

Comparative Analysis of Operative Outcomes and Postoperative Complications Among NDVH, LAVH, And TLH In Women with Fibroid Uterus

Smriti Kumari¹, Chanchal², Poonam Kumari³

¹Senior Resident, Department of Obstetrics and Gynaecology, Jannayak Karpoori Thakur Medical College and Hospital (JNKTMCH) Madhepura, Bihar, India.

²Assistant Professor, Department of Obstetrics and Gynaecology, Jannayak Karpoori Thakur Medical College and Hospital (JNKTMCH) Madhepura, Bihar, India.

³Associate Professor and HOD, Department of Obstetrics and Gynaecology, Jannayak Karpoori Thakur Medical College and Hospital (JNKTMCH) Madhepura, Bihar, India.

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Corresponding Author: Dr. Smriti Kumari

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Abstract:

Background: Hysterectomy is a definitive treatment for fibroid uterus, and minimally invasive approaches such as nondescent vaginal hysterectomy (NDVH), laparoscopically assisted vaginal hysterectomy (LAVH), and total laparoscopic hysterectomy (TLH) are increasingly utilized, each with distinct operative profiles.

Aim: To compare operative outcomes and postoperative complications among NDVH, LAVH, and TLH in women with fibroid uterus.

Methodology: This prospective analytical study included 80 women with fibroid uterus undergoing hysterectomy at Department of Obstetrics and Gynaecology, Jannayak Karpoori Thakur Medical College and Hospital (JNKTMCH) Madhepura, Bihar, India. Patients were allocated to NDVH (n=30), LAVH (n=25), or TLH (n=25). Operative time, blood loss, uterine weight, complications, analgesic requirement, and hospital stay were compared using ANOVA.

Results: NDVH had the shortest mean operative time (56.1 ± 14.8 min) and least blood loss (58.4 ± 15.9 mL), while TLH had the longest operative time (124.3 ± 9.1 min) and highest blood loss (112.6 ± 18.7 mL) ($P < 0.0001$). Intra-operative complications were minimal across groups. Postoperative complications were mild and comparable, and hospital stay did not differ significantly.

Conclusion: NDVH is the most efficient approach in appropriately selected patients, while LAVH and TLH provide safe alternatives when vaginal hysterectomy is not feasible.

Keywords: Fibroid Uterus, NDVH, LAVH, TLH, Minimally Invasive Hysterectomy.

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Introduction

Hysterectomy can be defined as the surgical removal of the uterus and is one of the common gynecological surgeries globally. It remains the definitive treatment for a variety of benign and malignant uterine conditions, including uterine fibroids, abnormal uterine bleeding, adenomyosis, and malignancies of the reproductive tract. Of these, fibroid uterus is one of the leading indications of hysterectomy in reproductive and perimenopausal age women, contributing mainly to morbidity due to symptoms such as menorrhagia, pelvic pain, and pressure symptoms. Basically, hysterectomy may be done through various surgical approaches such as abdominal, vaginal, laparoscopic routes, or a combination thereof; each technique has some distinct advantages and shortcomings with regard to invasiveness, recovery time, and complication rates [1].

Incidence of hysterectomy has been reported to be around 4%–6% in India, with around 90% being done for benign indications including fibroids, dysfunctional uterine bleeding, and endometriosis [2]. Despite the availability of minimally invasive surgical techniques, abdominal hysterectomy still remains the most frequently performed procedure, especially in rural and semi-urban areas. Several reasons are accountable for the persistence of abdominal route as the most prevalent modality: poor patient awareness about the benefits of laparoscopic or vaginal routes, lesser procedural expenses of open surgery, and relative simplicity and comfort of the technique among the practicing surgeons.

Over the past two decades, minimally invasive hysterectomy techniques have gained considerable popularity as a result of their associated advantages, including reduced postoperative pain, shorter hospital

stays, faster recovery, improved cosmetic outcomes, and lower risk of wound-related complications. Among these, nondescent vaginal hysterectomy (NDVH), laparoscopy-assisted vaginal hysterectomy (LAVH), and total laparoscopic hysterectomy (TLH) are increasingly employed in the management of benign uterine conditions, including fibroids. Each technique, however, is associated with unique operative considerations and potential complications that may influence surgical decision-making.[3]

NDVH represents the less invasive approach among minimally invasive techniques, offering a scarless outcome and reduced postoperative morbidity. It is associated with shorter operative times and quicker recovery; however, its applicability is limited in cases involving large uterine masses, significant pelvic adhesions, or coexisting adnexal pathology. Consequently, the feasibility of NDVH is often constrained by anatomical and pathological factors [4].

LAVH represents an important alternative to abdominal hysterectomy when vaginal hysterectomy is technically difficult. Combining laparoscopic and vaginal approaches, LAVH provides better visualization and treatment of adnexal pathology, adhesions, and larger uteri without the need for a complete abdominal incision. This hybrid approach enhances the benefits of minimally invasive surgery, which includes reduced postoperative pain, shortened hospital stay, and faster resumption of activities, while overcoming certain limitations imposed by standard vaginal hysterectomy.

In contrast, TLH involves the complete removal of the uterus via laparoscopic ports without the need for a vaginal incision. Although this gives excellent visualization and access to pelvic structures, it generally requires longer operative times and may have a higher intraoperative complication rate, especially in less experienced hands. Factors such as the learning curve with TLH and technical expertise needed for its safety remain significant considerations in determining suitability for this approach [5].

The uterine size, pelvic adhesions, adnexal pathology, patient comorbidities, experience of the surgeon, and resources can all affect the choice of surgical approach. Operative outcomes and postoperative complications must be compared among NDVH, LAVH, and TLH to achieve an optimal outcome in the planning of surgery. Such comparative studies about intraoperative blood loss, operative time, analgesic requirements, recovery, and complication rates will help in trying to find the most appropriate technique for women with fibroid uterus, especially in resource-poor settings where surgical expertise might be restricted.

This study will present a comprehensive comparison between NDVH, LAVH, and TLH regarding operative feasibility, safety, and postoperative outcome

among women undergoing hysterectomy due to benign uterine disease in a rural tertiary care center. The primary objectives include operative time, intraoperative blood loss, analgesics required, duration of hospital stay, and incidence of intra- and postoperative complications. In this research, these parameters will be systematically analyzed to find the most effective, safe, and feasible surgical approach, thereby guiding clinical decisions and improving patient outcomes related to the management of fibroid uterus.

Methodology

Study Design: This study was a prospective analytical study conducted in the Department of Obstetrics and Gynaecology at Jannayak Karpooi Thakur Medical College and Hospital (JNKTMCH), Madhepura, Bihar, India.

Study Area: This study was conducted in Department of Obstetrics and Gynaecology, JNKTMCH, Madhepura, Bihar, India.

Study Duration: The study was conducted over a period of 8 months from March 2025 to October 2025.

Sample Size: A total of 80 patients undergoing hysterectomy for fibroid uterus were included in the study.

Study Population: Women diagnosed with fibroid uterus requiring hysterectomy and fulfilling the inclusion criteria were enrolled. Patients were divided into three groups based on the type of hysterectomy performed: NDVH, LAVH, and TLH.

Inclusion Criteria

- Women with uterus size ≤ 16 weeks by clinical examination.
- Patients suitable for lithotomy or semi-lithotomy position.
- Women undergoing hysterectomy for benign fibroid uterus.
- Patients provide written informed consent.

Exclusion Criteria

- History of previous pelvic or abdominal surgery (e.g., myomectomy, adnexectomy, laparotomy).
- Previous lower segment cesarean section (LSCS).
- Presence of complex adnexal masses or simple adnexal masses > 5 cm.
- Restricted uterine mobility on examination.
- Cases requiring conversion to laparotomy.

Data Collection: Data were collected prospectively for all enrolled patients using a structured proforma. Preoperative data included patient demographics, clinical history, physical examination findings, uterine size, and relevant laboratory and imaging

investigations. Intraoperative parameters such as duration of surgery, estimated blood loss, and any intraoperative complications were recorded. Operative time for NDVH was calculated from the cervicovaginal incision to vaginal packing, whereas for LAVH and TLH it was measured from the insertion of the first laparoscopic port to completion of wound dressing. Blood loss was estimated by measuring the volume in the suction apparatus and by weighing surgical mops. Postoperative data included pain assessment based on analgesic requirement, febrile morbidity, postoperative complications, and duration of hospital stay. The requirement of additional analgesia in the form of tramadol on the first postoperative day was also documented. All patients were followed up during their hospital stay until discharge.

Procedure: All patients were admitted one day prior to surgery after obtaining anesthesia clearance. Written informed consent was taken from each patient. Standard preoperative bowel preparation was performed, and prophylactic broad-spectrum antibiotics were administered one hour prior to surgery. NDVH was performed under spinal anesthesia with the patient in lithotomy position. A circumferential incision was made at the cervicovaginal junction following hydrodissection, and standard steps of vaginal hysterectomy were followed. In cases where uterine delivery was difficult, bisection of the uterus was performed. LAVH and TLH were conducted under general anesthesia with pneumoperitoneum created using carbon dioxide. Laparoscopic ports were inserted in standard positions, and a colpotomizer was used in all cases. In TLH, uterine vessels were skeletonized, coagulated, and transected laparoscopically, followed by circumferential colpotomy and laparoscopic closure of the vaginal cuff. In LAVH, laparoscopic dissection continued up to bladder mobilization, after which the remaining steps were completed vaginally. The uterus was removed vaginally in all procedures. Hemostasis was

ensured, saline irrigation was performed, and port site closure was done where applicable. All surgeries were performed by senior surgeons with comparable surgical expertise to minimize operator-related bias.

Statistical Analysis: The collected data were compiled and entered into a master chart and analyzed using appropriate statistical software. Continuous variables were expressed as mean and standard deviation, while categorical variables were expressed as frequencies and percentages. Comparative analysis of operative outcomes and postoperative complications among the three groups (NDVH, LAVH, and TLH) was performed using one-way analysis of variance (ANOVA). A P value of less than 0.05 was considered statistically significant, and a P value of less than 0.0001 was considered highly significant.”

Result

Table 1 depicts the demographic profile of the study population (N = 80) across NDVH, LAVH, and TLH groups. The majority of patients in all three groups belonged to the 41–50 years age group, accounting for 24 patients (80.0%) in the NDVH group, 20 patients (80.0%) in the LAVH group, and 21 patients (84.0%) in the TLH group, contributing to 65 cases (81.3%) overall, with comparable mean ages of 45.2 ± 4.8 years, 44.6 ± 3.9 years, and 45.8 ± 4.2 years respectively. Most patients were multiparous, with parity of 3–4 being the most common, observed in 20 patients (66.7%) in the NDVH group, 17 patients (68.0%) in the LAVH group, and 13 patients (52.0%) in the TLH group, giving an overall proportion of 62.5%, while the mean parity ranged from 2.8 to 3.6 across groups. The mean body mass index was comparable among the groups, being 27.2 ± 2.1 kg/m² in the NDVH group, 26.4 ± 2.0 kg/m² in the LAVH group, and 25.8 ± 2.3 kg/m² in the TLH group. Overall, Table 1 indicates that the demographic characteristics were similar across the three hysterectomy approaches.

Demographic parameters	NDVH (n = 30)	LAVH (n = 25)	TLH (n = 25)	Total (n = 80)
Age (years)				
30–40	4 (13.3%)	3 (12.0%)	2 (8.0%)	9 (11.3%)
41–50	24 (80.0%)	20 (80.0%)	21 (84.0%)	65 (81.3%)
51–60	2 (6.7%)	2 (8.0%)	2 (8.0%)	6 (7.5%)
Mean age (years)	45.2 ± 4.8	44.6 ± 3.9	45.8 ± 4.2	—
Parity				
1–2	5 (16.7%)	6 (24.0%)	9 (36.0%)	20 (25.0%)
3–4	20 (66.7%)	17 (68.0%)	13 (52.0%)	50 (62.5%)
≥5	5 (16.6%)	2 (8.0%)	3 (12.0%)	10 (12.5%)
Mean parity	3.6 ± 1.4	3.1 ± 1.1	2.8 ± 1.3	—
Mean BMI (kg/m²)	27.2 ± 2.1	26.4 ± 2.0	25.8 ± 2.3	—

Table 2 summarizes the indication for hysterectomy, uterine size, and associated procedures among patients undergoing NDVH (n = 30), LAVH (n = 25),

and TLH (n = 25). Fibroid uterus was the indication for hysterectomy in all patients across the three groups, accounting for 100% of cases (80/80).

Regarding uterine size, the majority of patients had a uterine size of 10–12 weeks, seen in 14 patients (46.7%) in the NDVH group, 10 patients (40.0%) in the LAVH group, and 16 patients (64.0%) in the TLH group, contributing to 40 cases (50.0%) overall. Uterine size of 13–15 weeks was observed in 9 patients (30.0%) in the NDVH group, 8 patients (32.0%) in the LAVH group, and 4 patients (16.0%) in the TLH group. Smaller uteri of 6–9 weeks

constituted 15.0% of the total cases, while uterine size up to 16 weeks was noted in 7 patients (8.7%). Salpingo-oophorectomy was performed in 21 patients (26.3%) overall, with higher rates in the TLH group (11 patients, 44.0%), followed by LAVH (8 patients, 32.0%), and NDVH (2 patients, 6.6%), indicating that adnexal removal was more commonly associated with laparoscopic approaches.

Parameters	NDVH (n = 30)	LAVH (n = 25)	TLH (n = 25)	Total (n = 80)
Indication of hysterectomy				
Fibroid uterus	30 (100%)	25 (100%)	25 (100%)	80 (100%)
Uterine size (weeks)				
6–9	4 (13.3%)	5 (20.0%)	3 (12.0%)	12 (15.0%)
10–12	14 (46.7%)	10 (40.0%)	16 (64.0%)	40 (50.0%)
13–15	9 (30.0%)	8 (32.0%)	4 (16.0%)	21 (26.3%)
Up to 16	3 (10.0%)	2 (8.0%)	2 (8.0%)	7 (8.7%)
Salpingo-oophorectomy				
Unilateral	1 (3.3%)	3 (12.0%)	5 (20.0%)	9 (11.3%)
Bilateral	1 (3.3%)	5 (20.0%)	6 (24.0%)	12 (15.0%)
Total	2 (6.6%)	8 (32.0%)	11 (44.0%)	21 (26.3%)

Table 3 compares the intra-operative variables among different methods of hysterectomy, namely NDVH (n = 30), LAVH (n = 25), and TLH (n = 25). The operating time was shortest for NDVH, with 14 patients (46.7%) operated within 30–60 minutes and 16 patients (53.3%) within 61–90 minutes, resulting in a mean duration of 56.1 ± 14.8 minutes. In contrast, LAVH procedures predominantly lasted 91–120 minutes in 19 patients (76.0%), with a mean operating time of 101.6 ± 11.2 minutes, while TLH had the longest duration, with 18 patients (72.0%) requiring more than 120 minutes and a mean time of 124.3 ± 9.1 minutes; the difference in operating time was statistically significant (ANOVA, $P < 0.0001$).

Regarding uterine weight, most cases across all groups fell within the 100–200 g range, particularly in the TLH group (76.0%), with mean uterine weights of 195 ± 58 g for NDVH, 215 ± 62 g for LAVH, and 188 ± 65 g for TLH, showing a statistically significant difference ($P = 0.003$). Blood loss was lowest in the NDVH group, with a mean of 58.4 ± 15.9 mL, compared to 92.1 ± 11.4 mL in the LAVH group and 112.6 ± 18.7 mL in the TLH group; this difference was also statistically significant ($P < 0.0001$). Overall, Table 3 indicates that NDVH is associated with shorter operating time and less blood loss compared to LAVH and TLH.

Intra-operative variables	NDVH (n = 30)	LAVH (n = 25)	TLH (n = 25)	Statistical analysis
Operating time (minutes)				
30–60	14 (46.7%)	0	0	
61–90	16 (53.3%)	6 (24.0%)	0	
91–120	0	19 (76.0%)	7 (28.0%)	
>120	0	0	18 (72.0%)	
Mean time (minutes)	56.1 ± 14.8	101.6 ± 11.2	124.3 ± 9.1	ANOVA, $P < 0.0001$
Uterine weight (grams)				
100–200	18 (60.0%)	13 (52.0%)	19 (76.0%)	
201–300	10 (33.3%)	9 (36.0%)	5 (20.0%)	
301–400	2 (6.7%)	3 (12.0%)	1 (4.0%)	
Mean weight (g)	195 ± 58	215 ± 62	188 ± 65	$P = 0.003$
Blood loss (mL)				
30–60	10 (33.3%)	0	0	
61–90	15 (50.0%)	14 (56.0%)	6 (24.0%)	
91–120	5 (16.7%)	11 (44.0%)	11 (44.0%)	
>120	0	0	8 (32.0%)	
Mean blood loss (mL)	58.4 ± 15.9	92.1 ± 11.4	112.6 ± 18.7	$P < 0.0001$

Table 4 compares intra-operative and post-operative complications among patients undergoing NDVH (n = 30), LAVH (n = 25), and TLH (n = 25). Intra-operatively, bladder injury was noted only in the LAVH group in 1 patient (4.0%), while ureteric injury and intra-operative blood transfusion occurred exclusively in the TLH group, each in 1 patient (4.0%); no intra-operative complications were reported in the NDVH group. Post-operatively, nausea and vomiting were most frequent in the TLH group (4 cases, 16.0%), followed by LAVH (3 cases, 12.0%) and NDVH (2 cases, 6.7%). Fever occurred in 1 patient (4.0%) in the LAVH group and 2

patients (8.0%) in the TLH group, with none in the NDVH group. Vaginal cuff infection was observed in 1 patient each in the LAVH and TLH groups (4.0%), while wound infection was seen only in the TLH group (1 patient, 4.0%). Requirement of top-up analgesia was highest in the NDVH group (11 patients, 36.7%), followed by LAVH (8 patients, 32.0%) and TLH (6 patients, 24.0%). The mean duration of hospital stay was 3.1 ± 0.6 days for NDVH, 3.8 ± 0.7 days for LAVH, and 3.5 ± 0.6 days for TLH, with no statistically significant difference among the groups (ANOVA, $P = 0.42$).

Complications	NDVH (n = 30)	LAVH (n = 25)	TLH (n = 25)
Intra-operative complications			
Bladder injury	0	1 (4.0%)	0
Ureteric injury	0	0	1 (4.0%)
Blood transfusion	0	0	1 (4.0%)
Post-operative complications			
Nausea / vomiting	2 (6.7%)	3 (12.0%)	4 (16.0%)
Fever	0	1 (4.0%)	2 (8.0%)
Vaginal cuff infection	0	1 (4.0%)	1 (4.0%)
Wound infection	0	0	1 (4.0%)
Top-up analgesia required	11 (36.7%)	8 (32.0%)	6 (24.0%)
Mean hospital stay (days)	3.1 ± 0.6	3.8 ± 0.7	3.5 ± 0.6
ANOVA (hospital stay)	P = 0.42 (NS)		

Discussion

The present study evaluated and compared operative outcomes and postoperative complications among NDVH, LAVH, and TLH in women with fibroid uterus, and the findings largely align with existing literature while also highlighting certain contrasts. In our study, the majority of women were in the 41–50-year age group with a comparable mean age across all three surgical approaches, which is in line with several previous studies that have documented fibroid uterus as a common indication for hysterectomy in the perimenopausal age group (Schindlbeck et al., 2008; Murali & Khan, 2019) [6,7]. Similar age distribution has also been reported by Roy et al. (2011) [8] and Shin et al. (2011) [9], supporting the view of route selection being more dependent on clinical factors rather than age alone.”

Multiparity was more frequent in the NDVH group, with a higher mean parity as compared to LAVH and TLH. This finding is in concordance with previous reports that vaginal hysterectomy is more frequently performed in multiparous women due to better vaginal access and uterine descent (Cruikshank, 2008; Murali & Khan, 2019) [10,7]. Our findings are marginally different from Sesti et al. (2014) [11], who presented comparable parity in different hysterectomy routes, plausibly from differences in selected patient criteria and surgical expertise. The marginally increased BMI noted in the NDVH group in our

study further reaffirms evidence that NDVH can be safely performed even in women with higher BMI with associated comorbidities also emphasized by Murali and Khan (2019) [7] and the ACOG Committee Opinion (2017) [4].

The indication for hysterectomy was fibroid uterus in all patients in the present study, which reflects findings from several comparative studies where fibroids represented the most common benign indication regardless of the route of surgery (Roy et al., 2011; Siedhoff et al., 2015) [8,12]. While most uteri in our series measured between 10 and 12 weeks in size, larger uteri of up to 16 weeks were also safely managed, mostly using laparoscopic approaches. The mean uterine weight was significantly higher in the LAVH group, reflecting a preference for LAVH in moderately larger uteri. This result compares with the series by Shin et al. (2011) [9], who showed that LAVH is especially feasible in larger uteri because of the advantage of laparoscopic mobilization combined with vaginal extraction. In contrast, NDVH was predominantly selected for relatively smaller uterine sizes, which agrees with previous recommendations that vaginal hysterectomy may be technically challenging in significantly enlarged uteri (Wang et al., 2016) [13].

Associated salpingo-oophorectomy was most commonly performed in the TLH group in our study, followed by LAVH, with least adnexal removal in the

NDVH group. Though many studies have shown that adnexa can be removed vaginally in a high percentage of cases (Sesti et al., 2014; Roy et al., 2011) [11,8], our lower rate in the NDVH group could reflect cautious patient selection and limited vaginal access in fibroid uterus without descent. Similar trends favoring laparoscopic routes for adnexal surgery have been reported by Shin et al. (2011) [9] and Murali and Khan (2019) [7].

Operative time differed among the three techniques: NDVH had the shortest duration, while TLH had the longest. These findings are strongly supported by literature data. Roy et al. (2011) [8], Drahonovsky et al. (2010) [14], and Murali and Khan (2019) [7] also showed shorter operative time for NDVH compared to laparoscopic approaches. This may be because the longer duration for TLH in our study could be explained by the learning curve, extensive dissection, and intracorporeal suturing, as was also pointed out by Schindlbeck et al. (2008) [6]. Intraoperative blood loss was lowest in the NDVH group and highest in the TLH group. Similar trends were also seen from Murali and Khan (2019) [7] and Chattopadhyay et al. (2017) [2], who mentioned that NDVH is a surgery with minimal blood loss due to limited tissue dissection and absence of vascular changes due to pneumoperitoneum.

Intraoperative complications were few in our series. None of the patients in the NDVH group had complications. Incidence of bladder injury in LAVH and ureteric injury in TLH coincides with the reported incidence in literature, where urinary tract injuries are seen to vary from 0.8% to 2% (Baggish, 2012; Shin et al., 2011) [15,9]. Absence of major complications in NDVH further establishes its safety profile, a fact emphasized by Cruikshank (2008) [10]. Postoperative nausea, fever, and infection of the vault of the vagina were higher in the laparoscopic groups, comparable to that seen by Roy et al. (2011) [8] and Drahonovsky et al. (2010) [14]. The finding of a higher analgesic requirement in the NDVH group in our study is contrary to some reports of less postoperative pain in vaginal hysterectomy. However, similar findings of lower pain scores in TLH have been documented by Chattopadhyay et al. 2017 [2], due to less traction and better visualization.

The mean duration of stay in the hospital was similar among all three groups in our study, without any statistical significance. This is consistent with various studies showing that hospital stays range between 3 and 7 days irrespective of the route, especially in rural or resource-limited areas (Murali & Khan, 2019; Aboufotouh et al., 2020) [7,16]. Overall, our findings add to existing evidence that NDVH remains a safe, efficient, and cost-effective option for appropriately selected women with fibroid uterus, while LAVH and TLH offer definite advantages in cases of larger uteri and adnexal surgery, with a message that the choice of route must be individualized

according to patient characteristics and surgical expertise.

Conclusion

This comparative study concludes that all three-NDVH, LAVH, and TLH-are effective and safe surgical approaches to deal with fibroid uterus, each showing a different operative and postoperative profile. NDVH had shorter operative time, less intraoperative blood loss, fewer complications, and quicker recovery and thus is an attractive option in adequately selected patients. LAVH had the added advantage of better pelvic visualization, with acceptable operative outcomes and complication rates, and thus is a useful alternative when vaginal hysterectomy alone is not possible. TLH, though requiring longer operative time and advanced surgical expertise, allowed greater surgical precision and flexibility, especially when additional adnexal procedures were required. In general, the choice of surgical approach should be individualized based on patient characteristics, uterine factors, surgeon expertise, and available resources, with emphasis on minimizing morbidity and optimizing postoperative recovery.

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