

# A comparative study of 3 surgical methods for hysterectomy with staging for endometrial cancer: robotic assistance, laparoscopy, laparotomy

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## BACKGROUND AND OBJECTIVE

Endometrial cancer is the most common gynecologic cancer in the United States, with 42,100 new cases every year. In 1988, the International Federation of Gynecology and Obstetrics recommended that treatment include comprehensive surgical staging. Although such staging has improved patient outcomes, it has resulted in increased postoperative morbidity.

Laparoscopically assisted surgical staging results in decreased blood loss and a shorter recovery time. Its use remains limited because a long learning curve, longer operative time, and limited ability to perform complex surgical procedures.

The da Vinci Surgical System offers certain advantages over traditional laparoscopy that include 3-dimensional imaging of the operating field, instruments with wrist-like range of motion, lack of a fulcrum effect, and a shorter learning curve. Use of the da Vinci system in the comprehensive staging of endometrial cancer is relatively new. Recent reports on robot-assisted laparoscopic surgical staging suggest that it may be used as an alternative treatment for gynecologic

## OVERVIEW

Robot-assisted endometrial cancer staging, including hysterectomy with pelvic and paraaortic lymphadenectomy, is feasible and safe and yields higher lymph node counts, lower blood loss, and shorter hospital stays than open and laparoscopic staging.

cancers. However, the number of patients in these reports is small and includes only a few patients who were staged for endometrial adenocarcinoma.

We compared robot-assisted hysterectomy (TRH) with staging to both traditional laparoscopy (TLH) and laparotomy (TAH) in women with endometrial cancer and addressed perioperative and early postoperative outcome.

## MATERIALS AND METHODS

From June 2005 through December 2007, 103 patients underwent total hysterectomy with staging for endometrial cancer. A novel technique that was developed at the University of North Carolina at Chapel Hill that involves the da Vinci Surgical System (TRH) was used. These cases were compared with 2 historic cohorts of patients who underwent total hysterectomy in April 2000 through September 2004: 138 of the patients had staging by TAH, and 81 of the patients had staging by TLH.

All surgical approaches received complete endometrial staging that included hysterectomy, bilateral salpingo-oophorectomy, and periaortic and pelvic lymph node dissection according to the International Federation of Gynecology and Obstetrics staging system. A video demonstration of the robotic procedure may be accessed through the National Library of Medicine ([www.nlm.nih.gov](http://www.nlm.nih.gov)

[medlineplus/surgeryvideos.html](http://medlineplus/surgeryvideos.html), February 2007).

A 5-trocar transperitoneal approach was used. The entire procedure was performed with the da Vinci Surgical System docked at the foot of the bed. Dissection of the periaortic lymph nodes was performed with monopolar scissors in the left "hand" and a bipolar grasper in the right "hand." A second bipolar grasper placed in the fourth arm was used to retract the ascending colonic mesentery and ureter. Right periaortic node dissection was completed from the common iliac to the insertion of the gonadal vein into the vena cava. Left periaortic dissection was completed from the common iliac artery to the inferior mesenteric artery.

TRH was performed in the same manner as a traditional abdominal hysterectomy, with scissors and monopolar cautery for isolation and ligation of small vessels and bipolar cautery of the ovarian vessels, uterine artery, and vascular branches of the cardinal ligament.

After the right and left pelvic nodal dissections were completed from the common iliac artery to the circumflex iliac vein, the specimens were placed in EndoCatch bags and delivered vaginally along with the periaortic lymph nodes. The right robotic instrument was exchanged for a needle driver. With the use of intracorporeal suturing, the device closed the vaginal cuff with a running 0 Vicryl suture on a CT-1 needle.

## RESULTS

The mean age of patients in both cohorts ranged from 62.0–64.0 years (Table). Although body mass index was comparable between patients who underwent TAH vs TRH, body mass index was higher in the robot cohort than in the TLH cohort (29.0 vs 32.9 kg/m<sup>2</sup>, respectively;  $P =$

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.0008). The average number of total nodes that were retrieved was 14.9 in women who underwent hysterectomy by laparotomy vs 23.1 and 32.9 nodes in the TLH and TRH cohorts, respectively ( $P < .0001$ ).

Operative time, defined as first skin incision to skin closure, was  $146.5 \pm 48.8$  minutes for the laparotomy group vs  $191.2 \pm 36.0$  minutes for the robotic group ( $P < .0001$ ). The laparoscopy group experienced the longest average operative time at  $213.4 \pm 34.7$  minutes ( $P < .0001$ ). Patients who underwent TRH experienced a shorter hospital stay (1 day) vs the open cohort (4.4 days;  $P < .0001$ ) and the laparoscopy cohort (1.2 days;  $P = .001$ ). Estimated blood loss for patients was  $74.5 \pm 101.2$  mL for TRH vs  $266.0 \pm 184.5$  mL for TAH ( $P < .0001$ ) and TLH ( $145.8 \pm 105.6$  mL;  $P < .0001$ ).

We identified 1 small bowel leak in the TRH cohort, 1 enterotomy in the TAH cohort, and 3 intraoperative complications in the TLH cohort. The overall incidence of postoperative complications was 29.7% in the open cohort, 13.6% in the laparoscopy cohort, and 5.8% in the robot cohort ( $P < .0001$ ).

Four of 81 operations (4.9%) in the laparoscopy group were converted to laparotomy because of poor visualization ( $n = 2$ ), uterine size that prevented laparoscopic retrieval ( $n = 1$ ), and patient intolerance of the Trendelenburg position ( $n = 1$ ). Three patients in the robot cohort (2.9%) required conversion to open surgery because of adhesions ( $n = 1$ ) or to tumor eroding through the uterine serosa and involving the rectosigmoid colon ( $n = 2$ ).

## COMMENT

In our series comparing robotic hysterectomy with staging for endometrial cancer with laparoscopy and laparotomy, we report an increased lymph node yield, decreased blood loss, and shorter length of stay in the robot cohort than in the other 2 cohorts.

Average estimated blood loss for the robot group was 3 times less than that seen in the laparotomy group and one-half that of the laparoscopy group. Patients in the robot group stayed in the

TABLE

### Preoperative characteristics and operative results of patients who underwent hysterectomy by TAH, TLH, and TRH

Variable	TAH (n = 138)	TLH (n = 81)	TRH (n = 103)	P value
Age (y)				
Mean	64.0	62.0	61.9	.06 <sup>a</sup>
SD	12.8	10.8	10.6	.95 <sup>b</sup>
Body mass index (kg/m <sup>2</sup> )				
Mean	34.7	29.0	32.9	.17 <sup>a</sup>
SD	9.2	6.5	7.6	.0008 <sup>b</sup>
Stage				
IA	37	23	38	
IB	49	28	41	
IC	13	11	10	
IIA	5	4	1	
IIB	8	0	2	
IIIA/IIIB/IIIC	17	14	10	
IVA/IVB	3	1	0	
Unstaged	6	—	1	
Total nodes				
Mean	14.9	23.1	32.9	< .0001 <sup>a</sup>
SD	11.3	11.4	26.2	< .0001 <sup>b</sup>
Total pelvic nodes				
Mean	11.5	17.4	20.5	< .0001 <sup>a</sup>
SD	8.2	8.9	13.6	.06 <sup>b</sup>
Total periaortic nodes				
Mean	3.0	6.3	12.0	< .0001 <sup>a</sup>
SD	2.9	3.7	9.0	< .0001 <sup>b</sup>
Operative time (min)				
Mean	146.5	213.4	191.2	< .0001 <sup>a</sup>
SD	48.8	34.7	36.0	< .0001 <sup>b</sup>
Estimated blood loss (mL)				
Mean	266.0	145.8	74.5	< .0001 <sup>a</sup>
SD	184.5	105.6	101.2	< .0001 <sup>b</sup>
Length of hospital stay (d)				
Mean	4.4	1.2	1.0	< .0001 <sup>a</sup>
SD	2.0	0.5	0.2	.001 <sup>b</sup>
Conversion (n/N)	—	4/81 (4.9%)	3/103 (2.9%)	.70 <sup>c</sup>

TAH, laparotomy; TLH, laparoscopy; TRH, robotic technique.

<sup>a</sup> T-tests have been used for all continuous variables comparison of TAH to TRH cohort.

<sup>b</sup> T-tests have been used for all continuous variables comparison of TLH to TRH cohort.

<sup>c</sup> Mantel-Haenszel chi-square test for discrete variables.

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hospital for fewer days, on average, than did those in either of the other groups.

It has been suggested that the number of lymph nodes that are removed is the most important oncologic parameter for lymphadenectomy. We report an increase in the lymph node yield in the robot cohort, when compared with the laparotomy and laparoscopy cohorts. One reason is optimization of port placement, which requires a single docking of the robot, and greater ease in overcoming anatomic barriers with robotic assistance, which permits a more comprehensive lymphadenectomy.

Published operating times for laparoscopic staging range from 145.0-220.0 minutes; our operating times for the laparoscopy and robot cohorts fell within the same range. Our conversion rates at 3.7% for the laparoscopy cohort and 2.8% for the robot cohort fall within the range (0-6%) in published studies. Our complication rate for laparoscopy (18.5%) falls mid way in the range (9-

40%); our complication rate for the robot cohort (6.8%) falls well below this range.

Our lymph node yield was comparable to that in the literature, with an average of 17.4 for pelvic and 6.3 for periaortic in the laparoscopy cohort, and was higher in the robot cohort, with an average of 20.5 for pelvic and 12.0 for periaortic. Our length of hospital stay and conversion rates were also lower than those reported from a study of 2616 women with endometrial cancer who were assigned randomly to laparoscopy vs laparotomy (Gynecologic Oncology Group -LAP2).

Robotic assistance may make lymphadenectomy easier and more comprehensive by overcoming anatomic barriers to the process of staging for endometrial cancer without increasing patient morbidity and may result in the increased use of minimally invasive treatment of uterine cancer. Weaknesses of this study are lack of randomization and our inability to examine long-term

oncologic results because of our relatively recent incorporation of robotic technology. Nevertheless, we conclude that TRH with staging appears to be a safe and effective surgical alternative for patients with early-stage endometrial cancer.

#### CLINICAL IMPLICATIONS

- Robot-assisted endometrial cancer staging is feasible and yields superior lymph node counts, lower blood loss, and shorter hospital stay than open or laparoscopic staging.
- Complication rates of robotically assisted endometrial cancer staging are low, superior to those of laparotomy, and possibly superior to those of laparoscopy.
- Robotics may become the surgical approach of choice in women with higher body mass indexes to maximize surgical outcomes and reduce morbidity. ■