ORIGINAL ARTICLE

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Pioneering experience in robotic gynecological surgery in Peru: initial results with the Da Vinci XI System – Clínica Internacional San Borja

Experiencia pionera en cirugía robótica ginecológica en el Perú: resultados iniciales con el sistema Da Vinci XI - Clínica Internacional San Borja

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ABSTRACT

Introduction: Robotic-assisted gynecologic surgery offers advantages in submillimetric precision, 3D visualization, and enhanced instrument articulation over conventional laparoscopy. In June 2024, Clínica Internacional San Borja implemented the Da Vinci Xi system, marking the beginning of this technique in Peru. **Objectives:** To describe the demographic characteristics, diagnoses, intraoperative findings, and surgical outcomes in the initial series of patients undergoing robotic gynecologic surgery. **Methods:** A retrospective descriptive study was conducted from June to December 2024. Surgical reports and clinical records from 24 patients were analyzed for age, diagnosis, procedure type, operative time, estimated blood loss, and hospital stay. Results: Median age was 41.7 years. The most common diagnosis was uterine leiomyoma (83.3%). A total of 25 procedures were performed, mainly hysterectomies (58.3 %) and myomectomies (33.3 %). Mean operative time was 180.7 minutes, with a mean blood loss of 101 mL. No major complications or conversions occurred. The average hospital stay was 2 days. One patient conceived following robotic surgery. **Conclusions:** This initial experience with the Da Vinci Xi system supports the safety and effectiveness of robotic gynecologic surgery for complex cases, with satisfactory outcomes and minimal morbidity, advocating for its integration into national clinical practice.
Key words: Robotic surgery; Gynecology; Da Vinci Surgical System; Uterine leiomyoma; Retrospective study.
MeSH terms: Robotics; Gynecology; Da Vinci Surgical System; Uterine Leiomyoma; Retrospective Studies.

RESUMEN

Introducción: La cirugía robótica ginecológica ha demostrado ventajas en precisión submilimétrica, visualización tridimensional y maniobrabilidad frente a la laparoscopia convencional. En junio de 2024, la Clínica Internacional San Borja implementó el sistema Da Vinci Xi, marcando el inicio de esta técnica en el Perú. **Objetivos:** Describir las características demográficas, diagnósticos, hallazgos intraoperatorios y desenlaces quirúrgicos de la serie inicial de pacientes sometidas a cirugía robótica ginecológica. **Métodos:** Estudio descriptivo retrospectivo realizado entre junio y diciembre de 2024 en Lima, Perú. Se analizaron reportes quirúrgicos y registros clínicos de 24 pacientes, incluyendo edad, diagnóstico, tipo de procedimiento, duración operatoria, sangrado estimado y estancia hospitalaria. **Resultados:** La mediana de edad fue 41,7 años. El diagnóstico más frecuente fue leiomioma uterino (83,3 %). Se realizaron 25 procedimientos, principalmente histerectomías (58,3 %) y miomectomías (33,3 %). El tiempo quirúrgico promedio fue 180,7 minutos, con sangrado medio de 101 mL. No se registraron complicaciones mayores ni conversiones. La estancia hospitalaria promedio fue de 2 días. Se reportó un embarazo logrado tras cirugía robótica. **Conclusiones:** La experiencia inicial con el sistema Da Vinci Xi confirma que la cirugía robótica ginecológica es una alternativa segura y eficaz para procedimientos complejos, con desenlaces favorables y mínima morbilidad, promoviendo su integración en la práctica clínica nacional.
Palabras clave: Cirugía robótica; Ginecología; Sistema quirúrgico Da Vinci Xi; Leiomioma uterino; Estudio retrospectivo.
Descriptores DECS: Cirugía robótica; Ginecología; Sistema quirúrgico Da Vinci Xi; Leiomioma uterino; Estudios retrospectivos.

INTRODUCTION

The use of robotic surgery in gynecology has experienced remarkable growth in the last decade, establishing itself as a tool that improves surgical precision, three-dimensional visualization, and maneuverability compared to conventional laparoscopic surgery. Robotic-assisted surgery has revolutionized global gynecological practice, demonstrating technical superiority over traditional laparoscopy through three fundamental advantages: submillimeter precision, 3D visualization with adjustable optical zoom, and instrumental articulation with a greater degree of freedom that exceeds human mobility[1,2,3,4]. Internationally, robotic surgery has proven effective in complex gynecological pathologies such as symptomatic fibroids, deep endometriosis, ovarian masses, and pelvic prolapse. Its benefits include less bleeding, shorter hospital stays and accelerated postoperative recovery[3,4].

In Peru, robotic gynecological surgery began in 2024 with the implementation of the Da Vinci Xi system (Intuitive Surgical®) at the San Borja International Clinic, making it the first national center to develop this approach. This fourth-generation system integrates technologies such as Firefly®, which uses immunofluorescence after injecting indocyanine green to better differentiate tissues and, in the case of gynecological surgery, to better identify the ureters, and the Smartfire® stapler system ® stapler system when performing deep endometriosis surgery with intestinal involvement, which allows for sutures with a low rate of leakage and dehiscence of intestinal tissue, improving surgical safety and efficiency. On June 13, 2024, the first procedures were performed: a hysterectomy and a myomectomy, marking a milestone in Peruvian gynecological surgery.

Doctors Guillermo Escalante Kanashiro and José Delgado Delgado, certified by the SOCIETY OF ROBOTIC SURGERY (SRS), led this pioneering program after completing specialized training in Lima and Brazil.

The TRAINING PROGRAM for certification consisted of:

Location: Albert Einstein Hospital in Sao Paulo

Duration: 5 days from 8 a.m. to 8 p.m., where we were taught how to position the patient, place the trocars, position the robotic platform, and dock the robot (attach the robot's arms and their articulation with the trocars).

Simulations were performed daily on the robotic console with different programs of varying levels of difficulty.

Robotic gynecological surgeries were observed daily, with the proctor (instructor) explaining the entire process and the operation itself.

The fifth day consisted of an evaluation in a laboratory on an animal (pig) where we applied everything we had learned and performed procedures with a Da Vinci robotic platform, including hysterectomy, vessel dissection, and intestinal resection.

This initial series of cases, focusing on myomatosis, endometriosis, and uterovaginal prolapse, represents a first step in evaluating the impact of this technology on national clinical practice and in generating local evidence for future comparative studies.

OBJECTIVES

Primary objective:

• Describe the demographic characteristics, diagnoses, intraoperative findings, and surgical outcomes of the initial series of patients undergoing robotic gynecologic surgery.

Secondary objectives:

• Estimate the average duration of surgical procedures.

• Quantify intraoperative blood loss.

• Analyze the frequency of diagnoses (e.g., leiomyoma, endometriosis, among others) and the main surgical indication.

MATERIALS AND METHODS

STUDY DESIGN

A descriptive, retrospective case series study was conducted, including all patients who underwent robotic gynecological surgery at the Clínica Internacional San Borja, Lima, Peru, between June 2024 and December 2024. It should be noted that the first robotic gynecological surgery was performed on June 13, 2024; on that same day, a robotic hysterectomy was perfor-

med on one patient, followed by a robotic myomectomy on another patient. All procedures were performed by Dr. Guillermo Escalante Kanashiro and Dr. José Delgado Delgado.

Surgical team training

Both surgeons received rigorous training in Lima and Brazil, provided by the Albert Einstein Israelite Hospital and the Alvarez Larrea Medical Equipment Company (Alem). This training program included:

• Equipment and instrument theory: Technical and operational fundamentals of the robotic platform.

• Handling and positioning: Training in the correct arrangement and handling of instruments and robot.

• Sterility practices: Specific protocols to ensure asepsis in robotic interventions.

• Energy associated with robotics and instruments: Safe and efficient use of energy sources in the surgical environment.

• Disaster management: Strategies for rapid adaptation and resolution of intraoperative emergencies.

• Virtual platform simulations: Exercises with console and simulator to familiarize participants with the system.

• Simulations and practical exercises: Training with special instruments to perfect suturing techniques and comprehensive handling of surgical equipment.

This manuscript has been prepared in accordance with the STROBE guidelines for observational studies, available at: https://www.equator-network.org/reporting-guidelines/strobe.

Population and sample

A total of 24 patients were included, ranging in age from 30.7 to 50.9 years, with a median age of approximately 41.7 years and a standard deviation of approximately 6.1 years.

Inclusion criteria:

• Women of any age with a gynecological diagnosis requiring robotic surgical management (e.g., myomectomy, hysterectomy with or without adnexectomy, ovarian cyst resection, colposacropexy, among others).

Exclusion criteria:

• Cases with incomplete surgical data or surgeries converted to laparotomy for reasons unrelated to the robotic procedure (no conversions were recorded in this series). A total of 24 patients were included. Ages ranged from 30.7 to 50.9 years, with an approximate mean of 40.7 years, an approximate median of 41.7 years, and a standard deviation of approximately 6.1 years.

The main diagnosis was predominantly uterine leiomyoma (sometimes associated with endometriosis or abnormal uterine bleeding), with some cases of ovarian cysts, uterovaginal prolapse, and, in one case, an ovarian tumor of uncertain behavior.

Data collection

Data was extracted from institutional operational reports and clinical records, recording variables such as:

• Demographic data:

  - Age (in years).

• Primary diagnosis:

  - The pathology that led to surgical management was documented, with uterine leiomyoma being the most frequent diagnosis, either alone or in combination with endometriosis or abnormal uterine bleeding.

  - Other diagnoses included ovarian cysts, uterovaginal prolapse, and, in one case, an ovarian tumor of uncertain behavior.

• Procedure performed:

  - This included robotic myomectomy, hysterectomy with or without adnexectomy, robotic colposacropexy, and cuneiform resection of the ovary, among others.

- Type of anesthesia:

  - General or regional.

- Intraoperative findings:

  - Aspects such as uterine size (when reported), characteristics and location of fibroids, presence of adhesions, and description of cysts, among other relevant findings, were recorded.

- Surgical data:

  - Date, start and end time, total duration (minutes), and estimated bleeding (milliliters).

- Complications:

  - Intraoperative adverse events (e.g., conversions to laparotomy) were evaluated but not recorded.

- Hospital stay:

  - Length of postoperative hospitalization (1 to 3 days, average of 2 days).

Data análisis

The data were analyzed using descriptive statistics:

- Quantitative variables:

  - Measures of central tendency (mean) and dispersion (range and, where appropriate, standard deviation) were calculated for variables such as age, surgical duration, and bleeding.

- Qualitative variables:

  - These were expressed in absolute frequencies and percentages for the variables of diagnosis, type of procedure, and type of anesthesia.

Ethical considerations

The study was conducted with respect for patient confidentiality and in compliance with local regulations and the Declaration of Helsinki. Approval was obtained from the Ethics Committee of the San Borja International Clinic, Lima, Peru, prior to the start of the study.

Results

Patient characteristics

Twenty-four patients were included, with a mean age of 40.7 years and a median age of 41.7 years (range: 30.7–50.9 years; standard deviation: 6.1). The most frequent diagnosis was uterine leiomyoma (83.3%), followed by endometriosis (16.7%), abnormal uterine bleeding (12.5%), benign ovarian cysts (4.2%), uterovaginal prolapse (4.2%), and an ovarian tumor of uncertain behavior (4.2%).

Procedures performed

A total of 25 surgical procedures were performed on the 24 patients included, grouped according to the main technique used in each case. The most frequent interventions were robotic hysterectomies with or without adnexectomy, accounting for 58.3% of the total (14 procedures), followed by robotic myomectomies, which accounted for 33.3% (8 procedures). There were also two cases of cuneiform resection of the ovary (8.3%) and one case of robotic colposacropexy (4.2%). Distribution of surgical techniques in Table 2.

Intraoperative findings

In cases with documented measurements (n = 12), the average size of the uterus was 13.7 cm (range: 9 to 18 cm). Peritoneal adhesions were identified in 8 patients (33.3%), especially in those with a history of endometriosis or previous surgeries. In patients undergoing myomectomy, between 1 and 5 myomas were resected per case, with sizes ranging from 0.5 to 10 cm. In hysterectomies, uteri with multiple myomas were observed, some associated with adenomyosis.

Table 1. Pathologies treated in patients undergoing robotic gynecological surgery at the San Borja International Clinic, Lima, Peru, June 2024 and December 2024.

Gynecological pathology	n (%)
Uterine leiomyoma	20 (83.3)
Endometriosis	4 (16.7)
Abnormal uterine bleeding	3 (12.5)
Benign ovarian cyst	1 (4.2)
Uterovaginal prolapse	1 (4.2)
Ovarian tumor of uncertain behavior	1 (4.2)

A patient could have more than one diagnosis.

SURGICAL INDICATORS

The average duration of the procedures was 180.7 minutes, ranging from 95 to 320 minutes. The average intraoperative bleeding was 101 mL (range: 0–800 mL), with the case of greatest loss associated with an 18 cm uterus with a concomitant diagnosis of adenomyosis. No major intraoperative complications or conversions to open surgery were recorded. The hospital stay ranged from 1 to 3 days, with an average of approximately 2 days.

ADDITIONAL OUTCOMES

It was reported that the first patient to undergo robotic surgery successfully conceived in December 2024, demonstrating a favorable reproductive outcome.

DISCUSSION

Advances in robotic surgery in gynecology have transformed the traditional approach to treating various gynecological conditions, standing out for their precision, improved visualization, and greater surgical control. Clínica Internacional San Borja has been a pioneer in implementing the Da Vinci Xi system in Peru, which has enabled highly complex procedures to be performed with positive results in a local clinical setting.

In our initial series of 24 patients, we found an average surgical duration of 180.7 minutes, ave-

Table 2. Surgical techniques in patients undergoing robotic gynecological surgery at the San Borja International Clinic, Lima, Peru, June 2024 and December 2024.

Robot-assisted surgical technique	n (%)
Hysterectomy ± adnexectomy	14 (58.3)
Myomectomy	8 (33.3)
Cuneiform resection of the ovary	2 (8.3)
Colposacropexy	1 (4.2)

Table 3. Surgical indicators in patients undergoing robotic gynecological surgery at the San Borja International Clinic, Lima, Peru, June 2024 and December 2024.

Surgical indicators	average (range)
Operating time (min)	180.7 (95–320)
Intraoperative bleeding (mL)	101 (0–800)
Intraoperative complications	0
Conversion to open surgery	0
Hospital stay (days)	2 (1–3)

rage bleeding of 101 ml, and an average hospital stay of 2 days, results that are within the ranges reported in international studies. Furthermore, the absence of serious intraoperative complications highlights the safety of this technology.

These results are consistent with the literature supporting the benefits of robotic surgery in terms of precision, less bleeding, and faster recovery compared to open surgery. Despite these encouraging findings, it is important to recognize the limitations of our study.

The small sample size and lack of a comparison group limit the generalizability of the results, and the retrospective nature of the study introduces potential biases. Nevertheless, the experience gained so far at the San Borja International Clinic underscores the positive impact of robotic surgery in gynecology, especially in patients with complex pathologies such as large fibroids and endometriosis.

In the future, it is recommended that prospective and comparative studies be conducted with other surgical techniques, as well as long-term follow-up to evaluate the recurrence of pathologies and late complications. The expansion of robotic surgery in Peru should be accompanied by continuous training for surgeons, which will further optimize surgical times and reduce complications.

In conclusion, the preliminary results obtained in this study suggest that robotic surgery in gynecology offers a safe and effective option, with clear benefits in terms of precision, reduced bleeding, and rapid postoperative recovery. This experience is a crucial step for the future expansion of this technology in Peru and opens the door to new research that will allow its long-term impact to be evaluated and compared with other surgical approaches.

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Authors' contributions

Dr. Guillermo Escalante Kanashiro participated in the conception and design of the study, data collection and analysis, and initial drafting and critical review of the manuscript. Dr. José Delgado Delgado collaborated in the collection of clinical data, the performance of surgical procedures, and the revision of the manuscript. Dr. Franco Fanola Campos contributed to the technical planning and training of the surgical team, participated in the initial drafting of the article, and in its final revision. All authors approved the final version of the manuscript and assume full responsibility for its content.

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