Original Article

Application of Uterus Manipulator in Total Abdominal Hysterectomy for Benign Diseases

Fateme Salehi; M.D., Sara Saeedi; MD., Zeynab Amiriariya; M.D., Elham Feizabad; M.D.

Department of Obstetrics and Gynecology, Yas Hospital, Tehran University of Medical Sciences, Tehran, Iran

Received February 2023; Revised and accepted June 2023

Abstract

Objective: Pelvic access is a challenging matter in abdominal hysterectomy especially in obese patients and presence of pelvic adhesions. Uterus manipulators (UM) have been used in a number of studies on laparoscopic approach to improve surgical performance. This study aimed to assess the impact of UM application on the operation time and blood loss in total abdominal hysterectomy (TAH) for benign diseases.

Materials and methods: Forty-one patients aged 34 to 56 years were enrolled for abdominal hysterectomy – 20 as the case group (hysterectomy with UM application) and 21 as the control group (conventional hysterectomy). In the case group, UM was used after uterus artery ligation during TAH. The control group underwent traditional TAH.

Results: The mean operation time was significantly less in TAH with UM compared to traditional TAH (90.23 ± 10.54 minutes vs. 140.5 ± 16.61 minutes; p-value<0.001). The mean decline between preoperative and 12-hour postoperative hemoglobin was 0.74 ± 0.23 mg/dL in the TAH with UM group and 1.65± 1.02 mg/dL in the traditional TAH group (p-value<0.001). Also, no difference was detected in intra- and post-operative complications.

Conclusion: The current study showed that, using UM is beneficial in total abdominal hysterectomy by decreasing the operative time and blood loss.

Keywords: Blood Loss; Operation Time; Uterus Manipulator

Introduction

Hysterectomy (Surgical resection of the uterus) for various benign and malignant conditions is one of the most commonly performed gynecological procedures (1). Hysterectomy is performed through three different surgical approaches; vaginal, abdominal and laparoscopic (1). Despite the development of advanced minimally invasive techniques such as vaginal and laparoscopic methods (2), the traditional approach of abdominal hysterectomy is inevitable in many situations (3-5). Moreover, gynecologists are primarily trained through the abdominal route compared to vaginal and laparoscopic techniques (2). There is a significantly higher cost of the procedure in laparoscopic hysterectomy compared to abdominal hysterectomy due to more time-consuming operation and higher cost of tools and instruments needed

Correspondence:
Dr. Elham Feizabad
Email: elhamfeizabad@gmail.com

for the minimally-invasive approach (6). Pneumoperitoneum and Trendelenburg position can also be considered as two of disadvantages of laparoscopy that may cause not choosing this approach in patients with medical comorbidities. Huge uterine size, pelvic organ adhesions, multiple previous laparotomies, patient's preference, and surgeon's skills and utilities are the other factors leading to high incidence of abdominal hysterectomy in comparison with minimally invasive techniques worldwide (7, 8).

Pelvic access is a challenging matter in abdominal hysterectomy especially in obese patients and presence of pelvic adhesions. Uterine manipulators (UM) have been used in a number of studies on laparoscopic approach to improve surgical performance; where the use of UM was associated with reduced operation time and intraoperative complications including iatrogenic injuries to urinary tract system (9, 10). UM delineates the exact location of cervicovaginal junction to cut the cervix from the vagina. To the best of our knowledge, only a limited number of studies addresses use of UM in abdominal hysterectomy. The main objective of the current study is to evaluate UM in facilitating abdominal hysterectomy as well as reducing the operation time and intraoperative blood loss (11).

Materials and methods

The dataset used in this study includes 41 candidates, who were suffering from chronic pelvic pain or abnormal uterus bleeding, and scheduled for abdominal hysterectomy at Yas hospital from October 2021 to April 2022. Patients with severe endometriosis were excluded from this study and referred for laparoscopy.

All patients underwent transvaginal ultrasonography performed by the same specialist to determine the uterus size in sagittal and coronal planes as well as the presence of adenomyosis, uterus leiomyoma, and endometriosis. Prior to surgery, endometrial sampling with Pipelle was done to identify endometrial hyperplasia and rule out endometrial cancer.

All surgeries were performed by chief residents of gynecology under supervision of obstetrics and gynecology specialists at Yas hospital. Same as other surgeries, prophylactic antibiotics and anti-thrombotic agents were received by the patients.

This study protocol was approved by the ethics committee of Tehran University of Medical Sciences (IR.TUMS.MEDICINE.REC.1400.580). All the participants signed a written informed consent.

The following steps were performed on both case and control groups. First, under general anesthesia in lithotomy position, abdominal wall was opened through Pfannenstiel incision. Then, after abdominopelvic exploration, bowels were packed with soaked gauze. Next, round ligaments were ligated and cut bilaterally. Following salpingectomy, oophorectomy was performed if necessary. Moreover, uterovesical space dissection was done sharply. After ureterolysis and uterus artery skeletonization, the uterus artery was doubly ligated and cut.

In this part of the surgery, the patients in the case group received the following procedure: the uterus returned into the abdomen and UM (Hohl manipulator- KARL STORZ AG, Tuttlingen, Germany) was inserted and the colpotomy was performed through the colpotomizer cup guidance. In contrast, the patients in the control group received the following procedure: the cardinal and uterosacral ligaments were ligated and cut. Next, colpotomy was done at the level of external ostium of the cervix.

In both case and control groups, the surgery was concluded by vaginal cuff closure through continuous suturing by 0 Vicryl. Operation time from skin incision to the last suture was measured by room clock. In addition to pre-operative check, hemoglobin level was checked 12 hours after operation in the same laboratory. Two post operation visits were scheduled on day 7 and 40 to assess any complications.

The baseline data that were recorded and used in this study includes: demographic information (e.g., age, Body Mass Index, gravidity, and parity), past surgical history (e.g., cesarean section, cystectomy, myomectomy), and patients' symptoms (e.g., abnormal uterus bleeding, chronic pelvic pain.)

The percentage, mean, and standard deviation of the collected data were shown by descriptive analysis. To compare the case and control groups, this study used crosstab test and two independent-sample T-tests (or Mann-Whitney U test if the distribution of the date was non-parametric). All statistical analysis were performed by SPSS version 24. The p-value less than 0.01 was considered statistically significant.

Results

The average age of participants in this study was 46.39±3.95 years (range between 34 and 56). Their median Body Mass Index (BMI) was 28.22 ± 2.12 kg/m^2 (range between 20 and 32). According to the primarily statistical analysis, the differences

between the average age, BMI, parity, previous cesarean section, and previous abdominal surgery of the case and control groups were not statistically significant (Table 1).

Table 1: Participants' demographic data and indications for surgery

Variables	Group		P-Value
	Case (n=21)	Control (n=20)	
Age (years)	46.09±3.6	46.7±4.37	0.631
Body mass index (kg/m^2)	28.66±1.39	27.75±2.65	0.242
Gravidity	3.23±1.14	3.25±1.52	0.934
Parity	2.57±0.75	2.45±1.1	0.706
Cesarean History	1.38±1.24	0.95±1.1	0.26
Uterus Size (mm)	118.42±18.02	115.05±21.01	0.389
Preoperative Hemoglobin (mg/dl)	11.24±1.06	12.03±1.38	0.031
Mild to moderate endometriosis	6 (28.6)	4 (20)	0.523
Hysterectomy Indication			0.625
AUB	15 (71.4)	15 (75)	
Hyperplasia	4 (19)	2 (10)	
Uterus leiomyoma	2 (9.5)	3 (15)	
Pelvic infectious disease	0	1 (5)	0.488

Hysterectomy was performed on the following indications among 41 participants in this study: thirty cases of abnormal uterus bleeding (73.2% of the total sample size), five cases of uterus leiomyoma (12.2% of the total sample size), and six cases of endometrial hyperplasia (14.6% of the total sample size). The average of uterus size was 118.42±18.02 mm and 115.05±21.01 mm in TAH with UM and traditional TAH, respectively. The difference was not statistically significant (Table 1).

The average of the operation time was 90.23±10.54 minutes in the TAH with UM group and 140.5±16.61 minutes in the traditional TAH group, which was significantly (p-value<0.001) less in TAH with UM group (Table 2).

Table 2: Operation outcomes in case and control groups

	Group		P-Value
	Case (n=21)	Control (n=20)	
Postoperative Hemoglobin (mg/dl)	10.50±1.01	10.38±1.63	0.629
Operation Time (min.)	90.23±10.54	140.5±16.61	<0.001

The average of decline between preoperative and 12-hour postoperative hemoglobin was 0.74 ± 0.23 mg/dL in the TAH with UM group and 1.65 ± 1.02 mg/dL in the traditional TAH group (p <0.001) (Table 3). No intra- or post- operation complication were detected.

Table 3: Difference in patient preoperative vs postoperative hemoglobin values between the groups

Group	Preoperative Hemoglobin	Postoperative Hemoglobin	Dif.	p-value
Case	11.24±1.06	10.50±1.01	0.74	<0.001
Control	12.03±1.38	10.38±1.63	1.65	<0.001

Discussion

It has been estimated that about 90% of all cases of hysterectomy were performed to treat benign conditions. While vaginal and laparoscopic routes are preferred for these indications (2), contraindications to the aforementioned approaches, the cost and shortage of equipments, and lack of required expertise may restrict the choice of route of surgery to the fallback option of abdominal hysterectomy. Therefore, in surgical planning, several crucial factors may be considered for a safe and cost-effective route of hysterectomy to fulfill the medical needs of the patients.

Although there is an increasing tendency of performing hysterectomy in a noninvasive manner (e.g., vaginal, laparoscopic, or robotic procedures), many situations still require abdominal hysterectomy (12). Counseled patients may choose the abdominal route over laparoscopic or vaginal if they are concerned about the potential side effects of tissue morcellation. Also, in large uteri cases, the abdominal approach is preferred—over minimally invasive approaches—due to its shorter operation time (2). In addition, UM may further improve surgical outcome by first, assisting the surgeon in raising the uterine out of the true pelvis, and second, delineating the cervicovaginal junction site as a landmark to mark the colpotomy line. Pushing UM upward also improves surgical performance by moving the ureters away from the surgical field, which results in less ureteral injuries (13, 14).

In this clinical study, 41 patients underwent total abdominal hysterectomy, 21 cases with and 20 without UM. In comparison to the control group (average time of 140 minutes), the procedure time in the case group was significantly shorter (average time of 90 minutes). There was also a substantial reduction

in hemoglobin decline in patients in the case group (total abdominal hysterectomy with UM.) The hemoglobin declines were 0.74 mg/dl and 1.65 mg/dl in the case and control groups, respectively (with a p-value of 0.001). Considering potential intra- and post-operative complications (including hematoma infection, ileus, pulmonary emboli, and ureter and bladder injury), no significant difference was found between two groups.

To the authors' best knowledge, the use of UM in abdominal hysterectomy has been investigated in a very few studies. Allam et al. (2020) described the use of V- Care UM (ConMed Endosurgery) to facilitate total abdominal hysterectomy. They found that UM is helpful in challenging hysterectomies cases (e.g., obesity, complex pelvic pathologies, long cervix, and history of cesarean section) (15). Their results emphasized on the role of UM in protecting vital structures, preserving vaginal length, improving surgical field exposure, and facilitating dissection (15). Huseyin Kiyak et al. (2021) also reported that the use of UM in abdominal hysterectomy prevents unintended shortening of the postoperative vaginal length and reduces sexual dysfunction as compared to the traditional abdominal hysterectomy procedure due to the precise detection of the colpotomy (11).

Based on this study, UM presented the following benefits:

-Allowing the cervicovaginal junction to be accurately located and easily seen during the operation as well as facilitating the dissection of utero-vesical space.

-Reducing the number of bites of cardinal ligament after uterine arteries ligation.

-Making surgery easier and faster especially in obese patients and those with a history of previous cesarean section and utero-vesical space fibrosis and adhesion.

-Preventing the excision of uterosacral ligament by showing the exact line above the uterosacral ligaments arch, which ultimately preserves the support of these ligaments.

According to Khalek et al. (2020), some major complications such as bowel perforation and uterine rupture may arise with the use of UM with different UMs in laparoscopic approach (16). However, none of the potential complications was observed in this study.

Possible limitations of this study are the small sample size and short follow-up duration. For future studies, there are a couple of suggestions to improve the current work including utilizing a larger sample size and evaluating the impact of UM in total abdominal hysterectomy through a randomized controlled trial.

Conclusion

This report demonstrated that utilizing a UM in total abdominal hysterectomy optimized the surgical performance and shortened the length of the procedure while reducing blood loss.

Conflict of Interests

Authors declare no conflict of interests.

Acknowledgments

This study was supported by Tehran University of Medical Sciences, Tehran, Iran.

References

1. Kavallaris A, Chalvatzas N, Kelling K, Bohlmann MK, Diedrich K, Hornemann A. Total laparoscopic hysterectomy without uterine manipulator: description of a new technique and its outcome. Arch Gynecol Obstet. 2011;283(5):1053-7.
2. A Aarts JW, Nieboer TE, Johnson N, Tavender E, Garry R, Mol BW, Kluivers KB. Surgical approach to hysterectomy for benign gynaecological disease. Cochrane Database Syst Rev. 2015;2015(8):CD003677.
3. Clarke A, Black N, Rowe P, Mott S, Howle K. Indications for and outcome of total abdominal hysterectomy for benign disease: a prospective cohort study. Br J Obstet Gynaecol. 1995;102(8):611-20.
4. Khaniki M, Shojaie M, Tarafdari A. Histopathological Study of Hysterectomy Operations in A University Clinic in Tehran From 2005 to 2009. J Family Reprod Health. 2011;5(2):51-55.
5. 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):270-5.
6. Nezhat C, Bess O, Admon D, Nezhat CH, Nezhat F. Hospital cost comparison between abdominal, vaginal, and laparoscopy-assisted vaginal hysterectomies. Obstet Gynecol. 1994;83(5 Pt 1):713-6. PMID: 8164929.
7. Ramdhan RC, Loukas M, Tubbs RS. Anatomical complications of hysterectomy: A review. Clin Anat. 2017;30(7):946-952.
8. Moen M. Hysterectomy for Benign Conditions of the Uterus: Total Abdominal Hysterectomy. Obstet Gynecol Clin North Am. 2016 Sep;43(3):431-40.

9. Husslein H, Frecker H, Shore EM, Lefebvre G, Latta E, Montanari E, Satkunaratnam A. Comparing two Uterine Manipulators During Total Laparoscopic Hysterectomy: A Randomized Controlled Trial. J Minim Invasive Gynecol. 2017;24(5):764-771.
10. Macciò A, Madeddu C, Kotsonis P, Chiappe G, Lavra F, Collu I, Demontis R. Feasibility and safety of total laparoscopic hysterectomy for huge uteri without the use of uterine manipulator: description of emblematic cases. Gynecol Surg. 2018;15(1):6.
11. Kiyak H, Karacan T, Ozyurek ES, Turkgeldi LS, Kadirogullari P, Seckin KD. Abdominal Hysterectomy with a Uterine Manipulator Minimizes Vaginal Shortening: A Randomized Controlled Trial. J Invest Surg. 2021;34(10):1052-1058.
12. ACOG Committee Opinion No. 444: choosing the route of hysterectomy for benign disease. Obstet Gynecol. 2009;114(5):1156-1158.
13. Janssen PF, Brölmann HA, Huirne JA. Causes and prevention of laparoscopic ureter injuries: an analysis of 31 cases during laparoscopic hysterectomy in the Netherlands. Surg Endosc. 2013;27(3):946-56.
14. van den Haak L, Alleblas C, Nieboer TE, Rhemrev JP, Jansen FW. Efficacy and safety of uterine manipulators in laparoscopic surgery: a review. Arch Gynecol Obstet. 2015;292(5):1003-11.
15. Allam MS, El-Sapagh K, Allam MM, Ferguson EJ, Mehasseb MK. The use of the V-Care laparoscopic uterine manipulator to facilitate total abdominal hysterectomy: a novel approach and case-series. J Obstet Gynaecol. 2020;40(4):537-540.
16. Abdel Khalek Y, Bitar R, Christoforou C, Garzon S, Tropea A, Biondi A, Sleiman Z. Uterine manipulator in total laparoscopic hysterectomy: safety and usefulness. Updates Surg. 2020;72(4):1247-1254.

Citation: Salehi F, Saeedi S, Amiriariya Z, Feizabad E. **Application of Uterus Manipulator in Total Abdominal Hysterectomy for Benign Diseases.** J Family Reprod Health 2023; 17(3): 174-8.