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Hysterectomy in patients with previous cesarean section: comparison between laparoscopic and vaginal approaches☆

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ABSTRACT

Objective: To evaluate surgery-related outcomes of laparoscopic (LH) and vaginal hysterectomy (VH) in patients with a history of previous cesarean section (CS).
Study design: Data on 289 consecutive patients with a history of CS undergoing VH (n = 49, 17%) and LH (n = 219, 76%) were collected. Basic descriptive statistics, univariate and multivariate analyses were performed to evaluate surgery-related outcomes. A propensity-matched algorithm was applied in order to reduce allocation biases between groups.
Results: Patients undergoing LH were more likely to have a history of multiple cesarean sections (44% vs. 18%; p = 0.001). Additionally, uterine weight was greater among patients undergoing LH than VH (median weight: 235 (range, 45–2830) vs. 150 (range, 40–710) g; $p < 0.001$). Three patients in each group experienced procedural bladder injuries (3/219 (1%) vs. 3/49 (6%); p = 0.07; RR: 1.65; 95%CI: 0.74, 3.68). The rate of grade 3 or worse postoperative complications was balanced between LH and VH (1% vs. 0%; p = 1.00). Patients undergoing LH experienced a shorter length of hospital stay in comparison to patients undergoing VH (1 vs. 2 days; p = 0.02). Considering the overall population, we observed via multivariate analysis that age (OR: 1.003 (95%CI: 1.001, 1.004) per 10-year increase in age; p = 0.002), VH (OR: 17.80 (95%CI: 1.762, 180,378); p = 0.01) and number of cesarean sections ≥ 2 (OR: 27.70 (95%CI: 1.976, 388,285); p = 0.01) increased the risk of developing bladder injuries during hysterectomy.
Conclusions: LH is a safe and feasible procedure in patients with previous CS, and it is associated with a low bladder injury rate.

Introduction

Cesarean section (CS) and hysterectomy are the most common gynecological surgical procedures worldwide [1,2]. Although several attempts are being made to minimize the growing number of operative deliveries, the overall CS rate is expected to grow dramatically [1,3,4]. It is estimated that, in the United States in 2011, one in three pregnant women had delivery via CS [1,3,4]. Major concerns about the growing CS rate relate to its overuse. Accumulating evidence supports a possible association between CS and peri-partum morbidity as well as adverse outcomes in subsequent pregnancies [4]. However, a history of prior CS affects not only affects reproductive life but also, as is well known, increases operative time and the risk of complications during gynecological surgical procedures [5–8].

Several studies have underlined that a history of prior CS influences the risk of bladder injury and increases difficulties in patients undergoing hysterectomy [5–8]. However, despite the growing prevalence of patients with prior CS, there are still no mature data on how the route of hysterectomy influences the operative outcomes of these patients. Hence, we designed the present study to provide more in insight into the management of patients with prior CS. The primary endpoint was to assess the safety and feasibility of minimally invasive treatment for hysterectomy (i.e., vaginal (VH) and laparoscopic (LH) hysterectomy). As a secondary endpoint we sought to determine factors influencing the occurrence of surgical complications among patients with a history of prior CS.

Materials and methods

Data on all women undergoing hysterectomy for benign indications between January 01, 2000 and July 31, 2013 at the

☆ The study was conducted in Varese, Italy.

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Gynecologic Unit of the University of Insubria (Varese, Italy) were prospectively collected. All patients included in the database gave consent to data collection. We retrospectively queried the database for all patients with a history of previous CS. In our institution, research activities involving the study of existing data are exempt from the requirement for institutional review board (IRB) approval. Inclusion criteria were: (1) history of previous CS; (2) benign uterine disease (3) the absence of pelvic organ prolapse (POP); (4) age $\geq$ 18 years; (5) general endotracheal anesthesia; (6) at least 30-day follow-up. Exclusion criteria were: (1) consent withdrawn; (2) unexpected diagnosis of malignant disease; (3) open abdominal hysterectomy (AH). The latter was considered an exclusion criterion because significant attempts were made to decrease the rate of AH, hence patients undergoing AH were not comparable with those receiving LH and VH.

In 2000, we started a policy of systematic implementation of LH in order to reduce the rate of AH. Over the time period 2000–2011, no specific guidelines drove the choice to perform LH and VH. There were no significant differences in the facilities available for patient care and in the referral patterns of our service. Other aspects of patients' management remained consistent during the study period. All surgical procedures were performed by a team of expert surgeons under the direct supervision of the senior author (FG). The detailed surgical techniques of LH and VH have been previously reported [9–11].

Briefly, LH was performed as type IV-E according to the American Association of Gynecologic Laparoscopists (AAGL) classification [12]. An intrauterine manipulator (RUMI System; CooperSurgical, Trumbull, CT) in conjunction with a Koh cup (Koh Colpotomizer System; CooperSurgical) was inserted. After pneumoperitoneum was created, a 0° 5-mm laparoscope was introduced at the umbilical site. Under direct visualization, three 3- or 5-mm ancillary trocars were inserted, 1 suprapubically and 2 laterally to the epigastric arteries, in the left and right lower abdominal quadrants, respectively. Hysterectomy was started with coagulation and section of the round ligaments and the infundibulopelvic ligaments. The broad ligament was opened up to the uterovesical fold that was then incised with caudal reflection of the bladder. Then, the uterine vessels, cardinal ligaments, and uterosacral ligaments were coagulated and transected. Hysterectomy was completed by performing a circular colpotomy. The uterus was then extracted from the vagina with the intrauterine manipulator still in place. Vaginal cuff closure was performed vaginally. The laparoscope and laparoscopic instruments were reintroduced to ensure hemostasis. All port sites were approximated with absorbable suture or surgical strips.

Vaginal hysterectomy was done according to a standardized protocol. A circular colpotomy was performed. The pouch of Douglas was opened posteriorly and a retractor was positioned. The bladder was then dissected from the vagina anteriorly. The uterosacral ligaments were clamped, transected and sutured. Then the broad ligament and uterine vessels followed by the round and ovarian ligaments were clamped, transected and sutured. The uterus was then extracted from the vagina and hemostasis was ensured. The peritoneum and the vault were closed using Vicryl No. 1 sutures.

All surgical operations were performed under general endotracheal anesthesia. Women received a single dose of prophylactic antibiotic 1 h before surgery. Operative times were recorded from the first incision to the last suture (skin to skin). The operation assistant estimated the amount of blood loss, which was calculated as the sum of the volume collected by a suction device during the procedure plus the estimated volume of the total number of gauzes used during the procedure. Hospital stay was counted from the first postoperative day (POD). Intra-operative complications included any event occurring during surgery, including incidental damage of the surrounding organs and the need for intravenous drugs. Postoperative complications were graded by the expanded version of the Accordion severity grading system [13]. Only severe (grade $\geq$ 3) complications were reported. In-hospital complications were abstracted from clinical records, while complications after the discharge were recorded at the time of the 30-day follow-up visits. Trained residents and nurses, not directly involved in surgery, maintained the database on regular basis. Complications occurring after 30 days were not included in the present analysis. Martin criteria were applied to improve quality of complications reporting [14].

Because of the retrospective study design, we might speculate that patients allocated to VH and LH had different characteristics. Therefore, in order to minimize possible allocation biases, a propensity matching analysis was done. Propensity-matched comparison (1:1) attempts to estimate the effect of a treatment by accounting for possible covariates (e.g., age, body mass index (BMI), surgical indication, numbers of previous CSs, uterine weight, year of surgery) that predict receiving one treatment rather than another. Basically, using propensity-matching comparison we compared two homogeneous groups of patients. According to measurable covariates, the two groups have the same probability of receiving VH and LH. A detailed description of the propensity matching method is reported elsewhere [15].

The incidence of events among the groups was analyzed for statistical significance by using the Fisher exact test. Relative risks (RRs) and odds ratios (ORs) plus 95% confidence intervals (CIs) were calculated for each comparison, appropriately. Normality testing (D'Agostino and Pearson test) was performed to determine whether data were sampled from a Gaussian distribution. Continuous parametric and nonparametric variables were compared using the *t*-test and Mann–Whitney *U* test, respectively.

Factors predicting intraoperative and postoperative complications were evaluated using univariate and multivariate models. Multivariate models were fitted using stepwise and backward variable selection methods considering all variables with a p value < 0.20 based on univariable analysis. Associations were summarized by calculating ORs and corresponding 95% CIs. All p values were two sided. p Values < 0.05 were considered statistically significant. Statistical analysis was performed with GraphPad Prism version 6.0 (GraphPad Software, San Diego CA) and IBM-Microsoft SPSS version 20.0 for Mac.

Results

During the study period, 1894 patients underwent hysterectomy for benign uterine disease other than POP. Overall, 560 (30%) women were excluded due to incomplete information regarding parity and history of previous CS, leaving 1330 (70%) patients for the analysis. Among this group, 289 (22%) patients had a history of previous CS: 219 had undergone (76%) LH, 49 (17%) VH and 21 (7%) AH. This latter group was excluded for the study purpose. Baseline characteristics of patients undergoing LH and VH are reported in Table 1. Median age and BMI are similar between the two groups. The main surgical indication in both groups was the presence of symptomatic uterine fibroids (74%), but endometriosis is more common in the LH than the VH group (13% in LH vs. 0% in VH group; $p = 0.004$). Patients undergoing LH were more likely to have a history of multiple CSs (44% vs. 18%; $p = 0.001$), while the prevalence of a history of vaginal delivery was higher in the VH than in the LH group (55% vs. 37%; $p = 0.02$). Additionally, uterine weight was greater among patients undergoing LH than VH (median weight: 235 (range 45–2830) vs. 150 (range 40–710) g; $p < 0.001$).

Surgery-related results are listed in Table 2. Overall four (1.5%) patients had conversions. Three (1%) patients undergoing LH were