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Name of Journal: *World Journal of Clinical Cases*

Manuscript NO: 75364

Manuscript Type: MINIREVIEWS

Application of Imaging Techniques in Pancreaticobiliary Maljunction

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Abstract

Imaging techniques is a useful tool in the diagnosis and treatment of Pancreaticobiliary maljunction (PBM). PBM is precancerous lesion often relative to the disease of pancreas and biliary tract, for example, cholecystolithiasis, protein plugs and pancreatitis. For patients of PBM, early diagnosis and timely treatment is highly important, which is largely dependent on imaging techniques. With the continuous development of imaging techniques, including Endoscopic retrograde cholangiopancreatography (ERCP), Magnetic resonance cholangiopancreatography (MRCP), Computed tomography (CT), Ultrasound (US) and Intraoperative cholangiography (IOC), it is appropriate to become the diagnostic and therapeutic tools for PBM. Imaging techniques, including non-invasive and invasive, have distinct advantages and disadvantages. The purpose of this paper is to review the application of various imaging techniques in the diagnosis and treatment of PBM.

Key Words: Pancreaticobiliary maljunction; Endoscopicret rograde cholangiopancreatography; Magnetic resonance cholangiopancreatography; Ultrasound; Computed tomography; Intraoperative cholangiography.

Wang J, Mu PY, Xu Y, Bai Y, Shen DH. Application of Imaging Techniques in Pancreaticobiliary Maljunction. *World J Clin Cases* 2022; In press

Core Tip: Pancreaticobiliary maljunction (PBM) is a congenital structural abnormality, which is one of the risk factors of many pancreaticobiliary diseases such as cholangitis, pancreatitis, cholangiocarcinoma and gallbladder cancer. Early diagnosis of PBM is a procedure to improve the prognosis of PBM, which is closely related to the development of various imaging techniques. Imaging techniques can achieve the purpose of early diagnosis and timely treatment, which highlights the significance of imaging techniques.

INTRODUCTION

Pancreaticobiliary maljunction (PBM) was firstly recorded in the early 20th century, and officially named in 1969, which is referred to as congenital malfunctional [4]. The main anatomical feature of PBM is that the bile duct and pancreatic duct join out of the duodenal wall [1] forming a lengthy common duct (figure 1) [2], often combined with sphincter of Oddi dysplasia; thereby the pancreatic duct and bile duct lose control causing reflux [1,3]. Due to this anatomical abnormality, PBM is often associated with certain diseases, such as cholelithiasis, cholangitis, pancreatitis and increased risk of cholangiocarcinoma [5, 22, 49]. PBM is often reported in Asian countries and is one of the main reasons of biliary tract cancer. In PBM patients, the pressure in the pancreatic duct is usually higher than that in the bile duct. Pancreatic juice often flows back to the bile duct [52] and mixes with bile to produce cytotoxic substances, such as lysophosphatides. Due to the persistent pancreatic juice reflux to the bile duct, the mucosa of the bile duct and gallbladder is continuously damaged [6]. The repeated repair and damage process of biliary tract and gallbladder mucosa is related to DNA mutation. Contribute to various gene mutations, this results in histological variety, for instance hyperplasia, metaplasia and dysplasia, and finally lead to biliary and gallbladder carcinogenesis. Yuichiro Uchida [21] reported that prevalence of biliary tract cancer being 21.6–42.4% among adult PBM patients [41]. The theory of the hyperplasia-dysplasia-carcinoma sequence seems to explain the carcinogenesis of PBM [8, 13, 14]. This is different from the general principle of carcinogenesis that arises from the adenoma-carcinoma sequence. Narongsak Rungsakulkij [51] set forth that there is evidence that gene mutations are company with carcinogenesis, such as in the K-ras and p53 genes, which are involved in carcinogenesis of gallbladder cancer in this condition. Thus, patients with PBM have higher rates of stone and tumor within the biliary tract and gallbladder [53]. The characteristic of pathological change seen in PBM patients is that epithelial hyperplasia of the gallbladder and biliary tract due to longstanding continuous stasis of the bile intermixed with refluxed pancreatic juice. In summary, PBM is greatly associated with

pancreatic biliary disease. The early diagnosis of PBM is very important. The treatment of choice for PBM is prophylactic surgery before malignant changes can take place, which is heavily dependent on imaging techniques. ERCP is the most effective way to check PBM, which could show the connection structure clearly. On the ERCP there is communication between the pancreas and the bile duct despite the contraction of the sphincter, therefore PBM is diagnosed. MRCP and CT can diagnose PBM, based on image findings of an abnormal combination between the common bile duct and the pancreatic duct, in addition to a long common channel. Thickening of the gallbladder wall and expansion of the bile duct in conventional US are clues to the diagnosis of PBM. IOC is used during surgery to observe the anatomy of the pancreaticobiliary system and the function of Oddi sphincter, so, there is a great value in both diagnosis and treatment. For patients of PBM early diagnosis and timely treatment is highly important, which is largely dependent on imaging techniques. The following imaging features can be used for the diagnosis of PBM: showing abnormal long pancreatic bile duct confluence common channel and a morphological anomaly of the confluence [17, 40]. In this paper we reviewed current literatures about imaging techniques for PBM, in order to make early diagnosis and timely treatment of the disease.

CONCLUSION

In summary, the clinical features of PBM are atypical and usually characterized by pancreaticobiliary diseases. PBM is one of the pathogenic factors of pancreaticobiliary diseases such as cholangitis, pancreatitis, cholangiocarcinoma and gallbladder cancer [22]. Early diagnosis and timely treatment are very important [20]. Early diagnosis of PBM is a method to improve the prognosis of PBM, which is closely related to the development of various imaging techniques such as ERCP, MRCP, CT, US and IOC. If imaging shows that the bile duct and pancreatic duct outside the duodenal wall are connected through a long common tube, the diagnosis of PBM can be made [30]. In conclusion, the imaging techniques mentioned in this paper (ERCP, MRCP, US, CT and

IOC) are valuable for the diagnosis and treatment of PBM patients. ERCP can be used as gold standard for the diagnosis of PBM and can also be used to alleviate PBM related complications, but this technique is invasive and its application needs careful consideration. As a noninvasive imaging technique, MRCP can clearly show the junction of pancreaticobiliary duct. It is the first choice for the diagnosis of PBM in most patients. US can be used to detect gallbladder wall thickening and congenital biliary dilatation, which can play a warning role and need further examination and treatment. CT has high resolution in the diagnosis of PBM. IOC provides an intuitive understanding of the anatomy of the biliary system and guides the operation in real time. Each imaging technique has its unique advantages and disadvantages. No paper was indexed to report the official golden standard. So, we need further research on golden diagnosing imaging techniques for PBM. We should choose the appropriate techniques according to the actual situation to achieve the desired effect. The imaging techniques mentioned in this paper guide various diagnostic and treatment procedures, help surgeons accurately perform some surgical operation, and reduce the risk of intraoperative and postoperative complications. It can achieve complete and correct diagnosis, real staging, and help to establish an appropriate treatment attitude. We believe that the imaging technique with all the above characteristics is of great value in the diagnosis and treatment of PBM. In conclusion, imaging techniques ⁶ allows us to diagnose an anomalous pancreaticobiliary ductal junction on the basis of findings regarding the relationship between the duct confluence and the pancreatic parenchyma. The detection rates of ERCP, MRCP, EUS and MDCT for PBM were 90-100%, 82-100%, 88% and 78% [35, 55], respectively. Various imaging techniques also play a great role in the treatment of PBM. In order to achieve the purpose of early diagnosis and timely treatment, imaging techniques for PBM will be used more and more clinically.

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