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Original Research Article

A prospective observational study of branching pattern of middle hepatic vein on contrast enhanced computed tomography

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ABSTRACT

Background: The main purpose of pre-operative imaging in liver transplantation is to expose the arterial and venous vascular map. Prior to transplantation it is necessary to image the vascular structures property due to complex nature of liver vascular anatomy and its frequent variations. CT is a useful method not only in the determination of hepatic arterial anatomy, hepatic venous anatomy, accessory hepatic veins and portal veins variations.
Methods: This was a prospective observational study performed at the department of surgery, Gandhi Medical College Bhopal and study of CECT was carried out in the department of radiodiagnosis with approval from college ethical committee on 100 patients during a period of 2 years from 2017 to 2019.
Results: In study of 100 cases were studied. The study mainly done on the MHV mainly its length, width draining segments of liver by MHV and accessory hepatic veins. In overall cases maximum cases had drainage from segment IVb, V and segment VIII. The segment 5 accessory vein is the most common single accessory vein found in the study.
Conclusions: Many parameters of MHV have studied in the study and understanding of these parameters is undoubtedly important for operating surgeon its anatomical draining patterns, draining liver segments and has got the presence of the various accessory veins in the liver. Recognition of these accessory hepatic veins is important because some of these accessory veins may become useful in segmental liver transplantation.

Keywords: Accessory hepatic veins, Liver transplantation, MHV

INTRODUCTION

One of the most important problems experienced in liver transplantation is rapid increase in the difference between the number of patients in need for liver transplantation and the number of available cadaver livers. For that reason, liver transplantation from a living donor has been introduced as an alternative to liver transplantation from cadavers.[1-3]

The main purpose of pre-operative imaging in liver transplantation is to expose the arterial and venous vascular map. Prior to transplantation it is necessary to image the vascular structures property due to complex nature of liver vascular anatomy and its frequent variations. CT is a useful method not only in the determination of hepatic arterial anatomy, the hepatic venous anatomy, accessory hepatic veins and portal veins variations, but also in the evaluation of the bile ducts, liver volume and steatosis in the potential liver donor.[4-6]

In transplantation surgery, it is necessary to know the vascular architecture of the donor and the recipient which will help in the right surgical option and in preventing post-operative complications. Recent development in the techniques have enabled visualization of the intra-hepatic structures in contrast CT from any angle preoperatively. This precise visualization of the hepatic vascular

territories has provided new insights into the surgical anatomy of the liver. This preoperative liver analysis is widely used component of preoperative workup for liver resection and transplantation.[8,9]

Objective of the study was to find out different liver segments which is predominantly drained by middle hepatic vein in CECT abdomen to improve the surgical knowledge of the surgeon pre-operatively for the planning of segmental liver transplantation.

METHODS

This was an observational study done in the department of surgery Gandhi medical college Bhopal on 100 individuals from 2017 to 2019 with focus on the vascular anatomy of liver was carried out on the department of Radio-diagnosis after taking permission from Ethical committee.

We studied 100 spiral CT scans of liver which were taken on a brilliance 64 slices spiral CT after intravenous administration of 100ml of non-ionic contrast agent iohexol at a flow rate of 5 ml/sec. we used the software, installed in the computer for the measurements. We studied the CT scans in axial, coronal planes. The long axis and short axis of hepatic veins, for maximum visualization and then the measurements were made. We took an average of 3 readings to minimize the errors, and got them confirmed by a radiologist.

Inclusion criteria

Patients above 12 years of age and patient below the 70 years of age undergoing CECT abdomen and patients having normal liver architecture and having no vascular abnormalities.

Exclusion criteria

Patients less than 12 years of age and above the 70 years of age; all those who have architectural damage to liver and its vasculature and patients having liver pathology like cirrhosis, alcoholic liver disease, Budd Chiari syndrome etc.

RESULTS

In Table 1 we divided the MHV on the basis of its arising branch from MHV we had divided it into early, mid and late branching. We got maximum cases in the mid branching accounting to 43% of total then late branching accounting to 38% of total cases.

In Table 2 the drainage pattern of middle hepatic vein into IVC had common trunk of MHV with RHV and LHV together in only 6% of cases, common trunk between MHV and LHV had maximum number of cases accounting to 75% of total cases. Common trunk between MHV and RHV had only 15% of cases.

Table 1: Types of bifurcation of middle hepatic vein.

Types of bifurcation of middle hepatic vein	No. of cases (out of 100)	Percentage
Early	19	19
Mid	43	43
Late	38	38

Table 2: Draining liver segments by middle hepatic vein.

Liver segments	Number of cases out of 100	Percentage
IVa	51	51
Ivb	90	90
V	84	84
VIII	77	77

Table 3: Draining pattern of middle hepatic vein.

Trunk formation of MHV with other hepatic veins	Number of cases out of 100	Percentage
Common trunk formation of MHV with RHV and LHV	6	6
Common trunk formation of MHV with RHV	15	15
Common trunk formation of MHV with LHV	75	75
All separate draining pattern of hepatic veins	04	04

In this table maximum cases had segment IVb in 90% of total cases, then segment V accounting in 84% of cases then segment VIII in 77% cases. In overall cases in our study maximum cases had drainage from segment IVb, V and segment VIII.

Table 4: Presence of the accessory hepatic veins.

Types of accessory hepatic veins	No. of cases out of 100	Percentage
Accessory inferior RHV	9	9
Accessory vein to segment 8	15	15
Accessory vein to segment 5	23	23
Combination of both segment 8 and segment 5	10	10
Combination of all accessory vein (accessory IRHV, segment 8, segment 5)	32	32
Absent of accessory vein	11	11
Grand total	100	100

In Table 4 the presence of the accessory veins in 89 % cases there are various types of accessory veins, single accessory vein that is segment 5 accessory vein was found in 23% of cases then segment 8 accessory vein in 15% cases followed by anterior inferior RHV in 9% cases. And combination of all accessory veins was found in 32% of cases which was maximum.

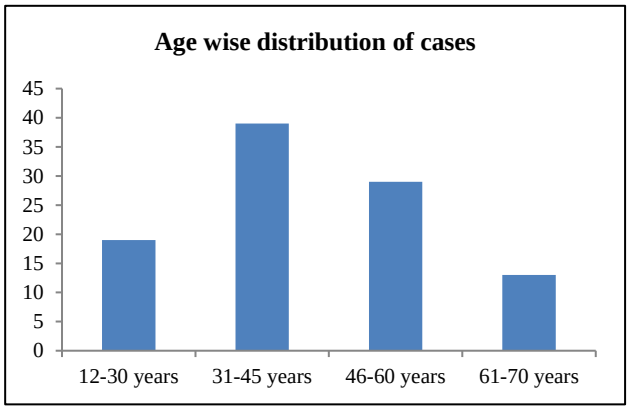

Figure 1: Bar diagram showing age wise distribution of cases.

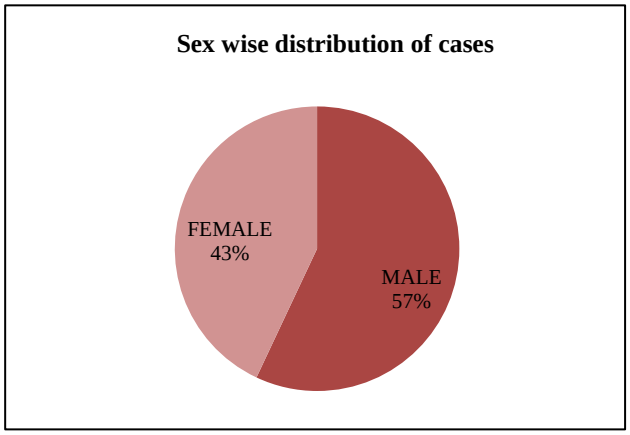

Figure 2: Pie diagram shows sex wise distribution of the cases.

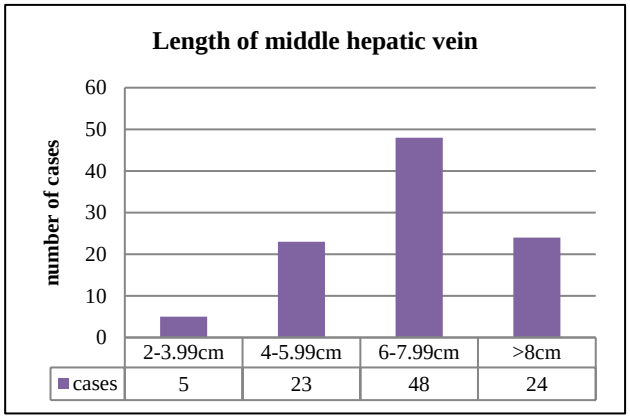

Figure 3: Bar diagram shows length of middle hepatic vein.

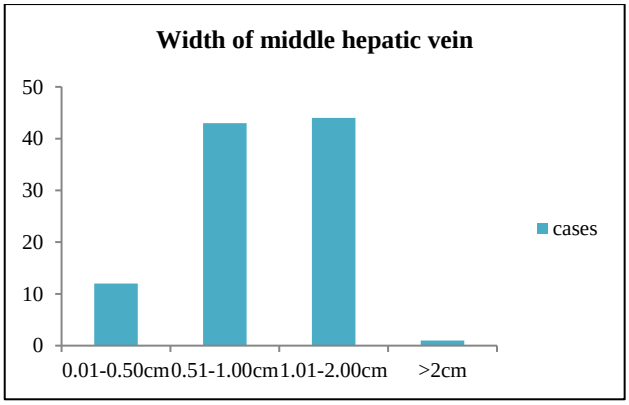

Figure 4: Shows width of the middle hepatic vein.

Figure 5: A CT image of 50 year male patient showing length and width of the middle hepatic vein.

DISCUSSION

In present study the type of bifurcation of middle hepatic vein into IVC had maximum cases of mid and late bifurcation accounting to 81% of total cases.

In present study maximum cases had segment IVa in 90% of total cases, Which was predominantly drain by MHV then segment V accounting in 84% of cases then segment VIII in 77% cases. In overall cases in this present study maximum cases had drainage from segment IVb, V and segment VIII.

In present study the drainage pattern of middle hepatic vein into IVC had common trunk of MHV with RHV and LHV together in only 6% of cases, common trunk between MHV and LHV had maximum number of cases accounting to 75% of total cases. Common trunk between MHV and RHV had only 15% of cases. And in only 4% of cases the pattern of drainage of hepatic veins into IVC drained separately.

In this present study the presence of the accessory veins in 89% cases there are various types of accessory veins, single accessory vein that is segment 5 accessory vein was found in 23% of cases then single segment 8

accessory vein in 15% cases followed by anterior inferior RHV in 9% cases. And combination of all accessory veins was found in 32% of cases which was maximum. There were other types of accessory veins also present.

Table 5: Comparison of the length of MHV.

Study	Length of MHV
Bhingardeo et al[10]	Mean length of MHV was 12.26 cm
Present study	Mean length 6.92 cm

CONCLUSION

Thus there was various parameters of MHV seen in the liver, and presence of the accessory hepatic veins in our study, and these parameters observed could definitely be useful to hepatobiliary surgeon and radiologists. It further reinforce our knowledge as well as the literature available on the topic suggesting that various parameters of MHV, its anatomical draining patterns, draining liver segments and has got the presence of the various accessory veins in the liver. Our study has great significance in radiological and surgical aspects. It also has a very good future prospect. This study can be continued in the different regions of the world and data can be compared to know the variations present in their local population to be helpful to the surgeons and radiologist.

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Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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