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Original article

Is an Enlarged Fibroid Uterus a Contraindication for Non-Descent Vaginal Hysterectomy (NDVH)? Retrospective Comparison between Cohort Whose Uterine Size ≥ 12 Weeks and Cohort Whose Uterine Size Less Than 12 Weeks Underwent NDVH

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Abstract:

Background: An enlarged fibroid uterus greater than 12 weeks considered a contraindication for Non-Descent Vaginal Hysterectomy (NDVH) by most gynecologic surgeons, is this contraindication real or alleged? **Aim:** to evaluate impact of uterine size on peri-operative consequences in women underwent NDVH for benign conditions. **Patients and Methods:** This study includes 340 women underwent NDVH; 232 women had uterine size up to 12 weeks (control group) and 108 women had uterine size more than 12 and up to 24 weeks (index group). **Results:** Both groups were similar regards menopausal, nulliparity status, number of prior vaginal birth, preoperative medical status, and American Society of Anesthesiologists grades ($P>0.05$), but different in percentage of women with fibroids, cervical pathology, prior Cesarean section, and virgin lower abdomen($P<0.05$). No important differences were detected in perioperative outcomes as transfusion, thrombosis, ureteral, bladder, or bowel injuries, fever, systemic infections, fistula, conversion to total abdominal hysterectomy, total postoperative (PO) complications and length of PO hospital stay ($P>0.05$). However, the effect of uterine size larger than 12 weeks in comparison to uterine size up to 12 weeks was significant on the subsequent outcomes total operative time (55 minutes) operative blood loss (160 ml), needs for general anesthesia, needs for debulking, needs for analgesics, decline in PO HB, and return to usual activity($P<0.05$).**Conclusion:** Non-Descent Vaginal Hysterectomy (NDVH) cloud be executed for women had fibroids with uterine size greater than 12 weeks without increase in perioperative morbid outcomes when compared to women with uterine size up to 12 weeks.

Keywords: fibroids, vaginal hysterectomy, NDVH, enlarged fibroid uterus, peri-operative consequences.

Introduction

Leiomyomas are benign growths that grow within or around the uterus. These tumors are popular in women of reproductive age and can initiate a range of symptoms, such as; intense menstrual bleeding, pelvic discomfort, and pressure on the bladder or rectum. In some cases, fibroids can grow to a size that requires surgical intervention, and hysterectomy is often the chosen treatment option [1,2].Non-Descent Vaginal Hysterectomy (NDVH) is the genuine minimally invasive Hysterectomy (MIH) that involves the extirpation of the uterus through the natural orifice without the need for abdominal incisions as in total abdominal Hysterectomy (TAH) or abdominal cuts as in total laparoscopic Hysterectomy (TLH) or Robotic assisted laparoscopic Hysterectomy (RALH) [3, 4].

As the NDVH is associated with high success rates, faster recovery times, lower morbidity rates , higher patient safety, higher security, efficient economics, excellent cosmesis, fewer perioperative morbidity, least complications, shortened operating time, reduced hospitalization, lesser costs, and quicker convalescence, the most prestigious gynecologic regularity authorities including American College of Obstetricians and Gynecologists (ACOG) in 2009 [5],2017 [6],2019 [7], International Society for Gynecologic Endoscopy (ISGE)in 2018,2020[8,9], American Association of Gynecologic Laparoscopists (AAGL)in2011[10], Danish Health Authority in 2017 (DHA) [11], National Institute for Health and Care Excellence (NICE) [12],Royal College of Obstetricians and Gynecologists (RCOG) [13], Society Obstetrics and Gynecology of Canada(SOGC) in 2002 [14],2011 [15],2018 [16],2019 [17], DGGG, OEGGG, SGGG collectively in 2015 [18,19], and Society of Gynecologic Surgeons (SGS)(20), are recommending vaginal route for hysterectomy for treatment of benign gynecologic conditions for mobile uteri up to 280 gram, which corresponding clinically to 12 weeks gestational age uterine size, in at least women who underwent prior vaginal delivery with absent of prior lower abdominal surgical procedures including cesarean section. Also, the same recommendation had been reported in literature [20-25] and Cochrane library reviews for surgical approach to hysterectomy for benign gynecologic disease of RCTs in 2005 [26],2006 [27],2009 [28],2015 [29],2023 [30] compared to traditional abdominal hysterectomy and other MIH including TLH and RALH. Moreover, AAGL has stated “surgeons-without the requisite training and skills required for the safe performance of vaginal hysterectomy or laparoscopic hysterectomy- should enlist the aid of colleagues who do or should refer patients requiring hysterectomy to such individuals for their surgical care.” [11] . Also, ACOG published a consideration on how to improve the evidence-based use of vaginal hysterectomy in benign gynecologic diseases by SGS educational committee [20]. Moreover, SGS systematic review group published an extensive review on comparison of vaginal hysterectomy (VH)Techniques and Interventions for Benign Indications [31] as well as a lot of American articles concentrate on underutilizations of the most value based vaginal hysterectomy [32].

However, there is a concern regarding the safety and feasibility of NDVH in women with an enlarged fibroid uterus. The size of the uterus can affect the ease of removal, and it is unclear whether an enlarged uterus is a contraindication for NDVH [1,4]. The large sized uterus more than 12 week was considered a traditional contraindication by most acting gynecologists who were surveyed for their opinion regrades routs for hysterectomy for benign gynecological diseases as stated in SGS’s systematic review attributable to uncertainties about increased technical difficulty and risk of complications [31,33,34], despite that a lot of pioneered

gynecologists worldwide including American [2,3,35-44], Canadian[45], English [46-49], Indian [23,50,51], Chinese [52], Malaysian [53],south Africans[8,9,45,54], French [4,55-57], polish [1,58], Italian [59-61], Greece [62] , Turkan [63-65] had been challenged the alleged uterine size as a contraindication for NDVH and they had succeeded in that task with great safety. Therefore, the goal of this retrospective research is to determine the safety and effectiveness of NDVH in women with an enlarged fibroid uterus in our local community and to compare the outcomes of NDVH in two cohorts: one with uterine size ≥ 12 weeks and the other with uterine size less than 12 weeks as well as reporting the most used volume reducing techniques including corporeal bisection, intra-myometrial coring procedure of lash, myomectomy, cervical transection , wedge resection, and spiral lateral morcellation [1,65]. This study will provide valuable insights into the safety and efficiency of NDVH in women with an enlarged fibroid uterus.

Patients and Methods:

This is an institutional review board (IRB) certified retrospective research explores the prior medical records- both paper and electronic- of women who underwent NDVH from January 2018 to May 2023, at the Obstetrics and Gynecology department of Benha University Hospital (BUH), Benha, Egypt, and various private centers related to the authors. We examined the records rigorously and de-identified data pertaining to all included patients after extracting and organizing pertinent data. Ethical approval was secured from the Benha Faculty of Medicine ethical committee (NO: RC.15. 8.2023).

Women deemed qualified for this analysis if they met the following conditions:1)-BMI ≥ 18.5 kg/m^2, 2)-hysterectomy performed through the vaginal route (TVH), 3)-underwent NDVH with either general or spinal anesthesia, 4)-age ≥18 years, 5)-Clinical follow-ups until complete recovery or at least 30 days post-surgery, 6)- non-descended uteri not exceeding first-degree uterine descent, even under anesthesia, 7)-diagnosed with benign uterine diseases. Women deemed unqualified for this analysis if: 1)-They had suspected malignancy, 2)-They exhibited second-degree uterine descent or more post-anesthesia, 3)-They underwent surgical interventions other than hysterectomy as vaginal repair or procedure for urinary incontinence, 4)-Their medical records were incomplete or lacked a 30-day postoperative follow-up.

All NDVH procedures were operated by senior gynecologic surgeons with a keen interest in the vaginal route for hysterectomy. These surgeons often challenged the traditionally accepted contraindications for NDVH including larger sized uteri more than 12 weeks, nulliparity, prior lower abdominal surgeries, absent prior vaginal birth, lack of uterine mobility, morbid obesity, benign adnexal pathologies, need for opportunistic bilateral salpingectomy (OBS) at time of hysterectomy as recommended by gynecologic societies and bilateral salpingo-oophorectomy for older age or when indicated.

We gathered the deemed important preoperative, intraoperative, and postoperative data from the medical records for each eligible patient. The pre-operative data collection encompassed various demographic details, involving; age, height, weight, and body mass index (BMI), parity, medical history indicating the need for hysterectomy, comorbid conditions such as; diabetes mellitus, hypertensive morbidity, renal disorders, orthopedic issues, hepatic disorders, airway obstructive diseases, any previous abdominal or vaginal surgeries, the preoperative hospital admission to correct preoperative medical disorders as; anemia either with blood transfer (BT) or intravenous iron with or without subcutaneous erythropoietin, clinical uterine size in gestational weeks,

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ultrasounds (US) uterine dimensions either transabdominal (TAS) or transvaginal (TVS) as length , width , thickness and calculated uterine weight in grams (length, width, thickness at fundus × 0.52) [66].

The intra-operative data collected included surgical details, such as the duration of surgery, which was defined as the total operative room (OR) time from entrance the OR to discharge from OR to ordinary or intensive care unit, including the actual surgical time from vaginal skin incision to vaginal skin closure. Usually, we started NDVH under spinal anesthesia for all patients, but in case of prolonged procedures general anesthesia either intravenous for shorter needed extra time or endotracheal controlled inhalational for longer need extra time may be needed. Also we collected the estimated intraoperative blood loss (OBL)ml, additional procedures performed at time of NDVH included bilateral salpingo-oophorectomy (BSO), opportunistic bilateral salpingectomy (OBS), ovarian cystectomy, restoration of damaged visceral organs such as the urinary bladder or intestine, and various techniques for voluminous uterine tissues reduction, including corporeal bisection, intra-myometrial coring procedure of lash, myomectomy, cervical transection , wedge resection, and spiral lateral morcellation, other the intra-operative complications as significant damage to major blood vessels or organs, such as the colon, bladder, and ureter, as well as the need for blood transfusion.

The collected post-operative information were; the duration of hospital stay (DOS) defined as time from discharge from OR till the discharge from hospital, HB concentration(CBC) in gm/dl, hematocrit value in %, decline in HB, revert to OR, postoperative complications as; pelvic or vault hematoma, vault cellulitis, vault dehiscence, vault abscess, abdominal wound status resulted from conversion, pulmonary consequences, and pneumonia, thromboembolic consequences, sepsis-related consequences, renal consequences, hospital readmission within 30 days, extended LOHS more than 3 days , postoperative histopathological uterine weight in grams as well as other medical situations deterioration.

The patients were subsequently classified into two groups- depending on their preoperative uterine clinical size, calculated ultrasound uterine weight and postoperative histopathological uterine weight- into: Group A; the study or index group, which was the focus of our study, consisted of women who had undergone NDVH with the clinical uterine size > 12 weeks ranging from 12 weeks to 20 weeks even more, ultrasound uterine calculated weight more than 280 grams, and postoperative uterine weight greater than 280 grams. Group B; the control or reference group include women who had undergone NDVH with the clinical uterine size ≤ 12 weeks ranging from 6 weeks to less than or equal 12 weeks, ultrasound uterine calculated weight up to 280 grams, and postoperative uterine weight less than 280 grams. The primary inquiry of our research was to clarify whether there is an impact on perioperative outcomes when comparing women in index study group with larger uteri than 280 grams to those who were in reference control group with uteri less than 280 grams.

For the statistical analysis, the 2016 version of Medcalc software for Windows desktop (www.medcalc.org) 2016 version was employed. Continuous variables were described as mean ± 2 standard deviations and range. Independent samples (unpaired) student's t-test was used to compare continuous variables between the two groups. Categorical variables were described as numbers and percentages. Fisher's exact test or Pearson's Chi-square test- were used to discern differences between the two groups. A two-sided $p < 0.05$ was deemed statistically significant.

Results:

This study includes a cohort of 340 women who underwent NDVH, 108 were in index study group with larger uteri than 280 grams and 232 women were in reference control group with uteri less than 280 grams, between January 2018 and May 2023, at BUH.

Table (1): Clinical and demographic attributes of studied patients who underwent NDVH with uterus ≤ 12 weeks and > 12 weeks.

Variable	uterus ≤ 12 weeks (n=232)	Uterus > 12 weeks (n= 108)	Δ(95% CI)	P value
- Clinical uterine size (weeks)	8.3 ± 3.7 (6 – 12)	16.7 ± 8.7 (12– 24)	8.4 (7.07 to 9.72)	**0.0001**
- US uterine weight grams	105 ± 36 (60 – 280)	165 ± 77 (280 – 1200)	60 (48 to 72)	**0.0001**
- US uterine length cm	9.5 ± 4.5 (6-12)	16.6 ± 9.7 (12 -28)	7.1 (5.58 to 8.61)	**0.0001**
- US uterine width cm	6.7 ± 3.4 (5-10)	14.6 ± 7.8 (8-17)	7.9 (6.7 to 9.1)	**0.0001**
- US uterine thickness cm	5.6 ± 2.9 (2.5-8)	10.4 ± 6.9 (7.5-18)	4.8 (3.75 to 5.85)	**0.0001**
- BMI (kg/m^2)	31.8 ± 6.5 (21.7 – 41.4)	32.3 ± 7.1 (22.7 – 44.6)	0.5 (1.03 to 2.03)	**0.52**
- Age (year)	46.6 ± 7.7 (37– 64)	43.7 ± 7.9 (40– 54)	2.9 (4.67 to 1.12)	**0.0015**
- Parity	2.7 ± 1.8 (0 - 9)	2.3 ± 1.3 (0 – 5)	0.4 (0.78 to 0.02)	**0.04**
- post-menopausal	78 (33.6%)	14 (13%)	20.6% (11% to 29%)	**0.0001**
- Nulliparity	42 (18.1%)	19 (17.6%)	0.5% (8.87% to 8.64%)	**0.9**
-NO prior vaginal delivery	76 (32.8%)	26 (24%)	8.8% (1.74% to 18.26%)	**0.1**
-PO HB (g/dl)	10.7 ± 1.7 (9.8-12.5)	10.9 ± 1.9 (10.2-12.9)	0.2 (0.2 to 0.6)	**0.33**
-PO HCT (%)	38.5 ± 11.4 (34-47)	39.5 ± 12.5 (34-50)	1 (1.69 to 3.69)	**0.47**
- PO IV Iron	112 (48.3%)	54 (50%)	1.7% (9.56% to 12.93%)	**0.77**
- PO erythropoietin	45 (19.4%)	23 (21.3%)	1.9% (6.78% to 11.67%)	**0.68**
- PO blood transfer	4 (1.7%)	3 (2.8%)	1.1% (2.09% to 6.28%)	**0.51**
- Previous pelvic surgery:				
- Cesarean section	134 (57.8%)	49 (45.4%)	12.4% (1.02% to 23.37%)	**0.03**
- other	25 (10.8%)	18 (16.7%)	5.9% (1.58% to 14.72%)	**0.13**
-virgin lower abdomen	61(26.3%)	41 (38%)	11.7% (1.2% to 22.5%)	**0.03**
- Comorbidity:				
- absent	142 (61.2%)	69 (63.9%)	2.7% (8.47% to 13.29%)	**0.63**
- HTN	53 (22.8%)	19 (17.6%)	5.2% (4.4% to 13.6%)	**0.27**
- DM	29 (12.5%)	12 (11.1%)	1.4% (6.77% to 8.13%)	**0.71**
- uncontrolled DM	15 (6.5%)	6 (5.5%)	1% (5.53% to 5.93%)	**0.72**
-others	18 (7.8%)	6 (5.5%)	2.3% (4.34% to 7.42%)	**0.44**
-POHBA1C (%)	7.9 ± 6.5 (4.6%-14.4%)	7.5 ± 5.6 (4.9%-14.8%)	0.4 (1.82 to 1.02)	**0.58**
-DOPS (days)	2.9 ± 1.7 (2-10)	3.1 ± 1.8 (2-11)	0.2 (0.19 to 0.59)	**0.32**
-ASA score :				
- ASA 1	145 (62.5%)	65 (60.2%)	2.3% (8.51% to 13.46%)	**0.69**
-ASA 2	67 (28.9%)	33 (30.6%)	1.7% (8.3% to 12.4%)	**0.75**
-ASA 3	20 (8.6%)	8 (7.4%)	1.2% (5.97% to 6.82%)	**0.71**
-ASA 4	3 (1.3%)	2 (1.9%)	0.6% (2.2% to 5.4%)	**0.67**
- Indication for hysterectomy:				
- Fibroid	33 (14.2%)	108 (100%)	85.8% (79.7% to 89.7%)	**0.0001**
- Adenomyosis	58 (25%)	28 (26%)	1% (8.45% to 11.36%)	**0.84**
- EH	45 (19.4%)	14 (13%)	6.4% (2.49% to 13.95%)	**0.15**
-CIN	66 (28.4%)	6 (5.5%)	22.9% (14.8% to 29.7%)	**0.0001**
- PMB	132 (57%)	59 (54.6%)	2.4% (8.72% to 13.65%)	**0.68**

NDVH: Non-Descent Vaginal Hysterectomy, US: Ultrasound, BMI: Body Mass Index, HTN: Hypertension, DM: Diabetes Mellitus, POHBA1C: Preoperative Glycated Hemoglobin A1C, DOPS: Duration of Preoperative Hospital Stay, ASA: American Society of Anesthesiologists, HB: Hemoglobin, HCT: Hematocrit, PO: postoperative, PMB: Perimenopausal Bleeding, EH: Endometrial Hyperplasia, CIN: Cervical Intraepithelial Neoplasia, Values were given as mean ± standard deviation (range) or number (percent), *P<0.05: Statistically significances*

Table (1) displays the clinical and demographic attributes of included women. There were substantial differences observed between women in both the index and control groups in terms of clinical uterine size (weeks), US uterine weight grams, length cm, width cm, thickness cm, age (study group was younger), parity (study group was lower), post-menopausal percentage (study group was lower), Cesarean section percentage (study group was less), percentage with virgin lower abdomen (study group was more), percentage with fibroid (study group was more) and percentage with cervical intraepithelial neoplasia (CIN) (study group was less) (P<0.05). However, there were no important differences

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regrades other items involving BMI, percentage of nulliparity, number of prior vaginal delivery, preoperative (PO) HB (g/dl), HCT (%), PO IV iron therapy, PO erythropoietin, PO blood transfer, associated comorbidities percentages, duration of preoperative hospital stays (DOPS), percentage of patients according to American Society of Anesthesiologists (ASA1,2,3,4), and other indication for hysterectomy (P>0.05). It is important to note that more women in index group had leiomyoma [33 (14.2%) vs. 108 (100%), Δ(95% CI) = 85.8% (79.7% to 89.7%), P=0.0001], while more women in control were underwent NDVH due to CIN.

Table (2): Comparison of intra-operative results of patients who underwent NDVH with uterus ≤ 12 weeks and > 12 weeks.

Outcome	uterus ≤ 12 weeks (n=232)	Uterus > 12 weeks (n= 108)	Δ(95% CI)	P value
Total OR time (min)	90 ± 20 (40– 150)	145 ± 55 (110-220)	55 (46.96 to 63.03)	**0.0001**
Operative blood loss (ml)	435 ± 120 (100-1000)	595 ± 190 (300 -1500)	160 (126 to 193)	**0.0001**
Conventional techniques	143 (61.6%)	77 (71.3%)	9.7% (1.3% to 19.7%)	**0.08**
Energy based techniques.	89 (38.4%)	31 (28.7%)	9.7% (1.3% to 19.7%)	**0.08**
-ligasure	46 (19.8%)	19 (17.6%)	2.2% (7.3% to 10.4%)	**0.63**
- biclamp	36 (15.5%)	9 (8.3%)	7.2% (0.69% to 13.69%)	**0.07**
- ultrasonics	7 (3%)	3 (2.8%)	0.2% (5.11% to 3.78%)	**0.92**
General anesthesia & its type	45 (19.4%)	88 (81.5%)	62.1% (52% to 70%)	**0.0001**
Intravenous	36 (15.5%)	65 (60.2%)	44.7% (33.93% to 54.33%)	**0.0001**
Endotracheal	9 (3.9%)	23 (21.3%)	17.4% (9.95% to 26.23%)	**0.0001**
Spinal anesthesia	232 (100%)	108 (100%)	0% (3.43% to 1.63%)	
Debulking & its type	148 (63.8%)	108 (100%)	36.2% (29.36% to 42.56%)	**0.0001**
- corporal bisection	88 (38%)	78 (72.2%)	34.2% (23.08% to 43.87%)	**0.0001**
- myometrial coring	32 (13.8%)	0 (0%)	13.8% (8.64% to 18.83%)	**0.0001**
- myomectomy	66 (28.4%)	108 (100%)	71.6% (64.58% to 77.01%)	**0.0001**
- wedge resection	43 (18.5%)	108 (100%)	81.5% (75.02% to 85.97%)	**0.0001**
- spiral morcellation	14 (6%)	96 (88.9%)	82.9% (74.65% to 88.12%)	**0.0001**
IO complications*				
- vesical injuries	4 (1.7%)	2 (1.9%)	0.2% (2.75% to 4.99%)	**0.9**
- ureteral	0 (0%)	0 (0%)	0% (1.63% to 3.43%)	
- intestinal injuries	0 (0%)	0 (0%)	0% (1.63% to 3.43%)	
- vascular injuries	0 (0%)	0 (0%)	0% (1.63% to 3.43%)	
- IO blood transfer	2 (0.9%)	2 (1.9%)	1% (1.63% to 5.72%)	**0.43**
-Conversion to laparotomy	3 (1.3%)	2 (1.9%)	0.6% (2.2% to 5.4%)	**0.67**
- total IO complications	9 (3.9%)	6 (5.5%)	1.6% (2.86% to 7.89%)	**0.5**
Concomitant procedures				
-VBS	142 (61.2%)	70 (64.8%)	3.6% (7.55% to 14.13%)	**0.52**
-VBSO	90 (38.8%)	38 (35.2%)	3.6% (7.55% to 14.13%)	**0.52**
- others vaginal	12 (5.2%)	5 (4.6%)	0.6% (5.5% to 5.1%)	**0.81**
-PO uterine weight(g)	132 ± 75 (60 – 280)	543 ± 285 (280 – 1500)	411 (371 to 450)	**0.0001**
-Uterus weight (category)				
-Small (≤100 g)	128 (55.2%)	0 (0%)	55.2% (47.91% to 61.46%)	**0.0001**
-Standard (101–280 g)	104 (44.8%)	0 (0%)	44.8% (37.66% to 51.23%)	**0.0001**
-Large (280–600 g)	0 (0%)	87 (80.5%)	80.5% (71.9% to 86.87%)	**0.0001**
-Very large (>600 g)	0 (0%)	21 (19.4%)	19.4% (12.84% to 27.85%)	**0.0001**

NDVH: Non-Descent Vaginal Hysterectomy, Δ(95% CI): Point estimate difference with 95% confidence interval, VBS: Vaginal Bilateral salpingectomy, VBSO: Vaginal Bilateral Salpingo-Oophorectomy, PO: postoperative, IO: intraoperative, OR: operative room, Values were given as mean ± standard deviation(range) or number (percent), *P<0.05: Statistically significance.*

Table (3): Comparison of early and late postoperative results of patients who underwent NDVH with uterus ≤ 12 weeks and > 12 weeks.

Outcome	uterus ≤ 12 weeks (n=232)	Uterus > 12 weeks (n= 108)	Δ(95% CI)	P value
PO pain - severe at 6h	64 (27.6%)	28 (25.9%)	1.7% (8.76% to 11.23%)	**0.74**
- severe at 24 h	36 (15.5%)	17 (15.7%)	0.2% (7.5% to 9.2%)	**0.96**
Analgesic requirements over 24h				
-Total narcotic (mg)	18.8 ± 8.2 (10-50)	19.2 ± 8.8 (10-50)	0.4 (1.52 to 2.32)	**0.68**
-Total parental NSAID (mg)	130.5 ± 49.5 (100-300)	150.5 ± 48.6 (100-350)	20 (8.72 to 31.28)	**0.0006**
Time to get out of bed (h)	5.9 ± 1.8 (2-14)	6.2 ± 1.9 (2-16)	0.3 (0.12 to 0.72)	**0.16**
Time to flatus(h)	5.8 ± 2.1 (3-24)	6.1 ± 1.9 (10-50)	0.3 (0.17 to 0.77)	**0.21**
-PO HB (g/dl)	9.9 ± 1.3 (9.1-11.8)	9.8 ± 1.4 (9.2-12.3)	0.1 (0.41 to 0.21)	**0.52**
-PO HCT (%)	36.3 ± 11.3 (33-45)	37.7 ± 13.4 (34-47)	1.4 (1.35 to 4.15)	**0.32**
decline in HB at (24h) (g/dl)	0.8 ± 0.6 (0.6-1.9)	1.1 ± 0.7 (0.8-2.1)	0.3 (0.15 to 0.45)	**0.0001**
LOHS (days)	1.3 ± 0.6 (0.5-14)	1.5 ± 0.8 (0.5-15)	0.2 (0.05 to 0.35)	**0.011**
Return to usual activity time (day)	10.6 ± 6.6 (3-20)	12.9 ± 8.9 (4-25)	2.3 (0.6 to 3.99)	**0.008**
Resumption of coitus(days)	17.6 ± 9.4 (6-50)	18.5 ± 10.8 (5-70)	0.9 (1.36 to 3.16)	**0.43**
Febrile morbidity	34 (14.7%)	13 (12%)	2.7% (5.76% to 9.76%)	**0.5**
Vaginal spotting	25 (10.8%)	17 (15.7%)	4.9% (2.4% to 13.6%)	**0.2**
Pelvic cellulitis	14 (6%)	6 (5.5%)	0.5% (5.98% to 5.34%)	**0.85**
Cystitis	28 (12%)	12 (11.1%)	0.9% (7.24% to 7.58%)	**0.81**
Wound complications	1 (0.4%)	1 (0.9%)	0.5% (1.59% to 4.63%)	**0.57**
Reoperation for wound	1 (0.4%)	1(0.9%)	0.5% (1.59% to 4.63%)	**0.57**
Need for VTE prophylaxis(days)	7 (3%)	5 (4.6%)	1.6% (2.44% to 7.54%)	**0.46**
Duration of VTE prophylaxis(days)	0.4 ± 0.2 (0.5-3)	0.3 ± 0.3 (0.5-4)	0.1 (0.15 to 0.05)	**0.0003**
PO vaginal length(cm)	7.3 ± 1.4 (5-10)	7.5 ± 1.6 (5-10)	0.2 (0.14 to 0.54)	**0.24**
Vesicovaginal fistula	1 (0.4%)	1 (0.9%)	0.5% (1.59% to 4.63%)	**0.56**
Total PO complications	103 (44.4%)	50 (46.3%)	1.9% (9.26% to 13.16%)	**0.74**
Return to ED	60 (25.9%)	25 (23.1%)	2.8% (7.42% to 11.97%)	**0.58**
Readmission within 30 days	45 (19.4%)	19 (17.6%)	1.8% (7.64% to 10.01%)	**0.69**

NDVH: Non-descent vaginal hysterectomy, Δ(95% CI): Point estimate difference with 95% confidence interval, NSAID: Non-steroidal anti-inflammatory drugs, VTE: venous thromboembolism, LOHS: length of postoperative hospital stays, HB: Hemoglobin, HCT: Hematocrit, PO: Postoperative, Values were given as mean ± standard deviation or number percent, *P<0.05: Statistical significance.*

Table (2) displays the intraoperative outcomes. The duration of operative room (OR) time was extended in the index group (90 min vs. 145, *P*= 0.0001), the likely operative blood loss (OBL/) was greater in the study group (435 ml vs. 595, *P*= 0.0001), the need for general anesthesia- both intravenous and endotracheal- was more in women with uterus > 280 grams (*P*<0.05), the debulking techniques, its types (figure1), postoperative (PO) uterine weight and its category were more in group with uterus >12 weeks(*P*<0.05). While opportunistic bilateral salpingectomy (OBS), bilateral salpingo-oophorectomy (BSO), conversion to total abdominal hysterectomy (TAH), intraoperative (IO) complications including unintended visceral injuries, blood transfusion, conversion to laparotomy, total intraoperative complications, bleeding requiring conversion, anesthetic complications, and retroperitoneal hematoma- no important differences- were observed between the groups (p > 0.05).

Table (3) displays the data pertaining to early and late postoperative outcomes for women who underwent NDVH, categorized into with uterus ≤ 12 weeks and with uterus > 12 weeks groups. The study group exhibited an increase (*P*<0.05) in the utilization of non-steroidal anti-inflammatory analgesics drugs (NSAIDs), length of postoperative hospital stays (LOHS), duration of returning to usual activity time, duration of resumption of coitus and duration of VTE prophylaxis, while, other postoperative consequences- were indifferent between groups.

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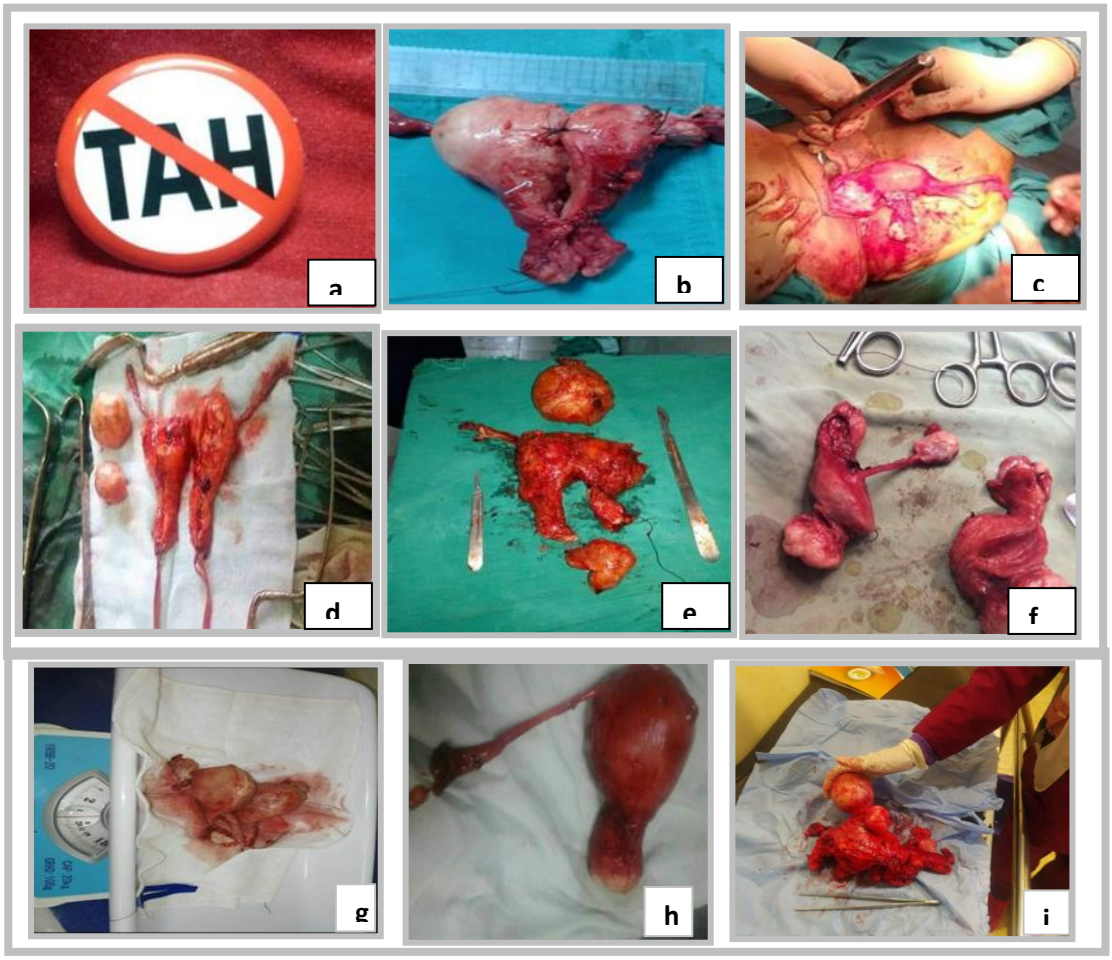

Figure 1: A: Stop doing total abdominal hysterectomy; B: non-descent vaginal hysterectomy (NDVH) with opportunistic bilateral salpingectomy (OBS) uterus was 12 weeks preoperative(PO) and 275 grams postoperative (PO); C: NDVH with salpingo-oophorectomy (SO) on the right side, broad ligament fibroid on left side during the procedures; D: non-descent vaginal hysterectomy (NDVH) with opportunistic bilateral salpingectomy (OBS) uterus was 16 weeks preoperative(PO) and 685 grams postoperative (PO); E: non-descent vaginal hysterectomy (NDVH) with salpingo-oophorectomy (SO) on the right side, uterus was 20 weeks preoperative(PO) and 1250 grams postoperative (PO); F: non-descent vaginal hysterectomy (NDVH) with bilateral salpingo-oophorectomy (BSO) uterus was 10 weeks preoperative(PO) and 245 grams postoperative (PO); G: non-descent vaginal hysterectomy (NDVH) with bilateral salpingo-oophorectomy (BSO) uterus was 16 weeks preoperative(PO) and 500 grams postoperative (PO); H: non-descent vaginal hysterectomy (NDVH) with opportunistic unilateral salpingectomy (OLS) uterus was 10 weeks preoperative(PO) and 245 grams postoperative (PO); I : non-descent vaginal hysterectomy (NDVH) with opportunistic bilateral salpingectomy (OBS) uterus was 24 weeks preoperative(PO) and 1500 grams.

Discussion:

Hysterectomy increased from 180 to 540 per 100,000 women/year in the West. The commonest benign reasons for hysterectomy are uterine leiomyomas (40-55%), perimenopausal bleeding (25%), endometriosis (17.7%) and uterine descent (15%). Safety and economic efficiency are crucial factors in determining hysterectomy route selection. In the latest hysterectomy route trend, VH has increased from 15/100,000 to 75/100,000 [(66)]. Despite that, VH is recommended by evidence for benign conditions to hysterectomy due to extensively documented health issues involving fewer morbidities, infections febrile episodes, shorter hospital stays, recuperation time and economic benefits versus TAH, TLH, RALH [(21-30)]. The NDVH is underutilized and continues after introduction of industry based TLH, RALH even in high

scientific communities [5-7]. This leads to, the United Healthcare company in USA to demand prior approval for all hysterectomies except those executed vaginally on an outpatient basis beginning April 2015 and, the FDA commended that surgeon no more use laparoscopic power morcellators for hysterectomy or myomectomy in most patients with uterine leiomyomas because of the hazard of disseminating occult cancer [66-68]. Also, lots of authors and communities has been succeeded in achieving higher rates of VH on expanses of TAH, as in Finland, VH rates improved from18% in 1996 to 44% in 2006 [20], in Sweden from 4% in 1987 to 31% in 2003[31], in university of Witwatersrand, Johannesburg, south Africa where rates of TAH/VH changed from 9/1 in 2001 to 1/1 at 2014 [49,54]. Hence, it is crucial to ensure that gynecologists have proper training in performing VH for benign disorders [33,34] as well as possess a comprehensive understanding of the indications [66-68], the real and the alleged contraindications with VH [20-25].

The evidence supporting VH for fibroid uteri up to 12 weeks in size and uterine volume ranging from 250 to 300 cc [5-30]. Non-Descent Vaginal Hysterectomy (NDVH) has been successfully performed on patients with larger uteri all over the globe [31-65]. Based on our trailed cases, it has been found that we could execute VH up to 24 weeks uterine size if the fibroids were multiple. Our success in VH with larger fibroid uteri than 12 weeks has been reported in literatures as single searched item either as a case report [62] or as a prospective cohort [45,46,63,65] in different countries across the globe, or as prospective both randomized and unrandomized or retrospective both simple or propensity score-based comparisons with either TAH, TLH, RALH exploring different perioperative both clinical and financial consequences [31-65]. Studies compare women underwent NDVH those with preoperative uterine size up to 12 weeks and postoperative histopathological uterine weight up to 280 grams against women with size more than 12 weeks and weight greater than 280 grams- displays similar results like we found regarding both safety and efficacy of NDVH in women with fibroids uteri larger than 12 weeks and 280 grams including Pogoda et al. [1], Shah et al. [3], Dubuisson et al. [4], Schmitt et al. [36], Wasson et al. [37], Buono et al. [40], Zaritsky et al. [41], Kammerer-Doak et al. [43], Unger et al. [44], Newbold et al. [49], Elzaher et al. [51], Deval et al. [55], Nazah et al. [56], Paparella et al. [59], Sirota et al. [63], Sahin et al. [64]. According to our findings, VH for uteri larger than 12 weeks is deemed safe, despite significantly longer OR time, higher OBL, longer LOHS, longer time needed to return to usual activity and more decline in postoperative HB. However, the rates of other perioperative consequences were not substantially different compared to VH performed on uteri less than 12 weeks. In our studies we didn't utilize a pre-operative regimen of GnRH agonists like other authors to medically debulk larger uteri, who reported an efficient surgical and beneficial clinical value from its usage [49,52].

The limitations of our data are the retrospective nature of the study, which may introduce potential selection bias. The mean complaints in our cohort were: perimenopausal bleedings (PMB), the causes of the uteri size greater than 12 weeks were myomas, which were confirmed in 100% of the cases in study group. Myoma is a significant contributor to PMB, so, it is reasonable to anticipate a higher prevalence of PMB among women with uteri weighing more than 280 g. Due to similar factors, there was a higher prevalence of VH for aberrant cervical pathology in the control group compared to the index group ($p < 0.05$). Instead, the decision-making process relied on clinical assessment of uterine size in vivo, the expertise of the surgeons, vaginal accessibility, and uterine mobility. We

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acknowledge that while this may lack objectivity, it does reflect the typical therapeutic practice of our unit at BUH.
Our research strengths were ability to reassure gynecologists regarding the use of NDVH for the removal of uteri larger than 12 weeks gestational size in women with previous CS, nulliparous women, higher BMI and in whom in need for OBS, BSO and those with benign adnexal pathology. We seek to demonstrate that the rates of complications associated with NDVH in these cases with larger uteri who underwent NDVH with 100% utilization of debulking techniques are not significantly different from those observed in cases involving uteri with size less than 12 weeks and weight less than 280 gram. Furthermore, it should be noted that pre-operative US- both TVS and TAS- were employed to estimate uterine volume or weight preoperatively beside clinical size estimation.

Conclusion:

The challenges during Non-Descent Vaginal Hysterectomy (NDVH) can be addressed with a skilled surgeon, capable and diligent assistants, appropriate surgical instruments, and optimal vaginal wall retraction. It is safe and effective to utilize both conventional and energy based to achieve NDVH and different intraoperative debulking volume reduction techniques. The results of this study indicate that NDVH can be performed safely in patients with uterine size up 24 weeks' gestational size, except for those with dense pelvic adhesions, severe endometriosis, solitary large uterine fibroid that widen both transverse and anteroposterior uterine diameters and adhesive or suspicious adnexal mass. Despite the longer duration of the procedure and increased blood loss during surgery, the findings demonstrate the feasibility and safety of vaginal hysterectomy in these patients. The performance of routine OBS and BSO- were feasible when needed during NDVH.

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