

# PATTERNS OF TRIBUTARIES OF MAJOR HEPATIC VEINS BY DISSECTION AND RADIOLOGY

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## SUMMARY

Intrahepatic venous patterns are important in planning and conducting liver resections and surgical transplantation procedures. We studied the intrahepatic venous patterns in 60 cadaveric liver specimens, using dissection and radiology. The middle hepatic vein was formed by two or less tributaries in most (80%) livers. The right and middle hepatic vein fused to form a common trunk in four livers while most of the left hepatic veins were formed by < 3 tributaries. Knowledge of these anatomical variations of vascular patterns serves as a road map before surgery.

**Key words-** Hepatic veins, tributaries.

## INTRODUCTION

Liver resection surgery, associated with significant perioperative mortality and morbidity, is technically challenging (Korea, 2005). The anatomical knowledge of the large intrahepatic veins is key in preoperative evaluation of hepatic tumors and in performing liver resection and transplantation procedures (Soyer et al., 1995). The intrahepatic anatomy is best studied by specially prepared dissections that show the vascular structures, with their interrelationships, and the routes of access to these vessels (Ger, 1988). Armed with the knowledge of anatomic variations in liver vasculature, the surgeon may then reduce the risk of complications including fatal bleeding. Knowledge of the exact course, length and tributaries of the hepatic veins is lacking. Therefore, this study was undertaken to clearly elucidate the anatomy of hepatic veins.

## MATERIALS AND METHODS

Liver specimens from 60 adult male cadavers of North Indian decent were studied. The cirrhotic livers and livers with tumors or other pathologies

were excluded from the study. The abdomen was opened and the liver retrieved by ligating inferior vena cava at the hepatic end. Hepatic veins were cleaned and thoroughly washed by water, followed by normal saline. Suction machine was used to remove any remaining clots. The liver was placed in the anatomical position by passing the inferior vena cava through a long, tapering stick on a wooden stand so as to avoid casting any shadows in the radiographs (Fig 1).

A freshly prepared emulsion of 125gm of barium sulphate mixed in 180ml of water was used as a contrast and injected in the hepatic veins via syringe. After that livers were kept on the stand, for about 20 minutes, to allow the contrast to settle (Fig 2). X-rays were taken in different views. The hepatic veins in radiograph, were traced on the tracing paper studied. Livers were washed thoroughly and dissected under bright illumination (Fig. 3). From the cephalic end, 2.5cm of the hepatic veins were studied both by radiology and dissection (Figs. 3, 4).

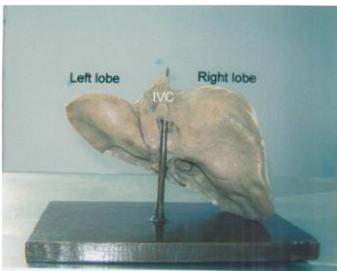


Figure 1. The liver mounted on wooden stand.

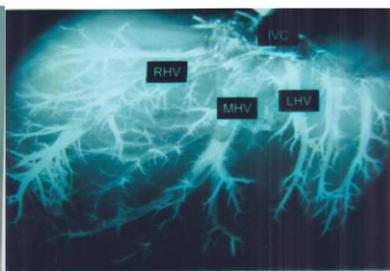


Figure 2. X-ray of liver showing the pattern of the major veins

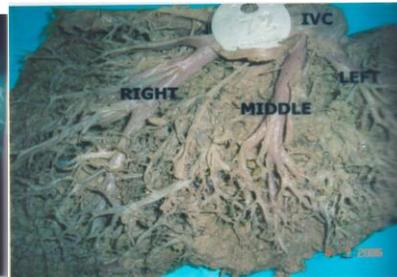


Figure 3. Piecemeal dissection of liver under bright illumination

## RESULTS

All major hepatic veins in the 60 livers emerged independently and drained into the IVC. The tributaries of the right hepatic veins ranged between 0 to 5 in number. Majority (80%) of the middle hepatic veins were formed by two or less tributaries. The right and middle hepatic vein fused

to form a common trunk in 4 livers (Fig. 5). The left hepatic vein showed variations in number of tributaries, ranging from 0 to 5 with majority showing less than 3 tributaries. Radiologically, the numbers of tributaries found were less than those during dissection.

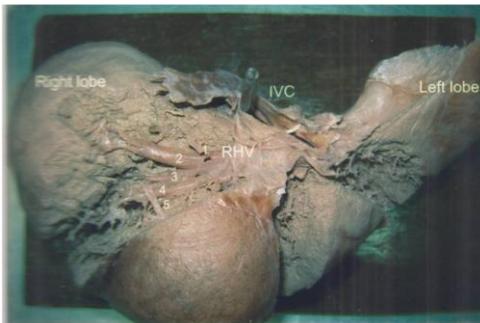


Figure 4. Tributaries of right hepatic vein.



Figure 5. Formation of common trunk by right hepatic vein and middle hepatic vein. The right and middle hepatic vein fused to form a common trunk in 4 livers.

## DISCUSSION

This study has demonstrated observations comparable to previous accounts (Hardy, 1972). Radiologically, the numbers of tributaries found were less than those during dissection. This could be probably due to incomplete infiltration of barium sulphate into minor veins.

The number of tributaries of the middle hepatic veins is in accordance with earlier reports (Hardy, 1972; Nakamura and Tsuzuki, 1981; Wind et al.,

1999; Ortale et al., 2003). The proportion of livers with two or more tributaries is however higher in the present study possibly due to the smaller sample size. The maximum number of tributaries of left hepatic veins mentioned in earlier reports was three (Honda et al., 1991; Wind et al., 1999; Ortale et al., 2003). Awareness of the individual anatomic variants seen in the liver vasculature enables the surgeon to plan the extent or type of procedure to be performed and reduce the risk of

surgical complications. The variations shown should remind liver surgeons of the venous landmarks

important for safety at resections.

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