

Important Factors of Successful Pregnancies and Deliveries After Abdominal Radical Trachelectomy for Early-stage Cervical Cancer; Single-institution Experience

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Abstract: We assessed pregnancies and deliveries after abdominal radical trachelectomy (ART) based on reproductive outcomes. We retrospectively analyzed patients undergoing ART in our hospital from 2011 to 2020. Twenty-one patients (median age, 35 [range 27-40] years) with histologically diagnosed cervical cancer (squamous cell carcinoma [n=16], adenocarcinoma [n=4] and adenosquamous carcinoma [n=1]) underwent ART. Clinical stages (FIGO 2018) were IA1 (n=2), IA2 (n=5) and IB1 (n=14). Median follow-up period was 49 (1-108) months with no post-ART recurrence. Among 10 patients with post-ART planned pregnancies, 6 patients had pregnancies. Although all patients in the pregnancy group had pregnancies at the first fertility treatment, none of patients in the non-pregnancy group had pregnancies after several fertility treatment. Age, period after ART and the rate of bilateral uterine arteries preservation showed no significant difference between the pregnancy and non-pregnancy groups. Residual cervical length was about 10 mm in the pre-term delivery group and over 20 mm in the full-term delivery group. Age, fertility treatment and score of normal bacteria flora of the vagina showed no significant difference between pre-term delivery group and full-term delivery group. Bilateral uterine arteries preservation in the ART procedures were not associated with pregnancies after ART. Residual cervical length was associated with gestational age at delivery.

Keywords: Abdominal Radical Trachelectomy, Cervical Cancer, Uterine Artery, Residual Cervical Length

1. Introduction

Previously, we assessed the function of uterine after abdominal radical trachelectomy (ART) using post-ART uterine enhancement rate of dynamic contrast-enhanced magnetic resonance (MR) imaging [1]. The uterine enhancement of MR imaging was not decreased after ART. This result suggested that the function of uterine would be preserved after ART. However, we could not evaluate long-term function of uterine after ART at that time.

Several reports on ART have been published since 1994 [2-6]. Recently, updated meta-analysis reported that ART was effective and safe for early-stage cervical cancer [7]. However, little was known about factors associated with pregnancy or delivery after ART.

Five years have passed from previous our report, we evaluate the long-term function of uterine and factors associated with pregnancy or delivery after ART based on reproductive outcomes in the present study.

2. Materials and Methods

Institutional review board approval was obtained to review the records of all patients undergoing ART in our hospital from July 2011 to March 2020. The surgical approach was laparotomy in all patients. Patients with high-risk histology or stage IIA-IVB cervical cancer were not considered eligible for ART. Tumor size was measured using pelvic MR imaging. All patients underwent a preoperative whole computed tomography (CT) scan to confirm no evidence of metastasis.

Our intraoperative protocol for performing ART is shown, briefly. Following the collection of frozen sections of pelvic nodes and the endocervical margin of the resected cervix, uterine curettage was performed. The cervix was shaved to leave over a 1-cm inter-cervical margin. We performed cervical cerclage using nonabsorbable monofilament polydioxanone sutures. Patients confirmed by pathology to have metastasis to the nodes or tumor in the uterine curettage specimen were converted to radical hysterectomy.

3. Result

We planned 25 patients who underwent ART for cervical cancer in our hospital from 2011 to 2020. Four patients were converted to radical hysterectomy because of a positive endocervical margin in 3 patients and positive lymph node in 1 patient. We assessed 21 patients who underwent ART.

Table 1. Patient characteristics.

Characteristics	Data
Age, yrs, median (range)	35 (27-40)
Already married, n	9
None of prior children, n	16
Histological diagnosis, n	
SCC	16
Adenocarcinoma	4
Adenosquamous carcinoma	1
Clinical stage (FIGO 2018), n	
IA1 with LVSI positive	2
IA2	5
IB1	14

SCC: squamous cell carcinoma, FIGO: International Federation of Gynecology and Obstetrics, LVSI: lymph vascular space invasion.

Patient characteristics are shown in Table 1. The median age of the patients was 35 (range 27-40) years. Half of the women were already married, and the majority had no children. Sixteen patients had squamous cell carcinoma, 4 had adenocarcinoma and 1 had adenosquamous carcinoma. These

patients' clinical stages (FIGO 2018) were IA1 in 2, IA2 in 5 and IB1 in 14 patients.

Oncological outcomes are shown in Table 2. The average time of the operation was 415±82 min. The average amount of intraoperative bleeding was 743±293 ml. Operative complications included urinary tract injury and cervical stenosis, which occurred in 1 patient each. Currently, no patient has suffered a recurrence over a median follow-up period of 49 months.

Table 2. Oncological outcomes.

Variable	Data
Operation time, min, average±SD	415±82
Intraoperative bleeding, ml, average±SD	743±293
Complications, n	
None	17
Urinary tract injury	1
Cervical stenosis	1
Risk category, n	
Low	16
Intermediate	3
High	0
Follow-up period after ART, m, median (range)	49 (1-108)
Recurrence, n	0

Reproductive outcomes are shown in Table 3. Among the 10 patients with planned pregnancies after ART, 6 patients had pregnancies. Although all patients in the pregnancy group had pregnancies at the first fertility treatment, none of patients in the non-pregnancy group had pregnancies after several fertility treatment. The median age was 32 (range 29-35) years in the pregnancy group and 35 (range 28-37) years in the non-pregnancy group. The median period after ART was 49 (range 41-108) months in the pregnancy group and 79 (range 36-98) months in the non-pregnancy group. Although we could not preserve bilateral uterine arteries in some patients, the rate of bilateral uterine arteries preservation showed no significant difference between two groups.

Table 3. Pregnancy outcomes after ART.

	Pregnancy (n=6)	Non pregnancy (n=4)	P value
Number of fertility treatment, median (range)	1 (1)	4 (2-7)	<0.01
Age, yrs, median (range)	32 (29-35)	35 (28-37)	0.32
Period after ART, m, median (range)	49 (41-108)	79 (36-98)	0.80
Preservation of uterine artery, n			
Both sides	5	3	0.75
One side	1	1	

Table 4. Delivery outcomes after ART.

	Pre-term (n=3)	Full-term (n=3)	P value
Delivery, w, median (range)	32 (26-36)	37 (37)	-
Age, yrs, median (range)	30 (29-32)	35 (34-35)	0.07
Fertility treatment, n			
Spontaneous	1	1	0.51
AIH	1	0	
IVF-ET	1	2	
Residual cervical length, mm, median (range)	10 (9-10)	23 (23)	<0.05
Normal bacteria flora of vagina, Nugent score, median (range)	1 (0-3)	2 (2)	0.49

AIH: Artificial Insemination of Husband, IVF-ET: in vitro fertilization – embryo transfer.

Delivery outcomes can be compared between the pre-term and full-term deliveries in Table 4. The application of caesarean section (C/S) was preterm premature rupture of the membranes (pPROM) in all patients of pre-term delivery group. Age, fertility treatment and score of normal bacteria flora of the vagina showed no significant difference between two groups. Residual cervical length was longer (>20 mm) in the full-term deliveries and shorter (<10 mm) in the pre-term deliveries.

4. Discussion

In our previous study, we showed that uterine enhancement of MR imaging after ART was not decreased [1]. This result suggested that the function of uterine was preserved after ART. However, we could not evaluate long-term function of uterine after ART or the influence of uterine enhancement rate in patients with ligation of bilateral uterine artery. In the present study, we assessed long-term evaluation after ART based on the reproductive outcomes.

We compared the pregnancy group with the non-pregnancy group after ART to assess the function of uterine. Although all patients had pregnancies at the first fertility treatment in the pregnancy group, none of the patient had pregnancies after several fertility treatment in the non-pregnancy group. This result suggested that the possibility of pregnancy after ART was determined at the first fertility treatment. The max of period after ART was 108 months in pregnancy group, which suggested that long-term function of uterine for pregnancy might be kept. Smith et al. showed the necessity of preserving the bilateral uterine arteries during ART to preserve fertility [8]. Alternatively, Rodriguez M et al. proceeded that ligation of the bilateral uterine arteries may achieve a similar outcome [9]. Although we could not preserve bilateral uterine arteries in some patients, it is not associated with pregnancy after ART. This result suggested that preserving of the bilateral uterine arteries was not important for fertility preservation after ART.

The final goal following ART is for the patients to experience a full-term delivery. The main reason for pre-term delivery in our patients was pPROM. Chorioamnionitis was detected in all patients with a pre-term delivery. Although our study suggested that normal bacteria flora of vagina might not be associated with full-term delivery, pPROM is induced by decrease of immunological defense of vaginal bacterial flora such as *Lactobacillus lactis* [10-12]. A decrease in cervical mucus and the accompanying reduction in antibiotic function results in chorioamnionitis. Several reports suggested that residual cervical length is correlated with gestational age at delivery [13-15]. Preservation of the cervical length decreased the risk of ascending infection, pPROM, and premature delivery. A residual cervix of over 20 mm in length was needed to achieve a full-term delivery in our study. These results indicated that an adequate length of normal cervix should be preserved because this would achieve a successful pregnancy.

5. Conclusion

We assessed pregnancies and deliveries after ART based on reproductive outcomes. Age, period after ART and bilateral uterine arteries preservation showed no significant difference between the pregnancy and non-pregnancy groups. The function of uterine was preserved after ART regardless of bilateral uterine arteries preservation. Age, fertility treatment and score of normal bacteria flora of the vagina showed no significant difference between pre-term and full-term delivery groups. Residual cervical length was associated with the gestational age at delivery.

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