

DISTANCE BETWEEN MAJOR AND MINOR DUODENAL PAPILLA FROM PYLORUS – A CADAVERIC STUDY

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ABSTRACT

Introduction: Without the knowledge of the normal pattern of the duct system and its variations, a radiologist can't interpret an Endoscopic Retrograde Cholangiopancreatography (ERCP) picture. So it becomes important to study the anatomy of pancreatic ducts, their relation to each other, to common bile duct and to duodenum in the available human cadavers. The present paper is about the study of distance between minor and major duodenal papilla from pylorus which was carried out on 96 cadaveric specimens of human duodeno-pancreas. To visualise and to see distance between minor and major duodenal papillae is necessary for the endoscopist who aims to perform the dilation, stenting, or papillotomy of the minor papilla.

Materials and Methods: The study was conducted in 96 (64 male and 32 female) cadavers. Major and minor duodenal papillae were visualized through eosin dye installation in both common bile duct and the accessory pancreatic duct. The measurement of distance between the duodenal papillae and to pylorus was done in cm.

Results: In the present work, the mean \pm SD of the Distance between pylorus to MAP is 8.05 ± 1.71 cm, pylorus to MIP is 6.19 ± 1.49 cm, the major to minor duodenal papilla was on an average 2.02 ± 0.40 cm, these distances were more in males as compared to females. But the size of Orifice of MAP in specimens is 7.25 ± 1.25 mm more in females as compared to males.

Conclusion: The length of the duct shows sexual dimorphism; the length being more in males than females.

KEY WORDS: Pancreatic duct, endoscopic retrograde pancreatography (ERCP), major duodenal papilla, minor duodenal papilla.

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INTRODUCTION

The management of mechanical causes of acute recurrent pancreatitis (ARP), including choledocholithiasis, ampullary masses (benign and malignant), congenital variants of biliary and pancreatic anatomy (e.g. pancreas divisum, choledochoceles), sphincter of Oddi dysfunction (SOD), pancreatic stones and strictures, and parasitic disorders involving the biliary tree and/

or pancreatic duct (e.g. Ascariasis, Clonorchiasis) were identified by the Endoscopic retrograde cholangiopancreatography (ERCP) [1]. Ampullary adenomas and carcinomas create an obstruction to pancreatic exocrine secretion and bile flow [2]. Duodenoscopy is mandatory in the investigation of ARP. This author believes that every trainee in gastroenterology should learn to use a side-viewing duodenoscope, not for

ERCP but to be able to assess duodenal lesions, including those involving the major and minor papilla. For adenomas and cancers limited to the mucosa (T1 lesions) by endoscopic ultrasound (EUS) examination, endoscopic resection is an option [3]. So it is mandatory now to know the surgical anatomy of major and minor duodenal papillae. Moreover a very few studies are reported on the surgical anatomy.

Major duodenal papilla (MAP): At the level of the second or third lumbar vertebrae the major duodenal papilla (papilla of Vater) is situated in the 2nd part of the duodenum, 7–10 cm from the pylorus. It is surrounded by the sphincter of Oddi, and receives a mixture of pancreatic enzymes and bile from the Ampulla of Vater, which drains both the pancreatic duct and biliary system [4]. The junction between the foregut and midgut occurs directly below the major duodenal papilla [5]. This is seen from the duodenum as lying within a mucosal fold. The MAP is occasionally found in the third part of the duodenum, the level of the vertebrae may be L2-3, and in about 10% of people, it may not receive bile. Additionally, in a small number of people, the primary papilla for draining the pancreas may in fact be the accessory pancreatic duct [4].

Minor duodenal papilla (MIP): The minor duodenal papilla (Santorini's minor caruncle) is contained within the 2nd part of the duodenum and situated 2 cm proximal to the MAP, and thus 5–8 cm from the opening of the pylorus. The gastroduodenal artery lies posterior [4]. The duct is an embryological remnant, however in a small majority of people drains the pancreas [4]. MIP is a remnant of the opening of the accessory pancreatic duct, which drains the dorsal pancreatic bud during foetal development. The MIP functioning sphincter of Helly, and the duct the accessory pancreatic duct of Santorini. In 10% of people, the MIP is the prime duct for drainage of the pancreas [4], although in others it may not be present at all [5]. Pain from the region will be referred to the epigastric region of the abdomen due to its associated dermatomes. When patent, the MIP may be associated with recurrent pancreatitis. This is particularly common in a subset of people, when the dorsal pancreatic bud fails to fuse with

the ventral pancreatic bud, a condition called pancreatic divisum [6], or when patent and ligated [4].

Embryology: The pancreas forms from the embryonic foregut and is therefore of endodermal origin. Pancreas develops by the formation of ventral and dorsal buds and its ducts develop from the ducts of these buds. At the 6-7th week of gestation, the ventral pancreas fuses with the dorsal pancreas to form the Main Pancreatic Duct (MPD). The accessory pancreatic duct is formed from the portion of the dorsal bud which gives rise to the upper pancreatic head [8]. The pancreas presents a complicated embryogenesis between the 5th and the 7th week of gestation [9, 10]. At the 6-7th week of gestation, the ventral pancreas fuses with the dorsal pancreas. A disorder during the complicated embryological development of the pancreas can lead to congenital abnormalities. Complete agenesis of the pancreas and agenesis of the ventral pancreas are unknown congenital abnormalities because complete agenesis of the pancreas is incompatible with life and the agenesis of the ventral pancreas is extremely rare [11].

MATERIALS AND METHODS

The present study title with “Distance between Major and Minor duodenal papilla – a cadaveric study” was done in the department of Anatomy and forensic medicine, Govt. Medical College in the period of Nov 2014 to Dec 2017 with 96 Cadaver specimens of pancreas along with the c-loop duodenum (1st, 2nd, and 3rd parts). Cases of septicemia, surgery in the pancreaticobiliary region and duodenal or peptic ulcer were excluded from the study. All the cadavers and medico legal cases were belongs to 30 to 80 years age group and sexes had been included.

The duodenum was opened along the converse border. The specimen was fixed by keeping in 10% formalin for 3 days and then washed and fixed on wooden board with paper pins. The main pancreatic duct and accessory pancreatic ducts along were dissected. A 16 gauge needle was passed down through cut end of the common bile duct and eosin was injected. Appearance of dye in duodenum helped us to locate the major duodenal papilla. Minor duodenal papilla was also visualized similarly through injection in the

Fig. 1: C-Loop duodenum along with the pancreas.

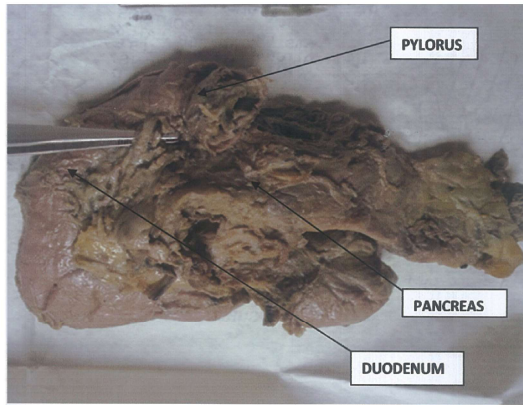


Fig. 2: Major Duodenal papilla (MAP).



Fig. 3: Minor Duodenal papilla (MIP).

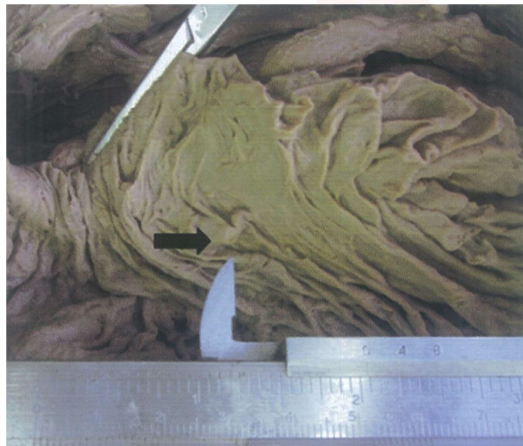


Fig. 4: Distance between MAP (arrow) to Pylorus (star).

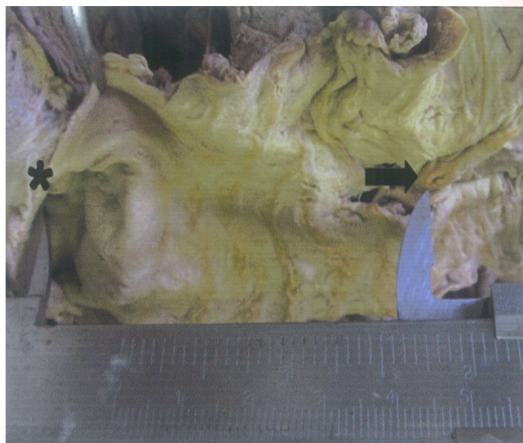
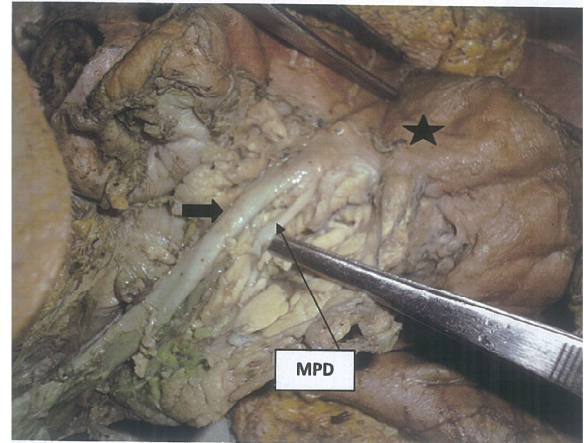


Fig. 5: Showing common bile duct (CBD) (arrow) and main pancreatic duct entering to Duodenum (star).



accessory pancreatic duct. We performed precise measurements of its distance between the duodenal papillae. Distance between papillae was measured in cm.

RESULTS

Table 1: Showing the number of cadavers included in the study and Gender distribution.

Gender	Cases	
	Number	%
Male	64	66.67
Female	32	33.33
Total	96	100

Table 2: Showing the prevalence of MIP in specimens.

Gender	MIP			
	present	%	absent	%
Male	60	93.75	4	6.25
Female	30	93.75	2	6.25
Total	90	93.75	6	6.25

Table 3: Showing the location of MAP in Duodenum in specimens.

S. No	Location of MAP	No. of Cases	Percentage (%)
1	Junction of first & second part	4	4.17
2	Second part	87	90.6
3	Junction of second & third part	5	5.21
4	Total	96	100

Table 4: Showing the Distance between pylorus and MAP in specimens.

Sex	Distance (cm) Mean ± SD	p-value
Male	8.13 ± 1.97	0.43
Female	7.89 ± 1.0	
Total	8.05 ± 1.71	

Table 5: Showing the size of Orifice of MAP in specimens.

Sex	Distance (mm) Mean ± SD	p-value
Male	7.19 ± 1.04	0.47
Female	7.39 ± 1.60	
Total	7.25 ± 1.25	

Table 6: Showing Distance between pylorus and MIP in specimens.

Sex	Distance (cm) Mean ± SD	p-value
Male	6.20 ± 1.77	0.91
Female	6.17 ± 0.63	
Total	6.19 ± 1.49	

Table 7: Showing inter Papillary Distance in specimens.

Sex	Distance (cm) Mean ± SD	p-value
Male	2.05 ± 0.32	0.32
Female	1.96 ± 0.53	
Total	2.02 ± 0.40	

DISCUSSION

The present study title with “Distance between Major and Minor duodenal papilla – a cadaveric study” was done in the department of Anatomy and forensic medicine, Govt. Medical College in the period of Nov 2014 to Dec 2017 with 96 Cadaver specimens of pancreas along with the duodenum (1st, 2nd, and 3rd parts). Cases of septicemia, surgery in the pancreaticobiliary region and duodenal or peptic ulcer were excluded from the study. All the cadavers were belongs to 30 to 80 years age, in which 64 (66.67%) belongs to Male; and 32 (33.33%) belongs to Female Gender.

The minor papilla is small sub mucosal mound in the appropriate location, generally located 2 cm cranial and slightly anterior or cephalad (anterior and superior) to the major papilla. Its size is quite variable and even locating it can be difficult. A swelling or exaggeration of the minor papilla sub mucosal prominence and can aid in identification [12]. It is smaller and less easily identified than is the major papilla. The most useful landmark is the gastroduodenal artery, under which lies the accessory duct and the minor papilla. Duodenal dissection for gastrectomy should end proximal to the artery [13]. In the present study Out of 96 specimens 93.75 % (90) of total specimens were visualized

Minor duodenal papilla, 93.75% (60) in Male, and 93.75% (30) in Female. In all specimens the MIP was located cranial to the MAP. IN 86 specimens MIP was cranio-Ventral to MAP whereas in 4 cases MIP was only cranial to the MAP. In all cases i.e.96 specimens, the major duodenal papilla was present. In no instances, more than two papillae were found. Since MIP present in 90 specimens, so the distance of MIP from Pylorus, intra-papillary distance (distance between MAP and MIP) were studied in the 90 cadaver specimens.

Similar findings were of Sulochana S et.al [14] out of 100 cadavers 90 male and 10 female, MAP present in all and MIP in 94%. Arora et al [15] 30 human cadavers (20male and 10 female) 76.67% and in the Baldwin (16) and Hand [17] were found MIP was present in all cases. In Kamisawa et al. [8] search he found the frequency of a patent minor papilla was 16 out of 33 (48%).

In the present study Out of 96 specimens MIP was located in 2nd part of duodenum in 87 (91%) specimens, at the junction of 1st and 2nd part in 4 (4%) specimens, and at the junction of 2nd and 3rd part of duodenum in 5 (5%) specimens which are similar to the previous studies Sulochana S et al. (14), Paraskevas G et.al. [18] and Dowdy J et. Al. [19] but the result of present study regarding location of duodenal papilla in 2nd part of duodenum was higher than that of Schwartz A et al and location of MAP at the junction of 1st and 2nd part of duodenum and at the junction of 2nd and 3rd part of duodenum were less as compare to Schwartz A et al. [20] Linder et al.[21] In the present study no 3rd papilla or double papilla of vater was found and this result was similar to sulochana S et al, [14] and different from studies of Baldwin [16] and simon [22].

The MAP is a Slight elevation on the duodenal mucosa when observed through the lumen. It is usually located about 8cm distal to the pylorus inside the descending limb of the duodenum. The MAP projects less than 1cm in to the duodenum, although it varies among individuals. In the endoscopic examination the MAP is a hemispherical or oval elevation. A diagonal running long oral protrusion similar to a long mucous membrane is also located at the oral side and the hooding fold covers this elevated

tissue at the oral side. A similarly frenulum fold, runs vertically at the anal side of the MAP. If MAP is hidden under the duodenal mucosa, these vertical folds give a good indication of its location. The longitudinal fold sometimes includes those at the oral side as well as the frenulum. A duodenal papilla sometimes does not have such folds and frenal [23].

In the present study the mean \pm SD of the Distance between pylorus and MAP in specimens is 8.05 ± 1.71 cm. The Distance between pylorus and MAP compared, in male it is (8.13 ± 1.97 cm) higher than female (7.89 ± 1.0 cm) but statistically not significant ($p = 0.43$). These results were similar to the finding of author's sulochana S et al (8.2 cm) [14], Pina et al. (7.8 cm) [24], Khalid A et al. (7.10 cm) [12] but Khalil MM et al. [25] were got slightly higher values (9.76 cm) than present study.

The MAP is a tubular projection on the postero-medial wall of duodenum overlain by a hood-like fold and continued below by the tapered longitudinal fold of duodenum. The average size of MAP is 1 cm and the orifice of the MAP is round or slit like. The external appearance of the MAP is flat, papillary or hemispherical appears to be more common, but other shapes like swollen, villous, cone shaped, sharply pointed have also been described [14].

In the present study the mean \pm SD of the size of Orifice of MAP in specimens is 7.25 ± 1.25 mm. The size of Orifice of MAP in specimens compared, in female (7.39 ± 1.60 mm) higher than male (7.19 ± 1.04 mm) but statistically not significant ($p = 0.47$). The findings of the present study were similar to the results of Sulochana S et al. [14] but slightly higher than the finding of Reinhoff et al. [26] but the result of present study was very much different from the results of Kang et al. [27] who found much higher value as compare to present study. The result of present study also deferred from finding of Opie et al. [28] got lower value as compare to present study. The mean \pm SD of the Distance between pylorus and MIP in specimens is 6.19 ± 1.49 cm. The Distance between pylorus and MIP compared, in male it is (6.20 ± 1.77 cm) higher than female (6.17 ± 0.63 cm) but statistically not significant ($p = 0.91$). The findings of present study were similar to the result of Sulochana S et al. [14]

but different from finding of Milbourn et al. (29) was got slightly higher values than present study.

Howard observed the distances between the minor and the major papilla was 24.0 mm [30]. Anatomical features of the minor duodenal papilla in pancreas divisum Singh while working on 100 specimens reported the minor duodenal papilla to lie cranio-ventral to major duodenal papilla with an average distance of 2.2 cm between the two [31]. Hamilton added that accessory duct which is much smaller is frequently present, and opening into duodenum 2 cm. proximal to major duodenal papilla [32]. Similar findings were of Cunningham who concluded the distance to be 2 cm [33].

In the present study the mean \pm SD of the inter Papillary Distance (distance between MAP and MIP) in specimens is 2.02 ± 0.40 cm. The inter Papillary Distance compared, in male it is (2.05 ± 0.32 cm) higher than female (1.96 ± 0.53 cm) but statistically not significant ($p = 0.32$). The present study that means distance between MAP and MIP was similar to the previous studies done by Sulochana S et al. (1.97 cm) [14], Pina L N et al (1.9 cm) [24]. But Arora et al (2.01 cm) found same distant in the male and female [15].

Alempijevic when carried out a study on 37 human autopsy specimens of duodenopancreas, which underwent pancreatography, manometrically controlled perfusion and light microscopy the average distances between the minor and the major papilla was 24.0 mm [34, 35].

In research done by Kamisawa, frequency of a patent minor papilla was 16 out of 33 (48%) when it existed 1.5 to 2.0 cm from the major papilla, and 31 out of 61 (51%) when the distance was more than 2.0 cm. They concluded that the minor papilla was more frequently patent when it was close to the major papilla ($P < 0.05$) [8].

CONCLUSION

Every trainee in gastroenterology should learn to use a side-viewing duodenoscope, able to assess duodenal lesions, including those involving the major and minor papilla for adenomas and cancers limited to the mucosa (T1 lesions) by endoscopic ultrasound (EUS) examination. So it is mandatory now to know the surgical anatomy of major and minor duodenal papillae.

The minor duodenal papilla was cranial to major duodenal papilla, the average distance between the two being 2.08 cm. In the present study the mean \pm SD of the Distance between pylorus to MAP is 8.05 ± 1.71 cm, pylorus to MIP is 6.19 ± 1.49 cm, the major to minor duodenal papilla was on an average 2.02 ± 0.40 cm, these distances were more in males as compared to females. But the size of Orifice of MAP in specimens is 7.25 ± 1.25 mm more in females as compared to males.

Conflicts of Interests: None

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