# Subintimal angioplasty after late thrombosis of hepatic artery stent implanted in liver transplantation

## *Angioplastia subintimal após trombose tardia de stent implantado em artéria hepática de fígado transplantado*

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### Abstract

The authors report a case of stenosis of a transplant hepatic artery, treated with percutaneous transluminal angioplasty and stenting, that progressed to occlusion 30 days after the procedure. Intra-arterial thrombolysis and subintimal percutaneous angioplasty were successfully performed. Computed tomography angiography 90 days after the procedure showed hepatic artery patency.


**Keywords:** angioplasty; hepatic artery; transplantation.


### Resumo

Os autores relatam um caso de estenose de artéria hepática transplantada tratada com angioplastia e *stent*, que evoluiu para trombose completa após 30 dias do procedimento. Realizada trombólise intra-arterial e angioplastia subintimal com sucesso. Controle angiotomográfico após 90 dias demonstra perviedade da artéria hepática.


**Palavras-chaves:** angioplastia; artéria hepática; transplante.

## Introduction

Hepatic transplantation is a highly complex surgical procedure, involving arterial, venous and biliary artery anastomoses. The hepatic artery of a transplanted liver plays an essential role in graft perfusion, as it is the main blood supply to the biliary ducts[1-3]. In case of reduced or absent arterial flow, biliary duct ischemia may occur and, consequently, cholestasis and its complications.

Hepatic artery stenosis is a complication of liver transplantation, with an incidence that ranges from 4.8 to 12%[1-3]. Out of these cases, about 65% develop secondary thrombosis[1,2]. For this reason, the early diagnosis and treatment of hepatic artery stenosis can prevent loss of the transplanted liver.

Nevertheless, the most frequent and feared vascular complication is hepatic artery thrombosis, which incidence ranges from 4 to 26%, with a mortality rate up to 80% when early revascularization or a new transplantation are not performed[4-9]. The main risk factors for hepatic artery thrombosis are: technical failure at the anastomosis, artery kinking and rejection of the transplanted liver[1,4-7].

Hepatic artery thrombosis should be suspected with the occurrence of recurrent bacteremia, cholestasis with or without biliary duct stenosis and fulminant hepatic failure with severe sepsis. For a long time, open surgical reconstruction was considered the first choice in these cases. However, endovascular treatment has become a safer, more effective and less invasive

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Conflict of interest: nothing to declare.
Submitted on: 11.12.09. Accepted on: 06.01.11.
J Vasc Bras. 2011;11(1):53-56.

method, as it allows the re-establishment of hepatic arterial flow without resorting to a difficult open surgical approach[10,13].

The authors report a case of early thrombosis of a stent in a transplanted hepatic artery, treated with thrombolysis and subintimal angioplasty.

## Case report

A 47-year-old male patient, who had undergone liver transplantation for fulminant hepatitis B six months previously,, was admitted with pain in the right upper quadrant of tha abdomen, followed by fever, choluria, acholic stools and rising transaminases.

Doppler ultrasonography showed hepatomegaly, dilated intra-hepatic biliary ducts and hepatic artery stenosis higher than 50%. Computed tomography, angiography confirmed a 70% stenosis of the transplant hepatic artery anastomosis (Figure 1A). The lesion was treated by angioplasty with stenting. The procedure was performed through a right common femoral artery puncture, with deployment of a Formula® stent (Cook) mounted on a 5.5x12 mm balloon (Figures 1B-D). Angiographic control after the procedure showed a properly positioned stent in the hepatic artery, with satisfactory blood flow and no residual stenosis.

There was marked improvement in the clinical picture of cholangitis after angioplasty and treatment with antibiotics. The patient was discharged from the hospital asymptomatic, on 75 mg of clopidogrel /day.

On the 30th post-operative day, the patient presented with recurrent cholangitis (abdominal pain, choluria, acholic feces and fever). Computed tomography angiography and catheter arteriography showed complete thrombosis of hepatic artery at the stent site (Figures 2A and B).

The patient was submitted to "superselective" catheterization of the hepatic artery with a microcatheter and a 0.014" hydrophilic guidewire placed across the thrombosed segment of the artery. A bolus of 30 mg of intra-arterial alteplase (Actilyse) was given initially, followed by 50 mg in a continuous infusion pump over 18 hours. After the end of thrombolysis, control arteriography showed residual thrombi in the intra-stent segment of the hepatic artery and reduced distal blood flow (Figures 2C and D).

After several unsuccessful attempts at crossing the thrombosed intra-stent arterial segment with guidewires, it was elected to do subintimal passage of the guidewire across the lesion. This was followed by angioplasty of this segment with a 4.5x15 mm balloon. The stent was compressed against the vessel wall (Figures 3A and B). Control arteriography showed hepatic artery patency without hemodynamically significant stenosis and satisfactory distal flow.

The patient had an uneventful post-procedure course and was discharged from the hospital 10 days later. Control computed tomography angiography 90 days after the procedure showed the hepatic artery to be patent without residual stenosis and with good distal blood flow. The stent was crushed against the arterial wall (Figures 4A-D).

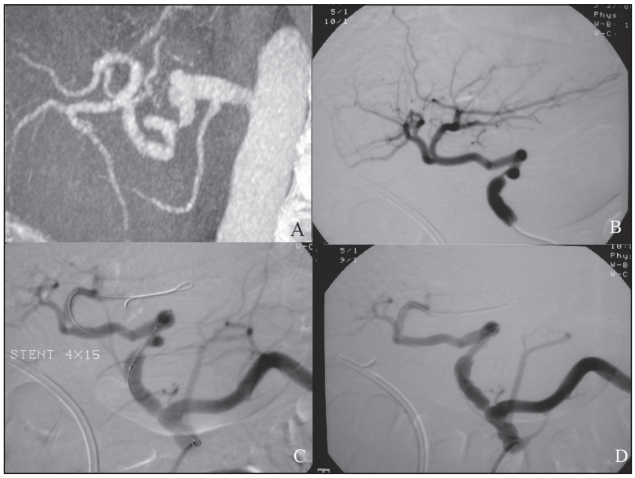


**Figure 1.** (A) Computed angiotomography showing stenosis in the hepatic artery anastomosis; (B) digital arteriography confirming the hepatic artery stenosis; (C) control angiography before the 4 x 15 mm stent implantation; (D) final result after the stent implantation.

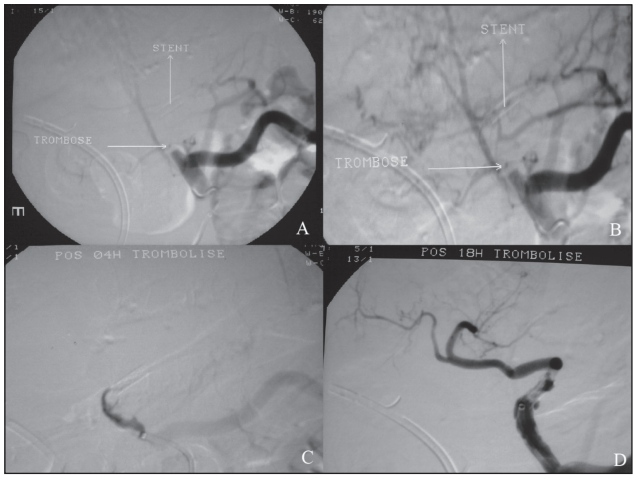


**Figure 2.** (A) and (B) Digital arteriography showing hepatic artery thrombosis; (C) result after 4-hour infusion of 30 mg alteplase; (D) result after 18-hour infusion of alteplase (total 80 mg), with the imaging exam showing persisting thrombus in the stent.

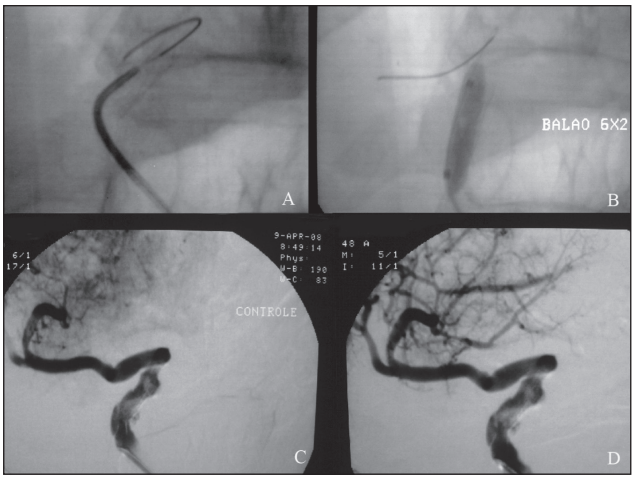


**Figure 3.** (A) Subintimal guidewire passage, outside the stent area; (B) subintimal angioplasty with 6x20 mm balloon; (C) and (D) control angiography after angioplasty.

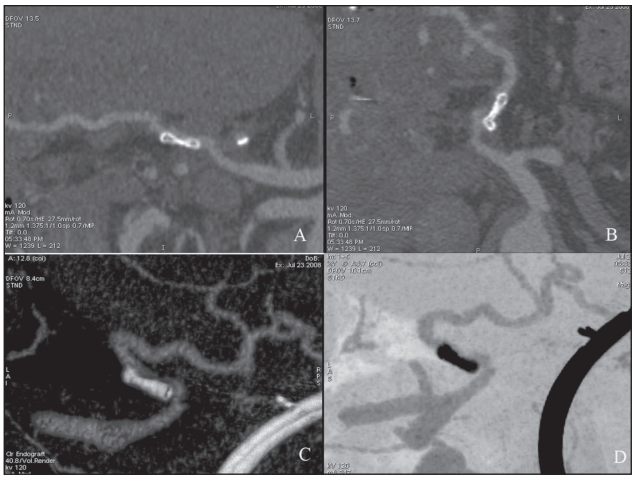


**Figure 4.** Computed angiotomography made 90 days after the subintimal angioplasty showing hepatic artery latency with proper distal flow.

## Discussion

Transplant hepatic artery stenosis presents a more insidious course than thrombosis. Patients with stenosis, however, may develop graft ischemia or occlusion, sepsis, cholestasis and biliary stenosis, besides arterial thrombosis in 65% of the cases[2,5,6]. For these reasons, stenosis of the hepatic artery anastomosis should be detected early, to prevent such complications. Some investigators advocate daily Doppler ultrasonography exams after liver transplantation, until the patient is discharged from the hospital. In cases with flow alteration, especially characterized by a resistance index lower than 0.5, computed angiotomography or arteriography is mandatory[10-12].

Transplant hepatic artery stenosis can be treated either by open repair or a endovascular method. Although no randomized studies have compared these methods, the current trend is to use first angioplasty, for it presents lower morbidity and mortality rates. Balloon angioplasty has a 93.3% success rate and a 6.7% immediate complication rate, with restenosis rates up to 33.3% within 2 years[8]. With stenting, single case reports have shown a patency rate above 75% in 20 months[10]. However, no consensus has been reached in the literature regarding primary stenting.

Hepatic artery thrombosis remains a therapeutic challenge, since it is the main cause of graft failure and retransplantation. In these cases, it is difficult to decide on whether to perform revascularization early on and retransplantation later (traditional method) *versus* endovascular treatment. Some studies have shown rethrombosis rate of 22% and implant patency rate of 65% in 6–18 months in patients submitted to surgical revascularization without retransplantation[4,10]. In cases where retransplantation is adopted, the mortality rate is close to 50%[4].

Over the past few years, endovascular treatment, including intra-arterial thrombolysis, percutaneous transluminal angioplasty and the use of stents has shown encouraging results (success rates above 75% in some treatment series), albeit controversial, due to the risk of bleeding[4,6,11]. Up to 2009, about 70 cases in 16 series had been published, with reported success rate of 68% after thrombolysis with subsequent angioplasty or 62% when stents were implanted in these patients[10-12]. The main complication was bleeding, with deaths resulting from intra-abdominal hemorrhage in 0.05% of the cases. On account of this reduced morbidity and mortality rates, when compared to conventional surgical treatment, there is a trend in the literature to indicate first the endovascular treatment in an attempt to salvage to the hepatic graft without resorting to retransplantation. The exceptions are cases of thrombolysis failure, procedural complications and hepatic dysfunction. In these situations, retransplantation should be the first option[11,12].

In the case reported, several attempts of hepatic artery revascularization were performed to salvage the graft. Balloon subintimal angioplasty, after thrombosis of the stent, was considered the last endovascular option before retransplantation. The patient's clinical improvement and hepatic artery patency without residual stenosis 90 days after the procedure was encouraging. However, a single report is not enough to predict long-term success and patency for this specific type of intervention.

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Data analysis and interpretation: FMO, GSM
Data collection: FMO, GSM
Writing: FMO
Critical analysis: FMO, GSM
Final approval*: FMO, GSM
Statistical analysis: N/A
Overall responsibility: FMO*
All authors have read and approved the final version submitted to J Vasc Bras.