

Contents lists available at [SciVerse ScienceDirect](http://SciVerse.ScienceDirect.com)

Gynecology and Minimally Invasive Therapy

journal homepage: www.e-gmit.com

Original article

Factors influencing the choice of hysterectomy approach for the management of fibroid uterus

Felix Wu Shun Wong^{a,*}, Danforn Chi Eung Lim^b

^a Department of Obstetrics and Gynecology, University of New South Wales, Liverpool Health Services, Liverpool, 2170, Australia

^b Division of Women's and Child Health, Liverpool Health Service, Liverpool, 2170, Australia

ARTICLE INFO

Article history:

Received 13 March 2012

Received in revised form

21 June 2012

Accepted 21 June 2012

Available online 9 April 2013

Keywords:

Clinical parameter

Hysterectomy

Risk factors

Surgeon's expertise

Uterine fibroids

ABSTRACT

Aim: The aim of this study was to identify factors influencing the choice between different approaches in hysterectomy for uterine fibroids.

Methods: A cross-sectional study was conducted involving 285 women who had undergone hysterectomy for uterine fibroids at the Liverpool Hospital, New South Wales, Australia.

Results: This study shows that several factors influenced the choice of hysterectomy approach. First, concomitant adnexal surgery increased the likelihood of undergoing an abdominal hysterectomy rather than either a vaginal or a laparoscopic hysterectomy by 10- and fivefold (both $p < 0.01$), respectively. Second, women with a larger uterus (>280 g) had a 20 ($p < 0.05$) and 10 ($p < 0.01$) times greater chance of undergoing an abdominal hysterectomy than either a vaginal or a laparoscopic hysterectomy, respectively. Third, gynecologic endoscopists were more likely to perform laparoscopic hysterectomy than gynecologic generalists ($p < 0.001$).

Conclusion: Certain clinical parameters determine the choice of hysterectomy approach. Surgeons' expertise also has significant influence over the choice between laparoscopic and traditional approaches for hysterectomy.

Copyright © 2013, The Asia-Pacific Association for Gynecologic Endoscopy and Minimally Invasive Therapy. Published by Elsevier Taiwan LLC. All rights reserved.

Introduction

Clinical factors influencing the use of hysterectomy are well known in older patients, being commonly associated with bleeding, leiomyomata, or cancer, leiomyomata having the highest association with hysterectomy.¹ Therefore hysterectomy is the most common surgical procedure for the treatment of uterine fibroids. Nevertheless, the choice of hysterectomy type is commonly not clearly defined, but is mostly based on disease pathology and the skill and training of the surgeons.

Abdominal hysterectomy (AH) has for a long time been the most common approach performed for fibroids. Although vaginal hysterectomy (VH) generally has the advantages of less intraoperative blood loss, fewer postoperative complications, better cosmetic results, and quicker recovery, it is not often the choice when a large-sized uterus is encountered.² The introduction of laparoscopic surgery^{3,4} has been shown to have an impact on the

use of AH since it offers gynecologists a new technique to maintain the advantages of VH, bypassing the abdominal route in women with large uterine fibroids.^{5,6} Controlled clinical trials have shown that laparoscopic hysterectomy (LH) or laparoscopically assisted vaginal hysterectomy (LAVH) has similar advantages to VH over AH, such as avoiding the use of large laparotomy incisions, reduced pain, and a quick and comfortable recovery.⁵ Nowadays, as argued by gynecologic endoscopists, LH/LAVH should replace traditional AH and VH for the treatment of uterine fibroids.^{2,4–9} However, the rationale of adopting for this new approach for the fibroid uterus has not been well established. Thus, it remains to be seen whether the trend is true in a teaching hospital.

Studies have shown that the choice of hysterectomy approach is often based not purely on clinical parameters, such as the presence of a large uterus due to uterine fibroids, but also on the expertise and experience of individual surgeons.^{2,10} In order to gain further insight into factors influencing the choice of hysterectomy approach for uterine fibroids and to evaluate the role of surgeons in the decision-making process, a cross-sectional study of women who underwent hysterectomy over a 32-month period at a tertiary teaching hospital was performed.

* Corresponding author. FW Medical Centre, Room 521, Central Building, 1–3 Pedder Street, Central, Hong Kong.

E-mail address: fwong3@hotmail.com.hk (F.W.S. Wong).

Materials and methods

The study population consisted of women undergoing hysterectomy at the Liverpool Hospital in the 3 years from 2007 to 2009 who had findings of histologically diagnosed fibroids in the hysterectomy specimens. Data were collected retrospectively from the hospital database and included patient demographics, clinical indications for hysterectomy, disease pathology, and a statement of the surgeon's expertise. Pairwise comparisons were made between VH and AH, LH/LAVH and AH, as well as between LH/LAVH and VH in terms of patient age, clinical indications, concomitant adnexal surgery, number of uterine fibroids, uterine weight, and surgeon's expertise.

The Chi-square test was used for categorical data, and analysis of variance for continuous data. Multiple logistic regression analysis was used to identify independent factors determining: (1) the likelihood of undergoing a VH versus an AH, (2) the likelihood of undergoing an LH/LAVH versus an AH, and (3) the likelihood of undergoing an LH/LAVH versus a VH. Data were classified into clinical meaningful dichotomous groups for bivariate comparison. The measure of uterine weight was classified into two groups: ≤ 280 g (12-week gestation) and >280 g. Surgeons were grouped as gynecologic generalists or gynecologic endoscopists. The former group comprised seven consultants who had no special expertise in endoscopic surgery. The gynecologic endoscopists group consisted of five surgeons who were experienced in performing LH/LAVH. Interaction was assessed at a significance level of $p < 0.01$. All statistical analyses were performed using the SPSS program (SPSS Inc., Chicago, IL, USA). A p value <0.05 was considered statistically significant.

Results

A total of 285 women who underwent hysterectomy and in whom uterine fibroids were diagnosed in the pathology reports were included in this study. AH was the most frequently performed hysterectomy ($n = 138$, 48%), followed by VH ($n = 98$, 34%) and LH/LAVH ($n = 49$, 17%).

Table 1 shows the patient demographics, clinical indications, pathology, and operating surgeons' expertise by type of hysterectomy. The mean patient age was 49 years (± 8.6), ranging from 31 to 79 years. The majority of women were over 40 years old (87.4%). Women who underwent LH/LAVH tended to be slightly younger (47 ± 5.2 years) than those who underwent either AH (49 ± 9.7 years) or VH (50 ± 8.7 years), but the differences did not achieve statistical significance ($p > 0.05$).

Of these women, only 41.8% had uterine fibroids as the main clinical indication, 22.5% were treated for abnormal uterine bleeding, 10.5% had their uterus removed due to potential concerns of malignancy, and 8.4% were treated for uterovaginal prolapse. Forty-one percent of women had concomitant adnexal surgery performed. It appeared that when adnexal surgery was performed, AH was more likely to be adopted (60.9%), and VH was much less likely to be performed (16.3%). Thirty-five percent of women had a single fibroid, and 65% had multiple uterine fibroids confirmed by pathologic examinations. There was no difference in the surgical approach in terms of the presence of single or multiple uterine fibroids. The mean uterine weight was 312 g (± 313.8 g), and 39% of women had a uterus weighing greater than 280 g. On average, women who underwent AH had a larger uterus (449 ± 386.7 g) than those who underwent either LH/LAVH (223 ± 157.4 g) or VH (164 ± 109.5 g) (both $p < 0.001$), and uterine weight was also significantly heavier in the LH/LAVH group than in the VH group ($p = 0.02$).

All the hysterectomies were performed by 12 gynecologists—seven general gynecologists and five endoscopic gynecologists.

Table 1
Clinical parameters and surgeons' expertise by hysterectomy type.

Patient characteristics	AH ($n = 138$)	LH/LAVH ($n = 49$)	VH ($n = 98$)	Overall
Age				
Mean \pm SD (y)	50 ± 8.7	47 ± 5.2	49 ± 9.7	49 ± 8.6
>40 y (%)	89.9	89.8	82.7	87.4
Main indication (%)				
Uterine fibroid	47.1	44.9	32.7	41.8
Abnormal uterine bleeding	18.1	26.5	26.5	22.5
Adnexal mass	9.4	2.0	0	4.9
Uterovaginal prolapse	1.0	8.2	19.4	8.4
Endometriosis	2.2	2.0	2.0	2.1
High risk of malignancy	13.0	10.2	7.1	10.5
Others	13.0	6.1	12.2	9.8
Concomitant adnexal surgery (%)	60.9	32.7	16.3	40.7
Multiple uterine fibroids (%)	67.8	66.7	59.4	64.8
Uterine weight				
Mean \pm SD (g)	449 ± 386.7	223 ± 157.4	164 ± 109.5	312 ± 313.8
≥ 280 g (%)	62.3	26.5	11.2	38.6
Gynecologists' expertise (%)				
Generalist	65.0	33.3	82.2	65.1
Endoscopist	35.0	66.7	17.8	34.9

AH = abdominal hysterectomy; LH/LAVH = laparoscopic hysterectomy/laparoscopically assisted vaginal hysterectomy; SD = standard deviation; VH = vaginal hysterectomy.

Sixty-six percent of the hysterectomies were performed by the general gynecologists, equivalent to 65.0% of the AHs and 82.2% of the VHs, while 66.7% of the LH/LAVHs were performed by the endoscopic gynecologists.

Table 2 demonstrates the analysis of associations between each factor and the choice of hysterectomy type. The need for

Table 2
Multiple logistic regression analysis of associations between patient characteristics, clinical presentations, and likelihood of undergoing vaginal hysterectomy (VH) vs. abdominal hysterectomy (AH), laparoscopic hysterectomy/laparoscopically assisted vaginal hysterectomy (LH/LAVH) vs. AH, and LH/LAVH vs. VH.

Clinical factors	VH vs. AH ($n = 236$)	LH/LAVH vs. AH ($n = 187$)	LH/LAVH vs. VH ($n = 147$)
Age (y)			
≤ 40	1.0	1.0	1.0
>40	0.5 (0.3–1.2)	1.0 (0.3–2.9)	1.8 (0.6–5.3)
Main indication			
Uterine fibroid	1.0	1.0	1.0
Abnormal uterine bleeding	2.1 (1.1–4.2)*	1.5 (0.7–3.5)	0.7 (0.3–1.7)
Adnexal mass	—	0.2 (0.03–1.8)	—
Uterovaginal prolapse	38.6 (4.9–301.3)**	11.8 (1.3–111.4)*	0.3 (0.1–1.0)
Endometriosis	1.4 (0.2–8.5)	1.0 (0.1–1.0)	0.7 (0.1–8.5)
High risk of malignancy	0.8 (0.3–2.1)	0.8 (0.3–2.5)	1.0 (0.3–3.7)
Others	1.9 (0.8–4.6)	0.7 (0.2–2.6)	0.4 (0.1–1.4)
Concomitant adnexal surgery			
Yes	1.0	1.0	1.0
No	10.0 (5.0–25.0)**	3.3 (1.5–5.0)**	0.4 (0.2–0.9)*
Number of fibroids			
Single fibroid	1.0	1.0	1.0
Multiple fibroids	0.8 (0.4–1.3)	0.9 (0.5–1.9)	1.2 (0.6–2.5)
Uterine weight			
≥ 280 g	1.0	1.0	1.0
<280 g	12.5 (5.0–25.0)***	5.0 (2.5–10.0)***	0.3 (0.1–0.8)*
Gynecologist's expertise			
Generalist	1.0	1.0	1.0
Endoscopist	0.4 (0.2–0.8)*	3.5 (1.8–7.0)**	8.4 (3.8–18.2)**

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

concomitant adnexal surgery, the presence of a larger uterus, and the involvement of a general gynecologist were found to significantly favor an AH rather than a VH. Also, indications for hysterectomy of abnormal uterine bleeding or uterovaginal prolapse increased the chance of undergoing a VH than an AH in the presence of uterine fibroids. When comparing LH/LAVH and AH, non-concomitant adnexal surgery, the presence of a smaller uterus, and having a gynecologist who was an endoscopist increased the likelihood of LH/LAVH. When a comparison was made between patients who had undergone an LH/LAVH and a VH, the need for concomitant adnexal surgery, the presence of a larger uterus, and having a surgeon who was an endoscopist increased the likelihood of the patient undergoing an LH/LAVH.

Table 3 presents the independent factors associated with the choice of hysterectomy type using multiple logistic regression analysis. In patients undergoing AH or VH, three factors—concomitant adnexal surgery, the presence of uterovaginal prolapse, and uterine weight—significantly influenced the choice between AH and VH, even after taking into account the patient's age and the number of fibroids. The strongest determining factor was the presence of uterovaginal prolapse. Women with uterovaginal prolapse were 28 times more likely to undergo a VH than an AH compared to those whose indication was uterine fibroids [odds ratio (OR) 28.4, $p = 0.02$]. In contrast, women with a uterus weighing more than 280 g had a 20 times higher chance of undergoing AH than VH (OR 20.0, $p < 0.001$). Women who required adnexal surgery were 10 times more likely to have an AH than a VH (OR 10.0, $p < 0.001$).

The surgeons' expertise had a strong impact when determining the choice between a LH/LAVH or an AH. Gynecologic endoscopists appeared more likely to perform LH/LAVH than the generalist gynecologists; the estimated likelihood was 12 times, and, after controlling for all other factors considered in this study, the difference reached statistical significance (OR 12.2, $p < 0.001$). Women who required concomitant adnexal surgery and those with a larger uterus had a significant fivefold (OR 5.0, $p < 0.01$) or 10-fold (OR 10.0, $p < 0.001$) greater chance of undergoing an AH than an LH/LAVH, respectively.

When an analysis was conducted on the women who underwent a VH or an LH/LAVH, it was noted that the gynecologists' expertise was the only significant factor influencing the choice of hysterectomy type ($p < 0.001$). As expected, gynecologic endoscopists were 12 times (OR 11.5, 95% CI 4.0–33.2) more likely to perform LH/LAVH than VH compared with general gynecologists, after all other factors had been taken into account.

Table 3

Multiple logistic regression analysis of factors determining the likelihood of undergoing vaginal hysterectomy (VH) vs. abdominal hysterectomy (AH), laparoscopic hysterectomy/laparoscopically assisted vaginal hysterectomy (LH/LAVH) vs. AH, and LH/LAVH vs. VH.

Clinical factors	VH versus AH ($n = 236$)	LH/LAVH versus AH ($n = 187$)	LH/LAVH versus VH ($n = 147$)
Main indication			
Uterine fibroid	1.0	1.0	1.0
Uterovaginal prolapse	28.4 (1.6–492.2) *	15.8 (0.5–538.7)	0.9 (0.2–4.1)
Concomitant adnexal surgery			
Yes	1.0	1.0	1.0
No	10. (5.0–25.0) ***	5.0 (2.0–10.0) **	1.1 (0.4–3.3)
Uterine weight			
≥280 g	1.0	1.0	1.0
<280 g	20.0 (10.0–50.0) **	10. (3.3–25.0) ***	0.5 (0.1–1.4)
Gynecologist's expertise			
Generalist	1.0	1.0	1.0
Endoscopist	2.4 (0.9–6.4)	12.2 (4.3–34.0) ***	11.5 (4.0–33.2) ***

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Discussion

Uterine fibroids are one of the most common indications for hysterectomy in women who are referred to the Liverpool Hospital, New South Wales, Australia. The technique of LH/LAVH was introduced in 1994 to the hospital, which later became a training center for endoscopic surgery. However, as indicated in this study, abdominal and vaginal approaches have for the last few years remained the most commonly adopted type of hysterectomy (83%) for the surgical treatment of uterine fibroids. We were thus interested to find out the significant factors influencing the choice of hysterectomy for uterine fibroids. We found that the choice of hysterectomy approach in this hospital was based on certain clinical parameters and the surgeon's experience.

In the literature, it has been shown that some clinical parameters can influence the choice of hysterectomy approach.^{2,10} Concomitant adnexal surgery has been considered as one of the important factors determining the choice of hysterectomy approach,¹⁰ and our data confirm this finding. In the Liverpool Hospital, there was a similar practice pattern of hysterectomy for uterine fibroids, in which women who needed adnexal surgery were more likely to undergo AH (60.9%) than LH/LAVH (32.7%) or VH (16.3%). Traditionally, women undergoing concomitant adnexal surgery were much less likely to have a VH because of difficulties in securely ligating the ovarian vessels, which are high up in the pelvis in the presence of an adnexal mass, making access difficult. Furthermore, the inability to identify the nature of the adnexal mass, and the surrounding adhesion if any, makes this surgical approach unfavorable.¹¹ The use of the laparoscopic technique could convert AH for an adnexal mass to LH/LAVH, as it appeared that concomitant adnexal surgery was more common in LH/LAVH than in VH.

However, further analysis showed that the need for adnexal surgery did not contribute to the choice between LH/LAVH and VH after taking other factors into account. The difference between the unadjusted and adjusted effect of adnexal surgery was due to the confounding effect of the surgeon's expertise. In other words, adnexal surgery was more common in hysterectomies performed by endoscopist gynecologists than generalist gynecologists. This result also reflects that any shift in practice towards the laparoscopic approach is mainly determined by the surgeon's expertise.

A large fibroid uterus is difficult to remove vaginally since VH for a large fibroid will lead to a prolonged operating time, increased bleeding time, and a high incidence of ureteric injury.² In this scenario, many gynecologists still prefer the abdominal approach.² We found that the average uterine weight was much larger in the AH group than in the VH and LH/LAVH groups. It was further confirmed that, after taking into account age, clinical indications, need for concomitant adnexal surgery, number of fibroids, and surgeon factors, AH was the preferred approach when a large uterus (>280 g) was encountered. In addition, larger uteri did not significantly influence the choice between LH/LAVH and VH, although women with larger uteri appeared to be more likely to undergo LH/LAVH. These findings suggest that increased uterine size due to fibroids was considered a relative deference for the choice of AH and other two approaches.

It was found in this study population that more than half of the women (58.2%) had other indications for hysterectomy in addition to a fibroid uterus. Compared to those who had hysterectomy for a fibroid uterus, women who had uterovaginal prolapse were significantly more likely to undergo either VH or LH/LAVH rather than AH, independent of other factors. Other indications did not appear to affect the choice of hysterectomy type.

The American College of Obstetricians and Gynecologists has suggested that choice of hysterectomy type is partly determined by

the surgeon's experience.² Our findings support this point of view. We found that the surgeon's expertise had a significant influence on the choice between traditional hysterectomy and the laparoscopic approach. Generally, the gynecologic endoscopists were more likely to perform LH/LAVH, while the general gynecologists tended to perform AH or VH. However, the surgeon's expertise failed to influence the choice between AH and VH. Although the analysis showed that a general gynecologist was 2.5 times more likely to choose VH rather than AH for a fibroid uterus compared to a gynecologic endoscopist, the significance of this difference disappeared after considering the other risk factors, that is, the need for concomitant adnexal surgery and the clinical indications. In this study population, concomitant adnexal surgery was more common in hysterectomies undertaken by endoscopists than generalists (74% vs. 30%), and generalists performed more hysterectomies for the treatment of uterovaginal prolapse than endoscopists (11.2% vs. 1.5%). The explanation for this nonsignificant effect of the surgeon's individual experience on the choice between AH and VH is probably due to the fact that gynecologic consultants generally are trained in these two hysterectomy approaches, and clinical conditions then become relatively more important concerns for choosing AH or VH.

In conclusion, our study demonstrates that, at the Liverpool Hospital, the traditional relative contraindications for VH, that is, concomitant adnexal surgery and increased uterine size, still significantly influence the choice of hysterectomy approach. When concomitant adnexal surgery and a large uterus are encountered, surgeons are in favor of AH. In addition, surgeon's expertise has a significant influence on the choice between the laparoscopic and traditional hysterectomy approaches.

Acknowledgments

We wish to acknowledge the contribution of gynecologic and obstetric consultants at the Liverpool Hospital for their kind permission to review their cases.

References

1. Gretz H, Bradley WH, Zakashansky K, et al. Patient clinical factors influencing use of hysterectomy in New York, 2001–2005. *Am J Obstet Gynecol.* 2008;199:349.
2. Kovac SR. Vaginal hysterectomy. *Baillieres Clin Obstet Gynaecol.* 1997;11(1):95–110.
3. Reich H, DeCaprio J, McGlynn F. Laparoscopic hysterectomy. *J Gynecol Surg.* 1989;5:213–216.
4. Kovac SR, Cruikshank SH, Retto HF. Laparoscopy-assisted vaginal hysterectomy. *J Gynecol Surg.* 1990;6(3):185–193.
5. Schneider A, Merker A, Martin C, Michels W, Krause N. Laparoscopically assisted vaginal hysterectomy as an alternative to abdominal hysterectomy in patients with fibroids. *Arch Gynecol Obstet.* 1997;259(2):79–85.
6. Salmanli N, Maher P. Laparoscopically-assisted vaginal hysterectomy for fibroid uteri weighing at least 500 grammes. *Aust N Z J Obstet Gynaecol.* 1999;39(2):182–184.
7. Dorsey JH, Steinberg EP, Holtz PM. Clinical indications for hysterectomy route: patient characteristics or physician preference? *Am J Obstet Gynecol.* 1995;173(5):1452–1460.
8. Currie I, Onwude JL, Jarvis GJ. A comparative study of the cosmetic appeal of abdominal incisions used for hysterectomy. *Br J Obstet Gynaecol.* 1996;103(3):252–254.
9. Marana R, Busacca M, Zupi E, Garcea N, Paparella P, Catalano GF. Laparoscopically assisted vaginal hysterectomy versus total abdominal hysterectomy: a prospective, randomized, multicenter study. *Am J Obstet Gynecol.* 1999;180(2 Pt 1):270–275.
10. Shao JB, Wong F. Factors influencing the choice of hysterectomy. *Aust N Z J Obstet Gynaecol.* 2001;41(3):303–306.
11. Wilcox LS, Koonin LM, Pokras R, Strauss LT, Xia Z, Peterson HB. Hysterectomy in the United States, 1988–1990. *Obstet Gynecol.* 1994;83(4):549–555.