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CHOLEDOCHOLITHIASIS — A PLEA FOR BILIARY *FENESTRATION*

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SUMMARY

A retrospective analysis is made, from the Authors experience with Biliary Tract surgery for cholesterol lythogenic diathesis and/or its consequences, during a period of time encompassing Jan. 73 — July 1980. Primary surgery was done on 185 patients while 14 others required 15 reoperations, 7 of which were, primarily, operated upon by the Authors, for a total of 200 interventions. On those undergoing primary surgery there were 132 simple cholecystectomies while on 53 a CBDE was indicated, as well. Among these a simple choledocholythotomy with a temporary decompression via a T-tube was carried out in 14 pts., 5 of which (35%) required resurgery for residual lythiasis in 1, recurrent stones in 3 and a stenotic papilla in the other, whereas 39 pts. undergoing, primarily, a permanent vent remain asymptomatic, without cholangitis. From this experience it is concluded that a biliary «fenestration» procedure should, probably, be carried out whenever there are absolute indications for CBDE, and particularly so when stones are, actually, found inside of it. Analyzing their series of 42 L-L Choledochoduodenostomies (33 primary cases plus 9 reoperations) it is concluded that this is a safe operation with a very low operative morbidity and mortality rates, a postoperative hospital stay similar to a simple cholecystectomy and without the inconveniences usually and erroneously ascribed to it.

«Cholecystectomy is so common that we must do everything possible to improve our results. The individual surgeon must review his own experience as well as that of the hospital in order to determine whether or not he is offering his patients the most effective and efficient biliary surgery possible»

ROBERT M. ZOLLINGER
Annual Surgery Course — University of Minneapolis; 1975

Strict adherence to Le Quesne's interpretation criteria [1] of pre and/or intra-operative cholangiograms, followed by a technically correct surgical exploration of the CBD, [2] whenever this step is deemed necessary, does, indeed, decrease the rate of residual intra-ductal stones. Nevertheless, the ocurrence of retained and/or recurrent calculi remains a challenge to any biliary surgeon, its incidence being reported as widely as 2-14%. [3-6] Stones in the hepatic ducts or in the upper reaches of the biliary tree are, frequently, missed at exploration [7] and can, later on, migrate down and cause obstruction, its percentage having been referred to vary from 15-25% [8] of all cases of choledocholythiasis. The reported frequency of papillary stenosis varies widely from 0 to 40% [9] of all cholecystectomies, with a seemingly higher incidence on those cases of coexisting

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duct stones. Similarly, the frequency with which it is reported to cause post-cholecystectomy syndromes also varies. While the condition is often mentioned in the French and German literature, the existence of papillary stenosis is often questioned by American and British authors. The lack of a clear definition and standardized diagnostic approach may account for this discrepancy.[9] Be it as it may, it seems that an ever increasing number of surgeons are accepting it as a true organic entity [10] and representing, in fact, a real cause of bile stasis, sludge and stone reformation, since the cholesterol lythogenic biliary diathesis does not seem to stop after cholecystectomy, [11–13] as opposed to what has been claimed.[14] Confirmed by several surgeons, [15, 16] intra-operative choledochoscopy is, indeed, quite effective decreasing the rate of residual stones, but, obviously, it's worthless regarding the recurrent, primary stone, which, on Madden's experience, [12] represents over 50% of all CBD calculi.

Radiocholangiomanometry has been utilized by French surgeons with two aims in mind: a) Diagnosing the presence of small intra-ductal stones, easily missed by surgical exploration, even an expert one, and, at the same time b) Predicting those cases prone to develop, at a later stage, duct drainage difficulties secondary to papillary dysfunction. In the United States of America, however, this has not proven to be really effective, the matter remaining quite controversial. [18–20] For this reason very few Centers have adopted it as a practical clinical tool. [21]

From what has been stated it becomes obvious that even an experienced surgeon, notwithstanding the help of the most sophisticated instruments will not avoid a significant number of patients from needing some type of further therapy, most of the times biliary resurgery proving to be the most efficient. [22] Being well known the higher morbidity and mortality rates that this type of surgery, usually, carries, [5, 23, 24] it seems reasonable to assume that a properly performed biliary *fenestration* procedure, when the surgeon is faced with a pathological CBD, at the occasion of primary surgery, will avoid this risk, as well as unnecessary, costly numerous further hospital admissions. It has to be proved, though, to be a safe, easy to do and effective operation. It's the purpose of this paper to prove this assumption, reviewing, retrospectively, our personal experience with surgery of biliary tract lythiasis within a Surgical Service of a major teaching University Hospital (all cases operated upon by the senior author).

CLINICAL MATERIAL, METHODS

Our personal experience (January 1973 — July 1980) concerning primary and secondary surgery of the biliary tract for lythiasis and/or related pathology is summarized on tables 1 and 4. On the group of those submitted to primary surgery there were 148 females and 37 males (5/1 ratio), their ages varying from 22 to 83 yrs., the higher incidence occurring on the 5th decade. Fifty three of these patients underwent CBDE (table 2) with corresponding ages from 36 to 83 yrs. and the higher percentage between 60 and 69 yrs. The female/male ratio in this sub-group was 3/1.

The diagnosis was obtained by OCG (oral cholecystography) and/or IVC (intra-venous cholangiography). USG (ultrasonography) was utilized as a screening test. Those cases clinically suspicious of some form of duct pathology (Hx of jaundice and/or colicky pains with chills, previous bouts of acute pancreatitis, dilated duct on USG and/or IVC, etc.) were submitted to ERCP (endoscopic retrograde cholangio-pancreatography), as summarized on table 7. Our experience is comparable to that of other authors with larger series [3, 25–27] in what concerns the parameters displayed on table 3.

Table 1

Primary surgery for biliary lithiasis and/or related pathology Personal series — (January 1973 — July 1980)

Operations	Nr.	Op. Morb.	Op. Mort.	Mean post-op Hosp. stay
Cholecystectomy, simple	132	2	1	7 days
Cholecystectomy, CBDE	53	3	1	11 days
Total	185	(2.7%) 5	(1%) 2	9 days

Table 2

Fifty three primary CBDEs for biliary lithiasis and/or related pathology — Personal series (Jan. 1973 — July 1980)

Operations	Nr.	Op. Morb.	Op. Mort.	Mean post-op Hosp. stay
L-L Choledochoduodenostomy	33	2	1	8 days
Sphincteroplasty	5	1	0	13 days
Hepaticojejunostomy, Y-loop	1	0	0	10 days
Choledocholythotomy, T-tube	14	0	0	13 days
Total	53	(5.5%) 3	(1.8%) 1	11 days

Choledocholithiasis 37, Papillary Stenosis 10,
Pancreatitis Nodule 3, Cholangitis 3

Table 3

Prevalence of choledocholithiasis in patients operated upon for chronic cholecystitis

	Nr. Cases	% CBDE	% Positive CBDE	% Positive Total
WAY (3)	925	21.0	65.0	14.4
WHEELER (25)	201	23.5	72.0	17.0
MARSHALL (26)	692	27.0	40.0	11.0
KAKOS (27)	753	25.0	62.0	15.0
Present Series	185	(53) 28.6	(37) 69.0	20.0

Table 4

Reoperations for biliary lithiasis and/or related pathology personal series — (January 1973 — July 1980)

Operations	Nr.	Op. Morb.	Op. Mort.	Mean post-op Hosp. stay
L-L Choledochoduodenostomy	9	0	0	8 days
Sphincteroplasty	2	1	0	14 days
Hepaticojejunostomy, Y-loop	3	1	1	11 days
Choledocholythotomy, T-tube	1	0	0	12 days
Total	15	2	1	10 days

Retained stones 2; Recurrent choledocholythiasis 6; Ampullary stenosis 3; Pancreatitis Nodule 2; Iatrogenic lesion of CBD (elsewhere) 2.

During the same period of time we had to perform 15 reoperations on 14 patients (3 men, 11 women), only two of them being under 55 yrs. of age. IVC and/or ERCP were obtained, preoperatively, in all of them. Primary surgery had been done by ourselves in 7 of these patients (2 simple cholecystectomies, 5 with CBDE).

We heavily rely on the IVC, both in primary and secondary surgical cases, not so much to rule out the presence or absence of intraductal stones, its high rate of false positive and negative results being well known in this respect, [28] but to elucidate us about which ducts have drainage difficulties at the CDJ (choledochoduodenal junction). It is now well established, beyond speculation, that a dilated duct on IVC (and dilatation means a diameter greater than 12 mm), more so if it shows an increasingly evident opacity until 2 hours time, means that there are emptying difficulties and consequent bile stasis, sludge and possibility of stone reformation. It can not be taken just as a simple, innocent, consequence of previous cholecystectomy [29] or of an atrophic, non-functioning GB (gallbladder).

LFT's (SGOT, SGPT, Bilirubin levels, Prothrombin time, Alkaline phosphatase, gammaglutamiltranspeptidase) and serum Amylase were obtained, preoperatively, in all primary as well as secondary cases.

With the exception of 22 of the patients undergoing simple cholecystectomy, a careful follow-up is kept on all these cases. Clinical interviews are obtained twice a year and LFT's every 12 months or whenever deemed necessary. Intra-venous cholangiograms are, regularly, ordered every 2 years or when symptomatology indicates its advisability.

Those patients on whom a biliary *fenestration* was undertaken, either as a primary or a secondary procedure, therefore precluding an IVC, are asked to submit themselves to UGI series and/or ERCP, for adequate evaluation of the bilio-enteric anastomosis, as well as eventual gastro-duodenal mucosal changes. These tests are done after a minimum period of 12-18 months, post surgery, has elapsed.

Schein's technical details were taken into account in building up side-to-side choledochoduodenostomies. [30] All sphincteroplasties were constructed according to A. JONES technique. [31]

RESULTS

On the group of 132 patients undergoing simple cholecystectomy there was 1 operative death, the exact cause of which could not be clarified during the post-mortem examination. Two patients in this group developed superficial wound infections, without any other significant morbidity. The mean post operative hospital stay was 7 days (table 1). Twenty two of these cases were lost to follow-up after their first Clinic visit. All the others remain asymptomatic (follow-up from 6 months to 7 years) with the exception of 2 of them (1.5%), requiring reoperation. Both these patients had had an intra-operative cholangiogram, at the time of primary surgery, considered to be normal. One of them developed several crisis of colicky pains with chills, without jaundice, 2 years after surgery. A dilated duct and stenotic papilla were disclosed on IVC and ERCP. During resurgery we could find several, easily crushable, dark, small bile concretions within a dilated duct (20 mm). A side-to-side choledochoduodenostomy was carried out 2 yrs. ago, the patient remaining asymptomatic ever since. The other one was reoperated 18 months after primary surgery, because of jaundice secondary to extrinsic compression of the terminal CBD by a pancreatitis nodule. A 25 mm caliber duct was found at resurgery without stones inside. The patient has remained well ever since a L-L choledochoduodenostomy was constructed 30 months ago. The outcome of 53 CBDE's, with a follow-up from 6 months to 7 years, deserves special mention. Five, out of 14 (35%) simple choledocholythotomies with T-tube drainage, developed symptoms, confirmed by IVC and/or ERCP, significant enough to require resurgery, at which time they were found to have residual lythiasis in one, recurrent stones in 3 and a stenotic papilla in the other. A T-tube cholangiogram had been read as normal before they were discharged after primary surgery. Comparatively, none of the 39 patients on whom a biliary *fenestration* procedure was added as an adjunct to choledocholythotomy has had any significant symptomatology. All maintain normal LFT's, except 1 with an elevated alk. phosphatase, though, otherwise, symptomless. Similarly, all patients who underwent a *fenestration* during resurgery remain asymptomatic, as well. Two of the patients with choledochoduodenostomy were, knowingly, left with an intra-ductal stone, which did not cause any complications and could not be visualized when an ERCP was carried out 1 year after surgery.

The operative morbidity and mortality, as well as the mean post-op. hospital stay, concerning the different types of *fenestrations* carried out, either as a primary or secondary procedures, are shown on table 5. There were 2 operative deaths and 5 complications. One death occurred on a 73 yrs. old lady, on the 7th post-op. day after a side-to-side choledochoduodenostomy had been done primarily, from massive UGI bleeding. The anastomosis was found to be intact during the autopsy. The other one was on a lady, 74 yrs. old, with biliary cirrhosis, 4 days after a Y-loop hepaticojepunostomy had been dene. This was the 4th operation for choledocholythiasis with cholangitis she had been submitted to, the first three procedures having been done elsewhere. Peritonitis was the cause of death as shown at autopsy Two patients undergoing sphincteroplasty (one as a primary case, the other after resurgery) had their post-operative course complicated by edematous pancreatitis. There were 2 wound infections, one after a primary L-L choledochoduodenostomy, superficial, the other one, requiring drainage, on a patient submitted to resurgery (Y-loop hepatico-jejunostomy) after his CBD had ben injured elsewhere during a simple cholecystectomy. Finally, one of the patients submitted to primary L-L choledochoduodenostomy developed a biliary fistula, which closed down, spontaneously, 3 weeks after TPN (Total Parenteral Nutrition) was started.

Fifteen of the patients with a choledochoduodenal anastomosis had it evaluated via ERCP. All stomas were seen to be widely patent, oval or round shaped. Food debris were observed, floating easily in and out through the anastomosis, in three of them. The contrast medium was seen to flush out of the biliary tree in less than 10 minutes in all patients scoped. No gastric, duodenal or common duct mucosal changes were observed, except in one man, 59 yrs. of age, where a rather significant duodeno--gastric bile reflux was detected, together with severe gastritis, confirmed by biopsy, which seemed to be far less severe, from the endoscopic point of view, when the pre-operative ERCP study took place 20 months before. At the anastomotic level it was noteworthy the absence of any inflammatory changes. No evidence of suture material could be detected (interrupted stitches of 0000 Poliglycolic Acid, inserted in one single layer, were utilized in all patients).

Table 5

Biliary fenestration operations (primary and secondary surgery)
Personal series (January 1973 — July 1980)

Operations	Nr.	Op. Morb.	Op. Mort.	Mean post-op Hosp. stay
L-L Choledochoduodenostomy	42	(4.7%) 2	(2.3%) 1	8 days
Sphincteroplasty	7	2	0	13 days
Hepaticojejunostomy, Y-loop	4	1	1	11 days
Total	53	(9.4%) 5	(3.7%) 2	9 days

DISCUSSION

The fundamental aim of any surgeon operating, primarily, upon a calculous GB is to make sure, after removing it, that a free and intact intra and extra-hepatic biliary tree, emptying easily into the intestinal tract, is left behind. A good quality pre-operative work up, intra-operative pre and post exploratory cholangiograms and a meticulous CBDE, [2] in carefully selected cases, are the steps mostly utilized to achieve that goal. Though not widely practiced, intra-operative choledochoscopy seems to be, indeed, a rather valuable tool in this respect. [15, 16] None of these techniques, though, has obviated the annoying and frustrating occurrence of residual or recurrent stones and/or its consequences. [3-6] Most of the patients undergoing primary biliary surgery do not meet any of the criteria considered as indications for CBDE (table 6), its percentage varying as widely as from 71.6% on the present series to 79%, as published by Way (table 3) On the other hand somewhat around 25% of ducts do have indications to be explored according to the same criteria. As previously shown, [4, 24, 32] the rate of overlooked and/or recurrent calculi among those patients undergoing a simple cholecystectomy stays somewhere between 1% and 2%, whereas this figure reaches values as high as 14% when there are indications for CBDE and particularly so whenever stones are, actually, found within the biliary tract. Our own, personal experience fully confirms these data. While only 2 patients, out of 132 simple cholecystectomies (1.5%), required resurgery, one of them for recurrent stones and the other one because of jaundice

secondary to a pancreatitis nodule, as much as 6 patients, out of 53 CBDEs (11.3%) were found to have been left with residual or recurrent calculi. According to Madden's criteria [17] three of them were considered to be reformed stones.

It seems appropriate to discuss what con be considered as the best approach to this problem. In what concerns the ducts without indication for surgical exploration and with normal pre or intra-operative cholangiograms it is quite unpredictable which are the very few ones that will develop, on the long run, emptying difficulties or stone recurrence. Therefore, nothing else should be done, during primary surgery, other than simple removal of the diseased GB. What about the ducts meeting the criteria (table 6) for surgical exploration? Most surgeons believe that a simple chodelocholythotomy, followed by a temporary T-tube decompression (8 to 12 days) is just enough, assuming, with Glenn, [4] that the behaviour of an overlooked stone, or even one knowingly left behind and taken as irretrievable, is unpredictable, not necssarily being the cause of troubles. Some others advocate leaving a T-tube with a large bore vertical limb, so a Mazzariello or Burhenne basket can, easily, be passed through the tracts, a few weeks later, to retrieve a stone eventualy diagnosed during cholangiography. A flexible choledochoscope could be inserted, via the tract, as well, with the same aim in mind. Still others rely on endoscopic sphincterotomy as a remedy to help them out of troubles in such cases and, therefore, don't worry too much about the possibility of overlooking a stone. Wiechel [33] has even achieved the sophisticated technique of removing calculi from within the biliary tree via, percutaneously introduced, transhepatic catheters. Besides not having stood the test of time, as yet, severe drawbacks can be ascribed to these approaches. It is well demonstrated [4] that the longer the follow-up of these patients the higher the rate of those found, on the long run, to have residual or recurrent stones, will be. The bile lythogenicity does not stop after cholecystectomy [11-13] and, consequently, if the duct pathology, conditioning the stasis, remains, the trend is set for recurrence of stones and cholangitis. This is, however, a complication to be avoided, at all costs. As Huang [34] has, clearly, demonstrated, a biliary pressure over 20 cms of water causes cholangiolymphatic reflux and this event occurs at the cholangiovenous level when the pressure surpasses values as low as 25 cms. Being well documented the presence of significant concentrations of pathogenic bacteria [35] within partially obstructed ducts it becomes easily understandable why the biliary tract must be fully cleared and/or permanently decompressed, so to prevent, at any given moment, those conditions from occurring, simultoneously, on the same duct. Cholangitis is, indeed, a treacherous disease entity, quite oftenly assuming sub-clinical patterns, but still keeping its devastating, smouldering effect, along the years, only to eventuate on a full blown picture of biliary cirrhosis. This same reasoning should be applied, as well, to the usually practiced choledocholythotomy with temporary T-tube decompression.

Surgeons have ressorted, since many years ago, to several technical manoeuvers to assure themselves of a permanently clear and free biliary pathway. Bakes [36] was, probably, the first one to utilize instrumental, mechanical dilation of the sphincter of Oddi, expecting it to stay patulous after it. This has not proven to be efficient and is, in all truth, contraindicated, because of resulting fibrosis and stenosis. [37] A *fenestration* procedure, venting and decompressing permanently the biliary tree seems to be a good answer to this problem.

The determination of duct width, as measured in the operative field with a ruler or a caliper, is the single most significant factor in making the right decision. Although stone containing choledochus have been referred as having a *normal* caliber in 4% to 5% of choledocholythiasis cases [38] this has not been our experience. Obviously it all

depends on what is taken as a normal caliber. A duct diameter between 10-12 mms has to be looked at as a borderline case and these are, indeed, the ducts that severely tax the surgeon's judgment. A duct wider than 12-14 mms surely means the presence of an organic cause [39] and will never regain its normal width. The chances are that such a duct will, most certainly, have drainage difficulties and will reform stones. Thereby, a permanent vent appears as a logical procedure to be carried out. On a total of 53 surgical duct explorations (table 2) we performed 14 simple choledocholythotomies with T-tube drainage, while the remaining 39 patients were primarily *fenestrated*. It appears to be more than coincidental that 5, out of 14 choledocholythotomies, had to be reoperated upon, because of unquestionably reformed stones in 3 of them, an overlooked calculus in another and a papillary stenosis in the remaining one, while all the other patients, definitively decompressed *ab initio,* don't have any complaints, namely of cholangitis. It is worth mentioning that 2 of the *fenestrated* patients were, knowingly, left with an irretrievable stone inside the duct, which, notwithstanding, was not visualized when an ERCP was undertaken 1 year later and thus suggesting that even if a stone is overlooked the patient will do allright and still has the chance of eliminating it through the vent.

The reported experience, together with the arguments previously brought forward prompted us to, progressively, come down to adopt the approach summarized on table 7.

Though it is not the purpose of this paper to discuss which is the ideal *fenestration* procedure it is appropriate mentioning that a L-L choledochoduodenostomy has to be considered a safe operation with a very low morbidity and mortality, serving perfectly the purpose it is meant for. Our experience with 42 of these operations (table 5), confirming that of others, [17, 30] fully corroborates our statement. It is our feeling that sphincteroplasty should be reserved for ducts with borderline dilatation or those with an impacted stone at the papilla. A Y-loop choledocho-ejunostomy has rather specific indications and can not be taken, at all, as an aternative to the previously mentioned techniques.

Table 6

Indications for common bile duct exploration

ABSOLUTE	RELATIVE
1 — X-Ray Evidence of Stones	1 — Previous Episodes of Pancreatitis
2 — Palpable Stones	2 — Multiple small stones in the GB in conjunction with dilated cystic duct
3 — Jaundice (Bilirubin > 7.0 mgm)	3 — Jaundice (Bilirubin < 7.0 mgm)
4 — History of Cholangitis	4 — Aspiration of murky Bile
5 — Fibrosis or Stenosis of the Oddi	5 — Thickening of CBD wall
6 — 2,3 or 4 + CBD dilatation	6 — 1 + CBD dilatation
7 — Biliary Fistula	7 — When in doubt? Tumor?

CONCLUDING REMARKS

1 — The cholesterol biliary diathesis is a progressive disease, which does not stop after cholecystectomy [11-13]

2 — Choledocholythiasis has a higher incidence on patients over 60 years of age. [4]

3 — The longer the follow-up of patients previously submitted to CBDE the higher the rate of residual and/or recurrent stones will be. [4]

4 — The previous statements suggest that this complication is almost inevitable, depending on how many years the patient will live.

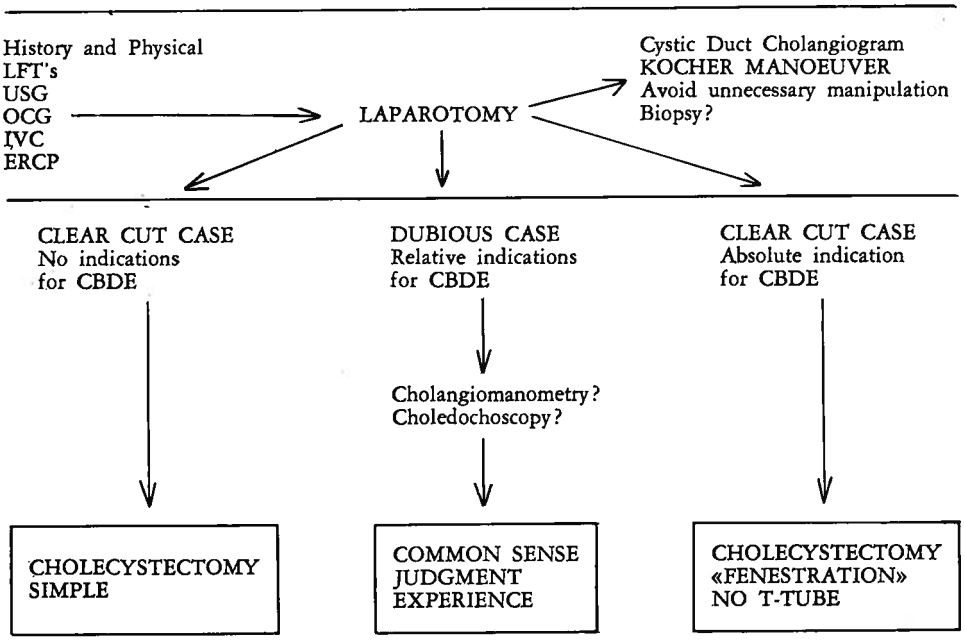
5 — The present series experience with 53 CBDEs allows us to presume that a permanent vent, during primary surgery is, probably, indicated whenever there are absolute indications for CBDE (table 6), and particularly so if stones are, actually, found inside the duct. The previous statements seem to lend support to this approach.

6 — L-L Choledochoduodenostomy is a safe, easy to do and effective operation without the ill effects usually and erroneously ascribed to it.

7 — Sphincteroplasty is, probably, indicated when a stone is impacted at the papilla or whenever there is a contra-indication for choledochoduodenostomy, as a borderline dilated duct may be considered.

Table 7

Biliary Lithiasis — Personal Approach



LFT — Liver Function Test; USG — Ultrasonography; OCG — Oral Cholecystography; IVC — Intra-venous Cholangiography; ERCP — Endoscopic Retrograde Cholangio Pancreatography; CBDE — Common Pile Duct Exploration

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RESUMO

Os autores analizam, retrospectivamente, a sua experiência, obtida ao longo de 7 anos e meio (Janeiro de 1973 - Julho de 1980), num dos serviços de Cirurgia Geral do Hospital Universitário de Santa Maria em Lisboa, em cirurgia das vias biliares por diátese litogénica ou suas consequências. Foram operados, em cirurgia primária, 185 doentes e 14 outros necessitaram 15 reoperações, 7 dos quais primariamente por nós operados, num total de 200 intervenções. No conjunto dos casos de cirurgia primária 132 dontes foram submetidos a simples colecistectomia e nos restantes 53 foi também feita a exploração da V.B.P.. Entre estes últimos, simples coledocolitotomia e descompressão temporária com tubo de Kehr foi efectuada em 14 doentes, enquanto que nos restantes 39 foi imediatamente levada a cabo uma descompressão definitiva. Entre os primeiros 14 doentes tiveram que reoperar 5 (35%), por calculose residual em 1, recorrente em 3 e estenose papilar no outro, enquanto que todos os doentes do 2.º grupo permanecem assintomáticos, sem qualquer evidência de colangite. Da análise desta experiência, comparando-a com a de outros autores, concluem que quando há indicação para exploração cirúrgica da V.B.P., muito em especial quando, de facto, se verifica coledocolitiase, parece dever efectuar-se, *ab initio, cirurgia* de descompressão permanente. Da análise de 42 doentes submetidos a coledocoduodenostomia L-L (33 em cirurgia primária e 9 em cirurgia) concluem que é uma operação simples, de muito baixa morbilidade e mortalidade operatórias, com um tempo de permanência hospitalar post-operatória semelhante ao duma simples colecistectomia, e sem os inconvenientes que habitualmente lhe são atribuidos, nomeadamente colangite.

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