Vaginal and laparoscopic hysterectomy. Which one is better? Critical analysis of complications associated with both routes

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Summary

Background: When hysterectomy is indicated for benign disease, there appears to be a general consensus in favor of the vaginal approach. However, it has been reported that the laparoscopic hysterectomy reduces postoperative complications and shortens hospital stay. The aim of this study was to compare complications and length of stay after vaginal *vs.* laparoscopic hysterectomy for benign disease in women treated at a tertiary care hospital in Southern Europe. *Materials and Methods:* This retrospective study included 573 women who underwent vaginal or laparoscopic hysterectomy for benign or premalignant disease between 2011 and 2015. The authors compared intraoperative, postoperative, and major complications, the duration of hospital stay, and the need for reoperation in the two groups. *Results:* The laparoscopic approach had a shorter hospital stays compared to vaginal hysterectomy, however it was associated with a higher risk of major complications (serious intra- and postoperative complications). Regarding total postoperative complications, there were no differences between the two approaches. *Conclusions:* Therefore the authors conclude that the approach of choice for hysterectomy indicated for benign disease should be the vaginal route for general gynecologists. The laparoscopic route is an alternative in women for whom the vaginal route is not feasible, and this approach should be performed by gynecological surgeons who have experience with this route.

Key words: Vaginal hysterectomy; Laparoscopy; Complications; Postoperative complications; Length of stay.

Introduction

Hysterectomy is one of the most frequent gynecological surgical procedures after cesarean delivery, with millions of operations performed worldwide [1, 2]. Traditionally, an abdominal approach has been used for 60% to 70% of all hysterectomies [3]. Research in the last ten years, however, has shown that this approach is associated with a higher incidence of intraoperative complications, greater need for blood transfusions, and longer hospital stays (among other complications), compared to vaginal and laparoscopic approaches [1, 4]. Since 1989, when the first hysterectomy via a laparoscopic approach was reported [5], the use of this route has spread because it is associated with a lower incidence of postoperative complications, less pain, fewer febrile episodes, less blood loss, and shorter hospital stays, compared to abdominal hysterectomy [6]. However, it is unclear whether the laparoscopic approach is associated with fewer intraoperative complications, given that the laparoscopic hysterectomy technique has a steeper learning curve, the procedure itself is longer than abdominal surgery, and major complications, such as urinary tract injury are more frequent during the learning process [7, 8].

When hysterectomy is indicated for benign disease, the route of choice – vaginal *vs.* laparoscopic – remains controversial. If the uterus is small and mobile, and if there is no adnexal disease, there appears to be a general consensus in favor of the vaginal approach as the surgical technique of choice given that epidural anesthesia can be used, and this approach is associated with shorter operating times than laparoscopy [8, 9]. However, other studies have reported that the laparoscopic approach reduces blood loss, shortens hospital stay, and renders bilateral adnexectomy more straightforward, if required [10, 11].

Despite the extensive literature on abdominal hysterectomy, few studies have compared the vaginal *vs.* laparoscopic surgical routes. In light of the current lack of information, the authors designed the present study in order to compare intraoperative and postoperative complications and the duration of hospital stay in two groups of women who underwent hysterectomy for benign disease, with either the vaginal or laparoscopic surgical approach.

Materials and Methods

This retrospective study included all women who underwent hysterectomy between January 2011 and December 2015 at a tertiary care hospital in Southern Europe that provides resident training. All women were asked to provide their informed consent for surgery and for the inclusion of their medical data in the present study, and the study was approved by the hospital's ethics com-

mittee.

The inclusion criteria for patients in this study were vaginal or laparoscopic hysterectomy for benign disease, premalignant disease or malignant disease not requiring additional surgical treatment, and not treated previously. The authors excluded from analysis all hysterectomies performed for malignant disease that required surgical measures in addition to hysterectomy and adnexectomy or that had been treated previously for tumoral disease (chemotherapy or radiotherapy).

The follow-up period for this study comprised the time between surgery and hospital discharge, when data for this analysis were recorded. For women who were readmitted because of postoperative complications, follow-up was extended to include the second hospital stay.

Vaginal hysterectomy was performed according to the technique described initially by Heaney [12]. Women who required a surgically implanted mesh to control incontinence after their vaginal hysterectomy were excluded from analysis because the mesh may give rise to complications unrelated to the hysterectomy per se. The group of laparoscopic hysterectomies included fully laparoscopic operations and laparoscopic-assisted vaginally, corresponding to American Association of Gynecologic Laparoscopists types I, II, III, and IV [13].

The choice of surgical approach was based, whenever possible, on an analysis of each patient's clinical characteristics, her gynecologist's recommendations, and the size of mobility of the uterus, according to American College of Obstetricians and Gynecologists guidelines [13].

Three clinician investigators (ARO, MTAR, and AGP) developed the data recording protocol by consensus based on the definitions of the variables of interest and the methods used to record the data for each. The patient-related variables we studied were age, weight, height, body mass index (BMI), presence or absence of concomitant medical conditions, presence or absences of previous abdominal surgery, American Society of Anesthesiologists (ASA) index, and smoking habit. According to their BMI the authors categorized participants as obese (BMI 30 kg/m^2 or higher) or not obese (BMI lower than 30 kg/m^2). According to their ASA index the authors categorized the patient's surgical risk as high (3 or 4) or low (1 or 2). Smoking habit was recorded for women who reported smoking at the time of their surgery. As concomitant medical conditions the authors recorded any diagnosis that could affect the patient's intraoperative or postoperative course, such as hypertension, heart disease, clotting disorder, endocrine disease, and pulmonary or neurologic disease.

The outcome variables were occurrence of complications, need for reoperation, and days of hospital stay. Surgical complications were categorized as intraoperative or postoperative (time of appearance) and as major or minor (seriousness). These categories were not mutually exclusive.

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). Women who required conversion of laparoscopic hysterectomy to a laparotomy were included in the laparoscopy group for the present analysis of complications, and conversion was recorded as a complication.

Postoperative complications after surgery 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 two 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 observed during the hospital stay. 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.

As an additional variable the authors considered major complications, defined here as 1) serious intraoperative complications, such as injury to a neighboring organ during surgery (bladder, ureter, intestine or major vessel) and 2) postoperative complications, such as bleeding, intestinal problems or infection that required reoperation for appropriate management. As an additional variable the authors recorded the need for reoperation in patients who required additional surgery for any reason. The length of hospital stay was analyzed as a continuous variable and was stratified into three levels: less than two days, three days, and four days or longer.

Descriptive statistics are reported for each variable as absolute and relative frequencies for categorical variables, and as means and standard deviations for continuous variables. Differences between the two groups were identified with the chi-squared test for qualitative variables, and with Student's t-test and ANOVA for quantitative variables. The significance level for all analyses was set at $p < 0.05$ for two-sided comparisons.

To estimate the strength of association between surgical approach and complications, the authors calculated crude (cOR) and adjusted odds ratios (aOR) and their 95% confidence intervals (95% CI) with unconditional logistic regression models. For each potential risk factor they designed a specific model that included, in addition to the factor of interest, all other variables that might have acted as confounders according to the bivariate analysis, crude analysis, and current knowledge. All data were analyzed with SPSS v. 21.0 software.

Results

Between January 2011 and December 2015, a total of 1,272 hysterectomies for benign disease were done at the study center. Of these, the authors excluded 634 hysterectomies done via and abdominal approach and 65 vaginal hysterectomies that also required surgery to prevent incontinence. Of the remaining 573 hysterectomies, 62.3% were done with a vaginal approach (n=357) and 37.7% with a laparoscopic approach (n=216).

Table 1 summarizes the characteristics of the women who underwent vaginal or laparoscopic hysterectomy. Of note are the significantly younger mean age, lower prevalence of medical conditions, lower surgical risk, and higher prevalence of smoking in the laparoscopic group.

Table 2 shows the complications associated with each surgical route according to time of appearance and seriousness. The proportion of women who had intraoperative complications was significantly higher ($p < 0.05$) in the laparoscopy group, and major complications occurred in 6% of the women in this group compared to 0.8% ($p. <0.001$) in the vaginal approach group.

Women who underwent laparoscopic hysterectomy re-

Table 1. — *Characteristics of women who underwent hysterectomy according to type of approach (vaginal vs. laparoscopic).*

	Vaginal (n=357)	Laparoscopic (n=216)	p
Age (SD), years	65.5 (10.0)	50.0 (11.4)	<0.05
BMI (kg/m^2)(SD)	28.1 (4.4)	27.9 (5.7)	ns
> 30	109 (32.4%)	70 (33.2%)	ns
Medical condition n (%)	224 (62.7%)	93 (43.1%)	<0.001
Smoking n (%)	34 (9.5%)	65 (30.1%)	<0.001
Previous surgery n (%)	137 (38.4%)	70 (32.4%)	ns
High surgical risk (ASA 3, 4) n (%)	53 (15.3%)	20 (9.3%)	<0.05
Adnexal surgery n (%)	0 (0%)	99 (67.8%)	<0.001

ns: not significant.

Table 2. — *Numbers of complications and lengths of stay in women who underwent vaginal or laparoscopic hysterectomy.*

Complications	Vaginal (n=365)	Laparoscopic (n=216)	p
Intraoperative	6 (1.6)	10 (4.6)	0.05
Bleeding	3 (0.8)	4 (1,8)	ns
Urologic	3 (0.8)	6 (2,8)	ns
Intestinal	0 (0)	0 (0)	ns
Postoperative	56 (15.3)	24 (11.1)	ns
Bleeding	18 (4.9)	17 (7,8)	ns
Urologic	18 (4.9)	3 (1,3)	ns
Intestinal	0 (0)	1 (0.5)	ns
Infection	18 (4.9)	1 (0.5)	ns
Wound	1 (0.3)	1 (0.5)	ns
Other	1 (0.3)	1 (0.5)	ns
Total (intra- and postoperative)	62 (16.9 %)	34 (15,7)	0.06
Major* (serious intra- and postoperative)	3 (0.8)	13 (6,0)	0.001
Reoperation needed	9 (2.5)	8 (3.7)	0.07
Mean length of stay (SD)	3.3 (2.2)	2.8 (1.9)	<0.01
1-2 days	125 (35.0%)	123 (56.9%)	
3 days	139 (38.9%)	57 (26.4%)	<0.001
>3 days	93 (26.1%)	36 (16.7%)	

ns: not significant.

quired more reoperations, although their mean hospital stay was significantly shorter than in the vaginal surgery group: 56.9% of the former were discharged during the first two postoperative days.

Table 3 details the major complications in each group. The authors noted that laparoscopic hysterectomy was associated with a higher number of serious bleeding complications and injuries to neighboring organs such as the bladder or ureters.

The results of the multivariate analysis are shown in Table 4. After adjustment for potential confounders, there were no significant differences between groups in intraoperative or postoperative complications. The laparoscopic approach was associated with a 50% lower risk of hospital stay longer than four days, although the risk of major complications in this group was 4.9-fold greater than in the

Table 3. — *Major complications after vaginal or laparoscopic hysterectomy.*

	Vaginal (n=3)	Laparoscopic (n=13)
Urologic		
	2 bladder ruptures	2 bladder ruptures (LPT)
	Urethral injury	Bladder rupture and ureter injury (LPT)
		Bladder injury (LPS)
		Ureter injury (LPS)
Bleeding		3 hemoperitoneum (LPT)
		3 hemoperitoneum (LPS)
Infection		Pelvic infection (drainage LPT)
		Pelvic infection (reoperation via LPS)

LPT: complication requiring conversion to laparotomy for management.
LPS: complication managed by laparoscopy.

Table 4. — *Complications after laparoscopic hysterectomy compared to vaginal hysterectomy. Logistic regression analysis*

Complications	Crude OR (95% CI)	Adjusted OR (95% CI)
Intraoperative	2.8 (1.1-7.9)	0.65 (0.2-2.4)
Postoperative	0.7 (0.4-1.2)	0.6 (0.3-1.2)
Major	7.6 (2.1-26.8)	4.8 (1.1-22.3)
Reoperation	1.5 (0.6-3.9)	1.2 (0.4-4.1)
Hospital stay > 4 days	0.6 (0.4-0.9)	0.5 (0.3-0.9)

Adjusted for age, BMI, smoking habit, medical condition, and surgical risk.

vaginal approach group (OR 4.9, 95% CI 1.1–22.3).

Discussion

There is currently a general consensus that compared to the laparoscopic approach, vaginal hysterectomy should be considered the gold standard treatment for women with benign uterine disease whose uterus is small, mobile, and free from adnexal disease [2, 14]. However, not all studies have confirmed the superiority of the vaginal approach. In the present study the authors found that postoperative morbidity was similar for laparoscopic and vaginal surgery, and that the former approach was associated with shorter hospital stays, but a greater risk of major complications.

The patients' postoperative course after laparoscopic and vaginal hysterectomy was similar, and the authors found no differences in the overall percentage of women in each group with postoperative complications. The present finding is consistent with the lack of superiority of either approach reported by other authors [1, 11].

The results of the present bivariate analysis of intraoperative and major complications yielded a significantly higher percentage frequency in the laparoscopy group, although in the multivariate analysis, only the risk of major complications remained significantly different (five-fold higher in the laparoscopy group). The present authors note that injuries to neighboring organs, especially the bladder, occurred in 2.8% of the women in the laparoscopy group *vs.*

only 0.8% in the vaginal approach group. Some authors [7, 15] who published results similar to the present have suggested that these complications reflect the learning curve and the surgeon's experience, both of which have an important impact mainly on injuries to neighboring organs such as the bladder, intestine or large vessels. Makinen *et al.* [7] noted that surgeons who had done fewer than 30 procedures had twice the risk of injuring the bladder and four times the risk of injuring a ureter compared to surgeons with more experience.

The present university hospital is a teaching center where residents undergo training, and although all procedures are supervised by experienced surgeons, the learning curve is never fully surmounted at any given time by surgeons in different years of their residency. This situation probably explains the higher percentage of complications in this sample of patients compared to other studies [15]. Other researchers, however, claim that once the learning curve is surmounted, intraoperative complications should be no more frequent during laparoscopic surgery than during vaginal hysterectomy [9].

The main advantage the authors observed for the laparoscopic approach is the shorter mean hospital stay of 2.8 days – a period similar to the lengths of stay found in earlier studies [7, 9]. In addition, 57% of the women who underwent laparoscopic hysterectomy were discharged during the first two postoperative days. This finding has important implications for hospital cost containment and patient satisfaction.

A further advantage of the laparoscopic approach is that it facilitates concomitant adnexectomy and the detection of other concomitant diseases [1]. At the present center, if adnexectomy is required, the surgeon usually opts to use a laparoscopic or abdominal approach to facilitate the procedure. However, some authors have reported that although more difficult to perform, adnexectomy via the vaginal route is also possible and is not associated with a higher rate of complications [9].

The present authors assigned the women in this study to the vaginal or laparoscopic approach, whenever possible, on the basis of their clinical characteristics and the nature of their disease, in accordance with current clinical guidelines [4, 14]. The authors opted to use the vaginal approach for women with a small, mobile uterus free from adnexal disease, whereas the laparoscopic approach was used if the uterus was larger (yet still smaller than at 14-16 weeks of gestation) and if adnexal disease was present.

The present authors appreciate that these criteria do not account for the intrinsic risk associated with each type of uterine pathology, independently from the surgical approach, and that not analyzing this intrinsic risk is a potential limitation of this study. The strength of this analysis, however, is that it allows to infer overall complications associated with different surgical approaches according to the classification, generally used in daily clinical practice at most hospitals. The lack or randomization in assigning the present patients to each of the three surgical techniques for hysterectomy (abdominal, vaginal, and laparoscopic) may have led to some confounding, although the adjusted analyses for all potential confounders the authors were able to identify, probably helped to counteract this source of bias.

Another potential limitation of this study, as in all retrospective analyses, is the reliability and validity of the information obtained from the database of medical records. However, information bias was unlikely given the longitudinal design and the fact that all data were retrieved and recorded by three of the authors after suitable training in the use of a data collection protocol and standardized definitions for the variables of interest. The internal validity of the present study was probably more robust than other retrospective studies based on information obtained from databases.

Conclusions

In conclusion, the present findings show that there were no differences in the frequencies of postoperative complications between women who underwent laparoscopic or vaginal hysterectomy. The former approach was associated with more major complications but with a shorter mean hospital stay than the vaginal approach. The choice of surgical route for hysterectomy should be made by consensus between the patient and surgeon, depending on the possible risks and benefits of different options, which will depend to a large extent on the surgeon's experience with different techniques. In the present setting, because of the greater risk of major complications associated with laparoscopic hysterectomy, the authors feel that the vaginal approach should be chosen whenever feasible. If the surgeon is experienced, the laparoscopic approach is a potentially advantageous option because of the shorter hospital stay and earlier discharge.

Acknowledgments

References

[1] Garry R., Fountain J., Mason S., Hawe J., Napp V., Abbott J., *et al.*: "The eVALuate study: two parallel randomised trials, one comparing laparoscopic with abdominal hysterectomy, the other comparing laparoscopic with vaginal hysterectomy". *BMJ*, 2004, *328*, 129.
[2] Aarts J.W., Nieboer T.E., Johnson N., Tavender E., Garry R., Mol B.W., *et al.*: "Surgical approach to hysterectomy for benign gynaecological disease". *Cochrane Database Syst Rev*. 2015, 8, CD003677.
[3] Brill A.I.: "Hysterectomy in the 21st century: different approaches, different challenges". *Clin. Obstet. Gynecol.*, 2006, *49*, 722.

[4] Kovac S.R.: "Route of hysterectomy: an evidence-based approach" *Clin Obstet Gynecol.*, 2014, *57*, 58.

[5] Reich H.D.J., McGlynn N.F.: "Laparoscopic hysterectomy". *J. Gynecol Surg.*, 1989, *5*, 213.

[6] 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.

[7] Makinen J., Johansson J., Tomas C., Tomas E., Heinonen P.K., Laatikainen T., *et al.*: "Morbidity of 10 110 hysterectomies by type of approach". *Hum. Reprod.,* 2001, *16*, 1473.

[8] Ribeiro S.C., Ribeiro R.M., Santos N.C., Pinotti J.A.: "A randomized study of total abdominal, vaginal and laparoscopic hysterectomy". *Int. J. Gynaecol. Obstet.,* 2003, *83*, 37.

[9] Candiani M., Izzo S., Bulfoni A., Riparini J., Ronzoni S., Marconi A.: "Laparoscopic vs vaginal hysterectomy for benign pathology". *Am. J. Obstet. Gynecol.*, 2009, 200, 368.e1.

[10] Ghezzi F., Uccella S., Cromi A., Siesto G., Serati M., Bogani G., et al.: "Postoperative pain after laparoscopic and vaginal hysterectomy for benign gynecologic disease: a randomized trial". *Am. J. Obstet. Gynecol.,* 2010, 203, 118.e1.

[11] Gendy R., Walsh C.A., Walsh S.R., Karantanis E.: "Vaginal hysterectomy versus total laparoscopic hysterectomy for benign disease: a metaanalysis of randomized controlled trials". *Am. J. Obstet. Gynecol.*, 2011, *204*, 388 e1.

[12] Heaney N.S.: "Vaginal hysterectomy: its indications and technique". *Am. J. Surg.,* 1940, *48*, 284.

[13] Olive D.L., Parker W.H., Cooper J.M., Levine R.L.: "The AAGL classification system for laparoscopic hysterectomy. Classification committee of the American Association of Gynecologic Laparoscopists". *J. Am. Assoc. Gynecol. Laparosc.,* 2000, *7*, 9.

[14] "ACOG Committee Opinion No. 444: Choosing the route of hysterectomy for benign disease". *Obstet. Gynecol.*, 2009, *114*, 1156.

[15] Walsh C.A., Walsh S.R., Tang T.Y., Slack M.: "Total abdominal hysterectomy versus total laparoscopic hysterectomy for benign disease: a meta-analysis". *Eur. J. Obstet. Gynecol. Reprod. Biol.,* 2009, *144*, 3.

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