

Original Research Article

Hysterectomy in Patients with Previous Cesarean Section: Comparison between Laparoscopic and Vaginal Approaches. A Prospective Randomized Controlled Study

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Objective: To compare intra- and post-operative data of laparoscopic hysterectomy (LH) and vaginal hysterectomy (VH) in patients with a history of previous cesarean section (CS). **Study Design:** A prospective, randomized study was performed at our gynecologic surgery center between January 2010 and January 2014. A total of 120 women with a history of cesarean section, indicated to undergo hysterectomy for benign uterine disease were randomly assigned to 2 groups LH (n=60), and VH (n=60). **Results:** VH had the shortest operating time (80.75 min \pm 28.2 versus 101.2 min \pm 24.5; p=0.031). However, mean blood loss was significantly higher when compared with LH (176.2 mL \pm 88.5 versus 81.8 mL \pm 52.4; p=0.004). Intra- and post-operative complications were balanced between the two groups. Two patients in the VH group and 3 in the LH group experienced procedural bladder injuries (3.3% versus 5%, NS). Post-operative pain on day 0 (VAS: 5.21 \pm 3.5 versus 2.63 \pm 2.7; p=0.023) and the mean use of analgesics (8.2 U \pm 0.62 vs 4.2 \pm 0.41; p=0.012) were higher in the vaginal group (p=0.023 and p=0.017, respectively). LH was associated with a reduced hospital stay (LH: 2.7 \pm 0.5 days; VH: 3.2 \pm 0.6 days; p<0.001). **Conclusion:** Both LH and HV are safe and feasible procedures in patients with previous CS. LH is associated with a reduction of blood loss, post-operative pain, and hospital stay. However, HV is associated with a reduced mean surgery time as compared with laparoscopy.

Keywords: Bladder injury, Cesarean section, Laparoscopic hysterectomy, Vaginal hysterectomy, Randomized.

INTRODUCTION

Cesarean section and hysterectomy for benign lesion, are the two most performed gynecological procedures in women worldwide [1,2]. Hysterectomy in patients with one or more previous caesarean section is therefore a situation encountered frequently [3]. Several studies have shown that a previous history of cesarean section increases the risk of surgical complications during a hysterectomy, particularly a higher risk of bladder injuries [4,5,6].

However, despite the important increase of cesarean sections' prevalence, few studies have evaluated the influence of hysterectomy on the results of surgery in patients with previous cesarean section. Therefore, we designed this study to provide more elements of analysis in relation to the practice of hysterectomy in this context. This randomized study compares intra- and post-operative data of two minimally invasive technique: laparoscopic (LH) and vaginal

hysterectomy (VH) performed for benign lesions in patients with a history of at least one cesarean section.

MATERIAL AND METHODS

Study design and ethical considerations

A randomized prospective study was conducted in our center of gynecological surgery between January 2010 and January 2014. All participants gave informed consent according to the protocol approved by the ethics review board.

Study population

Women with a previous history of at least one cesarean section and undergoing hysterectomy for benign disease were

included in the study and randomized into two groups: vaginal hysterectomy (VH) and total laparoscopic hysterectomy (LH), through a computer-generated list to allocate patients equally between the two groups. Opaque and sealed envelopes containing the assigned treatment (LH or VH) were opened after inclusion.

Patients and physicians were informed of the allocated treatment. Patients were excluded from this study in case of uterine volume greater than 300 ml, history of pelvic surgery for inflammatory disease or endometriosis, suspected gynecologic cancer, except for cervical intraepithelial neoplasia (CIN III), urogenital prolapse of second degree or higher, ovarian cyst > 4 cm, need for another concomitant surgical procedure, or contra-indications for anesthetics.

Study procedures and data collected

All patients had a pelvic ultrasound and the uterus size was estimated using the following formula: longitudinal diameter (starting from neck) x transverse diameter x anteroposterior diameter x 0.523. All procedures were performed by two experienced surgeons for each group (to avoid confusion, only surgeons who have performed at least 50 procedures were involved). VH was performed using Heaney's technique [7]. Laparoscopic hysterectomy was always total (E IV according to the classification of the American Association of Gynecologic Laparoscopists (AAGL) [8]. All operations were performed under general anesthesia with endotracheal intubation, and using the uterine manipulator from Clermont-Ferrand.

For each patient, the following information were recorded: age, body mass index (BMI), parity, previous history of pelvic surgery, number of cesarean sections, menopause, associated adnexal pathology, indication of hysterectomy, operative time, a unilateral or bilateral oophorectomy, uterine fragmentation, intra-operative blood loss, and intra-operative complications. The post-operative parameters were: uterus weight (as assessed by pathologists), hospital stay, fever (temperature > 38°C), reduction in hemoglobin level on the first post-operative day, time to transit resumption, recovery of detrusor sphincter function, and pelvic pain.

The Foley catheter was kept until the morning of the first post-operative day. To evaluate the post-operative pain, we used the visual analog scale (VAS) on days 1, 2 and 3 after surgery; and reported the number of analgesics unit (1 unit = 1g paracetamol IV) requested by the patient to relieve pain. Antibiotic prophylaxis was administered to all patients at the beginning of the surgery and repeated 12 hours later.

We also evaluated the same criteria before hospital discharge: resumption of a normal transit, absence of fever (< 37°C) and urinary disorders, pain bearable without the use of painkillers.

Statistical analysis

Statistical analysis was performed using SPSS software, version 17.0. Student's t-test was used for the comparison of continuous variables, χ^2 test and Fisher's exact test for non-continuous variables. A p-value < 0.05 was considered statistically significant.

RESULTS

In total, 125 patients were recruited and randomized into two groups: 60 had a VH and 60 LH. There was no significant difference between the pre-operative characteristics of the two groups in terms of age, BMI, parity or history of abdominal-pelvic surgery. The two main indications for hysterectomy were uterine myoma and uterine adenomyosis (Table 1).

The main intra-operative parameters assessed are summarized in Table 2. There was a significant difference in terms of operative time for VH group (LH: 101.2 ± 24.5 minutes; VH: 80.75 ± 28.2 minutes, p=0.031). However, the blood loss was significantly greater in this group (LH: 81.8 ± 52.4 ml; VH: 176.2 ± 88.5 ml; p=0.004). The rate of accidental bladder wound was comparable between the two groups (LH: 3.3% versus VH: 5%). Two occurred in the LH group (repaired during the same laparoscopic time by intracorporeal points vicryl 3.0) and three in the VH group (two repaired vaginally and one required a laparoconversion). All bladder injuries occurred in patients with a history of two or more cesareans. A Foley catheter was implemented and kept for 15 days in all cases with a favorable outcome. No other digestive or ureteral complications were reported. The conversion rate was comparable between the two groups (LH: 3.3%; VH: 1.7%; NS), concerning a laparoconversion: two patients in the LH group because of uncontrollable bleeding, and one patient in the VH group for repair of a bladder injury.

Post-operative results are reported in Table 3. The mean uterine weight was comparable between the two groups (LH: 190 ± 52.2 g; VH: 180 ± 46.4 g; NS). LH was associated with a significantly shorter hospital stay (LH: 2.8 ± 0.42 days, VH: 3.3 ± 0.53 days; p<0.001). The post-operative pain on day 0 as evaluated by VAS (VH: 5.21 ± 3.5; LH: 2.63 ± 2.7; p=0.023) and the mean analgesic use was significantly higher in the VH group (VH: 8.2 ± 0.62 units; LH: 4.2 ± 0.41 units; p=0.012). We reported a thrombophlebitis of the lower limb occurred on the 6th post-operative day in the HL group, and was successfully treated with heparin at curative dose. No severe post-operative complications were reported in the HV group.

DISCUSSION

The literature review over the last ten years did not identify any randomized study comparing VH and LH in patients with a previous history of caesarean section. Only 3 studies evaluating the feasibility of HL in patients with previous cesarean sections [9,10,11]. In particular, Sinha *et al.* [9] conducted a study over 261 patients, and showed that LH is an interesting alternative, regardless of the size of the uterus or the number of previous cesarean sections.

Unfortunately, although they support the laparoscopic approach, all these studies, were designed with no control group to compare LH with other approaches. Moreover, opinions are divergent regarding the impact of previous cesarean sections on the feasibility of pure vaginal hysterectomies. Some teams have demonstrated that uterine scar increases the intra-operative risk, including bladder injuries [12,13]. Boukerrou *et al.* [12], in a retrospective study about 741 patients, showed that previous cesarean sections, regardless of their number, increase the risk of intra-operative vaginal hysterectomies. The cumulative rate of intra-operative complications was 18.3% in the group with previous cesarean sections versus 3.5% in the group without previous cesarean sections (p<0.0001), with a significantly higher rate of bladder injuries in the group with previous cesarean sections (5.6% versus 0.9%; p=0.01).

Table 1. Pre-surgery characteristics of the patients

	LH N=60	VH N=60	p-value*
Age (years) ± SD	49.22 ± 7.8	52.14 ± 7.5	NS
Parity (n), ± SD	2.7±0.44	2.8±0.42	NS
Menopause, n (%)	18 (30)	18 (30)	NS
Pelvic surgery, n (%)	17 (28.3)	19 (31.6)	NS
BMI (kg/m ²) ± SD	25.3 ± 3.2	27.1 ± 5.2	NS
Uterine volume (mL) ± SD	171 ± 62.3	165 ± 56.5	NS
Surgery indication, n (%)			
Myoma, n (%)	37 (61.7)	40 (66.7)	NS
Adenomyosis, n (%)	13 (21.7)	10 (16.7)	NS
Endometrial hyperplasia, n (%)	8 (13.3)	7 (11.6)	NS
Cervical dysplasia, n (%)	2 (3.3)	3 (5)	NS
Previous cesarean, n (%)			
1	43 (71.6)	46 (76.7)	NS
2	14 (23.3)	12 (20)	NS
More than 2	3 (5)	2 (3.3)	NS

Data are summarized using numbers and frequencies, mean ± SD. Abbreviations: BMI=body mass index; LH=laparoscopic hysterectomy; NS=not significant; SD=standard deviation; VH=vaginal hysterectomy. * Significance level set at 5%.

Table 2. Parameters assessed in intra-operative

	LH N=60	VH N=60	p-value*
Operative time (minutes) ± SD	101.2 ± 24.5	80.75 ± 28.2	0.031*
Blood loss (ml) ± SD	81.8 ± 52.4	176.2 ± 88.5	0.004*
Transfusions, n (%)	0 (0)	1 (1.7)	NS
Conversion, n (%) ^a	2 (3.3)	1 (1.7)	NS
Bilateral adnexectomy, n (%)	34 (56.7)	27 (45)	NS
Unilateral adnexectomy, n (%)	2 (3.3)	2 (3.3)	NS
Uterine fragmentation (%)	14 (23.3)	18 (30)	NS
Intra-operative complications, n (%)			
Bladder injury	2 (3.3)	3 (5)	NS
Ureteral wound	0 (0)	0 (0)	NS
Digestive wound	0 (0)	0 (0)	NS

Data are summarized using numbers and frequencies, mean ± SD. Abbreviations: LH=laparoscopic hysterectomy; NS=not significant; SD=standard deviation; VH=vaginal hysterectomy. * Significance level set at 5%. ^aAll conversions were in laparotomy.

Table 3. Parameters assessed in post-operative

	LH N=60	VH N=60	p-value*
Weight of uterus (g) ± SD	190 ± 52.2	180 ± 46.4	NS
Hospital stay (day) ± SD	2.8 ± 0.42	3.3 ± 0.53	< 0.001
Mean difference of hemoglobin at day 1, (g/dL)± SD	-1.14 ± 0.82	-1.47 ± 0.61	NS
Resumption of the vesico-sphincter function (day) ± SD	1.55 ± 0.62	1.75 ± 0.44	NS
Temperature (> 38°C), n (%)	8 (13.3)	11 (18.3)	NS
Resumption of transit (day) ± SD	1.78± 0.52	1.94 ± 0.33	NS
Minor complications, n(%)			
Urinary infection	3 (5)	1 (1.7)	NS
Vaginal vault hematoma	2 (3.3)	2 (3.3)	NS
Vaginal scar dehiscence	1 (1.7)	0 (0)	NS
Major complications, n(%) ^a	1 (1.7)	0 (0)	NS
Pain (VAS) ± SD			
Day 0	2.63 ± 2.7	5.21 ± 3.5	0.023
Day 1	2.95 ± 2.8	3.14 ± 2.5	NS
Day 2	1.84 ± 1.4	2.45 ± 2.2	NS
Day 3	1.14 ± 1.2	1.56 ± 1.1	NS
Mean use of analgesics (units) ± SD	4.2± 0.41	8.2± 0.62	0.012

Data are summarized using numbers and frequencies, mean ± SD. Abbreviations: LH=laparoscopic hysterectomy; NS=not significant; SD=standard deviation; VAS=visual analog scale; VH=vaginal hysterectomy. * Significance level set at 5%. ^aOne case of thrombophlebitis of the lower limb occurred on the 6th post-operative day, successfully treated with heparin at curative dose.

Other studies found no significant difference in intra- and post-operative complications regardless of the number of cesarean sections. Sheth [14] and Unger [15] did not find more bladder or bowel injuries, and hemorrhages were comparable between the two groups with and without previous cesarean sections. Nonetheless, those two studies were conducted over small sample sizes.

The only study comparing LH and VH was conducted by Bogania [16], over 289 patients with a previous history of cesarean sections (49 VH versus 219 LH). It showed that both approaches are comparable in terms of intra- and post-operative complications, particularly the conversion rate and the rate of bladder injuries. LH was associated with less intra-operative blood loss and a significantly shorter hospital stay. However, the weak point of this study was its retrospective and non-randomized design. Our results comply with those of Bogania and suggest that both techniques are feasible in patients with previous cesarean section with a comparable level of safety. Similarly, LH reduces blood loss and shorten the hospital stay, whereas VH, and contrary to the results of Bogania, has the advantage of a significantly shorter operating time.

Several studies assessed the risk of accidental wound bladder during a hysterectomy, which was shown to be increased in case of cesarean history and dependently with the number of cesarean sections [17,18,19]. These results were confirmed by those of Bogania [16] which found that a number of cesarean sections ≥ 2 increases the risk of bladder injury (OR: 27.70; $p=0.01$). In this study, all accidental wounds of the bladder that occurred in the LH and VH groups concerned patients with a history of two or more cesarean sections.

Rooney *et al.* [18] in a study about 5,000 hysterectomies found that the risk of bladder injury doubles in case of previous cesarean sections [OR: 2.04 (95% CI: 1.2-3.5)]. Moreover, the authors highlight that, in patients with a previous cesarean section, this risk depends on the surgical approach, it is higher in case of laparoscopic-assisted hysterectomy (LAH) compared to VH and abdominal hysterectomy (OR: 7.5, 3 and 1.26 respectively).

These results appear to be discordant with the results of our study which shows that the rate of bladder injuries is comparable between VH and LH. This discrepancy can be explained partly by the fact that the LAH and LH are not entirely comparable. On the other hand, the experience of the operators and their mastery of the vaginal and laparoscopic surgical approaches can significantly bias the results' interpretation. However, it is likely that VH allows a safer dissection of the vesico-vaginal space compared to LH, and that the laparoscopic approach can ensure a safer dissection of the vesico-uterine space compared to the vaginal approach. This suggests that LAH, which combines both laparoscopic and vaginal approaches, would be the safest. It is unfortunate that the lack of a third arm evaluating the LAH's results was not expected in our study.

One of the study strengths is that all women were candidates to undergo one of two methods of hysterectomy and that the groups had comparable characteristics before surgery. This study was designed with exclusion criteria that would eliminate most of the factors that would favor one type of surgery over the other (e.g., uterine volume and surgery history of endometriosis).

CONCLUSION

In conclusion, the results of this study highlight the feasibility of LH and HV in patients with benign uterine pathology and a

previous cesarean history, with an acceptable safety level for both techniques. These results support the choice of minimally invasive approach in this patients' group. LH has the advantage of limiting intra-operative bleeding and shortening the hospital stay while VH is associated with a shorter operating time. The intra- and post-operative complications, particularly the risk of bladder injury, are not increased by the choice of one of the two approaches. Other randomized studies are needed to reduce morbidity in high-risk patients of surgical complications.

DECLARATION OF INTEREST

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

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