

Abdominal radical trachelectomy for invasive cervical cancer: A case series and literature review[☆]

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Abstract

Objective. The objective of this study was to review our experience with abdominal radical trachelectomy in patients with early-stage cervical cancer.

Methods. We performed a retrospective review of all patients who underwent an abdominal radical trachelectomy at the Instituto de Cancerología—Clínica las Americas in Medellín, Colombia, between April 2002 and January 2008. Data collected included age, stage, histopathologic subtype, tumor size, evidence of lymph-vascular space invasion, estimated blood loss, number of perioperative blood transfusions, number and disease status of lymph nodes removed, disease status of surgical specimen, length of hospital stay, intraoperative and postoperative complications, follow-up time, and fertility outcomes.

Results. Fifteen patients underwent an abdominal radical trachelectomy during the study period. The median patient age was 30 years (range, 25–38). Three patients had stage IA2 and 12 had stage IB1 cervical cancer. Eleven patients had squamous cell carcinoma and 4 had adenocarcinoma. Thirteen patients were diagnosed by cervical conization and 2 by colposcopically directed biopsy. All patients had tumors smaller than 2 cm. The median estimated blood loss was 400 ml (range, 200–1000). The median surgical time was 265 min (range, 210–330). The median number of units of packed red blood cells transfused per patient was 2. The median number of lymph nodes removed was 26 (range, 11–48). The median length of hospitalization was 3 days (range, 2–7). The median follow-up time was 32 months (range, 5–32). There was 1 intraoperative complication and 6 postoperative complications in 4 patients. No patient has had a recurrence. Three patients were able to conceive spontaneously; 1 delivered at 31 weeks' gestation, and 2 delivered at term.

Conclusion. Abdominal radical trachelectomy is feasible and can be performed safely in a developing country in well-selected patients with early cervical cancer who wish to preserve their fertility.

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Introduction

The recommended surgical treatment for women with stage IA2–IB1 cervical cancer is a radical hysterectomy and bilateral pelvic lymphadenectomy. Many women diagnosed with cervical cancer have not completed their childbearing. There is increasing evidence in the literature that radical trachelectomy is a viable option for young women with cervical cancer who wish to preserve their fertility [1–5].

Most reports in the literature describe the vaginal approach in performing a radical trachelectomy. This approach requires a

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superior level of expertise in both vaginal surgery and, to perform the pelvic lymphadenectomy, laparoscopic surgery. In developing countries, the availability of such training and novel technology is limited.

In 1997, Smith et al. [6] introduced the abdominal radical trachelectomy, which allows surgeons to perform this fertility-sparing procedure through a more conventional approach. Since that time, other investigators have reported their experience with abdominal radical trachelectomy, showing that it is feasible and safe, with results similar to those seen with vaginal radical trachelectomy [7–10].

The goal of this study was to report the surgical, oncologic, and obstetrical outcomes in a series of patients who underwent an abdominal radical trachelectomy at Instituto de Cancerología—Clínica las Américas in Medellín, Colombia.

Methods

The medical records of all patients who underwent an abdominal radical trachelectomy at Instituto de Cancerología—Clínica las Américas between April 2002 and January 2008 were reviewed. Institutional review board approval was obtained. Data were obtained from medical and pathologic records. Data collected included age, stage, histopathologic subtype, tumor size, evidence of lymph-vascular space invasion, estimated blood loss, number of perioperative blood transfusions, number and disease status of lymph nodes removed, disease status of the surgical specimen, length of hospital stay, intraoperative and postoperative complications, follow-up time, and fertility outcomes.

Eligibility criteria and patient counseling

Patients were considered eligible if they met the institutional criteria for abdominal radical trachelectomy. These included a confirmed diagnosis of cervical cancer, squamous cell carcinoma or adenocarcinoma histologic subtype, stage IA1 disease with lymph-vascular space invasion or stage IA2 or IB1 disease, lesion size <2 cm, desire for future fertility preservation, and no evidence of disease on chest radiograph. All patients were advised that the standard treatment for women with early cervical cancer remains a radical hysterectomy.

Surgical technique

Abdominal radical trachelectomy was performed as described here. Entry into the abdominal and pelvic cavity is performed through either a Pfannenstiel or median incision. The paravesical and pararectal spaces are developed. The round ligaments are either divided or kept intact depending on the surgeon's preference. The uterus is grasped with a Somer uterine elevating forcep (Aesculap Surgical Instruments, Tuttlingen, Germany). The infundibulopelvic ligaments with the ovarian vessels are kept intact. Care is taken not to injure the fallopian tubes or the utero-ovarian ligament. A complete pelvic lymphadenectomy is performed from the level of the bifurcation of the common iliac vessels to the circumflex iliac vein. This

dissection includes the external iliac nodes, internal iliac nodes, and obturator nodes.

The ureters are then dissected bilaterally to their insertion into the bladder with lateral mobilization. The uterine arteries are kept intact. We dissect the uterine artery from its origin in the internal iliac artery to the isthmus and then identify, tie, and cut the descending branch. We find that this approach is easier than the approach described by Smith et al. [6] in that we follow the vessels from the proximal origin to the distal insertion as opposed to the technique by Smith and his group where the uterine artery is dissected from the body of the uterus to produce a skeletonized vessel. In their technique the vessel is then transected. The uterosacral ligaments are identified and transected after the rectovaginal space is opened. A colpotomy is performed circumferentially, and the uterus is rotated up, being suspended from the uterine arteries, the utero-ovarian ligaments, and, in certain cases, the round ligaments. At this time, the cervix, parametrial tissue, and upper vagina are amputated from the uterus. The specimen is sent for frozen section evaluation to assure that at least a 5-mm margin is free of tumor.

The uterus is then anastomosed to the vagina with 2-0 Vicryl sutures. A total of 8 interrupted sutures are placed circumferentially. A cerclage was routinely placed in the first 3 patients. Because 2 of these 3 patients subsequently presented with expulsion of the cerclage through the vaginal fornix, subsequent patients did not have a cerclage placed. An 8-French Foley catheter is placed in the uterine cavity to maintain patency of the cervical canal and is routinely removed on postoperative day 4. The abdominal wall is then closed after placement of the catheter.

Follow up

All patients returned for a voiding trial 1–2 weeks postoperatively. Routine follow-up included a pelvic examination, pelvic sonography, and Pap smear every 3 months for the first year, every 4 months for the second year, and then every 6 months. All patients were instructed to use contraception for at least 6 months after the radical trachelectomy. We routinely recommend the 6-month period to allow for adequate healing of tissue after surgery. We do recognize that there is no consensus about the timing of the pregnancy after radical trachelectomy. Covens et al. [3] do not prohibit attempting pregnancy soon after surgery while Plante et al. [5] have proposed waiting 6 months to a year. Once a patient gets pregnant, our routine recommendation is to place a cerclage at the end of the first trimester. This is done when we confirm that there is a normal pregnancy by ultrasound. The procedure is performed by dissecting the vesicouterine fold and identifying the uterine vessels. We then place the cerclage in the avascular space between the vessels and the remnant of the isthmus wall of the residual cervix. We assure that the knot of the cerclage is tied posteriorly. A repeat ultrasound is performed the day after the cerclage is placed in order to assure fetal well being.

Results

A total of 1764 new patients diagnosed with cervical cancer were evaluated at the Instituto de Cancerología—Clínica las

Americas between April 2002 and January 2008. During this same time period, 228 radical hysterectomies were performed. A total of 15 abdominal radical trachelectomies were performed and these are the subject of this study. The median patient age was 30 years (range, 25–38). Three patients had stage IA2 and 12 patients had stage IB1 cervical cancer. Eleven patients had squamous cell carcinoma and 4 patients adenocarcinoma. Thirteen patients were diagnosed by cervical conization and 2 patients by colposcopically directed biopsy. Lymph-vascular space invasion was found in 5 patients (33%). All patients had tumors smaller than 2 cm.

In 1 patient, there was a deviation from the standard surgical procedure: the uterine vessels were transected because of extensive adhesions due to endometriosis. The median estimated blood loss was 400 ml (range, 200–1000). Four patients (27%) required a transfusion. The median number of units of packed red blood cells transfused per patient was 2. All transfusions were given postoperatively. The median surgical time was 265 min (range, 210–330). The median number of lymph nodes removed was 26 (range, 11–48). The median length of hospitalization was 3 days (range, 2–7) (Table 1). Eight patients (53%) had residual disease in the trachelectomy specimen. One patient required postoperative therapy in the form of radiotherapy because of evidence of microscopic parametrial disease.

There was 1 intraoperative complication resulting in a vascular injury to the external iliac artery. There were 6 postoperative complications in 4 patients. One patient had a tubo-ovarian abscess that manifested with pelvic pain and fever 8 months after the radical trachelectomy. This patient required reoperation and unilateral salpingo-oophorectomy. In addition, this same patient suffered expulsion of her cerclage. One patient presented with voiding dysfunction. At the time of discharge from the hospital, the patient reported not being able to evacuate her urine completely. No interventions were made, and the symptoms resolved spontaneously. Another patient reported expulsion of her cerclage 3 weeks after completion of radiotherapy. The last patient in our series suffered from apraxia of the quadriceps muscle. After neurologic consultation, it was determined that this complication

was a result of a femoral neuropathy most likely due to extended nerve compression from the retractor used during surgery. The patient went on to have physical therapy and experienced a partial recovery. This same patient was admitted with peritonitis on postoperative day 12. The patient required 5 abdominal lavages. The patient went on to develop adult respiratory distress syndrome and required intubation. Cultures from her blood and abdominal cavity revealed *Staphylococcus aureus*. The patient was ultimately discharged 29 days after readmission. She is currently doing well. The median follow-up time was 32 months (range, 5–32). No patient has had a recurrence.

In all the patients, menses resumed within the first 6 weeks after surgery. Six patients have tried to get pregnant. Three were able to get pregnant spontaneously. The remaining 3 patients are currently attempting to get pregnant. Of the 3 patients who became pregnant, the first patient was delivered by cesarean section at 31 weeks' gestation. She presented with preterm premature rupture of the membranes and chorioamnionitis. The newborn girl was in the neonatal intensive care unit for 32 days and discharged home in good health. Currently, she is a healthy 5-year old without any sequelae from this event. The other 2 patients were delivered by elective cesarean section at 38 and 37 weeks, respectively.

Discussion

The results of this study show that abdominal radical trachelectomy is feasible and can be performed safely in a developing country in well-selected patients with early cervical cancer who wish to preserve their fertility. The potential advantages of the abdominal approach include greater parametrial resection, ability to more accurately determine the site of cervical amputation from the uterine isthmus, no need for training in laparoscopic surgery, no costs associated with laparoscopic equipment, and no need for special training in radical vaginal surgery since abdominal radical trachelectomy is similar to a radical hysterectomy with the exception that the uterus is not removed. The potential disadvantages of the abdominal approach include the need to perform a laparotomy and its associated poor

Table 1
Results

Patient number	Age, years	Surgical time, min	Blood loss, ml	Number of units of packed red blood cells transfused	Hospital stay, days	Number of lymph nodes removed	Residual disease in trachelectomy specimen
1	29	270	350	0	7	24	No
2	37	240	800	3	3	21	Yes
3	35	290	500	2	7	37	Yes
4	35	250	400	0	2	24	Yes
5	38	330	350	0	5	47	No
6	35	270	1000	2	4	48	Yes
7	30	230	200	0	4	26	No
8	31	300	800	2	3	41	Yes
9	30	210	300	0	3	33	Yes
10	27	240	400	0	3	28	No
11	26	260	350	0	3	11	Yes
12	29	240	400	0	2	18	No
13	29	280	300	0	4	32	No
14	25	270	400	0	3	26	No
15	27	270	400	0	7	20	Yes

cosmesis, longer hospitalization, slower return of bowel function, and a slower return to daily activities.

To date, 55 cases of abdominal radical trachelectomy have been reported in 5 series in the literature, including our present series (Table 2). In contrast, 548 cases of vaginal radical trachelectomy have been reported [11]. After the initial report of abdominal radical trachelectomy by Smith et al. [6], Rodriguez et al. published a series of 3 patients who underwent this same procedure [7]. One patient had a stage IA1 squamous cell carcinoma with lymph-vascular space invasion, and 2 patients had stage IA2 cervical carcinoma (1 squamous and 1 adenocarcinoma). The median blood loss was 350 ml, and the mean operative time was 265 min. The median length of hospital stay was 4 days. There were 2 postoperative complications: a febrile episode and a case of uterine stenosis that necessitated dilatation

under anesthesia 4 months after abdominal radical trachelectomy. One patient in that series was able to get pregnant spontaneously and delivered at 39 weeks. At the time of publication, the patient was pregnant for a second time. No recurrences were reported with a median follow-up time of 31 months.

Subsequently, Ungár et al. [8] published the largest series to date of abdominal radical trachelectomy, including 33 patients. Three patients were excluded from the analysis because of positive pelvic nodes (2 patients) or positive endocervical margins at the time of frozen section evaluation (1 patient). The mean age was 30.5 years. Ten patients had stage IA2, 15 patients stage IB1, and 5 patients stage IB2 cervical cancer. Twenty-six patients had squamous cell carcinoma, 2 patients had adenocarcinoma, and 2 patients “glassy cell carcinoma.” Lymph-vascular space invasion was found in 8 patients. The mean

Table 2
Comparison of series

Characteristic	Rodriguez et al. [7]	Ungár et al. [8]	Wan et al. [9]	Abu-Rustum et al. [10]	Pareja et al.
Number of patients	3	30	2	5	15
Age, years					
Mean	26.3	30.5	30.5	36.2	30.2
Range	24–30	23–37	29–32	33–39	25–38
Median	26.6	NA	NA	36	30
Stage, number of patients					
IA1+LVSI	1	0	0	0	0
IA2	2	10	0	0	3
IB1	0	15	2	5	12
IB2	0	5	0	0	0
Histologic subtype, number of patients					
Squamous cell carcinoma	2	26	2	3	11
Adenocarcinoma	1	2	0	2	4
Other	0	2	0	0	0
LVSI, number of patients	1 (33%)	8 (26.60%)	NA	3 (60%)	5 (33%)
Number of lymph nodes removed					
Mean	NA	32.2	NA	27	29
Range	NA	17–44	NA	16–37	11–48
Median	NA	NA	NA	26	26
Estimated blood loss, ml					
Mean	416	NA	500	280	463
Range	200–700	NA	400–600	50–400	200–1000
Median	350	NA	NA	350	400
Operative time, min					
Mean	265	226	370	248	262
Range	260–270	170–300	350–390	180–275	210–330
Median	260	NA	NA	265	265
Hospital stay, days					
Mean	4.3	14	NA	4	4
Range	4–5	13–22	NA	3–5	2–7
Median	4	NA	NA	4	3
Follow up, mo					
Mean	23.9	32	NA	NA	29.7
Range	9–31	14–75	NA	NA	5–72
Median	31	47	NA	NA	32
Ligation of uterine arteries, number of patients	2	30	Reanastomosed	5	1
Transfusions, number of patients	0	20 (66%)	0	0	4 (26.6%)
Pregnancies, number of patients	2, 1 ongoing	3	0	0	3
Miscarriages, number of patients	0	1	–	–	0
Deliveries, number of patients	1	2	–	–	3

LVSI, lymph-vascular space invasion; NA, not available.

operative time was 226 min. The estimated blood loss was not reported, but 20 patients (66%) required transfusions, and the median number of units of packed red blood cells transfused per patient was 2. The mean number of lymph nodes removed was 32.2, and the mean length of hospital stay was 14 days. The mean follow-up time was 32 months. Five patients attempted to get pregnant. Two were successful spontaneously and 2 through assisted reproduction techniques. In this series, the authors reported a unilateral ureteral injury in 1 patient and the use of antibiotics in 44% of patients postoperatively.

Wan et al. [9] reported 2 patients who underwent abdominal radical trachelectomy. Both patients were diagnosed with stage IB1 squamous cell carcinoma. This report was unique in that the authors showed a novel technique of reanastomosing the uterine arteries to preserve the blood supply to the uterus after the parametria was resected. The mean operative time was 370 min, and the mean blood loss was 500 ml. The authors reported no complications.

Most recently, Abu-Rustum et al. [10] published a series of 5 patients who underwent abdominal radical trachelectomy. The median age was 36 years. All patients had stage IB1 cervical cancer. Three patients were diagnosed with squamous cell carcinoma and 2 patients with adenocarcinoma. The median operative time was 265 min, and the median blood loss was 350 ml. No patient required a blood transfusion. The median number of lymph nodes removed was 26, and the median hospital stay was 4 days. There were no complications reported in this series.

In comparing our results with those of other series in the literature, we found that the operative time, lymph node count, and length of hospitalization were very similar in our series and the others reported to date. Our series is the only one to report preservation of the uterine vessels in the majority of patients. We find no compromise in terms of operative time, blood loss, or intraoperative complications when the uterine artery is preserved. However, we do recognize that there is evidence in the literature that the blood supply to the uterus is preserved even when the uterine vessels are transected [12].

In the other series published in the literature, the authors report the routine placement of an isthmic cerclage. In our current practice we have abandoned performing a cerclage at the time of the radical trachelectomy as we had two patients with expulsion of the cerclage in association with pelvic infections. Although, we don't know if the cerclage was the direct cause of the infection, we feel that placement of the cerclage at the end of the first trimester decreases the likelihood of immediate postoperative complications or expulsion after the radical trachelectomy. In the series by Plante et al. [13], the authors reported that two patients had cerclage erosion following the trachelectomy that resulted in complete expulsion of the cerclage. The authors attributed this complication to the fact that perhaps the cerclage was placed too deeply within the cervical stroma eventually leading to erosion into the canal. All patients are informed that should they become pregnant, a cerclage will need to be placed through an intra-abdominal approach at approximately the 12th week of gestation.

To date, none of our patients have suffered a recurrence; however, we do recognize the limitation of assessing this variable

in our series given the short follow-up time. Currently, 2 cases have been reported in the literature of relapse of cervical cancer after abdominal radical trachelectomy. The first case was reported by Bader et al. [14] and the second in a letter to the editor from Del Priore et al. [15]. In comparison, there have been 28 reported cases of recurrent disease in the 548 patients reported to have undergone vaginal radical trachelectomy [8].

We are the first group to show that abdominal radical trachelectomy is feasible and can be performed safely in a developing country in patients with early cervical cancer who wish to preserve their fertility. We encourage others to report their experiences in additional series of patients undergoing this procedure so that we can ultimately demonstrate its appropriateness in this patient population with respect to oncologic safety and obstetrical outcomes.

Conflict of interest statement

The authors have no conflicts of interest to declare.

References

- [1] Dargent D, Brun JL, Roy M, Mathevet P, Remy I. La trachelectomie elargie (TE), une alternative a l'hysterectomie radicale dans le traitement des cancers infiltrants developpes sur la face externe du col uterin. *J Obstet Gynecol* 1994;2:285–92.
- [2] Roy M, Plante M. Pregnancies after radical vaginal trachelectomy for early-stage cervical cancer. *Am J Obstet Gynecol* 1998;179(6 Pt 1):1491–6.
- [3] Covens A, Shaw P, Murphy J, DePetrillo D, Lickrish G, Laframboise S, et al. Is radical trachelectomy a safe alternative to radical hysterectomy for patients with stage IA–B carcinoma of the cervix? *Cancer* 1999;86(11):2273–9.
- [4] Burnett AF, Roman LD, O'Meara AT, Morrow CP. Radical vaginal trachelectomy and pelvic lymphadenectomy for preservation of fertility in early cervical carcinoma. *Gynecol Oncol* 2003;88(3):419–23.
- [5] Plante M, Renaud MC, François H, Roy M. Vaginal radical trachelectomy: an oncologically safe fertility-preserving surgery. An updated series of 72 cases and review of the literature. *Gynecol Oncol* 2004;94(3):614–23.
- [6] Smith JR, Boyle DC, Corless DJ, Ungar L, Lawson AD, Del Priore G, et al. Abdominal radical trachelectomy: a new surgical technique for the conservative management of cervical carcinoma. *Br J Obstet Gynaecol* 1997;104(10):1196–2000.
- [7] Rodriguez M, Guimares O, Rose PG. Radical abdominal trachelectomy and pelvic lymphadenectomy with uterine conservation and subsequent pregnancy in the treatment of early invasive cervical cancer. *Am J Obstet Gynecol* 2001;185(2):370–4.
- [8] Ungár L, Pálfalvi L, Hogg R, Siklós P, Boyle DC, Del Priore G, et al. Abdominal radical trachelectomy: a fertility-preserving option for women with early cervical cancer. *BJOG* 2005;112(3):366–9.
- [9] Wan XP, Yan Q, Xi XW, Cai B. Abdominal radical trachelectomy: two new surgical techniques for the conservation of uterine arteries. *Int J Gynecol Cancer* 2006;16(4):1698–704.
- [10] Abu-Rustum NR, Sonoda Y, Black D, Levine DA, Chi DS, Barakat RR. Fertility-sparing radical abdominal trachelectomy for cervical carcinoma: technique and review of the literature. *Gynecol Oncol* 2006;103(3):807–13.
- [11] Beiner ME, Covens A. Surgery insight: radical vaginal trachelectomy as a method of fertility preservation for cervical cancer. *Nat Clin Pract Oncol* 2007;4(6):353–61.
- [12] Klemm P, Tozzi R, Köhler C, Hertel H, Schneider A. Does radical trachelectomy influence uterine blood supply? *Gynecol Oncol* 2005;96(2):283–6.
- [13] Plante M, Renaud MC, Hoskins IA, Roy M. Vaginal radical trachelectomy: a valuable fertility-preserving option in the management of early-stage

- cervical cancer. A series of 50 pregnancies and review of the literature. *Gynecol Oncol* 2005;98:3–10.
- [14] Bader AA, Tamussino KF, Moinfar F, Bjelic-Radisic V, Winter R. Isolated recurrence at the residual uterine cervix after abdominal radical trachelectomy for early cervical cancer. *Gynecol Oncol* 2005;99(3):785–7.
- [15] Del Priore G, Ungar L, Richard Smith J, Heller PB. Regarding “First case of a centropelvic recurrence after radical trachelectomy: literature review and implications for the preoperative selection of patients,” (92: 1002–5) by Morice et al. *Gynecol Oncol* 2004;95(2):414 [author reply 414–6].