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PROSPECTIVE STUDY

Splenic artery ligature associated with endoscopic banding for schistosomal portal hypertension

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Abstract

AIM: To propose a less invasive surgical treatment for schistosomal portal hypertension.

METHODS: Ten consecutive patients with hepatosplenic schistosomiasis and portal hypertension with a history of upper gastrointestinal hemorrhage from esophageal varices rupture were evaluated in this study. Patients were subjected to a small supraumbilical laparotomy with the ligature of the splenic artery and left gastric vein. During the procedure, direct portal vein pressure before and after the ligatures was measured. Upper gastrointestinal endoscopy was performed at the 30th postoperative day, when esophageal varices diameter were measured and band ligature performed. During follow-up, other endoscopic procedures were performed according to endoscopy findings.

RESULTS: There was no intra-operative mortality and all patients had confirmed histologic diagnoses of schistosomal portal hypertension. During the immediate postoperative period, two of the ten patients had complications, one characterized by a splenic infarction, and the other by an incision hematoma. Mean hospitalization time was 4.1 d (range: 2-7 d). Pre- and post-operative liver function tests did not show any significant changes. During endoscopy thirty days after surgery, a decrease in variceal diameters was observed in seven patients. During the follow-up period (57-72 mo), endoscopic therapy was performed and seven patients had their varices eradicated. Considering the late postoperative evaluation, nine patients had a decrease in variceal diameters. A mean of 3.9 endoscopic banding sessions were performed per patient. Two patients presented bleeding recurrence at the late postoperative period, which was controlled with endoscopic banding in one patient due to variceal rupture and presented as secondary to congestive gastropathy in the other patient. Both bleeding episodes were of minor degree with no hemodynamic consequences or need for blood transfusion.

CONCLUSION: Ligature of the splenic artery and left gastric vein with supraumbilical laparotomy is a promising and less invasive method for treating presinusoidal schistosomiasis portal hypertension.

Key words: Endoscopic banding; Esophageal varices; Portal hypertension; Schistosomiasis; Variceal bleeding

Core tip: In a recent study from our group assessing systemic and portal hemodynamic changes in schistosomal patients undergoing esophagogastric devascularization and splenectomy, we showed that the splenic artery ligature alone promotes correction of the systemic hyper-dynamic state and significantly decreases portal pressure. The objective of the present study was to propose a less invasive surgical treatment for portal hypertension in schistosomiasis, which consists of splenic

artery ligature, followed by endoscopic variceal treatment. This study showed that this new technique is a promising method in the treatment of presinusoidal portal hypertension due to its less invasive characteristic.

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INTRODUCTION

Portal hypertension is a pathologic increase in pressure in the portal venous system that leads to portosystemic collateral circulation. Moreover, portal hypertension is frequently associated with digestive hemorrhage due to the rupture of gastroesophageal varicose veins, independent of hepatocellular function. Portal vein pressure is directly related to intrahepatic vascular resistance and portal blood flow. In most patients, portal hypertension results from both increased intrahepatic resistance, due to the architectural distortion of liver parenchyma secondary to fibrosis, and to splanchnic hyperflow[1,2].

Schistosomiasis is an endemic disease in many countries and represents one of the main causes of portal hypertension worldwide. In the hepatosplenic subtype, the most severe form of the disease, liver fibrosis, hepatomegaly (mostly of the left lobe), presinusoidal portal hypertension, preserved hepatic function and substantial splenomegaly are observed[2-7]. Esophageal varices rupture and bleeding is the most feared complication of the disease, observed in up to 52% of the patients, with a mortality rate of 11.7% for the first episode[8-10].

Since upper gastrointestinal hemorrhage is the main cause of death in patients with portal hypertension and preserved liver function, surgical treatment is considered the best therapeutic alternative, mainly for those with hepatosplenic schistosomiasis[6,10-12]. However, there is no agreement on which surgical technique is the most appropriate: esophagogastric devascularization and splenectomy (EGDS) or distal splenorenal shunt? Distal splenorenal shunt had been employed for the treatment of presinusoidal portal hypertension, however, due to high rates of late postoperative portosystemic encephalopathy and long-term worsening of liver function, this procedure is less frequently used[13]. EGDS is the treatment of choice for the majority of cases, as it is a relatively simple technique with good results and no postoperative encephalopathy[11,14-16]. The disadvantage of EGDS is bleeding recurrence, observed in 6%-29% of the patients, and postoperative endoscopic therapy is therefore necessary[16,17].

In a recent study from our group, systemic and portal hemodynamic changes were assessed in schistosomal patients during EGDS and measurements were taken after every surgical step: ligature of splenic artery, splenectomy, and esophagogastric devascularization[18]. The hyperdynamic state, characterized by cardiac output increase and peripheral vascular resistance, which was observed preoperatively in all patients, returned to normal values after EGDS. The intraoperative hemodynamic monitoring showed that within all surgery steps, the splenic artery ligature alone promotes the correction of the hyperdynamic state, thus leading to the conclusion that the systemic hemodynamic changes were related to splenic hyperflow.

The objective of the present study was to propose a new, less invasive surgical treatment for presinusoidal portal hypertension in patients with schistosomiasis, supported by the knowledge of the physiopathology of the disease based on hemodynamic behavior. The technique involves ligature of the splenic artery followed by postoperative endoscopic treatment (variceal band ligature). This is a pilot study involving ten patients that were subjected to conventional surgery with intra-operative measurement of portal pressure and evaluation of long-term results before continuing with a minimally invasive laparoscopic approach.

MATERIALS AND METHODS

The study was approved by the University Hospital Ethics Committee and all patients provided written informed consent before the operation. Ten consecutive patients with hepatosplenic schistosomiasis and portal hypertension with a history of upper gastrointestinal hemorrhage from rupture of esophageal varices were evaluated. Exclusion criteria included other liver diseases, such as hepatitis caused by alcohol or virus, and patients with portal or mesenteric venous system thrombosis. After admission, patients underwent laboratory and liver function tests evaluation, chest X-ray (anterior-posterior and lateral view), abdominal ultrasound with portal system Doppler evaluation, and upper gastrointestinal endoscopy with esophageal varices diameter measurement.

All cases were discussed in a multidisciplinary meeting before surgery and were electively operated on at least 30 d after the bleeding episode. For the operation, patients received a small (10 cm) supraumbilical, midline incision, ligation of gastroepiploic vessels leading to the exposure of the retroperitoneum, followed by ligature of the splenic artery (as close as possible from celiac trunk) and the left gastric vein. At the beginning of the procedure, a small (6 Fr) catheter was inserted through a jejunal venous branch, locating its extremity inside the portal vein, allowing a direct portal vein pressure measurement before and after the ligature of the splenic artery. At the end of the procedure, the jejunal vein catheter was removed and the vein ligated. To confirm the etiology of liver disease, liver biopsy was performed with a Tru-Cut needle in all patients. An upper gastrointestinal endoscopy was performed on the 30th postoperative day, at which time the

diameters of esophageal varices were measured and band ligature was performed. Patients were followed at the Liver Surgery unit and at the Endoscopy clinics, where other endoscopic procedures were made according to endoscopy findings.

RESULTS

Of the ten patients included in our study, seven were male and three were female with a mean age of 41.9 years (range: 26-66 years). All patients had normal liver function and diagnosis of hypersplenism, characterized by low white blood cell and platelet counts, under 140000 and 4000, respectively. There was no intra-operative mortality and all patients had confirmed histologic diagnosis of schistosomal portal hypertension. During the immediate postoperative period, two patients (2/10; 20%) had complications; one patient had a splenic infarction, which was conservatively treated with painkillers and did not need re-operation, with rapid improvement, and the other patient had an incision hematoma, which was re-operated and drained on the second postoperative day. Both immediate postoperative complications were easy to solve and patients' evolution was uneventful. No complications related to the jejunal vein catheterization were observed. The mean hospitalization time was 4.1 d (range: 2-7 d), during which, none of the patients presented any change in liver function. On the other hand, an increase in platelet and white blood cell counts was observed in nine patients during the immediate postoperative period, and an improvement in the red blood cell count was observed in six patients.

Pre- and postoperative liver function tests did not show any significant changes. Concerning the hypersplenism, nine patients presented a transient increase of approximately 14.5% in leukocyte and platelet levels. However, low platelet and white blood cell counts persisted throughout the late postoperative period. Thirty days after surgery, we observed a decrease in varices diameter during endoscopy in seven patients.

The mean follow-up period was 67.2 mo (range: 57-72 mo). During follow-up, endoscopic therapy was performed and seven patients had their varices eradicated; varices recurrence was observed in four patients who then underwent endoscopic re-treatment. Considering the late postoperative evaluation, nine patients had a decrease in varices diameter. A mean of 3.9 endoscopic banding sessions were performed per patient. Two patients presented bleeding recurrence during the late postoperative period. However, bleeding was controlled with endoscopic banding in only one patient due to variceal rupture. The other patient presented with bleeding secondary to congestive gastropathy. Both bleeding episodes were of a minor degree with no hemodynamic consequences or need for blood transfusion.

DISCUSSION

It has been shown that surgical treatment is the best therapy for schistosomal patients with previous digestive hemorrhage due to esophageal varices rupture, though there is still no agreement on which is the best technique[6,11]. Distal splenorenal shunt and EGDS were the most commonly performed operations during the last 20 years, with arguments in favor of and significant postoperative complications for both[6,11]. Distal splenorenal shunts have excellent results considering hemorrhage relapse, with less than 5% bleeding recurrence[15,19-21], however, it can lead to postoperative portosystemic encephalopathy in 3.3%-14.8% of patients[15,16], and taking into account portal hypertension of schistosomal origin, where liver function is preserved and encephalopathy is not part of the disease clinical presentation, this procedure is not considered ideal. With this in mind, EGDS is the first choice due to its simplicity, good results, and lack of postoperative encephalopathy[11,14,15]. A disadvantage of this technique is bleeding recurrence, which can occur in 6%-29% of patients, making the association with postoperative endoscopic therapy necessary[22].

A previous study from our group showed that schistosomal patients subjected to EGDS present a hyperdynamic circulation characterized by cardiac output increase, low peripheral resistance and an increase in portal flow[18]. Hemodynamic measurements (portal and systemic) were taken after each step of the operation (splenic artery ligature, splenectomy, and esophagogastric devascularization), and it was shown that immediately after splenic artery ligature, the hyper-dynamic circulation normalized in all patients. Moreover, a 28% decrease in portal flow and a 30% decrease in portal pressure were also observed. No other surgical step changed the hemodynamic parameters, which remained stable after splenic artery ligation through the end of the procedure[18]. Therefore, it became clear that splenomegaly and splenic overflow are important factors in the generation of hyper-dynamic circulation in the hepatosplenic form of schistosomiasis. In addition, Sakai *et al*[22] showed that endoscopic sclerotherapy was more effective for schistosomal patients who had undergone EGDS compared to those without previous surgery, as varices have a smaller diameter, making the endoscopy easier and leading to significantly better results. The decrease in varices diameter may be related to portal pressure decrease after EGDS with consequent pressure decrease in esophageal vessels, as changes in portal pressure have a direct impact on esophageal varices[23]. Lacerda *et al*[24] measured the pressure in esophageal varices during splenectomy and left gastric vein ligature in schistosomal patients and found a 28.5% decrease in varices pressure after the procedure.

Based on the demonstration that splenic artery ligature alone leads to the normalization of cardiac output and peripheral vascular resistance and to a significant decrease in portal flow and pressure, and that splenectomy leads to a decrease in esophageal varices diameters, we proposed a new and less invasive treatment for patients with presinusoidal portal hypertension due to hepatosplenic schistosomiasis involving a simple splenic artery ligature with postoperative endoscopic treatment (esoph-

ageal variceal band ligature). Intraoperative mortality was not observed and the hospitalization period was short due to the low rate of complications. Spleen infarction was observed in one patient, possibly because the splenic artery ligation was performed in a distal portion of the artery due to technical issues.

We observed a decrease in the diameter of varices in 70% of the patients 30 d after surgery. During follow-up, seven patients had their varices eradicated, but four of them had recurrence. Ferraz *et al*[11] obtained esophageal varices eradication in 18.2% patients with the EGDS operation alone, and in 52.7% with postoperative endoscopic sclerotherapy. We have previously shown that endoscopic exams performed after EGDS with postoperative varices banding program, led to varices eradication in 85.7% of patients, though recurrence was observed in 56.6% of the cases[17]. In the last endoscopic evaluation, 90% of our patients had a decrease in varices diameter when compared with the preoperative period, which can be considered as an excellent result. Finally, two of our patients evolved with bleeding recurrence, but only one due to variceal rupture. In our experience, after long term follow-up, bleeding recurrence occurred in 24.7% of patients submitted to EGDS, half of which (14.6%) were due to varices rupture[17].

CONCLUSION

The present pilot study shows that this new surgical technique is a promising treatment for presinusoidal schistosomiasis portal hypertension due to its less invasive characteristic and low complication rate. Further studies will utilize a minimally invasive laparoscopic approach.

COMMENTS

Background

In a recent study from our group, systemic and portal hemodynamic changes were assessed in schistosomal patients at every step during esophagogastric devascularization and splenectomy. The intraoperative hemodynamic monitoring showed the splenic artery ligature alone promotes the correction of the hyper-dynamic state, indicating that the systemic hemodynamic changes were related to splenic hyperflow.

Research frontiers

This study proposes a new, less invasive surgical treatment for portal hypertension in patients with schistosomiasis, supported by the knowledge of the physiopathology of the disease based on hemodynamic behavior.

Innovations and breakthroughs

All patients were submitted to conventional surgery with intra-operative measurement of portal pressure with the ligature of the splenic artery and left gastric vein.

Applications

The new surgical technique is a promising treatment for presinusoidal schistosomiasis portal hypertension due to its less invasive characteristic and low complication rate. This initial series is a pilot study and the surgical procedures were made through a small laparotomy. Future studies will use a minimally invasive laparoscopic approach to this technique.

Terminology

Portal hypertension is the pathologic increase in pressure within the portal system, leading to portosystemic collateral circulation. It is frequently associated with digestive hemorrhage due to the rupture of gastroesophageal varicose veins, independent of hepatocellular function. Schistosomiasis is an endemic disease in many countries and represents one of the main causes of portal hypertension worldwide. Esophageal varices rupture and bleeding is the most feared complication of the disease.

Peer review

This article "Splenic artery ligature associated to endoscopic banding for schistosomal portal hypertension" is very interesting.

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