SCIENTIFIC PAPER JSLS

Radical Hysterectomy for Early Stage Cervical Cancer: Laparoscopy Versus Laparotomy

Sarah E. Taylor, MD, William C. McBee Jr., MD, Scott D. Richard, MD, Robert P. Edwards, MD

ABSTRACT

Objectives: Gynecologic oncologists have recently begun using laparoscopic techniques to treat early stage cervical cancer. We evaluated a single institution's experience of laparoscopic radical hysterectomy and staging compared with laparotomy.

Methods: A retrospective chart review identified stage IA2 and IB1 cervical cancer patients who underwent laparoscopic radical hysterectomy and pelvic lymph node dissection from July 2003 to April 2009. A 2:1 cohort of patients treated with laparotomy were matched by stage.

Results: Nine laparoscopic patients (3 stage IA2, 6 stage IB1) with 18 matched controls (6 and 12) were identified. Demographics for each group were similar. None had positive margins or lymph nodes. An average of 11.2 vs.13.9 pelvic lymph nodes (P=0.237) were removed. Average operating time was 231.7 vs. 207.2 minutes (P=0.434), and average estimated blood loss was 161.1 vs. 394.4mL (P=0.059). Average length of stay was 2.9 vs. 5.5 days (P=0.012). No transfusions or operative complications were noted in the laparoscopic group vs. 3 each in the open group (P=0.194). No laparoscopic patients and 5 open patients had a postoperative wound infection (P=0.079). No recurrences were noted.

Conclusions: Laparoscopic radical hysterectomy is a feasible alternative to laparotomy for early stage cervical cancer. Similar surgical outcomes are achieved with significantly less morbidity.

Key Words: Laparoscopic radical hysterectomy, Cervical cancer.

Magee-Womens Hospital of University of Pittsburgh Medical Center, Pittsburgh, Pennsylvania, USA (all authors).

Address correspondence to: Sarah E. Taylor, MD, Magee-Womens Hospital of UPMC, Department of Obstetrics, Gynecology and Reproductive Sciences, 300 Halket Street, Pittsburgh, Pennsylvania 15213, USA. Telephone: (412) 641-1092, Fax: (412) 641-2649, E-mail: taylorse2@mail.magee.edu

DOI: 10.4293/108680811X13022985132218

INTRODUCTION

In the early 1900s, radical hysterectomy with pelvic lymphadenectomy was developed for the treatment of cervical cancer.[1] Initially, this was associated with high morbidity and mortality, so radiation became the favored treatment modality. However, with the advent of antibiotics, blood transfusions, and improvements in anesthesia, surgery regained popularity for the treatment of early stage cervical cancer (stage IA2 and IB1). The National Comprehensive Cancer Network (NCCN),[2] which publishes and continually updates practice guidelines for all areas of cancer care and is used in 115 countries around the world, currently recommends radical hysterectomy with pelvic lymphadenectomy for stage IA2 and IB1 disease in those patients who no longer desire fertility and are good surgical candidates. However, the guidelines do not specify the approach in which this procedure must be accomplished. Until the early 1990s, the standard surgical practice for early stage, nonbulky disease was radical abdominal hysterectomy with pelvic lymphadenectomy. In the 1990s, gynecologic oncologists began using a laparoscopic approach with the aim of completing the same surgery with less morbidity.[3] Since that time, several studies have looked at the feasibility of completing the surgery laparoscopically. More recently, researchers have examined the morbidity and mortality rates associated with the newer technique.[4–23] In this study, we compare a cohort of women who underwent laparoscopic radical hysterectomy for early stage cervical cancer to a matched group that underwent open radical hysterectomy and assess the surgical outcomes for both groups.

MATERIALS AND METHODS

After obtaining institutional review board approval, a retrospective chart review was performed looking for all women who had undergone a laparoscopic-assisted vaginal radical hysterectomy and pelvic lymph node dissection for early stage cervical cancer at Magee-Womens Hospital of the University of Pittsburgh. Between July 2003 and April 2009, nine patients with stage IA2 and IB1 cervical cancer who had undergone the above procedure were identified. The initial diagnosis of cervical cancer was made by histologically confirmed biopsy prior to surgical resection. The patient's assigned stage was based on the clinical staging set forth by the

International Federation of Gynecology and Obstetrics (FIGO).[24] We matched a 2:1 cohort of patients by stage who underwent a radical hysterectomy and lymph node dissection through laparotomy. We chose the case immediately proceeding and following each laparoscopic case for comparison. The choice to perform the procedure laparoscopically was left to the discretion of the surgeon after a thorough discussion of risks and benefits with the patients.

Data were then collected on both the laparoscopic cases and the matched open cases. These data included patient demographics of age, body mass index (BMI), race, and tobacco use, tumor histological characteristics, presence of positive surgical margins, number of lymph nodes, and the presence of positive lymph nodes. Additionally, we collected operative outcomes including operating time, blood loss, transfusion requirement, and operative complications, as well as postoperative follow-up including postoperative wound infections, length of stay, adjuvant treatment, and recurrence.

None of the parameters analyzed during this study were used to include or exclude patients from the study. All data points were used for comparison between the 2 techniques to determine the feasibility of the laparoscopic technique as an alternative method to laparotomy. Statistical analysis was performed using the chi-square test or *t* test where appropriate, with a significance level of $P<0.05$.

RESULTS

A total of 9 patients were found to have undergone laparoscopic radical hysterectomy, with 18 matched open controls. The average age was 41.4 versus 41.1 years ($P=0.648$), and the average BMI was 26.3kg/m^2 versus 26.9kg/m^2 ($P=0.768$). All of the patients in the laparoscopic group were Caucasian compared to 15 of the 18 in the laparotomy group, with the remaining 3 being African American ($P=0.529$). Four of 9 (44.4%) women in the laparoscopic group versus 11 of 18 (61.1%) women in the open group ($P=0.411$) had a history of smoking. Three patients had stage IA2 and 6 had stage IB1, with 6 and 12 matched controls, respectively. Four in the laparoscopic group and 7 in the open group had adenocarcinoma, with the remaining cases being squamous cell carcinoma. None of the tumors had positive margins or positive lymph nodes. An average of 11.2 versus 13.9 pelvic lymph nodes ($P=0.237$) were removed **(Table 1)**.

Average operating time was 231.7 minutes for the laparoscopic cases and 207.2 minutes for open cases ($P=0.434$). The mean estimated blood loss was 161.1mL for laparoscopic versus 394.4mL for laparotomy ($P=0.059$). The average length of stay was 2.9 days versus 5.5 days ($P=0.012$). There were no transfusions required or operative complications in the laparoscopic group, but 3 patients were transfused in the open group, and 3 patients had operative complications in the open group ($P=0.194$). The operative complications noted in the laparotomy group included bleeding from the uterine vein, injury to the left external iliac artery, and a bowel perforation. No patients in the laparoscopic group and 5 in the open group had a postoperative wound infection, including superficial cellulitis in 1 patient and wound separation with purulent discharge in 4 patients ($P=0.079$). One woman in the laparoscopic group versus 4 in the open group were given adjuvant radiation at the discretion of the primary physician, depending on the high-risk features of postoperative pathology ($P=0.484$) **(Table 2)**. There were no noted recurrences of disease in either group.

Table 1.
Demographics and Cancer Characteristics

	LARVH (n=9), (range)	RAH (n=18), (range)	P Value
Age (years)	41.4 (31–60)	41.1 (25–61)	0.648
BMI (kg/m$^{2)}$	26.3 (20.6–36.1)	26.9 (17–38.3)	0.768
Race	9 Caucasian, 0 African American	15 Caucasian, 3 African American	0.529
Stage			
IA2	3	6	
IB1	6	12	
Histology			
SCC	5	11	
Adenocarcinoma	4	7	
Lymph Node Removal	11.2 (5–18)	13.9 (6–24)	0.237

Table 2.
Operative and Postoperative Characteristics

	LARVH (n=9), (range)	RAH (n=18), (range)	P Value
OR Time (minutes)	231.7 (148–313)	207.2 (119–340)	0.434
Blood Loss (mL)	161.1 (50–300)	394.4 (100–1400)	0.059
Operative Complication	0	3	0.194
Transfusion	0	3	0.194
Wound Infection	0	5	0.079
Length of Stay (days)	2.9 (2–4)	5.5 (3–24)	0.012
Adjuvant Therapy	1	4	0.484

DISCUSSION

Minimally invasive surgery is becoming a more popular option for many gynecological surgeries, because of its decrease in operative blood loss and length of stay after surgery as well as faster recovery time. Because of benefits like these, gynecologic oncologists have sought to perform traditionally open cases through laparoscopy. This study looks at a series of laparoscopic-assisted radical vaginal hysterectomies and compares the surgical outcomes to the outcome of cases done via traditional abdominal radical hysterectomy. Our results support previous findings that blood loss and length of stay are lessened in the laparoscopic cases. Additionally, the laparoscopic group appeared to have fewer operative and postoperative complications.

When considering whether a new surgical technique is equivalent to the standard of care, important aspects to critique include the feasibility and applicability of the new technique, the operative and postoperative complications, and for oncological cases, survival and risk of recurrence. Several studies have looked at the feasibility of completing laparoscopic radical hysterectomies. More recently, this technique has been directly compared to the traditional laparotomy. The studies done prior to this one suggest that laparoscopy is a safe and feasible alternative to laparotomy, but to date, there have been no large, randomized controlled trials comparing the 2 techniques. Until laparoscopic radical hysterectomy is more widely practiced, the feasibility and applicability will have to be assessed through retrospective studies.

This study adds to the already published data that support the use of laparoscopy as an alternative to laparotomy. Although it has a limited number of patients, this study does compare outcomes to a similarly matched control group of the same time period adding to the small pool of growing data that show equivalent outcomes for this new procedure. Even though the difference in length of hospital stay was the only measurement that proved to be statistically significant, postoperative wound infection, blood loss, and operative complications all appear to be lower in the laparoscopic cases than in the laparotomy cases, and may be statistically significantly different in a larger series. Additionally, shorter length of stay after laparoscopy has been reported previously and is again confirmed by our findings.[7,8,13,14,16–19,22]

We found that mean operating time was not significantly different between these 2 procedures, 231.7 minutes (range, 148 to 313) for the laparoscopic cases and 207.2 minutes (range, 119 to 340) for the open cases, but that the laparoscopic cases were slightly longer on average. This has been noted previously in other studies.[10,13,14,16,17] However, not all studies have shown this. Some reports have demonstrated that cases done laparoscopically were significantly longer.[18,19,22] This is likely because laparoscopy is a newer technique, and a learning curve is expected for new procedures. As surgeons become more comfortable with the technique, operating time should be reduced. Of note, there were some operating times that were longer than would be expected in both the open and the laparoscopic groups. The laparotomy case that took 340 minutes was an outlier with the rest of the cases well under 300 minutes. This case was complicated by a left external iliac artery injury and required a longer operating time for repair. Early experience with this technique may also explain the great variance in operating time documented within the laparoscopic cases. There were no noted complications in the laparoscopic case that took 313 minutes; however, it was only the second case in the series. Comparing this to the last case recorded in this series, which was completed in 148 minutes, without complications, it is easy to surmise that over time and with practice this procedure became easier and therefore the surgery was completed more quickly. As the laparoscopic surgical approach is accepted as equivalent in cancer outcomes, it is expected that more surgeons will adopt the technique, because of decreased morbidity and faster recovery for their patients.

Some may speculate that the cases done through laparoscopy may have been chosen because of certain patient characteristics, like lower BMI, no previous surgeries, and fewer medical comorbidities, which may make the cases easier and therefore result in fewer operative and postoperative complications. However, looking through these 2

patient populations, the average BMI for the individuals in both groups were similar, as well as the range of BMIs, 20.6 to 36.1 in the laparoscopic group and 17 to 38.3 in the laparotomy group. Similarly, both groups were heterogenous in regard to their past surgical histories and their medical comorbidities, noting that none of the patients were taking immunosuppressants, and the 2 with diabetes mellitus did not have postoperative wound infections. There was a mixture of smokers and nonsmokers. On an interesting note, all of the patients who had wound infections in the laparotomy group were smokers, except one that was a former smoker. It should be noted that even though there were smokers in the laparoscopic group, there were no wound infections in this group. Some may argue that there was limited follow-up, and so there was not enough time to detect all of the wound infections. However, the shortest follow-up period was 13 months, so it is unlikely that any wound infections directly associated with the surgery would be missed within this time period.

As noted by other groups, the blood loss with laparoscopic surgery tends to be less than with traditional laparotomy. This is one of the biggest reasons why surgeons started moving toward laparoscopic surgery in the beginning and this continues to hold true. In our small set of patients, it did not reach statistical significance; however, the trend is similar to what has been reported before and adds credence to the overall argument for the use of laparoscopy as an alternative to laparotomy.[7,9,10,16,17,19,22] Additionally, there were no operative complications in the laparoscopic group, which also supports previous findings that laparoscopy is a safe alternative.[10,13,16–23]

Long-term cancer outcome data are not available in our series due to small numbers and short follow-up. However, no patient had a recurrence in either the laparoscopic group over a median follow-up of 35.3 months (range, 13 to 82) or in the laparotomy group over a median follow-up of 35.1 months (range, 13 to 78).

There are limitations to this study, including the retrospective nature of the work, the small sample size, and the short follow-up for the more recent cases. With regard to the retrospective design, as mentioned before, there have not been any large prospective trials to date, because this is a relatively new surgical technique that is being applied to a standardized guideline of care. Because this is a new approach, it is not being widely practiced among the gynecologic oncologists at Magee-Womens Hospital. Therefore, to assess the current experience and gather enough cases to establish a pattern of outcomes, it was necessary to turn to historical data. The retrospective nature lends itself to criticism in that there is no great uniformity to the patient population or a standardized follow-up plan. However, because there were no strict standardizations as with a designed prospective trial, the outcomes may be more generalizable. This is because there will be inevitable practice variances among different gynecologic oncologists as well as patients who return for continued care. There are documented care records for this series of patients, without any loss to follow-up, which gives the results credence, even though the more recent cases have a limited time to assess recurrence and survival.

The second notable limitation is the sample size, which speaks to the newness of this technique. As mentioned above, this technique first became a part of gynecologic oncology in the early 1990s, gaining popularity over the last 20 years. However, as with any new procedure, it takes time and training to adopt a method as a regular part of surgical practice. For this reason, the cases presented within this series are limited in number. However, as mentioned before, the trends noted within this study follow what has been seen in the literature to date. There are no published data on exactly how many radical hysterectomies are done laparoscopically in the United States every year and no central reporting or large trials looking at laparoscopic radical hysterectomy. Until we have data like this, it is important to continue to report on institutional experiences to add to the growing data on the feasibility and safety of the technique as an alternative to standard laparotomy.

Lastly, the follow-up in this series was over a long range of time, starting with cases in 2003 and ending in 2009. The early cases allow for adequate assessment of 5-year follow-up with regard to recurrence and survival. However, the data are clearly limited with respect to the more recent cases. We report that we did not have any cases of recurrence or death, which does not align with all the current outcome literature.[12–15,18–22] This is likely secondary to the short interval follow-up from the later cases as well as the limited number in the series. Even with these limitations, it shows promise that these patients have similar outcomes, if not improved, when compared to the open cases.

CONCLUSION

Our results add to the results of a growing number of surgeons and researchers who have shown that laparoscopy is a feasible alternative to laparotomy for radical hysterectomy. This minimally invasive procedure should be considered for the treatment of any women with small volume invasive cervical cancer.

References:

1. Webb MJ. Radical hysterectomy. *Bailliere's Clin Obstet Gynaecol.* 1997;11(1):149–166.

2. National Comprehensive Cancer Network. http://www.nccn.org.

3. Canis M, Mage G, Wattiez A, Pouly JL, Manhes H, Bruhat MA. Does endoscopic surgery have a role in radical surgery of cancer of the cervix uteri? *J Gynecol Obstet Biol Reprod (Paris).* 1990; 19:921.

4. Nezhat CR, Burrell MO, Nezhat FR, Benigno BB, Welander CE. Laparoscopic radical hysterectomy with para-aortic and pelvic node dissection. *Am J Obstet Gynecol.* 1992;166:864–865.

5. Canis M, Mage G, Pouly JL, et al. Laparoscopic radical hysterectomy for cervical cancer. *Baillieres Clin Obstet Gynaecol.* 1995;9:675–689.

6. Spirtos NM, Schlaerth JB, Kimball RE, Leiphart VM, Ballon SC. Laparoscopic radical hysterectomy (type III) with aortic and pelvic lymphadenectomy. *Am J Obstet Gynecol.* 1996;174:1763–1767.

7. 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;187:340–348.

8. Ramirez PT, Slomovitz BM, Soliman PT, Coleman RL, Levenback C. Total laparoscopic radical hysterectomy and lymphadenectomy: the M.D. Anderson Cancer Center experience. *Gynecol Oncol.* 2006;102:252–255.

9. Gil-Moreno A, Diaz-Feijoo B, Roca I, et al. Total laparoscopic radical hysterectomy with intraoperative sentinel node identification in patients with early invasive cervical cancer. *Gynecol Oncol.* 2005;96:187–193.

10. Frumovitz M, dos Reis R, Sun CC, et al. Comparison of total laparoscopic and abdominal radical hysterectomy for patients with early-stage cervical cancer. *Obstet Gynecol.* 2007;110:96–102.

11. Ramirez PT, Frumovitz M, dos Reis R, et al. Modified uterine manipulator and vaginal rings for total laparoscopic radical hysterectomy. *Int J Gynecol Cancer.* 2008;18:571–575.

12. Pomel C, Atallah D, Le Bouedec G, et al. Laparoscopic radical hysterectomy for invasive cervical cancer: 8-year experience of a pilot study. *Gynecol Oncol.* 2003;91:534–539.

13. Li G, Yan X, Shang H, Wang G, Chen L, Han Y. A comparison of laparoscopic radical hysterectomy and pelvic lymphadenectomy and laparotomy in the treatment of Ib-IIa cervical cancer. *Gynecol Oncol.* 2007;105:176–180.

14. Sobiczewski P, Bidzinski M, Derlatka P, et al. Early cervical cancer managed by laparoscopy and conventional surgery: comparison of treatment results. *Int J Gynecol Cancer.* 2009 Nov; 19(8):1390–1395.

15. Lee CL, Wu KY, Huang KG, Lee PS, Yen CF. Long-term survival outcomes of laparoscopically assisted radical hysterectomy in treating early-stage cervical cancer. *Am J Obstet Gynecol.* 2010 Aug;203(2):165.e1–7. Epub 2010 May 11.

16. Sharma R, Bailey J, Anderson R, Murdoch J. Laparoscopically assisted radical vaginal hysterectomy (Coelio-Schauta): A comparison with open Wertheim/Meigs hysterectomy. *Int J Gynecol Cancer.* 2006 Sep–Oct;16(5):1927–1932.

17. Pahisa J, Martínez-Román S, Torné A, et al. Comparative study of laparoscopically assisted radical vaginal hysterectomy and open Wertheim-Meigs in patients with early-stage cervical cancer: eleven years of experience. *Int J Gynecol Cancer.* 2010 Jan;20(1):173–178.

18. Nam JH, Kim JH, Kim DY, et al. Comparative study of laparoscopic-vaginal radical hysterectomy and abdominal radical hysterectomy in patients with early cervical cancer. *Gynecol Oncol.* 2004 Jan;92(1):277–283.

19. Steed H, Rosen B, Murphy J, Laframboise S, De Petrillo D, Covens A. A comparison of laparoscopic-assisted radical vaginal hysterectomy and radical abdominal hysterectomy in the treatment of cervical cancer. *Gynecol Oncol.* 2004 Jun;93(3):588–593.

20. Pellegrino A, Vizza E, Fruscio R, et al. Total laparoscopic radical hysterectomy and pelvic lymphadenectomy in patients with Ib1 stage cervical cancer: analysis of surgical and oncological outcome. *Eur J Surg Oncol.* 2009 Jan;35(1):98–103. Epub 2008 Aug 28.

21. Pellegrino A, Villa A, Fruscio R, et al. Total laparoscopic radical hysterectomy and pelvic lymphadenectomy in early stage cervical cancer. *Surg Laparosc Endosc Percutan Tech.* 2008 Oct; 18(5):474–478.

22. Malzoni M, Tinelli R, Cosentino F, Fusco A, Malzoni C. Total laparoscopic radical hysterectomy versus abdominal radical hysterectomy with lymphadenectomy in patients with early cervical cancer: our experience. *Ann Surg Oncol.* 2009 May;16(5):1316–23. Epub 2009 Feb 18.

23. Yan X, Li G, Shang H, Wang G, Chen L, Han Y. Complications of laparoscopic radical hysterectomy and pelvic lymphadenectomy–experience of 117 patients. *Int J Gynecol Cancer.* 2009 Jul;19(5):963–967.

24. Benedet, JL, Bender, H, Jones H, 3rd, et al. FIGO staging classifications and clinical practice guidelines in the management of gynecologic cancers. FIGO Committee on Gynecologic Oncology. *Int J Gynaecol Obstet.* 2000;70:209.