

Management of post-ERCP duodenal perforations: experience at Hospital Juárez de México

Manejo de las perforaciones duodenales post-CPRE: experiencia en el Hospital Juárez de México

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Abstract

Background: Endoscopic retrograde cholangiopancreatography (ERCP) is an endoscopic study in which the duodenum is observed laterally, and the bile duct is instrumented. There are several indications and complications in the procedure. **Objective:** To determine the incidence of duodenal perforations, using the Stapfer classification in the Hospital Juárez de México over a period of 5 years, as well as the management implemented in such cases. **Method:** The study was carried out at the Hospital Juárez de México of the Ministry of Health. All patients who underwent ERCP between January 1, 2017, to May 30, 2022 were included. **Results:** 485 ERCP were performed in the study period. Incidence of 1.6% post-ERCP duodenal perforation. The average age of the subjects 56.37 years. In-hospital stay of post-ERCP perforations averaged 9.37 days. The time of the endoscopic study at the time of the surgical procedure is 10 h on average. **Conclusions:** Post-ERCP duodenal perforation is a complication that occurs with a low incidence, it tends to increase the number of days of in-hospital stay and increases morbimortality of patients; therefore, it is important to be always alert.

Keywords: ERCP. Perforation. Duodenum. Complication.

Resumen

Antecedentes: La colangiopancreatografía retrógrada endoscópica (CPRE) es un estudio endoscópico en el cual se observa lateralmente el duodeno y se instrumenta la vía biliar. Existen diversas indicaciones y complicaciones en el procedimiento. **Objetivo:** Determinar la incidencia de perforaciones duodenales utilizando la clasificación Stapfer para ubicación anatómica en el Hospital Juárez de México en un periodo de 5 años, así como el manejo implementado en dichos casos. **Método:** El estudio se realizó en el Hospital Juárez de México de la Secretaría de Salud. Se incluyeron todos los pacientes sometidos a CPRE entre el 1 de enero de 2017 y el 30 de mayo de 2022. **Resultados:** Se realizaron 485 CPRE en el periodo de estudio. Hubo una incidencia del 1.6% de perforación duodenal post-CPRE. El promedio de edad de los sujetos fue de 56.37 años. La estancia hospitalaria de los pacientes con perforación post-CPRE fue en promedio de 9.37 días. El tiempo del estudio endoscópico al momento de realizar el procedimiento quirúrgico fue de 10 h en promedio. **Conclusiones:** La perforación duodenal post-CPRE es una complicación que ocurre con una baja incidencia, suele aumentar los días de estancia intrahospitalaria y aumenta la morbimortalidad de los pacientes, y por ello es importante estar siempre alerta.

Palabras clave: CPRE. Perforación. Duodeno. Complicación.

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Date of reception: 27-05-2022

Date of acceptance: 22-02-2023

DOI: 10.24875/CIRUE.M23000714

Cir Cir (Eng). 2023;91(6):811-815

Contents available at PubMed

www.cirugiaycirujanos.com

Introduction

Perforation during endoscopic retrograde cholangiopancreatography (ERCP) can occur at an incidence of less than 1%, leading to various injuries that increase morbidity and mortality¹. Perforations during ERCP typically occur during sphincterotomy, guide placement, or due to inadequate manipulation of the endoscope during bile duct stone extraction². Duodenal wall perforation results from improper positioning of the endoscope during bile duct drainage³. Mortality rate for duodenal perforation ranges from 16% up to 18%, which is associated with delays in diagnosis and treatment, as it can lead to sepsis and multiple organ failure⁴.

Stapfer categorized endoscopic procedural perforations into 4 categories based on severity:

- Type I: corresponds to perforation of the lateral or medial portion of the duodenal wall, which can cause leak of a large volume of intestinal content. This occurs due to incorrect manipulation of the endoscope or migration of the bile duct stent. Type I lesions typically cause persistent leakage of pancreatic juice into the retroperitoneum or abdominal cavity, requiring early diagnosis and treatment.
- Type II: refers to ampullary perforations that usually occur during sphincterotomy. The retroperitoneum is usually the site where leaked material deposits. Depending on the lesion and nature of the leak, it is decided whether surgical treatment is necessary or conservative management is sufficient.
- Type III: refers to bile duct perforations that occur during guide placement or procedures for stone extraction from the bile duct. These lesions are generally small and require medical management with appropriate drainage.
- Type IV: refers to microperforations into the retroperitoneum that occur during sphincterotomy, with leak of material or gas into the retroperitoneal space. Most of these lesions are managed conservatively with medical care⁵⁻⁸.

The severity of ERCP-related perforations can be categorized based on symptoms:

- Minor perforations are those with leaks of intestinal secretions that require hospitalization for at least 3 days.
- Moderate perforations require 4 to 10 days of hospitalization with conservative treatment.
- Severe perforations are those where the patient requires more than 10 days of hospitalization with conservative, radiological, or surgical treatment^{9,10}.

Various risk factors increase the likelihood of perforation during endoscopic procedures, such as advanced age, Oddi sphincter dysfunction, papillary stenosis, anatomical abnormalities, difficult cannulation, or multiple cannulation attempts^{11,12}.

Clinically, post-ERCP perforations can range from asymptomatic to acute abdomen. In the initial stages, patients may be asymptomatic or only exhibit mild abdominal pain, and such lesions may easily go unnoticed¹³. Therefore, continuous observation is essential for patients suspected of perforation or those with multiple above-mentioned risk factors^{14,15}.

Method

This is a descriptive, observational, retrospective, and cross-sectional study that includes all cases of ERCP-related perforation during the study period. Inclusion criteria were all patients undergoing ERCP at Hospital Juárez de México from January 1st, 2017 through May 1st, 2022, who experienced procedure-related perforations. Diagnosis of duodenal perforation was established through direct visualization during an endoscopic procedure or as a post-study tomographic finding. Exclusion criteria were patients who requested voluntary discharge during hospitalization and those who had ERCP performed at another health institution. Patients with incomplete records and minors were excluded.

A database was created to identify patients admitted with a diagnosis of choledocholithiasis or cholangitis. Once the health records were identified, they were reviewed to determine the endoscopic procedure performed, the complications encountered, and the type of injury following Stapfer's classification, the clinical status of the patients, the management implemented by the service, and the patients' outcomes. An Excel database was compiled including the patient's name, record No., age, sex, diagnosis, type of injury, clinical status, and outcomes.

Data analysis was performed using SPSS. The mean age of patients with post-ERCP complications, sex distribution, the percentage of most common conditions associated with post-ERCP complications, the frequency of lesions according to Stapfer's classification and their correlation with admission pathologies, the percentage of patients with inflammatory response syndrome at the time of diagnosis of post-ERCP complications, the mean time until treatment for these complications at Hospital Juárez de México, the most common anatomical location, and the most common comorbidity associated with post-ERCP complications were obtained.

Results

During the study period, a total of 485 ERCPs were performed. In 2017, 112 procedures were performed (23.09%), 67 of which were performed in women (59.82%) and 45 in men (40.17%). In 2018, a total of 69 procedures were performed (14.22%), 50 in women (72.46%) and 19 in men (27.53%). In 2019, 142 procedures were performed (29.27%), 82 in women (57.74%) and 60 in men (43.66%). In 2020, 67 procedures were performed (13.81%), 44 in women (65.67%) and 23 in men (34.32%). In 2021, 87 procedures were performed (17.93%), 61 in women (70.11%) and 26 in men (29.88%). In 2022, a total of 8 procedures were performed (1.64%), 6 in women (75%) and 2 in men (25%). Therefore, of the 485 ERCPs, 310 were performed in women (63.91%) and 175 in men (36.09%). A total of 84 cases of duodenal perforation were recorded during the same period. Records with a history of ERCP and duodenal perforation were evaluated, and 8 cases were found (Fig. 1).

Of these cases, 50% were men and 50% were women. The participants' mean age was 56.37 years (standard deviation [SD], 18.59) (Fig. 2). Regarding comorbidities, 25% had none, 25% had diabetes mellitus, 12.5% had systemic arterial hypertension, and 37.5% had both diabetes mellitus and hypertension.

Regarding the length of stay of patients with post-ERCP perforations, the mean length was 9.37 days (SD, 3.46). Of the cases studied, 25% developed pneumonia and 75% had no additional morbidities. The most common indication for ERCP was choledocholithiasis, in 87.5%, while only 12.5% were indicated for jaundice syndrome.

Endoscopic findings were as follows: pancreatic head cancer in 12.5%, Klatskin bile duct cancer in 12.5%, severe Oddi sphincter dysfunction in 12.5%, choledocholithiasis in 37.5%, contrast medium leak in 12.5%, and duodenal perforation in 12.5%. The procedures performed during the study were: bile duct stent placement in 25%, sphincterotomy plus stenting in 12.5%, sphincterotomy plus balloon sweep in 25%, and sphincterotomy alone in 37.5% (Fig. 3).

The endoscopic lesions reported were: Stapfer I in 37.5%, Stapfer II in 12.5%, no Stapfer III cases, and Stapfer IV in 50%. The anatomical location of duodenal perforation post-ERCP was the second portion of the duodenum in 50% of cases; in the remaining 50%, the lesion could not be identified. Of these patients, 25% had inflammatory response syndrome and 75% did not. It was observed that 37.5% of cases did not require

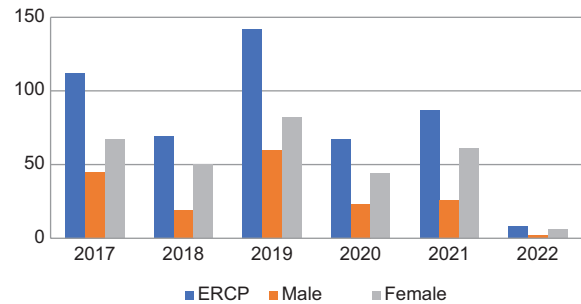


Figure 1. Endoscopic retrograde cholangiopancreatographies performed from 2017 through 2022, distribution by year and sex.

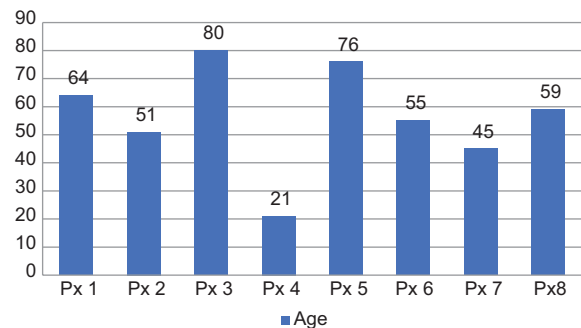


Figure 2. Ages of patients. The mean age was 56.37 years.

additional studies for the diagnosis of duodenal perforation, and 62.5% underwent computed tomography.

Of the cases presented, a total of 37.5% required surgical management while 63.5% were managed conservatively. For surgical management, primary closure of the duodenal perforation was performed in 100% of cases. The mean time from the endoscopic procedure to surgical intervention was 10 hours (SD, 11.26).

Discussion

Post-ERCP duodenal perforations have incidence rates from 0.8% up to 1.6%. At Hospital Juárez de México, the incidence rate of post-ERCP perforation during the study period was 1.6%, which falls within global statistics¹⁰.

Several risk factors for post-ERCP duodenal perforation include older age, prolonged endoscopic procedure time, Oddi sphincter dysfunction, papillary stenosis, and anatomical disorders. Notably, in the perforations that occurred among the 485 procedures performed, there was no difference between sexes.

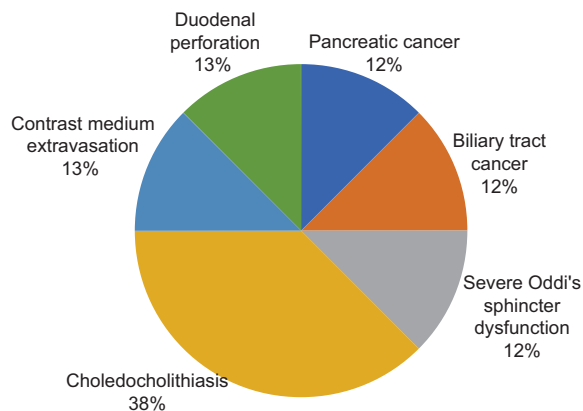


Figure 3. Endoscopic findings of Endoscopic retrograde cholangiopancreatographies associated with subsequent perforation.

The mean age described in the literature for presenting post-ERCP perforation is 51.3 years (SD, 15.8). In the study presented here, the mean age was 56.37 years (SD, 18.59), which can be considered within the risk age range for this complication⁷. Risk factors described by Retuerta et al.⁵ indicate that female sex and advanced age were not criteria in this study, as there was no difference between sexes and the mean age was 56 years. Other risk factors, such as bilirubin levels, post-ERCP pancreatitis, and Oddi sphincter dysfunction, were not included in the study variables, suggesting the need for further research including special tests to evaluate sphincter function prior to endoscopy, and monitoring post-ERCP pancreatitis, which may impact perforation risk⁴.

Post-ERCP duodenal perforations increase the length of stay depending on the type of injury, ranging from 3 days in mild cases to more than 10 days⁸. In the cases presented in this study, the mean length of stay was 9.37 days, with only 2 patients developing pneumonia during this stay. Further studies are needed to observe long-term morbidity in these patients.

Duodenal perforations during ERCP most commonly occur during sphincterotomy, guide placement, or endoscope manipulation. In this case, this is confirmed, as 75% of the perforations are related to the sphincterotomy procedure as a common factor, combined with balloon sweep or stent placement, and 25% occur with stent placement¹.

Post-ERCP duodenal injuries follow the classification established by Stapfer, and based on this, along with the patient's clinical status, a decision is made to perform either surgical or conservative treatment. The most common injury was Stapfer IV, characterized by

microperforations to the retroperitoneum and presenting asymptotically, which was managed conservatively. Of Stapfer I perforations, 100% required surgical intervention with primary closure of the injury^{2,3}. Lafor-gia et al.³ state that surgical intervention should be performed within a matter of 2 to 8 hours if there is no improvement and within 24 hours of the procedure. At Hospital Juárez de México, the mean time from the study to surgical intervention is 10 hours². Although the terms for early and late diagnosis are not yet established, the first 28 hours are considered crucial for diagnosing perforations. Based on this, it can be determined that at Hospital Juárez de México, duodenal perforations post-ERCP are not only diagnosed in a timely manner but also receive timely treatment¹. Cirocchi et al.⁶ describe that early surgical treatment is defined within the first 24 hours for Stapfer I perforations and late when surgical treatment occurs > 24 hours. Therefore, it is confirmed that at Hospital Juárez de México, early surgical treatment is achieved for Stapfer I perforations⁵.

During ERCP, duodenal perforation may or may not be diagnosed, and therefore, 37% of cases did not require additional studies for diagnosis. The usefulness of computed tomography is significant, as it diagnosed 63% of cases where there was suspicion of injury, and patients were asymptomatic¹⁰.

Surgical treatment that can be implemented for these perforations may include primary closure or primary closure plus omental patch as diversion. At Hospital Juárez de México, 100% of cases that required surgery received primary closure of the perforation².

Of note that 30% of cases intervened within the first 24 hours require multiple surgeries; this study only evaluated the first surgical procedure performed during the initial surgical event, leaving room for longer-term follow-up⁵.

Of note that Hospital Juárez de México is a teaching hospital, and most endoscopic procedures are performed by residents in training, under the supervision of an expert in the procedure. However, the prevalence of post-ERCP perforation is comparable to the statistics of other national and international centers. It should also be mentioned that during the study period, Hospital Juárez de México was a referral center during the COVID-19 pandemic, and as a result, endoscopic procedures were fewer compared to other years.

Conclusions

Duodenal perforation post-ERCP is a complication feared by surgeons and endoscopists alike, though it

has a low incidence rate. When it occurs, it increases the length of stay and patient morbidity and mortality, making it crucial to always remain vigilant.

The slow recovery of a patient undergoing ERCP should always raise suspicion of a post-ERCP complication, such as duodenal perforation. A comprehensive evaluation of the patient should be conducted, maintaining constant communication with the endoscopist to identify patients with elevated risk factors, requesting additional studies if needed, and achieving timely diagnosis of the perforation to provide appropriate treatment, tailoring it to each individual case.

Funding

None declared.

Conflicts of interest

None declared.

Ethical disclosures

Protection of human and animal subjects. The authors declare that no experiments were performed on humans or animals for this study.

Confidentiality of data. The authors declare that they have followed the protocols of their work center on the publication of patient data.

Right to privacy and informed consent. The authors have obtained approval from the Ethics Committee for analysis and publication of routinely acquired clinical data and informed consent was not required for this retrospective observational study.

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