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Original article

Effect of surgeon's experience on complications from laparoscopic hysterectomy

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ABSTRACT

Objective. – To analyze the effect of learning in two surgeons on complications and conversion to laparotomy during total and subtotal laparoscopic hysterectomy.
Material and methods. – We analyzed retrospectively 236 total and subtotal laparoscopic hysterectomies done by two surgeons from the time they first performed the procedure. The interventions were classified in three groups based on the surgeon's experience: the first 75 hysterectomies (''novice period''), the subsequent 75 hysterectomies (''intermediate''), and the subsequent 86 hysterectomies (''routine period'').
Results. – Patient's characteristics changed as surgeons gained experience, with more complex operations (greater obesity, previous surgery and malignant disease) becoming more frequent. During the second group of operations when surgeons had an intermediate level of experience, the risk of major complications decreased (adjusted odds ratio: 0.28, 95% confidence interval: 0.10–0.85), as did the risk of type III complications of Clavien–Dindo classification (adjusted odds ratio 0.15, 95% confidence interval: 0.03–0.93). However, the percent rate of conversion to laparotomy remained stable in the second (intermediate experience) group. In the third group, after the surgeons had performed 150 procedures and when the risk of any type of complication was lowest, the risk of conversion to laparotomy decreased compared to the routine group.
Conclusions. – The surgeon's experience in performing laparoscopic hysterectomy plays an essential role in the decrease in the risk of complications, and this finding supports the importance of providing appropriate training for residents and gynecologists to enable them to perform this procedure with an optimal degree of competence and safety.

Introduction

Hysterectomy is among the most frequently performed surgical procedures, and the route of approach can be abdominal, vaginal or laparoscopic [1]. Since 1989, when Reich carried out the first laparoscopy hysterectomy [2], there has been a steady spread in use of this procedure. Thanks to technological advances in imaging and electronics, this surgical approach has become the technique of choice for many gynecological diseases.

Compared to the abdominal approach, laparoscopic surgery is associated with lower pain intensity, less febrile morbidity, less blood loss and shorter hospital stays [3]. However, compared to the vaginal approach, the benefits of laparoscopy are less clear, and both the American College of Obstetricians and Gynecologists [4] and the most recent review in the Cochrane Database of Systematic Reviews [1] recommend the vaginal route as the first choice for benign disease.

Laparoscopic hysterectomy (LH) appears to be associated with a higher risk of major complications than other routes of surgical approach. For example, the rate of urinary tract injury was higher than 10% in some series [3,5]. However, other authors have reported that in the hands of experienced surgeons, LH was not associated with a higher risk of complications compared to other routes [6,7].

Training has been shown to reduce both operating time and the rate of complications after laparoscopic surgery [8,9]. Makinen et al. [6] found that surgeons who performed fewer than 30 procedures, compared to more experience surgeons, had a two-fold higher risk of causing bladder injury and a four-fold higher risk of damaging a ureter.

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To test the hypothesis that surgical experience improves the outcome of LH even for different indications, we designed this study to analyze the effect of training in two surgeons on the rate of complications and conversion to laparotomy as experience increased starting from the time of the operators' first LH.

Material and methods

This retrospective study was based on data for the first 236 total and subtotal LH performed by two surgeons at Virgen de las Nieves University Hospital in Granada (Spain) from the time of their first operation in 2008 until 2015.

Both surgeons had more than 20 years of practice in laparoscopic surgery, having acquired this experience through laparoscopy training courses, assisted surgery by other expert surgeons, and simulated pelvi-trainer surgery. The surgeons had no prior experience with LH but had completed the 4th laparoscopic skill level as defined by the Royal Australian and New Zealand College of Obstetricians an Gynaecologists (RANZCOG), i.e. they had performed more than 40 diagnostic laparoscopic procedures, more than 20 simple operative procedures (tubal ligation, simple cyst aspirations), more than 30 ovarian cystectomies, oophorectomies or salpingectomies, and they had also performed more than 30 laparoscopically assisted vaginal hysterectomies [10].

The surgeons were over 40years old when the study began, and they performed most of the hysterectomies as a surgical team (62.3%). Surgeon 1 performed 19.5% of hysterectomies as first surgeon assisted by another assistant and surgeon 2 performed 18.2% of them.

A protocol was developed by consensus for the definition of the variables used in this analysis, and three investigators were responsible for data collection in accordance with appropriate prior training. Information was recorded from hospital medical records starting from the time of surgery until hospital discharge. We also recorded any information on complications that motivated hospital readmission, and the patients' electronic medical records were reviewed to detect complications not requiring hospital readmission during the first 30 days after discharge.

All patients provided their informed consent in writing for the surgical procedure and the use of information from their medical records for research purposes. The study was reviewed and approved by the hospital's ethics committee.

The main variable used for hypothesis testing was called "surgeon experience" and was analyzed in three categories. The first was designated "novice period" and comprised data for the first 75 LH done by each surgeon. The second, designated "intermediate level of experience", was used for data from the subsequent 75 LH. The third category, called "routine period", comprised data for the subsequent 86 LH. This classification was developed on the basis of earlier findings [8,9] that between 50 and 100 LH are needed for surgeons to surmount the learning curve satisfactorily.

The patient-related variables we studied were age, obesity (body mass index $> 30 kg/m^2$), presence or absence of concomitant medical conditions and presence or absence of previous abdominal surgery. As concomitant medical conditions we recorded any diagnosis that could affect the patient's intraoperative or postoperative course, such as hypertension, heart disease, clotting disorder, endocrine disease (diabetes mellitus, hypothyroidism and other), and pulmonary or neurologic disease or disorder.

We also recorded the indication for the intervention: myomatous uterus, endometriosis, abdominal pain, abnormal uterine hemorrhage, adnexal cyst and malignant or premalignant diseases that could be corrected exclusively with a hysterectomy, with no need for additional procedures, i.e. atypical endometrial hyperplasia, cervical dysplasias, borderline ovarian tumors, and stage IA (grade A) endometrial cancer] and the type of hysterectomy. Hysterectomies could be either total or subtotal and with or without anexectomy. The uterine manipulator most frequently used was the Clermont–Ferrand manipulator or RUMI manipulator. The coagulation materials used were vessel sealers (Covidien LigaSure®, KLSMartin Marclamp® Gynecare Harmonic®), monopolar and bipolar grasper. The suture of the vaginal cuff could be transvaginal or laparoscopic interrupted sutures (novice period) or bidirectional barbed sutures (intermediate and routine period).

The outcome variables were occurrence of complications, need for conversion to laparotomy, and days of hospital stay. Surgical complications were categorized according to the time of appearance as intraoperative or postoperative, and according to the degree of severity using the Clavien–Dindo classification. These categories were not mutually exclusive.

The Clavien–Dindo classification defines a complication as any deviation from the ideal postoperative course that is not inherent to the operation and that cannot be considered as a therapeutic failure of the operation. In concept, the classification is made according to the degree of severity on the basis of the respective therapeutic intervention that led to treatment of the observed deviation [11].

Grade I includes any deviation from the normal postoperative course without the need for pharmacological treatment or surgical, endoscopic and radiological interventions. Allowed therapeutic regimens are: drugs as antiemetics, antipyretics, analgetics, diuretics and electrolytes and physiotherapy. This grade also includes wound infections opened at the bedside. Grade II complications were defined as complications requiring pharmacological treatment with drugs other than such allowed for grade I complications (blood transfusions and total parenteral nutrition are also included). Grade III complications include complications requiring surgical, endoscopic or radiological intervention. Grade IV complications include life-threatening complication (including central nervous system complications) requiring intensive care-management, and Grade V means death of a patient [11].

Intraoperative complications during surgery were recorded as bleeding (vascular injury, profuse bleeding, need for intraoperative blood transfusion, or hemorrhagic shock), urinary (injury to the urethra, bladder or ureters) or intestinal (injury to the rectum or an intestinal loop).

Postoperative complications were recorded as bleeding and/or anemia, infection, urinary, intestinal, wound-related and other complications. Bleeding complications comprised external or internal bleeding (hemoperitoneum) that required reoperation or postoperative blood transfusion. Anemia was defined as a decrease in hemoglobin of more than 2 points and/or the need for blood transfusion. Infective complications included urinary tract infection, surgical wound infection, pelvic infections, fever (defined as a temperature higher than 38°C on two occasions at least 12 hours apart) and other infection-related conditions. Wound healing complications included hematoma, dehiscence or eventration. Urinary retention was classified as a urinary tract complication; paralytic ileus and intestinal obstruction were classified as intestinal complications. Other complications considered in this study were metabolic disorders, neurological alterations and anesthesia-related alternations. If the same patient had two or more postoperative or intraoperative complications, we only considered the most serious one in our overall analysis of complications.

As an additional variable, we considered major complications, defined here:

- serious intraoperative complications such as injury to a neighboring organ during surgery (bladder, ureter, intestine or major vessel) or complications that required conversion to laparotomy;

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