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Original Research Article

A comprehensive review of 53 gynae surgeries on the versius robotic system in a tertiary care hospital

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ABSTRACT

Background: Robotic-assisted surgery has attained widespread acceptance within clinical practice, emerging as the definitive standard for various medical indications. Within the realm of Gynae surgery, there has been a notable upsurge in the utilization of robotic and laparoscopic techniques. The Versius robotic system, developed by CMR Surgical, has demonstrated its efficacy on a global scale since its introduction in 2018, marking a significant stride in the landscape of robotic-assisted surgery. This review article was dedicated to providing an impartial assessment of robotic technology, elucidating our insights gleaned from 53 gynaecological surgeries conducted with the Versius robotic system.
Methods: A meticulous examination of 53 cases was undertaken, wherein average operative time, estimated blood loss, postoperative hospital stay, Intraoperative and postoperative complications, and conversion rates were subjected to retrospective scrutiny.
Results: The study conducted at a Tertiary care hospital involved the analysis of 53 gynecological cases using the Versius system. Results indicate the feasibility, efficiency, and patient-friendly nature of the Versius system, with notable advantages such as reduced hospital stay and smoother manipulation of tissues.
Conclusions: We acknowledge the ongoing evolutionary trajectory of robotic surgery and it is evident that its merit has already been substantiated by the endorsement of numerous medical practitioners and patients worldwide. The Versius robotic system stands as a revolutionary force within the healthcare paradigm, distinguished not only by its favorability among medical professionals but also by its patient-friendly attributes. In the realm of minimally invasive gynecologic surgery, robot-assisted surgery emerges as a compelling alternative.

Keywords: Gynecological, Hysterectomy, Laparoscopy, Robot, Versius

INTRODUCTION

The landscape of surgical procedures has undergone profound changes due to technological advancements, necessitating the evolution of assessment techniques, especially within the technical, legal, and bioethical domains. Coined by Joseph and Karel Capek in 1917, the term 'Robot' marked the inception of a revolutionary era, influencing various facets of human life, with medicine being a significant arena.[1,2] Guided by Isaac Asimov's Three Laws, i.e. *First Law: A robot may not injure a human being or, by omission, cause harm to a human being; Second Law: A robot must take human instructions unless they would conflict with the First Law; Third Law: The existence of a robot must be protected as long as it does not conflict with the First or Second Law."*

The robotic revolution has ushered in transformative developments, and its impact is particularly conspicuous in the field of medicine.

The inception of robotics in medicine traces back to HERMES, an early voice-recognition system controlling surgical elements through vocal commands. Subsequent milestones include invention of AESOP in 1994, paving the way for ZEUS in 1999 and the establishment of the da Vinci robotic system (DRS) by Intuitive Surgical Inc. in 1997.[3,4] The approval of robotic surgeries for gynecological procedures by the U.S. FDA in 2005 marked a pivotal moment in this evolutionary journey [5-7]

The historical progression from simple voice-recognition systems to sophisticated robotic platforms like the da Vinci system highlights the rapid evolution of robotic surgery. The introduction of the Versius Surgical System by CMR Surgical in 2018 signifies a new era in the field, offering a more accessible and versatile alternative to its predecessors.

CMR has developed the world's first universal surgical robotic system, that is easy to adopt, and extends the benefits of minimal access surgery to everyone.

The Versius surgical system consists of four main components: The Versius surgeon console, the Versius instrument bedside unit, the Versius visualisation bedside unit, Versius endoscopes and instruments.[8]

Compared to the da Vinci system, the Versius surgical system boasts of several distinctive features. With an open console providing 3D vision accessible to visiting surgeons, inbuilt video recording, and portable training capabilities, Versius offers enhanced usability. The system's ergonomic design, including hand controllers which can control instruments, disengage instruments, move endoscope, apply energy via hand controllers with 720 degrees of rotation, contributes to a shorter learning curve and reduced fatigue for surgeons. In Davinci, Surgeon Console's Master controllers and Foot controls have to work together with 540 degrees of rotation of Davinci instrument making learning curve longer with Davinci. DRS has bulky patient cart, vision cart and surgeon console occupying lot of space. The bedside units of Versius are easily portable. They can be moved from one OT to another very easily. They have comparatively shorter foot print than that of Davinci patient cart. The CMR surgical's Bedside units can easily be setup even in the smallest of OR. Post-surgery storing the Versius bedside units is very easy. CMR Versius's Bedside unit has unique wrist design and mimics human hand and is very easy to set up.

Advancements in robotics, particularly with the Versius system, have mitigated challenges faced by laparoscopic surgeons, offering improved dexterity, reduced fatigue, and streamlined control mechanisms. These enhancements empower less-experienced surgeons to undertake complex procedures, such as intracorporeal suturing and knot tying, with greater ease and precision. The application of robotic systems extends across general gynecology, reproductive gynecology, urogynecology, and gynecologic oncology, enabling procedures like hysterectomies, myomectomies, and lymphadenectomies.

The versatility of the robotic platform, exemplified by the Versius system, yields benefits such as decreased wound infections, bleeding, and hospital stays, thereby enhancing postoperative recovery.[9] The integration of robotic surgery into gynecological practices is on the rise, driven by technological advancements, favourable outcomes, and adaptability to laparoscopic procedures.

Robotic surgery is implemented in the surgical community to an incredible level. It has been fueled in part by the quick rise of technology and in part by how quickly and easily current laparoscopic procedures have been modified. Surgeons and the medical community reported better outcomes with this procedure compared to conventional laparoscopy due to a number of technological advancements, including graphic designing due to the three-dimensional interface, vibration filtration, continued to improve wrist motion freedom, motion scalability, and enhanced ergonomics due to a more pleasant user interface.

The aim of the study was to provide an impartial assessment of robotic technology, elucidating our insights gleaned from 53 gynaecological surgeries conducted with the Versius robotic system at a tertiary care centre.

METHODS

This study was descriptive observational study conducted at Pushpawati Singhania Hospital and Research Institute, New Delhi (tertiary care hospital) from July 2021 to November 2023. Total 53 patients were included in this study.

Inclusion criteria

All the patient presenting to gynaecology OPD requiring surgical management for gynaecological disorders willing to give consent were included in the study.

Exclusion criteria

Patients who were either. Not willing to participate in the study or not given such written informed consent were excluded from the study

From July 2021 to November 2023, 53 robotic gynecological cases were performed at Pushpawati Singhania Hospital and Research Institute, New Delhi. Preoperative workup was the same as any gynaecological procedure. Case selection criteria were the same as that for any other laparoscopic procedure. Informed written consent for the procedure was obtained on the day of surgery and bowel preparation was done a night prior with charcoal and Dulcolax tablets and also they were given Tablet alprax 0.25 mg. Informed written consent was taken for conversion to laparoscopy in all cases. We used a three-

arm Versius robotic system, developed by a British private limited company CMR Surgical. We standardized the port positions. The robotic bedside unit was docked, A 30-degree scope was used for the procedure. Parameters such as operative time, blood loss, hospital stay, intraoperative and postoperative complications, and conversion rates were analyzed.

Statistical analysis

Dependable and independable variables were analyzed by using Microsoft Office Excel version 2021. There was no statical tests applied as this was purely descriptive study.

RESULTS

We had 53 robotic assisted gynaec surgeries, out of which 30 was TLH BSO, 7 were case of TLH with bilateral salpingectomy, 5 cases of robotic myomectomy, 6 of ovarian endometriotic cystectomy, 2 cases of TO mass removal, 1 of diagnostic hysterolaparoscopy with Chromopertubation, 1 cases of diagnostic laparoscopy with drainage of hematometra and haemato colpos and 1 case of robotic salpingectomy for ruptured ectopic pregnancy (Table 1).

Table 1: Overview of robot-assisted gynaec surgeries.

Robot-assisted gynaec surgeries	No. of surgeries
Robotic assisted TLH with bilateral salpingo oopherectomy	30
Robotic assisted TLH with bilateral salpingectomy	7
Robotic assisted ovarian endometriotic cystectomy	6
Robotic myomectomy	5
Robotic removal of TO mass	2
Diagnostic and operative robotic assisted laparoscopy with PCO drilling and chromopertubation	1
Diagnostic and operative robotic assisted laparoscopy with drainage of haematometra and haematocolpos	1
Robotic salpingectomy for ruptured ectopic pregnancy	1

In our study with 53 cases, done over a period of 2 ½ years, the average operative time for robotic assisted gynaec surgeries was 150 mins with minimal time of 49 mins and a maximum of 4 hours with the post-op hospital stay of 1 day. There was no intra op complications but 2 cases of minor postop complication which was a case of vault infection which was managed conservatively with antibiotics. The conversion rate from robotic to laparoscopy or laparotomy/open surgery in our study was none.

DISCUSSION

We have compared our study with similar 5 other studies done for robotic assisted total laparoscopic hysterectomies (Table 2).

Table 2: Comparison with other studies.

Author	Present study	Shashoua et al,[10] 2009	Payne et al,[11] 2008	Giep et al, [12] 2010	Sarlos et al,[13] 2010	Puntambekar et al,[14]
No. of cases	53	24	100	23	40	24
Duration of study	2021-2023	2005-2007	2006-2007	2007-2009	2007-2009	2012-2013
Operative time (Avg.)	150	142	119	90	109	80
Estimated blood loss (ml)	50	1.9gm hb drop	61	59	>50	20
Hospital stay(days)	1	1	1	1	3.1	1
Intraop complication	none	none	1/100	1/237	None	None
Post op complication	2 minor	Major: none Minor:1/24	Major: none Minor: 1/100	Major: none Minor: 6/237	Major: none Minor: 5/40	None
Conversion rates	none	none	4%	1.7%	None	none

No. of cases in our study was 53, more than most similar studies carried out. The duration of our study was 2½ years from July 2021 to November 2023, similar to Payne et al 2008, and Sarlos et al 2010.[11,13]

In this study, the average operative time was 150 mins with minimal time of 49 mins and a maximum of 4 hours almost near the average of all such similar studies conducted. The hospital stay (post-op) was 1 day, similar to most other studies.

In our sample size of 53/ in the 53 cases operated in this study, they was no intra op complications. There was 2 cases of minor postop complication which was a case of vault infection which was managed conservatively with antibiotics which was less than the Sarlos et al.[13]

Similar to Shashoua et al, sarlos et al, and Puntambekar et al, the conversion rate from robotic to laparoscopy or laparotomy/open surgery in our study was none.[10,13,14] This was less when compared to Payne et al with conversion rate of 4% and Giep et al with conversion rate of 1.7%.[11]

The Versius robotic system was installed in Pushpawati Singhania hospital and Research Institute, Delhi, India in 2021. Our experience during these 53 surgeries was quite satisfactory. It was feasible, less strenuous and provided easy manipulation of instruments as well as tissues with increased degree of freedom and smoothness. Surgeon friendly as surgeon can sit comfortably at the open console with the 3D spectacles on which allows them to sit in their comfortable position and reduces physical fatigue from surgery.

The portability and ergonomic nature of Versius system was a great help as it was less space consuming. Additionally, it is patient friendly as shorter hospital stay, reduced pain and patient can gain mobility sooner. There is a rapid increase in the amount of data being generated on robotic surgery. There have been various studies that evaluate the feasibility of robot-assisted surgery.

We realized that laparoscopy has limitations due to surgeon and patient factors. The patient factors include high BMI, narrow pelvis and bulky tumors. The main limiting surgeon factors are individual skills and team.

Robotic-assisted laparo-endoscopic surgery is still developing, and advancements in technology now make it possible to handle pathologic surgical anatomy that was previously difficult, such as oncology and reconstruction. Robotic surgical and medical platforms have become more widespread, and technology is increasingly being developed to meet this demand. Even more, technologies are being used to increase the capabilities of existing systems. Research is still needed to assess the benefits and disadvantages of each robotic surgical tool and base used in the operation room.

The invention of robotic surgery is one of the most important inventions, which has made even the most complex treatments possible through the articulation of the instruments and the precision of movement. Future progress in robotics will focus primarily on more lasting haptic systems that would provide tactile and kinesthetic input, downsizing and micro-robotics, improved visual feedback with higher fidelity detail and magnification, and autonomous robots.

This study has some limitations. Multicentric retrospective analysis with larger population is required. As there was no intra op complication or major post op complication with good success rate of robotic surgeries performed at our centre, so there was no chances to compare two or more different outcomes.

CONCLUSION

Robotic surgery, exemplified by the Versius system, presents a paradigm shift in gynecological practices, offering advantages in terms of patient outcomes, surgeon comfort, and adaptability to diverse procedures. While acknowledging the potential of traditional laparoscopy, the robotic approach demonstrates distinct benefits, especially in complex and high-risk cases. Individualized considerations, encompassing patient characteristics, surgeon expertise, and practice settings, are crucial in optimizing outcomes.

The dynamic landscape of robotic surgery in gynecology is poised for further advancements, with an emphasis on lasting haptic systems, downsizing, improved visual feedback, and autonomous robots. As the field continues to evolve, ongoing research endeavors will illuminate the nuanced benefits and potential drawbacks associated with various robotic surgical tools, shaping the future trajectory of this transformative technology.

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