

ABSTRACT

Introduction:

Due to increased demand for living liver donation and constant improvements in surgical methods, determination of the minimal liver mass compatible with survival is necessary for clinical as well as experimental liver surgery. A 10% remnant liver after extended hepatectomy in a rat was considered non-compatible with survival.

Detailed 3-D visualization of the vascular supply and drainage of rat livers served as a basis for the development of a new surgical technique.

Materials and Methods:

Rat liver plastinates and vascular corrosion casts were used for visualization of the rat lobar and vascular anatomy. As a result of this detailed anatomical study, the new surgical technique consisting of a delicate stepwise piercing of the liver parenchyma at the bases of median and right superior lobes was introduced. Achieving plain cutting surface of liver lobe pedicle while skipping a Pringle maneuver or ligation of the portal vein and hepatic artery prior to resection represented key points in this "parenchyma preserving" approach.

Results:

The paracaval liver was identified as a separate "liver lobe" with its own multiple portal blood supply and hepatic drainage contributing to about 4% of the total liver mass. Damage of the remnant liver was clearly dependent on the surgical approach. Mass ligation procedures caused severe damage to the remnant liver, whereas the newly developed technique was preserving the remnant liver parenchyma. Timely initiation of regeneration was related to the extent of morphological damage in the small remnant liver, which was dependent on technique used. All animals subjected to 90% PH survived. Extending liver resections to 95% led to a survival rate of 66%. Further reduction of liver mass up to 97% resulted in death of all animals.

Conclusion:

Newly optimized "vessel oriented" surgical technique was beneficial compared to widely used "classical" methods in terms of survival and early initiation of liver regeneration after subtotal hepatectomy.