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Original Article

Laparoscopic Treatment of Choledocolithiasis – A Retrospective Studyof 84 Patients

Tratamento Laparoscópico da Coledocolitíase: Um Estudo Retrospectivo de 84 Pacientes

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This study was carried out with casesfrom DIGEST (a private practice specializing in the digestive system in Recife, Pernambuco, Brazil) with the participation of surgeons from DIGEST and the Advanced Videosurgery Unit (AVU).

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ABSTRACT

Introduction: With the advent of laparoscopic bile duct exploration (LEBD) was introduced the trans-cystic access (TC) using monitoring by cholangiography or choledochoscope. Soon was perceived that the TC approach was not always possible, forcing an action strategy discussed and approved in national meeting. **Objective:** Evaluate the results of LEBD in local reality and the efficacy obtained by following the algorithm suggested. **Method:** Retrospective study of 84 patients treated by DIGEST team, with general data analyzed globally and others specifics dates divided by the complexity of the approach: trans-cystic, choledochotomy (CDT) or CDT supplemented by bile-digestive anastomosis (BDA). **Results:** The patients studied had an average of 66 years and 40.5% were male. Among the 52 "in situ" gallbladder 36% had TC approach, with a resolution of 83%. Of CDT, 60% did not BDA with 90% resolution, which reached 100% among those who underwent BDA. Overall morbidity of 12.9% and mortality of 1.2%. **Conclusion:** It was proved the feasibility of the ELVB in our midst with resolution, morbidity and mortality similar to the literature and reaffirmed the effectiveness of the strategy suggested by the algorithm developed by the surgical community in Brazil. The TC approach seems to depend on the local structure.

Key words: Choledocholithiasis, Common Bile Duct, Cholangiography, Choledochoscopy Laparoscopic Surgery, Laparoscopy.

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INTRODUCTION

With the advent of laparoscopic exploration of the bile ducts (LEBD), the transcystic approachemerged; it was appealing because it avoidedcholedocotomy and offereda postoperative course similar to that of laparoscopic cholecystectomy (LC). In the first publications that demonstrated the feasibility of LEBD, the transcysticapproach was used exclusively. What varied, however, was the imaging method used to monitor the manipulation of the common bile duct (CBD). Intraoperative cholangiography was used to identify the Dormia basket as it was introduced through the cystic duct[2],or a direct image of the CBD is provided by the choledoscope introduced through the cystic duct, to accompany the clearance of the common bile duct (CBD) performed using its workingchannel.[3,4]

Subsequent studies,however, showed that not all cases could be resolved trascystically. Strategies were developed in which the transcystic path would be preferred in feasible cases. In practice, this access is reserved for the removal of small calculi, in limited quantities, located below of the cystic implantation.[5,6,7,8]With the possibility of stenosis in a smaller caliber common bile ducts, choledocotomy has only been considered safe when performed in bile ductswith diametersexceeding 7 mm.[9]

In the literature, there is such a great variation in the percentage of cases performed using atranscysticapproach, that it seems to depend on the local infrastructure available to perform the LEBD.Regardless, however, of the rate of the transcysticapproach, published studies always report a very high resolution rate (Table 1).

Based on the data in the literature and the experience of participants in a Consensus Group coordinated by Dr. Renam Catharina Tinoco, during the XXV Congress of the Brazilian College of Surgeons, in 2003 in Porto Alegre city, a consensusregarding an action strategy represented by the algorithm in the accompanying Figure was discussed and approved at the time by all members of the group.

The main objective of this analysis was to examine the results of LEBD in the local context, and to evaluate the effectiveness of the strategy suggested by the algorithm designed by the Brazilian College of SurgeonsGroup Consensus. The primary author has followed this algorithm since the beginning of his experience.

MATERIALS AND METHODOS

From June 1993 to April 2012,84 patients were operated by one of the authors, in a private clinic (DIGEST - Clinic Specializing in Digestive Tract Surgery) in the city of Recife, Pernambuco, Brazilto treat choledocholithiasisby laparoscopic approach. Data were collected retrospectively from office records and hospital charts where the procedures were performed. The following variables were analyzed: age, sex, diagnosis, operative procedure, conversion, operative time, resolution of choledocholithiasis, duration of the hospitalization, complications, and mortality.

The analyses of age, sex, diagnosis, operative procedure, conversion and mortality were made together, while the analyses of operating time, hospital stay, and complications were evaluated by the type surgical approach used, divided into: transvesicular, by choledocotomy, and choledocotomy + biliodigestive anastomosis.

Operative Technique

The patient is placed in dorsal decubitus under general anesthesia, with the pneumoperitoneum

Table 1 – *Twenty published studies with the number of cases, rate of resolution of choledocholithiasis, percentage in which the ~~transvesicular~~transcysticapproach was used, periodical, and year of publication.*

Authors	Cases	Resol	TV Access	Publication	Date
Phillips EH et al[18]	130	93%	85%	SurgEndosc	1994
Berci G et al[19]	226	95%	83%	SurgEndosc	1994
De Paula et al[20]	114	95%	89%	SurgEndosc	1994
Rhodes M et al[21]	129	96%	73%	Br J Surg	1995
Drouardet al[22]	161	96%	50%	Hepatogastroent	1977
Millat B et al[23]	247	88%	47%	Hepatogastroent	1997
Dorman JP et al[24]	148	95%	0%	SurgEndosc	1998
Paganini AM et al[25]	161	97%	66%	SurgEndosc	1998
Bertou JC et al[26]	220	95%	51%	SurgEndosc	1998
Giurgiu DI et al[27]	217	95%	100%	ArchSurg	1999
Michel J et al[28]	612	84%	57/ 16%	GastroenterolClinBiol	2000
Thompson MH et al[29]	224	96%	26%	Br J Surg	2002
Tokumura H et al[30]	217	88%	42%	J HepatobilPancrSurg	2002
Petelin JB et al[31]	326	98%	83%	SurgEndosc	2003
Riciardi R et al[32]	346	97%	78%	SurgEndosc	2003
Nathanson LK et al[33]	372	97%	77%	Ann Surg	2005
Tinoco R et al[34]	481	97%	47%	Ann Surg	2008
Savita KS et al[35]	148	100%	28%	Indian J Surg	2010
Hanif F et AL[36]	459	90%	55%	SurgEndosc	2010
Chander J et al[37]	150	98%	3%	SurgEndosc	2011

pressuremaintained at 12 mmHg. The operating table is inclined 30 to 35 degrees and tilted10 degrees left lateral.Trocar placement is according to the American technique, with the introduction of an additional 5 mm trocar in the middle of the right upper quadrant, which is then used by the surgeon's left hand, while the subcostal port in the right mid-clavicular line is reserved for the instrument manipulation ofthe CBD.

The strategy used is described in the algorithm (see Figure 1) and considers the diameter of the cystic duct and of the CBD, as well as the size, location, and number of existing calculi in the common bile duct. The transcysticapproach was used for the smallergallstones. Saline infusion, preceded by chemical dilation of the papilla by intravenous injection of hyoscine, was reserved for the removal of gallstones smaller than 4 mm.Larger gallstones – but still amenable to retrieval (usually less than 10 mm) – were grasped using aDormia basket introduced into the CBD guided by an image intensifier.

For larger gallstones (those greater than 10 mm in diameter) in CBDs with calibers exceeding 7 mm,a longitudinal choledocotomywas performed, with the gallstones removed various ways: via standard laparoscopic forceps, by milking, using the turbulence provoked by the infusion of saline introduced under pressure catheter inserted in CBD, by special "endoflex" type forceps used to remove jammed gallstones or even through special baskets or balloons introduced by choledocotomy or through the working channel of the choledoscope. This flexible endoscope was used, especially to confirm that theCBD was clear.When the biliary diameter was especially large (particularly above 20mm in diameter) the clearing of the biliary duct was complemented by a biliodigestive anastomosis, preferably a choledochoduodenostomy.

In cases of stenosis of a prior anastomosis which remained unresolved after conventional endoscopic or percutaneous dilation, an anastomoplastywas performed. In patients who had prior gastroplastywith residual calculusin the bile duct, a laparoscopic gastrotomywas performed to permit an endoscopic retrograde papillotomy (ERP).

RESULTS

Of the 84 patients treated, 34 (40.5%) were male and 50 (59.5%) were female; the meanage was 66 years,

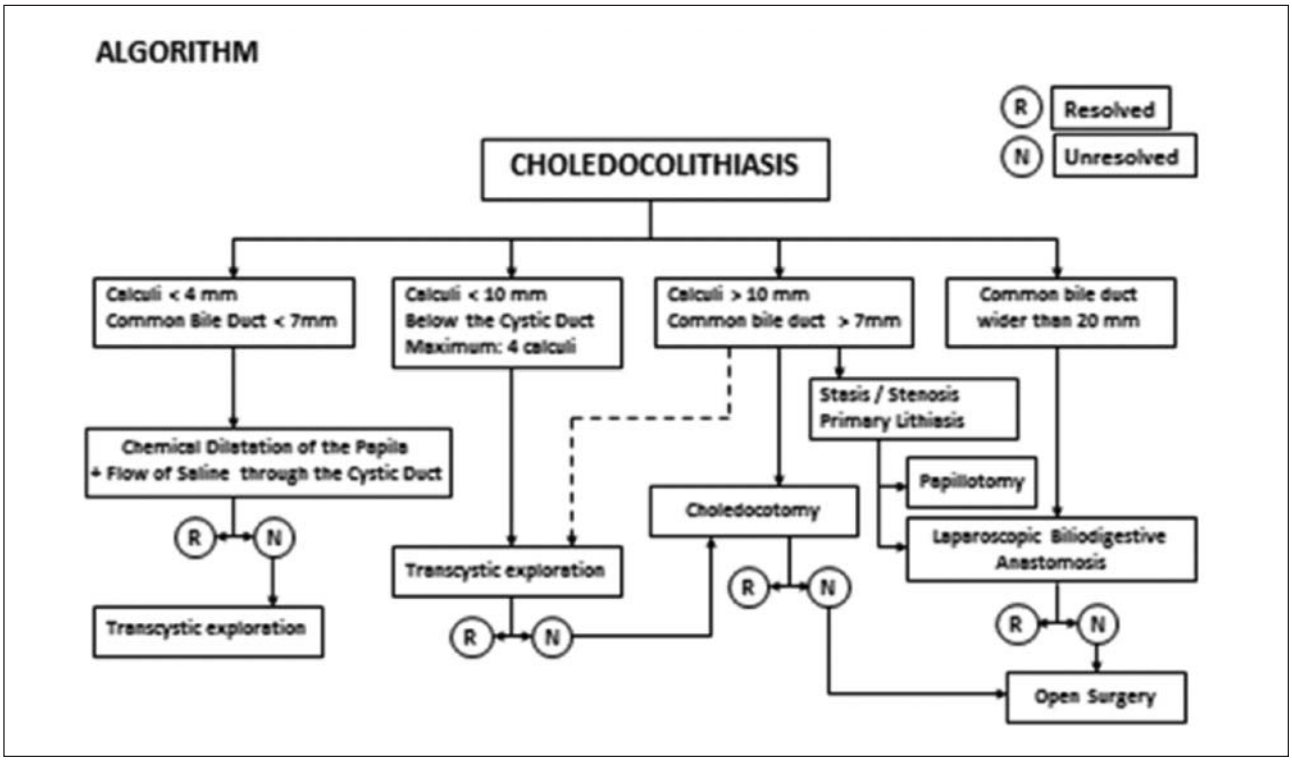

Figure 1 *– The algorithm for the treatment ofcholedocholithiasisdiscussed and approved by the Consensus Groupduring theXXVBrazilian Congress ofSurgery(2003)used in this study.*

and ranged between 18 and 91 years of age. The majority (62%) still had an "in situ" gallbladder,permitting, theoretically, atranscysticapproach. However, of these 52, only 30 (48%) were suitable candidates for this kind of approach.For the 84 cases, the approach wastranscystic in 30 (36%), by choledocotomy in 53 (63%), andlaparoscopic-endoscopic in a single patientwith prior gastroplasty and cholecystectomy, with a laparoscopic gastrotomyestablishing access that would permit an ERP.

Among the 52 patients with an"in situ" gallbladder, all had gallstones in the gallbladder, and 6 (11.5%) were diagnosed with acute cholecystitis (Table 2). Of the 32 cases that had previously undergone a cholecystectomy, all had residual or recurrent choledocholithiasis even though 23 (72%) hadundergone a prior internal drainage, 20 by ERP and three bybiliodigestiveanastomosis.

Of the 53 patients whose approach was by choledocotomy, 31 (58%) had undergone cholecystectomy. Of these, 23 (68%) had undergone some internal drainage procedure: 20 ERP (twopatients 4 times, three patients 3 times, and the other 15 a single time) and three biliodigestive anastomoses (2 choledochoduodenostomy and 1 choledochojejunostomy) afterattempts to treat with dilatation the stenosis of the anastomosis endoscopically or percutaneously, without success.

There was a single conversion (conversion rate: 1.2%) in a patient with stenosis of the choledochojejunostomy anastomosis who had bouts of cholangitis due to anastomotic stenosis and lithiasis. During the approach of the hepatic hilum major bleeding occurred that required a laparotomy to achieve hemostasis and complete the surgery.

The rate of resolution of choledocholithiasis varied in accordance with the approach.The resolution rate was lower with the transcysticapproach (83%) than with the choledocotomyapproach (94%) (Table 3).The overall resolution rate was 90%. The operative time and average length of hospitalization varied according to the complexity of the surgery performed. The mean

Table 2 – *General data and diagnoses of the patients analyzed.*

GENERAL DATA	
Mean Age (range)	66 years (18 a 91 years)
Sex(Male/Female)	M: 34 (40.5%) / F: 50 (59.5%)
DIAGNOSES	
Chronic calculous cholecystitis + Choledocholithiasis	46 (54.8%)
Acute calculouscholecystitis + Choledocholithiasis	6 (7.1%)
Residual or Recurrent Choledocholithiasis	29 (34.5%)
Stenosis of Biliodigestive Anastomosis	3 (03.6%)

Table 3 – Data about resolution, operative time, duration of hospitalization, and morbidity, analyzed for each procedure performed.

Procedure (or approach)	**No.of Cases** (percentage)	**Resolution** Absolute No. (percentage)	**OperatingTime** in minutes	**Hospitalization** average in days (minimum-maximum)	**Complications** Absolute No. (morbidity)
Cystic Path	30 (36)	25 (83)	120.2	3.0 (1-12)	3 (10)
Choledocotomy	30 (36)	27 (90)	175.4	4.5 (1-16)	3 (10)
Choledocotomy + biliodigestive anastomosis	20 (24)	20 (100)	188.1	5.2 (3-15)	4 (20)
Revision ofthe Anastomosis	3 (3)	3 (100)	195.3	6.3 (4-20)	1 (33)
Papillotomypostgastrotomy	01 (01)	1 (100)	230.0	3.0 (3-3)	0
TOTAL	84 (100)	76 (90)	165.3	5.9 (1-20)	11 (13)

overall operative time was 165.3 minutes and an average length-of-stay in the hospital was 5.9 days. Of the total of 84 patients, the transcystic approach was only possible in 30 cases (36%).

There were 11 postoperative complications (morbidity: 12.9%), of which three were at the umbilical port surgical site (two seromas and one infection); one respiratory infection;one urinary tract infection;and five bile leaks, of which three were associated with laparoscopic biliodigestiveanastomoses, one from thecystic stump, and another after KehrT-tube removal on the 20th postoperative day. One patient with cholangitis due to residual choledocholithiasis after ERP with endoscopic stent placement, who underwent a laparoscopic choledochoduodenostomy, died suddenly on the 3rd postoperative day while walking in the hospitalcorridor (mortality: 1.2%).

Three repeat operative approaches were necessary, two laparoscopically, one for T-tube drain replacement in a patient with choleperitoneum after T-tube removal, and the other to drain an area of bile leakage from the vesicular stump by endoscopic biliary drainage the next day. The third was operated by laparotomy in order to perform a transduodenalpapillotomy because of a residual calculuspost-LEBD that could not be cleared by ERPdue to a papilla implanted in a duodenal diverticulum.

Of the 8 cases in which clearing of the CBD was not achievedlaparoscopically, all were referred and resolved endoscopically, with the exception of the case described above where we had to return to the operating room to perform a transduodenalpapillotomy by open surgery.

DISCUSSION

With the beginning of LC experience, when surgeons suspectcholedocholithiasis concomitant with cholecystolithiasis, many prefer to refer their patients to the endoscopistfor clearing of CBD prior to the LC.[10] This fact, together with improvements in the capability of diagnostic imaging to confirmcholedocholithiasis in the pre-operative period,[11] resulted in a significant increase in the referral of this type of patient to the endoscopist.[12]This has resulted in a change in the profile of the patients seen by endoscopists, who began to perform more endoscopic cholangiography for therapeutic purposes.[13]

The experience with ERP revealed a 10% incidence of immediate complications, due to acute pancreatitis, perforation and bleeding, and a 10% incidence of late complications related to papillary stenosis, with a mortality of about 1%.[14] These complications were more common in non-dilated CBD where the morbidity was 37.5% and mortality 1.7%,[15]increasing the immediate complications to 14.9% and late complication to 23.4% in younger patients (younger than age 60).[16]

Even after more than 20 years of experience with LC and despite the evidence described in the literature stating that the handlingof choledocholithiasis should not be routinely recommended (Evidence 1A / Recommendation Level A) and that the choice of treatment of choledocholithiasis (endoscopic or laparoscopic) should depend on local experience (Evidence 1A / Recommendation Level A),[17] surgical teams continue routinely sending their patient with choledocholithiasis for endoscopic treatment.

The small number of attempts at transcystic resolution (30%) is notable. There may be a selection bias, as 38% of the patients studied had undergone prior cholecystectomy. Most studies published in the literature on the treatment of choledocholithiasis restrict themselves to patients with "in situ" gallbladders; the inclusion of cases of residual or recurrent calculi in the CBD is uncommon.

CONCLUSION

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The data presented here clearly demonstrate the possibility of performing the LEBD in our setting with rates similar to the world literature, particularly with regard to resolution and complications, even for cases of residual or recurrent choledocholithiasis. Furthermore, the data reveal that using the strategy recommended to the Brazilian surgeons by the Brazilian College of Surgeons Working Group presented publicly in 2003 constitutes a good choice for the laparoscopic treatment of choledocholithiasis, showing that the transcysticapproach can only be performed under specifics conditions,that range from no prior cholecystectomy to the presence of adequate infrastructure.

RESUMO

Introdução: Com o início da exploração laparoscópica das vias biliares (ELVB) introduziu-se o acesso via cístico (VC) usando-se o monitoramento por colangiografia ou coledocoscopia. Logo se percebeu que a VC nem sempre era possível, obrigando a uma estratégia de ação discutida e aprovada em encontro nacional. **Objetivo:** Avaliar os resultados da ELVB na realidade local e a eficácia obtida seguindo-se o algoritmo sugerido. **Método:** Estudo retrospectivo de 84 pacientes operados pela equipe da DIGEST, com dados gerais analisados globalmente e outros dados específicos divididos por três diferentes abordagens: via cístico, coledocotomia (CDT) ou CDT complementado por anastomose bilio-digestiva (ABD). **Resultados:** Os pacientes analisados tinham uma média de 66 anos sendo 40,5% do sexo masculino. Dentre as 52 vesículas "in situ", 36% tiveram abordagem VC, com resolução de 83%. Das CDT, 60% não fizeram ABD complementar com resolução de 90%, que chegou a 100% dentre os que realizaram ABD. Morbidade global de 12,9% e mortalidade de 1,2%. **Conclusão:** Ficou comprovada a possibilidade de realização da ELVB em nosso meio com resolução, morbidade e mortalidade semelhantes ao da literatura e reafirmada a efetividade da estratégia sugerida pelo algoritmo elaborado pela comunidade cirúrgica brasileira. A abordagem VC parece depender da estrutura local.

Palavras-chave: Coledocolitíase. Ducto Colédoco. Colangiografia. Coledocoscopia. Cirurgia Laparoscópica. Laparoscopia.

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