Pancreatobiliary Ductal Union in Chronic Pancreatitis:
Is the PBDU Really Guilty?

The main pancreatic duct (MPD) and the common bile duct (CBD) either open separately or unite to form a common channel of variable length before entry into the duodenum. The nature of pancreatobiliary ductal union (PBDU) has evoked interest and controversy since the days of Opie, who described long common channels in patients with gallstone-induced acute hemorrhagic pancreatitis. In the first half of the 20th century, the anatomy of the PBDU and its relationship with pathologic states could only be studied at autopsy. During the fifties and sixties, per-operative cholangiography (POC) was used to study the anatomy of this area in vivo. Since the early seventies, endoscopic cholangiopancreatography (ERCP) has emerged as the preferred tool for investigating the PBDU and has added to our understanding of its anatomy and role in disease.

Anatomy of PBDU
Of the early attempts made at defining the anatomy of this area, the painstaking descriptions of Boyden and Hand still remain important milestones. In over 3,000 cases studied at post mortem, Hand observed that the CBD and the MPD joined to form a common channel in 5% and opened separately in 13%. A recent detailed study on 390 unfixed human post mortem en bloc pancreaticoduodenal specimens showed that the entry of the biliary and pancreatic ducts into the duodenum followed one of three patterns: through a common channel (74%), with an interposed septum (7%) or through separate openings (19%). The common channel group could be further subdivided into those with a well-defined ampulla (25%); a long common channel (>3 mm) without an ampullary structure (18%); and a short common channel of less than 3 mm (31%). In the interposed septum group, both ducts were visualized as separate structures down to the duodenum but entered it at one opening. On the other hand, in the group with separate openings, the CBD and MPD entered into the duodenum clearly separated from each other by a distance ranging from 2 mm to several centimeters.

Cholangiography of PBDU
In recent years, delineation of the PBDU in vivo has been performed by POC or ERCP. POC underestimates the incidence of common channel, picking it up in 7-50% of all patients undergoing the procedure in contrast to 20-90% found at autopsy. Most of the large volume of literature generated in the 1980s about the PBDU in healthy individuals and in patients with choleodochal cysts, gallbladder carcinoma and chronic pancreatitis has been through ERCP examination, which is presently the preferred investigation for studying the PBDU. However, ERCP also has limitations, particularly for measuring the length of the common channel. Clearly, when shallow cannulation of the papilla results in simultaneous opacification of both ductal systems, a common channel is present although its length may be difficult to assess. However, this maneuver is generally avoided by the skilled endoscopist because contrast injection after shallow cannulation results in hemmorn spill more often than duct opacification. Even when opacification results, there is significant risk of over-filling of the pancreatic ductal system (risking post procedure acute pancreatitis) before the biliary ducts are adequately opacified. Experienced endoscopists usually perform deep selective cannulation of individual ducts during routine ERCP. In that case, however, common channels are likely to be missed. Secondly, only these ERCPs should be evaluated which have adequately visualized the distal ends of both the MPD and CBD as well as the duodenal wall on the same film. Finally, full lengths of both the ducts must be visible in the profile view of the cholangiogram. In order to avoid inaccurate assessment of length of the common channel (especially the short common channel), a careful prospective study would be superior to retrospective evaluation of routinely done ERCPs.

Indeed, such technical problems may possibly explain the high incidence of separate channels (37%) noted in the “control” group of the study published in a recent issue of the Journal as compared to the lower figures (13-19%) reported in autopsy studies.

PBDU and Biliary Tract Disease
Anomalous PBDU is diagnosed when the common channel is longer than 15 mm or when ductal union occurs clearly beyond the sphincteric notch of Boyden. Strong statistical evidence correlating this anomaly with the development of choleodochal cyst and carcinoma of the gall bladder has emerged recently. It has been shown that the anomalously long common channel, which often extends beyond the influence of the sphincter of Boyden, results in regurgitation of pancreatic juice into the biliary tree with resultant cholangitis. This leads to thickening, stenosis and dilatation of the bile duct wall, culminating in cystic dilatation. Elevated amylase levels in bile have been demonstrated in patients with choleodochal cysts. Observations by Japanese workers further suggest that the type of junction of the pancreatic and bile ducts in anomalous PBDU may be responsible
in some way for these associations.\textsuperscript{9,12} The so-called BP type junction, in which the bile duct opens in the pancreatic duct, is frequently associated with choledochal cysts; whereas the PB type junction, in which the pancreatic duct opens in the bile duct, is often associated with carcinoma of the gall bladder. These differences in associations will have to be studied further to understand their implications and etiologic role.

In patients with gall bladder carcinoma, the reflux of pancreatic juice into the gall bladder probably contributes significantly to tumorigenesis.\textsuperscript{12} Anomalous PBDU in such patients facilitates mixing of bile and pancreatic juice and formation of lyssolecithin, phospholipase A2 and other noxious compounds which in turn produce chronic irritation at stagnant sites like the gall bladder, resulting in metaplasia and anaplasia.\textsuperscript{12}

**PBDU In Pancreatic Disease**

The earliest correlation noted between PBDU and disease states was the report of a long common channel in patients with acute gallstone pancreatitis.\textsuperscript{1} Opie and others\textsuperscript{2} speculated that impaction of a gallstone at the ampulla of Vater would permit biliopancreatic reflux and intrapancreatic activation of pancreatic enzymes in the presence of a long common channel, whereas with a short common channel, the gallstone would obstruct both ducts and prevent such reflux.

Although preliminary studies on the association of particular types of PBDU with chronic pancreatitis and other diseases of the pancreas have been reported,\textsuperscript{4,5} few studies have explored these associations systematically. The study recently published in this Journal\textsuperscript{10} is an important step in this direction. In a retrospective analysis of routine ERCPs, the authors report a significantly higher incidence of separate openings of the CBD and MPD in patients with alcoholic chronic pancreatitis as compared to normal controls, though it was no different in those with idiopathic chronic pancreatitis.

Why should the presence of separate openings of the CBD and MPD predispose to alcoholic chronic pancreatitis? The authors propose an intriguing possibility that the presence of pancreatic ductal epithelial hyperplasia, which has been reported to be associated more frequently with separate openings,\textsuperscript{4} might be important in the development of ductal obstruction and eventually chronic pancreatitis. However, DiMagno et al.\textsuperscript{5} failed to find any correlation between the pattern of PBDU and histological changes of chronic pancreatitis. Indeed, the best correlation noted by DiMagno et al.\textsuperscript{5} was between a short common channel and papillary epithelial hyperplasia of the ductal epithelium, which is considered a preneoplastic condition. This made them speculate that a short common channel may predispose to pancreatic cancer.

The correlation, if any, between various patterns of PBDU and pancreatic diseases remains largely unexplored. The ERCP study by Misra et al.\textsuperscript{8} reiterates observations made earlier\textsuperscript{4} and, in addition, has the merits of including a control group and comparing two different etiologies of chronic pancreatitis; however, it suffers from the drawbacks of a retrospective analysis. This paper should stimulate planned, prospective ERCP studies in patients with various types of chronic pancreatitis to clearly confirm whether any association with the pattern of PBDU does indeed exist. Further detailed autopsy studies in subjects dying of non-pancreaticobiliary disease as well as in those with varying degrees of severity of chronic pancreatitis, correlating the nature of the PBDU with ductal and parenchymal histology, are eagerly awaited and should shed greater light on the several questions raised by ERCP observations.

**References**