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INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)

Article DOI: 10.21474/IJAR01/14999

DOI URL: <http://dx.doi.org/10.21474/IJAR01/14999>



RESEARCH ARTICLE

PREDICTORS OF FAILURE OF ENDOSCOPIC RETROGRADE CHOLANGIOGRAPHY IN CLEARANCE OF BILE DUCT STONES ON INITIAL PROCEDURE: A MOROCCAN RETROSPECTIVE STUDY

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Manuscript Info

Manuscript History

Received: 05 May 2022

Final Accepted: 08 June 2022

Published: July 2022

Abstract

Aims: Evaluate the predictive factors of failure rate of clearing the biliary system from stones at the initial ERCP.

Methods: This is a retrospective descriptive and analytical study from September 2002 to September 2021. All patients with bile duct stones, who underwent ERCP with endoscopic sphincterotomy and stone extraction by standard techniques (extraction balloon or Dormia basket) were included in this study.

Results: A total of 1080 ERCPs were performed to extract biliary duct stones. The mean age was 58.9 +/- 14.4 years and 59.5% were females. The mean diameter of the Bile duct was 13.4 +/- 4.31 mm. The presence of a biliary stricture in 6.3%. The primary vacuity rate was 75.1%. Supplementary techniques were used in 22.7% of cases. On multivariate analysis, only the presence of cholangitis (OR:1.9; CI95%: 0.2-1; p=0.001), impacted and/or large stone (OR:2.5; CI95%:0.5-1.3; p<0.001), dilatation of the CBD >15mm (OR:0.88; CI95%: -0.17 - 0.07; p<0.001), and biliary stricture (OR:2.9; CI95%:0.4-1.7; p=0.002) were significantly associated with failure of the primary CBD vacuity rate. The overall vacuity rate after using the supplementary techniques was 92.4%.

Conclusion: In our study, predictive factors for failure of the primary CBD vacuity rate were the presence of cholangitis, impacted and/or large stone, dilatation of the CBD (>15mm) and biliary stricture.

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Introduction:-

Endoscopic retrograde cholangiopancreatography (ERCP) is the treatment of choice for stone extraction in the common bile duct (CBD). It removes stones using standard techniques including endoscopic sphincterotomy and biliary extraction balloon or Dormia basket in most cases. These therapeutic procedures are well established for the management of bile duct stones and are successful in approximately 90% of cases (1, 2)

If necessary (remaining 10% of patients), supplementary techniques can be performed to achieve clearance of CBD due to the difficulties associated with anatomy of the biliary system [3] or the stones themselves [4] including the number (more than 10 stones) and size of the stones (>15 mm diameter) or bases on stone shape or location (intrahepatic, cystic duct) or the angle of the bile duct (1, 2, 5, 6)

Therefore, the aim of our study is to evaluate the predictive factors of failure rate of clearing the biliary system from stones at the initial ERCP.

Patients and Methods:-

Study Population:

This is a retrospective descriptive and analytical study from September 2002 to September 2021 in the endoscopic department of Mohammed V Military Hospital, Rabat, Morocco.

All patients with bile duct stones, who underwent ERCP with endoscopic sphincterotomy and stone extraction by standard techniques (extraction balloon or Dormia basket), were included in this study.

Data collection:

Data were extracted from hospital patient records, including demographic information, such as age, gender, prior abdominal surgery and prior cholecystectomy; the clinical presentation of the patients and morphological data: presence of a stone on abdominal CT or MRI.

Endoscopic findings, including the presence of a periampullary diverticulum, the presence of an impacted ampullary stone, the instruments used during ERCP (extraction balloon and/or Dormia basket) as well as cholangiographic findings (size of the common bile duct [CBD], size of the CBD stone, presence of biliary stricture) were extracted from the endoscopy reports.

Statistical analysis

The statistical analyses were conducted using JAMOVI Version 1.6.8.0.

Descriptive data are presented as means (\pm standard deviation [SD]) for normally distributed continuous variables. Categorical variables were presented as counts and percentages.

We performed logistic regression with adjustment for potential confounders to calculate odds ratios (ORs) and 95% confidence intervals (CIs) to identify the predictive factors of failure after initial procedure

A two-tailed P-value of <0.05 was considered statistically significant.

Results:-

A total of 1080 ERCPs were performed to extract biliary duct stones.

The mean age was 58.9 \pm 14.4 years with extremes ranging from 19 to 98 years.

The sex ratio (M/F) was 0, 67 and 59.5% were females.

Among the patients studied, 54,2% had a simple lithiasis, 29,2% had multiple choledochal stones and 16,6% had large stones (> 15 mm).

355 patients underwent cholecystectomy (32.9%), 67 patients had a prior history of endoscopic biliary sphincterotomy (6.2%) and 5 patients had a history of VBP surgery (0.4%).

Clinically, 18.2% of the patients presented with cholangitis and 9.2% with acute pancreatitis.

A periampullary diverticulum was found in 9.4% of cases.

The mean diameter of the Bile duct was 13.4 \pm 4.31 mm. The presence of a biliary stricture in 6.3%.

The primary vacuity rate was 75.1%. Supplementary techniques were used in 22.7% of cases.

On multivariate analysis, only the presence of cholangitis (OR:1.9; CI95%: 0.2-1; $p=0.001$), impacted and/or large stone (OR:2.5; CI95%:0.5-1.3; $p<0.001$), dilatation of the CBD >15 mm (OR:0.88; CI95%: -0.17- -0.07; $p<0.001$),

and biliary stricture (OR:2.9; CI95%:0.4-1.7; p=0.002) were significantly associated with failure of the primary CBD vacuity rate (Table 1)

The overall vacuity rate after using the supplementary techniques was 92.4%.

Table 1:- Predictive factors of failure after initial procedure after logistic regression analysis.

Variables	UNIVARIATE			MULTIVARIATE		
	OR	CI 95%	p value	OR	CI 95%	p value
Age	0,9	[-0,03- -0,01]	<0,001	0,8	[0,6-1]	0,4
Gender	0,7	[-0,5- -0,02]	0,036	0,5	[0,3-1]	0,06
Cholecystectomy	1,3	[0,02-0,6]	0,035	1	[0,1-4]	0,7
Cholangitis	0,4	[-1,1- -0,4]	<0,001	1,9	[0,2-1]	0,001
CBD > 15mm	0,8	[-0,2- -0,1]	<0,001	0,88	[-0,17- -0,07]	<0,001
Biliary stricture	0,3	[-1,7- -0,7]	<0,001	2,9	[0,4-1,7]	0,002
Impacted/Large stone	0,1	[-2- -1]	<0,001	2,5	[0,5-1,3]	<0,001

Discussion:-

ERCP is the gold standard for extraction of stones from CBD. However, several factors affect the success or failure of endoscopic treatment.

Factors that contribute to ERCP failure are: difficult access to bile duct (peri-ampullary diverticulum, sigmoidal CBD, and anatomy altered by gastric surgery), a large stone (diameter >15 mm), a high stone count (≥ 10), an unusual stone shape (barrel-shaped), or the stone location (intrahepatic, cystic duct, proximal to a stricture) (7)

The rate of primary vacuity of the common bile duct ranged to 72.5% and 80.8% (8, 9, 10), similar to the 75.1% in our study

In this study, the presence of cholangitis was associated with failure of primary biliary clearance. This result was reported by Almadi et al, who suggest that the aim of ERCP in cholangitis was to achieve biliary drainage and control the infection and defer the stone removal for a second procedure. (8)

Stone characteristics as number and size were associated with failure of the primary CBD vacuity rate in various studies, that noted large stones ($\geq 17.7 \pm 6.4$ mm) required additional techniques to achieve biliary vacuity, similar to our study (10-13)

Aujla UI et al reported that large stones, multiple stones, and dilated common bile duct were significant predictors of failed duct clearance at index ERCP (10)

Some studies have demonstrated a correlation between anatomy of CBD and endoscopic stone extraction difficulties (14,15). Kim et al describe the anatomical characteristics of bile duct in the first place and demonstrated the technical difficulty of endoscopic stone removal in patients with acute distal angulation of CBD and a short distal arm of CBD. (14)

The presence of stricture is a cause of difficulty for stone removal, as reported in our study and literature (8, 13). Han JY et al demonstrated that a stemware-shaped CBD was associated with a primary bile duct clearance rate of only 41.2%; although with stones less than 1cm, the primary clearance rate was 62.5%. While the complication rate of the procedure was relatively high at 14.7% (11)

A study by Christoforidis et al. found that presence of a periampullary diverticulum had no effect on the success of stone removal, in agreement with the present study (12)

Conclusion:-

In conclusion, some factors like presence of cholangitis, impaction and/or large stone, significant dilatation of the CBD (>15mm) and biliary stricture were associated with failure of the primary CBD vacuity rate.

Further prospective, comparative studies are needed to determine the most efficient and cost-effective approach for patients with difficult stones to optimize outcomes and minimize the need for repeat procedures.

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