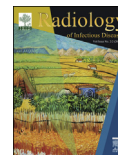


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Research article

# Comparison of partial splenic embolization in HIV infected and non-HIV infected patients with cirrhosis

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## Abstract

**Objective:** The aim of this study is to see whether it is effective for human immunodeficiency virus (HIV) infected patients conducted partial splenic embolization (PSE) and if there are differences in the effects of PSE between HIV and non-HIV patients.

**Method:** We retrospectively reviewed seven patients, three were HIV infected, the rest weren't. We compared the effects of PSE between the two groups using indices of hematologic indices and liver function.

**Result:** In HIV infected patients, WBC rose in all PSE procedure, RBC rose in 3 procedures. PLT increased in 2 procedures. ALT decreased in all patients, but the changes of ALB and AST were not obvious. In non-HIV infected patients, all the hematologic indices were increased, except one patient. ALT and AST were increased, the change of ALB was not obvious.

**Conclusion:** PSE do improve the hematologic indices and liver function in patients with HIV and hepatitis virus co-infected, but when compare with non-HIV infected patients included in our study, we haven't seen much differences in the effects.

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**Keywords:** HIV; Viral hepatitis; Hypersplenism; PSE

## 1. Introduction

The co-infection of human immunodeficiency virus (HIV) and hepatitis virus became more prevalent, because of the same route of transmission: blood. What is worse, infection with HIV accelerates the progression of HBV/HCV disease to cirrhosis by increasing hepatitis B/C viremia [1]. A study showed that non-AIDS related death was mostly caused by liver diseases and there was a strong relation between immunodeficiency and risk of liver related death [2]. This means that HIV and HBV/HCV co-infected patients may experience a higher risk of death than other HIV or HBV/HCV infected patients. In hepatic cirrhosis, hypohepatia, thrombocytopenia, anemia and leucopenia are frequently occurring clinic features. Additionally,

hypersplenism due to portal hypertension may result in further reduction of hematologic indices [3]. Thrombocytopenia increases a patient's risk of spontaneous bleeding, and may preclude surgical or endovascular interventions. Leukopenia decreases the patient's ability to overcome infection, and may serve as a contraindication to the use of chemotherapies. Anemia places a patient at a high risk of bleeding [4].

Splenectomy is a traditional treatment of hepatic cirrhosis and hypersplenism, but it is associated with severe complications, such as hemorrhage, thromboembolic, subphrenic abscess, overwhelming postsplenectomy infection (OPSI) [5]. While for partial splenic embolization (PSE), postembolization syndrome including abdominal pain, fever, malaise, and gastrointestinal symptoms is the most common side effect of PSE [6]. A retrospective study shows that both splenectomy and PSE can improve hematologic indices, but the patients conducted splenectomy may experience more severe complications [7]. The PSE not only improve liver function and serum cell counts, but also decrease the incidence of variceal bleeding and the protection

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can persist for at least a year [8]. But for the patients who have hypersplenism secondary to cirrhosis and infected with HIV virus at the same time, the effect of PSE is unclear.

## 2. Materials and methods

### 2.1. Materials

We retrospectively analysed seven patients with liver cirrhosis who underwent 8 PSE during 2007–2013 in Zhongnan Hospital of Wuhan University. One of the patients conducted twice PSE because of a smaller infarction area in the first time. The patients included in this study were those who conducted CT before and after PSE, and their CT images could be seen in the PACS system in our hospital and the WBC, RBC, PLT and liver function should be tested before and after PSE. The patients who only conducted B ultrasound or who hadn't had all of the biochemical tests were excluded. The seven patients are divided into 2 groups. There are three patients infected with HIV virus in group A, including 2 women aged 44 and 45 and a 55-year-old man. The 44 year-old woman has had hepatitis B for more than 8 years; the 45 year-old woman was the one who received PSE twice, had hepatitis B and C, and cirrhosis; and the man was diagnosed with hepatitis C and cirrhosis. The remaining four patients haven't infected with HIV virus are in group B. There are 2 women aged 56, 72 and 2 men aged 53, 54. Both group patients have bad liver functions and splenomegaly confirmed by computerized tomography, and associated decreasing hematologic indices including thrombocytopenia and leucopenia.

### 2.2. Methods

We used Seldinger's method through the right femoral artery puncture. Via a 5 F arterial sheath pipe, we inserted the

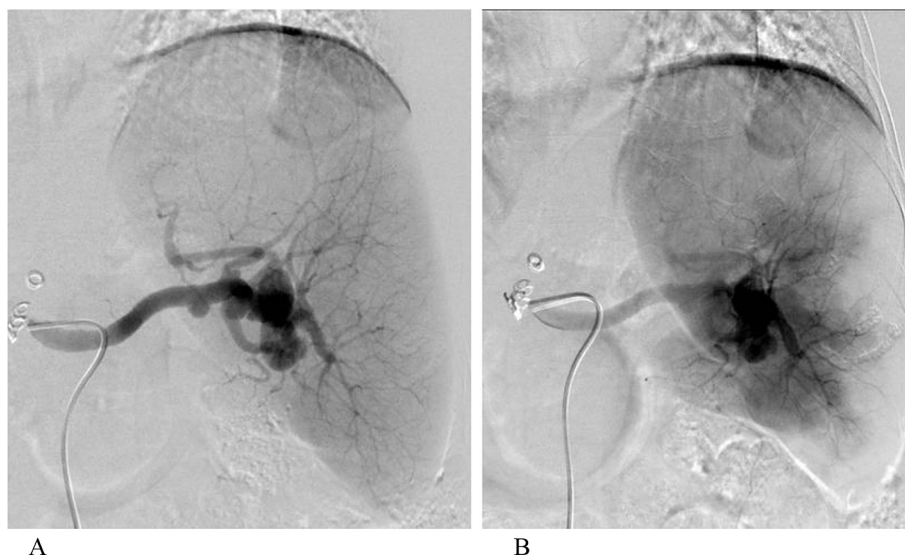
catheter into proximal splenic artery and conducted angiography to map the distribution and branches of the splenic artery, and the size of spleen. Then we further advanced the catheter to reach to the distal splenic artery or the hilum of spleen. Amount of gelatin sponge needed is based on the number of splenic artery branches with a diameter of 1 mm. Also, we needed to treat patients accordingly based on their conditions to control the embolism area within 30%–70%. The procedure was performed under X-ray fluoroscopy. We used low-pressure flow control technology to inject gelfoam. All the gelfoam were produced by HangZhou Alicon Pharma Science and technology Company and the size of gelfoam were 500–1000µm. We judged embolism area according to blood flow speed and contrast reflux (Picture 1). After operation, the patients should lie in bed and apply local compression for 24 h. Antibiotics may be required if embolism syndrome such as fever, spleen pain, nausea and other symptoms appear.

### 2.3. Observation items

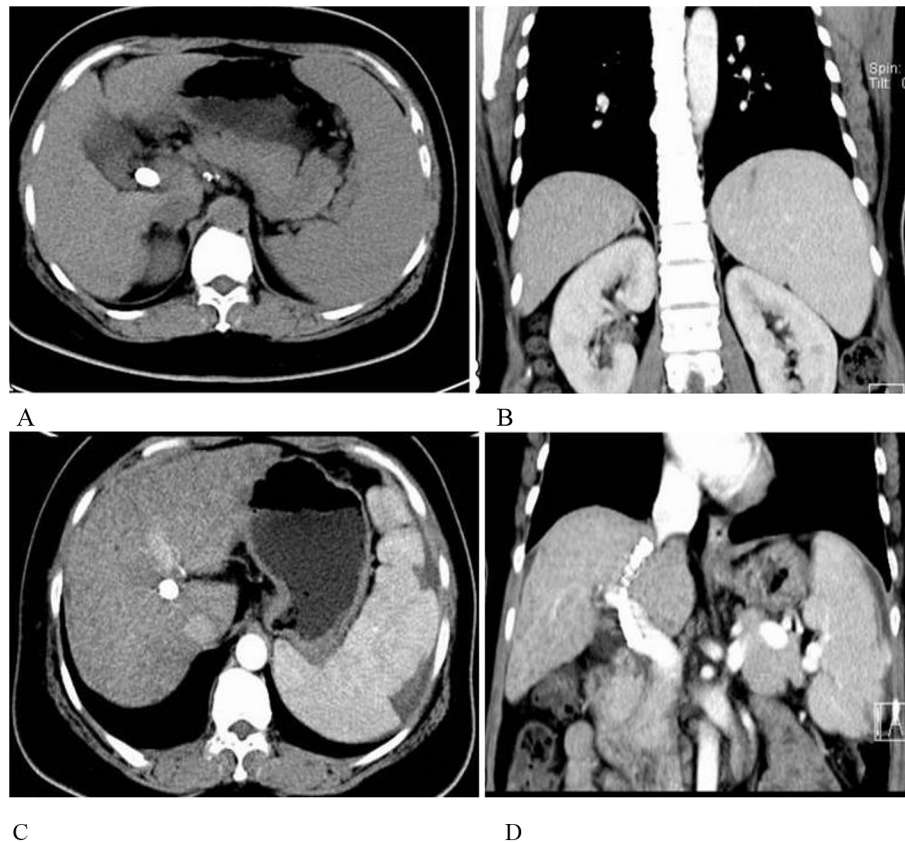
We observed and recorded the indices of liver function including alanine aminotransferase (ALT), aspartate aminotransferase (AST), albumin (ALB), the size of spleen and hematologic indices including thrombocyte, leukocyte and erythrocyte counts before and after PSE.

## 3. Result

PSE were conducted successfully in both groups. In group A, 1 of 4 patients experienced transient abdominal tenderness and disappeared 4 days later without any treatment; 1 of 4 patients developed abdominal pain during the night following the procedure and were given painkillers. The last patient received PSE twice and during the first time, the patient had no



Picture 1. The digital subtraction angiography (DSA) pictures of a 46 years old woman with HIV and cirrhosis. A: pre-embolization arteriogram shows the main splenic artery is wide and has many branches. B: digital subtraction splenic arteriogram obtained after embolization of approximately 50% of the spleen shows the terminal arteries of spleen are embolized.



Picture 2. The CT images of the same HIV infected patient. A, B: before embolization, the spleen is much bigger than ordinary. C, D: after embolization, the volume of spleen is reduced, we can see the embolization part in picture C with lower density than the normal part.

complications and left the hospital two days after PSE, however, after the second PSE, the patient had transient abdominal pain, fever, and vomit and recovered gradually with symptomatic treatment. In group B, all of the 4 patients got abdominal pain and 2 of 4 had fever after PSE and received symptomatic treatment. None of the patients got severe post-embolization complications such as splenic abscess, splenic rupture, and refractory ascite and so on.

On the basis of the CT findings after embolization, the splenic infarction percentages in group A were 50% in 2 of 4 and 35%, 45% in the patient who received PSE twice. In group B, the embolization area is 40%–70% (Picture 2). Changes of

blood cell counts, and liver function, in both group A and group B prior to procedures and 1 week after the procedures, are shown in Tables 1 and 2, respectively. In group A, the white cell rose differently after the embolization in all patients. One of 4 patients showed little decline in RBC, while 3 of 4 patients showed increases in RBC. But the platelet counts didn't show significant increase in all patients after PSE, with 2 of 4 rose slightly and the others decreased. The decrease of ALT, which is an indicator of recovery of hepatic function, is observed in all patients. But the changes in ALB and AST were not obvious, with 2 of 4 declined, 1 of 4 increased slightly, and 1 of 4 with no change. In group B, all the

Table 1  
Characteristics of hematologic indices and liver functional parameters of group A before and one week after PSE.

Patients	Items					
	PLT ( $1 \times 10^9$ g/l)	WBC ( $1 \times 10^9$ g/l)	RBC ( $1 \times 10^9$ g/l)	ALT (u/l)	AST (u/l)	ALB (g/l)
1	44	1.51	2.32	14	24	37.3
	30	7.52	2.58	10	44	38.8
2	34	1.13	3.13	43	44	27.3
	42	7.90	3.23	35	41	29.3
2*	39	1.36	2.97	40	41	27.7
	44	1.56	2.64	24	41	27.1
3	61	2.30	3.59	28	40	36.5
	52	4.80	3.93	22	44	34.9

Note: the data before PSE is shown upper the data after PSE. 2\* means the patient receive second time PSE.

Table 2  
Characteristics of hematologic indices and liver functional parameters of group B before and one week after PSE.

Patients	Items					
	PLT ( $1 \times 10^9$ g/l)	WBC ( $1 \times 10^9$ g/l)	RBC ( $1 \times 10^9$ g/l)	ALT (u/l)	AST (u/l)	ALB (g/l)
1	58	1.56	3.62	110	93	37.0
	92	3.74	3.73	54	42	36.0
2	62	3.82	3.37	55	62	30.8
	125	9.23	3.31	33	47	37.3
3	53	2.59	3.53	48	44	33.4
	100	7.24	3.76	29	32	29.7
4	39	2.0	3.41	37	50	31.9
	66	5.3	2.76	16	28	24.9

Note: the data before PSE is shown upper the data after PSE.

hematologic indices were significantly increased, except one declined in RBC. ALT and AST decreased in all patients. While the change of ALB was not obvious, 1 of 4 increased a little and 3 of 4 decreased. In general, all patients had smaller splenic volume after the procedure, WBC and RBC were increased in both groups but the improvements were not significantly different. The outcome of PLT in group B was better than in group A.

#### 4. Discussion

Thomas et al. [9] indicates that both PSE and splenectomy can improve PLT and WBC counts so as to allow for use of drugs, which suppress the bone marrow such as interferon or chemotherapeutic agents, to successfully treat the infection. The condition is also suitable for HIV-HBV/HCV co-infected patients, for whom highly active antiretroviral therapy is also needed to be used to improved prognosis of HIV infection and reduced the incidence of opportunistic diseases substantially [10]. Dua RS et al. retrospectively analysed 477 HIV infected patients who received 722 surgical procedures found that a significantly higher risk of complication followed intra-abdominal procedures, the septic sequelae (pelvic collections and wound infections) were the most common complications which were all related to delayed healing of wounds [11]. Compared with splenectomy, PSE is much safer which causes less severe complications and shorter length of stay in hospital [7].

Research indicates that end-stage liver disease, which may lead to spontaneous bacterial peritonitis, hepatic encephalopathy, or gastrointestinal bleeding secondary to esophageal varices or coagulopathy, has become the leading cause of death in HIV infected patients [12]. So improving the hepatic function is of vital importance in HIV and HBV/HCV co-infected patients. Moreno et al. indicated that PSE, with a mean infarcted area of 80%, conducted in HIV and HCV co-infected patients, leading to a significant increase in platelet and leukocyte counts [13]. In our study, the leukocyte counts increased in all patients, but the platelet counts only increased in 2 of 4, which is consistent with Moreno's research at some degree. Additionally, all patients in group A have a decrease in ALT, showing recovery of liver function, but 2 of 4 had an increase in AST and ALB. Unfortunately, there is no research about the changes of liver function after received PSE in HIV

infected patients. In group B, the results of PLT, WBC, RBC and ALT, AST are compatible with previous research [7], with all the hematologic indices were significantly increased, except one declined in RBC; ALT and AST decreased in all patients. Hiromitsu Hayashi et al. [14] also suggested that preoperative splenic volume and infarcted splenic volume were positively associated with liver functional improvement. Maybe this is the reason why the results of liver functional improvements in group A, which have a smaller infarcted splenic volume, are not as good as in group B.

The most common complication of post PSE is post embolization syndrome, including fever, abdominal pain, needing only symptomatic treatment. Some severe side effects such as splenic abscess and splenic rupture haven't appeared in our study. Hayashi et al. indicates that a massive infarcted splenic volume, not splenic infarction rate, is correlated with complications after PSE for liver cirrhosis and an infarcted splenic volume of between 388 and 540 ML is recommended for safe and effective PSE in patients with cirrhosis [15]. Other study indicates that the rate of splenic infarction is a critical factor for long-term improvement of blood cell counts and the splenic infarction rate should be limited to 50%–70% in order to ensure the long-term efficacy in alleviating hypersplenism and reducing complications [16].

Our study do had some limitations. First, our sample size is too small that many biases may exist in our results. Second, the patients in our study had a short following up time. Third, there is litter article about the accurate effects of PSE in HIV infected patients, so we cannot make a comparison with other researches. Therefore, we should accept the results cautiously and much more studies need to be done in this aspect to know the accurate effects of PSE in HIV infected patients.

#### 5. Conclusion

Based on the patients included in our study, PSE do improve the PLT or RBC or WBC or PLT in HIV infected patients and without severe side effects, which means that PSE is an effective way to relieve hypersplenism and improve liver fuction. And when compared with the non-HIV infected patients included in our study, we haven't seen much difference of the effects of PSE. What is more, considering the limitations in this study, we should accept the results cautiously, and more works should be done in this aspect.

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