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ORIGINAL ARTICLE

HPV Screening Following Subtotal Hysterectomy: Clinical Findings and Screening Adherence Analysis

Subtotal Histerektomi Sonrası HPV Taraması: Klinik Bulgular ve Taramaya Uyum Analizi

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ABSTRACT

Aim: Women who have undergone subtotal hysterectomy remain at risk for HPV infection and cervical cancer due to the preservation of cervical structure. This study aimed to assess the efficacy of HPV-based cervical cancer screening following subtotal hysterectomy and the rates of patient compliance.
Methods: A group of 284 women who underwent subtotal hysterectomy was evaluated, and data on HPV testing, cytology, and demographics was collected. HPV positivity, genotype distribution, and cytological results were examined.
Results: HPV positivity was observed in 14.4% of participants, with genotypes 16 and 18 being the most common types. Cytological abnormalities were identified in 21% of HPV-positive cases. The screening compliance rate was determined at 72.5%.
Conclusions: HPV-based screening in women with cervical preservation following subtotal hysterectomy is a crucial and essential approach to mitigate cervical cancer risk. It is recommended to establish particular protocols for this group under national screening programs.

Keywords: Cervical stump cancer, cytology, genotype distribution, HPV screening adherence, subtotal hysterectomy

ÖZ

Amaç: Subtotal histerektomi geçirmiş kadınlarda serviks korunması nedeniyle HPV enfeksiyonu ve servikal kanser riski devam etmektedir. Bu çalışmanın amacı, subtotal histerektomi sonrası HPV tabanlı servikal kanser taramasının etkinliğini ve hastaların taramaya uyum oranlarını değerlendirmektir.
Yöntemler: Çalışmada 284 subtotal histerektomi geçirmiş kadın incelenmiş, HPV testi, sitoloji ve demografik veriler toplanmıştır. HPV pozitifliği, genotip dağılımı ve sitolojik sonuçlar analiz edilmiştir.
Bulgular: Katılımcıların %14.4'ünde HPV pozitifliği saptanmış, en sık HPV 16 ve 18 genotipleri bulunmuştur. HPV pozitif vakalarda sitolojik anormallikler %21 oranında tespit edilmiştir. Taramaya uyum oranı %72.5 olarak belirlenmiştir.
Sonuç: Subtotal histerektomi sonrası serviks korunmuş kadınlarda HPV tabanlı tarama, servikal kanser riski açısından önemli ve gerekli bir yöntemdir. Ulusal tarama programlarında bu grup için özel protokollerin geliştirilmesi önerilmektedir.

Anahtar Kelimeler: Genotip dağılımı, HPV taramasına uyum, servikal stump kanseri, sitoloji, subtotal histerektomi.

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Introduction

A subtotal hysterectomy (supracervical hysterectomy) is a surgical technique that involves the removal of the uterine corpus while preserving the cervix. This surgical approach aims to maintain the patient's postoperative anatomical and functional integrity when total hysterectomy is unwarranted or perilous in the management of benign uterine pathologies. It is especially appropriate for benign problems including fibroids, abnormal uterine bleeding, and adenomyosis [1].

One of the main reasons for selecting subtotal hysterectomy is the decreased operational duration and intraoperative complications resulting from the lack of cervical excision. Nevertheless, since the cervix is retained post-surgery, patients continue to be susceptible to cervical pathology. This indicates that the cervix continues to be a potential location for HPV infection and, subsequently, precancerous lesions and invasive carcinoma [2].

The pivotal role of HPV infection in the etiology of cervical cancer has been scientifically established; it has been reported that 99% of cervical cancers globally are linked to high-risk HPV types (particularly 16 and 18) [3]. Consequently, HPV DNA testing and HPV genotyping are progressively prioritized in cervical cancer screening due to their heightened sensitivity and specificity, rendering them superior to the classic Pap smear test in identifying CIN2+ [4].

Current guidelines (ACOG, ASCCP, USPSTF) indicate that cervical/vaginal screening is typically unnecessary in women who have had a total hysterectomy with the cervix excised for benign indications [5]. Nevertheless, screening is recommended for patients who have had a subtotal hysterectomy, due to the preservation of the cervix; however, this recommendation is frequently disregarded in practice. This elevates the risk of HPV positivity and cervical pathology [6].

The necessity of screening following subtotal hysterectomy, in which the cervix remains intact, has long been contentious. However, recent retrospective studies have indicated that these patients may develop cervical dysplasia and even cervical stump cancer [7,8]. A study of 33 cases in Jordan reported a cervical stump cancer rate of 3.2%. This rate signifies that 3–9% of all cervical cancers arise in people who had previously had a subtotal hysterectomy [9].

A large-scale Danish study indicated that merely 61% of 259 women who underwent subtotal hysterectomy participated in frequent cervical screening tests over a 14-year follow-up period, 10.8% exhibited abnormal Pap smear results, and none progressed to invasive cancer [6]. This study illustrates that routine screening possesses high diagnostic value in this patient group and facilitates the early detection of cervical pathologies.

A case of advanced-stage cervical stump cancer reported from Germany shows that screening is either not performed at all or disregarded by some patients after supracervical hysterectomy. The diagnosis was made at an advanced stage due to postmenopausal bleeding symptoms, resulting in treatment delay [10]. This situation emphasizes the necessity of explicitly notifying patients undergoing subtotal hysterectomy that the cervix is retained and that screening should persist.

Another significant observation is that cervical dysplasia was identified in 18.2% of cases involving cervical stump resections conducted for surgical purposes following subtotal hysterectomy [11]. These data indicate that premalignant lesions may exist in asymptomatic patients. Moreover, this rate is essential in illustrating the magnitude of lesions that could be clinically missed if cervical monitoring is absent. The general trend in the literature advocates for routine cervical screening following subtotal hysterectomy, particularly in individuals with HPV positive or prior smear abnormalities. International guidelines, such as the American Cancer Society, recommend the continuation of HPV-based screening in these individuals, based on age and risk level, assuming they have not undergone total hysterectomy [12].

The extensive implementation of HPV-based screening programs, especially in developing countries, has resulted in access to and adherence to screening in women post-subtotal hysterectomy becoming a notable public health issue. Moreover, neglecting to monitor patients excluded from cervical screening may result in delayed diagnosis of precancerous lesions and reduced treatment opportunities [13].

In this context, generating data on HPV positivity, genotype distribution, cytological results, and the efficacy of sophisticated diagnostic techniques in women who have undergone subtotal hysterectomy is a crucial necessity that will illuminate national and worldwide screening guidelines. Our study sought to assess the clinical efficacy of HPV-based screening in this patient group and the rates of screening participation.

Materials and Methods

This retrospective study encompassed 284 women who underwent subtotal hysterectomy between 2020 to 2024. This study adhered to the ethical criteria established by the Declaration of Helsinki and got approval from the local ethics committee (Approval was received from Osmaniye Korkut Ata University Health Sciences Research Ethics Committee with the decision numbered 7/25 dated 05.08.2025). Given the retrospective design of this investigation, written informed consent was not acquired.

The study's inclusion criteria comprised women aged 30 to 70 years, those who underwent a subtotal (supracervical) hysterectomy ≥6 months prior, those who had (or will undergo) HPV testing for screening,

and cases that were documented with imaging/operative notes and in which the cervix was preserved. Participants who underwent total hysterectomy, those presumed to have no postoperative residual cervix, those who have a history of cervical intraepithelial neoplasia (CIN2+), invasive cervical cancer, HIV-positive or immunocompromised individuals, those who have primary or metastatic gynecological cancer, those diagnosed with malignancies in other systems, and those undergoing chemotherapy, radiotherapy, or systemic drug therapy were excluded from the study due to the potential negative or positive effects on laboratory test results. Demographic data encompassed: age, menopausal status, smoking status, age of sexual activity, information regarding surgical procedures, indication for subtotal hysterectomy, the number of years since the surgery was performed, HPV screening data, HPV DNA test results (positivity rate, genotype analysis—particularly HPV 16 and 18), cytological examination (Pap smear) results, and follow-up information (if prospective): All data regarding colposcopy, biopsy, and lesion progression was retrospectively collected from patient records.

The objective was to ascertain the HPV positivity rate, prevalence of high-risk HPV, cytological results, detection rate of cervical intraepithelial neoplasia (CIN 1–3), adherence to screening frequency, and the necessity for colposcopy or biopsy in HPV-positive cases.

Cervical samples were obtained for HPV DNA analysis and Pap smear cytology. HPV testing was conducted utilizing PCR-based techniques (Cobas® 4800 HPV test (Roche Molecular Systems, Pleasanton, Ca,USA)) that facilitate the detection of high-risk genotypes. Cytological assessment was conducted in accordance with the Bethesda system guidelines. Essential recommendations were provided for all cases to maintain their follow-up throughout and subsequent to the study, and their follow-up is ongoing.

Statistical Method

The data analysis for this study was conducted utilizing IBM SPSS Statistics 26. In descriptive statistics, continuous variables are represented as mean ± standard deviation (minimum-maximum) and median values, whereas categorical variables are represented as number (n) and percentage (%). The differences among categorical variables for HPV positivity evaluations were examined utilizing the Pearson chi-square test, and Fisher's exact chi-square test employed where required. Odds ratios and 95% confidence intervals were calculated for the evaluation of risk factors. Statistical significance was established at $p<0.05$ for all tests, and two-sided p values were reported.

Results

This study analyzed the HPV-based cervical cancer screening results of 284 individuals who underwent subtotal hysterectomy. The mean age of the patients was 49.5 ± 8.3 years (median: 50; min: 30, max: 70), with 50% (n=142) aged 50 years or younger and 50% (n=142) older than 50. The mean age at hysterectomy was calculated to be 44.3 ± 8.8 years (median: 44; min: 23, max: 68). The mean time since hysterectomy was 5.2 ± 2.9 years (median: 5.1; min: 0.5, max: 14.7), and 49.3% (n=140) of the patients had undergone surgery ≤5 years prior, and 50.7% (n=144) had undergone surgery >5 years prior. 31.7% (n=90) of the patients were active smokers, whereas 68.3% (n=194) were non-smokers (table 1).

Table 1. Demographic and Clinical Features

Feature (n=284)	Mean ±SD (min-max) / n(%)
Age (year)	49.5 ± 8.3 (30-70)
- ≤50 years	142 (50%)
- >50 years	142 (50%)
Age at hysterectomy (years)	44.3 ± 8.8 (23-68)
Time after hysterectomy (years)	5.2 ± 2.9 (0.5-14.7)
- ≤5 years	140 (49.3%)
- >5 years	144 (50.7%)
Smoke	90 (31.7%)

HPV tests were performed between 2020 and 2024 and exhibited a consistent distribution over the years (2020: 20.8%; 2021: 19.7%; 2022: 21.1%; 2023: 17.6%; 2024: 20.8%) (table 2).

Table 2. Distribution of HPV Tests by Year

Years	n (%)
2020	59 (20.8%)
2021	56 19.7(%)
2022	60 (21.1%)
2023	50 (17.6%)
2024	59 (20.8%)

HPV test results indicated that 14.4% (n=41) were positive, whereas 85.6% (n=243) were negative. Upon examining the genotype distribution of HPV-positive cases, HPV 16 was identified in 31.7% (n=13), HPV 18 in 22% (n=9), and other high-risk HPV types in 46.3% (n=19) (table 3).

Table 3. Scanning Results

Parameter	n (%)
HPV results (n=284)	
- Positive	41 (14.4%)
- Negative	243 (85.6%)
HPV genotypes (n=41)	
- HPV 16	13 (31.7%)
- HPV 18	9 (22.0%)
- Others	19 (46.3%)

Cytology (Pap smear) was performed in 72.5% (n=206) of the patients, while 27.5% (n=78) did not undergo the procedure. Abnormal results were detected in 3.4% (n=7) of the cases who underwent cytological analysis. The distribution of abnormal cytology was as follows: 0.5% AGC (n=1), 1.5% ASC-US (n=3), 0.5% HSIL (n=1), and 1.0% LSIL (n=2). The results were considered normal in 96.6% (n=199) of cases. Colposcopy was performed in only 2.5% (n=7) of the patients, with 28.6% (n=2) of the biopsied cases exhibiting CIN1, while 71.4% (n=5) showed negative results (table 4). Although the HPV positivity rate was low (14.4%) in HPV-based screening after subtotal hysterectomy, the presence of high-risk types, especially HPV 16 and 18, and the 3.4% abnormal cytology rate emphasize the importance of screening. The low rate of colposcopy and biopsy applications indicates a necessity for aggressive follow-up in cases with clinical suspicion.

Table 4. Cytology and Follow-up Findings

Features	n (%)
Cytology performed	206 (72.5%)
Anormal cytology	7 (3.4%)
- AGC	1 0.5(%)
- ASC-US	3 (1.5%)
- HSIL	1 (0.5%)
- LSIL	2 (1.0%)
Colposcopy performed	7 (2.5%)
Biopsy results (n=7)	
- CIN1	2 (28.6%)
- Negative(no dysplasia)	5 (71.4%)

Key Findings:

• HPV positivity: 14.4% (predominantly HPV 16/18).

• Abnormal cytology: 3.4% (ASC-US and LSIL are the predominant abnormalities).

The referral rate for colposcopy is low (2.5%).

The data endorse the efficacy of HPV-based screening subtotal hysterectomy, although suggest a necessity for improved patient compliance and follow-up protocols.

Smoking was identified as a statistically significant risk factor when the study assessed the factors associated with HPV positivity. The HPV positivity rate was 49% among smokers, in contrast to 29% among non-smokers (p=0.011). The odds of HPV positivity in smokers were determined to be 2.35 times higher than in non-smokers [OR: 2.35 (95% CI: 1.20-4.61)].

In terms of age demographics, HPV positive was seen at 49% in the ≤50 age group and 51% in the >50 age group (p=0.866). A significant correlation was not seen between the duration since hysterectomy and HPV positivity. HPV positivity was 41% in individuals ≤5 years post-hysterectomy and 59% in those >5 years post-hysterectomy (p=0.278).

A significant correlation was identified between the presence of abnormal cytology and HPV positivity. Abnormal cytology was identified in 21% of HPV-positive patients, but no abnormal cytology was observed in the HPV-negative group (p<0.001). Normal cytology was observed in 79% of HPV-positive patients and 100% of HPV-negative patients. These findings indicate that smoking is a considerable risk factor for HPV infection, whereas age and duration after hysterectomy did not significantly influence HPV positivity. Abnormal cytology exhibited a high correlation with HPV infection (table 5).

Discussion

This study emphasizes the clinical significance of HPV-based cervical cancer screening in women with preserved cervixes following subtotal hysterectomy. The HPV positivity rate in the study group was 14.4%, with high-risk types (HPV 16 and 18) identified in more than half of the cases. The rate of abnormal cytology was significantly higher at 21% in HPV-positive patients, but no abnormalities were detected in HPV-negative cases. Smoking was determined to elevate the risk of HPV infection by a factor of 2.35, although age and the duration after hysterectomy showed no correlation with HPV positivity. The low rates of colposcopy and biopsy signify the necessity for more efficient and proactive protocols in the context of high-risk types. The results strongly support for the ongoing use of regular HPV-based screening in this patient group.

Subtotal (supracervical) hysterectomy entails the excision of the uterine corpus while preserving the cervical tissue. This method has certain benefits by safeguarding pelvic nerves and supporting tissues; yet it poses a risk of cancer in the residual cervical tissue [9].

The results of our study reveal an important rate of being high-risk HPV positivity (14.4%) among women who have experienced subtotal hysterectomy. This rate is significantly higher in comparison to the HPV prevalence reported in the general population (about 3–8% among women in Turkey) [14]. Surgical preservation of the cervix exposes these patients to the risk of cervical HPV infection and associated precancerous lesions.

The central function of high-risk HPV types 16 and 18 in the etiology of cervical cancer is substantiated by the high prevalence of these types in our study (53.7%). Positivity for these genotypes is critical for the early diagnosis of clinically important lesions, including CIN2+ [15].

National and international guidelines recommend for routine HPV-based screening in women with a preserved cervix following subtotal hysterectomy [16]. Nonetheless, the current literature offers little data regarding screening adherence and efficacy in this patient group. Some studies indicate that

screening compliance among these patients is approximately 50–60%, which is lower to that of the general population [17]. The knowledge levels of women who had undergone minimally invasive hysterectomy regarding their cervical cancer screening requirements and types of hysterectomy were assessed in the study conducted by Mattingly et al. (2017). A total of 413 women were targeted, and 190 participated in the survey, yielding a 46% participation rate. Only 67% of participants accurately recognized if their cervix had been excised during surgery and appropriately responded to the necessity of cervical cancer screening in accordance with current guidelines. Furthermore, only 59% accurately responded to the inquiry regarding the Pap test's role in screening for cervical cancer, while 40% correctly identified the association between HPV and cervical cancer. The study showed that patient awareness regarding cervical protection is low, which can result in improper screening procedures or exclusion from screening altogether. High income and white race were identified as positively correlated with knowledge. These findings highlight the necessity of enhancing patient awareness of cervical screening for women who have undergone subtotal hysterectomy, as well as the insufficiency of perioperative counseling [18].

The correlation among Pap smear, HPV DNA test, and Co-test (Pap smear + HPV) results in diagnosing cervical premalignant lesions and colposcopic biopsy was examined. A retrospective analysis was conducted on the screening and biopsy data of 272 patients. Pap smear results were categorized based on the Bethesda system; HPV genotyping was conducted using PCR, and biopsies were assessed using H&E, p16, and Ki-67 immunostaining techniques. The analysis revealed that alone the HPV test had an important correlation with biopsy ($p < 0.05$). No statistically significant link was observed between co-test and Pap smear results and biopsy results. This study shows that the HPV test alone is a more reliable screening tool for identifying cervical premalignant lesions and emphasizes the significance of HPV-based screening methods, particularly in suspicious cases [19].

A case study by Andrikos et al. (2023) highlights a case of advanced-stage cervical stump cancer that developed eight years following laparoscopic supracervical hysterectomy (LASH). Following the patient's presentation of irregular vaginal bleeding and pelvic pain, the tumor was classified as FIGO stage IIIB and treated with radio chemotherapy; however, recurrence was observed in the fifth month. This case shows that women who have undergone subtotal hysterectomy are at risk of developing cancer due to the preservation of the cervical canal, with the malignancy frequently diagnosed at an advanced stage. Moreover, the significance of routine screening in this patient group is reiterated, underlining the necessity for a multidisciplinary approach. Our study also indicated that HPV positivity remains in women who have had a subtotal hysterectomy with cervical preservation, and this group should be explicitly incorporated into national screening programs. This aligns with similar findings in the literature [10]. A retrospective study conducted by Wang et al. in China investigated cases of cervical stump cancer arising after subtotal hysterectomy, using data from 127 patients. The study determined that cervical stump cancer was developed in approximately 1-3% of patients who underwent subtotal hysterectomy, and the proportion of these malignancies among all cervical cancers ranged from 3-9%. These cancers, which developed after an average of 130 months, were mainly marked by vaginal bleeding, postcoital bleeding, and pelvic pain. Treatment options encompassed surgery and concomitant chemoradiotherapy, yielding a 5-year disease-free survival rate of 51.8% and an overall survival rate of 77.3%. The study's findings indicate that preserving the cervix in individuals undergoing subtotal hysterectomy may present a potential cancer risk; hence, diagnostic procedures such as cytologic examination, cervical biopsy, and endocervical curettage should be contemplated prior to surgery. Moreover, it is imperative that patients are apprised of these risks and that regular cervical cancer screenings post-surgery is obligatory. These findings align with the elevated HPV positivity rates and cytological abnormalities identified in our

Table 5. Analysis of Factors Associated with HPV Positivity

Variables	Category	HPV Positive n (%)	HPV Negative n (%)	p-value	OR (95%CI)
Smoke	yes	20 (49%)	70 (29%)	0.011	2.35 (1.20 - 4.61)
	no	21 (51%)	173 (71%)		
Age	≤50	20 (49%)	122 (50%)	0.866	-
	>50	21 (51%)	121 (50%)		
Post-Hysterectomy Period	≤5 years	17 (41%)	123 (51%)	0.278	-
	>5 years	24 (59%)	120 (49%)		
Abnormal Cytology	positive	7 (21%)	0 (0%)	<0.001	-
	negative	26 (79%)	173 (100%)		

study, underscoring the significance of HPV-based screening and patient education following subtotal hysterectomy [8].

Cervical preservation following subtotal hysterectomy is a significant clinical condition that sustains the risk of cervical pathology in patients. Nonetheless, adherence to cervical cancer screening among these patients has been reported as insufficient. In a cohort study by Andersen et al. in Denmark, 259 women who underwent subtotal hysterectomies and 242 women who got total hysterectomies were monitored for a mean follow-up period of 14.1 years. In the subtotal hysterectomy group, 9.7% were not invited for cervical cancer screening, while the compliance rate for screening was 61.4%; however, 8.5% were entirely unscreened. In the total hysterectomy group, 14.5% were not invited for screening, only 6.6% participated in screening, and 65.7% were not screened. Moreover, 10.8% of women exhibited at least one abnormal test result following subtotal hysterectomy, whereas only one abnormal test was identified in the total hysterectomy group. Although the study reported no occurrences of cervical cancer, these data demonstrate the necessity for regular and effective screening following subtotal hysterectomy. Moreover, unnecessary screening following total hysterectomy presents a significant problem to the effective use of healthcare resources. This situation highlights the necessity to elucidate protocols for screening for women post-subtotal hysterectomy and to enhance patient awareness regarding screening [6].

The identification of cytologic abnormalities in 21% of the HPV-positive patients in our study demonstrates the clinical significance of the HPV test's high sensitivity. The existence of CIN1 cases validated by colposcopy and biopsy highlights the necessity for additional follow-up and treatment protocols for these women.

These findings confirm that routine screening should not be interrupted in patients with preserved cervixes following subtotal hysterectomy, and that clear protocols tailored to this group should be established within national screening programs. Health systems should enhance accessibility to screening for this patient group, increase awareness, and inform physicians. Future prospective, large-sample studies should elucidate the correlations among HPV positivity, cervical lesion progression, postoperative time, and additional risk factors, while also examining patient motivations for screening participation, obstacles, and social determinants. This data will facilitate the creation of more efficient and tailored screening procedures in clinical practice.

This study possesses numerous notable strengths. This is a unique and comprehensive patient series examining HPV positivity, genotypic distribution, and cytological abnormalities in women who have undergone subtotal hysterectomy in Türkiye. With a large sample size of 284 cases, it is valuable in revealing the sub distribution of high-risk HPV types. Furthermore, a two-way approach to cervical screening was adopted, using both HPV DNA testing and simultaneous Pap smear cytology. This facilitated a comparison of the tests' sensitivity and specificity, yielding an evaluation which was closer with actual clinical practice. Furthermore, assessing screening compliance rates gives valuable information about the efficacy of public health policies and patient behavior. The findings have the potential to increase awareness of a potential risk group that is currently excluded from national screening programs.

Nonetheless, the study also has several limitations. Firstly, due to the retrospective and single-center nature of the study, the generalizability of the findings may be limited. Extrapolating results to the entire country should be approached with caution unless corroborated by data from several geographic regions or health centers. Secondly, in cases where HPV positivity and cytological abnormalities were identified, the rates of colposcopy, biopsy, and histopathological confirmation were limited; hence, the actual prevalence of precancerous or malignant lesions could not be precisely ascertained. Moreover, behavioral and social factors, including patients' socioeconomic position, level of education, and obstacles to screening access, were not thoroughly evaluated. This data is essential for comprehending the factors contributing to low screening compliance rates. Furthermore, the history of HPV vaccination was not enquired about. This information may have been significant in analyzing HPV positivity rates, particularly among younger people. Finally, despite the study's average follow-up duration of 5 years, longitudinal (prospective) follow-up data were absent, precluding the monitoring of clinical course alterations, such as HPV persistence and lesion progression, over time.

Conclusion

The efficacy and urgency of HPV-based cervical cancer screening for women who have undergone subtotal hysterectomy are strongly supported. Including this specific group in screening programs will help decrease cervical cancer morbidity and mortality. Nonetheless, larger, multicenter, prospective studies are required. Future research can establish more effective early diagnosis and prevention strategies for this group by considering sociodemographic factors, advances in healthcare, and screening practices.

Conflict of Interest

The authors have no conflict of interest to declare.

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