A PERIAMPUTARY DUODENAL DIVERTICULA IN PATIENT WITH CHOLEDOCHOLITHIASIS – SINGLE ENDOSCOPIC CENTER EXPERIENCE

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The reported prevalence of periampullary duodenal diverticula varies between 9 and 32.8%. The aim of the study was to evaluate the prevalence of periampullary diverticula in the studied population and establish whether their presence influence the risk of choledocholithiasis and the risk of Endoscopic Retrograde Cholangio Pancreatography (ERCP) related complications.

Material and methods. The study group of 3788 patients who underwent ERCP between 1996 and 2016 at the 2nd Department of General Surgery Jagiellonian University Medical College in Kraków were analyzed. The group comprised of 2464 women (mean age 61.7 years) and 1324 men (mean age 61.8 years). 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 opening of the bile duct was in the vicinity of a duodenal diverticulum.

Results. There were 3332 patients included in group A (2154 women and 1178 men) and 456 patients in group B (310 women and 146 men). The prevalence of periampullary duodenal diverticula in the analyzed group was 12.8%. The presence of stones or biliary sludge was diagnosed in 1542 patients (47.6%) in group A and 290 patients (68.1%) in group B. Recurrence of choledocholithiasis occurred in 4.5% of patients (70/1542) in group A and 10.3% of patients (30/290) in group B. Complications occurred in a total of 76 patients in group A (2.3%) and 22 patients in group B (4.8%).

Conclusions. The presence of choledocholithiasis and the risk of ERCP related complications are significantly higher in the group with duodenal diverticula.

Key words: choledocholithiasis, digestive system endoscopic surgery, diverticulum, endoscopic retrograde cholangiopancreatography, prevalence
that the presence of a diverticulum in the vicinity of the ampulla of Vater may be a factor impeding successful bile duct cannulation and papillotomy what could be associated with a higher risk of complications and higher percentage of so-called “failed cannulations” of the ampulla of Vater. It is also speculated that they also increase the risk of recurrence of choledocholithiasis.

The aim of the study was to evaluate the prevalence of periampullary diverticula in the studied population and establish whether their presence increases the risk of choledocholithiasis. Difficulty of caniulation of the Vater’s papilla and safety of ERCP and endoscopic procedures were also addressed. The recurrence of choledocholithiasis in patients with diverticula was evaluated too.

**MATERIAL AND METHODS**

The analyze was performed retrospectively. The group of 3788 patients hospitalized between 1996 and 2016 at the 2nd Department of General Surgery Jagiellonian University Medical Collage in Kraków were analyzed. The study group comprised of 2464 women (mean age 61.7 years) and 1324 men (mean age 61.8 years). The mean age of the entire group was 61.7 years. Endoscopic procedures were performed in analgosedation after intravenous infusion of sedatives and analgesics in fractionated doses.

Inclusion criterium was ERCP performed due to the presence or suspicion of choledocholithiasis based on imaging examinations (such as abdominal ultrasonography (USG) or magnetic resonance cholangiopancreatography (cholangioMRI). Patients in whom ERCP was performed due to the suspected pancreatic head tumor, gall-bladder or bile duct tumor or biliary tree injury were excluded from the study. All of the examinations were performed by a team of experienced endoscopists certified by the Endoscopic Section of the Polish Surgical Society.

Duodenal diverticulum was defined as pouch-like herniation in the wall of the duodenum. We included periampullary diverticula when the lesion was over 5 mm in diameter and was placed within 2.5 cm from the opening of the ampulla of Vater. Successful cannulation was described as a deep cannulation of the ampulla of Vater allowing the full visualization of the bile tree. If concrements were found, the papillotomy was performed followed by removal of the stones from the bile ducts. In some patients another ERCP was needed due to suspected recurrence of choledocholithiasis. A total of 5504 endoscopic examinations were performed in the studied group. Any complications that occurred during or immediately after the procedure were noted in the surgery report and history of the patient.

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 opening of the bile duct was in the vicinity of a duodenal diverticulum.

All data were analyzed with Statsoft Statistica v.10. 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 surgical treatment was obtained from all patients before the surgical procedures. The study did not require approval of the local Ethics Review Committee.

**RESULTS**

There were 3332 patients included in group A (2154 women and 1178 men) and 456 patients in group B (310 women and 146 men). The prevalence of periampullary duodenal diverticula in the analyzed group was 12.8%. The mean age of the entire group was 61.7 years; 60.2 and 69.4 years in group A and B, respectively. The demographic characteristics of the study group are presented in tab. 1.

Visualization of the ampulla of Vater failed during the first ERCP in 8 (0.2%) patients in group A and 4 (0.9%) patients in group B. These patients were submitted to a second endoscopic examination shortly after the first one, during which proper visualization of the ampulla was
achieved in all of them. In 90 patients (2.7%) in group A and 30 (6.6%) patients in group B, after the cannulation of the opening of the common bile duct, the visualization of the bile duct failed. These patients were excluded from further analysis because deep cannulation of bile duct was not achieved (tab. 2).

In 1700 patients from group A (52.4%) and 136 patients from group B (31.9%) a normal cholangiogram was obtained in the ERCP. The presence of stones or biliary sludge was diagnosed in 1542 patients (47.6%) in group A and 290 patients (68.1%) in group B. Statistically, the presence of choledocholithiasis was significantly higher in the group with duodenal diverticula (p<0.01). After the diagnosis of choledocholithiasis, papillotomy was performed. This procedure was successful in 95.2% of patients (1468/1542) from group A and 94.5% of patients (274/290) from group B. The statistically significant difference between the two groups in the rates of success of the endoscopic papillotomy was not observed (p=0.6). The evacuation of stones was successful in 89.8% of patients (1384/1542) from group A and 91.7% of patients (266/290) from group B. The difference between the groups was not statistically significant (p=0.3). The comparison of these groups is provided in tab. 3.

We also analyzed complications associated with ERCP (tab. 4). Complications occurred in a total of 76 patients in group A (2.3%) and 22 patients in group B (4.8%). This difference was statistically significant (p<0.01). The most frequent complication was bleeding after papillotomy. It occurred in 46 patients from group A. In 30 of these patients, the bleeding stops spontaneously, while in 16 patients needed an injection of saline and adrenaline at the site of the papillotomy. In group B, bleeding occurred in 10 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

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Acute pancreatitis. These symptoms subsided in all the patients after the introduction of conservative treatment. 6 patients in group A and 4 patients in group B showed symptoms of transient cardiorespiratory events, requiring the administration of catecholamines within an intensive care unit setting. In 2 patients from group A perforation of gastrointestinal tract occurred due to endoskop manoeuvring during bile duct cannulation. There were no deaths directly associated with the ERCP and during 8 consecutive days after procedure (tab. 4).

The duration of follow-up for those who had undergone ERCP and complete stone evacuation from the bile duct ranged from 3 to 60 months. If there was suspicion of the recurrence of stones another ERCP was performed and all concrements found in the bile duct were evacuated. In total, recurrence of choledocholithiasis was diagnosed in 5.4% of patients (100/1832). Recurrence of choledocholithiasis occurred in 4.5% of patients (70/1542) from group A and in 10.3% of patients (30/290) from group B. The difference between the groups was statistically significant (p<0.01).

**DISCUSSION**

The prevalence of duodenal diverticula occurring in close proximity to the ampulla of Vater varies depending largely on the chosen imaging method. It is 0.16 – 5.76% in the case of a gastrointestinal passage examination performed with the oral administration of a contrast agent (14, 15). Autopsy examinations conducted in the first half of the 20th century showed that these kinds of lesions in the duodenum were observed in 11-22% of cases (17-19). In analyzed group, duodenal diverticula were found in 12.8% of patients. In Zoepf’s and Rajnakova’s studies these data were 12% and 20%, respectively (6, 9). Skar also noted a higher proportion of patients with duodenal diverticula – 24.3% (20). The data we present are in line with the findings of other researchers.

Lobo et al. observed that the mean age of the patients with duodenal diverticula was 9 years higher than in the group without them (5). In Zoepf’s study this difference was even greater, reaching 11 years (9). Likewise Vaira et al. observed that this type of lesions occurs more frequently in older patients (8) and Panteris et al. argued that there is a statistically significant difference between the age of patients with and without periampullary duodenal diverticula (21). In this study the mean age of patients without duodenal diverticula was 60.2 years and mean age of patients with this lesion was 69.4 years. The difference is over 9 years. This observation suggests that duodenal diverticula occur late in life and its incidence increases with age.

Our analysis showed that deep cannulation of the ampulla of Vater failed and visualization of the bile duct was impossible in 2.7% of patients without duodenal diverticulum and in 6.6% patients with it. In Vaira’s study these percentages were similar – 3.3% and 5.8%, respectively (8). Panteris reported failed cannulations in 6.9% patients without diverticulum and 14.4% of patients with duodenal one (21). All mentioned studies showed no statisti-
cally significant differences between groups. In contrary, Lobo et al. found a statistically significant difference in the effectiveness of deep cannulation of the ampulla of Vater, citing a failure rate for cannulations of 7.3% in patients without diverticula and as high as 37.6% in patients with periampullary diverticula (5). In 1988, Kennedy observed that the presence of periampullary duodenal diverticula favors the development of choledocholithiasis (12). This thesis was confirmed by Lotveit et al. comprehensive analysis published around the same time (13). Even though the data provided by the authors on the incidence of choledocholithiasis are very different, they both agreed that the presence of a periampullary duodenal diverticulum is an important risk factor for the accumulation of concrements in the bile duct. In Rajnakova’s study, the presence of choledocholithiasis was observed in 9.7% patients without diverticulum and in 16.7% patients with duodenal one (6). Tham and Kelly reports entirely different data, confirming only the thesis that the localization of the ampulla of Vater in the vicinity of a diverticulum significantly increases the incidence of stones in the bile duct. Cholelithiasis was documented in 64% of patients with diverticula and in 33% of patients without diverticula (7). Data provided by Zoepf et al. 46% in the diverticulum group and 33% in the group without diverticula and by Christoforidis et al. – 44% and 24%, respectively, are similar, and each of them observes a statistically significant difference between the studied groups (9, 11). Also Lotveit’s work, in which he reported the presence of stones in the bile duct in 80% of patients with periampullary diverticula and in 52% without, proves that the presence of the opening of the ampulla in proximity of the duodenal diverticulum is a risk factor for the development of choledocholithiasis (13). In this study the presence of stones was observed in 52% of patients with diverticula and in 33% of patients without diverticula (8). Also Lotveit’s work, in which he reported the presence of stones in the bile duct in 80% of patients with periampullary diverticula and in 52% without, proves that the presence of the opening of the ampulla in proximity of the duodenal diverticulum is a risk factor for the development of choledocholithiasis (13). In this study the presence of stones was observed in 52% of patients with diverticula and in 33% of patients without diverticula (8). The effective evacuation of the stones was obtained in 89.8% of the patients without and in 91.7% patients with duodenal diverticula. In Panteris’s study these percentages were slightly lower and amounted to 89.5% in patients without diverticula and 79.6% in patients with diverticula (21). In Vaira’s et al. study concrements were successfully removed after papillotomy in 88.1% and 84.2%, respectively (8). In 2001 Zoepf et al. published a study in which he reported that in a group of patients with duodenal diverticula the rate of recurrence of choledocholithiasis was 6.6%, compared to only 1.4% in patients without duodenal diverticula, and that the difference between the groups was statistically significant (9). In this study choledocholithiasis recurred in 10.3% of patients with periampullary diverticula, significantly more frequently in comparison to the 4.5% recurrence in patients without duodenal diverticula. In 2008 The British Society of Gastroenterology published guidelines which indicated that the presence of a periampullary diverticulum is an important risk factor for the perforation or hemorrhage from the gastrointestinal tract after ERCP (22). Whether the presence of a diverticulum in the vicinity of the ampulla of Vater is indeed a risk factor for complications after ERCP is a subject of debate. Some authors have confirmed this hypothesis in their studies (9, 23). However, other findings showed that there is no link between the presence of periampullary duodenal diverticula and ERCP complications (6, 7, 24). In our findings we have observed a statistically significant difference between the number of complications following ERCP in the
group of patients with duodenal diverticula and the group of patients without duodenal diverticula. The complications were more common in patients with duodenal diverticula.

CONCLUSIONS

1. Duodenal diverticula appear more commonly in older patients.

REFERENCES


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