

Outpatient versus inpatient laparoscopic cholecystectomy: a single center clinical analysis

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BACKGROUND: Outpatient laparoscopic cholecystectomy (OPLC) developed in the United States and other developed countries as one of the fast-track surgeries performed in ambulatory centers. However, this practice has not been installed as a routine practice in the major general hospitals and medical centers in China. We designed this case-control study to evaluate the feasibility, benefits, and safety of OPLC.

METHODS: Two hundred patients who had received laparoscopic cholecystectomy for various benign gallbladder pathologies from April 2007 to December 2008 at Jinling Hospital of Nanjing University School of Medicine were classified into two groups: OPLC group (100 patients), and control group (100), who were designated for inpatient laparoscopic cholecystectomy (IPLC). Data were collected for age, gender, indications for surgery, American Society of Anesthesiology (ASA) class, operative time, blood loss during surgery, length of hospitalization, and intra- and post-operative complications. The expenses of surgery and in-hospital care were calculated and analyzed. The operative procedures and instrumentation were standardized for laparoscopic cholecystectomy, and the procedures were performed by two attending surgeons specialized in laparoscopic surgery. OPLC was selected according to the standard criteria developed by surgeons in our hospital after review. Reasons for conversion from laparoscopic to open cholecystectomy were recorded and documented.

RESULTS: One hundred patients underwent IPLC following the selection criteria for the procedure, and 99% completed the procedure. The median operative time for IPLC was 24.0

minutes, blood loss was 16.2 ml, and the time for resuming liquid then soft diet was 10.7 hours and 22.0 hours, respectively. Only one patient had postoperative urinary infection. The mean hospital stay for IPLC was 58.2 hours, and the cost for surgery and hospitalization was 8770.5 RMB yuan on average. Follow-up showed that 90% of the patients were satisfied with the procedure. In the OPLC group, 99% of the patients underwent the procedure with a median operative time of 21.6 minutes and bleeding of 14.7 ml. The patients took liquid 11.3 hours then soft diet 20.1 hours after surgery. The mean postoperative hospital stay was 28.5 hours. In this group, 89% of the patients were discharged within the first 24 hours, and the remaining 11% were released within 48 hours after surgery. Two patients developed local complications. The cost for surgery and hospitalization was 7235.7 RMB yuan, which was 17.5% less than that in the IPLC group. At follow-up, 94% of the patients were satisfied with the surgery and short hospital stay.

CONCLUSIONS: OPLC can effectively treat a variety of benign, non-acute gallbladder diseases with shortened waiting time and postoperative hospital stay. OPLC benefits the hospital with a rapid bed turnover rate, and reduces cost for surgery and hospitalization.

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KEY WORDS: laparoscopic cholecystectomy; outpatient surgery; fast-track surgery

Introduction

As laparoscopic cholecystectomy (LC) matures, and its indications expand.^[1, 2] Many medical centers around the world have performed outpatient laparoscopic cholecystectomy (OPLC) in recent years.^[3, 4] Several studies showed that OPLC has a rapid bed turnover rate and reduces total cost.^[5-7] In China however OPLC has been performed because of numerous restrictions. At the well-equipped outpatient operating room of Jinling Hospital, Nanjing, from April 2007 to December 2008, we performed OPLC for 100 patients. These patients were compared with another 100 patients undergoing inpatient laparoscopic cholecystectomy (IPLC) in the same time period, attempting to evaluate the benefits, feasibility, and safety of OPLC.

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Methods

Patients

Hundred patients who had undergone OPLC at our hospital were retrospectively studied, and data were categorized according to age, gender, comorbidities, preoperative diagnosis, operative indications, American Society of Anesthesiology (ASA) class, operative time, intraoperative blood loss, intraoperative and postoperative complications, postoperative time for diet intake, time of postoperative hospitalization, and post-surgical complications. Patient satisfaction with OPLC was analyzed by a grading system for postoperative follow-up. Another 100 patients who had undergone inpatient laparoscopic cholecystectomy were enrolled similarly into the IPLC group.

The inclusion criteria of cases in the study included clinical diagnosis with various gallbladder diseases including cholecystitis, cholelithesis, and gallbladder polyps, as well as denial of any prior abdominal surgery. A conversion was defined as making any unexpected incision at the abdominal wall for the purpose of completing any portion of the laparoscopic procedure that could not, even after appropriate attempts, be accomplished laparoscopically without breaching the principles of the safety of laparoscopic procedures.

Methods

Preoperative examination of the IPLC and OPLC groups included ultrasonography, electrocardiography, chest X-ray and routine blood test, liver and renal function test. For the patients of the IPLC group, these tests were performed on their admission, whereas the OPLC patients underwent the tests in the out-patient clinic. The results of the tests were evaluated and decided by the OPLC inclusion criteria approved by the hospital ethics committee. After being selected for OPLC, the patient came to the outpatient clinic, where specialized nursing staff registered the patient, set up records, reviewed the disease-related information, and booked the operating theater for the procedure. On the day before surgery, the patient with his/her family members returned to the outpatient clinic, where they were asked to sign a consent form for the surgery after extensive discussion of the benefits and risks of the procedure. Then, they prepaid the estimated costs for the surgery and possible hospital stay. On the morning of the operation day, the patient arrived at the out-patient surgery center one hour before the planned operation after fasting for more than 6 hours.

Anesthesia was induced with propofol, remifentanyl, and atracurium. At this time, the patient was intubated

and continuously anesthetized by inhaling anesthetics. In the induction period, a single dose of cefenradine was given intravenously for infectious prophylaxis. Intraoperatively, electrocardiography, arterial line monitoring, and blood gas analysis were continued. Laparoscopic cholecystectomy had been standardized for the patients of the OPLC and IPLC groups, and was performed in the morning in the well-equipped operating room at our out-patient clinic. In the immediate postoperative period, a 5-HT₃ receptor antagonist was administered to prevent postoperative nausea and vomiting.

The patients of the OPLC group were sent to the postoperative anesthesia care unit (PACU) for extubation and immediate postoperative care. Twelve hours after the surgery. Both surgeons and anesthesiologists jointly evaluated if the patients could be discharged when the following were satisfied:^[8] 1) vital signs stable for more than 4 hours; 2) appropriate awakesness, alertness, and orientation to people, place and time; 3) independent dressing and walking; and 4) no nausea, vomiting, severe pain, and incision bleeding. The criteria for admission to the surgical ward for continuous inpatient care included: 1) fluctuating vital signs in the postoperative period; 2) incompletely resolved symptoms of nausea, vomiting and pain; 3) a significant amount of fluid from the abdominal drain; and 4) patients and their family members who expressed a strong wish to stay in hospital. The patients discharged on the first postoperative day were requested to contact the hospital shortly after arrival at home, and 24 hours after the discharge. The patients were evaluated at least once by the nursing staff. They could also consult surgeons and their associates via the internet at all times regarding any issue related to the surgery and postoperative care. The patients hospitalized were further observed, and reassessed by the surgeons for possible discharge on the second postoperative day.

The patients of the IPLC group were admitted to the surgical wards for postoperative management after immediate postoperative care. Normally, they were discharged 2-4 days after operation if no major and severe complications occurred.

In this retrospective study, the completion rate of laparoscopic cholecystectomy, operative time, estimated amount of intraoperative bleeding, time to take liquid and soft diet after operation, operative complications, length of postoperative hospital stay, and total cost for both operation and hospitalization were collected from our patient database. Satisfaction with the surgery and postoperative management was graded by patients two weeks after operation who were telephone-interviewed by nurses using a questionnaire containing 10 items with a

score of 1 to 10.

In this study, SPSS 13.0 statistical software was used to establish the database for analysis. Comparison between the OPLC and IPLC groups was made with Student's *t* test for categorical variables. Statistical significance was defined as $P < 0.05$.

Results

In the IPLC group, LC was performed successfully for 99 patients, one of whom later changed to have an open procedure. The median operating time was 24.0 minutes and the intraoperative bleeding was estimated to be 16.2 ml. An abdominal draining tube was placed in 3 patients, in whom two tubes were removed on the first day after the surgery, while the remaining one was kept until the second day. After operation, the median time to resume liquid and soft diet was 10.7 and 22.0 hours, respectively. The mean postoperative hospital stay was 58.2 hours. One patient developed a urinary infection, and recovered without any intervention. The mean total cost was 8770.5 RMB yuan. During the follow-up visit in the second week after operation, 19 patients graded their satisfaction with the IPLC management at 10, and 71 patients gave 6 to 9. However, 10 patients were dissatisfied with the IPLC pathway, giving scores less than 6. Taken together, the satisfaction rate was 90% (Table).

In the OPLC group, the completion rate for LC was 99% with one patient who had the operation converted. The median operative time was 21.6 minutes, and intraoperative blood loss was about 14.7 ml. Drainage tubes were used in 2 patients: one tube removed on the first day and the other taken out on the second day after the operation. The median time to have clear liquid was 11.3 hours and a semi-liquid diet was 20.1 hours after the operation. The mean time for postoperative hospital observation was 28.5 hours in two patients with umbilical infection and subhepatic abscess which were resolved after conservative treatment. On the first postoperative day, 89 patients were discharged home while 11 were hospitalized for further observation. Of the 11 patients, 6 had uncontrolled pain, 2 manifested significant nausea and vomiting, and 1 reported blurred vision. The remaining 2 patients did not wish to leave the hospital even though their condition was stable enough for discharge. All the 11 patients went home on the second day. There were no readmissions in the OPLC group. The total cost for both surgery and hospital stay was 7235.7 RMB yuan. Follow-up was conducted two weeks after the surgery. Thirty-one patients were well satisfied and 63 were satisfied, but 6 were dissatisfied with the OPLC management. Therefore, for the OPLC group, the satisfaction rate was 94% with

Table. Comparison of perioperative parameters between the IPLC and OPLC groups

Parameters	IPLC (n=100)	OPLC (n=100)
Success rate of LC (%)	99	99
Duration of operation (min)	24.0±8.2	21.6±9.4
Estimated operation blood loss (ml)	16.2±7.5	14.7±6.8
Time to resume liquid food (h)	10.7±1.4	11.3±1.9
Time to resume semi-liquid food (h)	22.0±2.6	20.1±4.8
Complication rate (%)	2.0	2.0
In-hospital time after operation (h)	58.2±19.5	28.5±6.4*
Total cost (RMB yuan)	8770.5±365.6	7235.7±415.8*
Total satisfaction rate (%)	90	94

*: $P < 0.05$, compared with the IPLC group.

four patients complaining of pain and vomiting on the first day at home, but the other two patients gave no specific reasons (Table).

Discussion

The practice of OPLC was conceptualized in the early 1990s. It has been shown that OPLC shortens hospital stay, and substantially lowers medical costs.^[9] Studies reported that OPLC accounted for 60%-90% of LCs in several centers, and most patients were safely discharged from hospitals after 6-8 hours of postoperative observation.^[10, 11] Besides the OPLC management was widely accepted by patients and their families. However, large randomized prospective studies are not available to further confirm the safety, feasibility, cost-effectiveness, and patient satisfaction of OPLC.

Our study did not show significant differences between OPLC and IPLC in success rate, operative time, blood loss during surgery, time to resume liquid and semi-liquid diet, complication rate, and patient satisfaction rate. This finding indicates that OPLC is feasible, safe, and can be accepted by patients. The safety of OPLC management can be guaranteed by several factors such as strict selection criteria, thorough preoperative preparation, and experienced laparoscopic surgeons, especially careful monitoring and examination with prompt intervention in the PACU and postoperative holding unit, which could be the key to ensuring the success of OPLC. It has been shown that the major risk in OPLC management is early postoperative complications such as intra-abdominal hemorrhage, bile leakage, vascular injury, or subcutaneous emphysema of the neck and chest. However, our experience showed that the risk can be found by careful observation from 12 to 24 hours after the operation, and if treated early the management plan was not compromised.

Outpatient versus inpatient laparoscopic cholecystectomy

We adopt the one-day OPLC management described in several reports that patients are scheduled for LC in the morning,^[12, 13] then observed in the postoperative holding room in the outpatient surgical unit for close monitoring of vital signs and other postoperative symptoms. On the first postoperative morning, if the patients tolerate a liquid diet without any adverse effect, they could be discharged from the hospital.^[14] We believe this management not only ensures the safety of patient care, but also compensates for the traditional concepts of Chinese people on postoperative in-hospital management.

Other interesting findings of our study include the significant differences between the OPLC and IPLC groups in the length of postoperative hospitalization and the total expenses for surgery and hospital stay. These results reflect the advantages of the OPLC management. OPLC can: 1) shorten postoperative hospital stay and waiting time for surgery, indicating that OPLC management financially benefits both patients and hospitals by facilitating in-patient bed turnover and saving medical costs; 2) liberate patients early from the discomfort of hospitalization; 3) decrease the chance of nosocomial infections; and 4) allow patients to follow their own schedules for preoperative examinations and surgery, thereby ensuring a personalized management. Moreover, this fast-track surgery can hasten postoperative recovery and subsequently accelerates the patients' return to work and a normal life.

Medical expenses have always been a major issue in every health care system worldwide. It has been reported that OPLC lowers medical care costs by 20%-40% those for inpatient LC.^[15] In our study, the total cost for OPLC decreased by 17.5% compared with that for IPLC. Although the cost reduction in our study is less than the reported, it is still significant for the current healthcare system in China, where the overwhelming numbers of patients have limited access to the healthcare resources.

OPLC management also has several disadvantages: 1) restricted indications, i.e., many patients are not selected for OPLC, especially in the mainland of China; 2) high resource requirements, like a well-equipped operation room and well-trained surgical team, which prevent many hospitals from OPLC practice; in addition, OPLC requires surgeons being capable of performing LC and having experienced laparoscopic skills; 3) heavy work load and psychological tolerance for patients and their family members; 4) lack of supporting management of post-hospital discomfort such as pain, nausea and vomiting, which will eventually result in dissatisfaction with OPLC. More importantly, hospitals and surgeons must bear great liability for any postoperative complications that cannot be identified and managed properly.

OPLC practice originated in the United States and other developed countries. However this practice has not been widely accepted in China. First, the costs covering surgery and hospitalization are only at a low proportion of the total costs, so the superiority of OPLC did not decrease medical expenses and save medical resources in China. Second, imperfect medical and surgical facilities might nullify the safety of OPLC. Third, the practice of OPLC has not been appropriately appreciated by medical institutes, medical staff, patients and families, and the quality of post-hospital patient care has been questioned by patients and their family members. Most importantly, the underdeveloped medical insurance system cannot satisfy the requirements of OPLC. Currently OPLC is still not listed in medical insurance coverage. Last, insufficient community healthcare services may not be prompt enough to manage postoperative complications in the post-hospital phase. Therefore, OPLC may not be widely practiced in China until these issues have been solved^[16, 17] The practice of OPLC is an outcome of the global development of medical technology, health care and medical services, insurance systems, and the social environment.

Laparoscopic cholecystectomy has dramatically transformed the management of gallbladder pathology in the past decades, and had a major influence on patient management in the development of modern surgery. The practice of OPLC has further enhanced this influence, hence it may soon become the new "gold standard" for the management of gallbladder disease.^[18, 19] Currently, although OPLC is not widely practiced in China, with its advantages and benefits, and more importantly, its match with the direction of current medical reform in China, OPLC will be extensively accepted by surgeons and patients in the near future.^[20] We suggest OPLC should be performed in some tertiary hospitals with well-trained staff and well-equipped outpatient surgery facilities, then gradually introduced to other lower level hospitals and medical centers. With the success of the practice of OPLC, the underlying principles may be applied to other practices such as general surgery, gynecology, and urinary surgery.

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