Branching Pattern of Portal Vein in Pig Liver

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ABSTRACT

The study was conducted on three pig livers collected from local slaughter house. Normal saline was injected to flush the portal vein. For cast preparation, 10 g of orthoplast powder and 20 ml of cross-linked orthoplast denture material was mixed. The blue colour was imparted by adding asian blue paint. The solution was stirred to attain honey like consistency. The blue solution was injected in portal vein. Then the organ was allowed to set for 4-6 hours and then transferred to conc. HCL. As tissue was dissolved in HCL, the cast was removed and washed with water. The study revealed the ramification of portal vein within the parenchyma of liver.

Key words: Cast, Pig liver, Portal vein

As compared to other domestic animals, pigs are considered as a superior model for some operations and research since they share many anatomical and physiological traits with humans. The study of the pig liver anatomy constitutes invaluable background for the teaching as well as for surgeons for performing hepatectomy and partial hepatic transplantation (Swindle *et al.* 2012). The best donor for these transplants is a domestic pig (Hryhorowicz *et al.* 2017). Cast preparation is a good method in plastination technique to study the branching pattern of vessels. In literature some reports are available on hepatic vessels in pig (Osman *et al.,* 2008; Biswas *et al*., 2018) and in buffalo (Gupta *et al.,* 2002). This study of branching pattern of portal vein will add information to available literature.

For preparation of cast of portal vein, three fresh pig livers were collected from slaughter house. After collection, fascia and fat was removed around liver and portal vein was exposed in hilus region Then with the help of 16 gauze needle, normal saline was injected to flush the portal vein. The saline was drained out. After that air was injected twice to remove the remaining normal saline. For cast preparation, 10 g of orthoplast powder and 20 ml of cross-linked orthoplast denture material was mixed. To impart colour to the mix, asian blue paint was mixed in the cast material in a beaker. The solution was stirred with stirrer for 2-3 minute to attain the honey like consistency. The blue solution was injected carefully in portal vein. The liver was gently pressed to spread the mixture in entire portal vein. The vein was ligated so that the solution doesn't come out side. Then the organ was allowed to set for 4-6 hours. After that the liver was transferred to conc. HCL. As tissue was dissolved in HCL, the cast was removed and washed with water (Ramkrishna *et al*. 2004).

The liver of pig was comprised of right lobe (medial and lateral), left lobe (medial and lateral), quadrate lobe and caudate lobe having caudate process only. Cast prepared for portal vein (Fig. I) revealed that portal vein entered the hilus of the liver with hepatic artery on dorsal side and bile duct on ventral side.

It detached off a small caudate branch and large *right lateral vein.* Right lateral vein proceeded within the parenchyma of right lateral lobe and divided into smaller branches. The small caudate branch entered and supplied the parenchyma of caudate process of caudate lobe. Earlier, Osman *et al.* (2008) and Biswas *et al.* (2018) in pig observed that the caudate and right lateral lobes were supplied by a common branch Right. dorsalis dexter which arose from portal vein. But in contrary to that in present study it was observed that caudate branch was a separate branch which arose directly from portal vein and supplied to parenchyma of caudate lobe. Earlier, Padmasri *et al.* (2020) also observed in sheep that caudate branch arose from dorsal aspect of the main

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trunk and supplied to parenchyma of caudate lobe.

The main vessel then continued for about 2-3 cm and divided into *right medial vein and large left vein.* Right medial vein proceeded within the parenchyma of the right medial lobe. It gave off many larger collateral branches on dorsal and ventral side which supplied to hepatocytes of right medial lobe. Osman *et al.* (2008) and Biswas *et al.* (2018) also reported that parenchyma of right medial lobe was supplied by Right ventralis dexter which arose from portal vein in pig.

The large left vein appeared to be the direct continuation of the portal vein and supplied to quadrate lobe, left medial and left lateral lobes. The left vein gave off a branch for quadrate lobe and then divided into two main branches ; left medial and left lateral branch. The quadrate branch divided into fine branches and supplied to parenchyma of quadrate lobe.

Left Medial Branch

i. The dorsal aspect of the left vein gave rise to the dorsal branch of the left medial lobe. Within the parenchyma of the dorsal half of the left lateral lobe, it expanded dorsolaterally and ended in many branches.

ii. The ventral branch of left vein which went ventrally and terminated by several branches within ventral half of left medial lobe.

Left Lateral Branch

Left lateral branch divided into many branches and supplied to parenchyma of left lateral lobe.

Earlier, Osman *et al*. (2008) and Biswas *et al.* (2018) reported in pig liver that R. sinister branch of portal vein supplied to the quadrate, left medial, and left lateral lobes. R sinister entered in dorsal part of quadrate lobe and then emerged ventrally between quadrate and left medial lobes. This left branch supplied to quadrate and both medial and lateral parts of left lobe.

In buffalo, Rashad *et al*. (2017) reported that portal vein splited into three major vessels as soon as it entered the liver. These large veins were right, left, and caudal omental ones. The caudal omental was similar to caudate branch reported in other species. The right vein gave off dorsal, ventral, and intermediate interlobular veins that supplied different parts of right lobe. The left interlobar branch may be thought of as the direct continuation of the portal vein, which initially ran from the porta toward the left lobe along the liver's long axis. It then bent almost sharply toward the round ligament notch between quadrate and left lobes and supplied to parenchyma of left lobe. Whereas Shirai *et al.,* (2005) in bovine reported four major branches namely ; superior, intermedius, inferior and processus caudate branches. Padmasri *et al.* (2020) observed in sheep that portal vein on entering the hepatic parenchyma was trifurcated as right branch, left branch and caudate branch.

Al-Sadi (2013) found that the sheep's portal vein was somewhat smaller than the goat's. He named main branches of portal vein as right dorsal, right ventral and left branches.

From the present observations it was revealed that portal vein circulation in pig liver can be divided into two halves i.e. right and left. The right part included parenchyma of caudate, right lateral and right medial lobes. The left half comprised of parenchyma of left lateral, left medial and quadrate lobes. Inspite of some variation in the branching pattern of portal vein as reported earlier by Osman *et al.* (2008) and Biswas *et al.* (2018) in pig liver, the parenchyma of the liver was divided into same pattern i.e right and left segment. Externally these two segments could be separated by an imaginary line joining esophageal notch to depression for gall bladder.

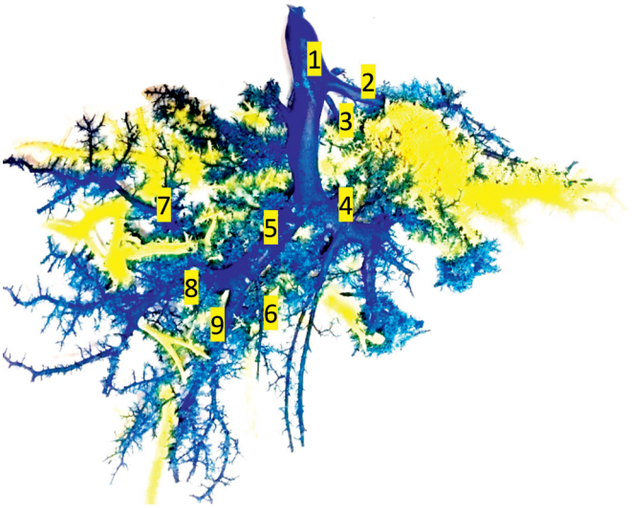

Fig. 1: 1. Portal Vein, 2. Right Lateral Branch, 3. Caudate Branch, 4. Right Medial Branch, 5. Large Left Branch, 6. Quadrate Branch, 7. Left Lateral Branch, 8. Dorsal Branch of Left Medial, 9. Ventral Branch of Left Medial

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