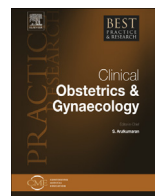




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# Indications and techniques for robotic pelvic and para-aortic lymphadenectomy with sentinel lymph node mapping in gynecologic oncology

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Robotic-assisted laparoscopic surgery is the most common approach for the treatment of early-stage endometrial and cervical cancers in the US. Surgical staging requires pelvic and often aortic lymphadenectomy, depending on the primary tumor characteristics. Pelvic and aortic lymphadenectomy procedures may also be indicated for debulking of larger metastases to improve disease control. The infra-renal basin is an important anatomic site of metastasis from pelvic tumors, and robotic dissection techniques for this site have been described. In recent years, sentinel lymph node (SLN) mapping has been adopted into the National Comprehensive Cancer Network guidelines' surgical algorithm for uterine and cervical cancers. SLN mapping has higher sensitivity for the detection of nodal metastasis, despite removing fewer lymph nodes, and potentially reduces morbidities such as lower extremity lymphedema. This article reviews current robotic pelvic and para-aortic lymphadenectomy dissection techniques for endometrial and cervical cancers and discusses the recent integration of pelvic SLN mapping in the surgical algorithm.

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## Introduction

Surgical staging has been central in the management of endometrial cancer since the International Federation of Gynecology and Obstetrics (FIGO) adoption of pelvic and aortic lymphadenectomy in 1988. Surgical staging allows for more accurate comparison of outcomes in clinical trials, estimation of prognosis, and more rational determination of therapies [1,2]. Cervical cancer remains a clinically staged disease by FIGO. However, findings from lymphadenectomy in early-stage cervical cancer are pivotal in the determination of adjuvant therapy. Preradiation staging with para-aortic lymphadenectomy in locally advanced cervical cancer has resulted in improved outcomes compared to unstaged patients in some studies [3,4]. Removal of bulky lymph node metastasis in both diseases improves prognosis, local disease control, and overall survival. Routine staging with pelvic and aortic lymphadenectomy in early-stage disease can be associated with morbidity including lower extremity lymphedema and neuralgia for a significant number of patients. Sentinel lymph node (SLN) mapping of cervical and uterine cancers has been investigated since the early 2000s, and these staging methods have recently been accepted as adequate for apparent uterine confined disease in lieu of traditional pelvic and aortic lymphadenectomy [3,5–8]. SLN mapping with enhanced pathology methods detects more metastatic diseases than pelvic lymphadenectomy and likely reduces the risk for lymphedema [9]. The purpose of this article is to review the indications and techniques for aorto-pelvic lymphadenectomy and recent information about SLN assessment for endometrial and cervical cancers.

## Endometrial cancer

Endometrial cancer is the most common gynecologic malignancy in the US, with an estimated 61,380 new cases in 2017 [10]. Robotic surgery techniques for staging gynecologic tumors developed soon after the 2005 FDA clearance of the da Vinci<sup>®</sup> operating system, and much of that experience accrued staging patients with endometrial cancer [11–15]. Despite the necessity for surgical staging by FIGO and improvements in staging accuracy, controversies remain regarding the clinical benefits of routine systematic pelvic and aortic lymphadenectomy. Two separate multi-institutional phase III trials in endometrial cancer failed to show a survival advantage for patients randomized to lymphadenectomy [16,17]. There were several criticisms of these trials including flaws in trial design, inconsistent degrees of lymphadenectomy between centers, lack of defined adjuvant therapy protocols, lack of requirements for para-aortic lymphadenectomy, and inclusion of a large proportion of low-risk cases [18,19]. In contrast, Todo et al. [20] reported that patients with high-risk histologies or deep invasion who underwent para-aortic and pelvic lymphadenectomy had an improved overall survival compared to patients with pelvic lymphadenectomy alone (HR, 0.53; 95% CI, 0.38-0.76,  $p < 0.001$ ).

The first reported laparoscopic pelvic and aortic lymphadenectomies in 1988 were by Professor Querleu [21]. Later in 1992, Nezhat et al. [22] reported the first laparoscopic radical hysterectomy with para-aortic lymphadenectomy. In 1993, Childers et al. [23,24] reported their series of endometrial cancer staging procedures. Despite these early publications by 2005, very few centers in the USA offered routine laparoscopic staging for the majority of their patients with endometrial cancer [25–27]. Since then, numerous publications comparing laparoscopy, robotic-assisted laparoscopy, and laparotomy have been completed. The Gynecologic Oncology Group (GOG) Lap-2 phase III trial in endometrial cancer randomized laparotomy to laparoscopy for hysterectomy with lymphadenectomy and found equivalency in lymph node counts and recurrence-free survival (RFS). However, the laparoscopy cohort had a much more favorable morbidity profile than the laparotomy group [28,29]. For many surgeons, the learning curve for laparoscopic lymphadenectomy was considered long and difficult. LAP-2 reported a conversion rate of 24.8% from laparoscopy to laparotomy [28]; however, more modern series with expert surgeons report conversions in less than 10% of cases. The robotic platform's technology enhancements enabled gynecologic surgeons to perform minimally invasive surgery with a much shorter learning curve [30]. Robotic-assisted laparoscopic procedures quickly gained popularity and exceeded the number of laparotomy and laparoscopy procedures by 2010 within the US. [12,29].

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