

Diagnostic Radiology

Research Activities

Evaluation of the effect of total isolated liver perfusion on hepatic circulation and the feasibility of a percutaneous approach in a pig model.

In ten pigs undergoing total isolated liver perfusion (Fig. 1), the unilateral common femoral artery, bilateral common femoral veins and right jugular vein were exposed through a cut-down incision, and sheaths (8 Fr., 12 Fr., 9 Fr. and 9 Fr. each) were inserted into each. Catheters were placed in the proper hepatic artery and the inferior vena cava (IVC). The portal vein branch was punctured with a PTCO needle under X-ray guidance, and a 12 Fr. sheath was inserted. Balloon catheters, that we had developed in-house, were then inserted into the portal vein trunk. They had specially designed side arms to allow a high flow and to keep the pressure in the pump-system low during withdrawal and return of the blood through the catheter. After systemic heparinization (120 U/kg), the balloons were used to occlude the proper hepatic vein and the portal vein trunk. We used two methods to occlude the hepatic vein. The first was balloons inflated in the infrahepatic and suprahepatic IVC. The second was an expandable metallic stent covered with a synthetic vascular prosthesis (covered EMS) in the IVC.

In first method, to maintain blood pressure, blood was withdrawn from the infrahepatic IVC with one rotary pump and returned to the jugular vein through the sheath using another rotary pump. Blood was withdrawn from the superior mesenteric vein and returned to the jugular vein through the sheath employing a rotary pump.

In both methods, blood was withdrawn from the portal vein using one rotary pump (60 ml/min) and returned to the proper hepatic artery (60 ml/min)

with contrast medium through the balloon catheter via another rotary pump. Perfusion was carried out for 30 min.

The 7 pigs investigated using the first balloon catheter method showed hemodynamic instability, making it impossible to assess the effect of the new isolated liver perfusion system. The remaining 3 pigs, investigated using the second method of the covered EMS, were hemodynamically stable. During complete occlusion of the hepatic veins, contrast medium was seen to drain in a reverse direction into the portal vein in all 3 pigs. Collateral vessels could not be seen.

Total isolated perfusion accomplished by occlusion of the IVC and the portal vein in combination with aspiration applied in the portal circulation results in rapid and extensive arteriportal shunting without visualization of collateral vessels. This percutaneous approach is technically feasible, but its hemodynamic safety must be evaluated before clinical application is attempted.

● M. Satake ●