

Role of the two-point pull-up technique for treating the uterine arteries during radical hysterectomy and trachelectomy



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ABSTRACT

Objectives: To introduce a safe and reliable method for the management of peripheral vessels around the uterine artery during abdominal radical hysterectomy or abdominal radical trachelectomy.

Study design: From 2007 to 2011, 102 patients with invasive cervical cancer underwent an abdominal radical hysterectomy. In 48 operations in 2007–2009, we performed the conventional radical hysterectomy, in which we ligated and cut the uterine arteries at their origin, and we divided the anterior leaf of the vesico-uterine ligament by blindly inserting scissors into the ureteral tunnel, pushing the ureter laterally from the cervix. In 54 operations in 2009–2011, we pulled up the origin and the bifurcation of the uterine artery using vessel tape, skeletonized the uterine artery and directly divided the superficial uterine vein, superior vesical vein and ureteric branch of the uterine artery. We also performed four radical trachelectomies using the two point pull-up method. We investigated whether this method was useful for the management of peripheral vessels around the uterine artery.

Results: The mean total blood loss in the two point pull-up method group (485 ± 270 ml) was significantly lower than that in the conventional surgery group (686 ± 554 ml) ($p < 0.05$). The mean length of the operation in the two point pull-up method group (481 ± 53 min) was not significantly different from the conventional surgery group (497 ± 74 min) ($p = 0.111$). The mean number of dissected lymph nodes in the two point pull-up method group (37.2 ± 11.6) was not significantly different from that in the conventional method group (34.4 ± 10.2) ($p = 0.096$). The overall survival and progression-free survival were also not substantially different between the two groups. In the radical trachelectomy, the mean blood loss was 377.5 ± 185.6 ml and the mean duration of surgery was 520.0 ± 48.5 min using the two point pull-up method. We were able to preserve both uterine arteries without accidental injury or disruptive bleeding. All four patients were menstruating normally as of the last examination.

Conclusions: The two point pull-up method enabled us to reduce intraoperative blood loss without increasing other complications during abdominal radical hysterectomy or abdominal radical trachelectomy.

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1. Introduction

Cervical cancer is the second most common cancer of females in developing countries, and the seventh most common cancer in developed countries [1]. The standard surgical approach for stage 1b and 2a cervical cancer is radical hysterectomy, first described by Wertheim [2], and subsequently modified by Latzko and Okabayashi [3]. Radical hysterectomy with

lymphadenectomy is a well-established treatment for early stage cervical cancer, with an efficacy equal to that of radiation therapy. The surgery is associated with a 5-year survival rate approaching 89% [4,5].

The number of patients diagnosed as having early-stage cervical cancer during their childbearing years has been increasing. Because of this trend, there has been an increased emphasis on fertility-sparing treatments for early-stage cervical cancer. Recently, one of these, abdominal radical trachelectomy, has become more widely accepted by many gynecologic oncology practices. Although the procedures performed during radical trachelectomy are similar to those performed during radical hysterectomy, the ovarian vessels and uterine arteries are preserved and the remaining uterus and vaginal cuff are sutured, so further studies

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are needed to gain a more detailed understanding of the precise procedures during radical hysterectomy to prevent the development of perioperative complications.

Radical hysterectomy, which must be performed by a gynecologic oncology surgeon, involves removal of the uterus, upper part of the vagina, the entire uterosacral and uterovesical ligaments, and all of the parametrium on each side, along with pelvic node dissection. The procedure is frequently associated with intraoperative complications such as massive bleeding and ureteral injury, and significant lasting morbidities such as bladder dysfunction because of damage to the pelvic autonomic innervation [6,7]. Previous studies reported that the blood loss during this operation was 300–1800 ml [8]. In radical hysterectomy, during the separation of the leaf of the vesico-uterine ligament, as Okabayashi described: “This tissue connects the posterior aspect of the bladder with the side wall of the vagina and the cervix of the uterus, and contains many venous vessels. Division of this tissue is a difficult procedure, as more or less bleeding is always present and there is always the danger of injuring the bladder, especially in advanced cases” [3]. These procedures are often difficult because they involve the separation of the anterior leaf of the vesico-uterine ligament. When this separation is performed, many surgeons note that there is extensive bleeding due to the blinded nature of the procedures, which must be performed along the space of the so-called ureteral tunnel. To separate the anterior leaf of the vesico-uterine ligament, it is necessary to carefully separate the connective tissue complex, including the uterine artery, the ureteral branch of the uterine artery, superficial uterine vein, and superior vesical vein, which connects the bladder and deep uterine vein within the deep layer of the vesicouterine ligament [9]. Precise understanding of this anatomy and these procedures has been difficult to obtain, however, causing this phase of the operation to be the most difficult part of a radical hysterectomy. To reduce the blood loss and facilitate separation of the uterine artery from the connective tissue complex, including the ureteral branch of the uterine artery, superficial uterine vein, and superior vesical vein, we developed a novel procedure, which we call the “two point pull-up of the uterine artery method”. In this report, we introduce the use of our new technique, which can reduce blood loss and prevent injury to the ureter.

2. Materials and methods

Permission to proceed with the data acquisition and analysis was obtained from Osaka Medical College Hospital's institutional review board. A list of patients who underwent radical hysterectomy for invasive cervical cancer at Osaka Medical College from 2007 to 2011 was generated from our institutional surgical record database. We retrospectively reviewed 54 patients with FIGO stage Ia2 ($n = 2$), Ib1 ($n = 28$), Ib2 ($n = 6$), IIa ($n = 8$), and IIb ($n = 10$) invasive cervical cancer who underwent radical abdominal hysterectomy with the two point pull-up method from December 2009 to September 2011. We compared this group with a group treated from January 2007 to November 2009 using the conventional method group as a historical control group of patients who underwent radical hysterectomy without the two point pull-up method. There were forty-eight patients in the conventional method group, and these patients had stage Ib1 ($n = 35$), Ib2 ($n = 4$), IIa ($n = 4$), and IIb ($n = 5$) cervical cancers.

All the patients underwent class C1 nerve-sparing radical hysterectomy [10]. In the type III hysterectomy, the parametria and uterosacral ligament are resected up to the pelvic wall, and the upper third of the vagina is also resected. All operations were performed by the same surgical team, and all intraoperative and postoperative complications were documented. In order to investigate the effectiveness of our technique, the mean blood

loss, mean length of the operation, and urinary fistula rate were compared between the historical control cases ($n = 48$) and the recent cases ($n = 54$). Student's *t*-test and Fisher's exact test were used for comparisons between the two groups. The level of significance was set at a value of $p < 0.05$. The statistical analysis was performed using the StatMates IV software program.

2.1. Surgical procedure

For the surgery, the abdomen was opened in the standard fashion through a midline incision, the round ligaments were divided and the broad ligament was opened onto the pelvic sidewall. Pelvic lymphadenectomy (level 2) was usually started before radical hysterectomy [10].

After pelvic lymphadenectomy, the ureter was dissected inferiorly, with the encompassing fibrofatty tissue removed and medially reflected to be removed with the uterus. In the conventional method, we ligated and cut the uterine artery and veins at their origin from the internal iliac artery, and we divided the anterior leaf of the vesico-uterine ligament by blindly inserting scissors into the ureter tunnel, pushing the ureter laterally from the cervix. In the new method, we first identified the uterine artery at its origin and used vessel tape to place traction on the uterine artery. Second, the uterine artery entering the uterus side was identified, and another vessel tape was used to place two point traction on the uterine artery (Fig. 1: the two point pull-up method). Using this two point pull-up method, the connective tissue around the artery became unobtrusive, because of the traction, and we could directly recognize the vessels around the uterine artery. We could also detect the superficial uterine vein and its connection with the bladder (Fig. 2), which is called the superficial vesical vein (Fig. 3) [11]. We clamped, ligated and cut each vessel. In this study, we used a bipolar coagulation device and Harmonic[®] (Ethicon Endo-surgery Inc, OH, USA). We could also reveal the ureteral branch of the uterine artery which runs from uterine artery to ureter cranially (Fig. 4), and this vessel was also isolated and ligated. After separating the uterine artery by recognizing it directly, and ligating the peripheral uterine artery vessels, we carefully divided the anterior leaf of the vesico-uterine ligament (Fig. 5). Thereafter, the uterine artery was ligated at its origin.

This procedure enabled us to separate the uterus completely from the ureter without massive bleeding. After dividing the anterior leaf of the vesico-uterine ligament, we always divided the

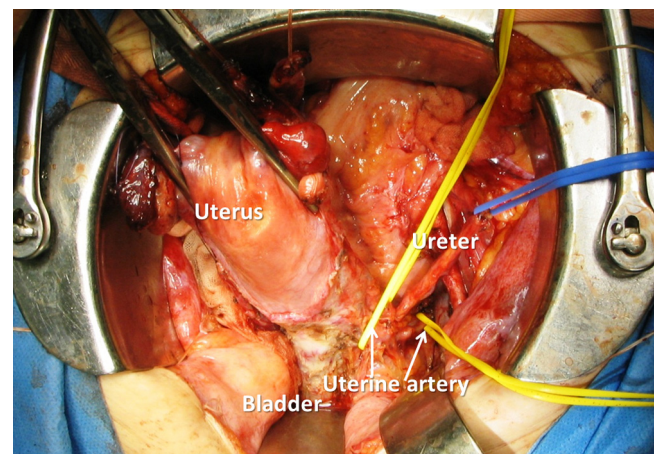


Fig. 1. The left side of the two point pull-up of the uterine artery. First, we identify the uterine artery at its origin and use vessel tape to place traction on the uterine artery. Second, the uterine artery entering the uterus side is identified, and we use another vessel tape to place two point traction on the uterine artery.

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