

Initial Experience of Robot-Assisted Surgeries

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ABSTRACT

Objective: To present initial experience with the first 100 cases of robotic-assisted surgery by the Department of General Surgery.

Study Design: Descriptive study.

Place and Duration of the Study: Department of Surgery, National Hospital and Medical Centre, Lahore, Pakistan, from May 2022 to August 2023.

Methodology: Demographic and postoperative details of the first 100 patients to undergo robotic-assisted surgery by the Department of General Surgery were reviewed. Prospective data were collected from the hospital information database as well as the CMR database. The data collected in the hospital database included the patients' age, diagnoses, genders, complications during hospital stay as well as 90-day readmission, morbidity, and mortality. Data collected by CMR via Versius robotic surgery console or internal databases included operative minutes using the console.

Results: The average age of patients undergoing robotic surgery was 44.26 ± 14.08 years. Cholecystectomy (78%) was the most commonly performed robotic-assisted procedure. Only one patient had blood loss of more than 100ml. There was no postoperative complication, readmission or mortality during the study period.

Conclusion: With proper patient selection, robotic-assisted surgery is safe and feasible even in low- middle-income countries (LMICs).

Key Words: Robotic-assisted surgery, Pakistan, Initial experience, Outcomes, Versius.

How to cite this article: Ayyaz M, Farooka MW, Butt UI, Umar M. Initial Experience of Robot-Assisted Surgeries. *J Coll Physicians Surg Pak* 2024; **34(07)**:838-841.

INTRODUCTION

Robotic surgery makes use of remotely controlled robotic arms operated by a surgeon sitting at a console which provides a 3D magnified view of the operative site and enables control over the movements of the robotic arms. Robotic surgery has progressed dramatically over the past 20 years. It has moved from the realm of science fiction into the operating theatres of today. *da Vinci* (Intuitive Surgical, California, USA) received approval from the United States Food and Drug Administration (FDA) in 2000 and has been widely used in all kinds of procedures. The number of systems and cases performed robotically has increased rapidly. There has been the entry of competing robotic surgery platforms in recent years.¹ The commonly performed procedures of robotic surgery relate to urology and gynaecology. However, its use is not limited to these fields, with rapid expansion in other surgical specialities. Robotic surgery offers a number of advantages as compared to conventional laparoscopic or open surgery. These include improved dexterity, better instrument handling, marked decrease in tremors, scaling of motion, reduced fatigue and musculoskeletal strain, and improved visualisation.²

Studies have shown that robotic-assisted surgery is associated with a number of clinical benefits. There are smaller incisions, less blood loss, shorter hospital stays, and faster healing. This translates into decreased time away from routine life and decreased financial burden. However, robotic surgery is associated with a number of limitations. The robotic surgical system is a complex technical equipment which requires proper training before setting-up and usage. The surgical team also requires training to carry out the surgical procedures. Increased duration of surgery at present because of the time taken to set up the system before incision is also a concern. The cost of the instruments and equipment involved poses a challenge, especially in lower income countries.³⁻⁵

Pakistan acquired the first robotic surgical system *da Vinci* (Intuitive Surgical, California, USA) in 2011 which was installed in Sindh; however, the machine soon went out of order. Another system was installed in 2013. Up to recently, these were the only systems installed in the country with a very limited number of cases performed on them.⁶ Things have changed recently with the introduction of new robotic system Versius (CMR, Cambridge, UK) in the country mainly in Karachi and Lahore. The Versius surgical system is a recently introduced robotic system intended for tele-operated robotic-assisted surgery.⁷ It has been designed on the basis of the human arm and wrist. It enables seven degrees of freedom at the tip of the instrument thus allowing a better approach as compared to the laparoscopic surgery.⁸

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Received: December 28, 2023; Revised: February 18, 2024;

Accepted: April 30, 2024

DOI: <https://doi.org/10.29271/jcpsp.2024.07.838>

At present, there are no large studies involving general surgical cases from the local settings. The main aim of this paper was to outline the initial experience with robotic-assisted surgery, especially keeping in mind general surgical procedures.

METHODOLOGY

The authors reviewed all the cases of robotic-assisted surgery performed at their institute. These cases belonged to general surgery, gynaecology, and urology. Each case was performed by the teams of surgeons belonging to respective specialities who had received proper training for robotic surgery. In this article, the authors included only the first 100 robotic-assisted procedures performed by the Department of General Surgery at the National Hospital and Medical Centre, Lahore. These cases were performed from 29th May 2022 to 22nd August 2023. The ethical approval was taken from the hospital's Ethical Committee. Operations were performed under general anaesthesia. Cases which were initiated as robotic surgery but had to be converted into another method (laparoscopic / open) were included in the study and were noted as hybrid. Prospective data were collected from the hospital's information database as well as the Versius database. Confidentiality and privacy of the patient information was maintained.

The data collected in the hospital database included the patients' age, genders, diagnoses, intraoperative complications, complications during hospital stay as well as 30-day readmission, 90-day morbidity, and mortality. Data collected by CMR via Versius robotic surgery console or internal databases included operative minutes using the console.

RESULTS

The first robotic-assisted surgery in Punjab, Pakistan was carried out on 29th May 2022 at the General Surgery Department of National Hospital and Medical Centre, Lahore. The 100th case of general surgery was done by the department by the end of August 2023. Since starting robotic-assisted surgery more than 250 operations have been performed up-till the time of writing. More than 60% of these cases had been performed by the Department of General Surgery with the rest being done by the Department of Gynaecology and the Department of Urology. These cases were performed by a team comprising of 10 trained robotic surgeons. A large variety of general surgery cases were performed and the breakdown of the first 100 cases done in general surgery (Figure 1).

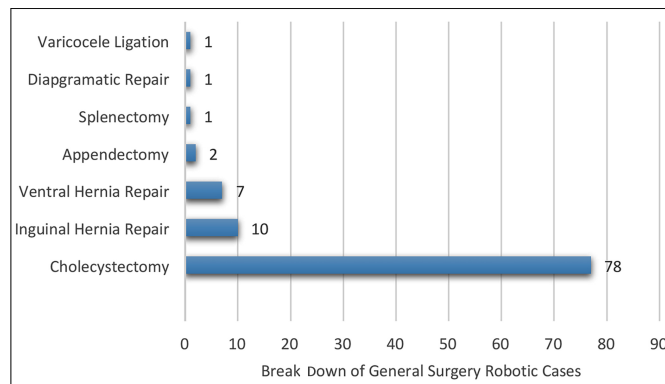


Figure 1: Breakdown of the first 100 general surgery robotic-assisted cases.

The average age of patients undergoing robotic-assisted surgery was 44.26 ± 14.08 years. Among the cases, only one had blood loss of more than 100ml. It was a case of splenectomy which had to be converted to open due to the bleeding. The mean operative time for each procedure was calculated. Procedure time was calculated from the start of induction of anaesthesia until skin closure. It included the time taken for creation of pneumoperitoneum, insertion of ports, docking of the robotic arms, and performance of the operative intervention followed by the closure of abdominal wounds. Mean operative time and mean hospital stay for each procedure is detailed in Table I.

DISCUSSION

The authors presented their initial experience with robotic-assisted surgery in a developing country. The results showed that robotic-assisted surgery is a safe procedure when carried out with proper training. There is growing evidence that both surgeons and patients are now beginning to choose robotic surgery over open surgery or conventional laparoscopy where there is availability and cost feasibility.⁹

There was only one conversion to open due to bleeding which was not controlled robotically. This is a limitation of the current system as options for haemostasis are limited at present. Similar difficulties were also faced by other surgeons.¹⁰ There was only one conversion to laparoscopic surgery due to dense adhesions and oedematous gallbladder which became difficult to manage with the robotic approach. There was one patient who had to be taken back to the operating room due to bleeding after undergoing robotic-assisted cholecystectomy. However, it was due to slippage of clips rather than technical issues with the procedure. The case was managed successfully via laparoscopic approach. Patient was discharged within 48 hours. Apart from these, there were no other conversions.

Table I: Summary of general surgery robotic-assisted cases.

Case	Number	Mean-time (minutes)	Conversion	Intraoperative complication	Need for transfusion	Return to OT	Postoperative complication	30 days readmission	90 days mortality
Cholecystectomy	78	98 (39.5)	1	Nil	1	1	No	No	No
Appendectomy	2	98.5	0	Nil	No	No	No	No	No
Diag hernia	1	157	0	Nil	No	No	No	No	No
Splenectomy	1	119	1	Bleeding	Yes	No	No	No	No
Varicocele	1	85	0	Nil	No	No	No	No	No
Inguinal hernia	10	143.5 (44.64)	0	Nil	No	No	No	No	No
Ventral hernia	7	183.5 (44.88)	0	Nil	No	No	No	No	No
Heller myotomy	1	285	0	Nil	No	No	No	No	No

All cases had follow-up at two weeks in the outpatient department followed by telephonic follow-up at 90 days. There was no morbidity or mortality during the 90-day follow-up. All patients are on further follow-up as well to determine long-term outcomes.

The reason for this may be that all cases were carefully selected. Initially, the selection criteria included simple and straightforward cases. The authors intended to avoid difficult and complex cases since it was the initial phase of learning curve. Similar policy has also been adopted by other surgeons in their practices.¹¹

The use of robotic surgery has increased greatly in general surgery. Increasing number of surgeons are now being trained to perform robotic surgery. It has been shown that the results of surgical outcomes improve with training.¹² An advantage of the modular design of the current system is that the robotic arms mimic the laparoscopic arms. As the port placements are similar, it also allows for the duplication and interchange of laparoscopic and robotic steps.¹³

The major chunk of the surgical workload was formed by cholecystectomies. This is due to a number of reasons. Firstly, the burden of disease seen at the hospital includes a large number of gallbladder pathology. Secondly, it is one of the most commonly performed procedures and is well versed with it via laparoscopic approach the authors concentrated on the robotic-assisted cholecystectomies to enable their skill enhancement. Although the authors had not delved into the financial aspect of the cases, however, it is without doubt that the initial cost of set up of robotic surgery set up is higher as compared to laparoscopic surgery. Although with the passage of time and the rapid development of newer models and technology, this aspect is expected to come down. Furthermore, the added benefits of decreased hospital stay, early return to work, and lesser surgical site infections would help in overall cost utility.¹⁴ The authors shall be discussing more about the financial aspect in further studies.

The study had a number of limitations. It was an observational study presenting initial experience. Since robotic surgery is expensive, the patients selected were mostly those who could afford it. Most of the patients belonged to the younger and educated class. Furthermore, it is only the first year of the authors' experience with robotic surgery and only a small number of cases have been documented. It can be assumed that as the experience of the surgical team grows the operative time shall decrease and more complex cases will be performed. Such evolution has also been documented by other researchers.¹⁵

This study is one of the first studies to present a large case series from a single institute in Pakistan regarding outcomes of robotic-assisted surgery.

CONCLUSION

With proper patient selection, it is feasible to carry out robotic assisted surgery even in a low- middle-income country.

ETHICAL APPROVAL:

Ethical approval was taken from the Ethical Committee of the National Hospital and Medical Centre, Lahore, Pakistan, via letter Ref (NHMC/1034, Dated: 30-07-2023).

PATIENTS' CONSENT:

Informed consent was taken from patients regarding publication of the study based on their data prior to the surgery.

COMPETING INTEREST:

The authors declared no conflict of interest.

AUTHORS' CONTRIBUTION:

MA, MWF, UIB, MU: Conception and design of the work, acquisition of the data, drafting of the manuscript, and review.

All authors approved the final version of the manuscript to be published.

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