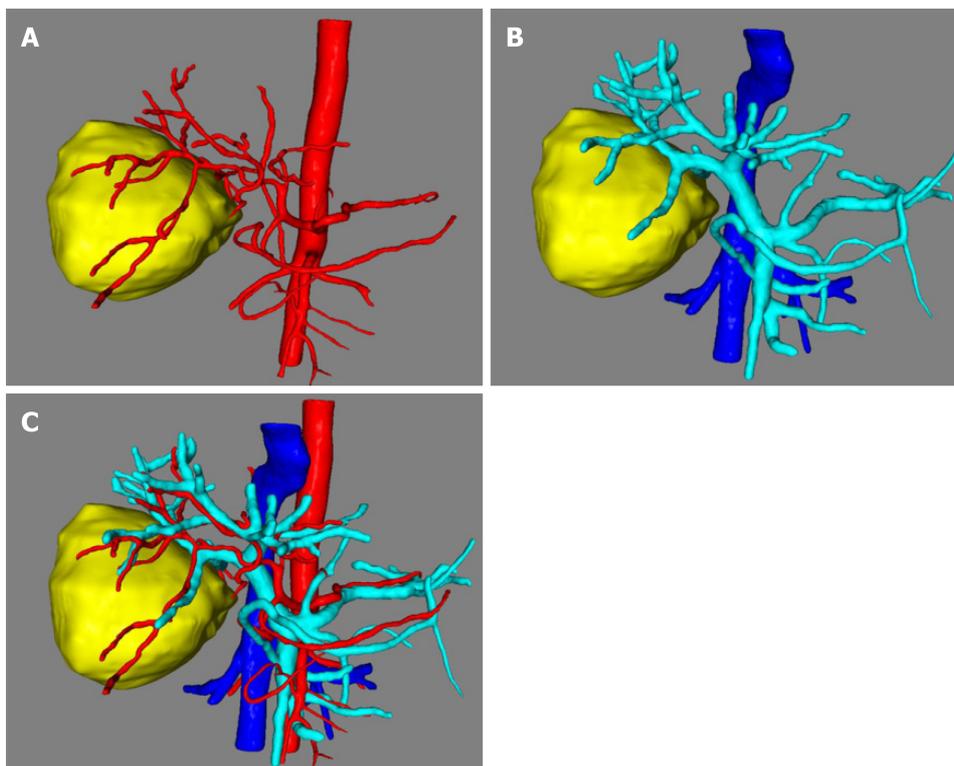


Figure 2 Three-dimensional reconstruction of liver and lesion. A: Arterial reconstruction of the liver revealed the relationship between lesion and hepatic artery; B: Venous reconstruction of the liver revealed the relationship between lesion and portal vein; C: Mixture of arterial and venous reconstruction.

methods are required. In addition, detailed history taking, physical examination, and related serum studies are also crucial. The treatment of primary diseases, such as APS and SLE, is essential, and treatment with antibiotics, hepatoprotective drugs, thrombolysis, hormones, and even surgery are also significant. We should also be aware of the clinical characteristics, imaging appearance, and serum results of other liver lesions, such as liver cancer and abscess, as the early precise diagnosis of liver infarction is difficult and important for controlling further progression and improving prognosis.

Table 1 Literature review for liver infarction

Ref.	Case	Symptoms	Serum study	Computed tomography	Liver vessels	Main treatments
Otani <i>et al</i> ^[3] , 2003	A 59-year-old man with Churg-Strauss syndrome	Cold and pain of fingers and toes	Hypereosinophilia, elevated IgE and transaminase	Low density at the periphery of the right lobe	Irregular narrowing of hepatic arteries	Surgery, intravenous PGE1, prednisolone
Khong <i>et al</i> ^[11] , 2005	A 30-year-old postpartum woman with DVT history	Right-sided chest pain, mild pyrexia	Leukocytosis, neutrophilia, elevated ALT	Multiple peripheral liver infarcts	-	Antibiotics, heparin and warfarin
Mayan <i>et al</i> ^[9] , 2001	A 66-year-old male with TIPS	Fever and shock, tenderness of right upper quadrant	DIC, AST and ALT increased	Wedge-shaped hypodense lesion of liver	No sign of portal vein occlusion or arterio-stent shunt	Amikacin, vancomycin, ceftriaxone
Park <i>et al</i> ^[23] , 2016	A 61-year-old woman with TACE	Epigastric pain, abdominal pain and distention	Elevations of AST and ALT	Nonenhancement and expansion of left hepatic lobe with DEE TACE	Middle hepatic vein to left portal vein shunt	Supportive care
Wong <i>et al</i> ^[15] , 2001	A 66-year-old woman with laparoscopic cholecystectomy	Fever, right upper quadrant pain	Leukocytosis, bacteremia	A cystic defect of right hepatic lobe	Occlusion of the right hepatic artery and right portal vein	Surgery
Wang <i>et al</i> ^[5] , 2011	A 44-year-old man with liver transplantation and TIPS	Refractory hypotension	Rise in serum aminotransferase level	A large, irregular hypodense lesion in the right lobe of the liver	Abrupt truncation of the native common hepatic artery	Aggressive resuscitation
Ashida <i>et al</i> ^[2] , 2003	A 74-year-old man with liver abscess	Diarrhea and abdominal pain	-	Low-density lesions	Interrupt of the hepatic artery and portal vein	Operation and drainage
Sakhel <i>et al</i> ^[16] , 2006	A 39-year-old primigravida with SLE and secondary APS	Upper abdominal pain, tachypnea, dyspnea, and tachycardia	Elevated AST and ALT	Multiple irregularly shaped, small, low-density lesions		Heparin and broad-spectrum antibiotics
Peng <i>et al</i> ^[19] , 2018	A 30-year-old woman with post-partum hemorrhage		Liver enzyme levels peaked, DIC	Poor enhancement of the right hepatic lobe on the periphery		Liver transplantation

PGE 1: Prostaglandin E 1; DVT: Deep venous thrombosis; TIPS: Transjugular intrahepatic portosystemic shunt; TACE: Transarterial chemoembolization; DIC: Disseminated intravascular coagulation; AST: Aspartate aminotransferase; ALT: Alanine transaminase.

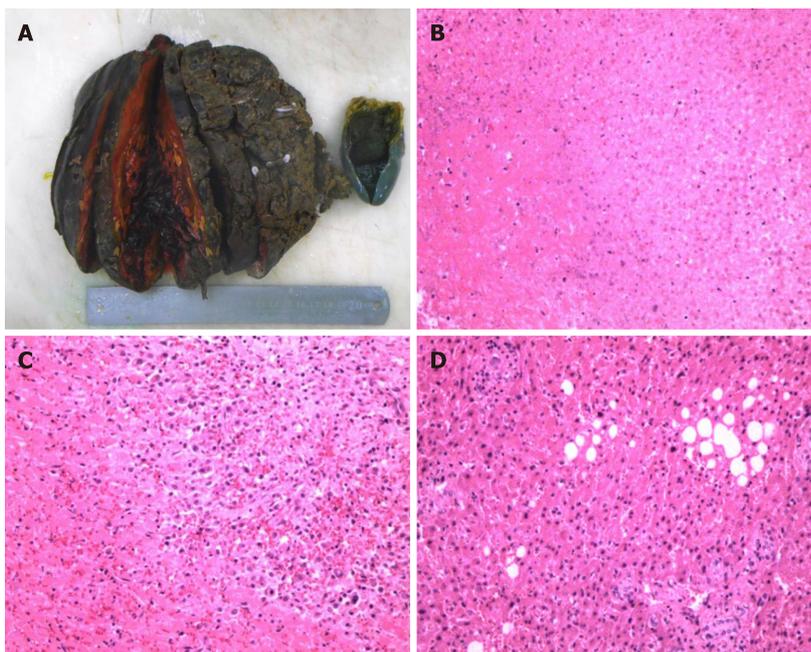


Figure 3 Pathological examination of lesion. A: Necrotic lesion was 16 cm × 12 cm × 8 cm in size without an envelope; B: Pathological section analysis of liver infarction; C: Pathological section analysis of tissue adjacent to lesion; D: Pathological section analysis of normal liver tissue, revealing fatty degeneration of hepatocytes.

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