



Hepatectomy in Robotic Surgery

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Abstract

Scientists developed the robotic surgery system to offer a solution to the increased challenges of conventional laparoscopic surgery. Robotic surgery is a minimally invasive surgical procedure, but scientists have not yet validated it. Over recent years, the use of the laparoscopic technique for liver surgery has reduced like other abdominal techniques due to the limitations of laparoscopic instruments. Robotic procedures can help surgeons to overcome these challenges, particularly during complex operations. Researchers conducted a review of major hepatic surgery on PubMed using designated keywords. They analyzed 237 patients in 17 series and recorded outcomes, for example, length of hospital stays, estimated loss of blood, duration of operation, costs, conversion rate, and related difficulties. The study indicated wedge resection and segmentectomy which were mainly performed procedures. However, the predominance of significant hepatectomies through robotic surgery has high chances because of the superior activities obtained by the robotic system. The complication and conversion rates were 13.4% and 4.2%, respectively. Bile leaks and intracavitary fluid collections were the frequent occurring morbidities. The mean time for conducting the operation was 285 min, while the mean blood loss during the process was 50–280 ml. The mean post-operative duration the patient remained at the hospital was 7 days. The study did not record long-term and survival outcomes. A study conducted in Italy indicated that robotic liver surgery had gained increasing acceptance due to its significant advantage to both patients and operators. Operators have done over 100 robotic hepatic surgeries in Italy, where most robotic training facilities are active. Robotic surgery is safe and feasible in experienced hands. More research is necessary to evaluate the improvement in long-term oncological follow-up and outcomes.

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Introduction

The development of robotic surgery in the past three decades has revolutionized liver resection operation. Robotic surgery helps patients in terms of length of hospital stays, estimated loss of blood, length of operation time, costs, conversion rate, and related problems. Conventionally, liver surgery is among the most challenging operations [1]. However, the introduction of robotic surgery has offered a reliable solution for the process for both operators and patients.

robotic hepatic surgery, and robotic liver resection [2]. The researchers screened all abstracts and titles for review with careful analysis of the data to ensure that there was no double counting of patients [3]. The study analyzed patient demographics (indication for surgery, sex, and age), outcomes (hospital stay, complications, conversion, transfusion requirements, blood loss, and operation time), perioperative characteristics (operating maneuverers), hepatocellular carcinoma (survival, recurrence, and tumor size), and standard oncological outcomes for liver metastasis [4].

Methods

A PubMed search selected a total of 25 publications related to robotic surgery. Seventeen papers with 235 patients that engrossed on liver resection offered detailed information about the patient. All the researchers incorporated the da Vinci robot system (United States, California, Sunnyvale, and Intuitive) during the study [2]. The researchers conducted the study using PubMed databases with primary search phrases such as robotic liver, robotic hepatic resection,

Results

A total of 25 periodicals with 235 patients provided pertinent information to robotic liver surgery. The review included 19 papers with 229 patients that engrossed on liver surgery and offered detailed details about the patient [5]. After sorting double-counted cases, 218 patients were eligible to be included in the research. Nine studies were comprehensive series, with two reasonable journals using conservative open surgery and laparoscopic surgery. Each of the nine studies involved more than 4 patients, contributing

toward the increased cases in 95.4 (208 patients) who responded in the survey [6]. Two of these case scenarios had four patients each, and there were eight single-case information in the study. Patient's number for every study ranged from 1 to 70, and all the researchers used the da Vinci robot system (California, Sunnyvale, and Intuitive).

Discussion

Robotic liver surgery is a new technology involving invasive surgical practice integrating laparoscopic surgeries with distant robotic control of tools and by a support patient and patient-side surgeon. This study entailed reports of around 200 patients who undertook liver resection surgeries [7]. The reported rates of complications and conversion were 20.3% and 4.6%, respectively, due to underestimation from publication and selection biases [8]. In two comparative studies during the research, the complications rates observed during robotic liver surgery were relevant to those of conventional laparoscopic procedures [9]. The series confirmed that robotic liver surgery was feasible and safe when executed by knowledgeable specialists. Research indicated that the structures of da Vinci robotic such as the usage of three robotic arms by the same operator, the ability to perform intracorporeally, and the use of enunciating tools that can be protected in vascular clamps are useful in managing and controlling bleeding without the use of open surgery [10].

The researchers observed that the capability to bolt the surgery enunciating tools to substitute vascular clamping was vital because it offers the anesthesia group time to save life of a patient. However, it is essential to note that the absence of tangible criticism during knot tying with robotic tools and performing suture procedures can lead to uncontrolled overstretching of the tissues, thus causing suture disruption [11]. Careful visual operation is critical during the compensation procedure. Segmentectomy and partial resection were the most commonly executed robotic liver resection surgeries [12]. Besides, right hepatectomy and partial resection had popularity among some patients. However, research revealed that most cases of directly hepatectomy were only conducted in specialized health facilities [13]. The series recorded a high tendency of blood loss during the intraoperative procedure. However, the researchers analyzed the results because the cases did not offer a full representation of the present standard in robotic liver surgery [14], [15].

A team approach comprising of highly skilled operators during the robotic liver section plays a critical role in saving the patient's life. Besides, the exchange and installation of robotic arms require knowledgeable staffs [16]. Adequate training is essential to the usage

of robotic surgery tools in health-care facilities. Some researchers have indicated that mastering the robot requires several robotic procedures in laparoscopic surgery [17]. The study analyzed the incidences of robotic liver surgery that have been described in the journal articles. However, the articles selected for the study failed to provide a precise analysis of specific outcomes and patient demographics [18]. The research's summary, particularly the oncological outcomes, was not well represented in all articles on this topic. Most of the materials focused on short-term perioperative outcomes. Future studies should analyze cost-effectiveness and long-term results [19]. The issue of future studies is necessary to investigate the strengths and weaknesses of robotic liver resection before making conclusions about its effectiveness.

Conclusion

Robotic liver resection is feasible and safe, mainly when used by experienced operators. Expert patient-side surgeons with progressive laparoscopic knowledge are necessary during robotic liver surgery operations. Wristed tools are used in different maneuvers, for example, in suturing bleeding points and looping glissonian pedicles. Long-term outcomes of oncologic procedures are not clear, but short-term perioperative consequences show that the robotic liver is similar to conformist laparoscopic liver surgery.

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