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Optimization of Laparoscopic Cholecystectomy Technique for Acute Calculous Destructive Cholecystitis in the Elderly

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Abstract The authors studied the possibility of reducing the number of conversions when performing laparoscopic cholecystectomy in patients of older age groups with acute cholecystitis in complex technical cases. The results of the execution laparoscopic cholecystectomy in 63 patients in a group of 177 patients. The procedure for performing the operation is described. The conclusion is made about the high efficiency of the methods worked in the clinic atypical paroscopic cholecystectomy.

Keywords Acute Calculous Cholecystitis, Laparoscopic Cholecystectomy, Surgical Tactics, Elderly

1. Introduction

To date, calculus of gallbladder is detected in about 10% of the adult population, more often in women over the age of 40, while the number of complicated forms of calculous cholecystitis remains consistently high [1,2,9,13]. At the same time, the problem of acute calculous cholecystitis (ACC) and its complications significantly increases in elderly and senile patients with a high operational and anesthetic risk due to the presence of severe concomitant metabolic pathology, disorders of the cardiovascular and pulmonary systems.

Laparoscopic cholecystectomy (LCE) has now become the method of choice in the treatment of patients with chronic calculous cholecystitis (CCC) [1,2,3,5,10]. The emergence of intraoperative complications and complications in the group of patients with acute cholecystitis, especially in the elderly and senile age, quite often leads to the transition from LCE to laparotomy [1,2,4,7]. Conversion, of course, negates all the advantages of LCE over open surgery. Costs increase significantly, the results of the treatment process deteriorate [6,12,14].

Thus, to date, clinical trials, performing laparoscopic surgical interventions in elderly and senile patients with acute cholecystitis, can provide good results with a minimum risk of complications and deaths in the postoperative period and improve patient survival.

Aim of the study: development of a technique for laparoscopic cholecystectomy for acute destructive cholecystitis in patients of older age groups.

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2. Materials and Methods

The paper studied the possibility of reducing the number of conversions during LCE in elderly and senile patients with acute destructive cholecystitis in difficult technical cases. The results of performing LCE in 63 elderly patients with destructive changes from 177 patients are presented. The procedure for performing the operation is described. In laparoscopic operations on the gallbladder, we used an endosurgical complex and sets of operating instruments from Karl Storz (Germany).

According to the general status, the severity of concomitant diseases, as well as the risk of surgery and anesthesia, patients were distributed according to the scale proposed by the American Society of Anesthesiologists (ASA). This scale is based on the presence and severity of severe concomitant systemic diseases in patients and implies the allocation of the following 5 classes.

Class I - patients without systemic diseases;

Class Il - patients with compensated systemic disease that does not significantly limit physical activity;

Class Ill - patients with a systemic disease that limits physical or social activity, but can be compensated by treatment;

Class IV - patients with decompensated disease requiring constant medication;

Class V - patients who may die within 24 hours, regardless of whether or not they receive medical care.

In our study, the risk class of ASA anesthesia in patients of all groups varied from Ill to IV. In patients at risk of class Ill anesthesia, concomitant diseases were compensated after preliminary short-term preoperative preparation. In 18 (28.7%) patients, the general condition at admission was assessed as

moderate, 5 (7.9%) patients were in serious condition and 2 (3.1%) in extremely severe.

The severe and extremely serious condition of the patients was due to the severity of the underlying disease, as well as the severity of concomitant diseases.

All patients on admission to the hospital underwent a comprehensive general clinical study. The presence of pathology from the gallbladder and bile ducts was diagnosed according to the clinical picture, laboratory, ultrasound and endoscopic methods. Prediction of the course of the pathological process and the choice of the treatment method were determined by the clinical picture, temperature reaction, indicators of clinical and biochemical studies, and most importantly, depending on the version of ultrasound imaging of the gallbladder.

Ultrasonic signs of AC were thickening of the walls of the gallbladder more than 5 mm, heterogeneity and stratification, double wall contour, an increase in the size of the gallbladder, an impacted stone in the mouth of the cystic duct, the nature of the intravesical fluid, the presence of perivesical infiltrate and (or) exudate.

We have identified 3 options for ultrasound imaging of the gallbladder in acute destructive calculous cholecystitis:

- signs of destruction of the gallbladder wall, the wall thickness exceeds 4 mm, there is its layering. Similar signs were found in all 63 patients (35%).
- signs of perivesical changes (infiltrate and exudate) in 19 patients (11%) had the listed signs.
- signs of limited local or widespread peritonitis. With ultrasound, free fluid is visualized in the subhepatic space and other parts of the abdominal cavity. Similar changes were diagnosed in 7 patients (4%) (Table 1).

As can be seen from the table, we most often diagnosed severe inflammatory infiltration, as well as gangrenous-necrotic changes or gallbladder empyema.

As you know, an important factor determining the degree and prevalence of inflammatory changes is considered to be the time from the onset of ACC to the operation itself, so the time was carefully and in detail noted in each clinical observation (Table 2).

At the same time, the late appealability of a significant part of patients, after 4 days or more, in 27 patients (42.8%) and their late operation deserve attention. This circumstance alarms surgeons and testifies to the obviously severe initial state of this contingent of patients.

We have optimized the technique of laparoscopic cholecystectomy by combining both the currently known techniques and our own original developments, which allows performing LCE even in difficult technical situations. Unfortunately, it is rather difficult to establish the true frequency of anatomy variants, since most surgeons do not record these deviations in the operation protocol and limit themselves to a standard description of the operation progress. When determining the anatomical conditions for performing cholecystectomy, special attention was paid to the typical and variant topography of the gallbladder.

Table 1. Interpretation of Inflammatory Changes in the Wall of the Gallbladder (N = 63)

The degree of inflammatory changes in the gallbladder	Inflammation	Inflammation
	Infiltration (S) Fibrosis (F)	Phlegmon Infiltration (S) Fibrosis (F) Necrosis (N)
Severe inflammatory changes in gallbladder or thickening	2	8
Pronounced inflammatory changes in the area of the Calot triangle in which there are difficulties in identifying the structures of the Calot triangle	3	11
Severe inflammatory process in the area of the Kalot triangle, it is very difficult to isolate and identify its elements	9	15
Severe inflammatory process in the area of the Kalot triangle with spread to the duodenal ligament (phlegmon, necrosis)	6	9

Table 2. Distribution of Patients Depending on the Duration of the Disease (N = 63)

Day from the onset of the disease	Observations and Degree					Conversion rate	%
	Il	111					
Number of patients	-	19	10	14	18	-	
2-3 days	-	8	6	4	6	-	
4-5 days	-	4	4	9	10	-	
6-7 days	-	5	2	1	2	1	1.5
8-10 days	-	3	-	-	-	-	

If during the initial revision there was a pronounced inflammatory infiltration, then gangrenousnecrotic changes, GB empyema or severe fibrosis were usually detected. Therefore, the detection of gangrenous-necrotic changes or gallbladder empyema was regarded as "negative consequences" of the duration of the history (Fig. 1).

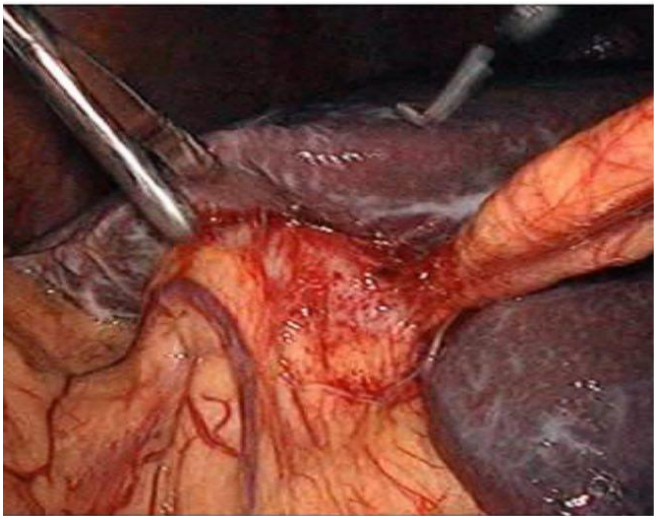

Figure 1. Expressed fibrous changes in the wall of the gallbladder are accompanied by changes in the paravesical tissue

We encountered atypical anatomy (in connection with destructive changes) of the gallbladder when performing LCE in one case: its neck was located above the hepatoduodenal ligament and wrapped in an omentum with a wide neck, and the body and bottom were fixed along the anterior edge of the left lobe of the liver. LCE was performed "from the bottom" after placement of laparoports in the right and left hypochondria, taking into account the peculiarities of the bladder topography.

In 12 (2.6%) patients of the main group, the cystic duct diameter was 8 mm. The ligation of the wide duct was carried out by staggering two or three 5 mm clips or a thread with intracorporeal knot formation. Difficulties in identifying elements of the gallbladder neck were associated with inflammatory-infiltrative or cicatricial-adhesive changes in the area of intervention, which was the reason for LCE "from the bottom".

Unfavorable variants of the anatomy of the cystic duct, namely the presence of a short as well as a wide duct (l patient) caused serious complications during the operation: marginal perforation of hepatic choledochus (0.2%) with a hook-electrode in one patient and prolonged bile leakage (0.2%) from the stump of a wide cystic duct during its stepwise ligation with clips from another.

The technical principles of these operations are as follows: opening the gallbladder cavity, which facilitates orientation; leaving the walls of the gallbladder in places of their firm fixation with the surrounding tissues in place and excision along the visible border of only free sections of the wall of the gallbladder; destruction (mucoclasia) of the mucous membrane of the gallbladder in the left areas.

In the technique of performing the operation, we provide for the following stages.

The first stage is aspiration of the contents of the gallbladder cavity. Introduce a suction tube with a puncture needle along a 2 to 5 mm trocar and aspirate the gallbladder. After aspiration, the gallbladder from the infiltrated wall will become more mobile and this creates conditions for traction of the gallbladder (Fig. 2).

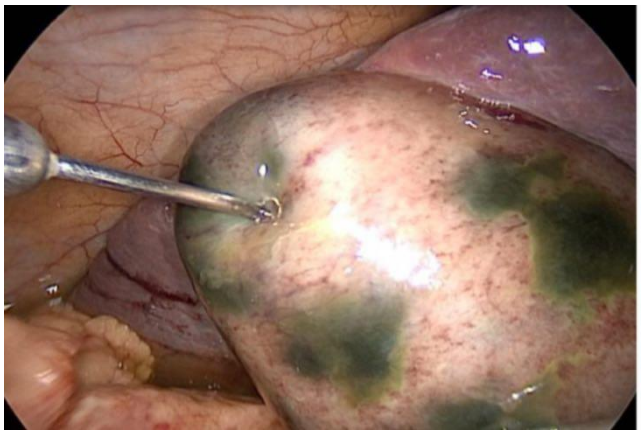

Figure 2. Infiltrated gallbladder (puncture and aspiration of the gallbladder)

Second phase. Mobilization of the cystic artery. The lymph node of Maskanji serves as a guide for mobilization of destructively altered bubbles. After traction over the cervix with a sharp instrument (under the swelling is the approximate localization of the lymph node), the serous layer is excised, then, with a 5 millimeter atraumatic manipulator, we move it upward and downward the artery layer is localized parallel to the lymph node. Then the isolated artery is clipped (Fig. 3).

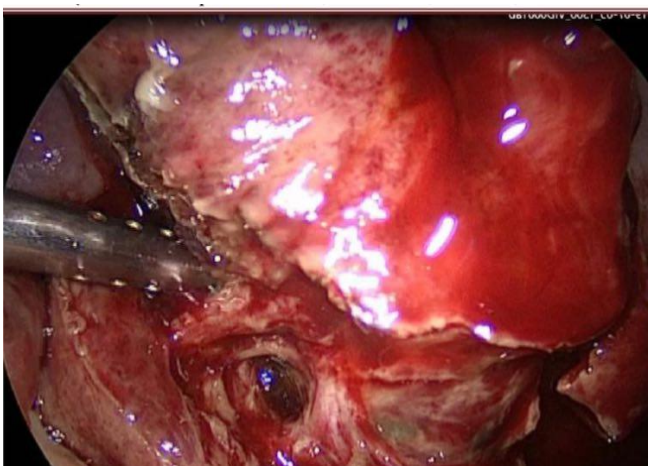

Figure 3. Mobilization of the cystic artery

Stage three. Isolation of the gallbladder from the its a bed. Isolation of the bladder neck during destruction by a generally recognized method carries a risk. Therefore, in such cases, we secrete the gallbladder from the bottom. To isolate the gallbladder with thickened walls, we use a suction tube with a blunt end, while the tube constantly aspirates the accumulated blood from the bed of the gallbladder and ensures the visibility of the operation zone (Fig. 4, 5).

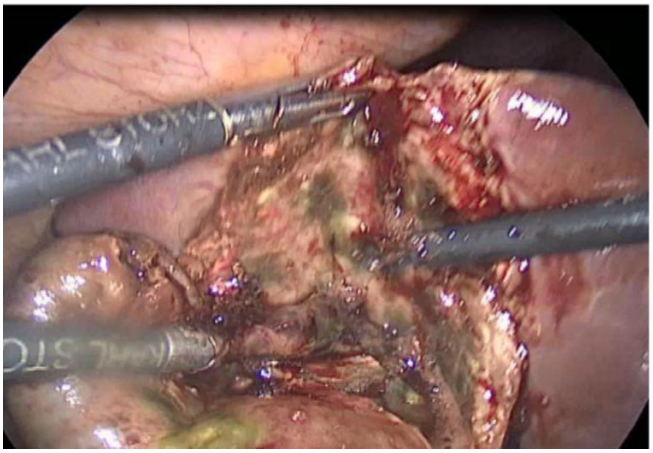

Figure 4. Isolation of the gallbladder from the gallbladder bed

Stage four. After reaching the level of the cystic duct, and visualization of the inner side of the orifice of the duct, we apply a clip with a large size or medium clips using the ladder method. We open the cavity of the bladder of the wall of the excised bladder and carefully coagulate. We put the contents in a container.

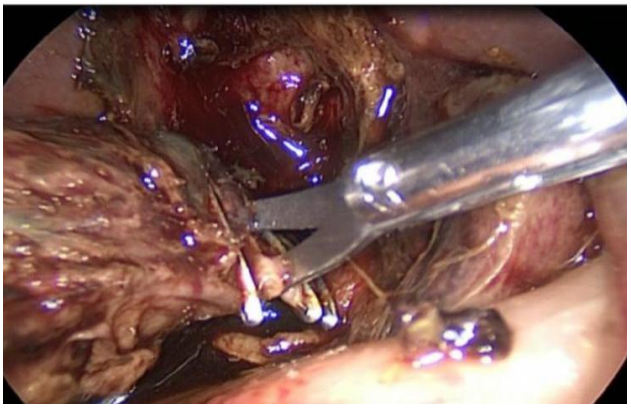

Figure 5. Clips with large size or medium clips are placed using the ladder method and intersection

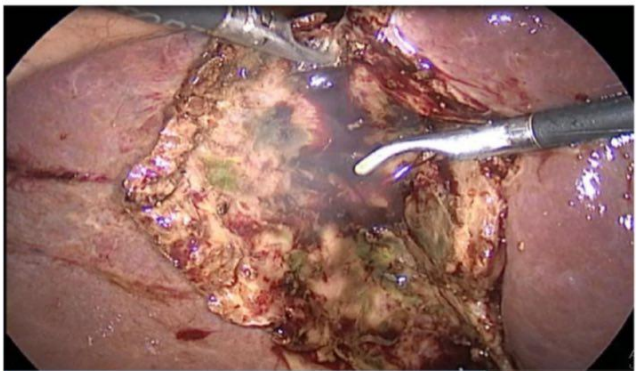

Figure 6. Control of the bleeding gallbladder bed

Fifth stage. Control of the bleeding gallbladder bed. In case of destructively altered bubbles, coagulation of the bed does not stop bleeding at all, so coagulation is done superficially and a tampon is inserted with a gauze napkin for physical hemostasis. The advantage of the hepatic tissue in the liver in such cases is that after tamponation for about 5-6 minutes, an independent hemostasis occurs. We finish the operation by draining with two drainage tubes "like a flow system" (Fig. 6).

The main advantage of the developed method is the preservation of controllability of the operating process, which makes it possible to guarantee safe operation.

We also studied the duration of the operation, as one of the important indicators affecting the results of surgical treatment and the timing of discharge. This indicator is of particular relevance in elderly and senile patients, since in this category of patients, the duration of pneumoperitoneum is of no small importance in terms of the development of intra- and postoperative complications.

The duration of the operation was assessed based on the study of the protocols of operations. The duration of the operation varied from 30 to 65 minutes (mean 45.4 ± 7.2).

More often the reason for the increase in the duration of the operation was a pronounced inflammatory process in the gallbladder and subhepatic space, bleeding from the bed of the gallbladder and atypical anatomy of the bile ducts and cystic artery.

3. Results

After the introduction of the improved LCE technique into clinical practice, since 2015, the conversion rate has decreased to 2%, and since 2000 to the present day it is 0.4%. This was a consequence of the development and further improvement of the techniques of laparoscopic cholecystectomy.

The results of the use of LCE remain ambiguous, and above all with regard to ensuring their safety. Differences in the anatomy and topography of the bile ducts, cystic duct and artery do not allow to classify interventions on the gallbladder as "standard". The conditions of the operation are complicated by acute inflammatory and adhesive processes, in which even the "typical" anatomy of the subhepatic space can undergo significant changes. Practically insurmountable difficulties arise when acute cholecystitis is combined with ductal and vascular dystopias.

4. Conclusions

The developed clear technical methods for performing laparoscopic cholecystectomy (LCE) in destructive forms of acute calculous cholecystitis will allow achieving high positive results while maintaining a stable rate of complications at the level of I -2% and reducing mortality to - 0.1%.

One of the advantages of minimally invasive surgery is the ability to stage-by-stage treatment of severe and non-standard cases. The presence in the arsenal of a medical institution of the whole complex of minimally invasive methods of diagnosis and treatment of destructive forms of acute calculous cholecystitis allows to reduce the number of complications and deaths to a minimum. The final choice of the method and methods of treatment for this category of patients depends on the equipment of the given medical institution and the

availability of appropriate qualified specialists.

The developed and applied tactics for the treatment of destructive forms of gallstone disease showed good results.

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