



**A STUDY TO DESCRIBE SOME CURRENT PROBLEMS IN THE TREATMENT OF CHOLELITHIASIS**

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**ABSTRACT**

Cholelithiasis is everywhere more often easily and quickly diagnosed and treated successfully by laparoscopic cholecystectomy (LCHEC) for cholecystolithiasis (up to 90 - 98%), by laparoscopic choledocholithotomy (LCHDLT), laparoscopic choledochoduodenostomosis and endoscopic papillosphincterotomy (EPST) for CHDLS and BS VP. If, for any reason, it is impossible to perform them then, in such cases, surgeons are forced to resort to open methods of these operations up to 5-15% of cases, especially in emergency surgery. However, their results (both open and endosurgical - endoscopic - laparoscopic variants of these operations) still do not satisfy some - experienced surgeons in this field. Due to, still developing a number of postoperative complications, especially and mainly in the long-term period after surgery. Such as recurrent or residual CHDLS and BS VP - up to 10 - 25%, as well as "postcholecystectomy syndrome" (after LCHEC) up to 40% or more. The paper we present the results of the developed new methods of these operations used in 42 patients (PST-12, PSP - 9 and DID (PST + CHDA) - 21) operated on for cholelithiasis complicated by choledocholithiasis and stenosis of the FP. When performing these new surgeries, no serious technical difficulties, errors, etc. were noted. All operated patients did not have any serious complications in the immediate postoperative period, as well as in the long-term period.

**KEYWORDS :** Chlolithiasis, endosurgical, Labroscopy, postoperative, papillosphincterotomy.

**INTRODUCTION:**

Now almost everywhere, cholelithiasis (CHLTS) is more often easily, quickly, easier to diagnose and successfully treated by laparoscopic cholecystectomy (LCHEC) for cholecystolithiasis (up to 90-98%), by laparoscopic choledocholithotomy (LCHDLT) and endoscopic papillosphincterotomy (EPST) for choledocholithiasis (CHDLS) and benign stenosis (BS) of the Vater papilla (VP) of the duodenum. In recent years, a number of surgeons [1,3,9] have also used laparoscopic choledochoduodenostomosis (LCHDA) in the treatment of CHDLS and BS VP.

If for any reason it is impossible to perform them (the above operations), then, in such cases, surgeons are forced to resort to open methods of these operations up to 5 - 15% of cases, especially in urgent - emergency surgery. [5,6]

However, their results (both open and endosurgical - endoscopic - laparoscopic variants of these operations) still do not satisfy some surgeons, especially expert - experienced surgeons in this field. [4]

Due to, still developing a number of postoperative complications - especially and mainly in the long-term period after surgery, - such as recurrent or residual CHDLS and BS VP - up to 10-25%, as well as "postcholecystectomy syndrome" (after LCHEC) up to 40% or more (2, 5, 6m and 3) Not to mention a number of immediate postoperative complications, such as subhepatic abscesses, postoperative pancreatitis, biliary fistulas - biliary peritonitis, etc. [7,9]

**The Purpose Of The Study:** To improve the quality of treatment of patients operated on for CHLTS drugs complicated by CHDLS and BS VP

**Study Tasks:**

To find out the main causes of unsatisfactory long-term results, the most commonly used methods of surgical treatment of CHLTS complicated by CHDLS and BS VP and to find ways to reduce these complications

**Materials and Methods of Research:**

We have studied both the most commonly used methods of surgical treatment of CHLTS complicated by CHDLS and BS VP, such as previously traditional open papillosphincterotomy (PST), papillosphincteroplasty (PSP) and double internal drainage (DID, etc.), and modern endoscopic - laparoscopic variants of surgery (LCHEC, LCHDLT, EPST, etc.,) - in patients operated on for CHLTS complicated by CHDLS and BS VP.

The most modern research methods (clinical and laboratory, ultrasound, CT, RPCP, MRI cholangiography, etc.) were used for diagnosis.

\*All systematic data collection followed local and international guidelines like (IRB). No consent was required from patients or other data sources. Throughout the study, there were no breaches of patient or volunteer ethics.

**DISCUSSION AND RESULTS:**

The results of the study showed that the main reasons for the unsatisfactory results of the most widely used operations for CHLTS and its main complications (CHDLS and BS VP) in the long-term period after surgery, recurrent or residual CHDLS and BS VP were found (Table 1).

**Table 1: Recurrent or residual CHDLS and BS VP after operations on the biliary tract (with cholelithiasis).**

|       | CHEC       | CHDLT   | CHDA   | PST      | PSP     | DID     |
|-------|------------|---------|--------|----------|---------|---------|
|       | № 8 052    | № 66    | № 48   | № 312    | № 246   | № 192   |
|       | L*   O*    | L   O   | L   O  | E*   O   | L   O   | Л   O   |
|       | 7950   102 | 17   49 | 9   39 | 299   13 | 6   240 | 6   186 |
| Whole | 970   32   | 28   8  | 4   24 | 31   1   | 0   26  | 0   3   |
| Total | 1002       | 36      | 28     | 32       | 26      | 3       |
| In %  | 12.4%      | 54.5%   | 58.3%  | 10.2%    | 1.56%   | 1.56%   |

\*L-laparoscopic, O –open, E – endoscopic, PST – papillosphincterotomy, PSP-papillosphincteroplasty and DID –double internal drainage.

As can be seen in the table, the comparatively worst results were after CHEC, especially CHDLT and CHDA, regardless of whether they were carried out (laparoscopic or open ways), and the best results were after PST, especially after PSP and DID. Despite their use in more advanced cases of this pathology, as well as when endosurgical methods (LCHEC, LCHDLT, EPST, etc.) were not possible or inadequate.

All these indicate the need to develop more effective methods of treating this pathology. in order to improve the quality of treatment of this category of patients.

Nevertheless, it should be emphasized that to date, cholelithiasis and its frequent complications (CHDLS and BS VP) are mainly treated with LCHEC and EPST up to 85-95%, as they say quite successfully. [8]

Although they are still not very perfect - by the standards of some experienced surgeons in this field, including in our opinion, too.

So, as a number of patients after them need long-term repeated treatment and even repeated operations due to various complications (mainly due to "postcholecystectomy syndrome" up to 40% or more cases (even after LCHEC performed allegedly for "uncomplicated" cholelithiasis), as well as residual and recurrent CHDLS or BS VP, or in their combinations - up to - 15-25% (Table - 2)

**Table 2: Some negative factors and complications of LCHEC and EPS**

|   |                      |
|---|----------------------|
| Some negative factors and complications of LCHEC  |                      |
| 1. Inability to perform (conversion) -----  | from 1-2 to 15%      |
| 2. Bleeding -----   | from 0.2 to 2%       |
| 3. Bile discharge and lymphorrhea -----   | up to 1-3%.          |
| 4. Subhepatic abscess-----  | up to 1-2%.          |
| 5. Iatrogeny - - -----  | from 0.2 to 2.5%     |
| 6. Lethality - -----  | from 0.5 to 4%       |
| Some negative factors and complications of EPST   |                      |
| 1. Impossibility of catheterization of BS VP .....  | up to 26.6% or more. |
| especially, with sever pronounced stenosis of VP .....  | up to 33.6% or more. |
| 2. The impossibility of the EPST stage itself for some .....  | up to 1.6% or more.  |
| for technical reasons (unexpected failure of some parts of the device (breakdowns, unexpected unwillingness of patients, etc.). |                      |
| 3. Difficulties or practically impossibility of EPST .....  | up to 2.8% or more.  |
| α - with parafaternal diverticula, especially .....   | up to 1.4% or more.  |
| With diverticulitis   |                      |
| b - After gastric resection and gastrectomy .....   | up to 1.2%           |
| c - after esophageojejunoanastomosis .....  | up to 0.1% or more.  |

|  |                     |
|--|---------------------|
| 4. No radically with extended stenosis of VP ..... | up to 1.6% or more. |
| b- Complications of EPST                           |                     |
| 5. Perforation of the VP or duodenum .....         | up to 0.5 - 3%      |
| 6. Postoperative pancreatitis.....                 | up to 5-10%         |
| 7. Postoperative pancreatic necrosis .....         | up to 1-2%          |
| 8. Bleeding .....                                  | up to 1.6 - 2%      |
| 9. Lethality .....                                 | up to 0.5 - 4%      |

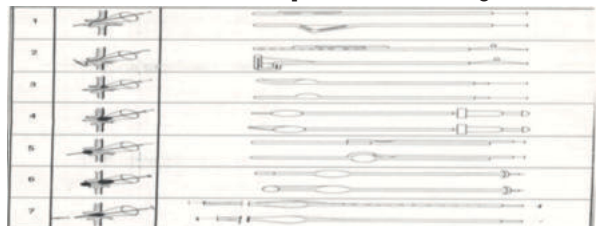
Another disadvantage of this tactic is also the two-stage nature of their implementation, first LCHEC and then EPST, or vice versa. And with regard to their simultaneous use, it is still at the stage of experimental clinical studies and trials.

Therefore, we have developed and applied a number of new methods of PST, PSP, CHDA and DID, i.e. PST or PSP+CHDA, etc., allowing them to be performed quickly, safely, minimally invasive, hemostatically, more radically, standard, etc.

Prior to their introduction into clinical practice, we previously used and tested almost all the new methods of PST, PSP and DID developed by us in experiments on animals and biliopancreatoduodenally complex (on corpses of an adult).

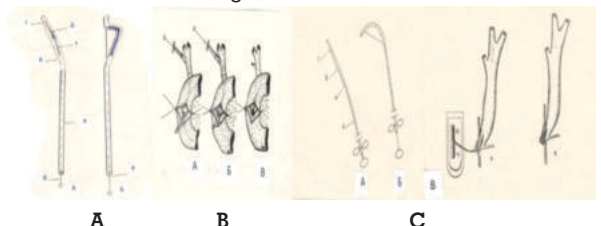
As a result, it was possible to choose the most suitable types (variants), i.e. the most acceptable types both with open and especially endosurgical methods without duodenotomy and even without a wide choledochotomy.

The main difference between the papillotomas we have developed from other well-known ones intended for EPST is that, these papillotomas of ours dissect - expand only a narrowed segment of the VP and strictly up to a certain required diameter, not to mention many other positive differences. Some of them are presented below (Fig.1)



**Figure 1:** Instruments developed and tested by us for the first time in the world (in an experiment and in a clinic) types of "papillotomas" intended for interoperational PST, both in open and laparoscopic operations.

The application of one of our papillotomes (papillotome No. 1) is schematically presented below. Comparing it with the well-known EPST method (Fig.1).



**Figure 2:** Schematic representation of our papillotoma No. 1 (A) and the implementation of PST (B - a, b, and c stages of the operation) in comparison with the known ones. C) known for papillotomy and performing PST.

The main difference between our papillotome and the known ones is that the working end of our papillotome with PST takes

the form of a triangle (and not a bowstring, as in the known one) due to the insertion of a resistant material with a hinge (shown by an arrow) at its working end. As a result, the cutting part of the device is sharply shortened, which significantly reduces the risk of damage to other elements – of the VP. And also our papillotome sailot dissects – expands the narrowed BS VP to a given size - diameter.

It should be noted that, a number of the above-listed methods of surgery for CHLTS and its complications (LCHEC, LCHLT, CHDA and LCHDA, EPST, etc.), can often be - non-radical (especially LCHEC, LCHLT, CHDA, etc.), non-physiologically (especially CHDA and LCHDA), not always possible (especially EPST) and finally, it's not always safe.

All types of endoscopic – laparoscopic surgery options (LCHLT, EPST, etc.), give the best results, mainly at 1-2 stages of the disease (see Table – 3).

**Table 3: The main signs and severity of CHLDS and BS VP during intraoperative cholangiography, X-ray television cholangioscopy, choledochoscopy, balloon papillography and probing.**

| No. | Research methods  | Degrees of BS VP   |                                  |                              |
|-----|---|--|----------------------------------|------------------------------|
|     |   | I  | II                               | III                          |
| 1   | Intraoperative cholangiography, X-ray television cholangioscopy and balloon papillography |  |                                  |                              |
| a   | Narrowing of the lumen of the VP, in mm   | up to 2-1  | up to 1                          | less than 1                  |
| b   | Intake of contrast agent through the VP   | Moderately (slightly) reduced  | Significantly or sharply reduced | Sharply reduced or no income |
| c   | Expansion of the diameter of the hepaticoholedochus, (in mm)                              | up to 15   | Within 15-19                     | 20 and more                  |
| 2   | Probing VP  | The 4mm probe does not pass, the 3mm probe passes with some effort   | 3mm probe does not pass          | 2mm probe does not pass      |
| 3   | Choledochoscopy   | Narrowing of the lumen of VP and of cicatricial-inflammatory deformity, polyps, lack of "motor play" of the sphincter of VP and the choledochoscope does not pass through the VP |                                  |                              |

But, in severe - advanced cases of pathology, i.e. at 2 and especially 3 stages (see table-3), they may be inadequate, and sometimes even impossible.

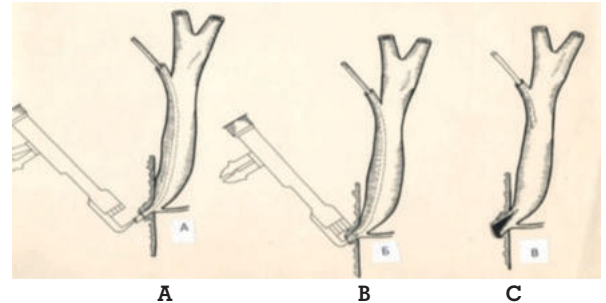
Therefore, in such cases, surgeons are forced to resort to the well-known existing open methods of performing the operation (PST, PSP, CHDA and DID).

However, the relative duration, complexity, morbidity, and potential for postoperative complications associated with these known methods of open surgery have resulted in a dramatic reduction in the number of these and other types of biliary-digestive anastomoses. Today they can be used rarely, and only in the above-mentioned - forced situations, and mainly in advanced cases of pathology - and their results are also not yet comforting.

Therefore, we have developed new versions of PST, PSP, CHDA and DID using our papillotomes (Fig.3) and new staplers (STI-

1, SMT-2, SB-2-3, PST-20, PSP-20, etc.), developed by us, allowing them to be performed both with open and laparoscopic methods, relatively, quickly, safely, hemostatically, radically, standardly, etc.

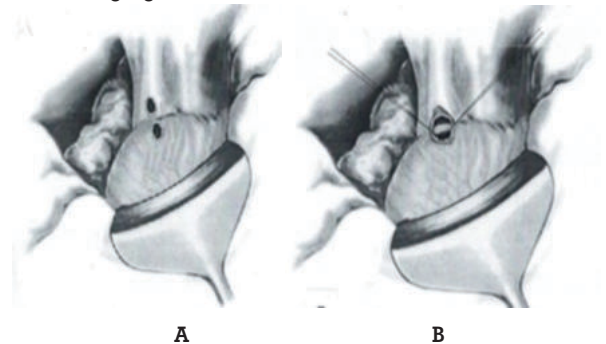
Many of them are protected by copyright certificates and patents of the largest developed countries of the world (such as England, Germany, Canada, Russia, USA, France, Japan, etc.). Some of them are schematically shown in Figure 2.

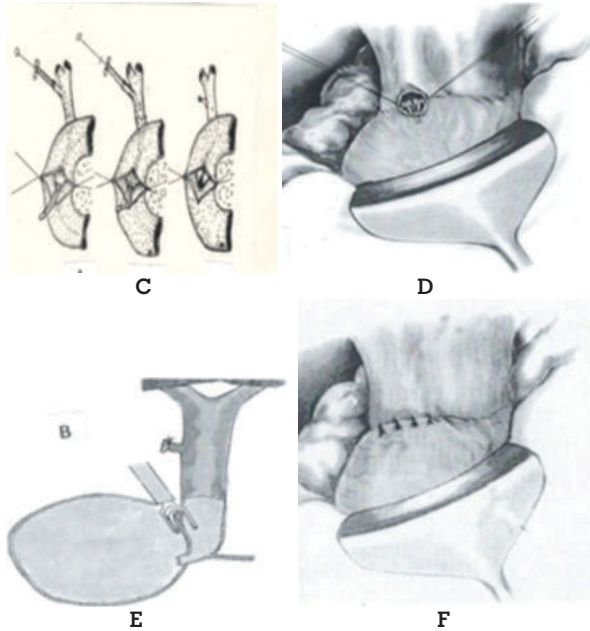


**Figure 3:** Schematic representation of the PSP using a special apparatus - a stapler PST - 20 and PSP - 20, a, b and c stages of the operation.

A brief technique for performing PSP, CHDA and DID is schematically shown below (Fig 4). After laparoscopic diagnosis and LCHEC, a median or right transrectal microlaparotomy is performed at the level of transition of the choledoch into the duodenum under the control of a laparoscope. Next, he performs microcholedochotomy near the duodenum, followed by microduodenotomy - as if continuing the incision of the choledochus on the wall of the duodenum (Fig.4 a) It connects the walls of the choledochus and duodenum with 2 interrupted sutures (Fig.4 b). After that, a very favorable situation develops for completing the diagnosis (choledocholithiasis, cholangitis, stenosis of the VP, etc.), as well as for treatment (removal of stones from the choledochus, antigrade PST, etc.).

Further, it clarifies the presence of stones in the bile ducts, the presence of BS VP, cholangitis, etc. by choledochoscopy, probing, balloon papillography, etc. If the length of BS VP does not hang 10-15 mm, PST is done using our papillotome (Fig.4 c), under the control of a choledochoscope, introducing it through microcholedotomy. If the length BS VP more than 10-15 mm, then a PSP is made using a clip applicator or an SPP-20 device (Fig. 4 d). Then, control choledochoscopy is again performed to identify residual stones, the adequacy of PST or PSP, whether there is bleeding from the dissected edge of the VP (after PST). Then, with the help of a clip-applicator, it forms CHDA (Fig.4 d and f), by applying parallel clips at a distance of 4-6 mm from each other, connecting the walls of the choledochus with the wall of the duodenum and dissecting between them., Forms an anastomosis of the desired size. Usually, 6-7 medium-sized clips (8 mm) are enough to make an anastomosis with a diameter of 20-30 mm. The anterior wall of the anastomosis is closed by applying several interrupted sutures (Fig 4.g).





**Figure 4:** Schematic representation of the implementation of DID (our papillotome No. 1 PST + CHDA with a clip applicator). (a) microcholedochotomy and microduodenotomy; (b) connection of choledochotomy and duodenotomy with a 2-nodal suture; In partial PST with our papillotome (c), scheme for applying a compression clip (d), continued application of the clip (e) and completion of the anterior wall of the CHDA by applying several interrupted sutures (g).

Figure 4: The new methods of these operations developed by us were used in 42 patients (PST-12, PSP - 9 and DID (PST + CHDA) - 21) operated on for cholelithiasis complicated by CHDLS and BS VP.

When performing these operations, we have never noted any serious technical difficulties, errors, etc. In all the patients operated on by us, no serious complications were noted in the immediate postoperative period.

Only in one patient, a few hours after the end of the operation, small discharges of blood from the safety drainage were noted, in a volume of 50-60 ml, and during the control ultrasound, the accumulation of fluid - blood in the subhepatic space and other parts of the abdominal cavity was not detected. The patient received hemostatic agents during the day and the discharge from the drainage stopped.

In 2 patients, the phenomena of postoperative pancreatitis were noted (mild - slight bloating, nausea, accompanied by 1-2 repeated vomiting, small girdle pains in the upper abdomen, etc.). In 3 patients, an increase in blood diastasis was noted, which was stopped - normalized within 2-5 days after the operation.

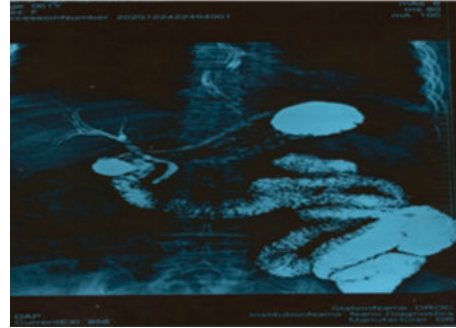
Other specific complications (failure of sutures, subhepatic abscess, necrotizing pancreatitis, etc.) were not noted.

Non-specific complications (postoperative pneumonia, exacerbation of chronic bronchitis, angina pectoris, episodes of hypertension, etc.) were observed in a small number (in 3 patients). There were no lethal outcomes after the operation, all patients were discharged in a satisfactory condition.

After discharge, the patients were followed up. An outpatient examination (ultrasound, duodenoscopy, X-ray studies, etc.) showed good patency of the anastomoses after PST, PSP, CHDA and DID (Fig.5 and 6).



**Figure 5:** Contrast study of the stomach and duodenum 3 years after PSP. There is a discharge - reflux of contrast into the bile ducts. "Anastomosis" pass.



**Figure 6:** X-ray examination 10 years after PSP. Contrast study of the stomach and duodenum. There is a discharge - reflux of contrast into the bile ducts. "Anastomosis" pass

#### CONCLUSION:

Our first experience in the use of our developed surgical technique (PST, PSP, CHDA and DID) in the treatment of patients with CHLTS complicated by CHDL and DS VP significantly simplifies, accelerates, facilitates, standardizes, and reduces the trauma of the operation. This creates conditions for improving the results of treatment of patients suffering from cholelithiasis complicated by CHDLS and BS VP, with the 2nd and especially the 3rd degree of pathology.

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**Author contributions:** Each author conceptualized the idea. All writers have curated the data. Approach: All authors. All writers were visualized. Original draft writers: all of the authors. By all authors; writing, reviewing, and editing.

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