

Cervical Cancer, Version 3.2019

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ABSTRACT

Cervical cancer is a malignant epithelial tumor that forms in the uterine cervix. Most cases of cervical cancer are preventable through human papilloma virus (HPV) vaccination, routine screening, and treatment of precancerous lesions. However, due to inadequate screening protocols in many regions of the world, cervical cancer remains the fourth-most common cancer in women globally. The complete NCCN Guidelines for Cervical Cancer provide recommendations for the diagnosis, evaluation, and treatment of cervical cancer. This manuscript discusses guiding principles for the workup, staging, and treatment of early stage and locally advanced cervical cancer, as well as evidence for these recommendations. For recommendations regarding treatment of recurrent or metastatic disease, please see the full guidelines on NCCN.org.

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NCCN CATEGORIES OF EVIDENCE AND CONSENSUS

Category 1: Based upon high-level evidence, there is uniform NCCN consensus that the intervention is appropriate.

Category 2A: Based upon lower-level evidence, there is uniform NCCN consensus that the intervention is appropriate.

Category 2B: Based upon lower-level evidence, there is NCCN consensus that the intervention is appropriate.

Category 3: Based upon any level of evidence, there is major NCCN disagreement that the intervention is appropriate.

All recommendations are category 2A unless otherwise noted.

Clinical trials: NCCN believes that the best management of any patient with cancer is in a clinical trial. Participation in clinical trials is especially encouraged.

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Individual disclosures for the NCCN Cervical Cancer Panel members can be found on page 84. (The most recent version of these guidelines and accompanying disclosures are available on the NCCN website at NCCN.org.)

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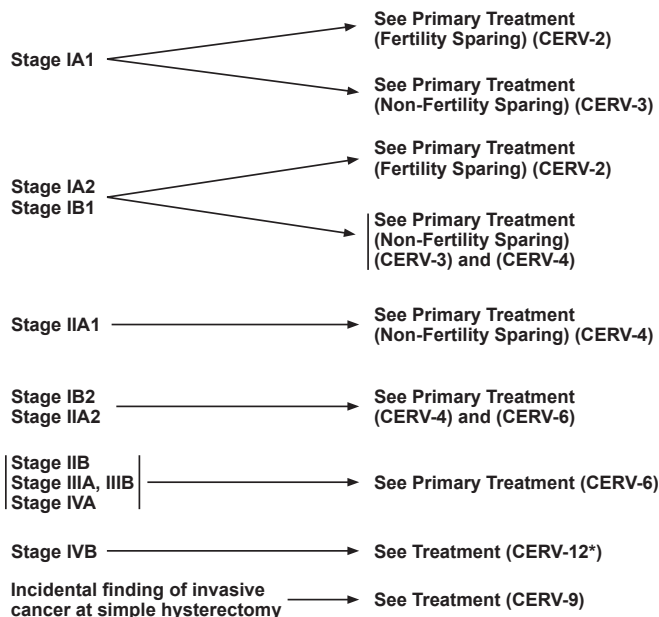
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*Discussion Section Writing Committee.

WORKUP

- History and physical (H&P)
- Complete blood count (CBC) (including platelets)
- Cervical biopsy, pathologic review^a
- Cone biopsy as indicated^b
- Liver function test (LFT)/renal function studies
- Imaging^c
- Smoking cessation and counseling intervention if indicated
- Consider HIV testing^d
- Consider examination under anesthesia (EUA) cystoscopy/proctoscopy^e (≥ stage IB2)
- Consider options for fertility sparing

CLINICAL STAGE



*Available online, in these guidelines, at NCCN.org.

^aSee Principles of Pathology (CERV-A).

^bSee Discussion for indications for cone biopsy.

^cSee Principles of Imaging (CERV-B*).

^dConsider HIV testing, especially in younger patients. Patients with cervical cancer and HIV should be referred to an HIV specialist and should be treated for cervical cancer as per these guidelines. Modifications to cancer treatment should not be made solely on the basis of HIV status.

^eFor suspicion of bladder/bowel involvement, cystoscopy/proctoscopy with biopsy is required.

All staging in guidelines is based on updated 2009 FIGO staging. (See ST-1*)

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CERV-1

Diagnosis and Workup

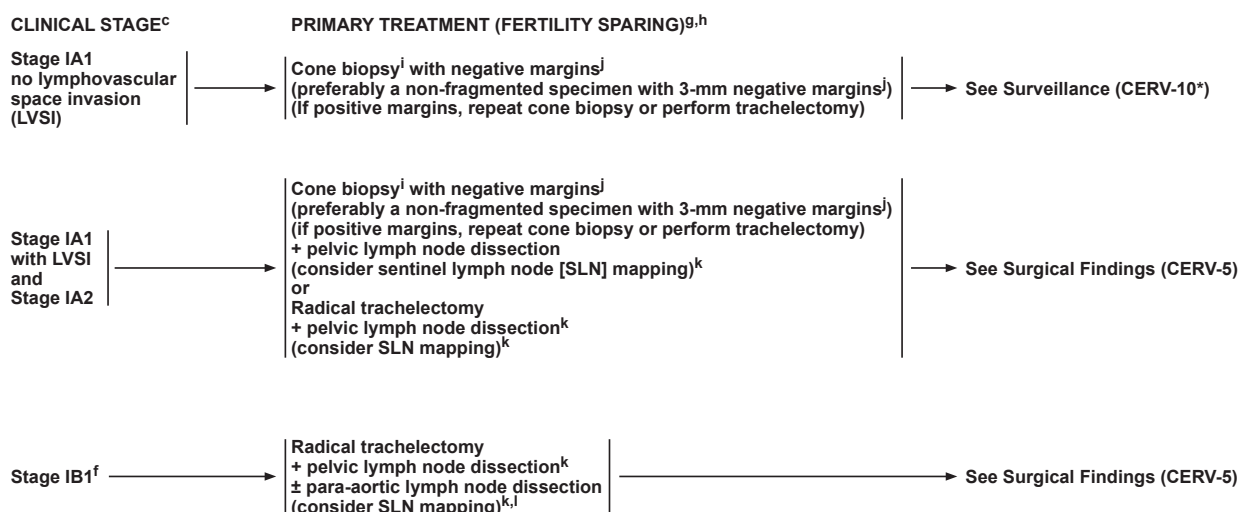
These NCCN Guidelines discuss squamous cell carcinoma, adenosquamous carcinoma, and adenocarcinoma of the cervix. Neuroendocrine carcinoma, small cell tumors, glassy-cell carcinomas, sarcomas, and other histologic types are not within the scope of these guidelines.

Currently, the International Federation of Gynecology and Obstetrics (FIGO) evaluation procedures for staging are limited to colposcopy, biopsy, conization of the cervix, cystoscopy, and proctosigmoidoscopy. More-complex radiologic and surgical staging procedures are not addressed in the FIGO classification. In the United States, however, CT, MRI, combined PET/CT, and surgical staging are often used to guide treatment options and design.¹⁻⁵

The earliest stages of cervical carcinoma may be asymptomatic or associated with a watery vaginal discharge and postcoital bleeding or intermittent spotting. Often these early symptoms are not recognized by the patient. Because of the accessibility of the uterine cervix, cervical cytology or Papanicolaou (Pap) smears and cervical biopsies can usually result in an accurate diagnosis. Cone biopsy (ie, conization) is recommended if the cervical biopsy is inadequate to define invasiveness or if accurate assessment of microinvasive disease is required.

However, cervical cytologic screening methods are less useful for diagnosing adenocarcinoma, because adenocarcinoma in situ affects areas of the cervix that are harder to sample (ie, endocervical canal).^{6,7} The College of American Pathologists (CAP) protocol for cervical carcinoma is a useful guide (available at http://www.cap.org/apps/docs/committees/cancer/cancer_protocols/2012/Cervix_12protocol.pdf). This CAP protocol was revised in June 2012 and reflects recent updates in the AJCC/FIGO staging (ie, AJCC Cancer Staging Manual, 8th edition).

Workup for these patients with suspicious symptoms includes history and physical examination, complete blood count (CBC; including platelets), and liver and renal function tests. Recommended radiologic imaging includes chest radiograph, CT, or combined PET/CT, and MRI as indicated (eg, to rule out disease high in the endocervix).^{2,8} For detailed imaging recommendations by stage and planned treatment approach, see "Principles of Imaging" in the NCCN Guidelines for Cervical Cancer, available online at NCCN.org). Smoking cessation and counseling, as well as HIV testing (especially in younger patients), are recommended. Cystoscopy and proctoscopy are only recommended if bladder or rectal extension is suspected. Options for fertility sparing should be considered.



^cSee Principles of Imaging (CERV-B*).

^fFertility-sparing surgery for stage IB1 has been most validated for tumors ≤2 cm. Small cell neuroendocrine histology and adenoma malignum (also known as minimal deviation adenocarcinoma) are not considered suitable tumors for this procedure.

^gThere are no data to support a fertility-sparing approach in small neuroendocrine tumors, gastric type adenocarcinoma, or adenoma malignum. Total hysterectomy after completion of childbearing is at the patient's and surgeon's discretion, but is strongly advised in women with continued abnormal pap smears or chronic persistent HPV infection.

^hConsultation with reproductive endocrinology fertility experts is suggested.

ⁱCold knife conization (CKC) is the preferred method of diagnostic excision, but loop electrosurgical excision procedure (LEEP) is acceptable, provided adequate margins and proper orientation are obtained. Endocervical curettage (ECC) should be added as clinically indicated.

^jNegative for invasive disease or histologic high-grade squamous intraepithelial lesion (HSIL) at margins.

^kSee Principles of Evaluation and Surgical Staging (CERV-C*).

^lFor SLN mapping, the best detection rates and mapping results are in tumors <2 cm.

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CERV-2

Principles of Staging and Surgery

Clinical Staging

Because noninvasive radiographic imaging may not be routinely available in low-resource countries, the FIGO system limits the imaging to chest radiography, intravenous pyelography, and barium enema. The staging of carcinoma of the cervix is largely a clinical evaluation. Although surgical staging is more accurate than clinical staging, surgical staging often cannot be performed in low-resource countries.^{4,9,10}

The panel currently uses the 2009 FIGO definitions and staging system, which takes into account primary tumor characteristics (diameter in greatest dimension, cervical stromal invasion, locoregional spread) and distant metastasis.^{9,11} Regional nodal metastasis is not included in the FIGO staging criteria. With the 2009 FIGO staging, stage IIA is now subdivided into stage IIA1 (tumor size ≤4 cm) and stage IIA2 (tumor size >4 cm), which is the only change from the previous 1994 FIGO staging system. FIGO directly aligns with AJCC staging with the exception of stage 0, which does not exist in the FIGO system.^{12,13} Importantly, lymphovascular space invasion (LVSI) does not alter the FIGO classification.⁹ FIGO did not include LVSI because pathologists do not always

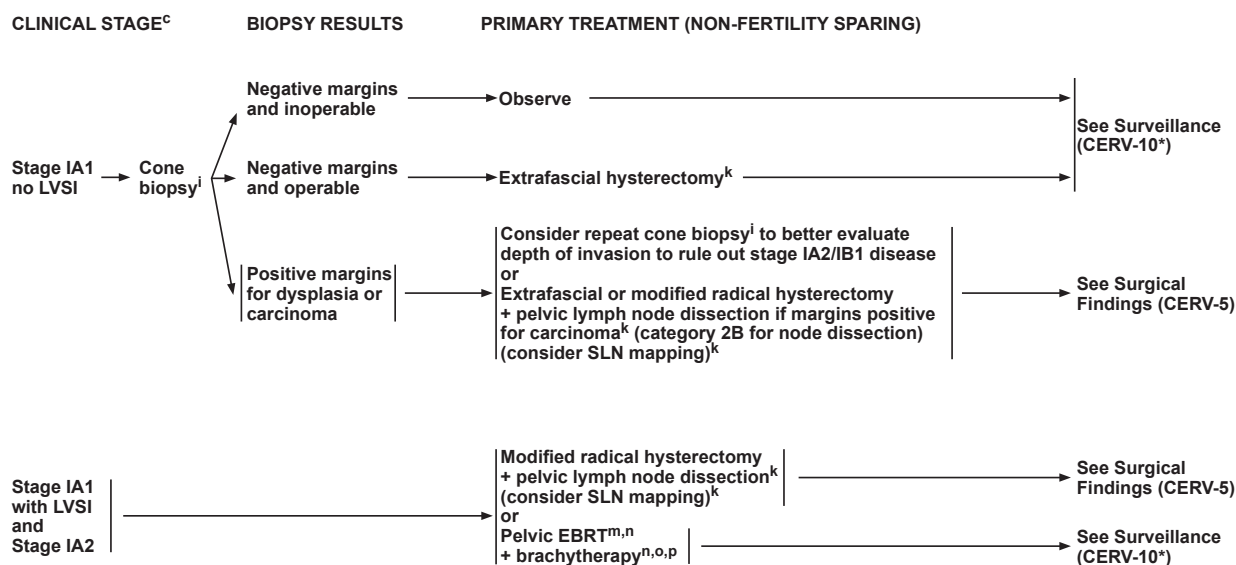
agree on whether LVSI is present in tissue samples. Some panel members believe that patients with stage IA1 who have extensive LVSI should be treated using stage IB1 guidelines.

The use of MRI, CT, or combined PET/CT scans may aid in treatment planning, but it is not accepted for formal staging purposes.^{8,10,14} In addition, FIGO has always maintained that staging is intended for comparison purposes only and not as a guide for therapy. As a result, the panel uses the FIGO definitions as the stratification system for these guidelines, although the findings on imaging studies (ie, CT, MRI, PET/CT) are used to guide treatment options and design. MRI is useful to delineate disease extent and to guide decisions regarding fertility-sparing versus non-fertility-sparing treatment approaches,^{15–21} whereas PET/CT may be useful to detect and/or rule out metastasis.^{22–26}

Surgical Staging

Pathologic Assessment

Surgicopathologic factors may be used to guide the extent of surgical staging and treatment decisions. Findings from pathologic assessment of the surgical specimen should be carefully documented. Important elements



^cSee Principles of Imaging (CERV-B*).

ⁱCKC is the preferred method of diagnostic excision, but LEEP is acceptable, provided adequate margins and proper orientation are obtained. ECC should be added as clinically indicated.

^kSee Principles of Evaluation and Surgical Staging (CERV-C*).

^mRadiation can be an option for medically inoperable patients or those who refuse surgery.

ⁿSee Principles of Radiation Therapy (CERV-D*).

^oThese doses are recommended for most patients based on summation of conventional external-beam fractionation and low dose-rate (40–70 cGy/h) brachytherapy equivalents. Modify treatment based on normal tissue tolerance, fractionation, and size of target volume. (See Discussion)

^pThe traditional dose would be 70–80 Gy to total point A dose.

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CERV-3

of primary tumor evaluation include tumor site; primary tumor volume (in multiple dimensions); histologic type and grade; stromal invasion; surgical margin status; and the presence of lymphovascular invasion. When resected, the number of lymph nodes with isolated tumor cells, micrometastases, and macrometastases should be recorded. When sentinel lymph node (SLN) mapping is performed, SLNs should undergo ultrastaging for detection of low-volume metastasis; non-sentinel nodes do not require ultrastaging. Other important factors include tumor involvement of tissues/organs such as the parametrium, vaginal cuff, fallopian tubes, ovaries, peritoneum, omentum, and others.

The “Sedlis criteria,” which are intermediate risk factors used to guide adjuvant treatment decisions, include: (1) greater than one-third stromal invasion; (2) capillary lymphatic space involvement; or (3) cervical tumor diameters greater than 4 cm.²⁷ However, potentially important risk factors for recurrence may not be limited to the Sedlis criteria. Additional risk factors for consideration include tumor histology (eg, adenocarcinoma component)^{28,29} and close or positive surgical margins.^{30,31}

Recent findings suggest that predictive factors for lymph node metastasis in endocervical adenocarcinoma

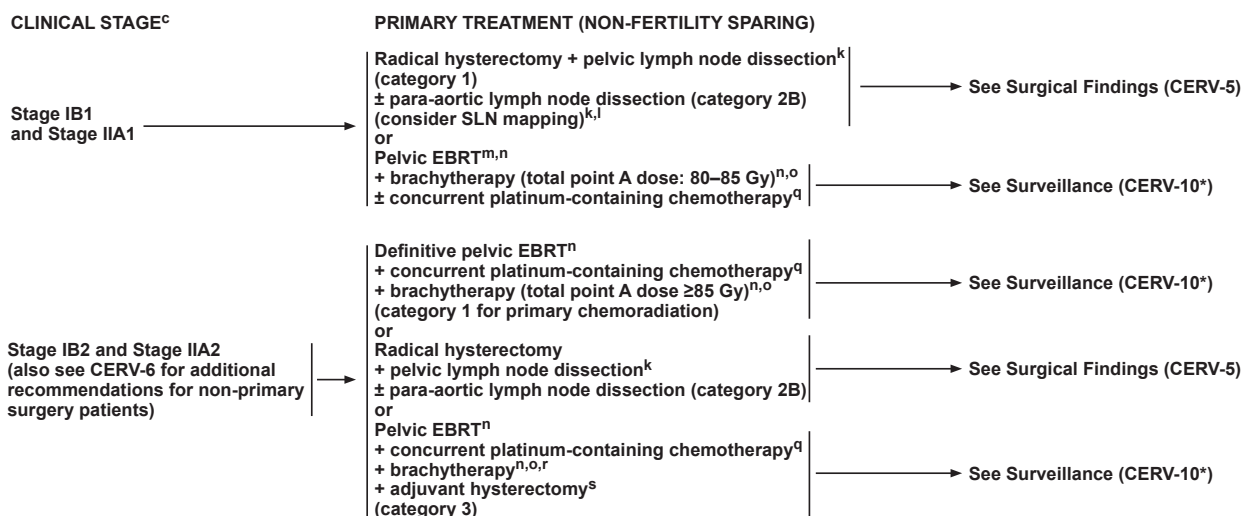
may differ from squamous cell carcinoma. Data from retrospective studies suggest that the pattern of cervical stromal invasion and presence of LVSI, but not primary tumor size, predict risk of nodal metastasis. Alternative classification systems incorporating stromal invasion pattern have been proposed for adenocarcinoma.^{32–34} These systems remain to be validated for clinical use.

Conservative/Fertility-Sparing Approaches

Fertility-sparing approaches may be considered in highly selected patients who have been thoroughly counseled regarding disease risk as well as prenatal and perinatal issues.³⁵ Consultation with reproductive endocrinology fertility experts is suggested.

Microinvasive disease (FIGO stage IA1 with no LVSI) is associated with an extremely low incidence of lymphatic metastasis,^{36–39} and conservative treatment with conization is an option (category 2A) for individuals with no evidence of LVSI. In stage IA1 individuals with evidence of LVSI, a reasonable conservative approach is conization (with negative margins) in addition to SLN mapping algorithm or pelvic lymphadenectomy.

The goal of conization is en bloc removal of the ectocervix and endocervical canal; the shape of the cone can be tailored to the size, type, and location of the lesion



*Available online, in these guidelines, at NCCN.org.

^cSee Principles of Imaging (CERV-B*).

^kSee Principles of Evaluation and Surgical Staging (CERV-C*).

^lFor SLN mapping, the best detection rates and mapping results are in tumors <2 cm.

^mRadiation can be an option for medically inoperable patients or those who refuse surgery.

ⁿSee Principles of Radiation Therapy (CERV-D*).

^oThese doses are recommended for most patients based on summation of conventional external-beam fractionation and low dose-rate (40–70 cGy/h) brachytherapy equivalents. Modify treatment based on normal tissue tolerance, fractionation, and size of target volume. (See Discussion)

^qConcurrent platinum-containing chemotherapy with EBRT utilizes cisplatin as a single agent (or carboplatin if cisplatin intolerant) or cisplatin plus 5-fluorouracil.

^rThe traditional dose would be 75–80 Gy to total point A dose.

^sThis approach can be considered in patients whose extent of disease or uterine anatomy precludes adequate coverage by brachytherapy.

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CERV-4

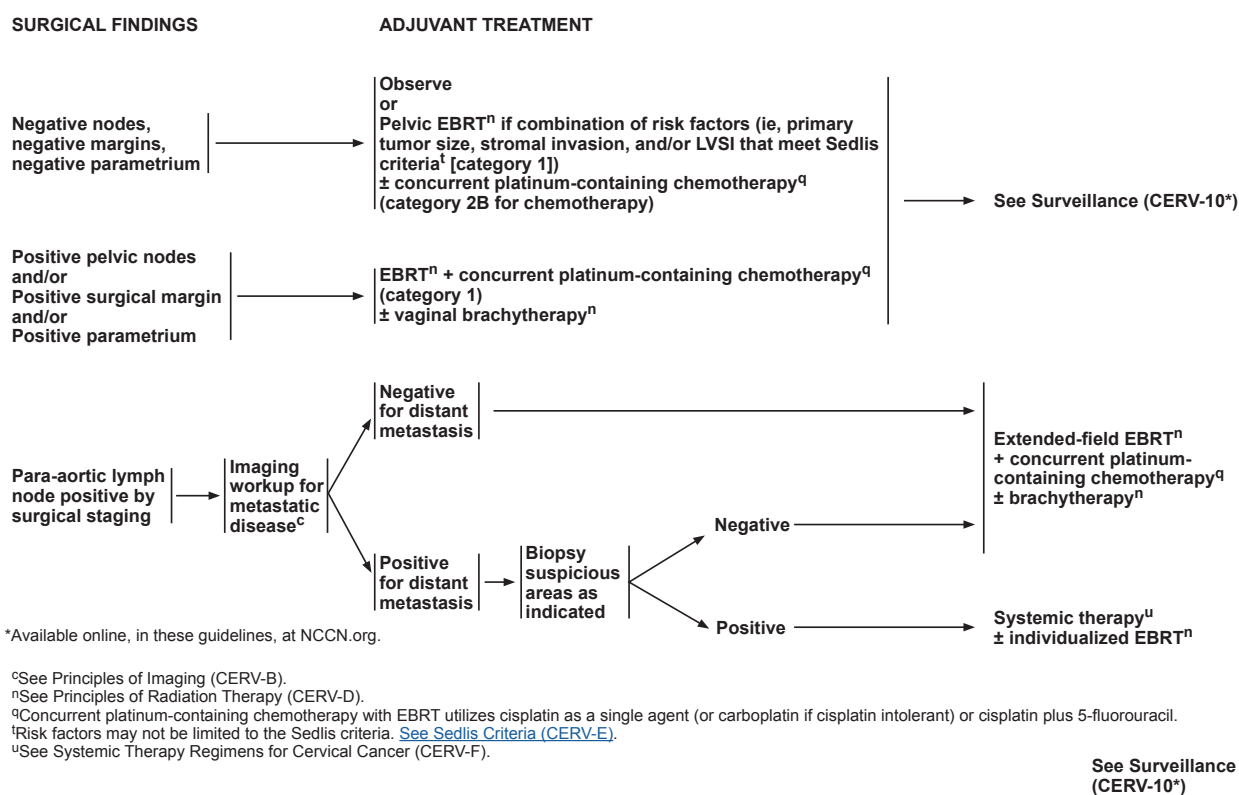
(ie, narrow long cone in cases of suspected invasive adenocarcinoma). The panel recommends cold knife conization as the preferred approach. However, LEEP (loop electrosurgical excision procedure) is acceptable as long as adequate margins, proper orientation, and a non-fragmented specimen without electrosurgical artifact can be obtained.^{40–45} Endocervical curettage should be added as clinically indicated.

Select patients with stage IA2 or IB1 cervical cancer, especially for those with tumors of less than 2 cm in diameter, may be eligible for conservative surgery.^{46,47} Radical trachelectomy may offer a reasonable fertility-sparing treatment option for patients with stage IA2 or IB1 cervical cancer with lesions that are less than or equal to 2 cm in diameter.^{48–50} In a radical trachelectomy, the cervix, vaginal margins, and supporting ligaments are removed while leaving the main body and fundus of the uterus intact.⁵¹ Laparoscopic pelvic lymphadenectomy accompanies the procedure and can be performed with or without SLN mapping (see “Lymph Node Mapping and Dissection” on page 69). Due to their aggressive nature, tumors of small cell neuroendocrine histology are considered inappropriate for radical trachelectomy.⁵² Trachelectomy is also inappropriate for treating gastric type cervical adenocarcinoma and adenoma malignum

(minimal deviation adenocarcinoma) due to their diagnostic challenges and potentially aggressive nature.⁵³

Vaginal radical trachelectomy (VRT) may be used for carefully selected patients with lesions of 2 cm diameter or less.^{54–56} Abdominal radical trachelectomy (ART) provides a broader resection of the parametria^{48,56} than the vaginal approach and is commonly used in stage IB1 lesions. Multiple case series have evaluated safety and outcomes with vaginal versus abdominal approaches to radical trachelectomy,^{54,57–59} including systematic reviews on VRT⁶⁰ and ART.⁶¹ A limited number of studies have specifically examined this approach in patients with larger stage IB1 tumors between 2 cm and 4 cm in diameter and reported safe oncologic outcomes; however, as expected, more patients in this subgroup will require adjuvant therapy that may reduce fertility.^{62–64}

Studies that examined pregnancy in women who underwent radical trachelectomy have provided differing success rates. One case series of 125 patients with cervical cancer who underwent VRT reported 106 pregnancies among 58 women.⁵⁵ In a systematic review of 413 women who underwent ART, 113 women attempted pregnancy and 67 (59%) successfully conceived.⁵⁸ However, miscarriage and preterm labor rates were elevated among women who underwent radical trachelectomy.^{55,65–67}



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CERV-5

Non-Fertility-Sparing Approaches

The Querleu and Morrow surgical classification system^{68,69} describes the degree of resection and nerve preservation for radical hysterectomy in 3D planes and updates the previously used Piver-Rutledge classifications.⁷⁰ Approaches to hysterectomy include simple/extrafascial hysterectomy (type A), modified radical hysterectomy (type B), and radical hysterectomy (type C).^{71,72}

For patients with IA1 disease, cone excision, simple/extrafascial hysterectomy, and modified radical hysterectomy are options. Radical hysterectomy with bilateral pelvic lymph node dissection (with or without SLN mapping) is the preferred treatment approach for patients with FIGO stage IA2 through IIA1 cervical cancers. Radical hysterectomy is preferred over simple hysterectomy due to its wider paracervix margin of resection that also includes aspects of the cardinal and uterosacral ligaments, upper vagina, pelvic nodes, and at times, para-aortic nodes. In the United States, definitive chemoradiation is typically preferred over radical surgery for select patients with bulky FIGO IB2 lesions and the vast majority of FIGO stage IIA2 or greater cervical cancers. Abroad, select FIGO IB2 to IIB cases may be treated with radical hysterectomy or neoadjuvant chemotherapy followed by radical hysterectomy.

For recurrent or persistent cervical cancers that are confined to the central pelvis (ie, no distant metastasis), pelvic exenteration may be a potentially curative surgical option.^{73,74} Discussion of the various approaches to pelvic exenteration are offered by Chi and colleagues,⁷¹ and in the GOG Surgical Manual.⁷²

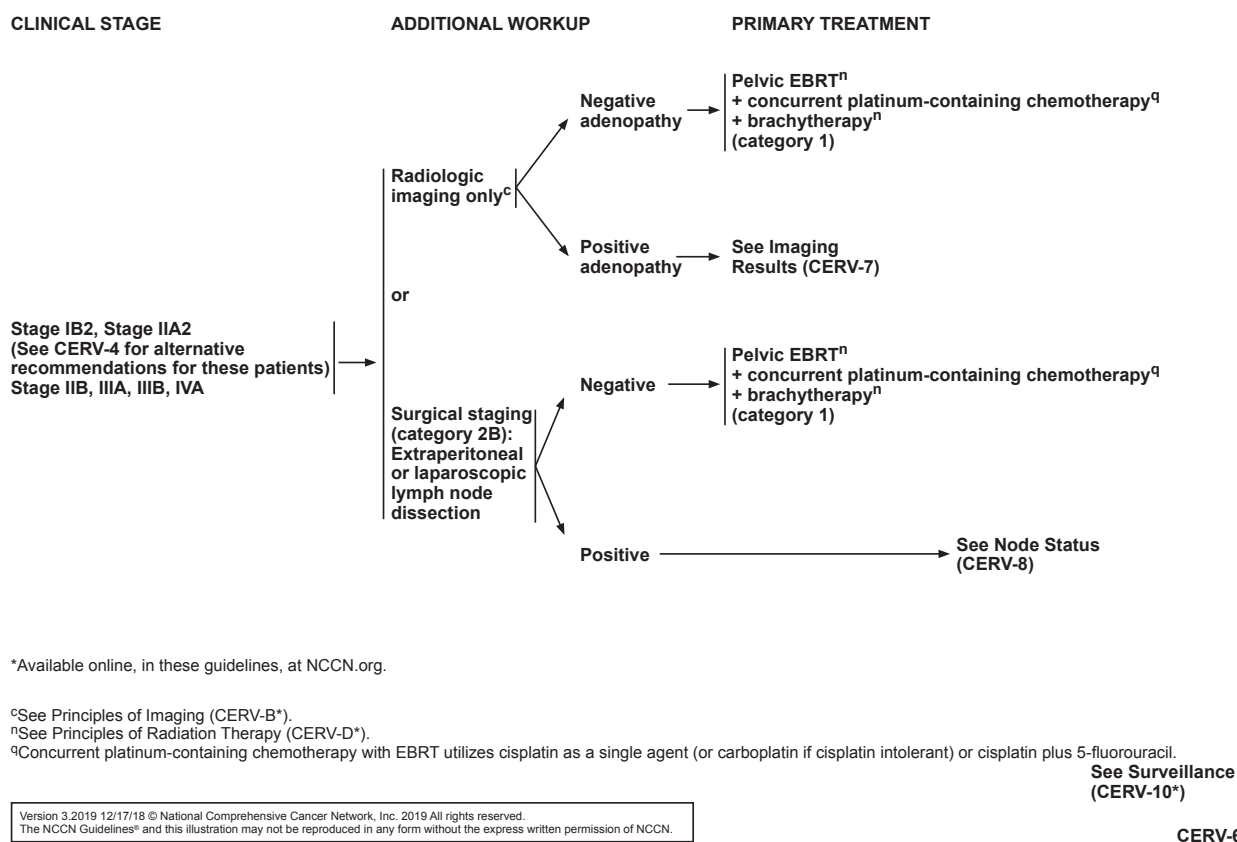
Lymph Node Mapping and Dissection

Sentinel Lymph Node Mapping

Recent data suggest that SLN biopsy may be useful for decreasing the need for pelvic lymphadenectomy in patients with early-stage cervical cancer.^{75,76}

Prospective studies generally support the feasibility of SLN detection in patients with early-stage cervical cancer and suggest that extensive pelvic lymph node dissection may be safely avoided in a significant proportion of early-stage cases.⁷⁵⁻⁸⁶

Meta-analyses of pooled data from SLN mapping studies have generated SLN detection rates of 89% to 92% and sensitivity of 89% to 90%.^{87,88} Factors determined to be important for detection included laparoscopy, dual blue dye/radiocolloid tracer approaches, and pathologic assessment using immunohistochemistry. However, based on a recent metaanalysis, indocyanine



green tracer appears to provide similar overall and bilateral detection rates to the standard dual blue dye/technetium-99 approach.⁸⁹ The randomized phase III FILM trial demonstrated that indocyanine green tracer identified more SLNs (overall and bilateral) than blue dye.⁹⁰

Study data also highlight the limited sensitivity of this approach and potential to miss SLN micrometastases and isolated tumor cells using intraoperative assessment (ie, frozen section or imprint cytology).^{78,82,84} The sensitivity of this approach appears to be better in patients with tumors ≤ 2 cm in diameter.^{75,77,79,91} Ultrastaging of detected SLNs has been shown to provide enhanced detection of micrometastases.^{80,81}

The SENTICOL longitudinal study demonstrated the utility of SLN mapping to uncover unusual lymph drainage patterns.^{79,92} It also highlighted limited agreement between lymphoscintigraphy and intraoperative SLN mapping.⁹² Additionally, this study revealed that bilateral SLN detection and biopsy provided a more reliable assessment of sentinel nodal metastases and led to fewer false negatives than unilateral SLN biopsy.⁷⁶ Generally, research supports ipsilateral lymphadenectomy if no sentinel nodes are detected on a given side of the pelvis as outlined in the SLN mapping algorithm.^{75,76,93}

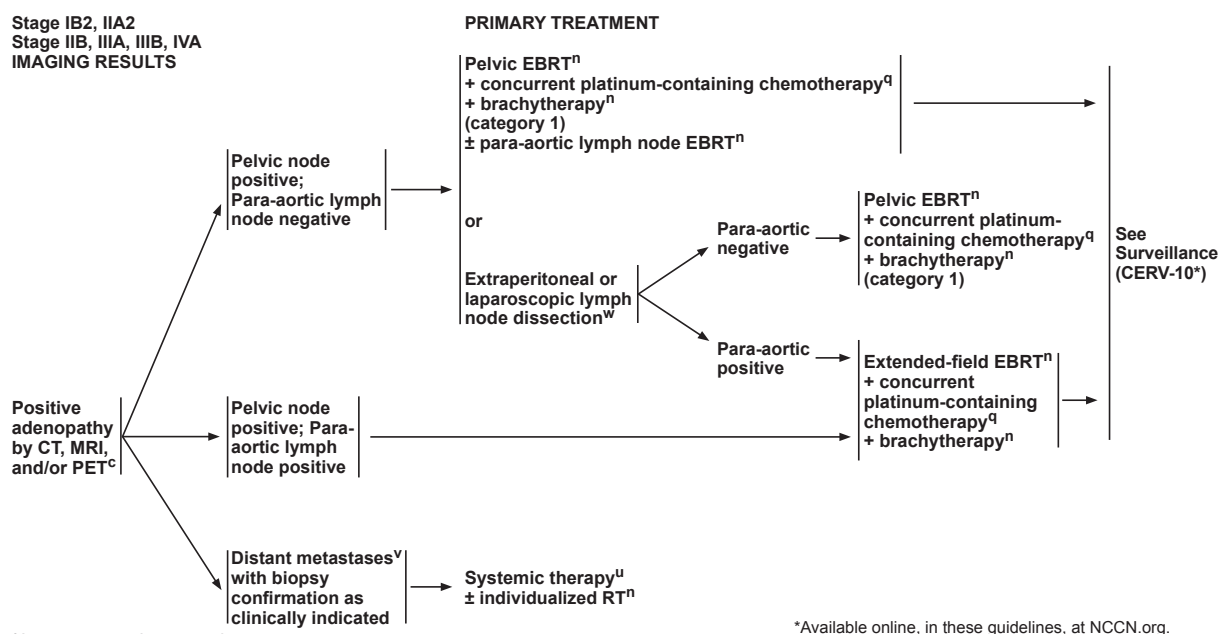
Based on these collective data, the panel recom-

mends consideration of the SLN mapping algorithm and emphasizes that best detection and mapping results are in tumors of less than 2 cm diameter. Adherence to the SLN mapping algorithm is important; surgeons should perform side-specific nodal dissection in any cases of failed mapping and remove all suspicious or grossly enlarged nodes regardless of SLN mapping.⁷⁵

Para-Aortic Lymph Node Assessment

Studies of the incidence and distribution of lymph node metastases in women with stage IB to IIB cervical cancers suggest that para-aortic lymph node involvement is closely tied to the presence of pelvic lymph node metastases, larger primary tumor size (>2 cm), and metastasis to the common iliac nodes.^{94,95}

Analysis of outcomes data from 555 women who participated in GOG trials (GOG 85, GOG 120, and GOG 165) revealed a more positive prognosis for patients who underwent surgical exclusion of para-aortic lymph node involvement versus those who underwent radiographic determination of para-aortic node involvement.⁴ One study examined the efficacy of extending the radiation therapy (RT) field to the para-aortic region in patients with para-aortic lymph node involvement, and showed therapeutic benefit especially in patients with small-vol-



^cSee Principles of Imaging (CERV-B*).

ⁿSee Principles of Radiation Therapy (CERV-D*).

^qConcurrent platinum-containing chemotherapy with EBRT utilizes cisplatin as a single agent (or carboplatin if cisplatin intolerant) or cisplatin plus 5-fluorouracil.

^uSee Systemic Therapy Regimens for Cervical Cancer (CERV-F).

^vPatients with distant metastatic disease confined to the supraclavicular nodes may be treated definitively. (Kim JY, Kim JY, Kim JH, et al. Curative chemoradiotherapy in patients with stage IIV cervical cancer presenting with paraortic and left supraclavicular lymph node metastases. *Int J Radiat Oncol Biol Phys* 2012;84:741-747.)

^wConsider postoperative imaging (abdominal/pelvic CT or MRI with contrast) to confirm the adequacy of node removal.

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**See Surveillance
(CERV-10*)**

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CERV-7

ume nodal disease.⁹⁶ A randomized controlled trial examining surgical versus radiologic staging and treatment of para-aortic lymph node involvement is ongoing.⁹⁷

The panel recommends para-aortic lymph node dissection for patients with stage IB1 or greater disease.

Minimally Invasive Surgical Approaches

The standard and historical approach for radical hysterectomy is with an open abdominal approach.

Previous iterations of the guidelines had indicated that radical hysterectomy could be performed via either open laparotomy or minimally invasive surgery (MIS) laparoscopic approaches, using either conventional or robotic techniques. Data from previous retrospective reviews and prospective observational studies demonstrated oncologic outcomes after conventional laparoscopic radical hysterectomy that were comparable to open abdominal approaches after 3 to 6 years of follow-up.⁹⁸⁻¹⁰¹ Similarly, multicenter retrospective reviews and matched cohort studies showed comparable oncologic outcomes (disease recurrence and survival rates) for open abdominal and robotic radical hysterectomy after 3 to 5 years of follow-up.¹⁰¹⁻¹⁰⁴ Additionally, a systematic review and meta-analysis of data from 26 studies found that laparoscopic and robotic radical hysterecto-

my approaches appeared to provide equivalent intraoperative and short-term postoperative outcomes.¹⁰⁵

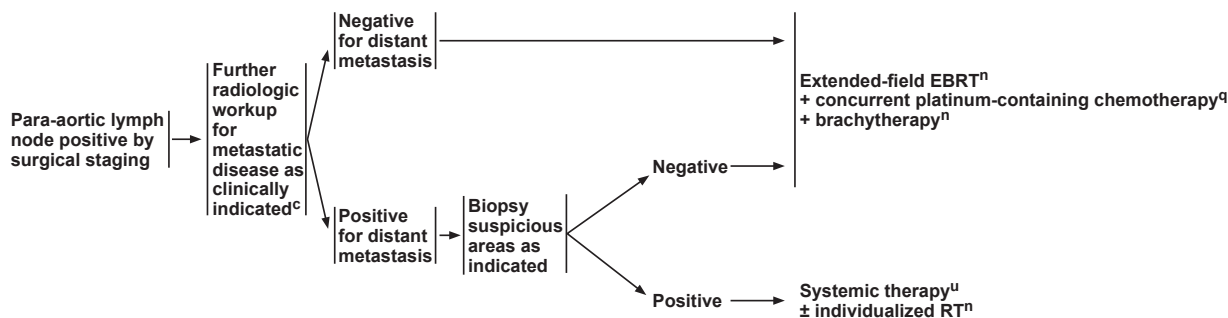
However, several key contemporary reports have questioned the presumed therapeutic equivalency of open versus MIS approaches. A recently published prospective randomized trial demonstrated that minimally invasive radical hysterectomy was associated with lower rates of disease-free survival (DFS) and overall survival (OS) than open abdominal radical hysterectomy.¹⁰⁶ This phase III LACC trial (Clinicaltrials.gov Identifier: NCT00614211) was designed to provide a definitive comparison of outcomes data in patients with early-stage cervical cancer undergoing total abdominal radical hysterectomy or total laparoscopic radical hysterectomy/total robotic radical hysterectomy. At closure, 319 patients had received MIS (84% laparoscopy, 16% robotic) and 312 patients underwent a total abdominal radical hysterectomy. Ninety-two percent of participants in both surgical arms had stage IB1 disease. MIS was associated with lower rate of DFS than open surgery (3-year DFS, 91.2% vs 97.1%; hazard ratio [HR], 3.74; 95% CI, 1.63 to 8.58), as well as a decrease in OS (3-year OS, 93.8% vs 99.0%; HR, 6.00; 95% CI, 1.77 to 20.30).¹⁰⁶ MIS did not meet predetermined noninferiority criteria compared with standard-of-care laparotomy ($P=.88$).

**Stage IB2, IIA2; Stage IIB, IIIA, IIIB, IVA
SURGICAL NODE STATUS**

Pelvic lymph node positive
and para-aortic lymph
node negative by surgical
staging

PRIMARY TREATMENT

Pelvic EBRTⁿ
+ concurrent platinum-containing chemotherapy^q
+ brachytherapyⁿ
(category 1)



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^cSee Principles of Imaging (CERV-B*).

ⁿSee Principles of Radiation Therapy (CERV-D*).

^qConcurrent platinum-containing chemotherapy with EBRT utilizes cisplatin as a single agent (or carboplatin if cisplatin intolerant) or cisplatin plus 5-fluorouracil.

^uSee Systemic Therapy Regimens for Cervical Cancer (CERV-F).

**See Surveillance
(CERV-10*)**

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CERV-8

Two other recent epidemiologic studies also showed that minimally invasive radical hysterectomy was associated with shorter OS than open surgery among women with stage IA2 to IB1 cervical cancer.^{107,108} Melamed et al¹⁰⁷ reported on a SEER-based cohort study that compared women with stage IA2 or IB1 cervical cancer who underwent laparotomy (n=1,236) or MIS (n=1,225). Four-year mortality was higher among patients undergoing MIS versus laparotomy (9.1% vs 5.3%; $P=.002$). Relative survival rates were stable before the adoption of MIS techniques (2000–2006), but a significant decline was noted in the years after adoption. Margul et al¹⁰⁸ examined National Cancer Database data from 2010 to 2013 to compare outcomes of patients with stage IB1 cervical cancer who underwent radical hysterectomy performed by open abdominal versus MIS approaches. Although MIS was associated with decreased surgical morbidity and costs, patients with tumor sizes ≥ 2 cm who underwent MIS had decreased 5-year survival compared with those undergoing open radical hysterectomy (81.3% vs 90.8%; $P<.001$).¹⁰⁸

These most recent findings stand in contradiction to the earlier referenced series that had suggested therapeutic equivalency of MIS compared with open approaches along with the MIS-associated potential advan-

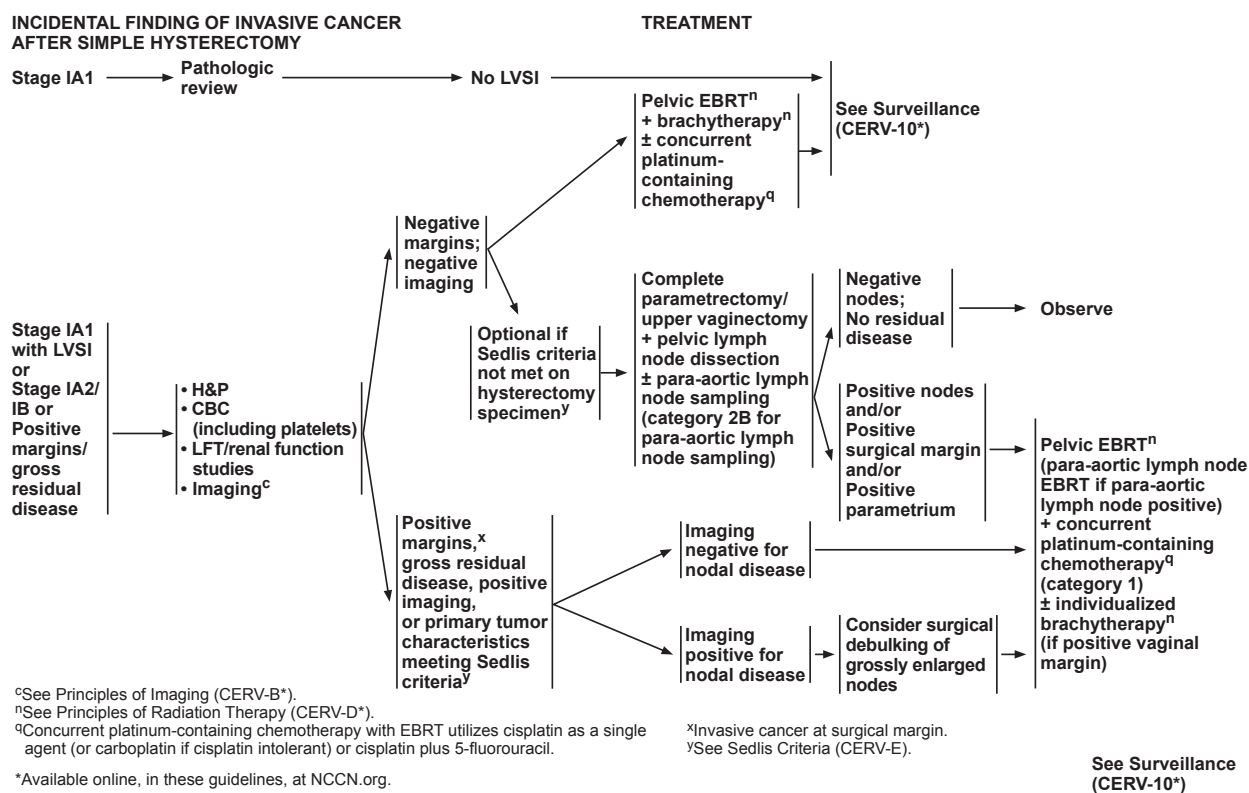
tages of decreased hospital stay and more rapid patient recovery.^{101,102,104,105,109–112}

Given the recently presented findings of poorer oncologic outcomes and survival with the MIS techniques compared with open laparotomy, women should be carefully counseled about the oncologic risks and potential short-term benefits of the different surgical approaches.

Primary Treatment

The primary treatment of early-stage cervical cancer is either surgery or RT. Surgery is typically reserved for early-stage disease, fertility-preservation, and smaller lesions, such as stage IA, IB1, and selected IIA1 cases.³ The panel agrees that concurrent chemoradiation is generally the primary treatment of choice for stages IB2 to IVA disease based on the results of 5 randomized clinical trials (see Table 1, available online, in these guidelines, at NCCN.org).^{113,114} Chemoradiation can also be used for patients who are not candidates for hysterectomy. Although few studies have assessed treatment specifically for adenocarcinomas, they are typically treated in a similar manner to squamous cell carcinomas.^{115–117}

Pelvic RT or chemoradiation will invariably lead to ovarian failure in premenopausal women.¹¹⁸ To preserve



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intrinsic hormonal function, ovarian transposition may be considered before pelvic RT for select women younger than 45 years of age with squamous cell cancers.^{119,120}

Important Phase III Clinical Trials Underpinning Treatment Recommendations

A randomized Italian study compared RT alone versus radical hysterectomy and lymph node dissection in patients with clinical early-stage disease (stage IB–IIA).¹²¹ Adjuvant RT was given to those with parametrial extension, less than 3 cm of uninvolved cervical stroma, positive margins, or positive nodes. Identical outcomes were noted for patients treated with radiation versus surgery, with (or without) postoperative radiation, but higher complication rates were noted for the combined modality approach.

Concurrent chemoradiation, using platinum-containing chemotherapy (cisplatin alone [preferred] or cisplatin/fluorouracil), is the treatment of choice for stages IB2, II, III, and IVA disease based on the results of randomized clinical trials.^{122–127} These trials have shown that the use of concurrent chemoradiation results in a 30% to 50% decrease in the risk of death compared with RT alone. Although the optimal concurrent chemotherapy regimen to use with RT requires further investigation, these trials clearly established a role for concurrent cis-

platin-containing chemoradiation. Based on these data, the NCI issued an alert stating that strong consideration should be given to using chemoradiation instead of RT alone for invasive cervical cancer.¹²⁷ Long-term follow-up of 3 of these trials has confirmed that concurrent cisplatin-containing chemoradiation improves progression-free survival (PFS) and OS when compared with RT with (or without) hydroxyurea.^{128–130} A recent meta-analysis reported that chemoradiotherapy leads to a 6% improvement in 5-year survival (HR, 0.81; $P < .001$).¹³¹ A large, population-based registry analysis in Canada ($n = 4,069$) confirmed that chemoradiotherapy improved outcomes when compared with RT alone.¹³²

Although chemoradiation is tolerated, acute and long-term side effects have been reported.^{131,133,134} Concurrent single-agent cisplatin chemoradiation may be preferred over cisplatin/fluorouracil chemoradiation due to lesser toxicity.^{114,135} Concurrent carboplatin (preferred if cisplatin intolerant) or non-platinum chemoradiation regimens are options for patients who may not tolerate cisplatin-containing chemoradiation.^{131,136–141} Carboplatin has been added to the guidelines as a preferred radiosensitizing agent for patients who are cisplatin intolerant.

Note that when concurrent chemoradiation is used, the chemotherapy is typically given when the exter-

PRINCIPLES OF PATHOLOGY¹

- Procedure:
 - ▶ Radical hysterectomy
- Pathologic assessment for carcinoma:
 - ▶ Uterus
 - ◊ Hysterectomy type (where applicable)
 - ◊ Tumor site
 - ◊ Tumor size, include greatest dimension and additional two dimensions
 - ◊ Histologic type
 - ◊ Histologic grade
 - ◊ Stromal invasion (depth of invasion in mm/cervical wall thickness in mm)
 - ◊ Longitudinal/length horizontal extent in mm
 - ◊ Circumferential/width horizontal extent in mm
 - ◊ Surgical resection margin status
 - If negative, include closest margin and distance to closest margin (in mm).^a
 - If positive, include location of positive margin.^a
 - ◊ Lymphovascular invasion
 - ▶ Other tissue/Organ involvement (parametrium, vaginal cuff, fallopian tubes, ovaries, peritoneum, omentum, other)
 - ▶ Lymph nodes (when resected)
 - ◊ SLNs should undergo ultrastaging for detection of low-volume metastasis.^b
 - ◊ Non-SLNs do not require ultrastaging and can be processed as per routine protocols.
 - ◊ Include the number of lymph nodes with isolated tumor cells, micrometastasis, macrometastasis
 - ▶ Consider MMR/MSI testing or PD-L1 testing for patients with recurrent, progressive, or metastatic disease^{2,3}

Footnotes

^aWhile reporting of this information is not required, knowledge of this information is useful for multidisciplinary treatment planning.

^bUltrastaging commonly entails thin serial sectioning of the gross SLN and review of multiple H&E stained sections and cytokeratin immunohistochemistry for all blocks of the SLN. There is not a standard protocol for lymph node ultrastaging.

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nal-beam pelvic radiation is administered.¹¹⁴ The panel believes that “systemic consolidation” (ie, adding chemotherapy after chemoradiation) should only be used in clinical trials (eg, OUTBACK [ANZGOG-0902/GOG 274, Clinicaltrials.gov Identifier: NCT01414608] and RTOG 724 [NCT00980954]).¹⁴²

Early-Stage Disease

After careful clinical evaluation and staging, the primary treatment of early-stage cervical cancer is either surgery or RT. The treatment schema is stratified using the FIGO staging system (see Table 1, available online, in these guidelines, at NCCN.org). A new fertility-sparing algorithm was added in 2012 for select patients with stage IA and IB1 disease [see “Primary Treatment (Fertility Sparing)” on page 66]. Fertility-sparing surgery is generally not recommended for patients with small cell neuroendocrine tumors, gastric type adenocarcinoma, or adenoma malignum (minimal deviation adenocarcinoma) because of its high-risk nature and a paucity of data.

Stage IA1 Disease

Recommended options for stage IA1 disease depend on the results of cone biopsy and whether patients (1) want to preserve their fertility; (2) are medically operable; or

(3) have LVSI [see “Primary Treatment (Fertility Sparing)” and “Primary Treatment (Non-Fertility Sparing)” in the algorithm, pages 66–68]. The extent of the lymph node dissection depends on whether pelvic nodal disease and/or LVSI are present and the size of the tumors. SLN mapping can be considered.

Fertility-Sparing

For patients who desire fertility preservation, cone biopsy with or without pelvic lymph node dissection is recommended.^{86,143,144}

The goal of cone biopsy is margins that are negative for invasive disease and high-grade squamous intraepithelial lesion. For patients with negative margins after cone biopsy and no findings of LVSI, observation may be an option if fertility preservation is desired. For patients with positive margins after cone biopsy, options include repeat cone biopsy to better evaluate depth of invasion (to rule out stage IA2/IB1 disease) or a radical trachelectomy. In studies of patients who had positive margins after conization, predictors of residual disease included positive endocervical curettage, combined endocervical margin and endocervical curettage, and volume of disease.^{30,145,146}

For patients with stage IA1 disease with LVSI, conization (with negative margins) plus laparoscopic pelvic

SEDLIS CRITERIA FOR EXTERNAL PELVIC RADIATION AFTER RADICAL HYSTERECTOMY IN NODE-NEGATIVE, MARGIN-NEGATIVE, PARAMETRIA-NEGATIVE CASES¹⁻⁴

LVSI	Stromal Invasion	Tumor Size (cm) (determined by clinical palpation)
+	Deep 1/3	Any
+	Middle 1/3	≥2
+	Superficial 1/3	≥5
-	Middle or deep 1/3	≥4

LVSI: Lymphovascular space invasion

¹Modified with permission from Sedlis A, Bundy BN, Rotman MZ, et al. A randomized trial of pelvic radiation therapy versus no further therapy in selected patients with stage IB carcinoma of the cervix after radical hysterectomy and pelvic lymphadenectomy: a gynecologic oncology study group. *Gynecol Oncol* 1999;73:177-183.

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³Rotman M, Sedlis A, Piedmont MR, et al. A phase III randomized trial of postoperative pelvic irradiation in stage IB cervical carcinoma with poor prognostic features: follow-up of a gynecologic oncology group study. *Int J Radiat Oncol Biol Phys* 2006;65:169-176.

⁴Risk factors may not be limited to the Sedlis criteria.

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SLN mapping/lymphadenectomy is a reasonable strategy. In addition, these patients may also be treated with a radical trachelectomy and SLN mapping/pelvic lymph node dissection [see “Primary Treatment (Fertility Sparing),” page 66].^{59,144–150}

After childbearing is complete, hysterectomy can be considered for patients who have had either radical trachelectomy or a cone biopsy for early-stage disease if they have chronic, persistent HPV infection, they have persistent abnormal Pap tests, or they desire this surgery.

For young (<45 years) premenopausal women with early-stage squamous cell carcinoma who opt for ovarian preservation (ie, hysterectomy only), the rate of ovarian metastases is low.^{151,152}

Non-Fertility-Sparing

For medically and technically operable patients with stage IA1 disease who do not desire fertility preservation, extrafascial (ie, simple) hysterectomy is commonly recommended for patients without LVSI and with either negative margins after cone biopsy or with positive margins for dysplasia. For patients with positive margins for carcinoma, modified radical hysterectomy is recommended with SLN mapping/pelvic lymph node dissection (category 2B for node dissection). SLN mapping

can be considered. Physicians can also consider repeat cone biopsy to better evaluate depth of invasion. If LVSI is present, then modified radical hysterectomy with SLN mapping/pelvic lymph node dissection is recommended. For patients with negative margins after cone biopsy, observation is recommended for those who are medically inoperable or those who refuse surgery.

Stage IA2 Disease

Recommendations for stage IA2 depend on whether a patient wishes to preserve her fertility and if the disease is medically operable.

Fertility-Sparing

For patients who wish to preserve their fertility, radical trachelectomy and pelvic lymph node dissection is recommended. SLN mapping can also be considered. Cone biopsy followed by observation is another option if the margins are negative and pelvic lymph node dissection is negative.

Non-Fertility-Sparing

For medically operable patients who do not desire fertility preservation, recommended treatment includes either surgery or RT [see “Primary Treatment (Non-Fer-

SYSTEMIC THERAPY REGIMENS FOR CERVICAL CANCER^a
(Strongly consider clinical trial)

Chemoradiation		
Preferred Regimens • Cisplatin • Carboplatin if patient is cisplatin intolerant		
Other Recommended Regimens • Cisplatin/fluorouracil		
Recurrent or Metastatic Disease		
First-line combination therapy ^{b,c}	Possible first-line single-agent therapy ^c	Second-line therapy ^d
Preferred Regimens • Cisplatin/paclitaxel/bevacizumab¹ (category 1) • Carboplatin/paclitaxel/bevacizumab • Topotecan/paclitaxel/bevacizumab¹ (category 1) • Cisplatin/paclitaxel (category 1)^{2,3} • Carboplatin/paclitaxel^{4,5} (category 1 for patients who have received prior cisplatin therapy) • Topotecan/paclitaxel¹ Other Recommended Regimens • Cisplatin/topotecan⁶	Preferred Regimens • Cisplatin³ Other Recommended Regimens • Carboplatin⁷ • Paclitaxel^{8,9}	Preferred Regimens • Pembrolizumab for PD-L1–positive^e or MSI-H/dMMR tumors Other Recommended Regimens (All agents listed here are category 2B unless otherwise noted) • Bevacizumab • Albumin-bound paclitaxel • Docetaxel • Fluorouracil • Gemcitabine • Ifosfamide • Irinotecan • Mitomycin • Pemetrexed • Topotecan • Vinorelbine

^aCisplatin, carboplatin, docetaxel, and paclitaxel may cause drug reactions (See NCCN Guidelines for Ovarian Cancer—Management of Drug Reactions [OV-C]).

^bCost and toxicity should be carefully considered when selecting an appropriate regimen for treatment.

^cIf not used previously, these agents can be used as second-line therapy as clinically appropriate.

^dReferences for second-line therapy are provided in the Discussion.

^eRecommended for disease progression on or after chemotherapy in patients whose tumors express PD-L1 (CPS ≥1) as determined by an FDA-approved test.

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tility Sparing),” page 67]. The recommended surgical option is radical hysterectomy and bilateral pelvic lymph node dissection. SLN mapping can also be considered. Para-aortic node dissection is indicated for patients with known or suspected pelvic nodal disease. Less radical surgical approaches for patients with stage IA2 disease are the subject of ongoing investigation.^{146,153}

Pelvic external beam RT (EBRT) with brachytherapy (traditionally 70–80 Gy to total point A dose) is a treatment option for patients who are medically inoperable or who refuse surgery.¹⁵⁴ These doses are recommended for most patients based on summation of conventional external-beam fractionation and low dose-rate (40–70 cGy/h) brachytherapy equivalents. Treatment should be modified based on normal tissue tolerance, fractionation, and size of target volume or on biologic equivalence calculations when using high dose-rate brachytherapy.

Stage IB and IIA Disease

Depending on stage and disease bulk, patients with stage IB or IIA tumors can be treated with surgery, RT, or concurrent chemoradiation. Fertility-sparing surgery is only recommended for select patients with stage IB1 disease (see subsequent section). A combined PET/CT

scan can be performed to rule out extrapelvic disease before deciding how to treat these patients. The GOG considers that surgical staging is an option for patients with advanced cervical cancer. Radiologic imaging is recommended for assessing stage IB2 and IIA2 tumors (see “Principles of Imaging,” available online, in these guidelines, at NCCN.org).

Stage IB1: Fertility-Sparing

For patients who desire fertility preservation, radical trachelectomy and pelvic lymph node dissection with (or without) para-aortic lymph node dissection is an option for stage IB1 disease, but typically only for tumors 2 cm or less [see “Primary Treatment (Fertility Sparing),” page 66].^{48,147–150,155} SLN mapping can also be considered. Tumors that are 2 to 4 cm have to be carefully selected for a fertility-sparing approach because many of these patients may require postoperative adjuvant therapy due to pathologic risk factors (eg, Sedlis criteria or positive nodes). However, some surgeons suggest that a 2-cm cutoff may be used for vaginal trachelectomy, whereas a 4-cm cutoff may be used for abdominal trachelectomy.¹⁵⁶ In one study, oncologic outcomes were similar after 4 years when comparing radical trachelectomy with radical hysterectomy for patients with stage IB1 cervical car-

SYSTEMIC THERAPY REGIMENS FOR CERVICAL CANCER
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cinoma.⁴⁸ Stage IB1 small cell neuroendocrine histology, gastric type adenocarcinoma, and adenoma malignum are not considered suitable for fertility-sparing surgery.

Stage IB and IIA: Non-Fertility-Sparing

For stage IB1 and IIA1 disease, primary surgery consists of radical hysterectomy plus bilateral pelvic lymph node dissection (category 1), with (or without) para-aortic lymph node dissection (category 2B for para-aortic lymph node dissection).^{122,157} SLN mapping can also be considered for stages IB1 and IIA1. Panel members feel that surgery is the most appropriate option for patients with stage IB1 or IIA1 disease, whereas concurrent chemoradiation is the most appropriate option for those with stage IB2 or IIA2 disease based on randomized trials.^{121-123,125,126} Thus, the primary surgical option is a category 1 recommendation for patients with stage IB1 or IIA1 disease; however, primary chemoradiation is the category 1 recommendation for those with stage IB2 or IIA2 disease. Para-aortic node dissection may be performed for patients with larger tumors and suspected or known pelvic nodal disease. Some panel members feel that a pelvic lymph node dissection should be performed first and, if negative, then the radical hysterectomy should be performed. If the lymph nodes are posi-

tive, then the hysterectomy should be abandoned; these patients should undergo chemoradiation. For patients with stage IB or IIA tumors (including those who are not candidates for hysterectomy), another option is combined pelvic EBRT and brachytherapy with (or without) concurrent platinum-containing chemotherapy [see "Primary Treatment (Non-Fertility Sparing)," page 68]. Preferred radiosensitizing regimens include cisplatin or carboplatin for patients who are cisplatin intolerant. Other recommended regimens include cisplatin/fluorouracil. Although concurrent chemoradiation has been proven effective in the definitive treatment of more advanced-stage disease, this approach has not been specifically studied in patients with stage IB1 or IIA1 disease. Careful consideration of the risk/benefit ratio should be undertaken in these patients with smaller tumors.

For patients with clinical stage IB2 or IIA2 tumors who are treated with definitive radiation, concurrent cisplatin-containing chemotherapy has been shown to significantly improve patient survival. The panel recommends definitive EBRT with concurrent platinum-containing chemotherapy and brachytherapy (traditionally 75–80 Gy to total point A dose). Again, treatment should be modified based on normal tissue tolerance, fractionation, and size of target volume. Primary chemoradi-

ation has a category 1 recommendation [see “Primary Treatment (Non-Fertility Sparing),” page 68].^{122,123}

For stage IB2 or IIA2 tumors, the panel had a major disagreement about recommending adjuvant hysterectomy (category 3) (also known as completion surgery) after primary chemoradiation.¹²² Adjuvant hysterectomy after RT has been shown to improve pelvic control, but not overall survival, and is associated with increased morbidity.¹⁵⁸ A recent Cochrane review examined whether the addition of hysterectomy to standard nonsurgical treatments benefitted women with locally advanced cervical cancer, finding insufficient data to demonstrate a survival benefit associated with surgery.¹⁵⁹ The morbidity is higher after completion surgery but this may be reduced using a laparoscopic technique.^{160–163} Although routine completion hysterectomy is not typically performed, this approach may be considered in patients whose extent of disease or uterine anatomy precludes adequate coverage by brachytherapy.

Advanced Disease

This category has traditionally included patients with stage IIB to IVA disease (ie, locally advanced disease). However, many oncologists now include patients with IB2 and IIA2 disease in the advanced disease category. For patients with more advanced tumors who are undergoing primary chemoradiation, the volume of RT is critical and guided by assessment of nodal involvement in the pelvic and para-aortic nodes. Radiologic imaging studies (including PET/CT) are recommended for stage IB2 or greater disease, especially for evaluation of nodal or extrapelvic tumor (see “Principles of Imaging,” available online, in these guidelines, at NCCN.org). MRI is useful to describe local disease extent and assist in radiation treatment planning. However, needle biopsy of extrauterine abnormality can be considered for questionable imaging findings. Surgical staging (ie, extraperitoneal or laparoscopic lymph node dissection) is also an option (category 2B) for these patients.¹⁶⁴ Surgical staging may also detect microscopic nodal disease that is not discernable with radiologic imaging.¹⁶⁵

For patients without nodal disease or with disease limited to the pelvis only through surgical staging, treatment consists of pelvic EBRT with concurrent platinum-containing chemotherapy and brachytherapy (category 1).^{113,114,123,125–127,166} Currently, acceptable concurrent platinum-containing regimens include either weekly cisplatin (preferred), carboplatin (preferred if cisplatin intolerant), or cisplatin/fluorouracil, given every 3 to 4 weeks during RT. An international phase III randomized trial reported that concurrent cisplatin/gemcitabine and EBRT followed by 2 additional cycles of cisplatin/gemcitabine after RT improved PFS and OS when compared with a standard regimen of concurrent cisplatin with pel-

vic EBRT.¹⁶⁷ However, this trial is controversial because of changes in its statistical design and because the reported superior regimen of concurrent cisplatin/gemcitabine and EBRT has unresolved toxicity issues.^{167–170}

However, for patients with positive para-aortic and pelvic lymph nodes by imaging, imaging workup for metastatic disease is recommended. Extended-field EBRT, concurrent platinum-containing chemotherapy, and brachytherapy is recommended (see “Primary Treatment” in the algorithm). Patients with positive para-aortic lymph nodes who are positive for distant metastases are treated with systemic chemotherapy (see “Systemic Therapy Regimens for Cervical Cancer,” page 76) with (or without) individualized EBRT.¹⁷¹

Adjuvant Treatment

Adjuvant treatment is indicated after radical hysterectomy depending on surgical findings and disease stage. Observation is appropriate for patients with stage IA2, IB1, or IIA1 disease who have negative nodes, negative margins, negative parametria, and no cervical risk factors after radical hysterectomy (Sedlis criteria). However, adjuvant treatment is indicated after radical hysterectomy if pathologic risk factors are discovered.

Pelvic EBRT is recommended (category 1) with (or without) concurrent platinum-containing chemotherapy (category 2B for chemotherapy) for patients with stage IA2, IB1, or IIA1 disease who have *negative* lymph nodes after surgery but have large primary tumors, deep stromal invasion, and/or LVSI.^{27,172–175} Recommended radiosensitizing regimens include cisplatin (preferred), carboplatin (preferred if cisplatin intolerant), or cisplatin/fluorouracil.

Adjuvant pelvic RT alone versus no further therapy was tested in a randomized trial (GOG 92) of selected patients with node-negative stage IB carcinoma of the cervix after hysterectomy and pelvic lymphadenectomy.²⁷ Patients were considered to have “intermediate-risk” disease and were eligible for this trial if they had at least 2 of the following risk factors (commonly referred to as Sedlis criteria): (1) greater than one-third stromal invasion; (2) capillary lymphatic space involvement; or (3) cervical tumor diameters more than 4 cm. Patients with positive lymph nodes or involved surgical margins were excluded. At 2 years, the recurrence-free rates were 88% for adjuvant RT versus 79% for the no-adjuvant-treatment group. After long-term follow-up (12 years), an updated analysis confirmed that adjuvant pelvic RT increased PFS; a clear trend towards improved OS was noted ($P=.07$).¹⁷² The role of concurrent cisplatin/RT in patients with intermediate-risk disease is currently being evaluated in an international phase III randomized trial (GOG 263, Clinicaltrials.gov Identifier: NCT01101451).

Potentially important risk factors for recurrence may not be limited to the Sedlis criteria (ie, stromal invasion, LVSI, primary tumor size). Additional risk factors for consideration include tumor histology (eg, adenocarcinoma component)^{28,29} and close or positive surgical margins.^{30,31}

Postoperative pelvic EBRT with concurrent platinum-containing chemotherapy (category 1)¹²⁴ with (or without) vaginal brachytherapy is recommended for patients with positive pelvic nodes, positive surgical margin, and/or positive parametrium; these patients are considered to have “high-risk” disease. Vaginal brachytherapy may be a useful boost for those with positive vaginal mucosal margins. Adjuvant concurrent chemoradiation significantly improves OS for patients with high-risk, early-stage disease (those with positive pelvic nodes, parametrial extension, and/or positive margins) who undergo radical hysterectomy and pelvic lymphadenectomy.¹²⁴ The Intergroup trial 0107/GOG 109 showed a statistically significant benefit of adjuvant pelvic radiation with concurrent cisplatin and fluorouracil in the treatment of patients with stage IA2, IB, or IIA disease who had positive lymph nodes, positive margins, and/or microscopic parametrial involvement found at surgery.¹²⁴ A recent study re-evaluated these findings from GOG 109 in a population-based cohort (n=3,053) in the National Cancer Database, confirming the survival benefit of adjuvant chemoradiation but suggesting that this benefit may be best realized in patients with lymph node involvement.¹⁷⁶

Depending on the results of primary surgery, imaging may be recommended to determine whether distant metastases are present. In women who are positive for distant metastases, perform biopsy of suspicious areas as indicated. For patients without distant metastases, recommended treatment is extended-field EBRT (including pelvic and para-aortic lymph nodes) with concurrent platinum-containing chemotherapy and with (or without) brachytherapy. Recommended radiosensitizing regimens include cisplatin (preferred), carboplatin

(preferred if cisplatin intolerant), or cisplatin/fluorouracil. For patients with distant metastases, recommended treatment is systemic chemotherapy (see “Systemic Therapy Regimens for Cervical Cancer,” page 76) with (or without) individualized EBRT.¹⁷¹

Although neoadjuvant chemotherapy followed by surgery has been used in areas where RT is not available, data suggest no improvement in survival when compared with surgery alone for early-stage cervical cancer^{177–179} or locally advanced cervical cancer.^{180,181} A meta-analysis of data on patients with stage IB1 to IIA cervical cancer found that neoadjuvant chemotherapy may reduce the need for adjuvant RT by decreasing tumor size and metastases, but indicated no OS benefit.¹⁸¹ However, data from a second meta-analysis suggested that response to neoadjuvant chemotherapy was a strong prognostic factor for PFS and OS.^{182,183} Outside of the clinical trial, the panel does not recommend the use of neoadjuvant chemotherapy.

Recurrent or Metastatic Disease

For recommendations regarding recurrent or metastatic disease, please see the full guidelines at NCCN.org.

Summary

Cervical cancer is decreasing in the United States because of the wide use of screening; however, it is increasing in developing countries (approximately 275,000 deaths/year), because screening is not available to many women. Effective treatment for cervical cancer (including surgery and concurrent chemoradiation) can yield cures in 80% of women with early-stage disease (stages I–II) and in 60% of women with stage III disease. The hope is that immunization against HPV (using vaccines) will prevent persistent infection with the types of HPV against which the vaccine is designed, and will therefore prevent specific HPV cancer in women.^{184–186}

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