Controversies in the Management of Early-stage Serous Endometrial Cancer

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Abstract. Background/Aim: Early-stage uterine serous carcinoma (USC) has one of the highest recurrence rates and mortality among early-stage uterine epithelial cancers. Research into the clinical management of USC has begun to progress, guided by surgical and pathological advances. This article summarizes the available literature regarding diagnosis, management, and possible future uses of molecular analysis of women with early-stage USC. Materials and Methods: PubMed was searched for all pertinent English language research articles published from January 1, 2006 through March 1, 2020 which included a study population of women diagnosed with stage 1 USC. Due to the scarcity of prospective or large-scale data, studies were not limited by design or numbers of patients. Studies performed at earlier dates were incorporated to provide context. Results: A total of 86 studies were included in the review. Multiple well-designed studies have confirmed the safety of a minimally invasive surgical approach for surgical management of USC. The role of sentinel node biopsy has been validated with both prospective and retrospective multi-center data. Stage I USC is associated with a highly variable risk of recurrence, even following completion of adjuvant chemoradiation. This aggressive phenotype has been linked to high numbers of somatic copy number alterations, tumor protein 53, and phosphatidylinositol 3 kinase mutations, which have been shown to be predictive of prognosis. Conclusion: Early-stage USC demonstrates a lack of predictable recurrence patterns, with reports noting distant recurrence in patients with disease confined to polyps. Unless no residual tumor is found on hysterectomy, chemotherapy and radiotherapy should be discussed and individualized by stage and treatment goals.

High-grade uterine serous carcinoma (USC) has an aggressive natural history, and relatively poor prognosis in contrast to its endometrioid counterparts (1). Stage I USC is a rare tumor which represents a unique combination of higher risk histology and lower risk stage. Current literature reports highly variable recurrence rates and inconsistent recommendations for adjuvant treatment (2-4). Accurate surgical staging is paramount to guiding treatment and informing prognosis, and includes hysterectomy, bilateral salpingo-oophorectomy, lymph node assessment, and omental biopsy (5).

Recent advances have been made in the molecular classification of uterine carcinomas. This testing has been able to identify aggressive alterations in patients with low-grade endometrioid histology. In contrast, molecular alterations associated with favorable prognosis have been identified in patients with higher grade or high-risk histology (6). As this information accumulates, it will start shaping our clinical decisions for adjuvant treatment and patient counseling. In this review, we discuss the current treatment strategies of early-stage USC and outline possible applications of molecular classification in the treatment of this disease.

Materials and Methods

PubMed was searched for all English language research articles published from January 1, 2006 through March 1, 2020 which included the study population of women diagnosed with early-stage (stage 1) USC. Key words included “serous endometrial” and “serous uterine”, which yielded 1,848 eligible articles. These were filtered by relevancy to the topic and applicability to clinical practice or molecular analysis. The resultant article bibliographies were cross-referenced to identify further publications for inclusion. Due to the scarcity of large-scale prospective data, studies were not limited by design or numbers of patients. Preference was given to meta-analyses, prospective studies and clinical trials when applicable. Non-translational basic science studies were excluded (n=640). This design is summarized in Figure 1.
Results

Epidemiology. Risk factors for USC include advanced age and African American race. At present, over 22% of cancer cases in women over 70 years of age are serous histology, compared with only 3% of women less than 45 years old (7).

Additionally, African American race may have an increased incidence of USC, a finding which was first noted in a Gynecologic Oncology Group (GOG) sub-analysis (8). In this study, 39% of African American women had high-grade serous endometrial cancer compared to 16% of Caucasian women. This disparity appears to be more pronounced among older rather than younger African American women (9, 10). This finding may partially explain the racial disparities noted in survival outcomes of patients with endometrial cancer but caution should be given to interpretation of these results due to multiple confounding variables (11).

The presence of pre-disposing germline cancer mutations has been found in 6.7% of all patients with USC, an incidence which is higher than for other histological subtypes (12, 13). In 2016, Shu et al. reviewed the incidence of serous endometrial carcinoma after risk-reducing salpingo-oophorectomy in 1,083 women with germline Breast Cancer Gene (BRCA) mutations, and noted four cases in 627 patients with BRCA1 mutation. The rate of USC in this group was 22.2-fold greater than expected. Limitations in their study included the small number of cases, and use of tamoxifen in three out of these four patients (14). In 2019, Long et al. expanded upon these findings by reviewing germline mutation incidence in a large cohort of patients with endometrial cancer, including 135 with serous histology. They noted the presence of germline mutations, including 1.48% BRCA1-interacting protein C-terminal helicase (BRIP1), and 0.74% each of ataxia telangiectasia mutated (ATM), BRCA1, MutS homolog 6 (MSH6), neurofibromin (NF1), PMS homolog 2 (PMS2), and tumor protein 53 (TP53) in patients with serous histology (13). Given the risk of germline mutation, a comprehensive family history should be obtained in the clinical setting, and consideration given to referral for genetic testing.

Initial diagnosis. Consistent with other histologies of endometrial cancer, women with USC often present with vaginal bleeding. Initial evaluation often includes pelvic ultrasound in an attempt to limit the need for invasive biopsy. Clinical guidelines have determined that office clinical biopsy can be safely omitted in patients with an endometrial complex thickness of <5 mm (15). However, these guidelines were predominately based on studies validating the negative predictive value of a thin stripe on tumors with endometrioid histology. Unfortunately, a significant proportion of USC may be missed using these criteria, as they more commonly present with a thin endometrial stripe (16-18). Additionally, concerns have been raised regarding the sensitivity of office endometrial biopsy on patients with endometrial stripe thickness <5 mm as the ability to produce a sufficient diagnostic sample is limited, with numbers as low as 27% reported in the literature (19).

The pre-operative serum level of cancer antigen 125 (CA-125) has been advocated as a biomarker for extra-uterine disease and prognosis, similarly to its use in serous epithelial ovarian carcinoma. A recent study by Schmidt et al. observed that high CA-125 levels correlated with positive cytology, omental, nodal, or adnexal disease (20). They found the traditional cutoff of 35 U/ml to have a sensitivity of 80% and specificity of 76% for predicting extra-uterine disease, and advocated a new threshold of 41 U/ml to increase specificity. Debate remains as to whether CA-125 is an independent predictor of survival in these patients, with conflicting evidence to date (21-24).

Surgical approaches. Comprehensive surgical staging in patients with serous endometrial cancer is paramount as 37-39.4% of patients without myometrial invasion on hysterectomy have been found to have extra-uterine disease upon complete staging (25, 26).

Both large-scale prospective and retrospective data have shown a minimally invasive surgical approach to be safe for patients with early-stage serous uterine disease (27, 28). The well-known LAP2 trial compared disease-free and overall survival following randomization to abdominal or laparoscopic hysterectomy in 679 patients with stage 1 endometrial cancer. This study included patients with serous histology in 12% of the abdominal hysterectomy and 7% of laparoscopic hysterectomy groups, and noted equivalency in
recurrence rates and overall survival (27). Stemming from this trial, several sub-analysis studies were performed in specific patient groups. In their sub-analysis of patients >60 years of age, Bishop et al. noted reduced postoperative complication and morbidity scores among those who underwent minimally invasive surgery, a finding of particular importance to the older cohort of patients with serous cancer (29). Fader et al. performed a sub-analysis of the patients with high-grade histology, including 289 with USC, finding no changes in recurrence or survival by surgical approach (30). Minimally invasive approaches have now become utilized as a quality measure in high-volume National Cancer Care Network (NCCN) centers (31-33). Indeed, the adoption of these approaches in the past 10 years has resulted in large improvements in all-cause operative and postoperative morbidity (32).

The performance of full lymphadenectomy as part of comprehensive staging of endometrial cancers has declined in response to the ASTEC trial, which did not demonstrate a survival advantage to systematic pelvic and para-aortic lymphadenectomy (34). Serious morbidity is associated with full lymphadenectomy, including increased intraoperative bleeding, nerve injury, lymphocele, infection, prolonged hospital stay and lymphedema (35). Additional studies have demonstrated that systematic lymphadenectomy does not improve survival in endometrial cancer but does increase surgical morbidity (36). Sentinel node biopsy has been shown to reduce the risk of surgical morbidity (37, 38), and was recently endorsed by the Society for Gynecologic Oncology and NCCN as a reasonable alternative for surgical staging (39). In response, centers have developed protocols for the use of sentinel lymph node biopsy based on risk factors, leading to worldwide variability in practice (40). Recent publications have shown that sentinel lymph node biopsy with ultrastaging detects a high percentage of metastasis in patients with high-risk endometrial cancer (41, 42). Prospective data were obtained in the FIRS trial (43), which enrolled N=41 (12%) of patients with serous histology for sentinel node biopsy followed by completion pelvic and peri-aortic lymphadenectomy. The study was able to affirm the high degree of diagnostic accuracy in detecting endometrial cancer metastases, and asserted that this practice can safely replace lymphadenectomy in the staging of endometrial cancer. Clinically, this information supports the use of sentinel node biopsy in routine surgical management of patients with early-stage serous endometrial cancer. Baiocchi et al. randomized 236 women with high-grade endometrial cancer and normal-appearing nodes on preoperative computed tomography to sentinel node biopsy and completion lymphadenectomy or full lymphadenectomy. Interestingly, more pelvic lymph node metastases were observed in the sentinel node group than the lymphadenectomy group (26.7 vs. 14.3%; p=0.02). They also did not identify any peri-aortic metastasis in women with mapped sentinel lymph nodes (41). Touhami et al. examined the practice of sentinel node biopsy followed by completion lymphadenectomy in 128 patients with high-grade endometrial cancer, finding a 63.2% bilateral detection rate, with 95.8% sensitivity and 98.2% specificity (44). Additionally, Naourae et al. examined the impact of ultra-staging of sentinel nodes on detection of nodal metastasis in 180 patients with presumed early-stage high-risk endometrial cancer. Ultra-staging detected metastases undiagnosed by conventional histology in 41% of patients with node-positive disease, with a low false-negative rate of 6% (42). The use of sentinel node algorithms in patients with USC has been tested in large multi-center studies which confirm a high sensitivity for nodal metastasis (45), without compromise in overall survival (46, 47).

With the use of sentinel node biopsy, circumstances may arise where omission of peri-aortic lymph node assessment might be considered. Previous studies without the use of sentinel node biopsy and ultrastaging found the incidence of isolated peri-aortic metastasis in high-grade non-endometrioid histology to be around 5% in the absence of gross extra-uterine disease and deep myometrial invasion (48). This rate may potentially be even lower in patients with ultrastaging of the pelvic lymph nodes (49). In two newer trials, by Rossi et al. (43) and Soliman et al. (45), in which 41 and 30 patients with USC, respectively, were noted to have no incidence of isolated peri-aortic metastasis in cases of adequate mapping and negative pelvic sentinel lymph nodes. While patients with USC were included in these studies, their numbers are limited relative to those with other histological subtypes, and further study is needed. If omission of peri-aortic lymph node assessment is considered, confirmation of normal nodal architecture and absence of gross intra-peritoneal disease on preoperative computed tomography is suggested by some institutions (46).

The procedure of sentinel node biopsy is not affected by serous histology. Traditionally, a dye (blue-based, or indocyanine green) is injected into either the uterine fundus or cervix, with the latter becoming more common due to the increase in minimally invasive surgery, the demonstration of higher overall detection rates, and NCCN endorsement (35, 50). Indocyanine green has the highest bilateral detection rate and an overall detection rate of >96% (51-53).

Other staging considerations include omental biopsy and the performance of peritoneal cytology. Omental biopsy has been advocated to be included in comprehensive staging as it can dramatically upstage and inform prognosis for patients. Omental metastasis is seen in 6.5-25% of patients with a grossly normal appearing omentum at the time of surgery (54, 55). Fortunately, this practice has been shown to be safely completed via a minimally invasive approach (55).

Peritoneal cytology, while removed from staging in 2009, may provide additional prognostic and research information at no additional surgical risk to the patient (56).
Pathologic and molecular analysis. An important question remains for patients with early-stage endometrial cancer: What pathological and genomic/molecular features, if any, are predictive of future disease progression? While variables such as tumor diameter, linear extent of myometrial invasion, percentage myometrial invasion, lymphovascular space invasion, and percentage serous histology have all been analyzed in small studies, none has achieved reproducible prognostic utility, specifically for early-stage serous tumors (57-62). Only the presence of any degree of myometrial invasion has been found to confer a non-significant trend in many small studies towards an increased risk of recurrence (63, 64).

With the recent completion of The Cancer Genome Atlas, endometrial cancer has been classified into four subcategories which have been found to be predictive of prognosis (6, 65-68). In tumors with serous histology, alterations within the high somatic copy number alteration (SCNA) subcategory are most common (in 97.7% of serous tumors), in contrast to the copy number-low/phosphatase and tensin homolog deleted on chromosome 10 (PTEN) -mutated, polymerase-epsilon (POLE) ultra-mutated, and mismatch repair-deficient tumors, which typically have endometrioid histology. The extent of SCNA has been found to correlate negatively with progression-free survival (6).

Clinically, how do we anticipate this testing affecting future patient care for patients with early-stage USC? The answer to this question is multi-dimensional and complex. Firstly, we know that histology is not always predictive of tumor behavior, and that tumor histological phenotype does not always perfectly correlate with genotype. For example, Kandoth et al. found 5% of tumors with grade 1-2 endometrioid, and 24% of tumors with grade 3 endometrioid histology had SCNA “serous-like” mutations, and that these may behave more aggressively (6). Adjuvant therapy for a stage IA, grade 3, endometrioid tumors is often limited to vaginal brachytherapy. However, if this same early-stage patient with deceptive high-grade endometrioid histology were to be diagnosed with genetically “serous type” high SCNA tumor, a more aggressive treatment may be recommended. Consideration may be given to treating these patients with high SCNA with chemotherapy, external beam radiotherapy, or a combination, given the correlation with poor progression-free survival.

Next, specific alterations within each subcategory may represent areas for current and future drug targeting. For example, among serous endometrial tumors, TP53 is mutated in 90.7%, phosphatidylinositol 3 kinase (PIK3CA) in 41.9%, F-box and WD repeat domain containing 7 (FBXW7) in 30.2%, and human epidermal growth factor receptor 2 (HER2) in 30% (6, 69-72). These mutations are potential drug targets with either investigational or currently available targeted therapies (70). Although more data are needed in patients with early-stage disease, current data are promising at extending the progression-free survival interval in patients with more advanced-stage serous histology via the addition of commercially available targeted treatments to the standard of care chemotherapeutics (69, 73). Notable among these, Fader et al. recently completed a phase II trial in patients with advanced-stage or recurrent disease, which demonstrated an increase in progression-free survival by over 4 months with the addition of trastuzumab to the standard of care carboplatin-paclitaxel chemotherapy in HER2-overexpressing USC (69). Further study is needed to confirm the benefits of additional targeted therapies specifically in those with early-stage disease, who have been hypothesized to receive less benefit than their advanced-stage counterparts (69).

Lastly, genomic and molecular analyses may predict response to specific chemotherapeutics. While platinum-based chemotherapy remains the mainstay, other agents may be used at recurrence with refractory or resistant disease (69). Multi-omic testing in this setting may guide therapy. For example, detection of low-density lipoprotein receptor-related protein 1B (LRP1B) deletions has been shown to be associated with doxorubicin resistance in other serous tumor types (74).

Taking these findings into consideration, the future direction of analysis may shift to testing for the categories as defined by The Cancer Genome Atlas (POLE, mismatch repair deficient, and T53/SCNA), which might be of particular utility in cases with ambiguous histology (6). At the time of a recurrence, new tissue samples may be obtained and consideration should be given to expanded testing for targeted mutations with commercially available treatments (e.g. HER2 and somatic BRCA) to individualize treatment decisions.

Adjuvant chemotherapy and radiotherapy. Outside of surgery, the ideal adjuvant management of stage IA USC remains highly controversial (75, 76). Initial adjuvant chemotherapy for USC has been extrapolated from platinum-based chemotherapeutic regimens used to treat high-grade serous ovarian carcinoma. NCCN guidelines at present suggest that post-surgical treatments can include observation, adjuvant chemotherapy, vaginal brachytherapy, external beam radiation, or any combination of the above (50). The field has resorted to applying proven therapies for more advanced-stage disease to early-stage disease, in the hope of achieving a benefit.

The impact of platinum-based regimens on overall and failure-free survival was recently demonstrated in the PORTEC-3 trial, in which 105 patients with all stages of USC received either radiotherapy or combination chemoradiotherapy (3). The addition of platinum-based chemotherapy increased failure-free survival for patients with serous endometrial carcinoma from 47.9% to 59.7% over 5 years. One notable concern is that while patients were analyzed by histology and stage separately, no sub-analysis of patients with early-stage serous cancer was possible due to limited numbers.

In 2013, Fader et al. completed a retrospective review of 11 studies to examine the role of adjuvant treatment on recurrence rates specifically in patients with early USC. In
patients with stage IA disease, they noted a trend towards reduced recurrence rates with adjuvant chemoradiotherapy (7/86, 8.1%) compared to observation (18/145, 12.4%) or radiation (10/50, 25%) but this did not reach significance, nor did it explain the heightened recurrence rate in the group those with radiation alone (1).

With the addition of platinum-based therapies to nearly all stages of USC following PORTEC-3, and the possible but yet largely unproven benefit in some patients with earliest stage IA disease (1, 77, 78), we anticipate it becoming even more difficult to determine the effect of this practice migration to near universal adjuvant chemotherapy administration from clinical data alone. Barriers to finding this answer include a limited number of patients with early-stage USC, the high number needed to treat to obtain a survival benefit, and limited numbers of patients undergoing observation.

The role of radiation in patients with early-stage disease has been analyzed via meta-analysis. Lin et al. demonstrated a progression-free survival benefit of adding radiation to chemotherapy when analyzing 9,354 patients from multiple national cancer registries, an effect that persisted when adjusting for early-stage disease (2).

Both retrospective and prospective studies have found a benefit of combination chemotherapy and vaginal brachytherapy in a small number of patients with IA disease but the sample size and inconsistent staging practices limit definitive generalizability (61, 78-86). In contrast, other retrospective studies failed to show a survival benefit with the addition of platinum-based chemotherapy to vaginal brachytherapy for patients with early-stage, high-risk cancer (87). To address this disparity, Qu et al. performed a recent comprehensive analysis of all IA serous cases at six high-volume cancer centers, finding increased regional control in patients treated with combination adjuvant chemotherapy and radiation (64). Interestingly, others noted that this benefit did not apply in patients undergoing lymphadenectomy (63), which represented fewer than 25% of patients in Qu et al.’s study.

Challenging clinical decision making arises when confronted with a patient with serous histology on preoperative biopsy but no residual disease on hysterectomy, or disease confined to a polyp. Hui et al. reviewed the outcomes of 22 patients with disease confined to a polyp, or without residual disease within the uterus, and saw no recurrences after a median follow-up of 26 months (range=0-67 months) (88). Conversely, reports of distant and unsalvageable recurrences in such patients have been published (82), including well-staged patients with disease confined to a polyp who received chemoradiotherapy (89). In this setting, we suggest counseling the patient regarding the role of chemotherapy in more advanced stage disease, and the limited evidence in their individual setting, and arriving at patient-centered individualized treatment decisions together. Our treatment paradigm for patients with early-stage USC is summarized in Table I, and is contrasted with the approaches suggested by GOG-249 (90), and PORTEC-3 (3).

**Recurrent patterns.** Unfortunately, recurrence risk estimates on stage 1 USC vary widely in the literature, ranging from 0-70% of patients with IA disease, with most estimates centering between 10% and 25% (30, 78). This recurrence is often systemic [50% of patients in one study (4)], and potentially unsalvageable. Indeed, recurrences have even been noted in small numbers (9%) of well-staged patients with disease confined to a polyp (82), and in up to 30% of those without any myometrial invasion (5, 77, 82).

Given this unpredictability, even patients with stage IA or non-invasive disease should be followed closely in the postoperative period, in accordance with NCCN guidelines.

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**Table I. Approaches to management of early-stage serous endometriatal cancer.**

| Pathology | Mayo Clinic | GOG-249 (90)* | PORTEC-3 (3)** |
|-----------|-------------|--------------|---------------|
| No residual tumor in hysterectomy, negative peritoneal cytology | Observe | EBRT | EBRT + chemotherapy |
| Stage IA - No myometrial invasion, confined to a polyp | VB | Suggest chemotherapy | | |
| Stage IA - With myometrial invasion or positive peritoneal cytology | VB | | |
| Stage IB | VB | | |
| Stage II | | | |
| Chemotherapy + EBRT | | | |

VB: Vaginal brachytherapy; EBRT: external beam radiation. *Comparing early-stage, high-risk endometrial cancer (15% serous) vs. VB + chemotherapy, found increased hazard ratio for pelvic or peri-aortic nodal recurrence in VB + chemotherapy at 3 years; no difference in overall survival was noted in subgroup analysis of patients with stage I serous disease. **Compared with EBRT alone in women with high-risk endometrial cancer, finding increased progression-free and overall survival with the addition of chemotherapy. Due to lack of statistical power, it was not possible to analyze survival stratified by stage in serous cancer.
The role of CA-125 in the detection of recurrence in patients with early-stage USC has yet to be demonstrated but could be considered on an individualized basis (24).

**Discussion**

Early-stage USC represents a rare tumor with a high risk of recurrence between 10-25%. USC is best staged using a minimally invasive surgical approach. Surgical staging includes hysterectomy, bilateral salpingo-oophorectomy, lymph node assessment and omental biopsy. Sentinel node biopsy is becoming the favored approach for nodal assessment in endometrial cancer and emerging data has demonstrated the validity of this approach in USC.

Currently, there is no consensus on the ideal adjuvant treatment for patients with early-stage USC. The available literature demonstrates a high risk of recurrence even in well-staged patients with stage IA, with the majority of recurrences exhibiting distant or non-localized spread. Adjuvant therapy options include chemotherapy, vaginal brachytherapy and external beam radiation therapy. It does appear that some patients with early-stage USC, such as those with disease confined to a polyp, have a low risk of recurrence and thus an individualized approach with less aggressive treatment or observation can be discussed with the patient. Further prospective studies are needed to clarify the ideal approach to adjuvant treatment in these patients.

Molecular analysis has reliably subcategorized endometrial cancers into four molecular types. USC is associated with SCNA, TP53 and PIK3CA mutations which are in turn predictive of poor prognosis. Molecular analysis is helpful in cases with ambiguous histology and should be considered in this context. At the time of writing, molecular classification has not further stratified patients with early-stage USC to better predict which are likely to experience recurrence. Additional analysis is needed to determine if molecular classification can better tailor adjuvant therapy for our patients. Lastly, at the time of recurrence, novel targeted treatments currently appear promising in extending progression-free survival. Therefore, consideration should be given to testing for HER2 and somatic BRCA alterations.

Given these recent advances, and the remaining uncertainties, we propose closely tracking the outcomes of these patients at each institution, and considering multi-institutional collaborations so that we may continue to optimize surgical and adjuvant treatments. Future areas of research should focus on delineating which patients with early-stage USC are most likely to benefit from adjuvant therapy and on developing targeted therapies for treatment of recurrences.

**Conflicts of Interest**

All Authors report no conflicts of interest.

**Authors’ Contributions**

All Authors contributed meaningfully to the creation of this work.

**References**

1. Fader AN, Santin AD and Gehrig PA: Early stage USC: Management updates and genomic advances. Gynecol Oncol 129(1): 244-250, 2013. PMID: 26076146. DOI: 10.1016/j.ygyno.2013.01.004
2. Lin Y, Zhou J, Cheng Y, Zhao L, Yang Y and Wang J: Comparison of survival benefits of combined chemotherapy and radiotherapy versus chemotherapy alone for USC: A meta-analysis. Int J Gynecol Cancer 27(1): 93-101, 2017. PMID: 28005619. DOI: 10.1097/IGC.0000000000000856
3. de Boer SM, Powell ME, Milesklin L, Katsaros D, Bessette P, Haie-Meder C, Ottevanger PB, Ledermann JA, Khaw P, D’Amico R, Fyles A, Baron MH, Jurgenleim-Schulz IM, Kitchener HC, Nijman HW, Wilson G, Brooks S, Gribaudo S, Provencher D, Hanzen C, Kruitwagen RF, Smit V, Singh N, Do V, Lissoni A, Nout RA, Feeney A, Verhoeven-Adema KW, Putter H and Creutzberg CL: Adjuvant chemoradiotherapy versus radiotherapy alone in women with high-risk endometrial cancer (PORTEC-3): Patterns of recurrence and post-hoc survival analysis of a randomised phase 3 trial. Lancet Oncol 20(9): 1273-1285, 2019. PMID: 31345626. DOI: 10.1016/s1470-2045(19)30395-x
4. Felix AS, Stone RA, Bowser R, Chivukula M, Edwards RP, Weissfeld JL and Linkov F: Comparison of survival outcomes between patients with malignant mixed Mullerian tumors and high-grade endometrioid, clear cell, and papillary serous endometrial cancers. Int J Gynecol Cancer 21(5): 877-884, 2011. PMID: 21666484. DOI: 10.1097/IGC.0b013e31821a62dd
5. Seward S, Ali-Fehmi R, Munkarah AR, Semaan A, Al-Wahab ZR, Elshaikh MA, Cote ML, Morris RT and Bandyopadhyay S: Outcomes of patients with USC using the revised FIGO staging system. Int J Gynecol Cancer 22(3): 452-456, 2012. PMID: 22274544. DOI: 10.1097/IGC.0b013e318236edd
6. Kandoth C, Schultz N, Cerniack AD, Akbani R, Liu Y, Shen H, Robertson AG, Aspithan I, Shen R, Benz CC, Yau C, Laird PW, Ding L, Zhang W, Mills GB, Kucherlapati R, Mardis ER and Levine DA: Integrated genomic characterization of endometrial carcinoma. Nature 497(7447): 67-73, 2013. PMID: 23636398. DOI: 10.1038/nature12113
7. Lachance JA, Everett EN, Greer B, Mandel L, Swisher E, Tamimi H and Goff B: The effect of age on clinical/pathologic features, surgical morbidity, and outcome in patients with endometrial cancer. Gynecol Oncol 101(3): 470-475, 2006. PMID: 16413048. DOI: 10.1016/j.ygyno.2005.11.009
8. Maxwell GL, Tian C, Risinger J, Brown CL, Rose GS, Thigpen JT, Fleming GF, Gallion HH and Brewster WR: Racial disparity in survival among patients with advanced/recurrent endometrial adenocarcinoma: A Gynecologic Oncology Group study. Cancer 107(9): 2197-2205, 2006. PMID: 17001661. DOI: 10.1002/cncr.22232
9. Oliver KE, Enewold LR, Zhu K, Conrads TP, Rose GS, Maxwell GL and Farley JH: Racial disparities in histopathologic characteristics of uterine cancer are present in older, not younger Blacks in an equal-access environment. Gynecol Oncol 123(1): 76-81, 2011. PMID: 21741078. DOI: 10.1016/j.ygyno.2011.06.027
Fader AN, Java J, Tenney M, Ricci S, Gunderson CC, Temkin SM, Spirito N, Kushner CL, Pearl ML, Zivanovic O, Tewari KS, O’Malley D, Hartenbach EM, Hamilton CA, Gould NS, Mannel RS, Rodgers W and Walker JL: Impact of histology and surgical approach on survival among women with early-stage, high-grade uterine cancer: An NRG Oncology/Gynecologic Oncology Group ancillary analysis. Gynecol Oncol 143(3): 460-465, 2016. PMID: 27743738. DOI: 10.1016/j.ygyno.2016.10.016

Bergstrom J, Aloisi A, Armbruster S, Yen TT, Casarin J, Leitao MM Jr., Tanner EJ, Matsuno R, Machado KK, Dowdy SC, Soliman PT, Wethington SL, Stone RL, Levinson KL and Fader AN: Minimally invasive hysterectomy surgery rates for endometrial cancer performed at National Comprehensive Cancer Network (NCCN) centers. Gynecol Oncol 148(3): 480-484, 2018. PMID: 29338923. DOI: 10.1016/j.ygyno.2018.01.002

Park DA, Lee DH, Kim SW and Lee SH: Comparative safety and effectiveness of robot-assisted laparoscopic hysterectomy versus conventional laparoscopy and laparotomy for endometrial cancer: A systematic review and meta-analysis. Eur J Surg Oncol 42(9): 1303-1314, 2016. PMID: 27439723. DOI: 10.1016/j.ejso.2016.06.400

Devaya O, Samara I and Papadopoulos AJ: Laparoscopically assisted vaginal hysterectomy (lavr) versus total abdominal hysterectomy (tah) in endometrial carcinoma: Prospective cohort study. Int J Gynecol Cancer 20(4): 570-575, 2010. PMID: 20666375. DOI: 10.1111/j.1525-1965.2009.x

Kitchener H, Swart AM, Qian Q, Amos C and Parmar MK: Efficacy of systematic pelvic lymphadenectomy in endometrial cancer (MARC ASTEC trial): A randomised study. Lancet 373(9688): 125-136, 2009. PMID: 19070889. DOI: 10.1016/s0140-6736(08)6766-3

Ghoniem K, Shazly SA, Dinoi G, Zanfagnin V, Glaser GE and Mariani A: Sentinel lymph nodes and precision surgery in gynecologic cancer. Clin Obstet Gynecol 63(1): 12-23, 2020. PMID: 31855397. DOI: 10.1097/GRF.0000000000001517

Benedetti Panici P, Basile S, Maneschi F, Alberto Lissoni A, Signorelli M, Scambia G, Angioli R, Tateo S, Mangili G, Katsaros E, Melpignano M, Raspagliesi F, Ragni N, Cormio G, Grassi R, Franchi M, Giannarelli D, Fossati R, Torri V, Amoroso M, Croce C and Mangioni C: Systematic pelvic lymphadenectomy vs. no lymphadenectomy in early-stage endometrial carcinoma: Randomized clinical trial. J Natl Cancer Inst 100(23): 1707-1716, 2008. PMID: 19033573. DOI: 10.1093/jnci/djn397

Casarin J, Multinu F, Tortorella L, Cappuccio S, Weaver AL, Ghezzi F, Cliby W, Kumar A, Langstraat C, Glaser G and Mariani A: Sentinel lymph node biopsy for robotic-assisted endometrial cancer staging: Further improvement of perioperative outcomes. Int J Gynecol Cancer 30(1): 41-47, 2020. PMID: 31780567. DOI: 10.1136/ijgc-2019-006672

Casarin J, Multinu F, Ubl DS, Dowdy SC, Cliby WA, Glaser GE, Butler KA, Ghezzi F, Habermann EB and Mariani A: Adoption of minimally invasive surgery and decrease in surgical morbidity for endometrial cancer treatment in the United States. Obstet Gynecol 131(2): 304-311, 2018. PMID: 29324598. DOI: 10.1097/aog.0000000000002428

Holloway RW, Abu-Rustum NR, Backes FJ, Boggs JF, Gottlieb WH, Jeffrey Lowery W, Rossi EC, Tanner EJ and Wolsky RJ: Sentinel lymph node mapping and staging in endometrial cancer: A Society of Gynecologic Oncology literature review with consensus recommendations. Gynecol Oncol 146(2): 405-415, 2017. PMID: 28566221. DOI: 10.1016/j.ygyno.2017.05.027

Ducic JA, Eriksson AGZ, Ali N, McGree ME, Weaver AL, Bogani G, Cliby WA, Dowdy SC, Bakkum-Gamez JN, Soslow RA, Keeny GL, Abu-Rustum NR, Mariani A and Leitao MM, Jr.: Comparison of a sentinel lymph node mapping algorithm and comprehensive lymphadenectomy in the detection of stage IIIC endometrial carcinoma at higher risk for nodal disease. Gynecol Oncol 154(1): 541-548, 2017. PMID: 28965698. DOI: 10.1016/j.ygyno.2017.09.030

Baiocchi G, Mantoan H, Kumagai LY, Goncalves BT, Badigian-Filho L, de Oliveira Menezes AN, Faloppa CC, De Brot L and da Costa A: The impact of sentinel node-mapping in staging high-risk endometrial cancer. Ann Surg Oncol 24(13): 3981-3987, 2017. PMID: 29058141. DOI: 10.1245/s10434-017-6132-8

Nouara I, Canlorbe G, Bendifallah S, Ballester M and Darai E: Relevance of sentinel lymph node procedure for patients with high-risk endometrial cancer. Gynecol Oncol 136(1): 60-64, 2015. PMID: 25449312. DOI: 10.1016/j.ygyno.2014.10.027

Rossi EC, Kwalski LD, Scalici J, Cantrell L, Schuler K, Hanna RK, Method M, Ade M, Ivanova A and Boggs JF: A comparison of sentinel lymph node biopsy to lymphadenectomy for endometrial cancer staging (FIRES trial): A multicentre, prospective, cohort study. Lancet Oncol 18(3): 384-392, 2017. PMID: 28519465. DOI: 10.1016/s1470-2045(17)30068-2

Touhami O, Greigore J, Renaud MC, Sebastianelli A and Plante M: Performance of sentinel lymph node (SLN) mapping in high-risk endometrial cancer. Gynecol Oncol 147(3): 549-553, 2017. PMID: 28942993. DOI: 10.1016/j.ygyno.2017.09.014

Soliman PT, Westin SN, Dioum S, Sun CC, Euscher E, Munsell MF, Fleming ND, Levenback C, Frumovitz M, Ramirez PT and Lu KH: A prospective validation study of sentinel lymph node mapping for high-risk endometrial cancer. Gynecol Oncol 146(2): 234-239, 2017. PMID: 28528918. DOI: 10.1016/j.ygyno.2017.05.016

Basaran D, Bruce S, Aviki EM, Mueller JJ, Broach VA, Cadoo K, Soslow RA, Alektiar KM, Abu-Rustum NR and Leitao MM, Jr.: Sentinel lymph node mapping alone compared to more extensive lymphadenectomy in patients with USC. Gynecol Oncol 156(1): 70-76, 2020. PMID: 31739992. DOI: 10.1016/j.ygyno.2019.10.005

Schlappe BA, Weaver AL, McGree ME, Ducic J, Zahl Eriksson AG, Dowdy SC, Cliby WA, Glaser GE, Abu-Rustum NR, Mariani A and Leitao MM, Jr.: Multicenter study comparing oncologic outcomes after lymph node assessment via a sentinel lymph node algorithm versus comprehensive pelvic and para-aortic lymphadenectomy in patients with serous and clear cell endometrial carcinoma. Gynecol Oncol 156(1): 62-69, 2020. PMID: 31776037. DOI: 10.1016/j.ygyno.2019.11.002

Kumar S, Podratz KC, Bakkum-Gamez JN, Dowdy SC, Weaver AL, McGree ME, Cliby WA, Keeny GL, Thomas G and Mariani A: Prospective assessment of the prevalence of pelvic, paraaortic and high para-aortic lymph node metastasis in endometrial cancer. Gynecol Oncol 132(1): 38-43, 2014. PMID: 24120926. DOI: 10.1016/j.ygyno.2013.10.002

Multinu F, Casarin J, Cappuccio S, Keeny GL, Glaser GE, Cliby WA, Weaver AL, McGree ME, Angioni S, Faa G, Leitao MM, Jr., Abu-Rustum NR and Mariani A: Ultrastaging of negative pelvic lymph nodes to decrease the true prevalence of isolated para-aortic dissemination in endometrial cancer. Gynecol Oncol 154(1): 60-64, 2019. PMID: 31126637. DOI: 10.1016/j.ygyno.2019.05.008
50 National Cancer Care Network Guidelines: Uterine Neoplasms. Version 1. 2018. https://www.nccn.org/professionals/physician _gls/default.aspx#site. Accessed 6/1/2020.

51 Papadia A, Gasparri ML, Radan AP, Stampfli CAL, Rau TT and Mueller MD: Retrospective validation of the laparoscopic ICG SLN mapping in patients with grade 3 endometrial cancer. J Cancer Res Clin Oncol 144(7): 1385-1393, 2018. PMID: 29691646. DOI: 10.1007/s00432-018-2648-y

52 Papadia A, Gasparri ML, Buda A and Mueller MD: Sentinel lymph node mapping in endometrial cancer: Comparison of fluorescence dye with traditional radiocolloid and blue. J Cancer Res Clin Oncol 143(10): 2039-2048, 2017. PMID: 28828528. DOI: 10.1007/s00432-017-2501-8

53 Papadia A, Buda A, Gasparri ML, Di Martino G, Bussi B, Verri D and Mueller MD: The impact of different doses of indocyanine green on the sentinel lymph-node mapping in early-stage endometrial cancer. J Cancer Res Clin Oncol 144(11): 2187-2191, 2018. PMID: 30043278. DOI: 10.1007/s00432-018-2716-3

54 Luz R, MacDonald N and Mould T: Omental biopsy for surgical staging of USC. Int J Gynecol Cancer 26(8): 1448-1454, 2016. PMID: 27465896. DOI: 10.1097/igc.0000000000000777

55 Ayeni TA, AlHilli MM, Bakkum-Gamez JN, Mariani A, McGree ME, Weaver AL, Ciby WA, Keyen GL, Podratz KC and Dowdy SC: Distribution and volume of extraterine disease in USC: Is minimally invasive surgery a suitable approach? Int J Gynecol Cancer 25(1): 87-91, 2015. PMID: 25474625. DOI: 10.1097/igc.0000000000000526

56 Vizza E, Mancini E, Laquintana V, Loría R, Carosi M, Balocco E, Ciccilitti L, Piaaggio G, Patrizi I, Sperduti I, Zampa A, Cutillo G, Falcioni R and Corrado G: The prognostic significance of positive peritoneal cytology in endometrial cancer and its correlations with L1-CAM biomarker. Surg Oncol 28: 151-157, 2019. PMID: 30851892. DOI: 10.1016/j.suronc.2019.01.001

57 Black C, Feng A, Bittinger S, Quinn M, Neesham D and McNally O: Uterine papillary serous carcinoma: A single-institution review of 62 cases. Int J Gynecol Cancer 26(1): 133-140, 2016. PMID: 26588230. DOI: 10.1097/igc.0000000000000569

58 Frimer M, Miller EM, Shankar V, Girda E, Mehta K, Goldberg GL and Einstein MH: Adjuvant pelvic radiation “sandwiched” between paclitaxel/carboplatin chemotherapy in women with completely resected USC: Long-term follow-up of a prospective phase 2 trial. Int J Gynecol Cancer 28(9): 1781-1788, 2018. PMID: 30371562. DOI: 10.1097/igc.0000000000001359

59 Ouyang C, Frimer M, Hou LY, Wang Y, Goldberg GL and Hou JY: Malignant endometrial polyps in USC: The prognostic value of polyp size and lymphovascular invasion. Int J Gynecol Cancer 28(3): 524-528, 2018. PMID: 29420362. DOI: 10.1097/igc.0000000000001213

60 Kaban A, Topuz S, Sozen H and Sahilhoglu Y: Does the increased rate of serous component (≥25% vs. >25%) increase recurrence in endometrial cancer with serous plus endometrioid histology? J Obstet Gynaecol Can 41(2): 160-165, 2019. PMID: 30316715. DOI: 10.1016/j.jogc.2018.03.002

61 Zhang M, Yang TJ, Desai NB, DeLair D, Kollmeier MA, Makker V, Lei tao MM, Jr., Abu-Rustum NR and Alektiar KM: Comparison of outcomes in early-stage uterine clear cell carcinoma and serous carcinoma. Brachytherapy 18(1): 38-43, 2019. PMID: 30316723. DOI: 10.1016/j.brachy.2018.08.015

62 Kulhan M, Kulhan G, Nayki U, Nayki C, Ulug P, Sipahi M and Yildirim Y: Assessment of clinicopathological features, evaluation of treatment, and prognosis of clear cell and serous papillary endometrial carcinoma. Ginekol Pol 87(8): 570-574, 2016. PMID: 27629131. DOI: 10.5603/gp.2016.0046

63 Velker V, D’Souza D, Prefontaine M, McGee J and Leung E: Role of adjuvant therapy for stage IA serous and clear cell uterine cancer: Is observation a valid strategy? Int J Gynecol Cancer 26(3): 491-496, 2016. PMID: 26825823. DOI: 10.1097/igc.0000000000000643

64 Qi XM, Velker VM, Leung E, Kwon JS, ElshaiKA M, Kong I, Logie NA, Mendez LC, van der Putten LJ, Donovan EK, Munkarah AR, Wiebe EM, Parra-Herran C, Warner A, Louie AV and D’Souza DP: The role of adjuvant therapy in stage IA serous and clear cell uterine cancer: A multi-institutional pooled analysis. Gynecol Oncol 149(2): 283-290, 2018. PMID: 29544706. DOI: 10.1016/j.ygyno.2018.03.002

65 Akhtar M, Al Hyassat S, Elaiwy O, Rashid S and Al-Nabet A: Classification of endometrial carcinoma: New perspectives beyond morphology. Adv Anath Pathol, 2019. PMID: 31567131. DOI: 10.1097/pap.p0000000000002251

66 Talhouk A, Hoang LN, McConneye MK, Nakonechny Q, Leo J, Cheng A, Leung S, Yang W, Lum A, Kobel M, Lee CH, Soslow RA, Huntsman DG, Gilks CB and McAlpine JN: Molecular classification of endometrial carcinoma on diagnostic specimens is highly concordant with final hysterectomy: Earlier prognostic information to guide treatment. Gynecol Oncol 143(1): 46-53, 2016. PMID: 27421752. DOI: 10.1016/j.ygyno.2016.07.090

67 Talhouk A, McConneye MK, Leung S, Yang W, Lum A, Senz J, Boyd N, Pike J, Anglesio M, Kwon JS, Karnezis AN, Huntsman DG, Gilks CB and McAlpine JN: Confirmation of promise: A simple, genomics-based clinical classifier for endometrial cancer. Cancer 123(5): 802-813, 2017. PMID: 28061006. DOI: 10.1002/cncr.30496

68 Kommoss S, McConneye MK, Kommoss F, Leung S, Bunz A, Magrijl I, Britton H, Kommoss F, Grevenkamp F, Karnezis AN, Yang W, Lum A, Kramer B, Taran F, Staeabler A, Lax S, Brucker SY, Fader AN, Roque DM, Siegel E, Buza N, Abdelghany O, Chambers SK, Secord AA, Havrilesky L, O’Malley DM, Backes F, Neudavnsky N, Edraki B, Pikaart D, Lowery W, ElSahwi KS, Celano P, Bellone S, Azodi M, Litkouhi B, Ratner E, Silasi DA, Schwartz PE and Santin AD: Randomized phase ii trial of carboplatin-paclitaxel versus carboplatin-paclitaxel-trastuzumab in USCs that overexpress human epidermal growth factor receptor 2/ neu. J Clin Oncol 36(20): 2044-2051, 2018. PMID: 29584549. DOI: 10.1200/jco.2017.76.5966

69 Menderes G, Clark M and Santin AD: Novel targeted therapies in USC, an aggressive variant of endometrial cancer. Discov Med 21(116): 293-303, 2016. PMID: 27232515.

70 Goebel EA, Vidal A, Matias-Guiu X and Blake Gilks C: The evolution of endometrial carcinoma classification through application of immunohistochemistry and molecular diagnostics: Past, present and future. Virchows Arch 472(6): 885-896, 2018. PMID: 29234950. DOI: 10.1007/s00428-017-2279-8

71 Schultheis AM, Martelotto LG, De Filippo MR, Piscaglia S, Ng CK, Hussein YR, Reis-Filho JS, Soslow RA and Weigelt B: TP53 mutational spectrum in endometrioid and serous endometrial
cancers. Int J Gynecol Pathol 35(4): 289-300, 2016. PMID: 26556035. DOI: 10.1097/pgp.0000000000000243
73 Nakayama K, Nakayama N, Ishikawa M and Miyazaki K: Endometrial serous carcinoma: Its molecular characteristics and histology-specific treatment strategies. Cancers 4(3): 799-807, 2012. PMID: 24213467. DOI: 10.3390/cancers4030799
74 Cowin PA, George J, Fereday S, Loehrer E, Van Loo P, Cullinane C, Etemadmoghadam D, Fiouni S, Galletta L, Anglesio MS, Hendley J, Bowes L, Sheppard KE, Christie EL, Pearson RB, Harnett PR, Heinzelmann-Schwarz V, Friedlander M, McNally O, Quinn M, Campbell P, deFazio A and Bowtell DD: Lrp1b deletion in high-grade serous ovarian cancers is associated with acquired chemotherapy resistance to liposomal doxorubicin. Cancer Res 72(16): 4060-4073, 2012. PMID: 22896685. DOI: 10.1158/0008-5472.Can-12-0203
75 Boruta DM, Gehrig PA, Fader AN and Olawaiye AB: Management of women with uterine papillary serous cancer: A Society of Gynecologic Oncology (SGO) review. Gynecol Oncol 115(1): 142-153, 2009. PMID: 19592079. DOI: 10.1016/j.ygyno.2009.06.011
76 Kwon J, Abrams J, Sugimoto A and Carey M: Is adjuvant therapy necessary for stage I and II uterine papillary serous carcinoma and clear cell carcinoma after surgical staging? Int J Gynecol Cancer 18(4): 820-824, 2008. PMID: 17892450. DOI: 10.1111/j.1525-1438.2007.01082.x.
77 Fader AN, Boruta D, Olawaiye AB and Gehrig PA: Uterine papillary serous carcinoma: Epidemiology, pathogenesis and management. Curr Opin Obstet Gynecol 22(1): 21-29, 2010. PMID: 19952744. DOI: 10.1097/GCO.0b013e328334d8a3
78 Kelly MG, O’Malley D M, Hui P, McAlpine J, Yu H, Rutherford TJ, Azodi M and Schwartz PE: Improved survival in surgical stage I patients with uterine papillary serous carcinoma (UPSC) treated with adjuvant platinum-based chemotherapy. Gynecol Oncol 98(3): 353-359, 2005. PMID: 16005947. DOI: 10.1016/j.ygyno.2005.06.012
79 Shinde A, Li R, Amini A, Chen YJ, Cristea M, Dellingler T, Wang W, Wakabayashi M, Beriwal S and Glaser S: Improved survival with adjuvant brachytherapy in stage I endometrial cancer of unfavorable histology. Gynecol Oncol 151(1): 82-90, 2016. PMID: 30170976. DOI: 10.1016/j.ygyno.2016.08.028
80 Jhingran A, Ramondetta LM, Bodurka DC, Slomovitz BM, Brown J, Levy LB, Garcia ME, Eifel PJ, Lu KH and Burke TW: A prospective phase II study of chemoradiation followed by adjuvant chemotherapy for FIGO stage I-III (1988) uterine papillary serous carcinoma of the endometrium. Gynecol Oncol 129(2): 304-309, 2013. PMID: 23835150. DOI: 10.1016/j.ygyno.2013.01.025
81 Dietrich CS, 3rd, Modesitt SC, DePriest PD, Ueland FR, Wilder J, Reedy MB, Pavlik EJ, Kryscio R, Cibull M, Giesler J, Manahan K, Huh W, Cohn D, Powell M, Slomovitz B, Higgins RV, Merritt W, Hunter J, Puls L, Gehrig P and van Nagell JR, Jr.: The efficacy of adjuvant platinum-based chemotherapy in stage I uterine papillary serous carcinoma (UPSC). Gynecol Oncol 99(3): 557-563, 2005. PMID: 16154185. DOI: 10.1016/j.ygyno.2005.07.104
82 Chang-Halpenny CN, Natarajan S and Hwang-Graziano J: Early stage papillary serous or clear cell carcinoma confined to or involving an endometrial polyp: Outcomes with and without adjuvant therapy. Gynecol Oncol 131(3): 598-603, 2013. PMID: 24153679. DOI: 10.1016/j.ygyno.2013.10.010
83 Kiess AP, Damast S, Makker V, Kollmeier MA, Gardner GJ, Aghajanian C, Abu-Rustum NR, Barakat RR and Alektria KM: Five-year outcomes of adjuvant carboplatin/paclitaxel chemotherapy and intravaginal radiation for stage I-II papillary serous endometrial cancer. Gynecol Oncol 127(2): 321-325, 2012. PMID: 22850412. DOI: 10.1016/j.ygyno.2012.07.112
84 Nagar H, Yun W, Parashar B, Nori D, Chao KS, Christos P, Gupta D, Holcomb K, Caputo T and Wernerike AG: Adjuvant pelvic radiation therapy +/- vaginal brachytherapy in patients with high-risk stage I or stage II uterine papillary serous, clear cell, and high-grade endometrioid carcinoma. Am J Clin Oncol 39(4): 335-339, 2016. PMID: 27028349. DOI: 10.1097/joc.0000000000000665
85 Townamchai K, Berkowitz R, Bhagwat M, Damato AL, Friesen S, Lee LJ, Matulonis U, O’Farrell D and Viswanathan AN: Vaginal brachytherapy for early stage uterine papillary serous and clear cell endometrial cancer. Gynecol Oncol 129(1): 18-21, 2013. PMID: 23262378. DOI: 10.1016/j.ygyno.2012.12.026
86 Barney BM, Petersen IA, Mariani A, Dowdy SC, Bakkum-Gamez JN and Haddock MG: The role of vaginal brachytherapy in the treatment of surgical stage I papillary serous or clear cell endometrial cancer. Int J Radiat Oncol Biol Phys 85(1): 109-115, 2013. PMID: 22543202. DOI: 10.1016/j.ijrobp.2012.03.011
87 Tortorella L, Langstraat CL, Weaver AL, McGree ME, Bakkum-Gamze JN, Dowdy SC, Cliby WA, Keeney GL, Sherman ME, Weroha SJ, Mariani A and Podratz KC: Uterine serous carcinoma: Reassessing effectiveness of platinum-based adjuvant therapy. Gynecol Oncol 149(2): 291-296, 2018. PMID: 29550183. DOI: 10.1016/j.ygyno.2018.02.022
88 Hui P, Kelly M, O’Malley DM, Tavassoli F and Schwartz PE: Minimal USC: A clinicopathological study of 40 cases. Mod Pathol 18(1): 75-82, 2005. PMID: 15389257. DOI: 10.1038/modpathol.3800271
89 Welp A, Temkin S and Sullivan S: Distant recurrence in a patient with polypl-confling stage IA serous endometrial carcinoma treated with adjuvant chemotherapy: A case report and review of literature. Gynecol Oncol Rep 31: 100512, 2020. PMID: 31890830. DOI: 10.1016/j.gore.2019.100512
90 Randall ME, Filiaci V, McMeekin DS, von Gruenigen V, Huang H, Yashar CM, Mannel RS, Kim JW, Salani R, DiSilvestro PA, Burke JJ, Rutherford T, Spirtos NM, Terada K, Anderson PR, Brewster WR, Small W, Aghajanian CA and Miller DS: Phase III trial: Adjuvant pelvic radiation therapy versus vaginal brachytherapy plus paclitaxel/carboplatin in high-intermediate and high-risk early stage endometrial cancer. J Clin Oncol 37(21): 1801-1818, 2019. PMID: 30995174. DOI: 10.1200/jco.18.01575

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