

## Comparative Analysis between Radical and Minimally Invasive Hysterectomy in Cervical Cancer

Varuni Sharma<sup>1</sup>, Navin Shukla<sup>2</sup>

<sup>1</sup>Associate Professor, Dep of obstetrics and gynaecology, Pacific Institute of Medical Sciences (PIMS), Umarda, Udaipur

<sup>2</sup>Ex Associate Professor, Dep of ENT, M. M. Institute Of Medical Sciences & Research, Ambala (Haryana)

Received: 15-03-2022 / Revised: 23-04-2022 / Accepted: 30-05-2022

Corresponding author: Dr. Navin Shukla

Conflict of interest: Nil

### Abstract

**Introduction:** Cervical malignancy is the 4th most frequently identified type of cancer. A radical abdominal hysterectomy (ARH) was once the standard treatment for initial phase cervical cancer patients while another type of surgery known as minimally invasive surgery (MIS) has evolved into the therapy of choice. In comparison to open surgery, cervical cancer incidence has gradually increased since the introduction of minimally invasive surgery (MIS). Oncology results for MIS and open surgery have been found to be similar in many trials.

**Aims and Objectives:** To find out the survival percentage and outcome efficiency of cervical cancer by using Radical Open surgery and Minimally Invasive Surgery (MIS).

**Materials and Methods:** The study was conducted retrospectively and included patients from our hospital. The patients had cervical carcinoma and they were staged and classified into 2 groups according to the type of surgery they received. The outcome of the study was determined by overall survival (OS) and disease-free survival (DFS) for each type of surgery. Statistical analysis was conducted for the oncologic parameters with the patients' survival for effective comparison between the two types of surgery.

**Results:** The follow-up time (mean value) had no significance between the two groups ( $P = 0.181$ ). There were 5 recurrent cases in "Radical Hysterectomy" group while 6 recurrent cases in "MIS" group. The study found that when radical open type surgery had significantly higher survival percentage when done on patients with more than 2cm of tumor size and with deep stromal invasion ( $P < 0.005$ ).

**Conclusion:** the study concluded that "MIS" should be done in patients with less than 2 cm of tumor size. It has also been observed that with "MIS", oncologic outcomes are not reduced significantly. Hence, "MIS" should be done judiciously with skilled surgical technique.

**Keywords:** cervical cancer, minimally invasive surgery, radical open, hysterectomy

This is an Open Access article that uses a fund-ing model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.

### Introduction

Cervical malignancy is the 4th most frequently identified type of cancer in

women, as well as the quarter most common reason of tumour mortality. The

majority of these occurrences in addition to Southeast Asia, events took occurring in Sub-Saharan Africa and South America, with the highest rates of illness and mortality in Sub-Saharan Africa [1]. In order to treat of selected stage IA, IB1, as well as IIA1 a few instances of cervical cancer, surgery was the primary therapy choice [2]. Individuals having sickness in phase IA should consider conization alone before a simple hysterectomy, whereas individuals who have reached stage stage IB1 or IIA1 disease should consider radical hysterectomy [3]. A radical abdominal hysterectomy (ARH) was once the standard treatment for initial phase cervical cancer patients [4,5].

Over the last two decades, as research advances in the case of initial phase cervical malignancy, minimally invasive surgery (MIS) has evolved into the therapy of choice [6,7]. The safety and feasibility of MIS known as laparoscopic or robot-assisted radical hysterectomy have increasingly gained acceptance[7,8]. It's been proven that MIS helps to prevent blood loss, shorten hospital stays, speed up recovery times, and reduces the risk of postoperative complications, according to numerous reviewing assessments and findings[9-11]. However, preliminary findings from a multi-center Phase 3 randomized controlled trial [12] presented at the Society of Gynecologic Oncology (SGO) meeting in March 2018 showed that cervical tumour persons who underwent MIS had a subordinate disease-free survival rate (DFS) as well as overall survival (OS) than individuals who underwent ARH.

The typical guideline intended for individual with initial-phase cervical malignancy is a radical hysterectomy with pelvic lymphadenectomy. The National Comprehensive Cancer Network as well as the European Society of Gynecologic Oncology both endorses laparotomy (open surgery) or laparoscopy (MIS using traditional or robotic methods) for radical

hysterectomy in individual with initial-phase cervical malignancy (IA2-IIA) [13]. Although there is a dearth of randomized, prospective, and sufficiently powered trials analyzing survival outcomes, these suggestions ultimately resulted in a massive acceptance of practice of a minimally invasive method to radical hysterectomy [13].

On behalf of phase IA1 cervical cancer by means of compromised lymphovascular space (LVSI) through stages IB2 as well as IIA1, radical hysterectomy through additional treatment is the conventional therapy, and intended for cancer cervical bulky tumors, radical hysterectomy with additional treatment is a treatment option. Nezhat et al. and Canis et al. published the first paper on laparoscopic radical hysterectomy in 1992. In comparison to open surgery, cervical cancer incidence has gradually increased since the introduction of minimally invasive surgery (MIS). Oncology results for MIS and open surgery have been found to be similar in many trials. Patients who have a minimally invasive radical hysterectomy having worse advancement permitted as well as inclusive existence rate associated to individuals who receive a radical abdominal hysterectomy, according to the findings of the Laparoscopic Approach to Cervical Cancer (LACC) research issued in November 2018 [14,15].

As a result, the prognosis of MIS vs. ARH in individual with initial-phase cervical malignancy is still debatable. Following that, several clinical trials as well as assessments found that in individual with initial-phase cervical malignancy that go through MIS or ARH had equal survival rates, while those who go through MIS had a tinier DFS. As a result, we developed and analyzed moderate (3-year) as well as long-standing (5-year) fatality results using a meta-analysis of the accessible indication in individual with initial-phase cervical malignancy that go through MIS or ARH (15).

In women with cervical cancer, there is inadequate evidence since surveying assessment indicating endurance outcomes subsequently laparoscopic or robotic radical hysterectomy (MIS) are comparable to those after radical open abdominal hysterectomy (open surgery). The researchers wanted to see how the two surgical procedures compared in terms of disease-free mortality after radical hysterectomy. Second, we wanted to see how the two treatments compared in terms of the chance of relapse, through an attention on invasive maneuvers (usage of uterine manipulator, protective closure of the colpotomy on the tumor). Finally, we wanted to see how the above-mentioned characteristics changed as tumor size increased[7,9,10,15].

### Materials and Methods

This is a retrospective study, which have included patients who visited our hospital during the period of two years. The patients who visited and operated in our hospital were only included. Specifically, the included patients underwent either radical or minimally invasive hysterectomy due to the presence of cervical carcinoma. Each patient's cervical carcinoma was staged using The International Federation of Gynecology and Obstetrics (FIGO) staging system. The patients who did not cooperate with our protocol, did not undergo surgery or their staging was not completely done, were excluded from this study. Further, excluded patients are those who received radiation or chemotherapy therapy prior to the hysterectomy, had carcinoma of histologic types except adenocarcinoma, squamous type or adenosquamous. After applying inclusion and exclusion criteria, the study considered 50 patients. The patients were divided into groups, those who underwent radical hysterectomy through abdominal route ("Radical Hysterectomy" group) and those who

underwent minimally invasive hysterectomy including robotic surgery ("Minimally Invasive Surgery" or "MIS" group).

Cervical cancer was diagnosed by Magnetic Resonance Imaging (MRI) before the surgery along with Computed Tomography (CT) scanning, for determination of the extent of the tumor, involvement of the lymph node and the status of metastasis. The current study extracted detailed information about the patients from several reports and records from the hospital including their information regarding basic characteristics, histopathologic classification, FIGO staging, size of the tumor, history of therapy. The outcome of the study was determined by assessing the overall survival (OS) and disease-free survival (DFS). OS is regarded as the duration (in months) between the date of first diagnosis and date of final outcome including death due to the cancer or last follow-up. DFS is the time duration (in months) between the date of surgery and the date of recurrence of the cancer which is confirmed by the imaging or the biopsy result.

### Statistics

The statistical analysis was conducted in SPSS 25 and excel software. The descriptive data was expressed as mean±standard deviation. The study considered t-test and chi-square test for effective statistical analysis. The level of significance ( $\alpha$ ) was considered at  $p < 0.05$ .

### Results

The study finally considered 50 patients and out of 50 patients, 22 patients (44%) received radical hysterectomy through abdominal route and 28 patients (56%) had underwent minimally invasive hysterectomy. The basic characteristics and histopathologic characteristics are given in Table 1.

**Table 1: The basic characteristics of two groups in this study**

Parameter	“Radical Hysterectomy” group	“MIS” group	P-value
Age (mean±standard deviation)	48.5±3.58	49.2±4.12	0.198
Number of patients	22	28	
<i>Histopathologic characteristics</i>			
Squamous type	14	17	0.145
Adenocarcinoma type	8	6	
Adenosquamous type	2	5	
<i>FIGO staging</i>			
IB1	11	15	0.000
IB2	5	5	0.0025
IB3	4	3	0.359
IIA1	1	3	0.655
IIA2	1	2	0.445
Tumor Size	3.30±1.5	2.18±1.29	0.000
<i>Invasion</i>			
Lympho-vascular space invasion	5	6	0.832
Deep stromal invasion	7	12	0.0008
Follow-up (mean time in months)	38.2	42.5	0.181

The follow-up time (mean value) had no significance between the two groups (P = 0.181). There were 5 recurrent cases in “Radical Hysterectomy” group while 6 recurrent cases in “MIS” group. The authors have studied each stage with number of cases and significance test was

conducted. It was found that there was no significance between the groups. Again, the significance test was conducted according to the sites of recurrence but found no significance. Table 2 shows the details of follow-up findings.

**Table 2: The follow-up findings of survival outcomes classified based on surgical approaches**

	“Radical Hysterectomy” group	“MIS” group	P-value
<i>Recurrence</i>			
IB1	5/11	4/15	0.261
IB2	0/5	1/5	0.112
IB3	0/4	1/3	0.412
IIA1	0/1	0/3	
IIA2	0/1	0/2	
<i>Site of Recurrence</i>			
Total	3	5	0.255
Stump	1	2	
Pelvic lymph node	2	3	
Lung	0		
Peritoneum	0		
Death	2	6	0.603

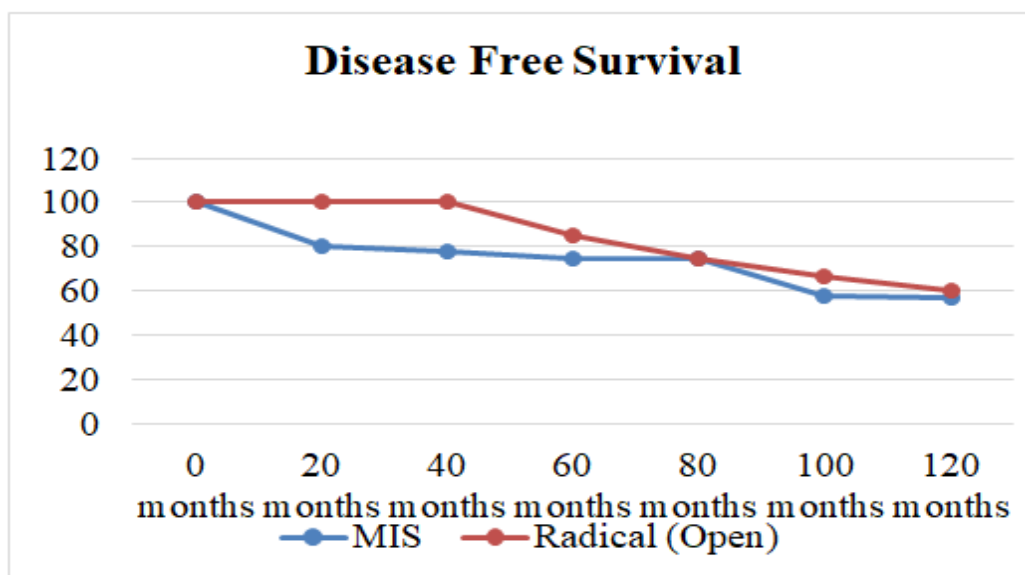
The main factors which are associated with survival outcomes were analyzed and found that factors like tumor size more than 2 cm ( $P < 0.005$ ) and presence of deep stromal invasion ( $P < 0.005$ ) are significantly associated with the survival outcomes. Table 3 shows the details of all the factors involved in deciding survival outcomes.

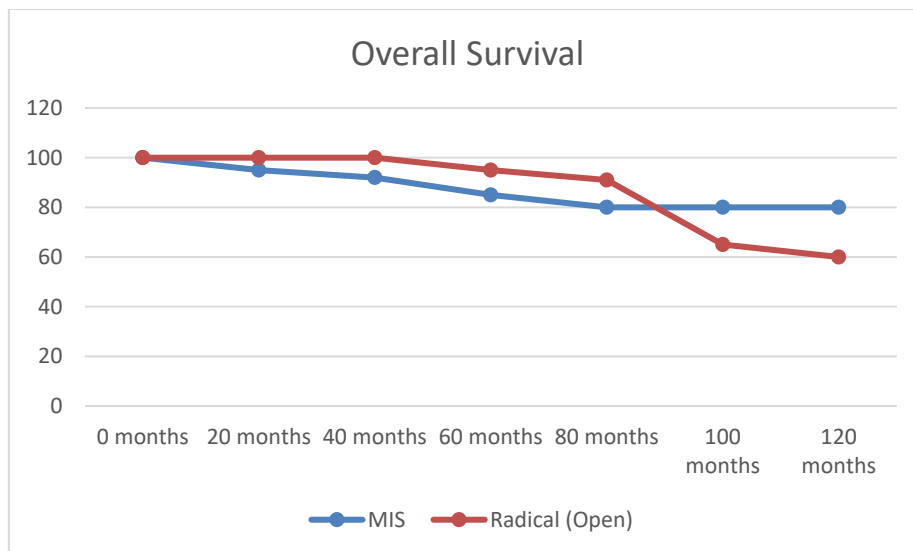
**Table 3: Factors on which survival outcomes are associated**

Factors	“Radical Hysterectomy” group	“MIS” group	P-value
<i>Tumor Size (in cm)</i>			
Less than or equal to 2 cm	4	2	0.255
More than 2 cm	1	4	0.007
<i>Lympho-vascular space invasion</i>			
Positive	0	1	0.408
Negative	5	5	0.230
<i>Deep stromal invasion</i>			
Positive	0	3	0.046
Negative	5	3	0.509

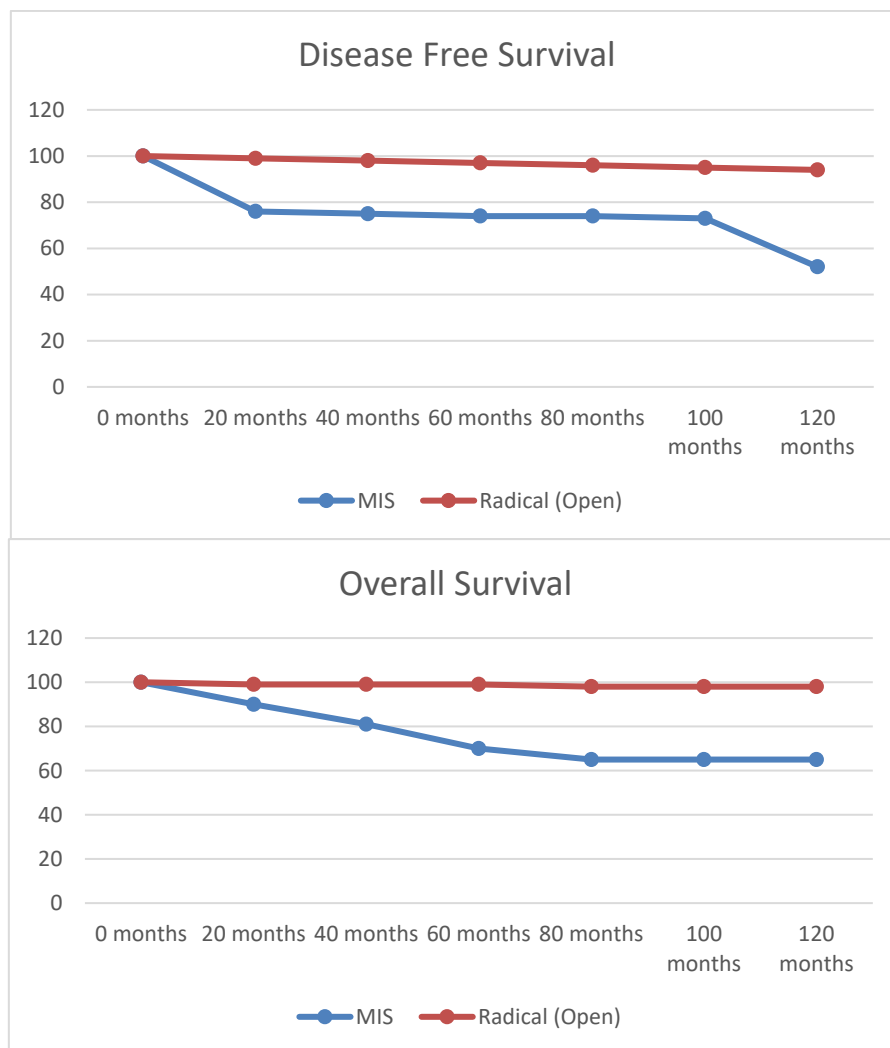
The study found that there were 2 deaths (09.09%) and 6 deaths (21.42%). It has been also found that Overall Survival with MIS is more than Open surgery when all the patients were analyzed. But when the patients with tumor size of more than 2 cm were considered, Overall Survival

percentage was more in case of Radical surgery than MIS type. Figure 1 and Figure 2 show the disease-free survival (DFS) and Overall Survival percentages in all the patients and in patients with more than 2 cm tumor size, respectively.





**Figure 1: Disease Free Survival percentage and Overall Survival percentage with the time among all the patients in this study**



**Figure 2: Disease Free Survival percentage and Overall Survival percentage with the time in patients with tumor size more than 2 cm**

## Discussion

Patients who received a minimally invasive hysterectomy aimed at initial-phase cervical malignancy had shorter ailment free as well as overall existence rates, as well as a higher likelihood of regional recurrence, according to this prospective randomized trial. Our findings contradict previous research recommends that a minimally invasive radical hysterectomy does not differ in cancer outcomes from an invasive procedure.

Wang et al. [16] compared laparoscopic radical hysterectomy to open radical hysterectomy aimed at cervical tumour in a recent meta-analysis. The 5-year inclusive endurance rate and illness permitted existence rate were not meaningfully different between the two treatments, according to their findings. Cao et al. [17] analyzed 22 trials with patients (some undergoing laparoscopic surgery and others undergoing open surgery) and found no substantial alterations in disease-free endurance, total endurance, or relapse frequency amongst the dual groups. Together Meta-analyses quoted a absence of description or a quick follow-up period by means of significant restrictions, as well as the fact that extended tenure cancer consequences subsequent laparoscopic radical hysterectomy in cervical malignancy patients were unclear.

The open technique was also compared to the robotic radical hysterectomy (MIS). The rates of relapse as well as mortality were not significantly different between the binary treatments, according to Serto et al. [18]. Sha et al. [19] compared robotic radical hysterectomy to open radical hysterectomy and found no substantial differences in the relapse rate, indicating that the oncology outcomes were comparable. However, in that study, when compared to previous subjects who had undertaken surgical treatment, in comparison to the open surgery cohort, the

robotic surgery cohort had a higher prevalence of stage IB2 bulky cancers.

The robotic operation cohort had a 10% reappearance frequency despite having a better prognosis. In cervical malignancy patients, minimally invasive radical hysterectomy was linked to a greater degeneration rate and a shorter disease-free endurance rate than the open technique. Furthermore, individuals who experienced minimally invasive surgery had a poorer overall survival rate.

Kong et al. [20] investigated at 128 cervical cancer patients who had a minimally invasive radical hysterectomy as well as associated relapse rates amongst those who had a vaginal colpotomy (79 patients) and individuals who had an intracorporeal colpotomy (49 patients). The intracorporeal colpotomy group had a greater rate of disease recurrence (16%) than the vaginal colpotomy group (5%), and 62% of the intracorporeal group's relapsed patients had intraperitoneal diffusion or carcinomatosis. The scientists found that circulating CO<sub>2</sub> exposure can reason tumor leakage interested in the peritoneal cavity in cervical cancer patients.

A minimally invasive radical hysterectomy was connected to a greater relapse rate and a shorter disease-free lifespan in cervical tumour patients when compared towards an open operation. Furthermore, individuals who had minimally invasive surgery had a worse overall survival frequency. Since the first report in 1992, the usage of MIS in gynecological oncology has steadily grown [21]. In terms of postoperative mortality and complications, MIS is superior to open surgery [22]. MIS also revealed equivalent survival results in a number of retrospective trials. The LACC study, on the other hand, totally refuted these findings [23]. The LACC trial is the individual randomized clinical trial that

associates the endurance consequences of MIS against open surgery, despite some dispute over the results [24]. The LACC study's unexpected findings prompted the NCCN as well as ESGO to revise their therapeutic strategies aimed at early-stage cervical cancer, impacting management protocols in numerous facilities [25].

They examined the oncology results of MIS to open surgical treatment aimed at management of initial phase cervical carcinoma in a retrospective review. They found some clinical pathological differences between the two groups in their entire cohort. Patients in the MIS group were mostly in phase IB1, while those in the open surgical treatment group were mostly in stage IB2. The diameter of the malignancy and the rate of extensive stromal invasion were meaningfully diverse amongst the binary groups between the middle danger causes. As a result, the rate of adjuvant treatment differed significantly.

Equally DFS as well as OS were analogous amongst groups in the whole cohort, which comprised tumors of all sizes. The results of the LACC study are in direct opposition to these findings. However, our findings were consistent with the findings of the LACC research in patients through tumors larger than 2cm; the MIS group had a much greater relapse rate and a significantly lower DFS than the open surgery group.

A 5.3 % relapse rate was found in the open surgery group, while the MIS group had a 13.6% relapse rate in the entire cohort. Both groups experienced higher relapse rates than the LACC research. Relapse rates were 2.2% in the LACC study and 8.5% in the LACC study, respectively [26, 27]. We included stage IIA2 and IB3 patients with large tumor masses, which explain the differences in outcomes. Relapse occurred in 9 of 40 (22.5%) of MIS patients through tumors bigger than 2cm. In the open surgery group, however,

no relapse was observed. In the total cohort, relapses in the MIS group were more common than in the non-MIS group. Furthermore, 8 of the 9 relapses in patients through tumors bigger than 2cm happened in the vaginal stump. Several variables can be blamed for the increased recurrence rates in the MIS group, as well as the high stump recurrence rates. The usage of the uterine manipulator is the first factor to consider. The tumor may rupture and spread as a result of this. Second, intracorporeal colpotomy exposes the tumor, allowing it to spread. A uterine manipulator was employed in our study through case basis, with intracorporeal colpotomy performed in the majority of instances. The MIS group may have a higher risk of relapse due to these surgery or surgeons correlated aspects [27].

Kanao et al. [28] presented study which can due prevent the intraoperative tumor effusion by using a method with four steps which are associated with invasive as well as oncological consequences of laparoscopic complete hysterectomy (radical type). They showed that the outcomes were significant in the first approach while oncological outcomes were similar in all techniques [29].

According to the findings, MIS patients through tumors larger than 2 cm had a considerably lower DFS. These conclusions are dependable with those of Kim et al. [30], who looked at endurance consequences between phases IB1-IIA2 patients and found that MIS patients had expressively worse DFS in the subcategory using tumor size >2cm. Our findings imply that tumor size should be addressed, and MIS used in patients with tumors smaller than 2 cm before deciding on the approach for radical hysterectomy.

When compared to open surgery, MIS was linked to a greater rate of recurrence and a shorter DFS in individuals with tumors larger than 2 cm. As a result, the findings of the LACC study are backed up by this



retrospective research. MIS did not appear to impact oncological consequences in those with tumors less than 2 cm. As a result, MIS should only be used on a small number of patients, and the surgical method should be used with caution. In addition, the outcomes of the LACC research should be shared with each patient before deciding on a radical hysterectomy procedure [28-31].

### Conclusion

The patients who had tumor size of more than 2 cm and received "MIS", had shown poor DFS percentage with respect to the patients who received "Radical Hysterectomy". Therefore, the current study proposed that "MIS" should be carried out in those patients only who have tumor size of less than 2 cm.

There are some limitations of this study. The study was retrospective in design and there are some information biases. Another limitation was that the sample size was not significantly larger and varied. There is a need to conduct the studies with larger and more varied population. The study has concluded that that patient of "MIS" group with tumor size more than 2 cm, had shown stronger association with higher rate of recurrence as compared to "Radical Hysterectomy" group. It has also been observed that with "MIS", oncologic outcomes are not reduced significantly. Hence, "MIS" should be done judiciously with skilled surgical technique.

### References

1. Sung H, Ferlay J, Siegel RL, Laversanne M, Soerjomataram I, Jemal A, et al. Global Cancer Statistics 2020: GLOBOCAN Estimates of Incidence and Mortality Worldwide for 36 Cancers in 185 Countries. *CA: A Cancer J Clin* (2021) 71(3):209–49.
2. Koh WJ, Abu-Rustum NR, Bean S, Bradley K, Campos SM, Cho KR, et al. Cervical Cancer, Version 3.2019, NCCN Clinical Practice Guidelines in Oncology. *J Natl Compr Canc Netw* (2019) 17(1):64–84.
3. Cibula D, Pötter R, Planchamp F, Avall-Lundqvist E, Fischerova D, Haie Meder C, et al. The European Society of Gynaecological Oncology/European Society for Radiotherapy and Oncology/European Society of Pathology Guidelines for the Management of Patients with Cervical Cancer. *Radiother Oncol* (2018) 127(3):404–16.
4. Nezhat CR, Burrell MO, Nezhat FR, Benigno BB, Welander CE. Laparoscopic Radical Hysterectomy with Paraaortic and Pelvic Node Dissection. *Am J Obstetrics Gynecology* (1992) 166(3):864–5.
5. Abu-Rustum NR, Hoskins WJ. Radical Abdominal Hysterectomy. *Surg Clin North Am* (2001) 81(4):815–28.
6. Spirtos NM, Eisenkop SM, Schlaerth JB, Ballon SC. Laparoscopic Radical Hysterectomy (Type III) With Aortic and Pelvic Lymphadenectomy in Patients with Stage I Cervical Cancer: Surgical Morbidity and Intermediate Follow-Up. *Am J Obstet Gynecol* (2002) 187(2):340–8.
7. Stewart KI, Fader AN. New Developments in Minimally Invasive Gynecologic Oncology Surgery. *Clin Obstet Gynecol* (2017) 60(2):330–48.
8. Koh WU, Greer BE, Abu-Rustum NR, Apte SM, Campos SM, Cho KR, et al. Cervical Cancer, Version 2.2015. *J Natl Compr Cancer Network JNCCN* (2015) 13(4):395–404.
9. Clayton RD. Hysterectomy. *Best Pract Res Clin Obstet Gynaecol* (2006) 20 (1):73–87.
10. Wenzel HHB, Smolders RGV, Beltman JJ, Lambrechts S, Trum HW, Yigit R, et al. Survival of Patients with Early-Stage Cervical Cancer After Abdominal or Laparoscopic Radical Hysterectomy: A Nationwide Cohort Study and Literature Review. *Eur J Cancer* (2020) 133:14–21.
11. Yuan Z, Cao D, Yang J, Yu M, Shen K, Yang J, et al. Laparoscopic vs. Open Abdominal Radical Hysterectomy for Cervical Cancer: A Single-Institution,

- Propensity Score Matching Study in China. *Front Oncol* (2019) 9:1107.
12. Ramirez PT, Frumovitz M, Pareja R, Lopez A, Vieira M, Ribeiro R, et al. Minimally Invasive Versus Abdominal Radical Hysterectomy for Cervical Cancer. *N Engl J Med* (2018) 379(20):1895–904.
  13. Ramirez PT, Frumovitz M, Pareja R, Lopez A, Vieira M, Ribeiro R, Buda A, Yan X, Shuzhong Y, Chetty N, Isla D. Minimally invasive versus abdominal radical hysterectomy for cervical cancer. *New England Journal of Medicine*. 2018 Nov 15;379(20):1895-904.
  14. Kim SI, Lee J, Hong J, Lee SJ, Park DC, Yoon JH. Comparison of abdominal and minimally invasive radical hysterectomy in patients with early-stage cervical cancer. *International Journal of Medical Sciences*. 2021;18(5):1312.
  15. Chiva L, Zanagnolo V, Querleu D, Martin-Calvo N, Arévalo-Serrano J, Căpîlna ME, Fagotti A, Kucukmetin A, Mom C, Chakalova G, Aliyev S. SUCCOR study: an international European cohort observational study comparing minimally invasive surgery versus open abdominal radical hysterectomy in patients with stage IB1 cervical cancer. *International Journal of Gynecologic Cancer*. 2020 Sep 1;30(9).
  16. Wang YZ, Deng L, Xu HC, Zhang Y, Liang ZQ. Laparoscopy versus laparotomy for the management of early-stage cervical cancer. *BMC Cancer* 2015; 15: 928.
  17. Cao T, Feng Y, Huang Q, Wan T, Liu J. Prognostic and safety roles in laparoscopic versus abdominal radical hysterectomy in cervical cancer: a meta-analysis. *J Laparoendosc Adv Surg Tech A* 2015; 25: 990-8.
  18. Sert BM, Boggess JF, Ahmad S, et al. Robot-assisted versus open radical hysterectomy: a multi-institutional experience for early-stage cervical cancer. *Eur J Surg Oncol* 2016; 42: 513-22.
  19. Shah CA, Beck T, Liao JB, Giannakopoulos NV, Veljovich D, Paley P. Surgical and oncologic outcomes after robotic radical hysterectomy as compared to open radical hysterectomy in the treatment of early cervical cancer. *J Gynecol Oncol* 2017;28(6): e82.
  20. Kong TW, Chang SJ, Piao X, et al. Patterns of recurrence and survival after abdominal versus laparoscopic/robotic radical hysterectomy in patients with early cervica cancer. *J Obstet Gynaecol Res* 2016; 42: 77-86.
  21. Nam JH, Park JY, Kim DY, Kim JH, Kim YM, Kim YT. Laparoscopic versus open radical hysterectomy in early-stage cervical cancer: long-term survivaloutcomes in a matched cohort study. *Ann Oncol*. 2012; 23:903-11.
  22. Wang W, Chu HJ, Shang CL, Gong X, Liu TY, Zhao YH. et al. Long-Term Oncological Outcomes After Laparoscopic Versus Abdominal Radical Hysterectomy in Stage IA2 to IIA2 Cervical Cancer: A Matched Cohort Study. *International journal of gynecological cancer: official journal of the International Gynecological Cancer Society*. 2016; 26:1264-73.
  23. Ramirez PT, Frumovitz M, Pareja R, Lopez A, Vieira M, Ribeiro R. et al. Minimally Invasive versus Abdominal Radical Hysterectomy for Cervical Cancer. *N Engl J Med*. 2018; 379:1895-904.
  24. Querleu D, Cibula D, Concin N, Fagotti A, Ferrero A, Fotopoulou C. et al. Laparoscopic radical hysterectomy: a European Society of Gynaecological Oncology (ESGO) statement. *International journal of gynecological cancer: official journal of the International Gynecological Cancer Society*. 2020; 30:15.
  25. Conrad LB, Ramirez PT, Burke W, Naumann RW, Ring KL, Munsell MF. et al. Role of Minimally Invasive Surgery in Gynecologic Oncology: An Updated Survey of Members of the Society of Gynecologic Oncology. *International journal of gynecological cancer: official journal of the International Gynecological Cancer Society*. 2015; 25:1121-7.
  26. Diver E, Hinchcliff E, Gockley A, Melamed A, Contrino L, Feldman S. et al. Minimally Invasive Radical Hysterectomy for Cervical Cancer Is Associated WithReduced Morbidity and Similar

- Survival Outcomes Compared With Laparotomy. *J Minim Invasive Gynecol.* 2017; 24:402-6.
27. Bogani G, Cromi A, Uccella S, Serati M, Casarin J, Pinelli C. et al. Laparoscopic versus open abdominal management of cervical cancer: long-term results from a propensity-matched analysis. *J Minim Invasive Gynecol.* 2014; 21:857-62.
28. Kanao H, Matsuo K, Aoki Y, Tanigawa T, Nomura H, Okamoto S. et al. Feasibility and outcome of total laparoscopic radical hysterectomy with no-look no-touch technique for FIGO IB1 cervical cancer. *Journal of gynecologic oncology.* 2019;30:e71.
29. Park JY, Nam JH. How should gynecologic oncologists react to the unexpected results of LACC trial?. *Journal of gynecologic oncology.* 2018;29: e74.
30. Kim SI, Lee J, Hong J, Lee SJ, Park DC, Yoon JH. Comparison of abdominal and minimally invasive radical hysterectomy in patients with early-stage cervical cancer. *Int J Med Sci* 2021; 18(5):1312-1317.
31. Berthelot, M., Rieker, A., & Correia, J. C. The difficulties experienced by patients with low back pain in France: a mixed methods study. *Journal of Medical Research and Health Sciences*, 2022:5(6), 2039–2048.