INTRODUCTION
Hepatic veins are the veins that drain deoxygenated blood from the liver into the inferior vena cava (IVC) via the hepatic veins. Usually a total of three hepatic veins leave the liver though numerical variations is not uncommon. Sometimes there is a single right hepatic vein while left and intermediate hepatic veins join to form a common trunk. Liver resection surgery, associated with significant perioperative mortality and morbidity, is technically challenging. Recent advances in resectional therapy of hepatic neoplasm, in portal systemic shunt surgery, angiography and angiotherapy of splanchnic arterial and venous systems, demand detailed knowledge of the vascular anatomy of the liver.

Knowledge of the surgical anatomy of the hepatic veins and inferior vena cava is indispensable for extensive hepatectomy, transplantation of the liver and the treatment of hepatic trauma with avulsion of the hepatic veins. A total of 60 cadaveric livers, used were included in the present study. Common trunk formed by union of left and middle hepatic veins was found in 7/60 (11.6%) specimens. Common trunk formed by union of left hepatic vein and right and left radicals of middle hepatic veins was found in 7/60 (11.6%). In 25/60 (41.6%) specimens there was separate opening for left, middle and right hepatic veins. The average diameter of ostium and new ostium of the common trunk was 13.52±3.50 and 16.35±3.30 (mean±SD) respectively. The average length of the common trunk was found to be 6.49±2.70 (mean±SD). The average diameter of right hepatic vein, middle hepatic vein and left hepatic vein was 10.98±2.60, 8.82±2.54 and 8.20±1.87 (mean±SD). Preoperative delineation of this complex venous anatomy is very important. It provides vital information in the preoperative evaluation needed before performing a liver surgery.

RESULTS
Table-1: Pattern of drainage of three major hepatic veins into the inferior vena cava

MATERIALS AND METHODS
Study Site- NMCH Patna. A total of 60 cadaveric livers (fixed by the 10% formalin) used for dissections for undergraduate teaching were included in the present study. The livers which were free of pathological conditions macroscopically were included. Livers along with hepatic segment of inferior vena cava were removed from cadavers by cutting all of the peritoneal attachments of the liver and the structures at the porta hepatis. In present study, the method of manual dissection was used for tracing the vascular structures. The structures were thus seen as they would have been visualized during an actual operative procedure. The plane forces were used to tease away the liver parenchyma and to expose the vessels.

The liver was dissected along the plane of the three major hepatic veins and these veins were exposed. These vessels were traced from their confluence into the inferior vena cava. The pattern of drainage of three major hepatic veins and their radicals were looked for. Presence or absence of the common trunk was observed. If present (Fig. 1, 2, 3), circumference of the ostium common trunk was measured near the site of its attachment with inferior vena cava. Circumference of new ostium of the common trunk was measured near its formation. Its length i.e., the distance from new ostium up to its attachment with the inferior vena cava, was measured. The circumference of the right, middle and left hepatic vein was measured. Diameter of these vessels was derived from circumference with the formula 2πr. Percentage, mean, standard deviation, and range of the observed values were derived.
DISCUSSION

The anatomical knowledge of the large intrahepatic veins is the key in preoperative evaluation of hepatic tumors and in performing liver resection and transplantation procedures. Soyer et al. reported that hepatic veins carry the venous blood of the liver and the venous blood that comes with the portal vein to the IVC. Usually numbering three (right, left and intermediate (middle) hepatic veins), hepatic veins open into the IVC, which travels in the groove for vena cava on the posterior surface of the liver, beneath the diaphragm.

The three cranial hepatic veins drain independently into inferior vena cava or they join and form common trunk as they approach inferior vena cava. In present study, the common trunk formed by joining of left and middle hepatic veins (Fig. 2) and common trunk formed by union of left hepatic vein and right and left radicals of middle hepatic veins, separate opening for the right hepatic vein (Fig. 3) was found in 28/60 (46.66%) and 7/60 (11.66%) respectively.

In present study the diameter of the ostium, new ostium and length of the common trunk were found to be 13.52±3.50 mm, 16.35±3.30 mm and 6.49±2.70 mm respectively. Wind et al. reported the length of diameter, new ostium, new ostium and length of the common trunk was 13.6±1.9 mm, 23.8±2.3 mm and 3 to 17 mm respectively.

The length of the common trunk was similar to the values reported by Ortale JR et al. (7.1±2.8 mm). Nakamura S and Tsuzuki reported the length of the common trunk to be 1.0±0.5cm. Adson and Goldsmith and Hodson reported 2 cm and 1 cm respectively. Baird and Britton reported that the length varied from 0.2 to 2.2 cm. Honda et al. considered 10 mm to be a sufficient length of the common trunk formed by joining of the middle and left hepatic veins for safe division of the left hepatic vein.

Cheng YF1 et al. (1996) fond the distance from the IVC to the confluence of the MHV and LHV ranged from 0 cm to 3.5 cm with an average of 1.5 cm in those cases whose MHV and LHV presented as common trunks.

The common trunk was present in the majority of the cases and the creation of a new ostium by section of middle and left hepatic veins proximal to their junction made it possible to obtain diameter close to that of inferior vena cava at its diaphragmatic passage. Thus it is possible to construct the anastomosis between the cranial extremity of the inferior vena cava of the graft and the common trunk formed by joining left and middle hepatic veins of the receiver in liver transplantation in the adult.

The minimization of blood loss is the main objective during hepatic resection to minimize perioperative mortality and morbidity. Selective clamping of the hepatic veins, combined with pedicle clamping, may make it possible to spare the non-resected territories from ischemia. These clamping procedures are particularly useful in the treatment of hepatic metastases of colorectal cancers, because preoperative chemotherapy may temporarily alter the hepatic parenchyma, increasing its susceptibility to ischemia. During left lobectomy or left hepatectomy, extraparenchymatous control of the left and median hepatic veins (the LHV and MHV, respectively) and of the common trunk (CT) requires exact knowledge of this anatomical region.

The average diameter of the middle (intermediate) hepatic and left hepatic veins was found to be 8.82±2.54 mm and 8.20±1.87 mm respectively. These values were similar to 8.7±1.8 mm and 8.6±2.0 mm, reported by Wind et al. but less than the 10.0±2.5 mm and 10.7±2.4 mm, respectively reported by Ortale JR et al. In our study the diameter of the right hepatic vein was found to be 10.98±2.60 mm. Nakamura S and Tsuzuki reported that the internal diameter of the right hepatic vein ranged from 1.0 to 2.5 cm, 1.7±0.5 cm (mean±SD). In study by Peschaud F1 et al. biometric analyses were carried out on
CONCLUSION

To conclude, results of the present study demonstrate the details about the morphology and biometric parameters of hepatic veins. The findings of the present study would be helpful in understanding more about venous drainage of the liver, as well as guide the surgeons for performing complicated surgeries such as liver transplantation and resections.

REFERENCES

2. Evcil EH, Malas MA, Desdicioğlu K. Review of 13 fetal cases with hepatic veins opening variously into the inferior vena cava within the diaphragm. Anatomy 2009; 3: 29-34.