A modification to facilitate end-to-side portacaval anastomosis in rats: Description of a modified technique

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ABSTRACT

Objective: To describe a modified technique of end-to-side portacaval shunt in the rat in order to simplify this relevant microsurgical model of liver disease.

Method: A loop in the distal end of the suture makes it easier both, the beginning and the end, of the portacaval anastomoses.

Conclusion: This surgical innovation decreases the technical difficulty of the portacaval shunt in the rat without adding complications, like portal hypertension related to anastomoses stenosis or hemorrhage.

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1. Introduction

End-to-side portacaval anastomosis in the rat is a shunt procedure which has become increasingly widespread since it was first performed by Sun Lee in 1961. Its value mainly lies in the fact that it is an appropriate technique for microsurgical training and also in the utility of this experimental model in researching liver diseases and, particularly hepatic encephalopathy in the long-term.

For these reasons, simplified versions of this technique are of considerable interest. In the present work, we described a modification of end-to-side portacaval anastomosis in the rat, which fulfils this requirement.

2. Method

2.1. Description of the microsurgical technique of anastomosis

The portacaval shunt was performed in male Wistar rats from the Vivarium of Complutense University, with body weights ranging from 230 to 250 g. The experimental procedures employed in this study are in accordance with the European Guidelines for the Care and Use of Laboratory Animals (1986) published in Spain in the Royal Decree 1201/2005.

Animals were anaesthetized with ketamine hydrochloride (100 mg/kg) and xylazine (12 mg/kg) i.m. After a xyphopubic incision, dissection of the caval vein and portal vein was done as described by other authors. In brief, the intestines are retracted to the animal’s left, and covered with a saline wet gauze, to expose the inferior vena cava and the portal vein.

The dissection and vascular anastomoses were done by a microsurgical technique with the aid of an operative microscope (Zeiss; 12.5×). The inferior vena cava is dissected between the hepatic parenchyma and the right renal vein. The portal vein is freed from the proper hepatic artery. The gastroduodenal vein is sectioned between two ligatures (7/0).

The ends of the dissected segment of the infrahepatic inferior vena cava are clamped with microclips and an elliptical venotomy is performed on the anterior wall (3 × 2 mm). The
The portal vein is ligated at the liver hilum with a 7/0 silk and is clamped with a microclip at the confluence with the splenic vein. Then the portal vein is only partially sectioned obliquely just below the hilar ligature (Fig. 1). To perform the end-to-side portacaval shunt a 9–10/0 nylon is used and the complete intervention has already been described. We introduce now a modification technique in order to simplify the execution of the anastomosis. So, in the distal end of the thread a loop is constructed (Fig. 1a, b). The first suture of the vascular anastomosis passes through the narrow bridge of the still unsectioned portal wall from outside and the loop of the distal end of the suture remains attached to the portal vein. This first stitch passes through the caval vein proximal corner from inside (Fig. 1c). On completing the section of the portal vein, the loop is anchored in the cranial corner of the portal vascular hole, making it easier to bring the anastomosed vessels together. The suture of the posterior wall is performed from inside of the anastomosis in a continuous way (Fig. 1d). The suture is brought out at the lower corner and then the anterior row is completed from outside. When it reaches the end corner the loop is untied by pulling on the end and the suture is tied to it (Fig. 1e). Finally, the caval and portal clamps are released and it is verified that the shunt is permeable and water-tight. The abdomen is closed into two layers, muscle and skin, using the continuous running technique, with 3/0 an absorbable suture (polyglucolic acid) and silk.

3. Conclusion

With this modified technique, upper and lower sutures are not required before starting the portacaval anastomosis, making the technique easier to perform and reducing the time of portal hypertension, which is a critical factor for this intervention, without adding complications, like portal hypertension related to anastomoses stenosis, haemorrhaging and without increasing mortality.

Conflict of interest

The authors have no conflict of interest.

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Ethical approval

The experiment procedures employed in this study are in accordance with the European Guidelines for the Care and Use for Laboratory Animals (1986) published in Spain in the Royal Decree 1201/2005. It was approved by the Ethical Committee of The Complutense University of Madrid, Spain.

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