

# Comparison of Minimally Invasive Surgery and Abdominal Surgery Among Patients With Cervical Cancer

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**Abstract.** *Background/Aim:* The aim of this study was to evaluate the difference in clinical outcomes in patients with histologically confirmed cervical cancer of the uterus treated with either laparoscopy or laparotomy with curative intent between 2011 and 2017 at the Department of Gynecology and Obstetrics of University Hospital Cologne. *Materials and Methods:* This retrospective analysis included all patients who received surgical treatment with curative intent between January 2011 and December 2017 for stages IA1 to IIB cervical carcinoma. Patients receiving primary or secondary surgery after neoadjuvant chemotherapy were also included. *Results:* In total, 75 patients were included, of whom 34 patients underwent minimally invasive surgery and 41 underwent open surgery. Neoadjuvant chemotherapy was performed in 10 patients in the minimally-invasive group and in 14 patients in the laparotomy group. Statistically, no significant difference in overall survival (OS) was observed in both groups. Disease-free survival showed a significant difference in favor of the minimally invasive group. *Conclusion:* Minimally invasive surgical therapy for cervical cancer improves disease-free-survival. Prospective trials are needed to further confirm these results.

In developed countries, cervical cancer is responsible for 15% of cancers among women (1, 2). In total, 80% of these cancers arise from squamous cell dysplasia, whereas 15% are adenocarcinomas, and 5% are clear cell adenocarcinomas (1, 3). Knowledge of the molecular mechanisms underlying the development and metastases of cervical cancer, except for human papilloma virus infection, is still limited (1, 4).

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*Key Words:* Cervical cancer, neoadjuvant therapy, OS, DFS, surgery.

Smoking and multiparity are known epidemiological cofactors for the development of cervical cancer (1, 5).

Therapy modalities depend on the patients' clinical stage. Therapeutical options vary from primary surgery or neoadjuvant chemotherapy followed by surgery or definitive radiochemotherapy to palliative systemic therapy (6).

New advances led to an improvement of the overall survival (OS) and disease-free survival in patients with metastatic and advanced cervical cancer (7).

The previously published Laparoscopic Approach to Cervical Cancer (LACC) study (8) showed that minimally invasive radical hysterectomy is associated with lower rates of disease-free survival and OS than open abdominal radical hysterectomy among women with early-stage cervical cancer. This led to a change in practice in many institutions. Hence, the aim of this study was to evaluate the difference in clinical outcomes in patients with histologically-confirmed cervical cancer of the uterus treated with either laparoscopy or laparotomy with curative intent at the Department of Gynecology and Obstetrics of University Hospital Cologne.

## Materials and Methods

In this retrospective hospital-based analysis, patients with histologically confirmed curable cervical cancer treated between 2011 and 2017 in the University Hospital Cologne were included (Table I).

*Inclusion criteria.* Patients with histologically proven stages IA1 to IIB cervical carcinoma without distant metastasis who received surgical treatment with curative intent.

*Exclusion criteria.* Patients who did not receive any guideline-based therapy due to noncompliance or patients for whom lymphadenectomy was not indicated according to their tumor stage (FIGO IA1 without risk factors).

A retrospective analysis was performed for the following parameters: patient age, FIGO tumor stage, histomorphological tumor type, lymphatic and venous infiltration, and grading at first presentation. The tumor size was documented as the longest diameter either post surgery on the basis of histopathological findings or pre-therapeutically before neoadjuvant chemotherapy on the basis of sonography or MRI imaging.

Table I. Patient characteristics.

Characteristics	Minimally invasive surgery (n=33)	Open surgery (n=41)	p-Value
Age (years)	41.16±9.15	46.39±13.37	0.057
Histologic subtype n (%)			0.487
Squamous-cell carcinoma	24 (70.6%)	26 (63.4%)	
Adenocarcinoma	9 (26.5%)	11 (26.8%)	
Adenosquamous carcinoma	1 (2.9%)	4 (9.8%)	
Stage of disease n (%)			0.134
FIGO IA1	9 (26.5%)	1 (2.4%)	
FIGO IA2	3 (8.8%)	1 (2.4%)	
FIGO IB1	9 (26.5%)	21 (51.2%)	
FIGO IB2	3 (8.8%)	6 (14.6%)	
FIGO IIA1	1 (2.9%)	2 (4.9%)	
FIGO IIA2	2 (5.9%)	4 (9.8%)	
FIGO IIB	7 (20.6%)	6 (14.6%)	
Grade (%)			0.035
G1	2 (6.3%)	0 (0%)	
G2	20 (62.5%)	19 (46.3%)	
G3	10 (31.3%)	22 (53.7%)	
Tumor size (cm)	2.63±2.19	3.26±1.64	0.221
LVSI			0.010
L1	5 (16.7%)	18 (47.4%)	
L0	25 (83.3%)	20 (52.6%)	
VSI			0.394
V1	4 (13.3%)	2 (5.3%)	
V0	26 (86.7%)	36 (94.7%)	
Recurrence			0.030
Yes	2 (5.9%)	10 (24.4%)	
No	32 (94.1%)	31 (75.6%)	
Death			0.222
Yes	2 (5.9%)	6 (14.6%)	
No	32 (94.1%)	35 (85.4%)	

FIGO: Fédération Internationale de Gynécologie et d'Obstétrique; LVSI: lymph vascular space invasion; VSI: vascular space invasion.

**Statistical analysis.** All statistical analyses were performed using SPSS software (IBM SPSS Statistics, v. 25). For comparison of continuous variables such as age and tumor size among groups, Student's *t*-test was applied; ordinal variables such as FIGO stage were compared using the Mann-Whitney *U*-test, and categorical variables were compared using the chi-square test. A survival analysis was performed through the Kaplan-Meier method, and groups were compared using the log-rank test. Statistical significance was set at  $p < 0.05$ .

## Results

In total, 75 patients were included in this retrospective analysis, of whom 34 patients underwent minimally invasive surgery and 41 underwent open surgery. The mean age was 41 years in the minimally invasive group and 46 years in the open surgery group. There was no significant difference in the age of patients between the two groups, with older patients being more likely to undergo laparotomy ( $p = 0.057$ ) (Table I). Furthermore, both groups did not show a significant difference in the histological subtype ( $p = 0.487$ ). Tumor stage was not significantly different in both groups ( $p = 0.134$ ).

Higher grading and higher grade of lymph vascular space invasion (LVSI) were significantly more frequent in the laparotomy group ( $p = 0.035$  and  $p = 0.016$ , respectively).

There was no significant difference in tumor size and VSI between the two groups ( $p = 0.182$  and  $p = 0.394$ , respectively). The mean follow-up time for both groups was 41 months. OS was 94.1% in the minimally invasive surgery group, and 85.4% of patients undergoing laparotomy were still alive. OS did not show a significant difference between both groups ( $p = 0.311$ ) (Figure 1).

The mean follow-up time for disease-free survival was 39 months, with a disease-free survival (DFS) rate of 94.1% in the minimally invasive surgery group and 75.6% in the laparotomy group. There was a significant difference in favor of the laparotomy group ( $p = 0.049$ ) (Figure 2).

## Discussion

In this hospital-based retrospective analysis, patients who underwent minimally invasive surgery showed improved

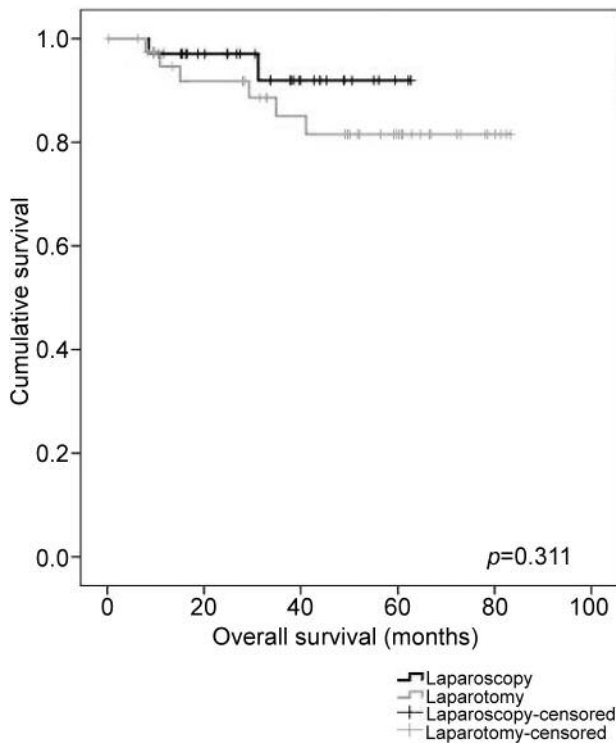


Figure 1. Overall survival in months.

DFS compared with patients who underwent open surgery (94.1% vs. 75.6%;  $p=0.049$ ). OS was not statistically different between the groups ( $p=0.311$ ), although the OS rate was 94.1% versus 85.4% within the follow-up time of 41 months. The results presented are in contrast with previous data of LACC analysis. Ramirez and colleagues showed that minimally invasive surgery is associated with a lower rate of OS than open surgery (3-year rate, 93.8% vs. 99.0%; HR=6.00; 95%CI=1.77-20.30) (4). The different results can be explained by the difference in higher grading and higher grade of lymphatic infiltration between the groups, which could have influenced the results. Furthermore, the current analysis included patients with FIGO stage IIB, whereas most patients (91.9%) in the study conducted by Ramirez *et al.* had stage IB1 disease (4). Another main difference is that the current analysis also included patients treated with neoadjuvant therapy prior to surgery. Additionally, we did not use any type of uterine manipulator during surgery.

Wang *et al.* evaluated 12 studies comparing laparoscopic radical hysterectomy (754 patients) with open radical hysterectomy (785 patients) for cervical cancer. They showed no significant differences in the 5-year rate of OS (HR=0.91; 95%CI=0.48-1.71;  $p=0.76$ ) or the 5-year rate of disease-free survival (HR=0.97; 95%CI=0.56- 1.68;  $p=0.91$ ) between the two groups (8, 9).

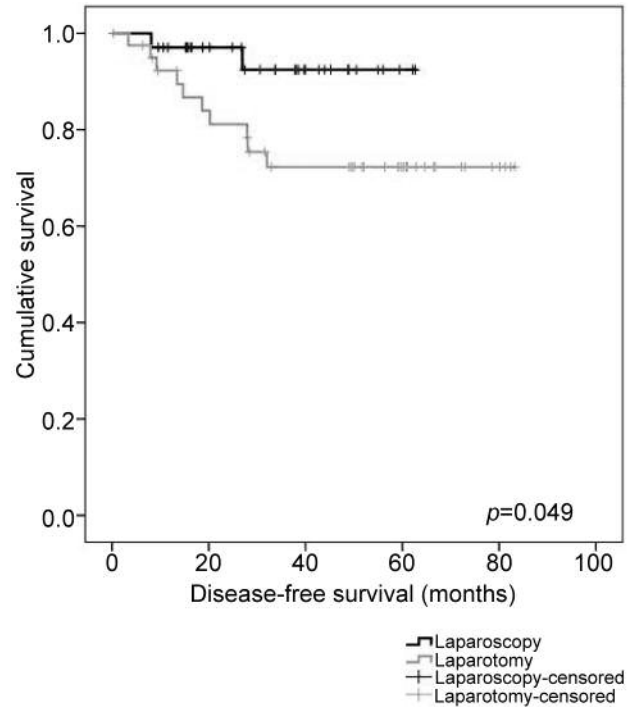


Figure 2. Disease-free survival in months.

In a meta-analysis including 22 studies involving 2,922 patients (1,230 underwent laparoscopic surgery and 1,692 underwent open surgery), Cao *et al.* showed that the disease-free survival rate, the OS rate, and the recurrence rate did not differ significantly between the two groups (8, 10). These results are in concordance with those of the current analysis. Studies comparing both surgical methods as a treatment method of cervical cancer seem to be inconclusive.

**Strengths and limitations.** The retrospective nature is a limitation of the study, although the current analysis presented data of adjuvant and neoadjuvant treatment.

## Conclusion

The results showed that minimally invasive surgical therapy for cervical cancer is not inferior to abdominal open surgery in terms of OS. Our minimally invasive surgery cohort showed improved DFS compared with the open surgery cohort. Additional prospective trials with larger cohorts are needed to confirm the results. Nevertheless, patients with FIGO stage IA1 (with LVSI), IA2, or IB1 cervical cancer have to be informed about the results of the previously published LACC study prior to making a decision on the route for radical hysterectomy in accordance with the official

statement of the Uterus Commission of the Gynecological Oncology Working Group (AGO) (11).

### Conflicts of Interests

The Authors have no conflicts of interest to declare.

### Authors' Contributions

Manuscript writing: DR, CL and FT; Manuscript editing: BM, CE, BG, SL and PM; Statistical analysis: DR, CL and FT; Data collection: DR, CL, BM, CE, BG, SL, PM and FT; Project development: DR, CL, PM and FT.

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