

Laparoscopic treatment experience of severe acute pancreatitis complicated by peptic ulcer perforation

J.-Y. SUN¹, D.-J. SUN¹, X.-J. LI², K. JIAO³, Z.-W. ZHAI⁴

¹Vascular Surgery, The Third Hospital of Jilin University, Changchun, Jinlin, China

²Department of Geriatrics, The Second Hospital of Mudanjiang, Mudanjiang, Heilongjiang, China

³The Second Affiliated Hospital of Qiqihar Medical School, Qiqihar, Heilongjiang, China

⁴The Second Department of General Surgery, The Second Hospital of Mudanjiang, Mudanjiang, Heilongjiang, China

Abstract. – OBJECTIVE: To explore the clinical effect of emergency laparoscopic repair of perforation and conventional open surgery in the treatment of severe acute pancreatitis (SAP) complicated with peptic ulcer perforation.

PATIENTS AND METHODS: A total of 34 patients diagnosed as severe acute pancreatitis complicated by peptic ulcer perforation were selected as experimental group and a total of 38 patients diagnosed as severe acute pancreatitis complicated by peptic ulcer perforation were selected as control group. The experimental group was treated with emergency laparoscopic perforation repair and the control group was treated with conventional open operation, comparing the difference between the results and the prognosis of the patients.

RESULTS: The success rate of the experimental group and the control group are compared was not statistically significant ($p > 0.05$). While the operation time, postoperative intestinal function recovery time, the time of drainage tube pulled out and the occurrence of complications in experimental group was significantly lower than those in control group. The survival rate of the experimental group was significantly higher than that of the control group, the recurrence rate was significantly lower than that of the control group ($p < 0.05$). The high sensitive C reactive protein (hs CRP) and tumor necrosis factor TNF- α levels of the experimental group were significantly lower than those of the control group ($p < 0.05$).

CONCLUSIONS: Emergency laparoscopic repair of peptic ulcer perforation in the treatment of SAP complicated with perforation is safe and effective, which can reduce the systemic inflammatory response and better than conventional open surgery.

Key Words:

Severe acute pancreatitis, Peptic ulcer perforation, Laparoscopic repair of perforation, High sensitive C reactive protein, Tumor necrosis factor- α .

Introduction

Severe acute pancreatitis (SAP) has a sudden onset and is unchangeable medical condition. SAP is as a biphasic disease, with first early or toxic enzymatic phase in first two weeks and later on septic phase after third to fourth week onwards. It occurs with about 20%-30% in clinic practices and mortality rate of up to 10%-35%. It is one of the most challenging medical conditions in acute abdomen surgery¹. Complications of SAP include pancreatic complications including gastrointestinal bleeding, fistula, perforation, abdominal cavity and general infection, even shock multiple organ dysfunction or failure, death, etc.

There are very few studies available on SAP complicated by peptic ulcer perforation. Clinical symptoms are not typical, easily miss diagnosis, and have a high mortality rate. The success rate of surgery is the characteristics of it². With the extensive development of laparoscopic, there are more advancement in SAP operations. At the Third Hospital, we follow laparoscopic treatment for patients having SAP complicated by peptic ulcer perforation. In current study, we compared the clinical effect and prognosis of patients treated with laparoscopic surgery with patients treated with conventional open surgery.

Patients and Methods

Patients

A total of 34 patients were diagnosed as severe acute pancreatitis complicated by peptic ulcer perforation consecutively admitted in the Third Hospital Jinlin, China from October 2013

to October 2014 were selected as experimental group. In addition, total of 38 patients diagnosed with severe acute pancreatitis complicated by peptic ulcer perforation were consecutively admitted in the hospital from October 2012 to October 2013 as a control group.

SAP Diagnostic Criteria

The criteria were on the basis of six steps. Firstly, clinical signs which include obvious abdominal tenderness, rebound tenderness, muscle strain and other peritoneal irritation signs, accompanied by abdominal distention, bowel sounds weaken or disappear. Secondly, biochemical markers e.g. blood and urine amylase, increase of lipase, increase in blood glucose (> 11.2 mmol/L) and decrease in blood calcium (< 1.87 mmol/L), severe water, and electrolyte disorders, metabolic disorders and acid-base imbalance. Thirdly, Cullen or Tumen or significant swelling of the lumbar and rib with tenderness. Fourthly, a marked cycle of physical instability e.g. irritability, peripheral coldness and spot shape change of skin mucous membrane or damage to other important organ. Fifth, CT or B ultrasound showing pancreatic swelling with pancreatic inflammatory infiltration or enhanced CT showing different degrees of necrosis of the pancreas. Sixth, APACHE II score of 8 or above, Balthazar CT score standard of grade II or above, and diagnosed as acute pancreatitis in the clinical. If the above two or more than two indicators are positive, it can be diagnosed as SAP.

Patients' Selection Criteria

Inclusion criteria were (1) age ≥ 18 to 80 years old (2) conform to diagnostic criteria of SAP complicated with peptic ulcer perforation, (3) first onset.

The exclusion criteria were: (1) previous history of peptic ulcer, chronic liver cirrhosis, gastrointestinal tumor, etc. (2) pregnancy, autoimmune diseases, combined with severe dysfunction of heart, liver, kidney and other organs, coagulation abnormalities etc. (3) severe SAP symptom, and expected survival time is less than 1 month (4) patients with poor compliance and rejection of the study, etc.

The study was endorsed by the Ethics Committee of The Third Hospital of Jilin University and also right of informed consent of the patients and their families were collected. The experimental group was treated with emergency laparoscopic perforation repair, and the control group

was treated with conventional open operation. In control group, there were 22 males and 16 females, aging from 38 to 69 years old, and the average age was (49.7 ± 12.3) years old. The course of disease was 0.5 h to 28h and the average course was (8.6 ± 1.2) h. The biliary pancreatitis includes 30 cases, alcoholic pancreatitis was 8 cases, gastric perforation was 10 cases, duodenal perforation was 15 cases and colon perforation was 13 cases. In experimental group, there were 21 males and 13 females aging from 36 to 71 years, and an average age of 50.2 ± 11.4 years. The course of disease was 0.8 h to 31 h and the average course was 8.9 ± 1.5 h. There were 28 cases of biliary pancreatitis, 6 cases of alcoholic pancreatitis, 9 cases of gastric perforation, 16 cases of duodenal perforation and 9 cases of colon perforation. The baseline data of the two groups was compared and the difference was not statistically significant with $p > 0.05$.

Experimental Method

The crucial steps of emergency laparoscopic repair of perforation includes trachea cannula, intravenous general anesthesia, indwelling gastric tube and catheter dorsal decubitus. Three spell type holes were made below of umbilicus cut at 10 mm arc incision and pneumoperitoneum pressure was established to 12 mmHg. Further, 10 mm of trocar was placed in the incision of the lower margin of umbilical hole and observation hole was placed in 30-degree laparoscopy. Patients who took high head, low pupil and leans body towards left at 15° - 30° . Under direct vision and in the xiphoid partial left abdominal wall, 10 mm trocar was placed as main operating hole. Clear pancreatic necrosis tissue and abscess sites were going through the incision up and down. The drainage strip was placed to do continuous closed drainage irrigation by using normal saline 6-8 L/d and injecting to double lumen indwelling catheter which holds the necrotic tissue to do irrigation and drainage, which sustains until no necrotic tissue flow out of it. The patients with severe pancreatic necrosis or close by diseased stage showed comparatively limited to perform partial resection or total resection of pancreas. For patients with combined gallbladder stone, obstructive cholecystitis and obstruction of choledoch stone can do cholecystectomy and cutting choledoch to get stone. In that case, Oddi sphincter stenosis can do Oddi sphincter incision to reduce compression. The abdominal cavity was examined in operation, and pus fluid was absorbed

and greater membrane adhesion was isolated. The site of perforation was found in the site of more abscesses. By using 3-0 absorbable sutures without damage, it was about 15 cm. According to the size of the perforation, it was sutured longitudinally in 8 types or sutured with 1-3 needle interruptedly. The incision was sealed under the endoscopic, part of greater retina was used to cover perforation site, and then sealed again to fix it. After the completion of the repair, warm saline and metronidazole solution was used again for thorough washing and continuously rinsed until rinse solution gets clear in small retinal hole and (or) pelvic cavity place drainage tube. The puncture hole was flew out of right side and fixed. After the operation, gastrointestinal decompression, fasting, anti-infection, anti-acid, nutritional support and other symptomatic treatment were given.

Observation Index

The difference of the operation success rate, operation time, complication rate, survival rate and recurrence rate of two groups were compared. The difference of high sensitive C reactive protein (hs-CRP) and tumor necrosis factor (TNF)- α level were compared. Venous blood collection and hs-CRP was detected by using i-CHROMA immune fluorescence analyzer. TNF- α uses the kits provided by Shanghai Biosource using ELISA method and in strict accordance with instruction manual.

Statistical Analysis

The data were analyzed by using the software package SPSS 20.0 (SPSS, Inc., Chicago, IL, USA) and quantitative data were expressed as mean \pm standard deviation. *t* test was used in comparison between groups, the data were expressed by percentage (%) and the χ^2 test was used to compare the groups, where $p < 0.05$ is considered as statistically significant.

Results

The comparison of physiological parameters for two groups showed that there was no significant difference in the level of APACHE score, hemodiastase, Ca^{2+} and systolic pressure between the two groups ($p > 0.05$) as shown in Table I.

Comparison of success rate, operation time and complication rate of the patients in two groups also showed no statistical significance with $p > 0.05$. There were 2 cases in experiment group who were converted to open surgery, 2 died at operation time. The postoperative recovery time of intestinal function, the time of drainage tube pulled out and occurrence rate of complications of observation group were significantly lower than those of the control group with $p < 0.05$ as shown in Table II.

The patients were followed for up to 6 months and the comparison of survival rate and recurrence rate of experimental group was significantly higher than that control group with $p < 0.05$. Postoperative death refers to 48 hours after operation. The causes of death include SAP and peptic ulcer perforation disease itself and its complications, as well as surgical complications. The causes of death in follow-up include SAP, the perforation of digestive tract ulcer itself, its complications and the recurrence of the disease.

Recurrence rate of follow-up = Number of recurrence / (total number of cases – preoperative death – postoperative death) \times 100%.

The recurrence rate of observation group was significantly lower than that of control group, and the difference was statistically significant with $p < 0.05$ as shown in Table III.

Comparison of level of hs-CRP and TNF- α in two groups showed no significant differences in the levels of hs-CRP and TNF- α before treatment in the two groups with $p > 0.05$. After treatment, the above indexes of two groups were reduced, and the observation group decreased more significantly. The difference was statistically significant with $p < 0.05$ as shown in Table IV.

Table I. Comparison of physiological parameters for two groups.

Group	APACHE II score	Hemodiastase (U/L)	Ca^{2+} (mmol/L)	Systolic pressure (mm Hg)
Control	10.5 \pm 2.1	767.4 \pm 34.6	1.05 \pm 0.03	96.4 \pm 5.5
Experimental	11.3 \pm 2.2	784.3 \pm 41.2	1.02 \pm 0.04	92.7 \pm 4.7
<i>t</i>	0.517	0.419	0.626	0.367
<i>p</i>	0.326	0.823	0.712	0.521

The data with $p < 0.05$ is considered as significant.

Table II. Comparison of operation success rate, operation time and complication rate of the patients in two groups. The data with $p < 0.05$ is considered as significant.

Group	Cases	Operation success rate	Operation time (min)	Postoperative recovery time of intestinal function (d)	Time of drainage tube pull out (d)	Infection	Bleeding	Tissue adhesion	Shock	Complication rate
Control	38	36 (94.7)	113.4 ± 24.6	6.7 ± 1.3	16.8 ± 3.2	7	4	4	2	17
Experimental	34	30 (88.2)	76.5 ± 16.7	3.4 ± 1.2	10.4 ± 2.5	2	4	3	1	10
t (χ^2)	0.324	3.746	4.618	5.037					4.180	
p	0.569	0.038	0.034	0.031					0.041	

The data with $p < 0.05$ is considered as significant.

Discussion

There are several reasons of ulcer perforation of digestive tract caused by SAP³⁻⁴. Firstly, under the stress visceral blood flow reduces, gastrointestinal mucosa receiveless blood flow in stomach cavity which reversely disperse to mucosa and leads to the formation of stress ulcer. Secondly, the enlarged pancreas impel to lead to gastric blood circulation disorders. Thirdly, a lot of trypsin releases which damages the peripancreatic tissues especially the stomach wall. Fourth, pancreatitis inducing systemic inflammatory factor releases which may lead to formation of ulcer.

Once ulcer perforation occurs, it has high mortality rate and timely discovery of it and surgical intervention are the key points. But pancreatitis complicated by digestive tract perforation makes the clinical symptoms and signs of the digestive tract perforation as non-typical and plain abdominal radiograph also can not find too little and hidden free gas out of gastrointestinal because of perforation covered by the greater adhesion of the retina and disease is covered by pancreatitis. Under the condition of the actively strengthen conservative treatment is invalid, it should be take a decisive surgical treatment.

The disease process of SAP is generally divided into 3 stages⁵. Early stage, a large amount of fluid leak into the third space and makes functional liquid drop markedly. Take strengthen the expansion of capacity for treatment and make the early disease died of shock become less. In middle stage from 48 hours to 10 days after the onset of disease, the treatment should focus on the support and maintenance of important organ function, preventing infection and other complications. The final or late stage including 10 days after the onset of the disease till patient's recovery. The focus of clinical treatment is to deal with all kinds of complications. In the later stage, the main surgical procedure is the removal of necrotic tissue. It is believed that acute necrotizing pancreatitis without infection should avoid operation. Because once take the operation, will inevitably lead to infection. But when combined infection and abscess form, it must be operated in a timely manner; otherwise the case fatality rate is very high.

SAP complicated by peptic ulcer perforation is critical and conventional open has big trauma, which may aggravate the disease progress, while laparoscopy has small trauma and fast entry. Explore disease accurately, technical requirements

Table III. Comparison of survival rate and recurrence rate in the two groups [cases (%)].

Group	Cases	Preoperative death	Postoperative death	Follow-up death	Survival rate	Recurrence rate
Control	38	2 (5.3)	12 (31.6)	5 (13.2)	19 (50.0)	7 (29.2)
Experimental	34	2 (5.9)	5 (14.7)	2 (5.9)	25 (73.5)	2 (7.4)
χ^2		<0.001	2.833	0.966	4.180	4.139
<i>p</i>		1.000	0.092	0.326	0.041	0.042

The data with $p < 0.05$ is considered as significant.

for the removal under the laparoscopy is not high. Operation time and complication is little can be beneficial to the safety of the disease⁶.

We found that the success rate of experimental group and control group has no statistically difference ($p > 0.05$) but the laparoscopic surgery showed higher success rate (Table II). In experimental group, the operation time, postoperative recovery time of intestinal function, time of drainage tube pulled out and prevalence rate of complications were significantly lower than those of the control group (Table II). The survival rate of the observation group is significantly higher than that of the control group and the recurrence rate is significantly lower than control group. The levels of hs-CRP and TNF- α in the experimental group were significantly lower than those in the control group (Table IV). The method in operation can be divided into repair without suture and suture repair. The former mainly use gelatin sponge to plug perforation and apply biological glue to seal. Its efficacy and effects have been confirmed by animal experiments. The latter uses suture method to repair perforation. Advantage is economic and when the diameter of perforation is more than 1.0 cm, it will have a better effect⁷. In the process of sewing, choose the normal tissue which away from perforation about 0.7 cm or far away from it and sew it in Y-direction, which is comparatively safe. Whole layer suture and moderate

knotting strength should be needed⁸. During the operation, it can be fully exposed to the eyes; can look into the whole abdominal cavity including pelvic cavity. To adjust the position when wash abdominal cavity. It may let the patient slightly lean to the right and absorb while washing, fully cleaning and thoroughly absorb the diaphragm, right colon side ditch, bowel loops and abscess of the urinary bladder and rectum⁹. Wound infection is a common complication after open perforation repair, because the surgical incision is the II-III class incision. Perforation often is associated with diffuse peritonitis. A large number of purulent exudates are accumulated in the abdominal cavity. For open surgery, protecting cut good is not easy and postoperative wound infection is difficult to avoid. While for laparoscopic surgery, operational hole is small. The opportunity of poking hole being polluted is reduced because of the isolation effect of pneumoperitoneum and devices; thus, the occurrence of wound infection is less¹⁰.

Conclusions

Emergency laparoscopic repair of peptic ulcer perforation for the treatment of SAP complicated with perforation is safe and effective. It can reduce the systemic inflammatory response and better than conventional open surgery.

Table IV. Comparison of levels of hs-CRP and TNF- α in control and experimental groups before and after treatment.

Group	hs-CRP before (mg/L)	hs-CRP after (mg/L)	TNF- α before (ng/L)	TNF- α after (ng/L)
Control	32.6 \pm 7.7	18.9 \pm 5.6	72.6 \pm 13.4	54.9 \pm 12.9
Experimental	33.4 \pm 8.2	7.5 \pm 3.3	74.1 \pm 14.5	32.6 \pm 10.3
<i>t</i>	0.629	5.847	0.348	5.129
<i>p</i>	0.427	0.024	0.625	0.028

The data with $p < 0.05$ is considered as significant.

Conflict of Interest

The Authors declare that there are no conflicts of interest.

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