

Original Article

Influence of resident training on length and outcome of laparoscopically assisted radical vaginal hysterectomy for treatment of early cervical cancer

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Abstract: Introduction: Laparoscopic surgery for early invasive cancer of the cervix is becoming widely accepted as standard treatment for cervical cancer. There is a learning curve for the attending surgeon associated with this technique. The question exists whether the procedure can be incorporated into the residency training program after the attending surgeon has acquired the skills. Materials and method: Seventy three patients with early cervical cancer underwent laparoscopic lymph node dissection and laparoscopic assisted vaginal hysterectomy (LAVRH) at the University Medical Center at the University of Arizona in Tucson Arizona. After a learning series of 25 patients where the 2 attendings operated together, the residents were incorporated into the operations with the majority of the surgeries performed with an attending and a resident assistant. Group A were patients operated by 2 attendings and Group B were operated with a resident as primary assistant. Intraoperative and postoperative data and complications were collected and compared. Results: Group A patients operated by attendings had higher blood loss, longer surgical times, and more intraoperative complications. Conclusions: Complications were higher as the attendings were attaining their skills. After the attendings acquired the skills to perform the operation the addition of the residents as the primary assistant did not prolong the learning curve and outcomes improved.

Keywords: Laparoscopic radical hysterectomy, cervical cancer

Introduction

Approximately 15,800 women are diagnosed in the US with cervical cancer every year [1]. More than half of patients with stage IA to IIA will undergo radical hysterectomy and lymph node dissection. The surgical treatment for early stage cervical cancer has changed from radical abdominal hysterectomy with pelvic lymph node dissection to laparoscopic lymph node dissection followed by either total laparoscopic radical hysterectomy or laparoscopically assisted radical vaginal hysterectomy.

There is a learning curve for the surgeon to develop his or her technique, with longer initial operating times which improves with the number of cases [9, 10]. Concerns have been raised that this procedure should be confined to a few experienced oncologists, although these observations are based on the above mentioned learning experiences from the introduction of

any new procedure [13]. This study compares outcomes of LRVH/LND when done by gynecologic oncologists assisted by other oncologists versus those performed by the same oncologists assisted by residents.

Materials and methods

Between 1992 and 2003, of all patients treated for stage IA to IIA cervical cancer in the University Medical Center, 73 underwent a laparoscopic radical vaginal hysterectomy and lymph node dissection. When this procedure was introduced at the University of Arizona, it was done by gynecologic oncology attendings assisted by other oncology attendings. After a learning series of 25 patients, the oncologists performed the majority of the surgeries with a resident as primary assistant. Length of surgery, blood loss, transfusion rate, length of stay, complication rate and number of nodes removed were recorded and the group of 40

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cases (Group A) performed with an attending being the primary assistant were compared to the case series of 32 (Group B) procedures with residents as primary assistant. Patient characteristics indicating a higher risk for complications or prolonged surgery were analyzed to assess comparability of the two groups. Weight, age, Quetelet index, gravity and parity, comorbidities and risk of preexisting adhesions and distortion of anatomy according to the patient's medical history, e.g., prior abdominal surgeries, history of peritonitis, endometriosis or PID, were compared.

Patients were excluded if the surgical approach differed, e.g. only lymph node dissection was completed via laparoscopy, concurrent procedures other than salpingo-oophorectomy, oophoropexy, appendectomy or conization for intraoperative staging purposes. Additionally, concurrent second malignancies and pregnancies beyond the first trimester were also excluded. A few planned LRVH/LND procedures were abandoned after noting aortic lymph node metastases upon laparoscopic entry. These cases were also excluded from the study.

All patients received a preoperative bowel prep, general endotracheal anesthesia and perioperative prophylactic antibiotics. A 10 mm. trocar was placed in an umbilical incision, and two additional 5 mm. lateral trocars and one 10 mm. suprapubic trocar were placed. Following visualization of the abdominal cavity, paraaortic and pelvic lymph nodes were dissected. For patients with small lesions, the paraaortic portion was not done. It was performed for 30/40 (75%) patients in the attending group and for 11/32 (34%) patients in the resident group.

The laparoscopic part included division of the uteroovarian ligament and fallopian tube, creation of the bladder flap, isolation of the ureter from the mid pelvis through the cardinal ligament tunnel, as well as isolation and transection of the uterine arteries and cardinal ligaments, and transection of the uterosacral and vesicouterine ligaments. In some cases, the peritoneum of the posterior cul-de-sac was also incised laparoscopically. Salpingo-oophorectomy or oophoropexy and appendectomy were performed as indicated by patient age, history and preferences. Following vaginal removal of the specimen, the pelvis was re-inspected with the laparoscope to assess and establish hemostasis.

In 3 of the earlier cases, a minilaparotomy via Pfannenstiel skin incision was performed at the end of the procedure to visualize completeness of the lymph node dissection, but no additional parts of surgery were performed using the abdominal incision.

Data were obtained from medical records. Operating times were obtained from anesthesia records and do not include additional anesthesia time. Data for blood loss are recorded in the operative reports. Criteria for discharge from the hospital were similar for all patients. Postoperative hematocrits were from the morning of postoperative day 1.

Reviewing complications, fever was only included if higher than 38.5, and bladder dysfunction only if persistent for more than four weeks and requiring treatment or surgical evaluation. Anemia was not included as a separate complication, but postoperative hemorrhage and need for peri- and postoperative transfusion was recorded.

Data analysis techniques included two-sample t tests for comparison of the two groups for variables with normal or approximately normal distributions (e.g., age and Quetelet Indices) and multivariate logistic regression for dichotomous variables for assessment of potential confounding variables. Results with a corresponding probability value of $< .05$ were considered statistically significant.

Results

Bladder dysfunction, the most common long-term problem, is seen in up to 50% of patients undergoing radical hysterectomy. Ureteral fistulas are found in approximately 2% and vesicular fistulas in an additional 0.9% [2]. Lymphocyst and lymphedema formation, pelvic cellulitis, intraoperative hemorrhage particularly from pelvic floor veins, deep venous thrombosis and pulmonary embolism, neuropathies and rectal dysfunctions are less commonly seen. Efforts have been made to reduce complications with several modifications and different approaches. In modification of the original procedure described by Wertheim [3, 4], radical vaginal hysterectomy was introduced by F. Schauta in 1902 for microinvasive cervical cancer and for medically compromised patients who could not tolerate the classic abdominal procedure [5]. The drawback was that no lymph node dissec-

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Table 1. Patient Characteristics - Means

	Attending assisted By Attending N = 40	Attending assisted By Resident N = 32	Significant Difference**
Age	39	46	No
Height (cm)	161	164	No
Weight (kg)	67	69	No
Quetelet Index	25.9	25.8	No
Gravity	3.2	2.6	No
Parity	2.4	2.2	No
Risk for Preexisting adhesions*	12/40 (30%)	16/32 (50%)	No

*Includes prior abdominal and pelvic procedures. **Significance with $p \leq 0.05$.

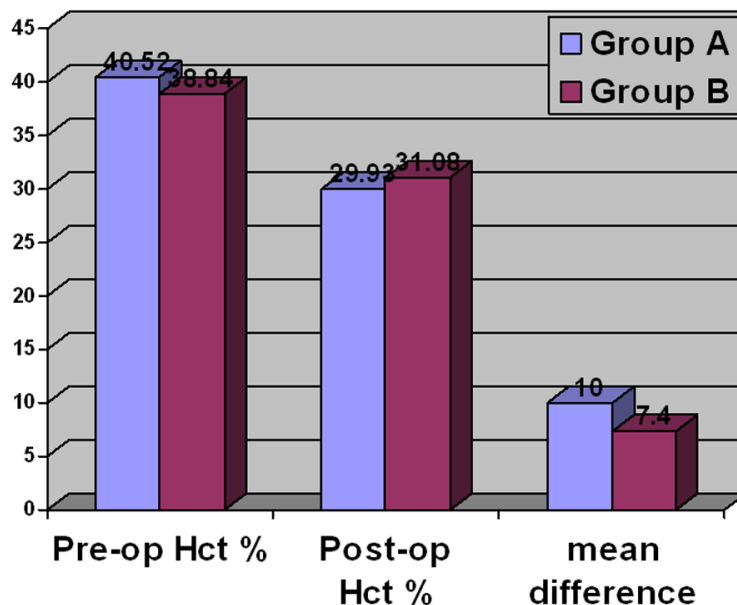


Figure 1. Preoperative and postoperative hematocrits.

tion would be performed, and lymphatic chains could not even be inspected for gross metastasis. Although necessity of lymph node dissection has been controversial and Wertheim only performed it sporadically, there are studies suggesting survival benefits for node positive patients if dissection is carried out thoroughly [6], and there is evidence that debulking of positive lymph nodes prior to radiation also improves survival [7]. Lymph node status is one of the most important predictors of patient survival and reliable information about it is essential to be able to tailor therapy to the individual patient. Thus, use of the Schauta procedure was somewhat limited, although it was later combined with retroperitoneal lymph node dissection.

All patients included in this study had successful completion of their procedure by the initially assigned team. Demographic data are shown in **Table 1**. There was no statistically significant difference in respect to age, parity, or Quetelet index. 30% of the patients in Group A had risk factors for preexisting abdominal adhesions, including prior abdominal surgery and/or history of peritonitis or endometriosis, compared to 50% in Group B with similar risk factors. **Figure 1** shows the mean preoperative hematocrits, 40.52% in Group A vs. 38.84% in Group B. None of these data indicate any significant difference between the two groups.

Results of the pathologic evaluation are shown in **Table 2**. One sample from the lymph node dissection in Group B had cauterization artifacts. Neither of the groups' pathology reports contained complaints about fragmentation of lymph node samples. The mean number of removed lymph nodes from the pelvic dissection was 32.3 in Group A and 20.8 in Group B ($P < 0.009$), and for paraaortic dissection

6.8 and 2.1 ($P < 0.001$), respectively. Five patients in Group A had between 1 and 5 positive pelvic lymph nodes, and 4 patients in Group B had between 1 and 3 positive pelvic lymph nodes. No patient had metastasis to paraaortic lymph nodes.

Attendings completed the procedure in a mean of 252.1 minutes, attendings with residents in 200.9 minutes. These times are significantly different $P < 0.001$ (**Figure 2; Table 3**). Patients of Group A experienced significantly more intraoperative complications ($P = 0.05$) as well as a significantly higher blood loss with a mean of 556.3 ml. versus 360.9 ml. (**Figure 3**) and by the difference in preoperative and postoperative hematocrits, 10.6% vs. 7.76%. These differ-

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Table 2. Pathologic Data

	Group A (40)	Group B (32)
Stage IA ₂	8	7
Stage IB	31	24
Stage IIA	1	1
Squamous CA	26	19
Adeno CA	13	13
Pelvic LNs	32.3	20.8
Paraortic LNs	6.8	2.1
Positive LNs (# of patients; %)	11 (5; 12.5)	7 (4; 12.5)

Group A: attending and attending, Group B: attending and resident.

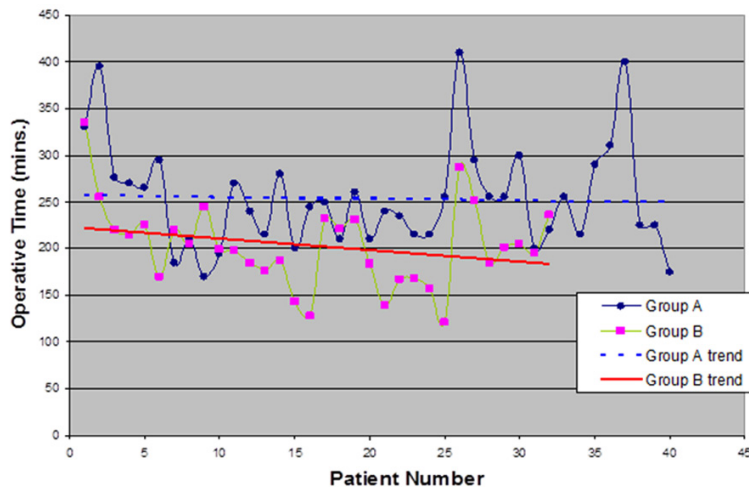


Figure 2. Comparison of operative times.

Table 3. Operative Morbidity

		Group A (40)	Group B (32)	P
Operative Time (mins.)	Mean	252.0	200.9	< 0.001
	Median	248	200	
	(Range)	170-410	143-255	
Hospital Stay (days)	Mean	3.18	2.88	< 0.001
	Median	3.0	3.0	
	(Range)	1-11	2-5	
Blood Loss (liters)	Mean	0.55	0.361	< 0.001
	Median	0.45	0.30	
	(Range)	0.2-2.0	0.15-1.0	

ences did reach statistical significance. Both groups had similar rates of intraoperative transfusions, 2/40 (5%) patients in Group A versus 1/32 (3%) in Group B, although the rate of hemorrhage, which we consider any blood loss of 1000 ml. or more was 4/40 (10%) in Group A and 1/32 (3%) in Group B. Overall transfusion rates were higher in Group A (7 vs. 1) (Table 4).

There was no difference in the rate of postoperative and short-term complications between groups A and B and recovery times were similar between groups as evidenced by Length of Stay (Table 3). Severe complications are summarized in Table 5. There was no mortality in either group; however there was one intra-operative, nonfatal myocardial infarction and one post-operative pulmonary embolus in Group B. No cases of sepsis occurred.

Discussion

When oncologists began to perform laparoscopic lymph node dissections and LRVHs, initial operating times were longer and urinary tract injuries were more common than with the classic radical abdominal hysterectomy. A previous publication from this institution found that the procedures in Group A included one bowel and two bladder injuries. It also reported two ureterovaginal fistulas in this group. The two cystotomies and one of the ureterovaginal fistulas occurred in the first ten surgeries [15]. Twenty five of the patients in Group A represented the learning curve for the attending surgeons and this explains the complication and longer times. After the surgeon becomes more experienced and starts to train residents, complications and OR times are flat as shown in Figure 2 and do not show an increase in complications. Operating times, number of removed lymph nodes, transfusion and complication rates compare well to other studies [13, 20].

This is not a randomized study, and it is not likely that a randomized trial can be conducted

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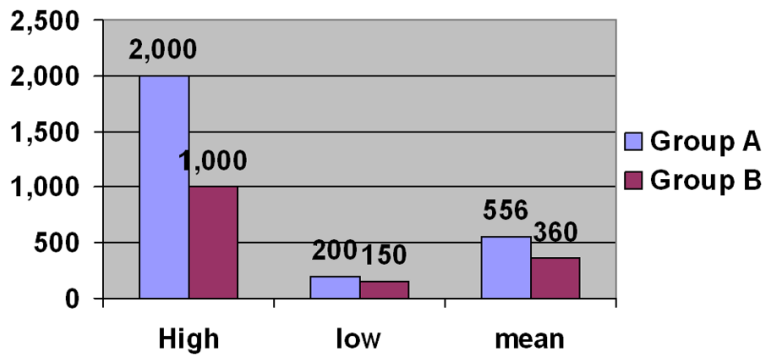


Figure 3. Estimated blood loss (ml).

Table 4. Complications and transfusion rates

	Group A N (%)	Group B N (%)	Significance
Intraoperative Complications	7 (18)	1 (3)	Yes
Intraoperative Transfusions	2 (5)	1 (3)	No
Postoperative Complications	14 (35)	8 (25)	No
Postoperative Transfusions	5 (13)	0 (0)	Yes

Table 5. Operative Complications

	Group A N (%)	Group B N (%)
Intraoperative Complications		
Vaginal vein bleeding	2 (5)	0
Bladder injury	2 (5)	0
Large bowel injury	1 (2.5)	0
Blood transfusion	2 (5)	1 (3)
Ureteral injury	1 (2.5)	2 (6)
Postoperative Complications		
Uretero-vaginal fistula	2 (5)	1 (3)
Vesico-vaginal fistula	1 (2.5)	0
Febrile after 36 hrs (> 38.5 C)	4 (10)	1 (3)
Post-operative appendicitis	1 (2.5)	0
Pelvic/cuff cellulitis	2 (5)	1 (3)
Bladder hypotonia	1 (2.5)	3 (9)
Hernia (incisional)	2 (5)	0

for the topic in question. However, the patient groups are comparable with regard to risk factors for complications. Patient numbers are small, but sufficient to demonstrate a significant reduction of blood loss. No learning curve can be assumed for resident physicians, as the assisting residents changed, and none of them were involved in more than 3 cases, and usually less. Long-term follow-up, as it is under investigation for LRVH with LND in general to

assure that recurrence and cure rates are similar to radical abdominal hysterectomies, is also necessary for LRVHs performed by residents under attending supervision, as this aspect has not been addressed yet.

Not many studies have been compared results of any type of surgery between attending and resident physician. Concerns about problems occurring when new techniques such as laparoscopic assisted radical vaginal hysterectomy are adapted by inexperienced surgeons are certainly appropriate, and the unknown shortcomings of this still new procedure require continued caution. Nevertheless, this study suggests that the published

learning curves for oncologists developing a new procedure are different from what we will see if a resident or a physician who has not been performing this procedure before is introduced to it by an experienced surgeon. Complex laparoscopic surgery can safely be included in residency training.

Disclosure of conflict of interest

None.

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