International Surgery Journal
Srinivas RY et al. Int Surg J. 2022 Feb;9(2):416-420
http://www.ijsurgery.com
pISSN 2349-3305 | eISSN 2349-2902

DOI: https://dx.doi.org/10.18203/2349-2902.isj20220334

Original Research Article

Risk factors and surgical outcomes of conversion of minimally invasive surgery to open procedure

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Received: 10 October 2021
Revised: 22 November 2021
Accepted: 05 January 2022

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ABSTRACT

Background: Majority of laparoscopic procedures can be performed on day-care surgery basis, unexpected conversion to open surgery requires overnight or longer admission in these patients and can have additional financial and psychological impact on the patient. The aim of our study is to study the risk factors associated with conversion and the surgical outcomes in patients who underwent conversion of minimally invasive surgery to open procedure.
Methods: It was a prospective observational study. All the patients who were planned for minimally invasive surgery but had intraoperative conversion to open surgeries were included.
Results: A total of 41 patients were recruited in the study. Mean age of the patients was 44.7 years. Male patients had more frequent conversion (24 patients, 58.5%). 11 patients (26.8%) had history of previous surgery. Most common cause of conversion to open procedure was dense intra operative adhesions (24 patients, 58.5%); followed by iatrogenic injury to surrounding visceral organs or uncontrolled bleeding (11 patients, 26.8%). The average recovery time (duration till return to work) was 12 days. As per Clavien-Dindo classification, 28 patients (68.29%) had grade I, 9 patients (21.95%) had grade II, 3 (7.31%) had grade III, and one patient (2.43%) had grade IV complication.
Conclusions: History of previous surgery and presence of intraoperative adhesions were frequently present in patients who underwent conversion of minimally invasive procedure. These patients required long period for recovery from the surgery and had frequent minor surgical complications.

Keywords: Laparoscopy, Conversion to open, Laparotomy, Hepatobiliary surgery, Laparoscopic cholecystectomy

INTRODUCTION

With the advent of laparoscopic surgeries, currently majority of surgical procedures can be performed by minimally invasive route. Advantages of laparoscopic surgery over open surgery are shorter surgical incision, decreased intraoperative bleeding, less post-operative pain, decreased incidence of surgical site infection (SSI), early discharge from hospital, shorter duration required to resume to work. However, it has few short comings like more expensive, requires more expertise, lengthy learning curve, and sometimes necessitates conversion to open surgeries intraoperatively.

Conversion to open surgery is associated with higher complication rates, higher morbidity and mortality, and longer hospital stay.[1] Majority of laparoscopic procedures can be performed on day-care surgery basis, unexpected conversion to open surgery requires overnight or longer admission in these patients and can have additional financial and psychological impact on the patient.[2]

The aim of our study is to study the risk factors associated with conversion and the surgical outcomes in patients who underwent conversion of minimally invasive surgery to open procedure.

METHODS

It was a prospective observational study performed during the study period from January 2018 to December 2018. All the patients who were admitted in the general surgery ward of All India Institute of Medical Sciences, New Delhi and planned for minimally invasive surgery but had intraoperative conversion to open surgeries were included. Approval was taken from the institute ethics committee before starting the study.

Patients with age more than 18 years, fit for undergoing surgery under general anesthesia and planned for minimally invasive surgery who underwent conversion to open surgery were included in the study. Patients planned for open surgery, patients with hemodynamically instability, clinical features of peritonitis (except in cases of acute appendicitis), patients unfit for general anesthesia and patients who did not give consent for the study were excluded. All patients who were eligible for our study based on the inclusion and exclusion criteria during the approved study period were included in the study and a sample size of 41 was achieved.

Primary outcomes of our study were the causes for conversion and surgical outcomes. Secondary outcomes were recovery time (duration till return to work), post-operative complications and need for readmission.

All patients were admitted in our general surgical wards, planned for minimally invasive surgery were approached for consent preoperatively for the participation in the study. After obtaining written informed consent from the patients, they were enrolled in the study if they underwent conversion to open surgery and fulfilled the inclusion criteria. Comorbidities and past surgical history of the patient were noted. Intraoperative details and reasons for conversion were noted. Complications including seroma formation, hematoma formation, surgical site pain (recorded on VAS, visual analogue scale), post-operative fever, wound dehiscence and SSI (measured according to the Southampton scoring system) were noted. Duration of hospital stay, recovery time (duration till return to work) and need for readmission were noted. Hospital course of the patients was followed, and these patients were assigned an appropriate grade as per the Clavien-Dindo classification of surgical complications at the time of discharge. These patients were followed up 1 week, 2 weeks, 6 weeks, and 3 months after the surgery for development of surgical complications. Telephonic follow up was performed for patients who were not able to visit hospital. All patient data was recorded in Microsoft excel and was later analyzed using the Statistical package for social sciences (SPSS) software version 26.

RESULTS

A total of 41 patients were recruited in the study. Mean age of the patients was 44.7 years, range (18-82 years). 2 patients (4.87%) were less than 20 years old, 14 patients (31.14%) were between 20-40 years, 18 patients (43.9%) were between 40-60 years, 7 patients (17.07%) were more than 60 years old. 17 patients (41.5%) were females and 24 (58.5%) were males.

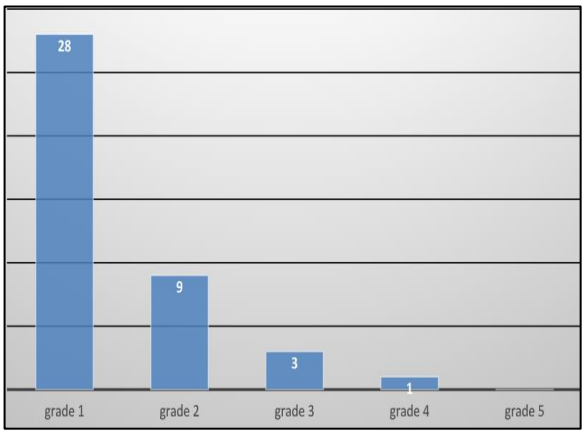

Figure 1: Clavian Dindo grading for the patients who underwent conversion of laparoscopic surgery to open surgery.

Most patients underwent surgery for diseases related to hepatobiliary system with 22 cases (53.7 %); followed by thoracic diseases with 7 cases (17.1%); kidney or adrenal gland diseases (5 cases, 12.2%); hematological diseases like hypersplenism (2 cases, 4.9%); intestinal diseases (3 cases, 7.3%); and other diseases like diaphragmatic hernia (2 cases, 4.9 %). In the 22 patients with hepatobiliary system involvement, 17 patients had gall stone disease (GSD), 4 patients had choledocholithiasis and one patient had choledochal cyst. Amongst patients who underwent thoracic surgery, 3 had lung hydatid cyst disease, 2 had pulmonary sequestration, one had hemothorax and one patient had paravertebral mass.2 patients had renal angiomyolipoma, 2 patients had pheochromocytoma and one underwent donor nephrectomy for live related kidney transplantation.

In our study, 26 patients (63.4%) had co-morbid medical conditions or significant past surgical history. 11 patients (26.8%) had history of previous surgery. Most common medical comorbidity associated was diabetes mellitus (6 patients, 14.6%), followed by hypertension (4 patients, 9.8%) and tuberculosis (3 cases, 7.3%) and one patient each with history of pancreatitis (2.4%) and CAD (2.4%).

Most common cause of conversion to open procedure was dense intra operative adhesions (24 patients, 58.5%); followed by iatrogenic injury to surrounding visceral organs or uncontrolled bleeding (11 patients, 26.8%); difficulty in retrieval of stone or surgical specimen (3 patients, 7.3%); and 1 case (2.4%) was converted to open

because of an anatomical variation in the target organ. 2 patients (4.9%) were converted to open surgery because of technical issues including less working space inside the body cavity.

Most patients (34, 82.92%) were discharged from hospital during the 1st week after surgery, 5 patients (12.19%) were discharged during 2nd week, and 2 patients (4.87%) required admission for more than 2 weeks. The average recovery time (duration till return to work) was 12 days. 3 patients (7.31%) resumed work within 1 week after surgery, 29 patients (70.73%) resumed work during 2nd week, 6 patients (14.63%) resumed work during 3rd week and 3 patients (7.31%) needed more than 3 weeks after the open surgery to return to work.

Clavien-Dindo classification of surgical complications was applied to all patients at the time of discharge. 28 patients (68.29%) were assigned grade I (deviation from the normal postoperative course without the need for pharmacological treatment or surgical, endoscopic, and radiological interventions), 9 patients (21.95%) had grade II (requiring pharmacological treatment with drugs, blood transfusion or total parenteral nutrition), 3 (7.31%) had grade III (requiring surgical, endoscopic, or radiological intervention), and one patient (7.31%) had grade IV complication (life-threatening complication requiring ICU management). There were no mortalities during the hospital stay (grade V) (Figure 1).

Amongst the 41 patients included in our study, at the end of 1st week, 29 patients (70.73%) had complaint of surgical site pain, 8 (19.51%) had surgical site infection, 7 (17.07%) had post-operative fever, 4 (9.7%) had seroma formation and one (2.43%) had developed wound dehiscence. SSI and seroma formation were managed conservatively.[7] patients had developed post-operative fever secondary to SSI and underlying fluid collection in the body cavity, they were managed with the treatment for SSI and drainage of the collection. For the patient who had developed wound dehiscence, wound was left open for few days, appropriate antibiotics therapy was given, daily dressing of the surgical site was performed, and secondary suturing was performed at the end of the 2nd week after surgery.

At the end of 2 weeks after the surgery, 7 patients (17.07%) had SSI (2 of these patients were readmitted for the management of SSI), only 3 patients (7.31%) had complaint of surgical site pain, 2 patients (4.87%) had fever and one (2.43%) continued to have wound dehiscence. 2 patients had fever secondary to post-operative collection, ultrasound guided pigtail insertion was performed for draining the collection. At the end of 6 weeks after the surgery, 3 patients (7.31%) had SSI, where wounds were allowed to heal by secondary intention; and only 1 (2.43%) had surgical site pain. At the end of 3 months, only one patient (2.43%) had SSI with wound healed by secondary intention.

During the follow up period, 3 patients (7.31%) required readmission. One patient who had underwent laparoscopy converted to open splenectomy presented with fever to our emergency department, on evaluation ultrasonography showed fluid collection in the splenic fossa. The patient was admitted, and ultrasound guided pig tail insertion was performed for draining the collection. 2 patients who had undergone laparoscopy converted to open cholecystectomy were readmitted during follow up for management of SSI.

DISCUSSION

Currently majority of surgical procedures can be performed by minimally invasive route. Laparoscopic procedures have many advantages over open procedures, they require shorter surgical incision, decreased intraoperative bleeding, less post-operative pain, decreased incidence of surgical site infection (SSI), early discharge from hospital, shorter duration required to resume to work. Thus, they significantly decrease the morbidity in these patients.[3-5] But they are more expensive, requires more expertise, lengthy learning curve, and occasionally necessitates conversion to open surgeries intraoperatively.[3-5]

Wolf et al reported that patients who underwent conversion of laparoscopic cholecystectomy to open cholecystectomy had worse prognosis compared to those who underwent open cholecystectomy.[1] These patients had higher frequency of post- operative major complications, reoperations, and deaths. Identifying the patient related risk factors which are associated with higher conversion rates in minimally invasive procedures can help in better planning of these procedures. Open procedures can be opted in patients with presence of multiple such risk factors to avoid the prolonged operating time, higher cost, increased morbidity, and mortality which is associated with conversion from laparoscopic procedure. This knowledge ensures a more informed decision making by the patients and avoids the increased physical, psychological and financial burden of conversion on them.

Hu et al and Sanabria et al reported that male gender and older age were associated with higher rate of conversion to open cholecystectomy.[6,7] Similarly in our study, male gender constituted 58.5% cases of conversion. Most of the patients (43.9%) were in the 40-60 years age group and 60.9% of the cases were over 40 years age in our study.

Ashfauq et al reported history of abdominal surgery as one of the predictors for conversion to open cholecystectomy.[8] In our study, we found that 11 patients (26.8%) had history of previous surgery which was the most common comorbid indicator on the history in these patients. Zeng et al reported intraabdominal adhesions and bleeding as the reasons for conversion of laparoscopic gastrectomies.[9] Most common cause of conversion to open procedure in our study was also found

to be dense intra operative adhesions (24 patients, 58.5%); followed by iatrogenic injury to surrounding visceral organs or uncontrolled bleeding (11 patients, 26.8%).

Wolf at el reported higher rate of complications like bile duct injury and bile leak in patients who underwent conversion to open cholecystectomy compared to open cholecystectomy.[1] Increased iatrogenic injuries to surrounding visceral organs in patients who have high risk features like intraabdominal adhesions can lead to significantly higher morbidity in these patients. A case-to-case basis decision for selecting open procedures in high-risk patients can avoid these unnecessary iatrogenic injuries which are associated with failed laparoscopy attempts. Petrucciani et al reported significantly higher rates of minor postoperative complications (Clavien-Dindo grade I and II complications) in patients who underwent conversion for laparoscopic right colectomy compared to the laparoscopic group.[10-13] In our study, total 90.24% patients had Clavien- Dindo grade I and II complications.

Ashfauq et al reported longer duration of hospital stay in patients who underwent conversion to open cholecystectomy with 5 days as the mean length of hospital stay.[5] In our study, 82.92% patients were discharged from hospital during the 1st week after surgery.

Limitations of our study is small sample size, no comparison group and limited follow up period. An adequately powered, good quality study which compares the risk factors and surgical outcomes in patients who undergo laparoscopic surgery, laparoscopy converted to open surgery and open surgery is needed in future. Development of reliable and accurate surgical predictive models for conversion in laparoscopic surgeries can help in making an informed decision and safer surgical plan for the patients.

CONCLUSION

History of previous surgery and presence of intraoperative adhesions were frequently present in patients who underwent conversion of minimally invasive procedure to surgery. Intraoperative iatrogenic injury to surrounding visceral organs or uncontrolled bleeding was also associated with high chances of conversion to open surgery. These patients required long period for recovery from the surgery and had frequent minor surgical complications especially surgical site pain, surgical site infection and fever. A case-to-case basis decision for selecting open procedures in high-risk patients can avoid the increased complications which are associated with failed laparoscopy attempts.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Srinivas RY, Gupta K, Rathore YS, Chumber S, Baig KAM, Ramana P. Risk factors and surgical outcomes of conversion of minimally invasive surgery to open procedure Int Surg J 2022;9:416-20.