SCIENTIFIC PAPER

Total Laparoscopic Hysterectomy and Laparoscopy-Assisted Vaginal Hysterectomy

Jin Woo Shin, MD, Ho Hyung Lee, MD, Soon Pyo Lee, MD, Chan Yong Park, MD

ABSTRACT

Background and Objectives: To compare the feasibility of total laparoscopic hysterectomy (TLH) and laparoscopy-assisted vaginal hysterectomy (LAVH) in the treatment of benign gynecologic diseases and to determine the selection criteria for each technique.

Methods: This was a retrospective medical records review of 168 patients who underwent TLH or LAVH performed by one surgeon. A chi-square test was used to compare the difference between the TLH and LAVH groups. Pearson's correlation coefficient was calculated for the relationship between the clinico-demographic factors of the patients.

Results: There were no differences between the 2 groups with respect to age, parity, history of abdominal delivery, body mass index, and indication for hysterectomy. The operative time was similar between the 2 groups ($P>.99$). The uterine weight was greater in the LAVH group compared to the TLH group ($P<.01$). Ten patients were converted from TLH to LAVH, because of a large uterus and/or a lower segmental mass on the uterus, making it difficult to expose the Koh cup rim contour.

Conclusions: TLH and LAVH are safe, feasible methods by which to perform a hysterectomy. LAVH is preferred in patients with a mass involving the lower segment or a relatively large uterus.

Key Words: Benign gynecologic diseases, Laparoscopy-assisted vaginal hysterectomy, Total laparoscopic hysterectomy.

Department of Obstetrics and Gynecology, Gil Medical Center, Gachon University of Medicine and Science, Incheon, Korea (all authors).

Address correspondence to: Jin Woo Shin, MD, PhD, Department of Obstetrics and Gynecology, Gil Medical Center, Gachon University of Medicine and Science, 1198 Guwol-dong, Namdong-gu, Incheon, Korea, 405-760. Telephone: 82-32-460-3823, Fax: 82-32-460-3290, E-mail: jwshin@gilhospital.com, golfshinkr@yahoo.co.kr

DOI: 10.4293/108680811X13071180406394

INTRODUCTION

Laparoscopic hysterectomy, either total laparoscopic hysterectomy (TLH) or laparoscopy-assisted vaginal hysterectomy (LAVH), has been widely reported to offer benefits over abdominal hysterectomy (AH), such as shorter hospital stays, quicker recovery, less postoperative pain, lower complication rates, cost-effectiveness, and patient preference.[1–4]

This study was undertaken to compare the feasibility of TLH and LAVH for the treatment of benign uterine disease with respect to clinicopathologic parameters and complications involving one surgeon's cases, and to determine the selection criteria for each technique.

MATERIALS AND METHODS

We retrospectively reviewed the medical records of 217 patients who underwent a simple hysterectomy by one surgeon in the Department of Obstetrics and Gynecology of Gachon University of Medicine and Science in Korea between January 2006 and April 2008. The Gachon University institutional review board approved the study. The women with malignancies and planned abdominal or vaginal hysterectomies were excluded.

The selection criterion for the type of operation was uterine size. A uterus >12 weeks gestation in size was the only factor considered for LAVH. Previous operative histories and obesity were not considered for selection of the type of treatment.

After general anesthesia was induced, the patients were placed in the dorsal lithotomy position with the buttocks well off the table. The patients were then prepped and draped. The RUMI system (Cooper Surgical, Trumbull, CT, USA) and a reusable rigid uterine manipulator were used in TLHs and LAVHs, respectively. A 10-mm transverse incision was made just above or below the umbilicus for the Veress needle and the primary trocar. After insufflation of CO_2 up to a pressure of 15mm Hg, a 10-mm trocar was placed and a 0^o telescope with a camera was inserted. An additional 3 ancillary trocars (5-mm trocars for the suprapubic and right midabdomen and a 10-mm trocar for the left midabdomen) were placed. All trocars, except the

primary trocar, were inserted under direct vision of the telescope. The intraabdominal pressure was maintained at 12mm Hg by an automated insufflator during the surgical procedure.

After the abdominal and pelvic cavities were inspected, any adhesions to the uterus or other organs were dissected with monopolar scissors (Thyco Healthcare, Norwalk, CT, USA). The hysterectomy was begun by dissection and hemostasis of the infundibulopelvic or ovarian ligaments with an Endo GIA (Thyco Healthcare). After bipolar coagulation of both round ligaments, dissection with monopolar scissors followed. Both broad ligaments were dissected with monopolar scissors down to the vesico-uterine ligaments. The bladder peritoneum was dissected from the uterus with monopolar scissors, and the bladder was advanced caudally by sharp dissection. The procedures for the TLH and LAVH were the same up to the bladder dissection.

In the case of a TLH, further skeletonization of the uterine vessels and bipolar coagulation were performed bilaterally. A circumferential colpotomy was performed on the rim of the Koh cup with monopolar scissors. Morcellation was done in the case of a large uterus. After removal of the uterus or adnexa, or both, through the vagina, the vaginal cuff was closed laparoscopically with a running absorbable suture (No.1 Vicryl; Ethicon, Livingston, UK).

In the case of an LAVH, a weighted retractor was placed on the posterior vaginal wall and a Deaver retractor was placed on the anterior vaginal wall to facilitate visualization of the cervix. A circumferential incision was made along the cervicovaginal junction. After an anterior colpotomy was performed, the tip of the Deaver retractor was advanced into the peritoneum, which displaced the bladder from the operative field. A posterior colpotomy was also performed. Both uterosacral ligaments, cardinal ligaments, and the uterine vessels were clamped with a Kelly clamp, cut, and tied with absorbable suture (No.1 Vicryl). Morcellation was done in the case of a large uterus. After removal of the uterus or adnexa, or both, through the vagina, transvaginal reperitonealization was performed with running absorbable suture (No. 2.0 Vicryl). The vaginal cuff was closed by the transvaginal route with running absorbable suture (No.1 Vicryl).

After closure of the vaginal cuff, either laparoscopically or transvaginally, vigorous saline irrigation of the abdominal cavity was performed to identify any foci of bleeding, and hemostasis by bipolar coagulation was performed as necessary. When the absence of bleeding within the operative field was confirmed, the trocar sites and abdominal wounds were closed.

The operative time was calculated as the time that elapsed from scrubbing the surgical field to establishing closure of the abdomen. The hemoglobin change was defined as the difference between the preoperative hemoglobin level and the hemoglobin level the day after surgery.

All continuous data were compared using the Student *t* test. The chi-square test was used to compare the difference between the TLH and LAVH groups. Pearson's correlation coefficient was calculated for the relationship between the clinico-demographic factors of the patients. The Statistical Package for the Social Sciences for Windows (version 10.0; SPSS, Inc., Chicago, IL, USA) was used to analyze all data. For all statistical tests, a P value <0.05 was considered significant.

RESULTS

Twenty-six patients underwent abdominal hysterectomies (AHs) for benign diseases or metastatic cancer. Two patients underwent vaginal hysterectomies (VHs) for genital prolapse. Laparoscopic hysterectomies were preformed in 189 patients. Of the 189 patients, 18 who were preoperatively diagnosed with endometrial cancer or FIGO stage Ia1 cervical cancer with a depth of invasion <1mm and had planned laparoscopic hysterectomies were excluded from the study. The study enrolled 171 patients who met the study criteria. In the TLH group, 3 patients were converted to laparotomies, because severe adhesions made it difficult to perform TLHs or LAVHs, and thus they were excluded from further analysis. Of the 168 patients, 96 and 72 underwent TLHs and LAVHs for benign uterine diseases, respectively. Three patients in the TLH group and 4 in the LAVH group had a lack of information regarding parity and mode of delivery in the medical records.

There were no differences between the 2 groups with respect to age, parity, history of abdominal delivery, body mass index (BMI), and indication for hysterectomy **(Table 1)**. The operative times were similar between the TLH and LAVH groups (112.60 ± 33.90 and 112.57 ± 31.20 minutes, respectively). The postoperative hospital stays were also similar between the 2 groups. The hemoglobin change in the TLH and LAVH groups were 1.61 ± 1.18 and 2.13 ± 1.44g/dL, respectively, a statistically significant difference ($P=.02$). The weights of the uteri in the LAVH group were significantly greater than weights in the TLH group ($P<.01$; **Table 2**). Ten patients were converted from TLH to LAVH

Table 1.
Distribution of Patient Characteristics

	TLH (n=96)	LAVH (n=72)	P
Age	44.51±6.35	46.38±6.12	.06
Parity	1.94±0.81	1.99±1.04	.74
History of Caesarean Delivery			
0	73	59	
1	10	4	
>2	10	5	.39
Body Mass Index	23.82±3.48	24.21±2.79	.43
Main Indications			
Leiomyoma/adenomyosis	83	63	
Premalignant conditions	13	9	.52

Table 2.
Main Outcomes

	TLH (n=96)	LAVH (n=72)	P
Operation Time (min)	112.60±33.90	112.57±31.20	>.99
Hemoglobin Change (g/dL)	1.61±1.18	2.13±1.44	.02
Postoperative Stay (days)	3.55±2.01	3.79±2.12	.46
Uterus Weight (g)	189.70±108.98	270.87±145.93	<.01

in cases of a large uterus and/or a lower segmental mass on the uterus, making it difficult to expose the posterior vaginal pouch. The mean uterine weight was 252.60±100.19g in the conversion group (TLH → LAVH) and was heavier than that in the TLH group (189.70±108.98g), but there was no significant difference (P =.087). The conversion group was evaluated as part of the LAVH group. There was no correlation between the hemoglobin change and other factors (uterus weight, BMI, operation time, previous cesarean delivery, and age). The operative time correlated with the number of previous surgeries (r=0.235, P=.003) and uterine weight (r=0.221, P=.006). One ureteral injury occurred in the TLH group, and one bladder injury occurred in the LAVH group. Each complication was identified intraoperatively and properly repaired. Three cases of delayed healing and partial disruption of the vaginal cuff occurred in the TLH group, but no patients required resuturing of the vaginal cuff. All 5 patients recovered without serious complications. No major vascular or bowel injuries occurred.

DISCUSSION

To date, laparoscopic surgery has evolved rapidly worldwide, not only for patients with benign gynecologic disease, but also for patients with malignancies.[5] The proportion of laparoscopic hysterectomies has been increasing compared with hysterectomies performed through a laparotomy.[6]

A significantly larger uterus can be removed by LAVH compared to TLH. This finding was attributed to the surgeon's selection criteria of the operative procedure, as indicated in Materials and Methods above. The operative time, however, was similar between the 2 groups. Thus, LAVH might have been more feasible in this study for a large uterus. During the TLH procedure, the circumferential colpotomy over the rim of the Koh cup is one of the most important procedures, and is possible when the Koh rim is fully identified and the contour of the Koh rim is exposed over the pelvic peritoneum. In the case of a large uterus and mass involving the lower segment of uterus, especially the posterior aspect, a circumferential colpotomy is very difficult or even impossible to perform. The patients in this study who had a relatively large uterus and a lower uterine segment mass were converted from TLH to LAVH.

Gynecologists perform LAVH, because they have already undergone training for vaginal hysterectomy, and TLH requires technical expertise and a longer learning period,[7] which could have affected the result of this study.

A greater hemoglobin change was observed in the LAVH group; however, no relationship was noted between the change in hemoglobin with uterine weight, operative time, and the previous number of surgeries. Some authors have reported that the operative time correlates with intraoperative blood loss[3]; that study, however, was based on TLH, VH, and AH. Surgeons use the topical injection of vasoconstrictors to minimize bleeding during a transvaginal colpotomy.[8] In the current study, the surgeon did not use the topical injection of vasoconstrictors during LAVH, and this resulted in a greater hemoglobin change in the LAVH group than in the TLH group.

A heavy uterus and a previous operative history required more operative time. A large uterus makes it difficult to manipulate the uterus and to handle laparoscopic instruments. The more abdominal surgeries the patient has undergone, the more adhesions that develop, and the more time involved in adhesiolysis.

In the current study, 2 urinary tract injuries occurred, one of which was a ureteral injury (0.6%) in the TLH group and one a bladder injury (0.6%) in the LAVH group. The reported incidence of ureteral injuries is 0% to 2% and corresponds well to that in the current study.[9,10] Injury to the bladder, as occurred in this study, would have occurred on vaginal entry into the peritoneum during the LAVH.[11]

TLH has been reported as a significant risk factor for vaginal cuff dehiscence.[12] Extensive tissue destruction caused by thermal injury at the time of colpotomy with monopolar scissors make the vaginal cuff vulnerable to delayed healing and dehiscence. To avoid or lessen such a vaginal cuff complication, the topical injection of a vasoconstrictor at the colpotomy site, followed by a sharp colpectomy with a laparoscopic scalpel, was reported and could be considered.[12]

CONCLUSION

TLH and LAVH are safe and feasible methods. Previous operative histories, BMI, age, and parity were not considered factors that influence the choice of hysterectomy (ie, TLH or LAVH). LAVH may be preferred in cases with a mass involving the lower segment or a relatively large uterus.

References:

1. Lenihan JP, Jr., Kovanda C, Cammarano C. Comparison of laparoscopic-assisted vaginal hysterectomy with traditional hysterectomy for cost-effectiveness to employers. *Am J Obstet Gynecol.* 2004;190:1714–1720; discussion 1720–1722.

2. Muzii L, Basile S, Zupi E, et al. Laparoscopic-assisted vaginal hysterectomy versus minilaparotomy hysterectomy: a prospective, randomized, multicenter study. *J Minim Invasive Gynecol.* 2007;14:610–615.

3. Schindlbeck C, Klauser K, Dian D, Janni W, Friese K. Comparison of total laparoscopic, vaginal and abdominal hysterectomy. *Arch Gynecol Obstet.* 2008;277:331–337.

4. Johnson N, Barlow D, Lethaby A, Tavender E, Curr L, Garry R. Methods of hysterectomy: systematic review and meta-analysis of randomised controlled trials. *BMJ.* 2005;330:1478.

5. Holloway RW, Finkler NJ, Pikaart DP, Bigsby GE, DeNardis SA, Ahmad S. Comparison of total laparoscopic and abdominal radical hysterectomy for patients with early-stage cervical cancer. *Obstet Gynecol.* 2007;110:1174; author reply 1174–1175.

6. David-Montefiore E, Rouzier R, Chapron C, Darai E. Surgical routes and complications of hysterectomy for benign disorders: a prospective observational study in French university hospitals. *Hum Reprod.* 2007;22:260–265.

7. Wattiez A, Soriano D, Cohen SB, et al. The learning curve of total laparoscopic hysterectomy: comparative analysis of 1647 cases. *J Am Assoc Gynecol Laparosc.* 2002;9:339–345.

8. Ottosen C, Lingman G, Ottosen L. Three methods for hysterectomy: a randomised, prospective study of short term outcome. *BJOG.* 2000;107:1380–1385.

9. Ostrzenski A, Radolinski B, Ostrzenska KM. A review of laparoscopic ureteral injury in pelvic surgery. *Obstet Gynecol Surv.* 2003;58:794–799.

10. Karaman Y, Bingol B, Gunenc Z. Prevention of complications in laparoscopic hysterectomy: experience with 1120 cases performed by a single surgeon. *J Minim Invasive Gynecol.* 2007;14:78–84.

11. Johns DA, Diamond MP. Laparoscopically assisted vaginal hysterectomy. *J Reprod Med.* 1994;39:424–428.

12. Hur HC, Guido RS, Mansuria SM, Hacker MR, Sanfilippo JS, Lee TT. Incidence and patient characteristics of vaginal cuff dehiscence after different modes of hysterectomies. *J Minim Invasive Gynecol.* 2007;14:311–317.