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Original Article

Induction of total laparoscopic hysterectomy adopted the marionette technique in peri-menopausal and post-menopausal CIN3 patients-A retrospective observational study.

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Abstract

Background
A total laparoscopic hysterectomy (TLH) is a type of laparoscopic hysterectomy in which the trocars are used for all sutures, ligations, and surgical dissections including vaginal closure. This study intends to reveal the viability of TLH as a therapy option for perimenopausal and postmenopausal CIN3 patients at a single hospital over 4 years.

Methods
The analysis of medical records from approximately 44-year-old CIN3 patients who underwent open or laparoscopic hysterectomy at a tertiary care facility between 2017 and 2020 in a retrospective manner was done. Out of a total of 60 CIN3 patients, 10 were assigned to the ATH group and 50 to the TLH group.

Results
A total of 60 patients were selected, and they were divided into two groups based on the surgical technique: ATH (n = 10) and TLH (n = 50). The inclusion criteria comprised patients aged 44 years or older and/or those who had undergone an ATH or TLH. The TLH group experienced a shorter in-hospital stay (6 days vs. 10 days, $p < 0.001$) and perioperative blood loss (18 mL vs. 218 mL, $p = 0.003$) than the ATH group. Neither the operating length (153.40 ± 26.80 min vs. 160.0 ± 61.40 min, $p = 0.825$) nor age at hysterectomy (52 y vs. 76 y, $p = 0.053$) showed a significant difference between the two groups.

Conclusion
For perimenopausal and postmenopausal CIN3 patients, hysterectomy is a suitable therapeutic option, albeit being more intrusive than conization. Due to its less invasive nature, a total laparoscopic hysterectomy with marionette approach may be a better option in these situations.

Recommendations
It is advised that clinicians regard TLH as the optimal surgical choice for perimenopausal and postmenopausal CIN3 patients, owing to its minimally invasive characteristics, diminished complications, and expedited recovery period.

Keywords: *Hysterectomy, Laparoscopic, Marionette technique*
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Introduction

A total laparoscopic hysterectomy (TLH) is a type of laparoscopic hysterectomy in which the trocars are used for all ligations, sutures and surgical dissections including vaginal closure [1]. TLH has been shown to have quicker procedure times, lesser blood losses, and shorter hospital stays than both laparoscopic-assisted vaginal hysterectomies (LAVH) and abdominal hysterectomy (AH) [2,3].

The development of cervical intraepithelial neoplasia (CIN) is a precursor to cervical squamous cell carcinoma. Based on the degree of atypical cell development from the cervical epithelium's basal layer to its superficial layer, CIN is divided into three distinct phases, ranging from CIN1 to CIN3.

Generally, surgical therapy is advised for cases of CIN3, or severe dysplasia or carcinoma in situ (CIS), while observational monitoring is used for cases of CIN1 or CIN2.In many countries, the usual course of treatment

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for CIN3 is cervical conization [4]. Adult women who are young and whose fertility needs to be maintained can benefit from the minimally invasive procedure. Nevertheless, problems like the higher incidence of preterm deliveries in pregnancies after conization and the persistence of postoperative cervical stenosis and blockage continue to exist [5].

The treatment guidelines for cervical cancer state that older CIN3 patients who do not want to keep their uterus intact should get a total hysterectomy without conization. But before the procedure, a thorough preoperative evaluation is advised to rule out any concurrent invasive malignancies.

For CIN3 patients 45 years of age or older, open or laparoscopic hysterectomy has recently drawn interest as a therapeutic option. Additionally, the marionette approach was adopted for total laparoscopic hysterectomy (TLH), which has been actively performed for these patients, with the exception of situations where concomitant difficulties make it impractical. At this tertiary care facility, a diagnostic conization is done before a total hysterectomy when preoperative screening tests are unable to rule out the risk of concomitant invasive malignancy.

This study intends to reveal the viability of TLH as a therapy option for perimenopausal and postmenopausal CIN3 patients at a single hospital over 4 years.

Materials and methods

Study design

A retrospective observational analysis.

Study setting

The study was conducted from August 2017 to July 2020 at NMCH, Sasaram.

Participants

A total of 60 patients were chosen, and according to the surgical technique, they were split into two groups: ATH (n = 10) and TLH (n = 50).

Sample size

The size of the sample for this investigation was calculated using the formula:

$$n = \frac{Z^2 \times p \times (1-p)}{E^2}$$

-n = size of sample

Z = Z-score associated with the specified confidence level

- E = margin of error
- p = estimated population proportion

Inclusion criteria

- Patients who are 44 years of age or older.
- Patients who had an abdominal total hysterectomy (ATH) or TLH performed here in the tertiary care hospital.

Exclusion criteria

- Individuals with invasive malignancies that coexist

Sources of data and their collection methods

At the time of procedure, the patient's age, menopausal state, preoperative diagnosis, and any diagnostic conization history were recorded. Additionally, treatment outcomes, that is, details regarding the surgical operation, its duration, the volume of blood lost during the procedure, the period of hospitalisation, the postoperative diagnosis, and any perioperative complications, were examined.

Procedure

The lateral method is used to identify the ureters and uterine arteries during TLH, which involves positioning four trocars in a diamond pattern. Moreover, uterine manipulators are not used to prevent harm to an endocervical lesion. Surgical procedures like uterine traction and others benefited from the marionette approach. The marionette approach employed for this study entails carefully inserting straight-needle threads into the abdominal cavity from the abdominal wall by laparoscopy. These threads are then fixed onto the myometrium on both sides of the fundus of the uterus. They are then drawn to apply traction to the uterus in four separate directions. The same team of surgeons performed all of the procedures.

Bias

To reduce bias, a thorough data gathering process from medical records, rigorous statistical analysis, and strict compliance with inclusion and exclusion criteria was employed.

Statistical analysis

To conduct statistical studies, JMP 16 was used. The duration of the surgery was examined using Welch's test, while the Wilcoxon signed rank test was used to examine the age of the patient at operation time, blood loss during surgery, and the length of hospital stay. For statistical purposes, a p-value below 0.05 was considered significant.

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Ethical considerations

Approval from the Ethics Committee was obtained for this research. The committee waived the patient's consent because the study was retrospective, and each patient's privacy was protected. Every step was taken in compliance with global ethical norms.

Results

During the study period, 60 patients had complete hysterectomy. Table 1 displays the patient's attributes. 36 (60.0%) of the patients were post-menopausal, and the median age was 53 years (range: 44–77 years). ATH was done in 10 (16.7%) cases and TLH in 50 (83.3%) cases. Large uterine fibroids (2 cases), heart disease (4 instances), pulmonary disease (2 cases), and patient preferences (2 cases) were the factors that led to the selection of the ATH surgical method. Because an invasive lesion cannot be ruled out, diagnostic conization was done in 24 cases before total hysterectomy 20(83.3%) of these 24 cases in whom diagnostic conization was done had a positive endocervical cone margin.

Table 1: Features of patients

Features	Number of patients (Total n =60)
Age of patient during hysterectomy, median (range), y	53 (44-77)
Status of Menstrual cycle at hysterectomy, n (%)	
Pre-menopausal women	24(40.0)
Post-menopausal women	36 (60.0)
Diagnosis before surgery, n (%)	
Carcinoma in situ	44 (73.30)
Severe dysplasia	16 (26.70)
Method of Surgery, n (%)	
Abdominal total hysterectomy	10(16.7)
Total laparoscopic hysterectomy	50 (83.3)
Conization done for diagnosis, n (%)	24 (40.0)

The ATH group (n = 10) and the TLH group (n = 50) were compared based on the following variables: length of hospital stay, quantity of blood loss during surgery, time taken for surgery, and participants' ages (Table 2). The blood loss during surgery in the ATH group was 218 mL (range: 48-478 mL), whereas in the TLH group it was much lower at 18 mL (range: 18-298 mL) ($p = 0.003$). The TLH group's median hospital stay was 6 days (range: 5–11 days), which was substantially less than the ATH group's 10 days (9–15 days) ($p < 0.001$). However, there were no appreciable variations in the two groups' ages at hysterectomy or the length of the procedure.

Table 2: Surgical technique comparison

	Abdominal total hysterectomy (ATH) (n=10)	Total laparoscopic hysterectomy (TLH (n = 50)	p value
Patient's age at hysterectomy, median (range),y	76 (46-77)	52 (44-75)	0.053
Duration of hospital stay, median (range), d	10 (9-15)	6(5-11)	<0.001
Time taken during surgery, mean ± SD, (minutes)	160.0 ± 61.4	153.4 ± 26.8	0.825
Total amount of blood loss during surgery, median (range), (mL)	218(48-478)	18 (18-298)	0.003

Due to postoperative intestinal obstruction, two non-menopausal women aged 46 years and 48 years, respectively, who chose ATH because of a big uterine fibroid and pulmonary illness, respectively, had to stay in the hospital for an additional 15 days for follow-up surveillance. A preoperative diagnostic conization was performed on a 75-year-old elderly patient with pulmonary sickness to eliminate the possibility of an invasive tumour. The patient chose ATH over TLH after receiving a CIS diagnosis. The pathology report of the surgically excised uterus revealed squamous cell carcinoma, and the final diagnosis was cervical cancer stage IA2 (pT1a2, pNx, pM0) according to FIGO 2018. Nedaplatin was given to her concurrently with chemoradiotherapy after surgery. Since then, it hasn't happened again.

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Discussion

Development of postoperative cervical stenosis before menopause may result in infertility, secondary endometriosis from intraperitoneal menstrual blood reflux, or dysmenorrhea from hematometra. But the ailment hardly ever appears before menopause, and it is said to become more common after menopause [6]. Clinical symptoms, or clinical cervical stenosis, are rare in people with cervical stenosis after menopause; instead, the majority of instances have developed cervical stenosis that is asymptomatic or blockage, or prospective cervical stenosis.

Conization after menopause is thought to have a greater positive incidence of endocervical cone margin because there is migration of squamocolumnar junction into the uterine cavity as a result of lower oestrogen levels, increasing the likelihood of CIN lesions in the cervix [7]. Indeed, out of the 24 patients in this study who had diagnostic conization before complete hysterectomy, a positive cone margin was present in 20 (83.30%) patients. This suggests that a significant majority of patients retained aberrant or potentially malignant cells at the margins of the excised tissue, indicating that the conization may not have completely eradicated all high-grade lesions. This outcome is particularly significant about CIN3, where the likelihood of progression to invasive cancer is elevated, highlighting the imperative to evaluate therapeutic strategies like TLH to avert disease recurrence.

If cervical stenosis prevents a pathological examination of the tissues inside the uterus, a clinical postoperative follow-up is insufficient, and there is a chance that the remaining lesions will develop into invasive malignancies. Furthermore, as endometrial malignancies are known to occur more frequently after menopause, caution is required due to their difficulty in detection. Patients with CIN3 who are 45 years old or older have the option of undergoing a total hysterectomy, as the presence of cervical stenosis can often make intrauterine cavity pathological testing more difficult. Patients are educated on the potential risks of invasive surgery, the risks of cervical stenosis after menopause due to conization, and the advantages and disadvantages of total hysterectomy and cervical conization. Patients who provide their consent are given comprehensive information before having a total hysterectomy.

A recent study by Bogani et al. presented the outcomes of women with high-grade cervical dysplasia who tested positive for high-risk HPV and those who tested negative for the virus. They found that whereas those who tested positive for high-risk HPV had an eightfold increased risk of recurrence compared to those who tested negative, approximately 10%-15% of women who were found to have high-grade cervical dysplasia tested negative for high-risk HPV [8]. In the future, for perimenopausal and postmenopausal CIN3 patients, performing the high-risk HPV status to tailor the total hysterectomy procedure can be considered. Except in situations where endoscopic surgery is impractical because of additional complications, including huge uterine fibroids, extensive intraperitoneal adhesions, and several issues with anaesthetic administration, TLH, a minimally invasive surgical approach, is actively chosen.

Laparotomy causes increased blood loss, incisional difficulties, and infection problems in obese patients, while a laparoscopic technique may be far more beneficial for these people. In this study, the TLH group experienced a shorter in-hospital stay and perioperative blood loss than the ATH group, making TLH a viable therapy option for perimenopausal and postmenopausal CIN3 patients. Cochrane Systematic Reviews found that total hysterectomy (TLH) is better than anterior total hysterectomy (ATH) in terms of intraoperative blood loss, postoperative recovery time, and infection rates, even though TLH takes longer to perform and has more complications like ureteral injuries [9]. The TLH group saw a considerable decrease in blood loss during surgery and duration of hospital stay, although there was no discernible difference between the two groups in terms of surgical duration, despite the small sample size that constrained this analysis. Before performing a total hysterectomy on patients with CIN3, it is crucial to rule out coexisting invasive cancers. Diagnostic conization should therefore ideally be carried out. However, to lessen the physical strain on the patient, the concerned institution also considers omitting cervical conization in individuals who have a low probability of developing invasive malignancies at the same time. To exclude simultaneous invasive cancers, patients wishing for a total hysterectomy undergo blood tests for squamous cell carcinoma antigen, cervical biopsy with endocervical curettage, and magnetic resonance imaging (MRI) for assessing the state of the endocervix.

Several distinct biomarkers have been created recently to identify cervical cancer in its early stages [10]. In order to exclude the possibility of concurrent invasive malignancy, there should be a thought about updating the pre-operative screening protocols in the future. This study used the marionette approach for doing TLH. La Greca et al. initially described the Marionette technique in 2003 as a supplemental method for laparoscopic tumour resection in the management of desmoid tumours in the abdomen [11]. The procedure was later the focus of multiple reports, primarily as a laparoscopic cholecystectomy auxiliary technique. In a study, when treating ectopic tubal pregnancies, the marionette approach was initially used as an adjunct to single-port laparoscopic salpingectomy [12]. The four strands that protrude from the abdominal wall create traction forces, which allow the uterus to be freely moved.

"Age 44 years or older" is currently the prerequisite at the concerned institution for permitting CIN3 patients to have a total hysterectomy. The prerequisite of 44 years old, which corresponds to the perimenopausal stage, was chosen at random with the assumption that the patient would soon enter menopause. Although cervical stenosis after conization becomes more common after menopause, there is currently insufficient data to support the surgical

removal of the uterus from perimenopausal CIN3 women who have not yet reached menopause. So, it's important to figure out when a total hysterectomy is the best option for perimenopausal women or older women with CIN3 [13-20]. Since the same surgical team performed each operation, it can be assumed that there is little technical variability and heterogeneity, and information will be useful for clinical practice.

Conclusion

Even though cervical conization requires less surgical intervention, total hysterectomy (TLH) using the marionette technique may be a better choice for perimenopausal and postmenopausal CIN3 patients who are considering this treatment option. This is because TLH with the marionette technique is less invasive, and there is a lower risk of cervical stenosis following surgery. It is intended that by being aware of the risks associated with this method, issues can be prevented, and TLH can be safely learnt by more surgeons.

Limitations

The size of the sample in the present study is small, and the study is retrospective, covering a period of four years at one institution only. Hence, we are unable to provide adequate evidence.

Recommendations

It is advised that clinicians regard TLH as the optimal surgical choice for perimenopausal and postmenopausal CIN3 patients, especially owing to its minimally invasive characteristics, diminished complications, and expedited recovery period. Additional prospective studies are recommended to corroborate these findings and investigate long-term consequences.

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Conflict of interest

The study had no conflict of interest.

Source of funding

No funding received

List of abbreviations

ATH Abdominal Total Hysterectomy:
CIS Carcinoma In Situ:
CIN3 Cervical Intraepithelial Neoplasia 3:
LAVH Laparoscopic-Assisted Vaginal Hysterectomies:
TLH Total Laparoscopic Hysterectomy:

Data Availability

Data is available upon request.

Author contributions

All authors contributed to the design of the research. VP collected and analyzed the data. S wrote the manuscript. VP and S edited the paper.

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