

## A CADAVERIC STUDY OF DISTANCE BETWEEN THE TERMINATIONS OF THE HEPATO- PANCREATIC AND ACCESSORY PANCREATIC DUCTS IN THE DUODENAL MUCOSA

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**ABSTRACT: Objective:** The present paper is about the study of distance between minor and major duodenal papillae which was carried out on 30 cadaveric specimens of human duodeno-pancreas. With introduction of ERCP, the pattern of pancreatic ductal system visualization has attained popularity. Without the knowledge of the normal pattern of the duct system and its variations, a radiologist can't interpret an Endoscopic Retrograde Cholangio-Pancreatography (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. 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. ERCP is proved to be "first line" therapeutic tool in the management of surgical, medical and pathological disorders involving the biliary tree and pancreatic duct.

**Methods:** The study was conducted in thirty (20 male and 10 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 was done in cm.

**Results:** In the present work, the distance measured between the major and minor duodenal papilla was on an average  $1.93 \pm 0.61$  cm. in females and in males it was  $2.05 \pm 0.31$  cm.

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

**Keywords:** Accessory pancreatic duct, endoscopic retrograde pancreatography (ERCP), major duodenal papilla, minor duodenal papilla.

## INTRODUCTION

Endoscopic retrograde cholangiopancreatography (ERCP) has evolved from a largely diagnostic to a largely therapeutic modality. ERCP remains the "first line" therapeutic tool in the management of mechanical causes of acute recurrent pancreatitis (ARP), including bile duct stones (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). [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

The major papilla is on the posteromedial wall of the second (descending) part of the duodenum to the right of L2 or L3. It may lie at a slightly lower level with increased age. The distance from the pylorus varies from 7 cm to 10 cm (range, 1.5-12.0 cm). The distance is decreased in the presence of inflammation of the cap or the postbulbar region of the duodenum. Viewed from the mucosal surface, the papilla may be difficult to locate because of the mucosal folds. Its oval or slit like orifice lies at its tip, the posterior tip of which is prolonged downward, and the posterior tip raises a longitudinal fold, the plica longitudinalis. The orifice is commonly filled by villous like projections called valvules or valvulae. A diverticulum lying near the papilla may cause difficulty for surgeons or endoscopists. [4]

## The minor duodenal papilla

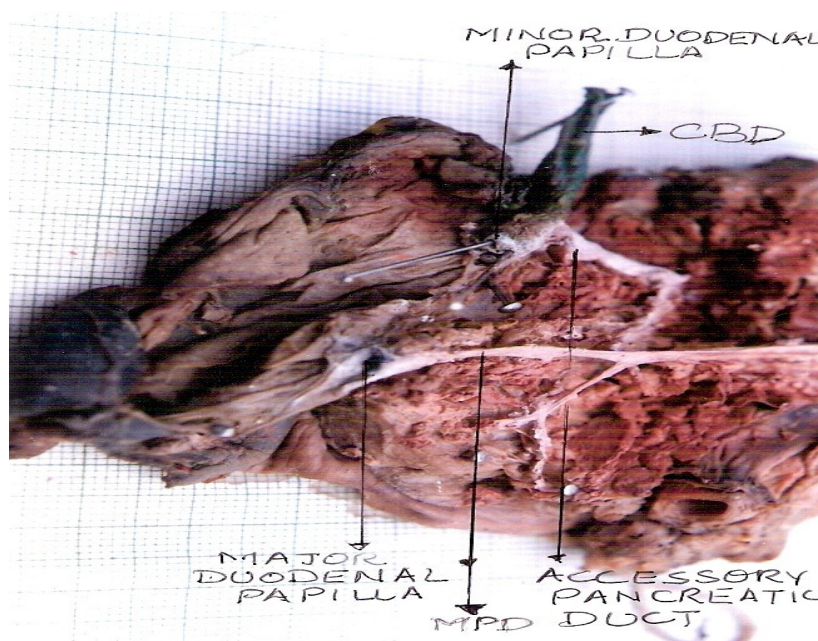
The minor papilla, through which the accessory pancreatic duct of Santorini opens, is approximately 2 cm cranial and slightly anterior to the major papilla. It consists of the accessory pancreatic duct; pancreatic tissue of the dorsal pancreas, which penetrate the muscularis propria of the duodenum; and the surrounding fibrous connective tissue [5]. The minor papilla can be identified as a small submucosal mound in the appropriate location. Its size is quite variable and even locating it can be difficult. A swelling or exaggeration of the minor papilla submucosal prominence and can aid in identification. [4] 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. [6]

## 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 6-7<sup>th</sup> week of gestation, the ventral pancreas fuses with the dorsal pancreas to form the MPD. The accessory pancreatic duct is formed from the portion of the dorsal bud which gives rise to the upper pancreatic head. [7] The pancreas presents a complicated embryogenesis between the 5<sup>th</sup> and the 7<sup>th</sup> week of gestation. [8] [9] At the 6-7<sup>th</sup> 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. [10].

## MATERIAL AND METHODS

Our findings are based on the investigation and study of 30 pancreas and duodenum enblock of both sexes obtained from adult cadavers. 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 and accessory pancreatic ducts along with the lumen of duodenum and exposed. (Figure 1). 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 accessory pancreatic duct. We performed precise measurements of its distance between the duodenal papillae. Distance between papillae was measured in cm.



**FIGURE 1 Showing 1. The common bile duct (CBD) and main pancreatic duct (MPD) and accessory pancreatic duct 2. Openings in the major and minor duodenal papillae.**

**RESULTS**

In the present work, In 5 specimens belonging to male subjects, the minor duodenal papilla was not visualized. In the female group, the minor duodenal papilla was not visualized in 2 specimens, the accessory duct being absent in one. The distance measured between the major and minor duodenal papilla was on an average  $1.93 \pm 0.61$  cm. in females and in males it was  $2.05 \pm 0.31$  cm. (Table 1) This was in accordance with the findings of Shirmer (Table 2) who while working on 48 specimens found the distance between major and minor papilla to be between 2.5 -3.5 cm. [11]

**Table 1 : MEAN DISTANCE BETWEEN MAJOR AND MINOR DUODENAL PAPILLA (cm)**

Sr No.	SEX	No.	Distance (cm)		t	p	Remarks
			Range	Mean $\pm$ SD			
1	Male	15	1.6 -2.6	$2.05 \pm 0.31$	<b>0.63</b>	>0.05	Significant
2	Female	08	1.2 -2.8	$1.93 \pm 0.61$			
3	Total	23	1.2 -2.8	$2.01 \pm 0.43$			

## DISCUSSION

The minor papilla is generally located cephalad (anterior and superior) to the major papilla. It is approximately 2 cm cranial and slightly anterior to the major papilla. Sometimes the minor and major duodenal papillae because of some pathology in duodenal mucosa may join or fuse. In such conditions, sphincterotomy is done through the duodenal mucosa. Howard observed the distances between the minor and the major papilla was 24.0 mm. [12] 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. [13] Hamilton added that accessory duct which is much smaller is frequently present, and opening into duodenum 2 cm. proximal to major duodenal papilla. [14] Similar findings were of Cunningham who concluded the distance to be 2 cm. [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. [16, 17].

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 ( $P < 0.05$ ). [7] (Table 2).

**TABLE 2 : MEAN DISTANCE BETWEEN MAJOR AND MINOR DUODENAL PAPILLAE (cm) IN LITERATURE**

S. No	Scientist	Year	Distance (cm)
1.	Shirmer	1893	3.0
2.	Howard	1947	2.4
3.	Singh	1956	2.2
4.	Hamilton	1976	2.0
5.	Cunningham	1986	2.0
6.	Kamisawa <i>et al</i>	2002	In 48% of cases, 1.5- 2.0. In 51% of cases, >2.0
7.	Alempijevic <i>et al</i>	2006	2.4
8.	Present Study	2011	2.08

## SUMMARY

The minor duodenal papilla was cranial to major duodenal papilla, the average distance between the two being 2.08 cm. the distance measured between the major and minor duodenal papilla was on an average  $1.93 \pm 0.61$  cm. in females and in males it was  $2.05 \pm 0.31$  cm. Hence it is more in males as compared to females.

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