International Surgery Journal
Bada VC et al. Int Surg J. 2021 Jan;8(1):307-311
http://www.ijsurgery.com
pISSN 2349-3305 | eISSN 2349-2902

DOI: https://dx.doi.org/10.18203/2349-2902.isj20205896

Original Research Article

Robotic surgeries: an initial experience in a multispeciality hospital

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Received: 31 October 2020
Revised: 05 December 2020
Accepted: 08 December 2020

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ABSTRACT

Background: The use of robotic surgical systems is an expanding technology in the world. Robot-assisted surgery overcomes some limitations of laparoscopy. Aim was to evaluate a single surgeon's experience with safety, feasibility, complications, and short- and long-term outcomes for robotic assisted procedures.
Methods: It was a prospective study of 39 patients operated by robotic assistance performed 39 surgeries from November 2018 to June 2020 in three departments with follow up of 2 years. The surgeries performed included gastroenterology, gynecological and urological system.
Results: It was a prospective, analytical and descriptive study. In total 39 cases in present study followed up for 3 years. Most of the patients in study are in >65 years age group, and females have been operated mostly. Surgeries in our hospital done with robotic assistance ware 13 cases (33.3%) in gastroenterology department, gynecological department with total 17 cases (42.5%) and in urology department it was 9 cases (23.2%). Gastroenterology surgeries took less time of 100 minutes. Blood loss in gynecological surgeries was more compared to other departments with 103 ml followed by urology 98 ml. Hospital stay in present study was less for gynecological surgeries with one day of admission. All over complications are around 2.5%. Success rate in our study was 97.5%.
Conclusions: It was concluded that robotic surgery offers an effective and safe alternative in the surgical treatment.

Keywords: Complications, Feasibility, Robot-assisted surgeries

INTRODUCTION

Robot-assisted, minimally invasive surgery is now a reality and is expected to become the future surgical technique. Traditional laparoscopy has many drawbacks and disadvantages, including limited movement, the inability to conduct high-precision sutures, awkward surgeon positions, and flat vision. These limitations can be solved by robotic surgery and allow the expansion of minimally invasive surgery to a growing number of patients. However, many concerns, such as the clinical viability and safety of robotic surgery in the general surgical sense, the duration and complexity of the learning curve, as well as clinical applications and disadvantages, are still not resolved. Because of the great success it has experienced, and the influence it has created in the last two decades, robotic surgery is considered the future of surgery. This has not only changed how surgery can be done, but also how it can be taught and practised. Worldwide extension that overcomes those limitations of conventional laparoscopic procedures. There have been 1,661 Da Vinci robots deployed worldwide since 2011, 1,228 in the United States of America, 292 in Europe and 141 in other parts of the globe. Total robotic procedures performed worldwide from 2007 to 2009 it has tripled from 80,000 to 205,000,000 surgeries.[1]

Robot-assisted, minimally invasive surgery is now a reality and is expected to become the future surgical technique. The frontal or inclined orientation of the scope (0-30°) is set during the configuration of the optical

system; 2-dimensional or 3-dimensional vision is selected; the picture on the remote console display is focused after the scope has been placed into its special view (0-30°); and the white balance of the robotic camera is carried out.[2]

The laparoscopic ports are located after pneumoperitoneum induction, and the robotic cart is mounted. It is important to correctly position the robotic cart since its axis must align with the working axis coming from the opposite site. The patient is positioned in a surgical position and the robotic arms are attached to the optical and operating ports; the robotic arms must be removed from the ports to adjust the patient's position. To prevent collisions between the mechanical arms and to optimise the operation, precise positioning of the ports and the robotic cart is important. For accessory surgical instruments operated by the assistant surgeon, extra ports can be mounted. Specific to this robot are the scope and the endoscopic surgical instruments. A double camera is attached to the scope, which allows for 3-dimensional vision. A hook, scissors, forceps, and a needle holder are part of the instruments. The recorded surgical time for robotic procedures includes all phases of configuration, pneumoperitoneum induction, port positioning, and overall surgical time. Gastrointestinal surgery represents a large field for the application of mini-invasive technologies, and gastrointestinal surgeons have contributed, to a large degree, to the widespread adoption of laparoscopy among almost all the hospitals worldwide.

Our study evaluates a single surgeon's experience with safety, feasibility, complications, and short- and long-term outcomes for robotic assisted procedures.

METHODS

It was prospective, analytical and descriptive study in 39 patients operated by robotic assistance performed 39 surgeries from November 2018 to June 2020 in three departments with follow up of 2 years. The surgeries performed included gastroenterology, gynaecological and urological system. The procedures were performed by surgeon with extensive experience in advanced laparoscopy.

Inclusion criteria

All patients of age greater than 18 years posted for laparoscopic procedures.

Exclusion criteria

Surgeries performed by other methods, emergency surgeries and sepsis patients.

Sample size n = $\frac{Z_{1\alpha/2}{}^2(\sigma)^2}{d^2}$

(n)=32

(n)=32+4 (considering 10% dropout of study participants)
Sample size (n) = 36
$Z_{1-\alpha/2} = 1.96$
$\sigma = 13$
$d = 4$

σ is taken according to previous study of Ruiz et al.[3]

Informed written consent for was taken in all the cases. The procedure was performed by the surgeon with a vast experience in advanced laparoscopy and certified to perform robotic surgeries. The robot used in the present series was the DaVinci (Intuitive) 'S' system. Three or four robotic ports with one/two accessory laparoscopic ports were used when necessary.

Gastroenterological surgeries included were radical gastrectomy, low anterior resection, ventral hernia, cholecystectomy, hellers myotomy. gynaecology procedures included radical hysterectomy and sacricolpopexy. Urology procedures included radical prostatectomy, radical and partial nephrectomies. We noted the total surgeries conducted, duration of surgery, hospital stay and complications.

Statistical analyses were performed using the SPSS version 15.0. Quantitative data were analyzed as mean±standard deviations. Fisher's exact test and t-tests were done to compare data sets. P values >0.05 were considered to be indicative of statistically significant differences.

RESULTS

Total 39 cases in present study followed up for 3 years with mean age of surgery of 47±8 years.

Table 1: Demographic details in study.

Variables	Number of subjects	Percentage (%)
Age intervals in years		
<25	1	2.6
25-34	4	10.2
35-44	8	20.5
45-54	7	17.9
55-64	6	15.3
>65	13	33.3
Gender		
Males	18	46.1
Females	21	53.8

Most of the patients in study were in >65 years age group, and females have been operated mostly.

13 cases (33.3%) in gastroenterology department, gynecological department with total 17 cases (42.5%) and in urology department it is 9 cases (23.2%) were operated in our center.

Table 2: Total surgeries operated in the various departments.

Type of surgery in departments	No. of subjects	Percentage
Gastroenterology (cholecystectomy, gastrectomy ventral hernia, Hellers myotomy, low anterior resection)	13	33.3
Gyneacology	17	43.5
Urology	9	23.2

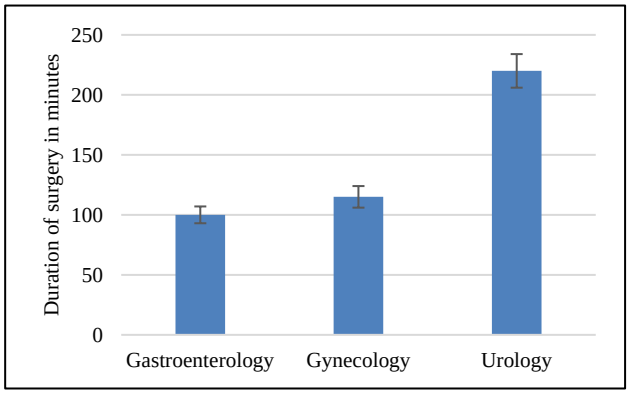

Figure 1: Duration of surgery in various departments.

Gastroenterology surgeries took less time of 100 minutes. Duration of surgery in urology department was more compared to other 2 departments.

Table 3: Blood loss and hospital stay in present study.

Blood loss	Amount of blood loss in ml
Gastroenterology	65±15.1
Gynecology	103±22.5
Urology	98±13.7
Hospital stay	**Number of days (Mean±SD)**
Gastroenterology	1.3±1.1
Gynecology	1.5±0.8
Urology	2.2±1.4

Blood loss in gastroenterology surgeries was less compared to other departments with 65 ml followed by urology 98 ml.

Hospital stay in present study was less in gastroenterology surgeries with compared to other 2 departments.

Ileus was the complications noted in the study with each one case (2.5%) success rate in our study was 97.5%. No recurrences of ventral hernias in 2 year follow up.

Conversion of robotic assisted surgeries to open laparoscopic surgeries study was zero. All the procedures were completed with robotic assistance and there was no conversion to laparoscopic or open surgeries.

DISCUSSION

The benefits of robots are most apparent for surgeries in areas of the body which are anatomically confined and difficult to access by open surgical means, like the deep pelvis. Accordingly, robotic system has been used most commonly in the field of urology, with most studies reporting its use in radical prostatectomy. Advantages include easier ergonomics; scaled, filtered and miniaturized movements for easier and precise dissection and suturing in the confines of true pelvis. Several studies are now available, documenting good short- and long-term outcomes with the use of this technology.[3-5] However, given the cost of robotics, the system is still new to developing nations with limited resources.

It was prospective study of 39 patients operated by robotic assistance was done in our study. The mean age of our patients undergoing robotic surgery was 47±8 years. In Dogra et al study mean age of surgeries was 65±1.2 years, which is higher than that reported when compared to our series. Menon et al reported mean age of 57.4 years, while Mikhail et al reported it to be 58.4 years in their series.[3,4] A comparable average age of 63.2 years has been reported by Patel et al.[5]

13 cases (33.3%) in gastroenterology department, gynecological department with total 17 cases (42.5%) and in urology department it was 9 cases (23.2%) were operated in our study in which gastroenterology surgeries took less time of 100 minutes, gynecological surgeries of 120 minutes which is similar to study done by Landeen et al found that robotic hysterectomy required longer operative time (117.2 minutes versus 83.7 minutes, $p<0.001$).[8]

In ours study blood loss in gastroenterology surgeries was less than other two departments as 65 ml followed by urology 98 ml. However, more recent publications report greater blood loss for the conventional laparoscopic approach (207.7 ml versus 131.5 ml).[9] Blood loss is another parameter which when compared between the two surgical techniques showed great fluctuations (50-1500 ml) in initial studies. More recent publications report greater blood loss for the conventional laparoscopic approach (207.7 ml versus 131.5 ml).[10]

In our study hospital stay was less for gastroenterology surgeries with one day of admission. The length of hospital stay though influenced by multiple factors, still most studies do show an average one day less stay in hospital for robotic surgeries. In fact same day discharge is increasingly becoming popular for both surgeon and patients. Out of 200 cases that Lee et al and associated planned to discharge on the same day, they were able to send 157 women (78%) were successfully the same day.[11] Median time for discharge for these cases was 4.8 hours

(range, 2.4-10.3). The length of hospital stay though influenced by multiple factors, still most studies do show an average one day less stay in hospital for robotic surgery patients.[10,12]

In two comparative studies, Berber et al found no differences in the mean operation times of the robotic and laparoscopic procedures, whereas a cohort-matched study conducted by Ji et al and a retrospective study conducted by Spampinato et al suggested that the robotic procedure required longer operation times than laparoscopic and open resection surgeries.[13-15] The mean intraoperative blood loss ranged 50-660 ml.

Three recent papers that conducted matched comparisons of robotic and laparoscopic liver resections (globally, 203 laparoscopic versus 129 robotics) failed to show significant differences between the two techniques.[16] However, the robotics technique could have facilitated the management of lesions arising from the posterior segments, thus increasing the number of patients undergoing minimally invasive resection (from 2 to 10 times) and major hepatectomies. Pigazzi et al reported how operative time decreased after 20 consecutive procedures, while D'Annibale et al obtained a decrease in mean operative time from 312.5 minutes in the first 25 procedures to 238.2 minutes in the last ten (p=0.002).[17,18]

Over all complications in all 39 patients were around 2.5% in present study which correlates with other studies. The overall complication rate was acceptably low. There could be surgeon's bias in doing more difficult cases using the robotic platform. Swenson et al found that the rate of post-surgical complications was lower in the robotic surgery group (3.5% versus 5.6%, p=0.01), including lower rates of surgical site infection (0.07% versus 0.7%, p=0.01) and need for blood transfusion (0.8% versus 1.9%, p=0.02).[13] Major post-surgical complications such as intraoperative bowel and bladder injury, readmissions, and the need for reoperations were similar between groups. Thus, robotic hysterectomy did not decrease major morbidity following hysterectomy for benign indications when compared to laparoscopic hysterectomy. Pellegrino et al retrospective study found no other intraoperative complications with success outcome reported in 94% of the patients which was very similar to our study with success rate of 97.5%.[14] Conversion of robotic assisted surgeries to open laparoscopic surgeries study was zero. All the procedures were completed with robotic assistance and there was no conversion to laparoscopic or open surgeries.

Laparoscopy is now accepted and is most likely recognized as the gold standard in the management of some gastrointestinal procedures (i.e., colonic surgery). However, our opinion is that greater development should be expected for robotics when dealing with gastroenterological surgeries. Moreover, robotic technology could lead to a crucial improvement of laproendoscopic, single-site surgery, which currently requires excellent surgical skills and dexterity.[21] The potential capabilities of new robotic technologies, including three-dimensional viewing, intraoperative guidance, training simulators, and robotics, will undoubtedly contribute to improving minimally invasive surgery.[22]

However, the widespread adoption of robotic technology in gastrointestinal and other surgeries is far from becoming a reality. The three main drawbacks of RS are represented by the increased costs, the longer operative times, and unproven benefits for patients. Most of these concerns are expected to be resolved with future studies and gaining of experience.

CONCLUSION

The advantages of this robotic technique are smaller incisions, leading to lower morbidity, less postoperative pain and shorter hospital stays which are similar to any minimally invasive surgery. However, robotics do seem to have an edge in highly complicated procedures when extensive dissection and proper anatomy reestablishment is required. The use of robotic assistance in laparoscopy is slowly becoming popular because this technology has enabled surgeons to overcome difficulties of conventional laparoscopy while allowing patients to benefit from minimally invasive surgery. The purpose of this article was to highlight the acceptance of robotic surgeries in gastroenterology procedures and review the current literature. However we need large studies with long term follow up of reproductive outcomes before deriving firm conclusions.

Most clinical outcomes such as blood loss, complications, and hospital stay are less for the robotic surgeries and can be concluded that robotic surgery offers an effective and safe alternative in the gastroenterological surgical treatment.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: Not required

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Cite this article as: Bada VC, Pavankumar V, Kumar PA, Reddy S, Sasanka V. Robotic surgeries: an initial experience in a multispeciality hospital. Int Surg J 2021;8:307-11.