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# Choledochal Lithiasis. Multidisciplinary Therapeutic Target. Past and Present

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## Rezumat

***Litiaza coledociană. Țintă terapeutică multidisciplinară. Trecut și prezent***

*Introducere*: Litiaza biliară rămâne în continuare una dintre cele mai frecvente patologii întâlnite în practica chirurgicală. Autorii fac o trecere în revistă a etapelor care au marcat evoluția tratamentului litiazei coledociene (LC) în ultimii 50 de ani, bazându-se pe propria experiență. De la coledocul de resort exclusiv chirurgical s-a ajuns la o terapie multidisciplinară în care şi-au făcut loc atât endoscopia cât şi radiologia intervențională.
*Material şi Metodă*: Autorii au luat în studiu 2 loturi de pacienți: Lotul 1 a cuprins pacienții din perioada 1959-1997 (38 ani – 982 cazuri de litiază coledociană) la care s-a practicat chirurgia clasică. Lotul 2 cuprinde pacienții trataţi în perioada 1997-2017 (20 ani – 347 cazuri) la care s-au folosit atât chirurgia endoscopică cât şi chirurgia clasică pentru obținerea dezobstrucției coledociene. Sunt prezentate tipurile de litiază coledociană (LC) în funcție de care s-au stabilit şi ales metoda de dezobstrucție.
*Rezultate*: Toți pacienții din Lotul 1 au fost supuşi chirurgiei clasice, reprezentând 9.8% din operațiile pentru litiaza biliară. La Lotul 2 chirurgia clasică a fost înregistrată la 23.4% dintre pacienți, iar cea endoscopică la 76.6% dintre aceştia. Menționăm că nu a existat abordare laparoscopică pentru tratamentul LC din cauza absenței experienței. Am înregistrat la Lotul 2, 26.3% eşec endoscopic, în timp ce la bordul clasic s-a înregistrat 12,3% eşec al dezobstrucției, rezolvarea realizându-se prin anastomoze bilio-digestive.

*Concluzii*: Autorii propun trei categorii de indicații terapeutice în LC. O primă categorie o reprezintă „coledocul endoscopic", unde se încadrează litiaza migrată. O a 2-a categorie o constituie „coledocul chirurgical". Este situația litiazelor complexe şi complicate. În fine, ar fi şi o a 3-a categorie – „coledoc litogen". În acest ultim grup se încadrează cele mai agresive litiaze cu recidive repetate, panlitiaze, etc. Pentru categoriile 2 şi 3 încercările de dezobstrucție endoscopic – laparoscopic nu au şanse de reuşită sau sunt chiar contraindicate.

**Cuvinte cheie:** litiaza de main biliary duct (MBD), chirurgia clasică a main biliary duct, endoscopia main biliary duct

**Abstract**

*Introduction*: Cholelithiasis still remains one of the most frequent pathologies encountered in surgical practice. The authors review the stages which marked the evolution of the treatment of choledochal lithiasis (CL) during the last 50 years, based on their own experience. From the exclusively surgical choledochus, we have reached a multidisciplinary therapy in which both endoscopy and interventional radiology have found their place.

*Material and Method*: The authors studied 2 groups of patients: Group 1 included patients from the period 1959-1997 (38 years - 982 cases of choledocholithiasis) who underwent classical surgery. Group 2 included patients treated between 1997-2017 (20 years – 347 cases) in whom both endoscopic surgery and classic surgery were used to obtain choledochal clearance. The types of choledochal lithiasis (CL) according to which the method of obstruction clearance was decided upon and chosen are presented here.

*Results*: All the patients in group 1 underwent classical surgery, representing 9.8% of operations for biliary lithiasis. In group 2, classical surgery was recorded in 23.4% of patients, and endoscopic surgery in 76.6% of them. We mention that there was no laparoscopic approach for the treatment of CL due to the absence of experience. In group 2 we recorded 26.3% endoscopic failure, while in the classical approach group there was 12.3% failure of obstruction clearance, the solution being biliodigestive anastomoses.

*Conclusions*: The authors propose three categories of therapeutic indications in CL. A first category is represented by the "endoscopic choledochus", which includes migrated lithiasis. A second category is the "surgical choledocus". It is the situation of complex and complicated lithiases. Finally, there would be a third category - the "lithogenic choledocus". This last group includes the most aggressive lithiases with repeated relapses, panlithiases, etc. For categories 2 and 3, endoscopic - laparoscopic clearance attempts have no chance of success or are even contraindicated.

**Key words:** main biliary duct lithiasis (MBD), classical surgery of the main biliary duct, endoscopy of the main biliary duct

## Introduction

The treatment of choledochal lithiasis has gone through important stages during the last 50 years. Until the 70s in the 20th century, classical surgery was the only therapeutic option for choledochal lithiasis (CL). It was the "primadonna", the saving solution for achieving the clearance of the main bile duct. The choledocus belonged exclusively to open

surgery. Thus it could be rightly called the "surgical choledocus". However, starting with the 7th decade of the last century, a new technique to approach the main biliary duct (MBD - main biliary duct) appeared. It was endoscopic retrograde cholangiography (ERCP). This new approach, advanced by Ogoshi (1) in 1973, subsequently allowed the development of endoscopic surgical procedures - Oddian sphincterotomy, introduced by Classen in 1974 (2). Soon after, in 1976, Cotton P.B. (3,4) performed the first endoscopic clearance of the lithiasic choledochus. Starting with that moment, the transduodenopapillary approach of MBD expanded rapidly, considerably diminishing the role of surgery in the treatment of CL. After the implementation of laparoscopic cholecystectomy (LC), the laparoscopic approach to MBD lithiasis followed rapidly (5-7). Surgery thus managed to develop its own minimally invasive approaches. Currently, the idea has crystallized that the combined laparoendoscopic, sequential approach, constitutes the standard approach to the treatment of cholecysto-choledocholithiasis. Finally, under quite special circumstances, when minimally invasive endolaparoscopic treatment fails or is not indicated, a percutaneous transhepatic procedure can be used with the help of interventional radiology. Success rates of 95.7% are reported for this type of approach to MBD lithiasis (8). There is currently a "gold standard" function: LC and laparoendoscopic MBD clearance (8-10). The ones presented so far illustrate, unequivocally, the drastic narrowing of the field of indication of classical surgery in favor of the minimally invasive methods. A normal question arises: what is the current place of classical surgery and what are the situations that demand a classical surgery approach?

At present, "gold standard" for MBD lithiasis remains LC preceded or concurrent with endoscopic clearance (ES - Endoscopic Sphincterotomy). In this regard there is an unanimous consensus. Surgery, be it laparoscopic or classical, has at hand its own means of approaching MBD, real intra-operative endoscopy techniques: cholangiography, ultrasonography and choledochoscopy. However, the use of these procedures during a LC involves accepting additional risks which can be avoided by using cholangio-MRI, as this does not presuppose the biliary and pancreatic risks accompanying minimally invasive access maneuvers on the MBD.

From the very beginning, it must be stated that there are a multitude of forms in which choledochal lithiasis presents itself. Thus, in the evaluation of a CL, two components have to be evaluated: the contents of the choledochus, i.e. the type of calculi – migrated or autochthonous – and the condition of the choledochus. According to these parameters, 2 categories of CL are distinguished: simple lithiases, in which the stones are migrated from the cholecyst through the cystic, in a normal MBD, and complex lithiases, autochthonous (primary) lithiases, with stones formed in the MBD, panlithiases or choledochal calcifications, intrahepatic lithiases, recurrent lithiases, blocked lithiases, calculi with a diameter larger than 1 cm. This complex category also includes lithiases associated with: stenoses of the MBD, compressive cephalic pancreatitis, biliobiliary and biliodigestive fistulas, cystic dilatations of the MBD, juxtavaterian diverticula, and angiocolitis. Complex lithiases are responsible for additional risks when a minimally invasive approach is attempted, often requiring iterative interventions with uncertain results. (11-14). (*Figs. 1, 2, 3, 4* ).

## Material and Method

We wanted to find out what was the evolution over time of the therapeutic attitude appropriate for CL. We had both the opportunity and the access to two types of patients treated over different periods of time. A first group included patients from the period 1959-1997 (38 years), a period in which the classical surgical approach to CL was practised. The statistics belong to the surgery department of the Caritas Clinical Hospital in

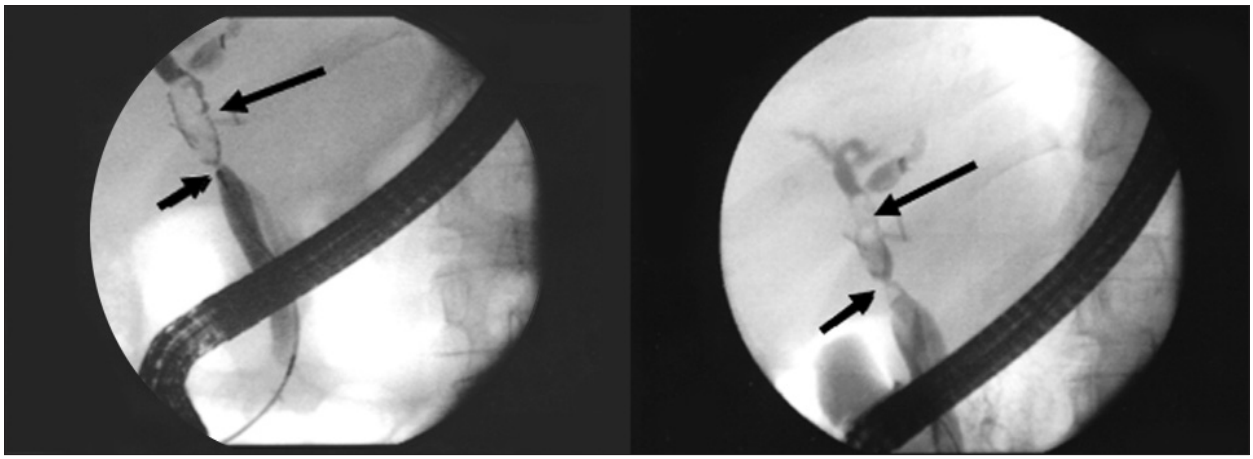

**Figure 1.** Primary lithiasis above an inflammatory stenosis of the MBD (main biliary duct). The short arrows shows the circular stenosis. The long arrow shows MBD lithiasis – lithiasic cast (collection of Prof. Dr. Eugen Brătucu)

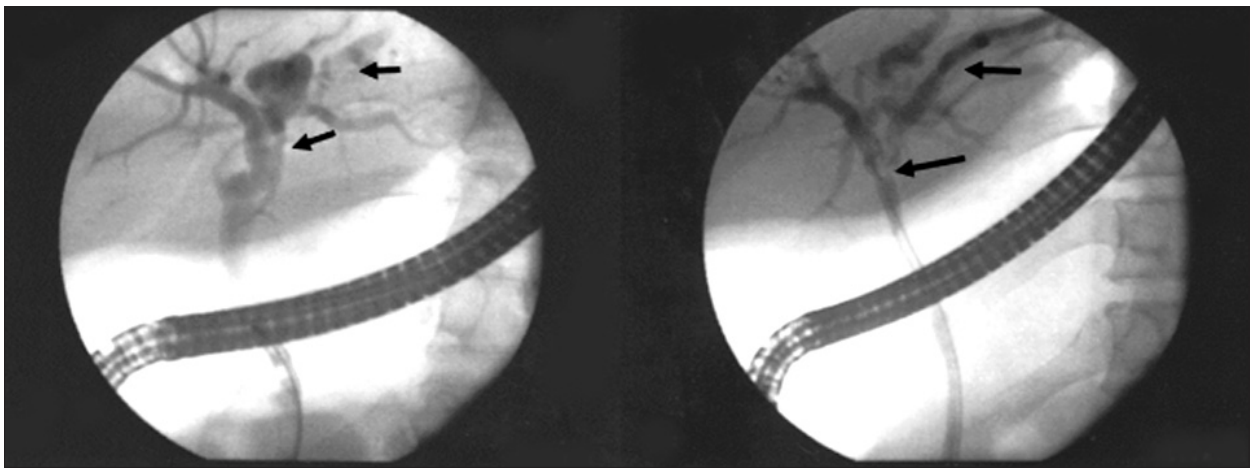

**Figure 2.** Intra and extrahepatic sclero-inflammatory cholangitis with intra and extrahepatic lithiasis. The arrows show lithiasis (collection of Prof. Dr. Eugen Brătucu)

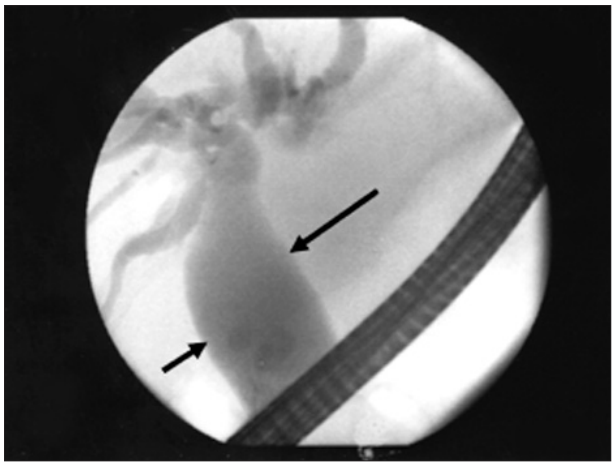

**Figure 3.** Cystic dilatation of MBD type I C Todani (long arrow) with lithiasis (short arrow)
(collection of Prof. Dr. Eugen Brătucu)

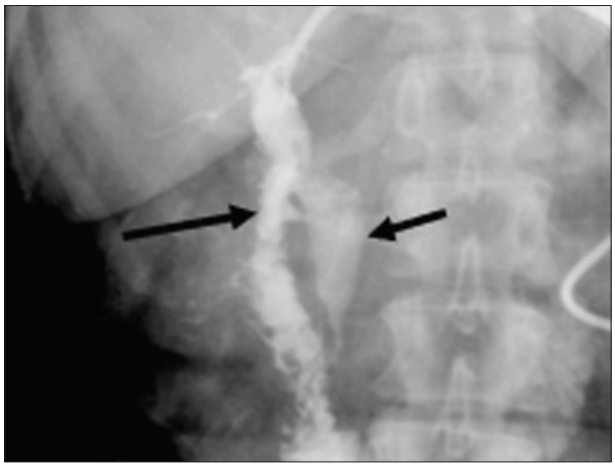

**Figure 4.** Lithiasis in the "bottom of the choledochal sac" (short arrow) after a latero-lateral choledochoduodenal anastomosis (long arrow) with recurrent angiocolitis. Image obtained with Omnipaque contrast agent administered through transhepato-parietal axial biliary drainage
(collection of Prof. Dr. Eugen Brătucu)

Bucharest, currently closed down. The second group includes patients treated between 1997-2017 (20 years) in the Caritas Clinical Hospital and in the Surgery Clinic I of the Oncological Institute in Bucharest. In this second group, endoscopic MBD clearance was performed, together with the surgical approach in certain situations. We wanted to find out, comparatively, what were the success and failure rates of these two therapeutic options – the classical one and the minimally invasive endoscopic one. We mention that laparoscopic choledochal clearance was not used. The analyzed groups had the following structure:

Total lithiasis surgery MBD 1959 - 2017 – 1329 patients.

- Group 1: 1959-1997 (classical surgical approach) – 38 years – 982 cases

10,015 surgical procedures were performed on the biliary tract, of which 982 were MBD lithiasis (9.8%).

- Group 2: 1997-2017 (endoscopic and surgical approach) – 20 years – 347 cases.
  - Endoscopic surgery – 266 patients (76.65%);
  - Classical surgery – 81 patients (23.34%).

Types of lithiasis:

- Migrated – 282 patients – 81.2%;
- Authochthonous (primary) – 42 patients – 12.1%;
- Mixed (migrated and authochthonous) – 23 patients – 6.6%.

## Results

As seen from *Table 1* (period 1997-2017), the endoscopic clearance approach was preferred in 76.6% of cases. The treatment by classical surgery was practised on 23.4% of patients; this latter type of treatment was reserved for cases with complex lithiases in which autochthonous or mixed lithiases were prevalent. The situations in which the oddian region could not be approached or the situations in which there were associated lesions of the bile ducts for which the endoscopic approach was contraindicated were also included here. Regardless of the simple or complex type of lithiasis, the first intention was to intervene through an endoscopic approach, while the surgical one was preferred only for complex or complicated lithiases, as well as after an endoscopic failure.

A percentage of 26.3% (70 patients) was recorded in which endoscopy did not lead to choledochal clearance: 20% failure in migrated lithiases and 25.7% in authochthonous lithiases. Referring to the first group (1959-1997), the approach was strictly surgical and there were 42 reinterventions after the surgical clearance (4.27%) and 8 deaths due to specific causes (0.85%): severe acute pancreatitis, septic angiocolitis, MBD lesions. Following the classical approach in pacients from Group 1, 12.2% procedure failures were recorded, meaning that there were residual calculi or biliary complications attributable to the surgical procedure. The surgical approach consisted of choledocholithotomy and drainage or biliodigestive anastomoses: choledocho-duodenal or choledocho-jejunal.

## Discussions

From the analysis of these two categories it

**Table 1.** Choledochal clearance GROUP 2 – 347 cases

| Therapeutic approach | Migrated lithiasis 282 patients - 81.2% | Autochtonous lithiasis 42 cases – 12.1% | Mixed lithiasis 23 cases – 6.6% |
|---|---|---|---|
| Endoscopic – 266 cases – 76.6% | 69.6% | 73.8% | 0% |
| Classical surgery – 81 cazuri – 23.4% | 30.4% | 26.2% | 100% |
| • Endoscopic failure - 70 cases - 26.3% | | | 20% migrated lithiasis (14 cases)<br>25.7% autochtonous lithiasis (18 cases) |
| • Classical surgery failure – 10 cases – 12.3% | | | |

appears that the therapeutic difficulties in CL represent a percentage of 15% - (255 of the cases), cases in which endoscopic clearance fails or is not indicated. In such situations, a combination of more sophisticated techniques such as lithotripsy, with all its variants: mechanical, electrohydraulic and laser, can be used. Indicated for calculi larger than 1.5 cm, these techniques are associated with quite important complications (5-15%): perforations, instrument blockages, hemobilia, acute pancreatitides, angiocolitis. Multiple sessions are often required, with the procedure being repeated, thus adding extra risks (15-17).

From our point of view, based on the experience presented here, 3 categories of therapeutic indications in CL could be outlined. Thus, the first category can be called the "endoscopic choledochus". This group includes simple lithiasis cases: calculi migrated from the cholecyst, remaining stones after CL, the first recurrence after a laparoendoscopic procedure. The endoscopic approach has a chance of success in 95% of these simple CLs. Endoscopic extraction restores the freedom of the bile transit, which is going to occur normally (18).

The second is represented by the "surgical choledochus". It is the situation of either simple lithiasis, but with unsuccessful laparoendoscopic clearance attempts in group 1 patients, such as duodenum excluded from transit, or complex lithiases: biliobiliary, biliodigestive fistulas, and other complex situations previously described. For this category of CL, the endoscopic approach is either not indicated, impractical, or is going to fail (19-22). Finally, there is a 3rd category- the "lithogenic choledochus". This group includes the most aggressive complex lithiases: repeated recurrences, intrahepatic lithiases, panlithiases, associated stenoses, congenital cystic dilatations, juxtavaterian diverticula associated with lithiasis. For categories 2 and 3, endolaparoscopic clearance attempts do not have a high chance of success or are even contra-indicated. In these two circumstances open surgery should represent the first therapeutic intention. In groups 2 and 3, especially in MBD lithiasis recurrences, a choledochojejunostomy should be performed with the creation of a path for "visiting" the bile ducts in order to treat possible subsequent lithiasis recurrences (23).

The recent literature dedicated to the treatment of choledochal lithiasis insists on two methods of treatment, both minimally invasive: laparoscopic approach and endoscopic approach. These techniques are successful in 95-97% of cases, without significant differences between them (24,25). In 21.2% of endoscopic approach cases, multiple unobstruction sessions are necessary (25). After laparoscopy, a conversion rate to open surgery of 14.2% is recorded, requiring a classic solution (26,27). We want to emphasize the fact that open surgery accounts for an important share of choledochal lithiasis. In fact, it remains to solve the most difficult and complex cases of choledochal lithiasis, being the solution of last resort in obtaining the MBD clearance.

## Conclusions

Thus, in the therapeutic arsenal of MBD lithiasis, classical surgery remains the emergency solution either as the first-line treatment in 10% of cases, or as a solution in endoscopic clearance failures. Classical surgery aims to correct the failures, accidents and incidents of minimally invasive surgery. At the same time, it remains to be used "ab initio" in cases of complex lithiasis. Of course, minimally invasive and classical surgery are performed sequentially, each within its own scope of indications. Nowadays, "classical" surgery is neither a "primadonna", nor a "cinderella". It remains a potentially saving solution whose disadvantages should be forgiven and qualities acknowledged.

### *Author's Contributions*

All authors had equal contributions in all steps of the development of this study.

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*Conflicts of Interests*

The authors state that there are no conflicts of interests.

*Ethical Statement*

Due to the fact that the study is retrospective, no ethical issues were raised.

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