

Colpotomizer-assisted Total Abdominal Hysterectomy (CATAH Technique): A New Technique for Uterine Removal in Benign Pathologies

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Abstract

Objectives: The aim of this study is to evaluate the applicability and feasibility of Colpotomizer-assisted total abdominal hysterectomy (CATAH), a new technique for uterine removal in benign uterine pathologies.

Materials and Methods: This study is a prospective cohort study conducted at a tertiary University hospital in Egypt. Eligible patients ($n = 88$) for total abdominal hysterectomy (TAH) were divided into two groups; the study group who underwent TAH by the CATAH technique and the control group who underwent TAH by the conventional technique. Demographic data, operative time, blood loss, and operative complications were recorded.

Results: The mean operative time was significantly reduced (64.47 ± 3.60 min) in the study group than in the control group (86.42 ± 5.54 min, $P < 0.001$). The mean time for cervical removal was significantly less (8.60 ± 1.39 min) in the study group than (17.77 ± 2.62 min) in the control group ($P < 0.001$). The mean volume of blood loss was less (197.38 ± 39.42 ml) in the study group than in the control group (462.69 ± 167.96 ml). Complications were fewer in the study group than in the control group.

Conclusion: The CATAH technique was feasible, quicker with less intraoperative and postoperative complications than the conventional technique for TAH in benign uterine pathologies.

Keywords: Benign uterine pathologies, colpotomizer, colpotomizer-assisted total abdominal hysterectomy, total abdominal hysterectomy

INTRODUCTION

Hysterectomy is considered the second most commonly performed operation after cesarean section in the United States; in 4 years (2000–2004), approximately 3.1 million hysterectomies were performed with approximately 600,000/year.^[1] The most common indications for hysterectomy are uterine fibroids (40.7%), endometriosis (17.7%), and genital prolapse (14.5%).^[2]

Hysterectomy could be performed vaginally, abdominally, or with laparoscopic or robotic assistance.^[3] The best route for hysterectomy depends on the physician's skills, safety for

the patient, and economic cost. Vaginal hysterectomy, when feasible, is considered the safest and most cost-effective route for hysterectomy. In the USA; abdominal hysterectomy was performed in 66% of cases, vaginal hysterectomy in 22% of cases, and laparoscopic hysterectomy in 12% of cases.^[4]

Many gynecologists perform a supracervical hysterectomy (SCH) to reduce intraoperative blood and surgical times, to limit the likelihood of lower urinary tract symptoms and to maintain normal sexual function.^[5] Moreover, the risk of cancer cervix is not eliminated, requiring strict regular

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cytological follow up for a long period when SCH was chosen also irregular bleeding may complicate 20% of cases with the retained cervix.^[6]

Thakar *et al.*, randomized 279 patients with the benign disease to total or SCH and followed them for 1-year. They found that total abdominal hysterectomy (TAH) was associated with longer operative time and significant blood loss compared SCH group. Women who underwent TAH had a higher incidence of fever while in the hospital (27% versus 10%), but there was no difference in the rate of infectious morbidity. Within 1 year of discharge, more patients undergoing SCH experienced complications: 7% had cyclic bleeding, 2% had cervical prolapse.^[7]

TAH is associated with some complications like infectious morbidity (10.5%), urinary tract injuries (1%–2%), bowel injuries (0.1%–1%), and excess blood loss compared to vaginal or laparoscopic hysterectomy. Neuropathy occurs by a rate of 0.2%–2% after TAH. Vaginal cuff dehiscence was also reported after TAH (0.15%).^[8] Louie *et al.* reported that abdominal hysterectomy had a higher incidence of many complications, compared to laparoscopic hysterectomy regardless of uterine weight.^[9]

Theoretically, the new technique brings together the advantage of laparoscopic hysterectomy that of open surgery. The new technique utilizes the colpotomizer of laparoscopic hysterectomy in open surgery, allowing more delineation of the cervix, rising up the vagina away from the urinary bladder and hence minimizes hysterectomy related complications. Therefore, this study was conducted to evaluate the applicability and feasibility of a new technique; Colpotomizer-assisted total abdominal hysterectomy (CATAH) a new, simple technique for TAH.

PATIENTS AND METHODS

This study was a prospective cohort study conducted at Obstetrics and Gynecology Department, Tanta University Hospitals, Egypt, in the period from May 1, 2017–April 30, 2018. The last operation was done on April 30, 2018 with 1 year of follow-up.

Eligible participants

We included in our study women with benign uterine pathologies like fibroids, adenomyosis, endometrial hyperplasia, and chronic pelvic pain who accepted hysterectomy as a final treatment after failed other lines of treatment. All recruited women completed their family and were generally fit for surgery. However, we excluded from our study women who refused hysterectomy or had any suspicious malignancy. Finally, all women who refused participation in our study were excluded.

Methods

Eligible women who gave their informed consent were allocated to one of the study groups; CATAH group (Group I) or conventional hysterectomy group (Group II). All participated women were subjected to Pap smear, D and C biopsy, and pelvic U/S or computed tomography before surgery. After surgery, all patients received the standard postoperative care till discharge from the hospital.

Intervention

Under general anesthesia, laparotomy was done through Pfannenstiel incision; the uterus was extracted outside the abdomen. Division and transfixation of upper pedicles were done using vicryl 1 suture. The division included both round ligaments and infundibulopelvic ligament with leaving one or both ovaries according to age. The broad ligament on both sides was opened, and the bladder was dissected down as far as possible. Both uterine arteries were identified and clamped then secured by transfixed vicryl 1 sutures. After clamping and division of uterine arteries, patients were either operated by CATAH or conventional technique.

For the study group, the CATAH technique, the colpotomizer of the Mangeishkar uterine manipulator [Figure 1] was inserted at the beginning of surgery after urinary catheter fixation. The colpotomizer cup was not pushed up except after ligation of both uterine arteries. The assistant was asked to push the cup of colpotomizer into the vagina as high as possible to outline the cervix all around, facilitating its harvesting. Two clamps were applied to the stumps of ligated uterine arteries to demarcate the line of cutting not to be below the stump of uterine arteries. Monopolar diathermy was used to remove the cervix against the colpotomizer cup in a similar method to total laparoscopic hysterectomy. Colpotomy must be above the level of uterosacral ligaments, as displayed in the attached video. The vaginal cuff was then sutured by vicryl 1 then the peritoneum over the stump was closed by



Figure 1: Colpotomizer of Mangeishkar uterine manipulator

vicryl 2/0, then saline irrigation and closure of the abdomen in anatomical layers.

For the control group, the conventional TAH was continued by clamping and division of both Mackenrodt's ligaments transfixing them by vicryl 1. The anterior vaginal wall was grasped by long Allis and opened by sharp knife then the cervix was removed all around by sharp scissor from the vagina. The vaginal cuff was closed by vicryl 1 then the peritoneum over the stump was closed by vicryl 2/0, then saline irrigation and closure of the abdomen in anatomical layers.

Study outcomes

The primary outcomes were the feasibility of the CATAH technique measured by how many hysterectomies could be completed using the CATAH technique, the safety of the CATAH technique measured by blood loss, and intraoperative complications and the operative time which was calculated from skin incision to skin closure. Cervical removal time was the surgical time used to remove the cervix from the vagina. It is calculated immediately after divisions of both uterine arteries till complete removal of the uterus out of the abdomen. Blood loss was measured by combined weight methods and suction apparatus volume.

The secondary outcomes were postoperative complications and duration of hospital stay.

Ethical approval and trial registration

- Declaration of patient consent: All patients consented to participate in this study and signed informed consent
- Ethical approval: Before starting the study, approval from The Ethical Committee of Faculty of Medicine, Tanta University, was obtained on October 10, 2016 and the code 31167/10/16 was given to this clinical trial
- Clinical trial registration: This clinical trial was registered in University Hospital Medical Information Network clinical trials registry and given the code of UMIN000026891 on December 31, 2017. The URL of the trial: https://upload.umin.ac.jp/cgi-open-in/ctr_e/ctr_view.cgi?recptno=R000030849

Statistical analysis

The data were collected and entered into a Microsoft Access database then analyzed using the Statistical Package for the Social Science (SPSS Inc., Chicago, IL, USA, version 22). Quantitative data were presented in terms of mean \pm standard deviation then compared using a Student's *t*-test. Qualitative variables were presented as frequency and percentage. Chi-square test was used for comparison between groups. For analysis, $P < 0.05$ was considered to be significant.

RESULTS

Out of 90 eligible patients, two women had extensive dense pelvic adhesions and operated by SCH due to surgical

difficulty of reaching the cervix. Eighty-eight patients were divided into two groups.

The demographic data of enrolled patients were comparable in both groups without statistically significant differences. Patients with previous surgeries and laparotomy were nearly similar in both groups. The indications of hysterectomy are demonstrated in Table 1.

The total operative time and cervical removal times were shorter in the study group than in the conventional technique group ($P < 0.001$). The blood loss was significantly reduced in the study group than in the control group ($P < 0.001$). The complications were minimal in the CATAH group than in the conventional group. Operative complications were reported only in the conventional group and were bleeding (9.09%), urinary injuries (4.55%), and GIT injuries (2.27%).

Bleeding occurred in four cases in the conventional technique group, and they were managed by blood transfusion, hemostatic drugs. Two cases were due to bleeding from vaginal mucosal tear and managed by vaginal packing for 24 h. The third case was due to slipped infundibulopelvic ligament and was re-operated, and the bleeding pedicle was clamped and ligated once again, while the fourth case was due to pelvic hematoma and managed only by blood transfusion and antibiotics.

Organ injuries also occurred in the conventional technique group, where one case was complicated by mesenteric injury of the small bowel and managed by resection and re-anastomosis. The Urinary injuries were in the form of bladder injury, which occurred in 2 cases and re-sutured immediately at the same time. These cases required an extended hospital stay.

The postoperative complications were fever and wound infection, and these were not significantly different in both groups. Total cases with complications were significantly lower in the CATAH group 6/44 (13.64%) than in the conventional group 16/44 (36.36%) with $P = 0.014$. The duration of hospital stay was shorter in the CATAH Group 1.76 ± 1.01 days versus 2.55 ± 1.30 days in the conventional technique ($P = 0.002$), as shown in Table 2. Cases with fever were managed by antipyretics and antibiotics with an extended hospital stay. Wound infections were discovered at discharge with erythema, induration, and discharge. These cases also required extended hospital stay with broad-spectrum antibiotics injections.

DISCUSSION

Hence hysterectomy affects both woman's health and psyche; more efforts were investigated to minimize morbidity and complications related to hysterectomy. Patients' safety is

Table 1: Demographic data of the study participants

	CATAH group (n=44), n (%)	Conventional hysterectomy group (n=44), n (%)	P
Age	44.27±3.65	44.35±2.76	0.908
Parity	3.97±1.32	4.04±1.39	0.809
BMI	24.50±2.16	24.66±1.79	0.706
Previous laparotomy			
Yes	7 (15.9)	11 (25)	0.290
No	37 (84.1)	33 (75)	
Indication of hysterectomy			
Fibroid	21 (47.7)	18 (40.9)	0.198
Adenomyosis	14 (31.8)	10 (22.7)	
Endometrial hyperplasia	6 (13.6)	6 (13.6)	
Chronic pelvic pain	3 (6.8)	10 (22.7)	

All data are presented as mean±SD or n (%). BMI: Body mass index, CATAH: Colpotomizer-assisted total abdominal hysterectomy

Table 2: The operative details and complications of the study groups

	CATAH group (n=44)	Conventional hysterectomy group (n=44)	P
Operative time (min)	64.47±3.60	86.42±5.54	<0.001*
Cervical removal time (min)	8.60±1.39	17.77±2.62	<0.001*
Size of uterus (cm)	14.40±3.37	14.79±3.48	0.594
Blood loss (ml)	197.38±39.42	462.69±167.96	<0.001*
Operative/postoperative complications, n (%)			
No complications	38 (86.36)	28 (63.64)	0.014
Fever	3 (6.82)	6 (13.63)	0.291
Bleeding	0	4 (9.09)	0.041*
GIT injuries	0	1 (2.27)	0.315
Urinary injuries	0	2 (4.55)	0.153
Wound infection	3 (6.82)	3 (6.82)	1.000
Total complications	6/44 (13.64)	16/44 (36.36)	0.014*
Hospital stay (days)	1.76±1.01	2.55±1.30	0.002*

*Statistical significant difference. All data are presented as mean±SD or n (%).CATAH: Colpotomizer-assisted total abdominal hysterectomy, SD: Standard deviation

the main criterion to be put in mind during the choice of the type of hysterectomy. Introduction of minimally invasive procedures as vaginal, laparoscopic, laparoscopic-assisted and robotic-assisted hysterectomies were designed to increase the patients' safety, but unfortunately, these routes are limited to certain indications or so expensive or unavailable at countries with low resources.^[4,10]

In the current study, the aim was to test the feasibility and safety of TAH by the CATAH technique in benign uterine pathologies. The technique was associated with little blood loss. The estimated mean blood loss was (197.38 ± 39.42 ml) in the CATAH group, while it was (462.69 ± 167.96 ml) in the conventional group. Blood loss was minimized in the CATAH technique because of the use of monopolar diathermy in the opening of the vagina with little blood loss.

In this study, the use of colpotomizer of the Mangeshikar uterine manipulator provided benefits of laparoscopic hysterectomy to open surgery. The mean operative time was shorter in the study group than in the control group (64.47 ± 3.60 vs. 86.42 ± 5.54 min), respectively, $P < 0.001$). The mean time for

cervix removal was (8.60 ± 1.39 min) in the study group while it was (17.77 ± 2.62 min) in the control group ($P < 0.001$). The operative time was shortened due to good demarcation of the cervix all around the vaginal cuff, allowing confident and rapid removal of the cervix. The procedure was not associated with any urinary tract injuries due to the effect of colpotomizer, which elevated the vagina away from the bladder. The new technique had nonspecific postoperative complications due to little tissue trauma and manipulations.

To our knowledge, this is the only study to address the use of colpotomizer of laparoscopic hysterectomy in open surgery. The limitations of this study were the long term outcomes which are not reported in the current study as these require long follow up periods. We are already following these patients, and follow-up results will be illustrated in a separate study. The nonrandomized design of this study also is a weak point in the current study.

CONCLUSION

Total hysterectomy should be performed in women with benign uterine pathologies. As the compliance in

follow-up with Pap smear after SCH is deficient, this new technique (CATAH) for TAH provided the solution of such problem making total hysterectomy quicker with less blood loss and less procedure-related complications. Further studies should be carried out in different countries to confirm our results and validate the use of this new technique.

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Conflicts of interest

There are no conflicts of interest.

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