

Predicting Failure During Endoscopic Retrograde Cholangiopancreatography: Is There A Better Way? – A Single Centre Study

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Abstract: Endoscopic retrograde cholangiopancreatography (ERCP) is frequently used for the diagnosis and treatment of hepatic, biliary tract, and pancreatic disorders. However, failure during cannulation necessitates other interventions. The aim of this study was to establish parameters that can be used to predict failure during ERCP. A total of 783 ERCP procedures performed on 688 patients, between January 2016 and May 2018, were retrospectively evaluated. The age of the patients ranged between 22 and 74 years, and the mean age was estimated to be 45.4 years. The reasons for performing the ERCP procedure were for jaundice in 60%, abdominal pain in 30 %, others in 10%. Cholangitis was seen in 40% of patients. Cannulation, which is considered to be an indicator of a successful procedure, was possible in 88% patients. A diverticulum was detected in 11% patients. A precut incision was performed in 18 % patients. It was found that the cannulation failure rate increased by 1.11 fold for every one-year increase in age. A tumour infiltrating the ampulla and peptic ulcer increased the failure rate by 68 and 4.47 fold, respectively. Patient gender and duodenal diverticula do not influence the success of cannulation during ERCP. Cannulation rate decreased as the age advanced. A tumour infiltrating the ampulla and peptic ulcer increased the failure rate of cannulation.

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I. Introduction

ERCP is a commonly used procedure for the diagnosis and management of biliary tract and pancreatic disorders. Numerous diagnostic and therapeutic interventions, such as sphincterotomy, stone extraction, and stent placement provide cures for biliary and pancreatic disorders¹. Side-viewing endoscopes (SVS), supportive equipment have helped to establish the current ERCP standards. However, difficulties imposed by the anatomy of the biliary tract and pancreas as well as the need for both an experienced endoscopist and an endoscopic assistant have made ERCP the most complicated and difficult to learn². Although the complication rates of ERCP are higher than those of other endoscopy procedures, they are markedly lower compared to surgical interventions. The morbidity rate following ERCP is 4–15.9% whereas the mortality rate is between 0 and 1%^{3,4}. The success of ERCP involves the cannulation of the biliary tract because cannulation is the first step for both diagnostic and therapeutic interventions⁵. Failure during cannulation renders the ERCP unsuccessful and may require interventions, such as percutaneous transhepatic cholangiography (PTC) and surgery, with higher morbidities⁶. Indian data about ERCP cannulation failure rates are sparse. The present study was designed in view of these facts. By means of a cross sectional study we have tried to establish parameters that can be used to predict failure during ERCP in South Indian population.

II. Material And Methods

Our study involved the retrospective evaluation of 783 ERCP procedures performed on 688 patients by experienced endoscopists in the Department of Digestive health and diseases, attached to Kilpauk Medical College, between January 2016 and May 2018. The aim of the study was to establish the factors that could be used to predict cannulation failures. The cases were evaluated (with the help of a computer) with regard to the following: (1) age, (2) gender, (3) presence of periampullary diverticula, (4) previous upper abdominal surgery, (5) success of cannulation, (6) final diagnosis and (7) additional findings any obtained during endoscopy.

Study Design: Retrospective cross-sectional study

Study Location: This study was done in the Department of Digestive health and diseases, Government peripheral hospital, Kilpauk medical college, Chennai, Tamil Nadu, and India.

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Study Duration: January 2016 to May 2018.

Sample size: 688 patients.

Inclusion criteria:All ERCP Procedures performed between January 2016 and May 2018 were included in the study.

Exclusion criteria:Procedures deferred due to technical reasons were excluded from the study.

Statistical analysis

Data was analyzed using SPSS version 20 (SPSS Inc., Chicago, IL). Chi-square test was performed to test for differences in proportions of categorical variables between two or more groups. The level $P \leq 0.001$ was considered significant.

III. Result

A total of 783 ERCP procedures were performed on 688 patients at the Endoscopy Unit in the Department of Digestive health and diseases, attached to Kilpauk medical college, between January 2016 and May 2018. The procedure was performed two or more times on 85 patients. The age of the patients ranged between 22 and 74 years, and the mean age was estimated to be 45.4 years. The reasons for performing the ERCP procedure were as follows: Jaundice in 60%, abdominal pain in 30 %, others in 10%. Cholangitis was seen in 40% of patients. Cannulation, which is considered to be an indicator of a successful procedure, was possible in 88% patients, while the papilla could not be cannulated in 12% patients. A diverticulum was detected in 11% patients. A precut incision was performed in 18 % patients. A total of 5% patients previously had upper abdominal surgery.

Of the ERCP procedures where cannulation was possible, a papillotomy was performed in 70%. ERCP procedures which involved extraction of calculi from the biliary tract, plastic stent was placed in the biliary tract in 567 patients. Of the 93 patients for whom ERCP had failed, the procedure was repeated for 60 of them. A second ERCP was performed in 50 patients. The data that were collected with regard to age, gender,presence of periampullary diverticula, previous upper abdominal surgery, biliary tract cannulation, andadditional findings obtained during endoscopy were evaluated with regard to their influence on the cannulation success rate using single- and multiple-variable analyses. The mean age for the cases where a successful cannulation could not be performed was 55.6 ± 12.4 years. In the patients for whom a successful cannulation was conducted, the mean age was 48.3 ± 3.5 years. A statistical analysis of these subgroups showed that the cannulation success rates in patients who had a history of previous GI surgery were significantly lower. The cannulation was successful in the second ERCP attempt in 188 patients for whom the first ERCP had failed.In the patients with the additional aforementioned findings, the cannulation success rate was significantly lower (chi-square test, the factors that were found to produce significant differences in the single-variable analysis (i.e., age, gender, a history of upper abdominal surgery, any additional findings obtained in endoscopy) were re-evaluated in a multiple-variable analysis.

Table No 1: Distribution of variables amongst the ERCP procedures (Chi-square test, $P \leq 0.001$)

Variables	Cannulation		Total
	Yes	No	
Success rate	83 (12%)	605 (88%)	688 (100%)
Diverticulum	9 (89%)	8 (11%)	17 (100%)
Precut	14 (18%)	8 (82%)	22 (100%)
Upper abdominal surgery	4 (5%)	10 (95%)	14 (100%)
Papillotomy	51 (70%)	3 (30%)	54 (100%)

Multiple-variable logistic regression analysis was performed using the backward LR method. While the female gender was found to be advantageous for cannulation success rates in the single-variable analysis, the multiple-variable analysis did not reveal a statistically significant difference with regard to gender. It was found that the cannulation failure rate increased by 1.11fold ($P \geq 0.05$) for every one-year increase in age.A tumour infiltrating the ampulla and peptic ulcer increased the failure rate by 68 and 4.47 fold respectively ($P \leq 0.05$).

IV. Discussion

Success during ERCP implies the cannulation of the biliary tract because cannulation is the first step for both diagnostic and, if necessary, therapeutic interventions⁵. It should also be noted that cannulation failure renders ERCP unsuccessful and may lead to serious consequences andmay necessitate interventions with higher morbidities⁶.There are few studies in the medical literature regarding age and cannulation success rates during ERCP. Lobo et al showed that frequency of periampullary diverticula increases significantly in patients over 75 years of age, and they found that cannulation success rates decrease significantly due to diverticula that increase with age⁷.

When evaluating our data, increasing age was found to be a risk factor for successful cannulation in the single-variable analysis. In the multiple-variable analysis, the failure rate was found to have increased by 1.11-fold for each one-year increase in the patient's age. There is also no data regarding the impact of gender on the cannulation success rate. In a Japanese study, the success of ERCP was reported to be lower in women⁵. Although the cannulation success rate was found to be significantly lower in the single-variable analysis in our series, gender was not found to be a factor influencing the failure of ERCP in the multiple-variable analysis. The relationship between duodenal diverticula and the cannulation success rate has been investigated in detail. There are different views regarding the effect of duodenal diverticula on cannulation. Lobo et al.⁷ determined that the frequency of duodenal diverticula increases with age and decreases the cannulation success rate. They found that the success of treating intradiverticular papillas was significantly lower than that of juxtadiverticular papillas.

In a study conducted on 400 patients, Boix et al detected periampullary diverticula in 131 (32.8%) patients. They classified these diverticula according to the location of the papilla: Type 1 where the papilla is inside the diverticulum, In Type 2 papilla is on the border of the diverticulum, Type 3 where the diverticulum is close to the papilla⁸. Periampullary diverticula do not adversely affect cannulation. However, they concluded that cannulation is more difficult in Type 1 diverticula, and hemorrhagic complications following a sphincterotomy increase in periampullary diverticula. In our series, duodenal diverticula were detected in 75 (11%) of the 688 patients. A single variable analysis suggested that the presence of duodenal diverticula does not influence the cannulation success rate.

Adhesions due to previous upper abdominal surgery affect the cannulation of the papilla during ERCP. In the series by Choudari et al.⁹, Billroth I or II interventions, Roux-en-Y gastrojejunostomy, gastric outlet obstruction, and narrowing of the duodenum have been listed as reasons for ERCP failure.

We detected that the cannulation failure rate increased by 68-fold in patients where periampullary tumors infiltrated or distorted the ampulla of Vater compared to patients with no such pathology. In their published series, Fukatsu et al.⁵ showed that malignant biliary tract obstructions decrease the cannulation success rate during ERCP. Factors that increase the success of ERCP have also been investigated. Of these, most data are available regarding precut (or needle-knife) incisions. In many studies, it has been reported that, in cases where cannulation cannot be performed during ERCP, a precut incision increases the success rate^{10,5}. Because precut incisions were not directly used in our series, it was not taken into consideration in this study.

V. Conclusion

Patient gender and duodenal diverticula do not influence the success of cannulation during ERCP. Cannulation rate decreased as the age advanced. A tumour infiltrating the ampulla and peptic ulcer increased the failure rate of cannulation.

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