Original Research Article

A study on periampullary diverticula – 6 years ERCP experience from a referral centre

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Abstract

Introduction: Periampullary diverticula (PAD) are mucosal outpouchings commonly situated on the medial aspect of second part of duodenum; usually within 2-3 cm of the ampulla of vater. PAD are usually asymptomatic incidental findings during side viewing scopy. We aimed to analyze the influence of PAD in the management of patients who underwent ERCP during past 6 years in our centre.

Materials and methods: Patients between the ages of 13 and 74 with the diagnosis of pancreaticobiliary diseases who underwent ERCP at Institute of medical gastroenterology, Madras Medical College from January 2012 to December 2017 were taken into account for retrospective analysis. We assessed and compared ERCP results in patients with and without PAD.

Results: A total of 3412 patients underwent ERCP that of these 197(5.77%) patients had PAD. Among the 3412 cases , the incidences of PAD in patients age group less than 50 years was 2.6% and age group more than 50 years was 8.1%(P<0.001). Successful biliary cannulation was achieved in 79.18% (n=156) of patients with PAD and 93.1% of patients of patients without PAD (P<0.001). Of that in patients with PAD, for 28.93 %(n=57) cases underwent precut needle papillotomy. The papilla

was undetectable in 6 cases with PAD. Incidence of PAD was higher in choledocholithiasis group (9.2% vs 4.1%, p=0.003), but in incidence of CBD stricture had no difference. Complete clearance of CBD stones was achieved lesser in patients with PAD (72.4% vs 86.8% P=0.02).

Conclusion: The frequency of PAD increases with age and occurs more in choledocholithiasis cases. Our experience showed decreased rate of cannulation success with PAD, increased difficulty in cannulation and decreased rate of successful stone retrieval.

Key words

Periampullary diverticulum, ERCP, Chledocholithiasis.

Introduction

Duodenal diverticula are mostly primary diverticula describing extraluminal mucosal outpouchings lacking muscle layer. In 90% of cases, they are single and approximately 75% of them are located in the second part of the duodenum, mostly in its medial aspect next to the ampulla of Vater. When they occur within 2–3 cm from the ampulla of Vater they are named periampullary, paravaterian or peripapillary diverticula. Diverticula arising in a range of 2–3 cm from the ampulla of Vater but not containing the papilla are also referred as juxtapapillary duodenal diverticula [1]. Diverticula accommodating the papilla (intradiverticular papilla) are also known as ampullary diverticula. Secondary duodenal diverticula are usually associated with chronic duodenal ulcer and they occur in the duodenal bulb.

Periampullary diverticula (PAD) prevalence ranges from 0.16 to 22% depending on the diagnostic approach used such as barium meal, endoscopic retrograde cholangiopancreatography (ERCP) or autopsy. Periampullary diverticula prevalence increases with age [2, 4]. Periampullary diverticula are thought to occur because of abnormal duodenal motility, progressive weakness of intestinal smooth muscles and increased intraduodenal pressure [3, 4]. Most of the periampullary diverticula are asymptomatic and are found incidentally through endoscopic or imaging procedures, but infrequently non-pancreaticobiliary or pancreaticobiliary complications may occur [5, 6].

In the retrospective analysis, we aimed to determine the ERCP success rate and its related complications in patients with periampullary duodenal diverticulum. We compared baseline characteristics and ERCP results and complications in patients with and without periampullary diverticulum.

Materials and methods

The examinations were performed using a standard technique and duodenoscopes by experienced endoscopists. Successful cannulation was defined as free and deep instrumentation of the biliary tree and a cannulation attempt was defined as sustained contact with the cannulating device and the papilla for at least five seconds.

Patients between the ages of 13 and 74 with the diagnosis of pancreaticobiliary diseases who underwent ERCP at Institute of medical gastroenterology, Madras Medical College from January 2012 to December 2017 were taken into account for retrospective analysis. We assessed and compared ERCP results in patients with and without PAD.

For the purpose of the study the patients were divided into two groups. Group A included patients in whom there were no periampullary diverticula detected. Group B included patients in whom the periampullary diverticulum was documented.

All data were analyzed with SPSS 20.0. The study of categorical variables used the chi-square test of independence and Fisher’s exact test.

Shapiro-Wilk test was used to check for normal distribution of data and the T-student test was used for normally distributed quantitative data. For non-normally distributed quantitative variables, the Mann-Whitney Results were considered statistically significant when p-value was found to be less than 0.05. All procedures have been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki and its later amendments. Informed consent for endoscopic treatment was obtained from all patients before the procedures. The study did not require approval of the local Ethics Review Committee.

Results

A total of 3412 patients underwent ERCP that of these 197(5.77%) patients had PAD. There were 3215 patients included in group A (2014 men and 1201 women) and 197 patients in group B (110 men and 87 women).The prevalence of periampullary duodenal diverticula in the analyzed group was 5.77 %.The mean age of the entire group was 51.7years; 50.2 and 65.4 years in group A and B, respectively. The demographic characteristics of the study group were as per **Table - 1**.

Table – 1: Demographic characteristics of the study group.

Data	**Group A (without periampullary diverticula)**	**Group B (with periampullary diverticula)**	**Total**
Number of patients	3215	197	3412
Number of men	2014(62.65%)	110(55.84%)	2124(62.25%)
Number of women	1201(37.35%)	87(44.16%)	1288(37.75%)
Mean age (years)	50.2	65.4	53.7

Table – 2: Significant procedural differences between the groups.

Data	**Group A (without periampullary diverticula)**	**Group B (with periampullary diverticula)**	**Total**	**p**
Number of patients	3215	197	3412	
Successful cannulation	2993(93.1%)	156(79.81%)	3149(92.29%)	<0.01
Papilla not detectable	2	4	6	<0.01
Precut-papillotomy required	232(7.21%)	57(28.93%)	289(8.47%)	<0.01
Complete CBD stone clearance	2791(86.83%)	143(72.43%)	2934(85.99%)	0.02

Table – 3: Complications in ERCP cases. (NS – Not significant)

Complications	**Group A (without periampullary diverticula)**	**Group B (with periampullary diverticula)**	**Total**	**p**
Bleeding	46(1.4%)	6(3%)	52(1.5%)	0.03
Post ERCP pancreatitis	6(0.2%)	4(1.97%)	10(0.3%)	<0.01
Perforation	1	0	1	NS

The papilla was undetectable in 4 cases with PAD and 2 cases in group A (without PAD). Among the 3412 cases , the incidences of PAD in patients age group less than 50 years was 2.6% and age group more than 50 years was 8.1% (P<0.001) (**Figure - 1**). Successful cannulation was achieved in 79.18 % (n=156) of patients with PAD (group B) and 93.1% of patients of

patients without PAD (P<0.001) (**Table – 2, Figure - 2**). Of that in patients with PAD, for 28.93 %(n=57) cases underwent precut needle papillotomy. Whereas only 7.21% of group A required precut papillotomy (p<0.01) (**Figure - 3**).

Figure – 1: Age wise variation with prevalence of PAD.

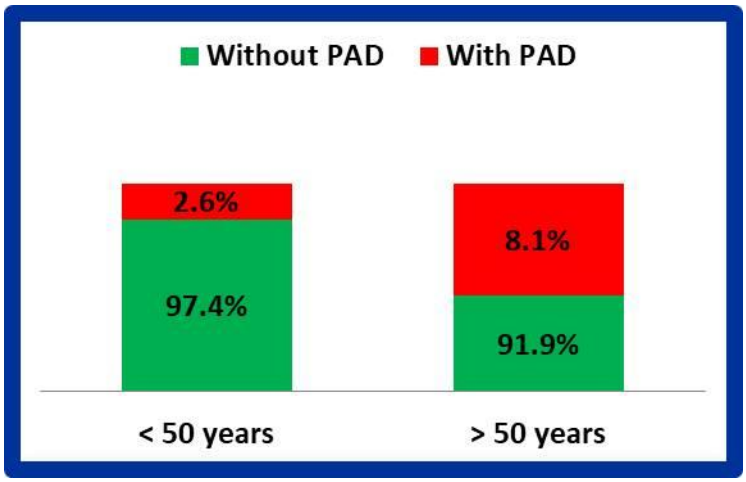


Figure – 2: PAD influence on selective cannulation.

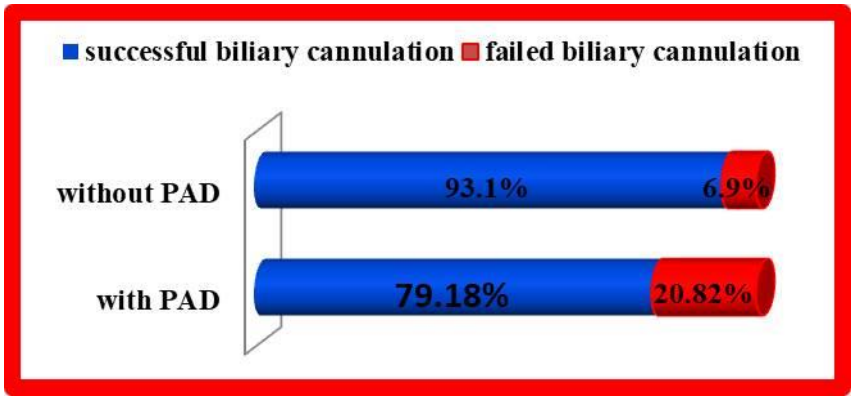
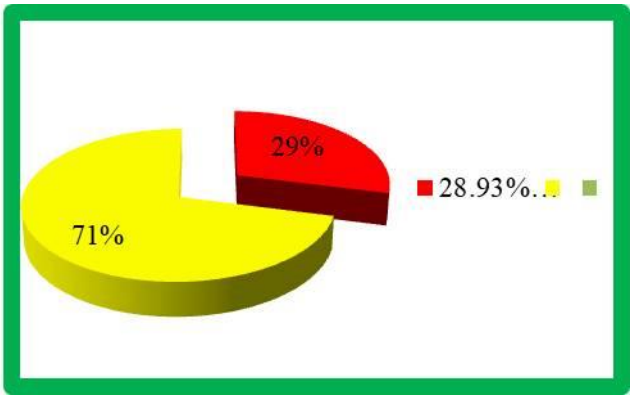


Figure – 3: Pre cut papillotomy in PAD cases.



The presence of stones or biliary sludge was diagnosed in 1318 patients (41%) in group A and 125 patients (63.45%) in group B. Statistically, the presence of choledocholithiasis was significantly higher in the group with duodenal diverticula (p<0.01).

Similarly the incidence of PAD was higher in choledocholithiasis patients compared with other

indications (9.2% vs 4.1%, p=0.003), but had no difference in incidence of CBD stricture.

After the diagnosis of choledocholithiasis and successful biliary cannulation, biliary sphincterotomy was performed.This procedure was successful in 95.2% of patients from group A and 94.5% of patients from group B. The statistically significant difference between the two groups in the rates of success of the endoscopic biliary sphincterotomy was not observed (p=0.6).

Complete clearance of CBD stones was achieved lesser in patients with PAD (72.4% vs 86.8% P=0.02) (**Table - 2**).

We also analyzed complications associated with ERCP (tab. 3). Complications occurred in a total of 57 patients in group A (1.7%) and 10 patients in group B (5.1%). This difference was statistically significant (p<0.01). The most frequent complication was bleeding after needle knife papillotomy or sphincterotomy. It occurred in 46 patients from group A. In 35 of these patients, the bleeding stopped spontaneously, while in 11 patients needed an injection of adrenaline at the site of the papillotomy. In group B, bleeding occurred in 6 patients, out of which 4 required adrenaline solution injections. Moreover, 6 patients in group A and 4 patients in group B developed a mild form of acute pancreatitis. These symptoms subsided in all the patients after the introduction of conservative treatment. In one patient from group A perforation of gastrointestinal tract occurred due to endoscope maneuvering during sphincterotomy and bile duct cannulation. There were no deaths directly associated with the ERCP and during consecutive days after procedure (**Table - 3**).

Discussion

The impact of the periampullary diverticula on the success of therapeutic or diagnostic ERCP procedures is the main concern for any endoscopist [7, 8]. Cannulation difficulty during ERCP was associated with the presence of periampullary diverticulum and the selective cannulation rates vary from 74% to 90% in various reports [3, 9]. In some others reports, these diverticula were related to higher risk of retained stones in common bile duct [10, 11]. Explanations for a high incidence of bile duct stones in patients with PAD are not entirely defined, but PAD appears to be an important contributing factor [12].

In the analyzed study group, the prevalence of the periampullary diverticula was 5.77 percent. The reported prevalence varies from 0.16 to 22 percent, mainly because of the varied population groups and the operator difference [24]. In few previous reports slight female preponderance were notified [13, 14]. But in our observation gender preponderance was not statistically significant. As reported in previous many studies, the prevalence of PAD was higher in elderly group in our study also. The difference in mean age between group A without PAD and group B with PAD was around 14 years. This observation suggests that duodenal diverticula occur late in life and its incidence increases with age [2, 4, 15].

We observed that the presence of diverticulum increased the difficulty of biliary cannulation and failure rate. As in the previous studies, PAD was a major cause of ERCP failure, particularly in patients with intradiverticular papillae in comparison to that of juxtapapillary diverticula [3, 7].

The different techniques for cannulation can be explaining higher cannulation failure rate. A low cannulation rate can be also because of the inability of the endoscopist to find the papilla in a substantial number of cases with duodenal diverticula [6, 15, 16]. In our study four such cases were reported. Also, when the papilla is seen deep inside the diverticulum, frequently lying at the bottom, the cannulation becomes difficult. Also an intradiverticular papilla increases the bleeding risk due to problem in orienting the sphincterotome.

Different techniques are tried to keep the papilla out of the diverticulum for proper cannulation and adequate safe sphincterotomy, like a simultaneous introduction of a guidewire, another cannula or a biopsy forceps; placing a stent in the pancreatic duct; using forward view scope and recently, EUS assisted techniques [8-11].

PAD is demonstrated to be associated with biliary disease, particularly bile duct stones [2, 17]. In our observation also the choledocholithiasis prevalence was higher in PAD group. It is a known fact that as the age increases choledocholithiasis incidence also increases and whether this serves as a confounding factor has to be studied in future. Dysfunction of the sphincter of Oddi causing reflux of pancreatic juice and intestinal content into the bile duct with PAD, leading onto stone formation is one of the hypothesis proposed [1, 4]. It has been also proposed that diverticula cause spasm of the sphincter and raise biliary duct pressure.

PAD also makes the complete clearance of biliary stone less successful as shown in our study and previous observations [10, 18]. In case of PAD balloon trawling of the stones is difficult because the inflated stone extraction balloon cannot rest properly against the distal end of bile duct with diverticulum. Recurrence of bile duct stones is a well-known fact in PAD cases which again signifies the causal relation.

The British Society of Gastroenterology published guidelines had indicated that the presence of a periampullary diverticulum as a risk factor for the hemorrhage or perforation after ERCP [19]. It is debatable whether the complication rates increase with the presence of PAD as the reports are varying [20, 21]. In our observation we have found a statistically significant difference between the numbers of complication following ERCP in the PAD group.

Regarding therapy for PAD, bleeding and perforation are the indications for radiological, surgical or endoscopic intervention. Choledocholithiasis in PAD could be treated either endoscopically or surgically. Obstructive jaundice caused by PAD without gallstones is also known as Lemmel's syndrome and may be complicated by cholangitis. It is because of external mechanical compression of the terminal bile duct by the diverticulum. For acalculous cholangitis as a result of Lemmel's syndrome, endotherapy such as endoscopic sphincterotomy have been found to be effective. Asymptomatic diverticula are not indicated for treatment [22].

Conclusion

The frequency of PAD increases with age and occurs more in choledocholithiasis cases. Cannulation of the common bile duct is more difficult in patients with periampullary diverticulum and requires more skills. PAD is also associated with increased risk of retained stones in the common bile duct.

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