ORIGINAL ARTICLE

Comparison of early and delayed diagnosis of mortality in ERCP perforations: A high-volume patient experience

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ABSTRACT

BACKGROUND: Although ERCP (Endoscopic retrograde cholangiopancreatography) perforation is a rare complication, it results in high morbidity and mortality. In this study, clinical evaluation was performed concerning the incidence, clinical data and time of diagnosis for ERCP perforations that were either surgically or medically treated. To reduce the ERCP perforations and related mortality, in this study, we aimed to reveal the clinical features and compare them with the literature.

METHODS: In this clinical retrospective study, 51 perforations were detected in 8676 ERCP procedures performed in the past eight years in our hospital. We compared the two groups: early diagnosed patients [Group 1: n=40] and the delayed diagnosed patients [Group 2: n=11] concerning primary diagnosis, blood and biochemical tests before ERCP, perforation type, treatment method, clinical features, length of stay, and mortality. These groups were compared concerning stent placement, papillotomy choledochal dilatation and the number of ERCP procedures.

RESULTS: The ERCP perforation rate in our hospital was 0.59%. The majority of patients who underwent ERCP procedures was due to the choledocholithiasis and periampullary tumors. The mean age was 62.78±17.13 (24–89 years old) and 56.9% of the patients (n=29) were women. Stapfer type II perforations (49%) were the most common type of perforation. However, 62.5% of the total mortality occurred in patients with type I perforation. The overall mortality rate was 13.72% (n=7). The duration of hospitalization (13.38±10.09 days) was higher in the patients who were treated surgically (n=24). Choledochal stents were utilized mostly in the medically treated patients (74.1%) (p=0.039). The patients in Group 1 were detected visually by the operator during the ERCP by leakage of contrast substance (13/40) or by abdominal tomography due to clinical suspicion. Patients in Group 2 had higher pre-ERCP leukocyte levels (p=0.044). The urgent surgery requirement in Group 2 was 72.7%, while the mortality rate was 36.4%. Significant mortality difference was observed between the early and late detection of perforations, indicating a higher rate in Group 2 (p=0.014).

CONCLUSION: In the patients who were diagnosed early, fewer surgical interventions were required, except for the type I perforations. Type II perforations can often be safely treated non-surgically if there are no signs of acute abdomen and sepsis. Early diagnosis and treatment significantly reduce ERCP-related mortality.

Keywords: Early diagnosis; endoscopic retrograde cholangiopancreatography; mortality; perforation; surgery.

INTRODUCTION

Endoscopic retrograde cholangiopancreatography (ERCP), as an invasive procedure, has been often used in the diagnosis and treatment of pancreatic and biliary diseases. Although ERCP-associated perforation is a rare complication, it may result in high mortality. The use of ERCP for diagnostic pur-poses has dramatically decreased with the increased usage of magnetic resonance cholangiopancreatography and endo-scopic ultrasonography.

According to the commonly used Stapfer classification, there are four types of ERCP perforations that have been identified. The anatomical localization of ERCP associated perforation

determines whether the need for surgical intervention.[1] The most common type of the perforation is retroduodenal perforations which are seen in the range of 0.5 to 2.1% of all sphincterotomies during an ERCP procedure.[2] When performed by highly experienced endoscopists, the rate of perforation decreases below 0.5%.[3,4]

Intraperitoneal duodenal perforations generally require surgical intervention, while other types of perforations may be treated with choledochal stenting in most of the cases and medical treatment. Although there have been many studies highlighting that the delay of diagnosis in ERCP perforation may result in critical clinical outcomes, there is no consensus on which terms the early and late diagnosis time is determined. Some studies reported that early diagnosis times cover the first 28 hours after the initiation of the ERCP procedure.[4–6] However, there are not many studies focusing on a comparison of the outcomes between the early and late diagnosis times in ERCP perforations.

This study aims to evaluate the patients who were treated surgically or medically following the diagnosis of ERCP perforation concerning their incidence, clinical features and time of diagnosis. To reduce ERCP perforations, the further aim was to reveal clinical data, compare it with the literature, and protect patients from the complications that may result in mortality.

MATERIALS AND METHODS

This clinical retrospective study was conducted following the approval of the ethics committee with the number of 2019/381 on 02.10.2019. In this study, the medical records of 51 patients who were followed up and treated with ERCP perforation among all ERCP procedures (n=8676) between November 2010 and March 2018 were examined retrospectively from the hospital records.

All ERCP perforations were divided into two groups according to the time of diagnosis: the patients with perforation noticed or suspected during ERCP, who were diagnosed and started to be treated within the first 24 hours, were classified as the early diagnosis group (Group 1) while the patients with the diagnosis of ERCP perforation after 24 hours were classified as the delayed diagnosis group (Group 2).

In the early period, the diagnosis of perforation was either diagnosed radiologically by contrast leakage during the procedure, by visual detection of perforation during endoscopy, or by post-ERCP abdominal tomography if the endoscopist suspected a perforation during the procedure. The delayed diagnosis perforation was made with the abdominal tomography following either the abdominal pain exacerbated 24 hours after the procedure, fever or examination findings of the acute abdominal syndrome.

After clinical and demographic characteristics of all cases were examined, ERCP perforations were classified according to the Stapfer classification system.[1] This classification was selected since it is the most frequently used and directs the anatomical localization of the perforation, the severity of the injury and the need for surgical interventions. The four types of perforations include Stapfer Type I perforation (acute perforation of the medial or lateral wall of the duodenum intraperitoneally before choledochal cannulation utilizing a lateral-view endoscope); Type II perforation (perforation of the peripapillary duodenum during sphincterotomy); Type III perforation (bile duct perforation with a guidewire, choledochal stenting or stone extraction,), and Type IV perforation (patients having air in retroperitoneum due to excessive insufflation).

We compared the mortality in the early and delayed diagnosis groups concerning primary disease diagnoses, blood and biochemical tests before ERCP, perforation type, treatment method, clinical features and duration of hospitalization. In addition, during ERCP, papillary interventions were compared concerning stent placement, choledochal dilatation and the number of ERCP procedure attempts for a specific patient if needed more than once. We managed the medical and surgical surveillances of our perforation cases following the algorithm suggested by Miller et al.[7]

In statistical analyses, the normal distribution of the data was tested using Kolmogorov Smirnov and Shapiro-Wilk. The test revealed that our data were not normally distributed (p<0.05). Therefore, the Mann-Whitney U test was used to compare all biochemical values in the groups. Chi-square analysis was used to analyze ERCP related procedures and clinical parameters in the groups. All statistical analyses were performed using SPSS 22.0 program, while p<0.05 was set as the significance level.

RESULTS

Between November 2010 and March 2018, 8676 ERCP procedures were performed in the Gastroenterology Department of our Hospital. In this study, 51 ERCP perforations (0.59%) were followed up and treated in General Surgery and Gastroenterology Clinics during this period.

The mean age of ERCP perforations was 62.78±17.13 (ranging from 24 to 89 years old) while 56.9% of the patients (n=29) were women.

According to the Stapfer classification, type II perforations (49%) were the most commonly observed type of perforation in our patients. However, most of the mortality seen among all of the patients was due to type I perforations (62.5%).

Concerning the clinical features of all patients (Table 1), the choledochal diameter was larger than 8 mm in 70.6% of the patients. Papillary sphincterotomy procedure was performed

to 80.4%, while stenting was performed to 60.8% of the patients. Only 24 of ERCP perforations were surgically treated while conservative medical follow-up and treatment was applied to the other 27 patients.

The hospitalization duration of the patients who were treated surgically (13.38±10.09 days) was significantly higher than that of the patients treated medically (4.19±2.86 days) (p=0.001). More choledochal stents were placed into the patients who were medically treated, compared to patients treated with surgery (74.1% vs. 45.8%, respectively) (p=0.039). Total mortality following the ERCP perforation was seen in only seven patients (13.72%). Choledocholithiasis and periampullary tumors were the majority of the primary diagnoses of the patients (Table 2). A percentage of 78.4% of ERCP perforations (n=40) were detected early period (Group 1). However, only 13 of 40 patients were detected using contrast agent leakage. The vast majority of the ERCP perforations were detected visually by the physician's experience during the procedure or

by postoperative computerized abdominal tomography due to the possibility for ERCP perforation. On the other hand, 21.6% of the total patients were diagnosed with ERCP perforation in the late period (Group 2) (n=11). More clinical and biochemical comparisons of the groups are seen in Table 3. No statistically significant differences were observed among the Stapfer perforation types concerning the blood values before ERCP, biochemical values, time of diagnosis or duration of hospitalization (p>0.05).

In 88.2% of all ERCP perforation patients (n=45), after applying sphincterotomy or choledochal stenting or stone extraction for primary disease, the perforation was noticed towards the end of the ERCP or after the procedure. In the other six patients, the perforation was detected early during ERCP without choledochal cannulation or sphincterotomy; therefore, the procedure was terminated. Since Stapfer type I perforation occurred in these patients, duodenal primary repair and peritoneal drainage surgery were performed for

Table 1. General, clinical and demographic features of the ERCP perforations

	Patient (n=51)	
Age	62.78±17.13	(24–89)
Gender (female/male)	29/22	59.9%/40.1%
Stapfer perforation classification		
Type 1	16	31.4%
Type 2	25	49.0%
Type 3	7	13.7%
Type 4	3	5.9%
Choledochal diameter (>8 mm)	36	70.6%
Papillotomy	41	80.4%
Choledochal stenting	31	60.8%
Early detection of perforation (within 24 hours)	40	78.4%
Choledochal stone extraction with ERCP	22/27	
Surgical treatment	24	47.06%

ERCP: Endoscopic retrograde cholangiopancreatography.

Table 2. The primary diagnosis of patients before ERCP procedure

Diagnoses	Group 1 (Early diagnosis) n=40	Group 2 (Delayed diagnosis) n=11	Total
Choledocholithiasis	27	5	32
Periampullary tumor	6	2	8
Postoperative choledochal stricture	2	1	3
Klatskin tumor	2	1	3
A postoperative bile leak	1	1	2
Periampullary diverticulum, papillary adenoma	2	1	3

ERCP: Endoscopic retrograde cholangiopancreatography.

Table 3. The comparisons between ERCP perforation groups

	Group 1 (n=40)	Group 2 (n=11)	p-values
Stapfer classification [Type I/II/III/IV]	11/22/6/1	5/3/1/2	0.108
Surgical treatment	16/40 (40%)	8/11 (72 7%)	0.054
Multiple ERCP procedure (2 or more procedures)	9/40	3/11	0.741
Choledochal diameter (>8 mm)	30/40	6/11	0.187
Choledochal cannulation	30/40	10/11	0.256
Choledochal stenting	26/40	5/11	0.240
Papillotomy	30/40	11/11	0.064
Contrast leak	12/40	1/11	0.159
Lenght of hospitalization (days)	7.43±6.28	12.55±13.60	0.713
Pre-ERCP laboratory values			
C-reactive protein (mg/L)	32.28±33.98	71.94±72.47	0.270
Leukocyte (10^3/μL)	8.77±3.87	12.31±5.73	0.044
Neutrophil (10^3/μL)	6.41±3.77	8.78±5.39	0.119
Lymphocytes (10^3/μL)	1.51±0.73	2.54±2.22	0.276
Total bilirubin (mg/dL)	5.68±5.67	7.14±8.49	0.991
Direct bilirubin (mg/dL)	4.26±5.18	4.50±5.81	0.963
Alkaline phosphatase (U/L)	300.33±228.70	325.64±340.12	0.590
Gamma Glutamyl Transferase (U/L)	380.05±366.13	439.55±481.63	0.837
Alanine transaminase (U/L)	136.34±157.56	191.00±261.69	0.360
Aspartate transaminase (U/L)	102.38±111.67	194.00±341.97	0.372
Amylase (U/L)	117.23±127.07	150.64±165.11	0.565
Albumin (g/L)	3.64±0.59	3.52±0.92	0.973
Mortality	3/40	4/11	0.014

ERCP: Endoscopic retrograde cholangiopancreatography.

them. When all perforations were evaluated together, we observed that surgical procedures, such as choledochotomy, stone extraction, and t-tube placement, were performed in 11 patients during the same hospitalization for their primary diseases.
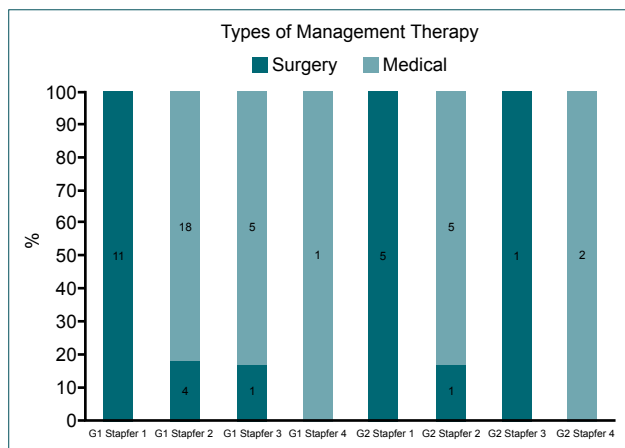

Figure 1. Frequency of the various types of management therapy according to the groups. G1: Group 1 (The early diagnosed patients); G2: Group 2 (The delayed diagnosed patients).

Group 1 and 2 patients were compared concerning treatment by Stapfer injury type (Fig.1). Duodenal primary repair and peritoneal drainage surgery were performed for all patients in the Stapfer type I injury group. In Stapfer type II injury group, the rate of surgery in group 1 was 18.2%, and only one of these patients underwent duodenal primary repair. Cholecystectomy, choledochal t-tube application, and peritoneal drainage were performed for the other patients in this group. In the delayed diagnosed group, the rate of surgery was 66.6%. The surgical decisions were made in both patients due to acute abdominal and sepsis findings. In the Stapfer type III injury group, t-tube application and peritoneal drainage surgery were performed in one patient in each group while all patients were treated medically in the Stapfer type IV injury group.

ERCP perforations were diagnosed in the patients with delayed diagnosis (Group 2) (n=11) using abdominal tomography following abdominal pain. The abdominal tomography revealed widespread free air densities in intraabdominal and/ or retroperitoneal, perirenal, periampullary regions. An urgent surgical treatment was required for 72.7% of patients in the group 2. In this group, ten patients received choledochal

cannulation, five patients received choledochal stenting, and all had papillotomy. Anterior incision with a needle-tipped papillotomy was required in only one patient. Three patients who were followed-up medically without surgery were in the Stapfer II and Stapfer IV perforations. Among these three patients, one patient had already a stent from the previous ERCP session, and the other two were patients with choledochal stenting during the procedure.

Four of the patients (36.4%) in the Group 2 had a mortal course. The causes of mortality were found to be related to septic shock in two patients, while postoperative myocardial infarction accompanied by septicemia and recurrent atrial fibrillation for other two patients. The characteristics of patients with late detection of ERCP perforation are shown in Table 4.

Compared to the group diagnosed early, leukocyte levels were found to be higher in patients whose ERCP perforation was detected after 24 hours of the procedure (p=0.044). Concerning mortality, a statistically significant difference was observed between the early and delayed diagnosis of ERCP perforation (p=0.014), clearly demonstrating that the mortality rate (7.5%) of patients diagnosed with ERCP perforation in the early period was lower.

DISCUSSION

In this study, we examined 51 patients who had undergone ERCP procedures, which resulted in perforations, covering the past eight years in our clinic. The findings of this study showed that the mortality rate of patients who diagnosed and were treated early was significantly lower compared to patients who were diagnosed late. Another finding was that surgical treatment was also higher in lately diagnosed patients. Moreover, the patients with Stapfer type II and III perforations that endoscopically had choledochal stenting had successful outcomes.

Similarly, in the examination of 14045 patients over 10 years, Bill et al.[4] reported that there was a lower incidence of systemic inflammatory response syndrome, less need for intensive care, and shorter hospital stay for patients whose ERCP perforation was detected during the ERCP procedure.[4] Although the mortality rate difference between the early and delayed diagnosis was not significant in all ERCP perforations, they showed that delayed diagnosis increased mortality in especially type I and type II perforations. Although it did not reach the level of statistically significance in our study, the duration of hospitalization was also shorter in the patients who were diagnosed early. In fact, this was due to the relatively extended length of required hospital stay for the patients who had to be treated surgically. It was also noteworthy that pre-ERCP leukocyte values were found to be high in patients who were delayed diagnosed perforation.

According to the reported data in the literature, the early diagnosis incidence of ERCP perforation is above 70% in the experienced centers.[7] In a similar manner, the detection rate of ERCP perforation in the early period was 78.4% in our

Table 4. Demographic and clinical characteristics of the delayed diagnosis group (group 2) in ERCP perforations

Age	Gender	Type of perforations	Time to diagnosis (days)	Diagnosis	Treatment type	Length of hospitalization (days)	The cause of mortality
49	Female	I	2	Choledocholithiasis	Surgery	18	
75	Male	I	6	Choledocholithiasis	Surgery	40	
63	Male	IV	1	Pancreas tumor	Medical	5	
63	Female	I	3	Hydatid cyst, cholangitis	Surgery	2	Exitus (Septic shock)
61	Female	II	1	Periampullary diverticulum	Medical	2	
51	Male	I	2	Choledocholithiasis	Surgery	30	
52	Male	IV	2	Choledocholithiasis	Medical	1	
65	Female	II	1	Benign stricture	Surgery	19	
71	Male	III	5	Pancreas tumor	Surgery	19	Exitus (Septicemia, Myocardial infarction)
24	Female	II	1	Choledocholithiasis	Surgery	1	Exitus (Septic shock)
72	Female	I	4	Klatskin tumor	Surgery	1	Exitus (Septicemia, Atrial fibrillation)

ERCP: Endoscopic retrograde cholangiopancreatography.

series. Since late diagnosis increased both the rate of surgery and mortality, the detection of the type of perforation during the procedure or in the early period offers a good opportunity for early medical intervention. Though the contrast agent extravasation, retroperitoneal air or intraperitoneal air may be seen in the detection of perforation, the amount of air does not indicate the severity of the perforation.[8] In our clinical experience, the attention of the endoscopist was significant in recognizing perforation early. Therefore, even suspicion of ERCP perforation was one of the indications for post-ERCP abdominal tomography, which helped us for an early diagnosis.

Prevention of fluid leakage into the peritoneal area by correcting the gastrointestinal luminal continuity in the early period is imperative. Therefore, oral feeding was temporarily suspended for all patients who were diagnosed with a perforation in our clinic. Furthermore, nasogastric decompression, proton pump inhibitors, and appropriate antibiotherapy were administrated. Definitive treatment was also planned depending on the time of detection of localization and perforation. All patients with type I perforation were treated with the surgical repair since the current algorithms and general consensus suggest that the surgery is a more effective treatment option for type I perforations.[1,6] Endoscopic mucosal clipping techniques for type I perforation, which was noticed during the ERCP procedure, can be preferred in suitable patients. Interestingly, four of the seven deaths which developed after the ERCP perforation were in the type I perforation. This suggests that the duodenal injury may be controlled with a conventional forward-viewing-endoscope at the end of the ERCP procedure or all patients may be radiologically evaluated for free air under the diaphragm.

In type II and type III perforations, clinical follow-up is recommended primarily for patients with choledochal stents while the surgical options should be considered in the case of acute abdominal signs or sepsis. Moreover, if contrast leakage is minimal in non-stented patients, it is a good choice to place a stent in choledochus endoscopically or perform a percutaneous drainage accompanied by ultrasound. Along with such options, early definitive surgery for type II perforation may also be considered; however, the annual ERCP number and the level of evidence of the specified study are not high.[7] Since non-surgical interventional treatment methods are mostly available in the fully equipped tertiary centers in our country, the chance of success may be considered to be relatively high depending on the experience. On the other hand, the type IV perforations, which are rather not considered as a true perforation, are in the form of air transfer from the intestine to the retroperitoneum due to excessive air insufflation. Thus, they do not require any surgical treatment. In an abdominal CT scan taken 24 hours after the ERCP, in 29% of all cases, retroperitoneal air can be detected.[9] However, surgical exploration is almost never necessary, excluding the patients with acute abdominal signs, which cannot be ruled out from having an overlooked perforation despite all non-invasive diagnostic modalities.

The patients with anatomical abnormalities around the sphincter and patients with a history of Billroth II diversion surgery are in the risk group and deserve excessive attention.[10,11] To reduce the possibility of a type I perforation occurrence, it is necessary to be aware of the predisposing factors[12] along with paying the highest attention to the manipulations with the side-viewing endoscope during an ERCP procedure. In the setting of a perforation, early diagnosis can very effectively reduce mortality.[13] For the patients who require surgery, sepsis and an unstable patient significantly impact the surgical procedure. Therefore, in addition to an effective repair, biliary and gastrointestinal diversion techniques may be preferred.

According to an analytic-study which evaluated studies performed between 2000 and 2014, the incidence of perforation was as low as 0.39%,[14] while a sphincterotomy was associated with 41% of these perforations, which supports that the early diagnosis of a perforation (73%) during the same ERCP procedure, resulted in better outcomes. In the evaluation of

Table 5. ERCP-related perforations and mortality rates

Study published by	Publication year of the study	Study duration (years)	Number of ERCP procedures	Perforation rate	Stapfer Type I perforation number	Surgery rate	Mortality rate
Fatima[15]	2007	11	12427	76 (0.6%)	8	22 (28.9%)	5 (6.6%)
Morgan[16]	2009	13	12817	24 (0.2%)	0	10 (41.7%)	1 (4.2%)
Jin[5]	2013	7	22998	59 (0.26%)	17	18 (30.5%)	5 (8.4%)
Kodali[17]	2015	10	8264	12 (0.14%)	2	3 (25%)	0
Kumbhari[6]	2016	14	3331	61 (1.83%)	7	9 (15%)	2 (3%)
Bill[4]	2018	10	14045	63 (0.46%)	14	9 (14.28%)	3 (4.76%)
The present study	2020	8	8676	51 (0.59%)	16	24 (47.06%)	7 (13.72%)

ERCP: Endoscopic retrograde cholangiopancreatography.

these 18 separate studies in the review, it is clearly seen that the mortality was higher in the groups which required surgical treatment.

In experienced centers with a high number of patients, the perforation rate is below 1%. When compared with high volume studies performed in the past 12 years (Table 5), we observed that our type I perforations were high. Thus, the number of surgical treatments was inevitably also high. We should also note that in our study the patients who were diagnosed lately led to this high number as an outcome. In the light of the latest available data, it is unlikely that ERCP perforations can completely be prevented. The majority of our patients with mortality were patients with underlying conditions, such as malignancy, chronic obstructive pulmonary disease (COPD) and atrial fibrillation. To reduce the mortality, it is significant to be careful in pre-ERCP risk groups and to diagnose all patients early to avoid the type I perforation.

This study has some limitations. One of the limitations that would potentially affect the results is that the presence of a high number of patients with significant comorbidities may disrupt randomization due to the referral of patients to the department as a tertiary medical institution. Another potential limitation is that although we obtained the detailed data (diagnostic codes, patient files, ERCP reports and surgery notes) from the hospital database, there is a possibility that there may be patients whose diagnosis and follow-up are overlooked, especially when they are asymptomatic. Another limitation, if the number of patients were high in our study, the early diagnosis group would be sub-grouped as the patients who were diagnosed during ERCP and within the first 24 hours.

Taking all into consideration, although our ERCP-related perforations were rare, the overall mortality was 13.72%. The patients who were diagnosed at an early stage required less surgery, with the exception of type I perforations. Type II perforations can often be safely treated non-operatively if there are no signs of an acute abdomen or sepsis. Finally, ERCP-related mortality is significantly reduced when early diagnosis and treatment can be made, especially during the first 24 hours of a perforation.

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REFERENCES

1. Stapfer M, Selby RR, Stain SC, Katkhouda N, Parekh D, Jabbour N, et al. Management of duodenal perforation after endoscopic retrograde cholangiopancreatography and sphincterotomy. Ann Surg 2000;232:191–8. [CrossRef]

2. Cotton PB, Lehman G, Vennes J, Geenen JE, Russell RC, Meyers WC, et al. Endoscopic sphincterotomy complications and their management: an attempt at consensus. Gastrointest Endosc 1991;37:383–93. [CrossRef]

3. Enns R, Eloubeidi MA, Mergener K, Jowell PS, Branch MS, Pappas TM, Baillie J. ERCP-related perforations: risk factors and management. Endoscopy 2002;34:293–8. [CrossRef]

4. Bill JG, Smith Z, Brancheck J, Elsner J, Hobbs P, Lang GD, et al. The importance of early recognition in management of ERCP-related perforations. Surg Endosc 2018;32:4841–9. [CrossRef]

5. Jin YJ, Jeong S, Kim JH, Hwang JC, Yoo BM, Moon JH, et al. Clinical course and proposed treatment strategy for ERCP-related duodenal perforation: a multicenter analysis. Endoscopy 2013;45:806–12. [CrossRef]

6. Kumbhari V, Sinha A, Reddy A, Afghani E, Cotsalas D, Patel YA, et al. Algorithm for the management of ERCP-related perforations. Gastrointest Endosc 2016;83:934–43. [CrossRef]

7. Miller R, Zbar A, Klein Y, Buyeviz V, Melzer E, Mosenkis BN, et al. Perforations following endoscopic retrograde cholangiopancreatography: a single institution experience and surgical recommendations. Am J Surg 2013;206:180–6. [CrossRef]

8. Wu HM, Dixon E, May GR, Sutherland FR. Management of perforation after endoscopic retrograde cholangiopancreatography (ERCP): a population-based review. HPB (Oxford) 2006;8:393–9. [CrossRef]

9. Genzlinger JL, McPhee MS, Fisher JK, Jacob KM, Helzberg JH. Significance of retroperitoneal air after endoscopic retrograde cholangiopancreatography with sphincterotomy. Am J Gastroenterol 1999;94:1267–70.

10. Avisse C, Flament JB, Delattre JF. Ampulla of Vater. Anatomic, embryologic, and surgical aspects. Surg Clin North Am 2000;80:201–12.

11. Vaira D, Dowsett JF, Hatfield AR, et al. Is duodenal diverticulum a risk factor for sphincterotomy?. Gut 1989;30:939–42. [CrossRef]

12. Loperfido S, Angelini G, Benedetti G, Chilovi F, Costan F, De Berardinis F, et al. Major early complications from diagnostic and therapeutic ERCP: a prospective multicenter study. Gastrointest Endosc 1998;48:1–10.

13. Ercan M, Bostanci EB, Dalgic T, Karaman K, Ozogul YB, Ozer I, et al. Surgical outcome of patients with perforation after endoscopic retrograde cholangiopancreatography. J Laparoendosc Adv Surg Tech A 2012;22:371–7. [CrossRef]

14. Vezakis A, Fragulidis G, Polydorou A. Endoscopic retrograde cholangiopancreatography-related perforations: Diagnosis and management. World J Gastrointest Endosc 2015;7:1135–41. [CrossRef]

15. Fatima J, Baron TH, Topazian MD, Houghton SG, Iqbal CW, Ott BJ, et al. Pancreaticobiliary and duodenal perforations after periampullary endoscopic procedures: diagnosis and management. Arch Surg 2007;142:448-54; discussion 454–5. [CrossRef]

16. Morgan KA, Fontenot BB, Ruddy JM, Mickey S, Adams DB. Endoscopic retrograde cholangiopancreatography gut perforations: when to wait! When to operate!. Am Surg 2009;75:477–84. [CrossRef]

17. Kodali S, Mönkemüller K, Kim H, Ramesh J, Trevino J, Varadarajulu S, et al. ERCP-related perforations in the new millennium: A large tertiary referral center 10-year experience. United European Gastroenterol J 2015;3:25–30. [CrossRef]

ORİJİNAL ÇALIŞMA - *ÖZET*

ERCP perforasyonlarında erken ve gecikmiş tanının mortalite ile karşılaştırılması: Yüksek hacimli hasta deneyimi

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AMAÇ: Endoskopik retrograt kolanjiyopankreatografi (ERCP) perforasyonu nadir görülen, fakat mortalitesi yüksek seyredebilen bir komplikasyondur. Bu çalışmada, cerrahi veya tıbbi tedavi edilen ERCP perforasyonlarına insidans, klinik veriler ve tanı zamanına göre klinik değerlendirme yapıldı. ERCP perforasyonlarının azaltılabilmesi için klinik özelliklerinin ortaya konulması, literatür ile karşılaştırılması ve mortalitenin azaltılması hedeflendi.

GEREÇ VE YÖNTEM: Bu klinik geriye dönük çalışmada 8 yılda yapılan tüm ERCP işlemleri (n=8676) içinde 51 perforasyon saptandı. Erken tanı konulan [Grup 1: 40], geç tanı konulan [Grup 2: 11] gruplar primer tanıları, ERCP öncesi kan ve biyokimyasal incelemeleri, perforasyon tipi, tedavi yöntemi, klinik özellikleri, yatış süresi, mortalite yönünden karşılaştırıldı. Ek olarak ERCP sırasında papillotomi, stent yerleştirilmesi, koledok dilatasyonu, ERCP işlemi sayısı yönünden karşılaştırıldı.

BULGULAR: Hastanemizde ERCP perforasyonu oranı %0.59'du. Hastaların çoğunluğu koledokolitiazis ve periampuller tümörlerdi. Hastaların yaşı 62.78±17.13 (24–89); %56.9'u (n=29) kadındı. En sık stapfer tip II perforasyonlar (%49) görüldü. Ancak mortalitenin %62.5'i stapfer tip I'di. Toplam mortalite %13.72 (n=7) idi. Cerrahi tedavi edilen hastaların (n=24) yatış süresi (13.38±10.09 gün) daha fazla idi. Tıbbi tedavi edilenlere (%74.1) daha çok koledok stenti yerleştirilmişti (p=0.039). Grup 1, ERCP sırasında görsel olarak veya kontrast madde kaçağı (13/40) ile veya şüphe nedeniyle tomografi ile tespit edildi. Grup 2 hastaların Pre-ERCP lökosit seviyesi daha yüksekti (p=0.044). Acil cerrahi gereksinimi %72.7 ve mortalite %36.4 idi. Perforasyonunun erken ve geç farkedilmesi arasında mortalite açısından farklılık belirlendi (p=0.014).

TARTIŞMA: Erken tanı konulanlarda, tip I perforasyonlar hariç, daha az cerrahi gereksinim olmuştur. Tip II perforasyonlar, akut karın ve sepsis bulguları yok ise, çoğunlukla non-operatif güvenli bir şekilde tedavi edilebilmektedir. Erken tanı ve tedavi mortaliteyi azaltmaktadır.

Anahtar sözcükler: Erken tanı, Endoskopik retrograt kolanjiopankreatografi, Mortalite, Perforasyon, Cerrahi