



**ANATOMICAL VARIATIONS OF PANCREATIC DUCT IN KASHMIRI PATIENTS UNDERGOING MR CHOLANGIO PANCREATOGRAPHY**

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**ABSTRACT**

**PURPOSE:** Major clinically significant developmental anatomic anomalies of the pancreatic duct include fusion anomaly (complete, incomplete pancreas divisum) and migration anomaly (annular pancreas). Apart from being an important albeit rare cause of recurrent pancreatitis the recognition of pancreato-biliary anomalies assumes importance in view of the growing prevalence and complexity of hepato-biliary and pancreatic surgeries. In this study, we aimed to study the prevalence of normal and variant pancreatic ductal anomalies in patients attending MRCP examination in a Kashmiri tertiary care hospital.

**MATERIALS AND METHODS:** Between March 2016 and September 2017, 314 patients suspected of having pancreato-biliary disease underwent MRCP with a 3.0 Tesla scanner. A phased-array coil was used for signal detection. Pancreatic ductal anatomy was studied by evaluation of the thick slabs, source and three dimensional reformatted images.

**RESULTS:** Out of 314 patients studied by MRCP, majority of patients -300 had normal ductal anatomy. 11 patients (4 males and 7 females) were diagnosed as having the fusion anomaly -"pancreas divisum" (3.5%) and 3 patients (1 male and 2 females) had migration anomaly -"Annular pancreas" i.e 0.95%

**CONCLUSION:** MRCP is a rapid and non-invasive method of evaluating the pancreatic ductal system. Majority of patients have normal ductal anatomy with the prevalence of pancreatic divisum and annular pancreas being 3.5% and 0.95% respectively in our study. Data from this study can be used for further epidemiological and clinical studies apart from highlighting the importance of preoperative imaging in complex pancreato-biliary surgeries.

**LIMITATIONS:** Small sample size of study group might affect the representative statistics.

**KEYWORDS :** Pancreatic divisum, Annular pancreas, Magnetic resonance cholangiopancreatography (MRCP).

**INTRODUCTION**

Major clinically significant developmental anatomic anomalies of the pancreatic duct include fusion anomaly (complete, incomplete pancreas divisum) and migration anomaly (annular pancreas).<sup>1,2,3</sup>

Apart from being an important albeit rare cause of recurrent pancreatitis especially in childhood and /or gastric outlet obstruction the recognition of pancreatobiliary anomalies assumes importance in view of the growing prevalence and complexity of hepato-biliary and pancreatic surgeries.

Iatrogenic biliary injuries are a relatively frequent problem following hepato-biliary surgeries, that negatively influences the postoperative course, leading to increased complication rates and mortality, in addition to reducing the quality of life<sup>4</sup>.

Despite improved survival rates and advances in surgical technique, Pancreatico-biliary complications occur in 7–10% of donors, representing the most common cause of morbidity in living donor liver transplantation<sup>5,6,7</sup>.

This can be lowered by preoperative pancreatobiliary ductal mapping<sup>8,9,10</sup>. Pancreatobiliary anatomy mapping can be defined using endoscopic retrograde cholangio-pancreatography (ERCP), intraoperative cholangiography, computed tomography (CT) and magnetic resonance cholangiopancreatography (MRCP)<sup>8,11</sup>.

Although the diagnostic endoscopic retrograde cholangiography is the standard examination for defining biliary anatomy, it carries a major complication rate of 1.4–3.2%<sup>12,13</sup>. CT imaging of biliary system has some disadvantages, mainly related to the biliary contrast agent and high radiation dose<sup>14</sup>.

The introduction of Magnetic resonance cholangiopancreatography (MRCP) in the early 1990s served as a non-invasive safe examination that does not expose the patient to ionizing radiation and requires no intravenous contrast agent<sup>9,12,15</sup>. MRCP at 3 Tesla is very promising as a diagnostic tool for defining the anatomy and

diagnosing the diseases of the hepato biliary tree and pancreatic ductal system with high resolution<sup>16</sup>.

**1. FUSION ANAMOLY (Pancreatic Divisum).**

Pancreatic divisum occurs in 4-14% of the population and results from failed fusion of the dorsal and ventral ducts during embryological development. Two variants have been described table 1.

**Table 1 showing different variants of pancreatic divisum.**

	Two variants of pancreatic divisum <sup>17</sup>
Type 1	Classical divisum/Complete divisum.i.e in which there is total failure of fusion(Fig.1)
Type 2	Incomplete divisum.i.e where a small communicating branch is present(Fig.2)

In pancreatic divisum, the majority of the pancreatic gland (body,tail and upper part of head of pancreas) drains into the minor papilla via the Duct of Santorini, whereas the lower part of head and uncinate process drain into the major papilla via the Duct of Wirsung<sup>17</sup>.

**MATERIAL AND METHODS**

Our study was hospital based cross sectional observation study, conducted from March 2016 to September 2017 in the post graduate Department of Anatomy in collaboration with the Department of Radio diagnosis and Imaging of Government Medical College Srinagar. Prior Ethical Clearance from Institutional Ethical Committee was taken.

**INCLUSION CRITERIA:** Patients undergoing MRCP for various medical and preoperative surgical indications.

**EXCLUSION CRITERIA:** Altered pancreatic ductal system anatomy due to Neoplastic masses or previous surgical resections.

**MRI Equipment:** Magnetom Skyra, Siemens 3 Tesla.

**Protocol:** Thin and thick slab Half fourier Acquisition with Single shot Echo (HASTE) coronal and axial, T1 weighted axial, MRCP using heavily T2 weighted sequences.

All the studies were analyzed by two experienced radiologists. Data obtained was analyzed with respect to normal and variant ductal anatomy. Variant pancreatic ductal anatomy was subgrouped into fusion and migrational anomalies. Each subgroup was further analyzed with respect to gender and age distribution.

**OBSERVATION AND RESULTS**

Over a period of 18 months 314 patients were studied with MRCP as per the study protocol in the Department of Radiodiagnosis and Imaging.

1. Among 314 subjects, 110 cases were males and 204 were females.

**Table 1: Gender distribution**

Gender	Number	(%)
Male	110	(35.03%)
Female	204	(64.97%)
Total	314	(100%)

2. Fusion anomalies like pancreatic divisum was found in 11 cases (3.5%) and Migration anomaly i.e annular pancreas was found in 3 cases (0.95%)

**Table 2: Frequency of fusion Anomaly (pancreatic divisum) of Pancreas**

Gender	Number	(%)
Male	04	(1.27%)
Female	07	(2.22%)
Total	11	(3.5%)

**Table 3: Frequency of migration Anomaly (Annular pancreas) of Pancreas**

Gender	Number	(%)
Male	1	(0.32%)
Female	2	(0.63%)
Total	3	(0.95%)

**DISCUSSION**

Many anatomical studies have been conducted in order to determine the specific pancreatic anatomical variations, using cadaveric material, intraoperative data, or imaging such as ultrasonography and magnetic resonance cholangiography. Preoperative or intraoperative identification of the atypical or anomalous ducts and appropriate tailoring of the surgical technique are important in order to avoid serious postoperative complications.

We have taken study cases irrespective of their age and gender. All cases in our study were aged between 10-96 years. Our study population size was comparable to previous studies<sup>21,22,23,26</sup>

Complete pancreatic divisum has been reported as a relatively rare condition with the frequency of 0.5-11% by **Kozu T et al [1995]**<sup>16</sup>, **Seungmin et al [2006]**<sup>24</sup> and **Shu et al [2006]**<sup>25</sup>. In our study, the frequency was 3.5% (11/314) which is more than reported by **Hakan Onder et al**<sup>26</sup>(0.2%) and **Gonoi et al**<sup>27</sup>(2.6%) in Japanese population and less than reported by **Shu et al**<sup>25</sup> (7.7%) in chinese population. And we think that the different prevalence may be because of ethnicity or variabe study sample size. Annular pancreas being very rare anomaly was reported in 0.9%(3/314) cases in our study while **Seiugmin et al [2006]**<sup>24</sup> reported no case of annular pancreas in 582 patients. **Yogi Y et al [1987]**<sup>28</sup> reported annular pancreas in 4 (3.8%) cases among 152 patients.

**CONCLUSION**

• MRCP is sensitive and reliable method for preoperative assessment of pancreatic ductal anatomy and in diagnostic

workup of recurrent pancreatitis, apart from being a realistic and less invasive anatomical study model.

- Difference in the frequency of variations of pancreatic ductal anatomy in Kashmiri population in comparison to other populations may be because of ethnicity and/or study sample size.



Coronal and Axial view of MR Cholangiogram depicting separate drainage of MPD and CBD, migration anomaly (pancreatic divisum): MPD (large arrow) draining into mionr papilla and CBD (small arrow) draining into major papill



Axial view of MR Cholangiogram depicting fusion anomaly (partial Annular pancreas) shown by arrows“crocodile jaw appearance”

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