DENEYSEL ÇALIŞMA

A SIMPLE METHOD FOR CANNULATING THE PORTAL VEIN IN HEPATIC INFLOW OCCLUDED RATS

HEPATİK İNFLOWU OKLÜZE FARELERİN PORTAL VEN KANÜLASYONUNDA BASİT BİR METOD:

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SUMMARY

A simple and safe technique for cannulating the portal vein through the anterior mesenteric vein in the rat is described. The present technique is used in combination with cannulation of the superior vena cava via a jugular vein. Simultaneous, repeated blood sampling from the cannulas was successfully carried out at fixed intervals for 2hrs. The system and the sampling were well tolerated by the rats. (Key words: Portal vein, cannulation,rat.)

ÖZET:

Farelerde V. Mesenterica anterior aracılığı ile portal ven kanülasyonu için basit ve emniyeti bir teknik tanımlan-maktadır. Sunulan teknik Jugular ven aracılığı ile V.kava superior kanülasyonu ile birlikte uygulanır. Her iki kanülden 2 saat ara ile kan nümunesi alınabilmiştir. Sistem ve nümune alma işlemi farelerce iyi tolere edilmiştir.

Hepatic inflow occlusion is usually used in major liver resection or liver transplantation, but, in these cases, if occlusion is prolonged, it occasionally causes deterioration of the general circulation and reperfusion is sometimes followed by a state of irreversible shock (1). In addition, in studies of liver transplantation in rats, the occlusion of portal inflow for periods in excess of 30 minutes results in almost universal mortality irrespective of the viability of the graft (2). The hepatic inflow occlusion model in rats is usually used to investigate the etiology of this phenomenon however, it is important to determine the change in the nature of the blood in the general circulation but also portal circulation. In the paper we describe a simple technique for cannulating the portal vein via the anterior mesenteric vein in rats.

Many studies for cannulating the portal vein have been reported (3,4,5,6,7,8), such as the direct introduction of a cannula into the portal trunk by puncturing (3,4,5,6), the catheterization through the left hepatic branch of the portal vein (7) and catheterization through the mesenteric vein into the portal trunk (8).

In experiments on hepatic inflow occlu-

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sion in rats, the catheter and the portal trunk must not be injured by manipulation during the operation. To avoid injury to the portal trunk by the surgical procedure the selection of the route for cannulation is important. For this purpose cannulation from a mesenteric vein prefeable and we designed a new technique for cannulating the portal vein in rats.

METERIALS AND METHODS

Construction of the portal vein cannula

The portal vein cannula is a 7 cm length of polyethylene tubing (İnner diameter 0.28 mm, Outer diameter o.61 mm, Intermedic PE-10) and it was inserted into a 15 cm length of the silicone tubing (O.D. 1.0 mm, I.D. 0.5 mm). The tip of the polyethylene tubing was tied to the silicone tubing with a 4-0 silk ligature. The end of the polyethylene tubing should be leveled but not beveled. The silicone tubing was connected to a 1 ml tuberculin syringe (Fig.1).

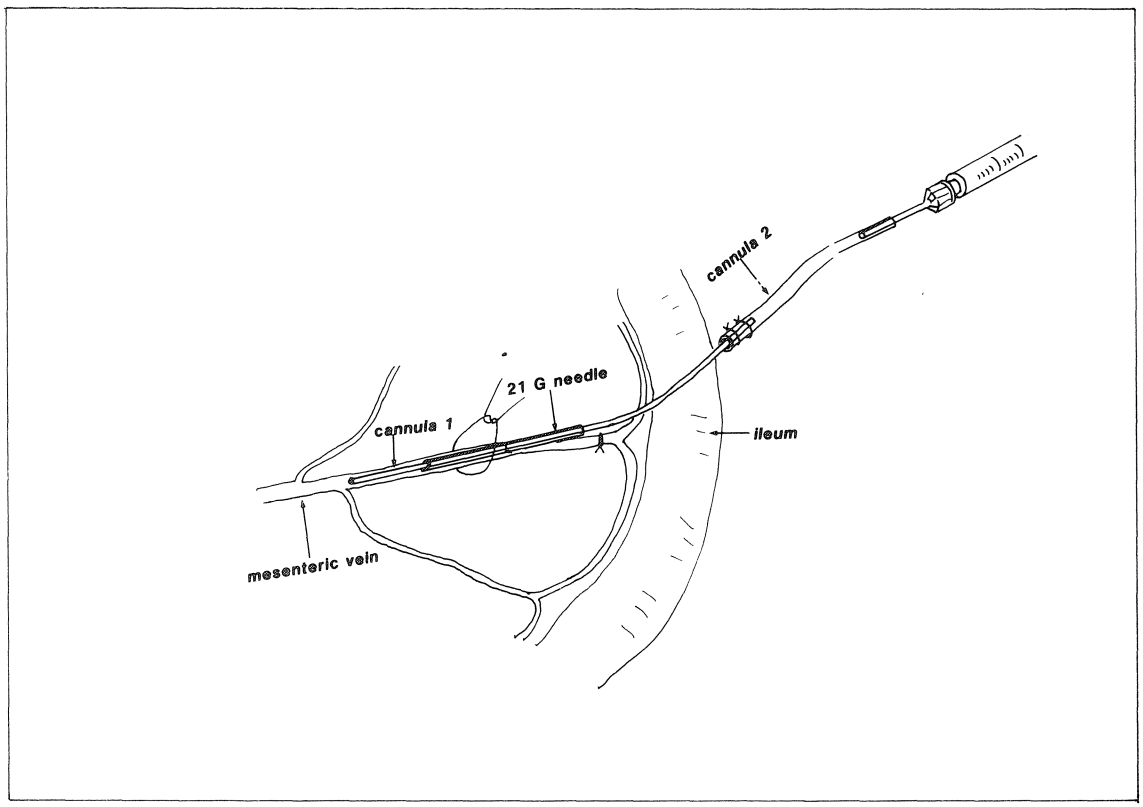

Fig. 1 Detail of the portal cannula showing the leveled tip of cannula 1 which is connected to cannula 2. Cannula 1: polyethylene tubing, Cannula 2: silicone tubing.

Diagram of the anatomy of the mesenteric vein and technique for insertion of the polyethylene cannula into the mesenteric vein through a 21 G needle

Surgical procedure

Male Wistar strain rats weighig 300-350 g were enesthetized with sodium pentobarbital (50 mg/kg, Body weight, intrapeintoneally). Median laparotomy was performed from the mid-abdomen to the xiphoid process. The small intestine was pulled out and spread on sterile saline soaked gauze which covered the lower abdomen of the rat. All exposed viscera were kept covered with sterile saline soaked gauze.

A small anterior mesenteric vein near the mesenteric edge of the ileum end was selected for cannulation. The selected vein was carefully separated from its accompaning mesenteric artery. The distal end of the vein was then ligated with 5-0 silk. A large, untied ligature (5-0) was then placed under the proximal end of the cleared portion of the vein.

The mesenteric vein was then pierced with a 21 G needle which was cut down to 2 cm in length and then the cannula was introduced through the 21 G needle into the anterior mesenteric vein and drawn toward the portal vein. The presence of the cannula in the portal vein was confirmed by flatting the vein with a blunt instrument. After ligating the proximal site of the anterior mesenteric vein to secure the cannula, the 21 G needle was extracted. The cannula was flushed with a very small amount of heparinized saline and blood samples were taken at fixed intervals (Fig. 2).

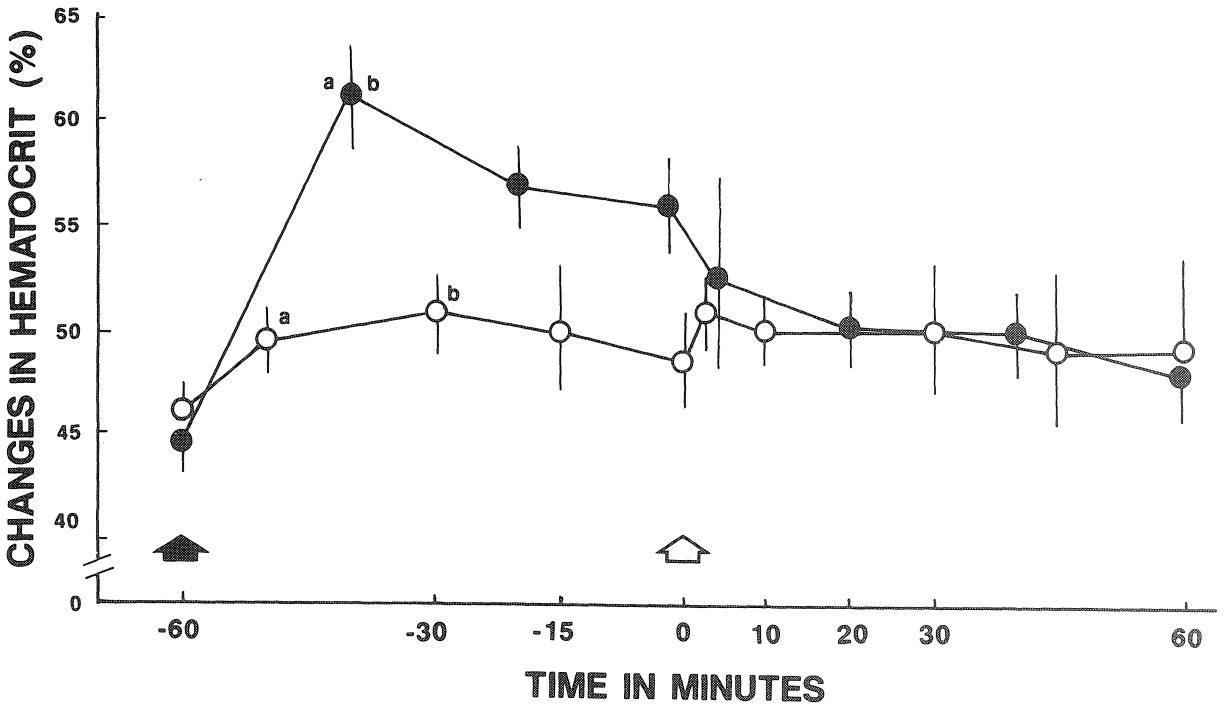

Fig. 2 The changes in the hematocrit values in the general circulation and the portal blood.

●—● :portal blood. o—o : general blood

:hepatic inflow occlusion

:hepatic inflow reperfusion

a: P<0.001, b: P<0.01. Significant differences were seen between the hematocrit values for the portal blood and general circulation.

A jugular vein cannula was interested into the right jugular vein toward the superior vena cava to take blood samples from the general circulation.

Hepatic inflow occlusion was performed by Pringle's method (9). The stomach and duodenum were reflected down and covered in saline soaked gauze. The small omentum was cut and the caudate lobes were gently reflected to the left side and the portal triad was exposed. Then a curved tweezer was slipped under the freed portion of the portal triad and 2-0 silk was pulled out through the dorsal side of the portal triad. The two 2-0 silk which was turned back was inserted into a 3 degree gum catheter (Outer, Diameter 3mm, Inner Diameter 2 mm) and then the catheter was pulled down to wring the portal triad for hepatic inflow occlusion.

All laboratory animals were treated according to the National Institule of Health guidelines for the use of experimental animals.

DISCUSSION

Our method for cannulating the portal vein is simple and safe, and the cannulating site is not injured by the manipulation of hepatic inflow occlusion. Cannulation of the portal vein of rats has been accomplished by a variety of methods (3,4,5,6,7,8). Direct puncture of the portal vein wall (3,4,5,6) greatly increases the possibility of injury where the portal trunk is punctured in the operative procedure. In our method, since the distal enterior mesenteric vein is used for the first puncture site, if cannulation is unsuccessful, another mesenteric vein can be used. However, care is required when the cannula is inserted into the 21 G needle end. The needle should be gently manipulated in order not to puncture the mesenteric vein wall. The fine, flexible, level tipped PE tubing reduces the possibility of puncturing the mesenteric vein wall when the cannula is drawn toward the portal trunk. Our method is somewhat similar to Sloop and Krause's method (8). However, their method requires a specially constructed portal vein cannula. As sloop indicated, the cannulation of a very small mesenteric vein minimizes the effects of venous obstruction.

Fig. 2 shows the changes in hematocrit values in the general circulation and portal blood. 60 min hepatic inflow occlusion caused an increase in hematocrit in the general circulation and after the reperfusion it further increased and then gradually decreased, but it did not recover to the normal control value. In the portal blood a remarkable increase in hematocrit was observed and the increased value was maintained during the occlusion. After the reperfusion it decreased gradually for 60 min. The hematocrit value in portal blood became significantly higher than in the general circulation. This suggests that remarkable extravasation of plasma into the intestine wall is easily produced by hepatic inflow occlusion.

The technique described in the paper can also be used for portal blood sampling in unrestrained rats.

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