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Research Article

Study of Anatomical Dimensions of Portal Vein

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Abstract: The portal vein drains blood from the abdominal part of alimentary tract except the lower part of rectum and anal canal, also from spleen, pancreas, gallbladder. It measures 8cm in length and 2cm (range 7 to 15 mm) in diameter. In liver transplantation and pancreatectomy a length of portal vein is removed for anastomosis with recipient vessels. The effect of anthropometrical measurements on the dimensions of portal vein, liver, spleen is important marker for evaluation, diagnosis, and assessment of portal hypertension, organomegaly and organ transplantation. There are very few studies regarding anatomical dimensions of portal vein; not much studied in Indians. Present study was done to note the variations in the normal length and diameter of the portal vein in cadavers dissected during normal dissection and after statistical analysis compared with the previous data available. The study was conducted on total 40 embalmed cadavers (22 males and 18 females). The mean length and mean diameter of all portal veins were 4.69cm (range 3cm to 7cm) and 1.64cm (range 0.9cm to 2 cm) respectively. In males , the mean length and mean diameter were 4.87cm (range 3.3cm to 7cm) and 1.75cm (range 1.2cm to 2cm) respectively. Whereas in females the mean length and mean diameter were 4.47cm (range 3cm to 5.7cm) and 1.51cm (range 0.9cm to 2cm) respectively. Considering the normal variations in the anatomical dimensions of portal vein in relation to gender, height, weight, race its knowledge is essential for surgeons and radiologists for various surgical and radiological procedures.
Keywords: Portal vein, Length, Diameter

INTRODUCTION

The portal vein drains blood from the abdominal part of alimentary tract except the lower part of rectum and anal canal. It also receives veins from spleen, pancreas, gallbladder. It is formed by union of superior mesenteric and splenic veins behind the neck of pancreas in front of inferior vena cava and at the level of L2 vertebra [1].

It measures 8cm in length [2, 3] and diameter is variable (range is 7 to 15mm) [4]. From its formation the trunk of portal vein passes upward and slightly to the right behind the neck of pancreas and first part of duodenum. It then enters the free margin of lesser omentum and reaches porta hepatis to divide and distribute branches to liver [1].

In liver transplantation and pancreatectomy a length of portal vein is removed for anastomosis with recipient vessels. Therefore proper knowledge of variations in the anatomical dimensions of portal vein is really essential for surgeons [5].

The effect of anthropometrical measurements on the dimensions of portal vein, liver, spleen, could be important markers for evaluation, diagnosis, and assessment of portal hypertension, organomegaly and organ transplantation [6].

Very few literatures are available on portal vein study but not much studied in Indians. Considering the importance of anatomical dimensions of portal vein present study is conducted to investigate the variations in diameter and length of portal vein in Indian population and to compare the result with the published data.

MATERIALS AND METHODS

The study was conducted on total 40 embalmed cadavers (22 males and 18 females) during routine dissection in dept. of Anatomy, B. J. Govt. Medical College, Pune in the duration of 2 years. The ages of the cadavers were ranging between 40 to 80 yrs.

The superior mesenteric vein, the splenic vein, inferior mesenteric vein and formation of portal vein of all the cadavers were exposed during routine dissection. The diameter and length of each portal vein from formation upto its bifurcation at porta hepatis were measured with help of sliding vernier calliper with an

accuracy of 0.01mm. The data is analyzed with statistical methods and compared with previous data.

RESULTS

The study was conducted on total 40 cadavers (22male and 18 female) over the period of 2 yrs. The mean length and mean diameter of all portal veins were 4.69cm (range 3cm to 7cm) and 1.64cm (range 0.9cm to 2 cm) respectively (Table 1).

In males, the mean length and mean diameter were 4.87cm (range 3.3cm to 7cm) and 1.75cm (range 1.2cm to 2cm) respectively (Table 2).

Whereas in females the mean length and mean diameter were 4.47cm (range 3cm to 5.7cm) and 1.51cm (range 0.9cm to 2cm) respectively (Table 2).

Table 1: Mean length and mean diameter of all portal veins

Dimension	N	Mean	Min	Max	S.D.	Mean + 3 S.D.	Mean – 3S.D.
Length (cm)	40	4.69	3	7	0.86	7.29	2.09
Diameter (cm)	40	1.64	0.9	2	0.31	2.58	0.70

Table 2: Length and mean diameter in males

Sex	N	Mean	Min	Max
Length (cm)				
Male	18	4.87	3.3	7
Female	22	4.47	3	5.7
Total	40	4.69	3	7
Diameter (cm)				
Male	18	1.75	1.2	2
Female	22	1.51	0.9	2
Total	40	1.64	0.9	2

For total 40 cadavers the S.D. for length is 0.86. The values for mean+- 3S.D. are (2.09cm to 7.29cm) which included mostly all the values in the present study whereas mean +- 2 S.D. (2.95cm to 6.43cm) did not include all values in study (Table 1).

For total cadavers the S.D. for diameter was 0.31. The values for mean +-3S.D. are (0.7 cm to 2.58 cm) which included all the values in the present study whereas mean +- 2S.D. (1.01cm to 2.27cm) did not include all values in study (Table 1).

Table 3: Comparison of the present study with the previous literature

Sr. No.	Name of the Study	Mean Diameter	S.D. for diameter	Mean Length	S.D. for Length
1	Most primitive established data [7]	6.3±2.3mm	-	-	-
2	Bannazadeh H *et al*. [8] in Iranians	11.6 mm	-	8.3cm	-
3	Yazdi HR *et al*. [9] in Iranians	9.4±1.7mm	-	-	-
4	Anakwue *et al*. [7] in Nigerians	11.45±1.45mm	-	-	-
5	ChaijaroonKhanarak W *et al*. [10] in Northeastern Thais	1.1837cm 11mm	0.22908	6.6134	0.92968
6	Pinsara GHM *et al*. [5] in Srilankans	8.96±1.26mm	-	8.28+-1.26cm	-
7	Hawaz Y *et al*. [11] in Ethiopians	10.0±1.8mm	-	-	-
8	Present study in Indians	(1.645cm) 16mm	0.31456	4.695cm	0.86793

DISCUSSION

In the present study length is smaller than mentioned in the text, also smaller than the other populations studied in the past. Whereas diameter studied is greater than mentioned in the text and also greater than the other populations studied. This could be related to racial differences. Even the values are less in females than males. Thus present study denotes that gender could be one of the factors affecting the dimensions. But according to the other workers,

- Hawaz Y *et al*. stated that with increasing age diameter was also increased [11].
- Anakwue AC *et al*. stated that diameter varied with age but not with gender [7].
- Study conducted in India by Ravi Shankar et al on a large sample size concluded that in males - portal vein diameter did not vary with age but height had positive correlation with PVD. In the same study PVD in the female subjects was found to have no correlation with age or height. In total population including males and females the study showed – with increase in age PVD proportionately increases. With increase in height, PVD proportionately increases. So

that there is positive correlation between these two variables [4].

CONCLUSION

According to present study , though the length of portal vein is less than mentioned in the text and diameter is greater than mentioned in text, gender is found to be one of the important factor affecting these values as both the values are greater in males than females.

The dimensions of portal vein are affected in portal hypertension and various other pathologies affecting the organs related to portal system. Hence this study could be a diagnostic tool to find out these pathologies.

As stated in the discussion above, there are other factors such as height, weight, race which affect these values of portal vein dimensions. So knowledge of these normal variations is essential for surgeons and radiologists before coming to diagnosis for problems related to portal system.

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