

Morphohistological Study of a Peculiar and Grooved Pancreas with its Unusual Relation with Stomach and Duodenum

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ABSTRACT

Background Knowledge regarding any variations related to the morphology, relations of the pancreas is imperative for a surgeon operating on this region. Cadaveric observations are considered to be the base for clinical investigations and hence this morphohistological study of the unusual, grooved pancreas with its unique presentation was undertaken in an adult cadaver. **Materials and method** Abdominal dissection of a male corpse aged about 60 years showing an altered relation of the pancreas with stomach and duodenum was studied grossly and histologically. A sample of pancreatic tissue was processed and stained with Haematoxylin & Eosin and a special Mayers Mucicarmine stains. **Results** Pylorus of the stomach was structurally adherent to the head of the pancreas. Due to the deep incisura of lesser curvature of the stomach, the body of the pancreas was completely exposed to the anterior abdominal wall. The gastroduodenal junction crossed over the head which resulted in a groove at the neck of the pancreas. Pancreatic parenchyma showed normal histological features with no evidence of ischemia or necrosis. However, vascular congestions were clearly evident probably due to the compression of overlying organs. **Conclusion** An awareness of these variations may help in surgical planning and prevention of inadvertent injury.

INTRODUCTION

In recent years, studies on gross anatomy of the pancreas are gaining a lot of significance due to the current advances in pancreatic surgery, particularly in limited resection of pancreas. Knowledge regarding any variations related to the morphology, presentation or relations of the pancreas is imperative for a surgeon operating on this region. The pancreas is a soft lobulated gland that is situated close to the posterior abdominal wall. It is about 15-20 cm long and weighs about 90 gm. It has a head, neck, body, tail and an uncinat process. The head fits into the curve of the duodenum, the body crosses in front of the vertebral column and the tail touches the hilum of spleen [1]. Numerous anatomical abnormalities of the pancreas are commonly encountered during radiological examination. These pancreatic variants may mimic various neoplastic, inflammatory and post-traumatic conditions [2]. Every endoscopist who employs in pancreatography or any associated diagnostic and therapeutic procedures should always be aware of all sorts of anatomical variations which they might encounter. Variations in the position,

morphology and anomalies of pancreas is mainly attributed to its complex development process. Few of these anomalies are usually detected by ultra-sonogram, computerized tomogram and magnetic resonance imaging while few go unnoticed [3]. Although very important, there are very limited studies regarding variant morphology and presentations of pancreas in human cadavers. Since cadaveric observations are considered to be the base for clinical investigations, this morphohistological study of the unusual, grooved pancreas in adult cadaver was undertaken.

MATERIALS AND METHOD

A cadaveric abdominal dissection of a male corpse aged about 60 years showing an altered relation of the pancreas with stomach and duodenum was studied grossly and histologically.

Detailed morphological and microscopic studies were performed for histopathological investigation. A sample of tissue from the head of the pancreas was incised and preceded with the histological preparation to observe any changes in the cellular architecture due to its adherence with the pylorus. With the due application of fixation, dehydration, clearing and impregnation, a paraffin section was prepared. Sections of 5 μ thickness were obtained using Leica rotary microtome and stained with routine Haematoxylin & Eosin (H&E) and a special Southgates modification of Mayers Mucicarmine (MC) stains. The aluminium compound containing mucicarmine stain owing to its affinity towards the acidic groups of mucins selectively stains the mucins with bright red color. We stained the tissue with this special stain

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to detect any mucous infiltrations from the stomach to the pancreas due to its adherence.

RESULTS

Gross findings: The following morphometric features of the pancreas were noted:

Total length (From head to tail): 11.5 cm

Length of head (horizontal): 2.5 cm

Length of body (horizontal): 9 cm

Vertical height of head (from upper border till uncinated process): 5.5 cm

Vertical height of body (from upper to lower border): 4 cm

Abnormal topographic position of pylorus of stomach and unusual course of duodenum with the head of the pancreas resulted in its variant anterior relation with the pylorus. The stomach was stag horn shaped with a deeper lesser curvature. Pylorus was dragged inferiorly and lied in front of the third part of the duodenum extending nearly two inches below its inferior border. The gastroduodenal part extended over the anterior surface of head of the pancreas and curved around its superior border and the duodenum coursed downwards, medially along the posterior surface of the head of pancreas (**Figure 1**). This resulted in a groove between the head and body of the pancreas involving its neck part (**Figure 2**). The pyloric part of the stomach was mere adherent to the head of the pancreas which is very unusual.

The duct system of pancreas and its opening into second part of the duodenum were normal. The vascular anatomy of pancreas was also found to be normal. Due to the deep incisura of lesser curvature of the stomach, it resulted in

an extensive exposure of body of the pancreas. The inferior border of the body of pancreas was about an inch above the lesser curvature and hence the body was completely exposed through the lesser omentum. The gastroduodenal junction crossed over the head which resulted in a groove at the neck of the pancreas. No positional displacement of contents in the right free margin of lesser curvature was noted.

Histological findings

Pancreatic parenchyma showed normal histological features with no evidence of ischemia or necrosis. Closely packed pancreatic acini arranged in lobules separated by fibrous septa with intra and interlobular ducts were apparent and normal (**Figures 3, 4**). However, vascular congestions were clearly evident probably due to the compression of overlying organs. Adjacent to the parenchyma, bit of smooth muscle fibers were also seen mostly due to adherent pyloric wall on the head of the pancreas. Mucicarmin was negative which proved the absence of mucin secreting cells and hence ruled out the possibility of any mucous infiltrations from the stomach.

DISCUSSION

Studies in the past have found that the normal pancreas assumes different morphologic patterns and its shape changes with respect to its function and age. Sodee in his study in 1964 found that in diagnostic radiology great effort was spent by the student in interpreting normal structures. According to him difficulty with interpreting pancreatic scans lies not only with the more or less imperfect technique, but also with the paucity of the knowledge regarding the normal appearance and variations of this organ [4]. Since then many studies have been done on the pancreas to note its variant morphology.

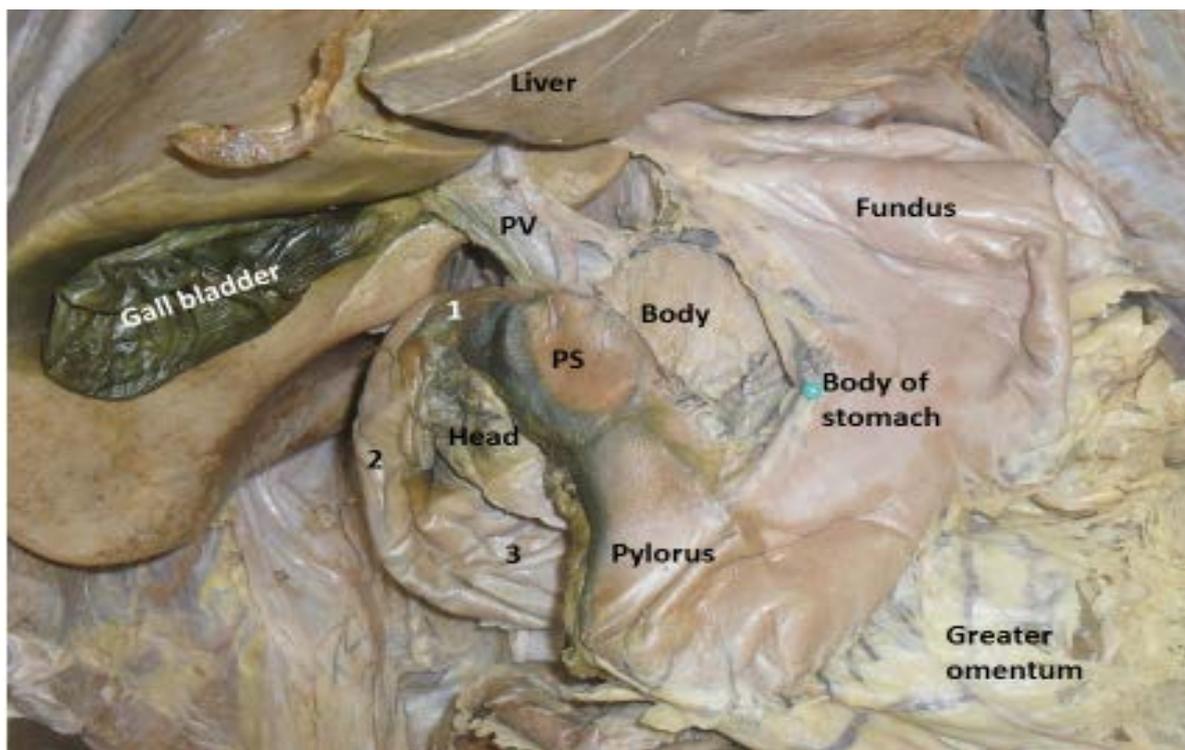


Figure 1. Showing peculiar relation of pylorus part of the staghorn shaped stomach with the head of pancreas. Further anomalous course of the duodenum in relation to head of the pancreas also can be seen. PS- pyloric sphincter. 1, 2, 3 represents the first, second and third part of the duodenum respectively.

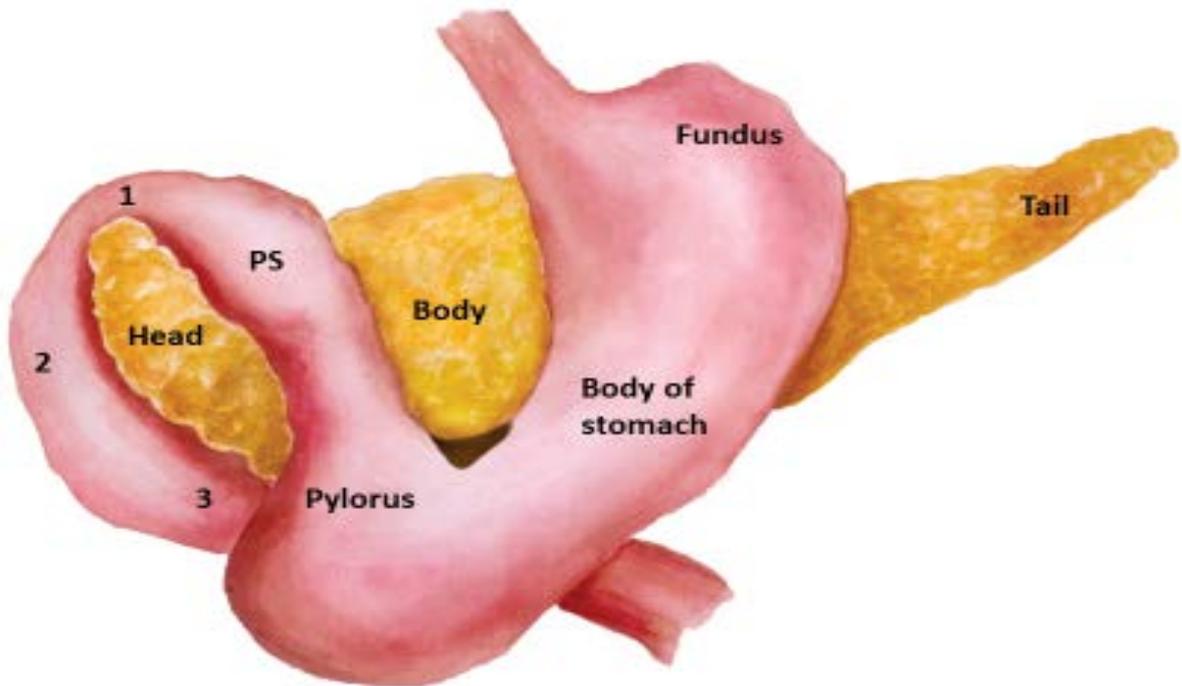


Figure 2. Illustration of the altered relation of head of pancreas by the stomach and duodenum. PS- pyloric sphincter. 1, 2, 3 represents the first, second and third part of the duodenum respectively.

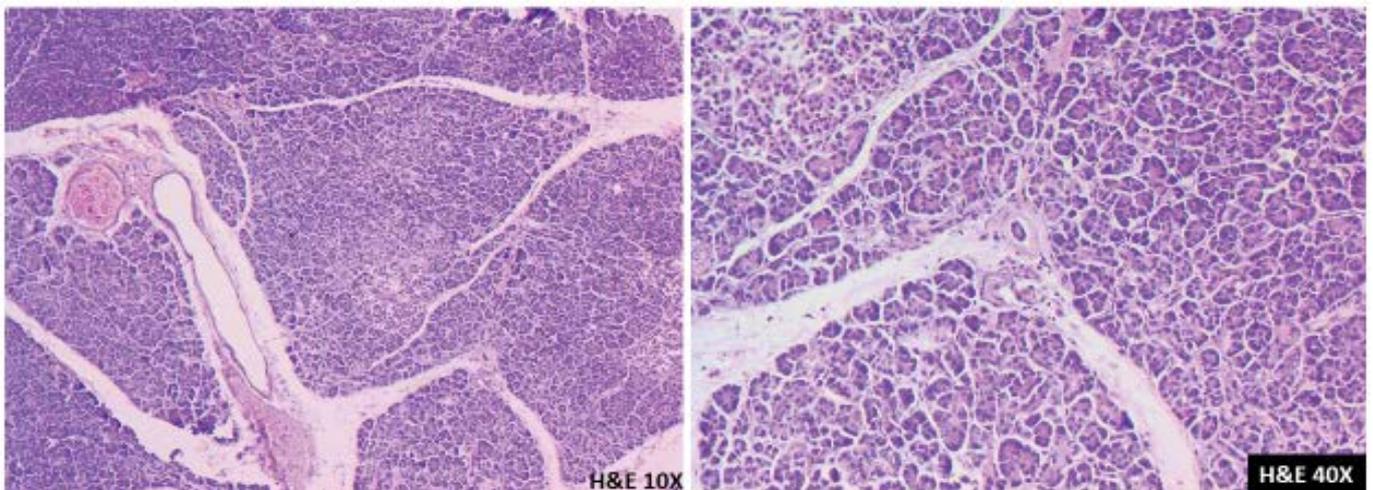


Figure 3. Histological features of head of pancreas as stained by Haematoxylin and Eosin (H&E) method. Pancreas with normal parenchyma, lobules packed with acini and pancreatic ducts but with congested vascular pattern can be seen.

Most of these studies are experimental or done by using advanced techniques like CT and MRI. In our literature review we found that cadaveric studies in this regard are lacking. Hence we focused to study the morphohistological features of the pancreas which showed unique appearance and presentation. Basnet *et al.* in their study on pancreas reported that the mean length of pancreas of both sexes together was 14.4 cm [5]. But in our study we found the length of the pancreas to be 11.5 cm which is much smaller when compared to the above study and the description given in textbooks of anatomy. This may be as a result of the larger region occupied by the stomach and the winding of the gastroduodenal junction over the pancreas. Further we also observed that the pylorus was adherent to the head of the pancreas. We did the histology study to find if this had any effect on the cellular architecture of the pancreas. The

tissue sections appeared normal but vascular congestions were clearly seen which may be due to the compression of the overlying organ. This adherence may result in infiltrations from the pylorus to the pancreas. Pancreatic duct may be obstructed by viscous mucus secretions of the stomach which may lead to pancreatitis [6]. Such a variation should be borne in mind during differential diagnosis for abnormal conditions of pancreas and its associated structures.

The changes in the morphology of the pancreas are frequently related to its embryological development. Abnormal pancreatic developmental stages are linked with a variety of diseases of the gland which might alter the parenchyma of the gland. The pancreas is formed by ventral and dorsal pancreatic buds originating from the

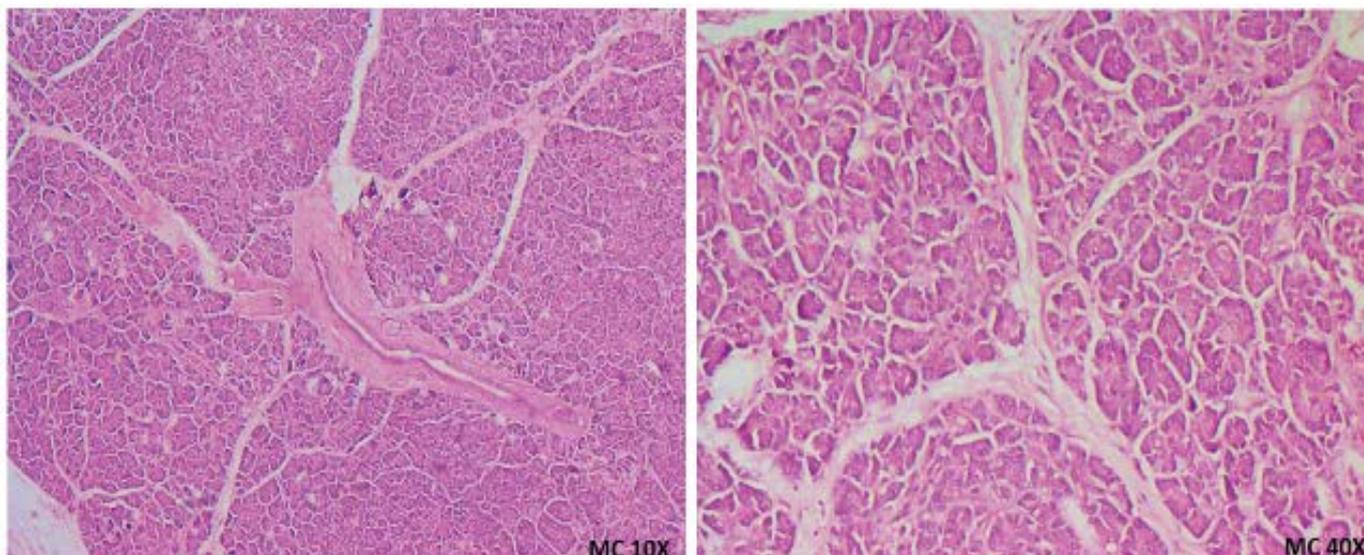


Figure 4. Histological feature of head of pancreas showing negative mucicarmine as demonstrated by Mucicarmine stain.

endodermal lining, at the junction of foregut and midgut during fourth week of gestation. When the duodenum rotates to the right, the ventral pancreatic bud migrates dorsally and finally comes and lies below the dorsal pancreatic bud. Finally both these buds fuse to form the pancreas [7]. We believe that the developmental errors in the rotation of stomach, duodenum and the pancreatic buds have led to such anomalous presentation of the organs as seen in this study.

Further we also observed that the gastroduodenal junction crossed over the head of the pancreas which resulted in a groove at the neck of the pancreas. This changed the normal position and appearance of notch on the head of the pancreas. Duodenum passed slightly behind the head and appeared to be constricted. Such a looped course of gastroduodenal junction may result in gastric outlet obstruction or narrowing of first part of duodenum causing unexplained signs and symptoms such as abdominal pain, nausea and vomiting. Additionally, complications such as obstructive jaundice, peptic ulcer, duodenal perforations and peritonitis may also occur [8]. Magnetic resonance cholangiopancreatography (MRCP) is being performed with increased frequency nowadays to detect such variations. Preoperative diagnosis might avoid unwarranted intra-operative complications. Endoscopists should be aware of such strange course of duodenum during endoscopic examinations as this may lead to difficulty in passing the equipment and also during endoscopic retrograde cholangiopancreatography [9]. Normal modification of the pancreatic contour is referred to as pseudo mass and can mimic pancreatic neoplasm [10]. The head and neck portions of the pancreas may have lobulated contours, especially in the lateral aspect, mimicking a pancreatic tumor, peripancreatic metastatic tumor deposit or lymphadenopathy [11]. This is believed to present potential diagnostic challenges when encountered during surgery. These unique relations of the pancreas with the nearby organs may lead to problems in procedures like pancreaticoduodenectomy and also could be noteworthy during surgical resection and pancreaticojejunostomy. If such presentations are incorrectly

diagnosed, it might lead to unnecessary follow-up examinations or other surgical procedures.

CONCLUSION

We have discussed in here the clinical significance of pancreas with its unusual relation with nearby organs and believe that endoscopists, surgeons and radiologists should give utmost importance to such rare pancreatic variance during various therapeutic procedures. An awareness of these variations may help in surgical planning and prevention of inadvertent injury.

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Conflict of Interest

The authors declare that there is no conflict of interests.

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