Analysis of Lymph Node Metastasis and Risk Factors in 975 Patients with FIGO 2009 Stage IA–IIA Cervical Cancer

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Keywords
Cervical cancer · Lymph node metastasis · Distribution characteristics · Risk factors

Abstract
Objectives: The objective of this study was to summarize the rate of lymph node metastasis (LNM) of patients with stage IA–IIA cervical cancer and further analyze its distribution characteristics and related risk factors. Design: This study is a retrospective analysis of clinical data about cervical cancer. Participants: According to the International Federation of Gynecology and Obstetrics (FIGO) 2009 staging standard, 975 patients with stage IA–IIA cervical cancer treated in our hospital from January 2010 to December 2018. Setting: This is a single-center study. Methods: The incidence and distribution of LNM were analyzed, and the influencing factors of cervical cancer LNM were analyzed using univariate and multivariate logistic regression. Results: In this study, the LNM rate was 14.8% (144/975), and a total of 20,288 lymph nodes were removed, among which 359 lymph nodes had metastasis. According to the number and frequency of metastatic lymph nodes in different regions, the metastatic rate was the highest in the external iliac regions. Univariate analysis showed that more than three pregnancies, tumor size >4 cm, gross type, FIGO stage, pathological type, positive lymphovascular space invasion (LVSI), deep cervical stromal invasion (outer half invasion), parametrial involvement, and uterine corpus invasion (UCI) were correlated with LNM (p < 0.05). Multivariate analysis showed that tumor lesion of >4 cm (odds ratio (OR) = 2.253, 95% confidence interval (CI): 1.486–3.416, p < 0.001), positive LVSI (OR = 5.353, 95% CI: 3.303–8.676, p < 0.001), deep cervical stromal invasion (OR = 3.461, 95% CI: 2.106–5.688, p < 0.001), and deep UCI (myometrial invasion ≥50%) (OR = 3.529, 95% CI: 1.321–9.427, p = 0.012) were independent risk factors for LNM. Limitations: Retrospective nature of the study and limitation to a single-center study are the limitations of the study. Conclusions: Patients with cervical cancer are more likely to have LNM with a tumor size of >4 cm, positive LVSI, deep cervical stromal invasion, or deep UCI. When these risk factors are present, the presence of LNM is possible, and attention should be paid. This study provides a certain reference value for predicting LNM risk for patients with early cervical cancer and for the stratified management of early cervical cancer treatment.
Introduction

Cervical cancer is the fourth most common cancer worldwide [1, 2]. Lymph node metastasis (LNM) is the most common cervical cancer metastasis and this is an important factor affecting patient prognosis [3, 4]. The International Federation of Gynecology and Obstetrics (FIGO) 2018 new staging of cervical cancer now includes LNM. Once LNM occurs, staging is IIIC [5]. The revised FIGO stage reflects the importance of LNM [6] and can better assess the risk of patients with cervical cancer [7].

For early-stage cervical cancer, the main purpose of lymph node resection is to determine the occurrence of a positive lymph node and provide a basis for postoperative supplementary treatment. In China, sentinel lymph node biopsy is not widely used. Most early-stage cervical cancer is treated with systematic lymph node resection, leading to unnecessary surgery in many patients with cervical cancer who do not have LNM. Especially for early-stage low-risk patients (tumor size <2 cm, no lymphovascular space invasion (LVSI), depth of invasion <10 mm, no LNM indicated by imaging examination) [8], this leads to unnecessary surgical risk.

However, it remains unclear which patients are more likely to have LNM and also if FIGO 2018 changes the groups at risk. Although there have been many studies on LNM of cervical cancer [9–14], few included large samples. Our hospital, a large obstetrics and gynecology hospital in China, treats many patients with cervical cancer. In this study, we analyze the data of 975 patients with FIGO 2009 early-stage cervical cancer in our hospital for LNM to increase the attention paid to risk stratification management scheme of early-stage cervical cancer and provide a reference for clinical treatment.

Materials and Methods

Patients

We collected the clinical data of patients with cervical cancer admitted to Beijing Obstetrics and Gynecology Hospital affiliated with Capital Medical University/Beijing Maternal and Child Health Care Hospital from January 2010 to December 2018. Inclusion criteria were as follows: (1) pathological diagnosis of cervical cancer, including squamous carcinoma, adenocarcinoma, and adenosquamous carcinoma; (2) FIGO 2009 stage IA–IIB; (3) underwent or received radical hysterectomy and systematic pelvic lymphadenectomy with or without para-aortic lymphadenectomy; and (4) complete clinical data available. Exclusion criteria were (1) cervical cancer in pregnancy, (2) cancer of the cervical stump, (3) special and rare types of cervical cancer, (4) presence of cancer other than cervical cancer, and (5) other patients who did not meet the inclusion criteria.

We included a total of 975 patients with the following characteristics: age range, 21–73 years (average age = 45.95 ± 9.20 years); FIGO stage IA in 64 cases, IB in 706 cases, and IIA in 205 cases; histological types of squamous carcinoma in 697 cases, adenocarcinoma in 136 cases, and adenosquamous carcinoma in 142 cases; and resection of para-aortic lymph nodes in 58 cases without metastasis. Based on the postoperative pathology examination, we divided the patients into the positive group (metastasis group, n = 144) and the negative group (nonmetastasis group, n = 831).

Clinical Data Collection

We divided the bilateral pelvic lymph nodes into four regions: common iliac, external iliac, internal iliac, and parauterine/obturator. The number of metastatic lymph nodes in each region was counted and the proportion was calculated. Because of the variation in the total number of LNM in each region, we calculated the distribution again based on the frequency of metastatic lymph nodes in each region. Subsequently, to explore the risk factors of cervical LNM, we analyzed age, body mass index, menopausal status, number of pregnancies and births, surgical history, tumor size, FIGO stage, gross type (exophytic or endophytic tumor), histological type, differentiation, stromal invasion depth, LVSI, uterine corpus invasion (UCI), parametrial involvement (PMI), and vaginal margin. The difference in the clinical presentation of tumors was referred to as the “gross type.” Tumors were classified according to the dominant morphology for clinical presentation. Ulcerative tumors and tumors with barrel-shaped morphology were referred to as “endophytic tumors.” Fungating tumors with or without small superficial ulcerations were referred to as “exophytic tumors.”

Data Analysis

According to the new 2018 FIGO staging system, the stage was defined again based on the tumor size in 706 cases of stage IB cervical cancer.

Statistical Analysis

We performed statistical analyses using the SPSS 23.0 software package (IBM Corp., Armonk, NY, USA). The data were expressed as the median and range or mean with standard deviation and compared using the Mann-Whitney U test. The rates of LNM in

| Table 1. The distribution characteristics of LNM |
|-----------------------------------------------|
| Anatomical region | LNM according to the number | LNM according to the frequency |
|-------------------|-------------------------------|-------------------------------|
| Total, n (%)       | 359 (100)                     | 211 (100)                     |
| Common iliac, n (%)| 24 (6.7)                      | 15 (7.1)                      |
| External iliac, n (%)| 145 (40.4)                    | 85 (40.3)                     |
| Internal iliac, n (%)| 49 (13.6)                     | 30 (14.2)                     |
| Parauterine/obturator, n (%)| 141 (39.3)                | 81 (38.4)                     |
### Table 2. Univariate analysis of the clinical pathological parameters

| Risk factors                        | LNM, n (%)                  | $\chi^2$ | p value |
|-------------------------------------|-----------------------------|----------|---------|
|                                     | negative (n = 831)          | positive (n = 144) |         |
| Age                                 |                             |          |         |
| ≤45 years                           | 417 (85.5)                  | 71 (14.5) | 0.038   | 0.846   |
| >45 years                           | 414 (85.0)                  | 73 (15.0) |          |         |
| BMI                                 |                             |          |         |
| <25 kg/m²                           | 522 (85.0)                  | 92 (15.0) | 0.061   | 0.806   |
| ≥25 kg/m²                           | 309 (85.6)                  | 52 (14.4) |          |         |
| Menopausal                          |                             |          |         |
| Premenopause                        | 587 (85.1)                  | 103 (14.9) | 0.047   | 0.828   |
| Postmenopause                       | 244 (85.6)                  | 41 (14.4) |          |         |
| Gravidity                           |                             |          |         |
| ≤3                                  | 558 (83.5)                  | 110 (16.5) | 4.858   | 0.028   |
| >3                                  | 273 (88.9)                  | 34 (11.1) |          |         |
| Parity                              |                             |          |         |
| ≤2                                  | 731 (85.1)                  | 128 (14.9) | 0.100   | 0.752   |
| >2                                  | 100 (86.2)                  | 16 (13.8) |          |         |
| Surgical history                    |                             |          |         |
| No                                  | 430 (86.7)                  | 66 (13.3) | 1.716   | 0.190   |
| Yes                                 | 401 (83.7)                  | 78 (16.3) |          |         |
| Tumor size                          |                             |          |         |
| ≤4 cm                               | 636 (88.2)                  | 85 (11.8) | 19.525  | <0.001  |
| >4 cm                               | 195 (76.8)                  | 59 (23.2) |          |         |
| Gross type                          |                             |          |         |
| Exophytic                           | 491 (88.5)                  | 64 (11.5) | 25.642  | <0.001  |
| Endophytic                          | 272 (77.9)                  | 77 (22.1) |          |         |
| Unknown                             | 68 (95.8)                   | 3 (4.2)   |          |         |
| Stage (FIGO 2009)                   |                             |          |         |
| IA                                  | 61 (95.3)                   | 3 (4.7)   | 11.883  | 0.003   |
| IB                                  | 608 (86.1)                  | 98 (13.9) |          |         |
| IIA                                 | 162 (79.0)                  | 43 (21.0) |          |         |
| Histologic grading                  |                             |          |         |
| G1                                  | 27 (100)                    | 0 (0)     | 5.346   | 0.069   |
| G2                                  | 625 (85.3)                  | 108 (14.7) |          |         |
| G3                                  | 179 (83.3)                  | 36 (16.7) |          |         |
| Pathological type                   |                             |          |         |
| Squamous cell carcinomas            | 602 (86.4)                  | 95 (13.6) | 11.725  | 0.003   |
| Adenocarcinoma                      | 121 (89.0)                  | 15 (11.0) |          |         |
| Adenosquamous carcinoma             | 108 (76.1)                  | 34 (23.9) |          |         |
| LVI                                 |                             |          |         |
| Negative                            | 511 (95.3)                  | 25 (4.7)  | 96.567  | <0.001  |
| Positive                            | 320 (72.9)                  | 119 (27.1) |          |         |
| Stromal invasion                    |                             |          |         |
| Inner 1/2                           | 487 (95.3)                  | 24 (4.7)  | 86.543  | <0.001  |
| Outer 1/2                           | 344 (74.1)                  | 120 (25.9) |          |         |
| Vaginal margin                      |                             |          |         |
| Negative                            | 821 (85.3)                  | 141 (14.7) | 0.208   | 0.648   |
| Positive                            | 10 (76.9)                   | 3 (23.1)  |          |         |
| PMI                                 |                             |          |         |
| Absent                              | 812 (86.2)                  | 130 (13.8) | 18.540  | <0.001  |
| Present                             | 19 (57.6)                   | 14 (42.4) |          |         |
| UCI                                 |                             |          |         |
| No                                  | 765 (87.3)                  | 111 (12.7) | 30.933  | <0.001  |
| Endometrial invasion                | 13 (86.7)                   | 2 (13.3)  |          |         |
| Myometrial invasion <50%            | 43 (68.3)                   | 20 (31.7) |          |         |
| Myometrial invasion ≥50%            | 10 (47.6)                   | 11 (52.4) |          |         |

BMI, body mass index; LVI, lymphovascular space involvement; PMI, parametrial invasion; UCI, uterine corpus invasion.
the defined fields were shown as percentages. The risk factors for LNM were identified by univariate and multivariate logistic regression analysis. For all tests, a p value <0.05 was considered statistically significant.

**Results**

**LNM and Distribution Characteristics**

In total group, the incidence of LNM was 14.8% (144/975). A total of 20,288 lymph nodes were removed, ranging from 11 to 49 lymph nodes per case, with a median of 19 lymph nodes per case. We compared the positive and negative groups and found no statistically significant difference (p = 0.216). There were 359 metastatic lymph nodes, ranging from 1 to 14 per case, with the median number of metastatic lymph nodes being 2 per case. The external iliac accounted for the largest number of metastatic lymph nodes (40.4%, 145/359), followed by the parauterine/obturator region (39.3%, 141/359), internal iliac (13.6%, 49/359), and common iliac (6.7%, 24/359).

The external iliac region also had the highest frequency of LNM (40.3%, 85/211), followed by the parauterine/obturator (38.4%, 81/211), internal iliac (14.2%, 30/211), and common iliac (7.1%, 15/211) regions. We found consistent results between the two statistical methods (Table 1) (Fig. 1a, b).

**Multivariate logistic regression analysis of patients with LNM**

| Variables                  | Comparison                        | OR   | 95% CI          | p value |
|----------------------------|-----------------------------------|------|-----------------|---------|
| Tumor size                 | >4 cm versus ≤4 cm                | 2.253| 1.486–3.416     | <0.001  |
| LVSI                       | Positive versus negative          | 5.353| 3.303–8.676     | <0.001  |
| Stromal invasion           | Outer 1/2 versus inner 1/2        | 3.461| 2.106–5.688     | <0.001  |
| UCI                        | Endometrial invasion versus no    | 0.554| 0.111–2.767     | 0.471   |
|                           | Myometrial invasion <50% versus no| 1.821| 0.976–3.398     | 0.060   |
|                           | Myometrial invasion ≥50% versus no| 3.529| 1.321–9.427     | 0.012   |

CI, confidence interval; LVSI, lymphovascular space involvement; UCI, uterine corpus invasion.

The distribution of LNM was calculated according to the number of LNM in each region. The distribution of LNM was calculated according to the frequency of LNM in each region.

**Univariate Analysis of the Clinical Pathological Parameters**

We investigated and analyzed the potential clinicopathological risk factors associated with lymphatic metastasis. Univariate analysis indicated that gravidity of more than three times, tumor size of >4 cm, gross type, FIGO stage, pathological type, positive LVSI, deep cervical stromal invasion (outer half invasion), PMI, and UCI were influential factors for LNM. However, there were no statistically
significant differences between the two groups in age, body mass index, menopause, parity times, surgical history, tissue differentiation, or vaginal margin (Table 2).

**Multivariate Logistic Regression Analysis of Patients with LNM**

We performed a multivariate logistic regression analysis to confirm the identified risk factors. LNM was associated only with the tumor size of >4 cm, positive LVSI, cervical stromal outer half invasion, and deep UCI (myometrial invasion ≥50%; Table 3).

**Analysis of LNM in Stage IB Patients**

According to FIGO 2009, the LNM rate of stage IB1 was 10.5% and of IB2 was 25.5%. We then recalculated the LNM rate of stage IB according to FIGO 2018, resulting in 272 patients of stage IB undergoing a recalculation based on tumor size. The rates of LNM of IB1, IB2, and IB3 were 9.0%, 16.2%, and 25.5%, respectively (Table 4).

**Discussion**

Our data showed that among 975 patients with cervical cancer, the incidence of LNM was 14.8%, with metastasis rates of 4.7% in stage IA, 13.9% in stage IB, and 21.0% in stage IIA patients. Although the clinical stage is not an independent risk factor for LNM, we found that the rate of LNM increases with the increase of the clinical stage, and this result is consistent with previous reports [15, 16]. We know that the new FIGO 2018 staging reclassified stage IB. To further understand the LNM rate, we recalculated stage IB patients according to the tumor size. Among these patients, 272 received different stages, and the results showed that the LNM rates of stages IB1, IB2, and IB3 also increased gradually. This finding indicates that the tumor size influences the risk of LNM in stage IB [17], supporting the rational classification of stage IB in FIGO 2018.

Our conclusions were consistent according to the number and frequency of metastatic lymph nodes in our analysis of the partitions of metastatic lymph nodes. The results showed that the rates of LNM of the external iliac region and paraurterine/obturator region were significantly higher than the rates of the other two regions. Nearly 80% of metastatic lymph nodes occur in the external iliac and paraurterine/obturator regions. Thus, attention must be paid to lymph node resection in these two regions during pelvic lymph node resection. Similar reports also remind us to pay attention to LNM excision of the paraurterine/obturator regions [16, 18].

Our results indicate four independent risk factors, “positive LVSI” had the highest odds ratio value (Table 3), and similar findings have been reported in the past [17, 19]. Therefore, we should pay special attention to a preoperative LVSI-positive pathology, even if the imaging examination did not suggest metastasis. We further analyzed the relationship between preoperative pathology and LNM. We found that among all patients (N = 975), 416 cases were positive LVSI, as indicated by preoperative pathology, whereas postoperative pathology confirmed LNM in 107 cases, accounting for 74.3% (107/144) of all patients with LNM. In addition, we found that 3 patients with stage IA had LNM (Table 2). We analyzed the clinical data of these 3 patients and noted an infiltration depth of <5 mm and width of <7 mm; however, preoperative biopsy pathology showed positive LVSI. These findings suggest that attention should be paid to a positive LVSI result of the preoperative biopsy, even among stage IA patients [20]. We also found that 23 patients had no LVSI on biopsy but did have LVSI on the final pathology, with a false-negative rate of 5.2%.

We did not pay enough attention to UCI in the past, but we believe that this did not affect staging. In this study, 99 patients had UCI, and the LNM rate of patients with endometrial, myometrial invasion <50%, and myometrial invasion of ≥50% was 13.3%, 31.7%, and 52.4%, respectively. The only uterine deep myometrial invasion among these patients was an independent risk factor affecting LNM. In addition, studies have shown that LNM is also an independent risk factor for UCI [21], and uterine deep myometrial invasion is an independent risk factor for poor prognosis of patients with cervical cancer [22, 23]. The presence of UCI should be considered a poor prognostic factor in the diagnosis and treatment protocol, and systematic chemotherapy or prophylactic irradiation of the para-aortic lymph node region may be considered as an option because of its increased risk of para-aortic LNM [24]. Thus, we emphasize that great attention must be paid to UCI of cervical cancer, especially to the depth of UCI.

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**Table 4. Analysis of LNM in stage IB patients**

| FIGO IB | Tumor size | LNM, n (%) |
|---------|------------|------------|
| 2009    |            |            |
| IB1 (545) | ≤4 cm    | 57 (10.5)  |
| IB2 (161) | >4 cm    | 41 (25.5)  |
| 2018    |            |            |
| IB1 (434) | ≤2 cm    | 39 (9.0)   |
| IB2 (111) | >2 cm, ≤4 cm | 18 (16.2) |
| IB3 (161) | >4 cm    | 41 (25.5)  |

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Gynecol Obstet Invest 2023;88:30–36

DOI: 10.1159/000527712
Currently, relevant imaging examinations, such as magnetic resonance imaging or computed tomography, commonly assess LNM. And relevant articles have shown that diffusion-weighted magnetic resonance imaging has the highest sensitivity and that positron emission tomography computed tomography has the highest specificity [15, 25–27].

We recommend that increased risks of LNM should be considered in the presence of risk factors such as tumor size of >4 cm, positive LVSI, deep cervical stromal invasion, or deep UCI. Therefore, based on the principle of individualized treatment, attention should be paid when the above risk factors occur, and the consideration of systematic complete lymph node resection is suggested. However, sentinel lymph node mapping is feasible for early-stage cervical cancer without lymph node enlargement and high-risk factors [28–33].

In conclusion, this study provides a certain reference value for predicting LNM risk for patients with early cervical cancer and for the stratified management of early cervical cancer treatment. Thus, for patients with early-stage cervical cancer, attention should be paid to evaluating LNM, and evaluation criteria and a risk stratification management scheme should be formed as soon as possible.

Limitations

Although some studies prove that LNM is related to tissue differentiation [34], we did not find this result. In addition, Li et al. [35] pointed out that endogenous type was an independent risk factor for PMI. Our study analyzed the relationship between LNM and gross type, indicating that the difference was statistically significant in the univariate analysis, yet it was not an independent risk factor. This finding might be related to the large span of the FIGO stage in this study and the vague gross type of some early patients. Because this study is a single-center and retrospective study, another multicenter, large-sample, and prospective study is required to provide a more valuable reference for clinical practice.

Statement of Ethics

This retrospective study was approved and informed consent was waived by the Institutional Review Board of Beijing Obstetrics and Gynecology Hospital, Capital Medical University (number: 2021-KY-085-01) on November 20, 2021.

Conflict of Interest Statement

The authors declare that there is no conflict of interest regarding the publication of this article.

Funding Sources

No funding.

Author Contributions

Lina Cao is the first author, who designed the study and wrote the manuscript. Weimin Kong supervised and revised the article. Jing Li, Chao Han, and Tingting Liu contributed to analysis. Bixia Jin and Dan Song contributed to data collection. All authors have read and approved the final manuscript.

Data Availability Statement

All data generated or analyzed during this study are included in this article. Further inquiries can be directed to the corresponding author.

References

1 Sharma S, Deep A, Sharma AK. Current treatment for cervical cancer: an update. Anticancer Agents Med Chem. 2020;20(15):1768–79.
2 Sung H, Ferlay J, Siegel RL, Laversanne M, Soerjomataram I, Jemal A, et al. Global cancer statistics 2020: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. CA Cancer J Clin. 2021 May;71(3):209–49.
3 Hosaka M, Watari H, Mitamura T, Konno Y, Odagiri T, Kato T, et al. Survival and prognosticators of node-positive cervical cancer patients treated with radical hysterectomy and systematic lymphadenectomy. Int J Clin Oncol. 2011 Feb;16(1):33–8.
4 Balaya V, Guani B, Bonsang-Kitiz H, Deloménie M, Ngô C, Montero Macias R, et al. Sentinel lymph node biopsy in early-stage cervical cancer: current state of art. Bull Cancer. 2020 Jun;107(6):696–706.
5 Bhatla N, Berek JS, Cuello Fredes M, Denny LA, Grenman S, Karunaratne K, et al. Revised FIGO staging for carcinoma of the cervix uteri. Int J Gynecol Obstet. 2019 Apr;145(1):129–35.
6 Jeong SY, Park H, Kim MS, Kang JH, Paik ES, Lee YY, et al. Pretreatment lymph node metastasis as a prognostic significance in cervical cancer: comparison between disease status. Cancer Res Treat. 2020 Apr;52(2):316–23.
7 de Gregorio A, Widschwendter P, Ebner F, Friedl TWP, Huober J, Janni W, et al. Influence of the new FIGO classification for cervical cancer on patient survival: a retrospective analysis of 265 histologically confirmed cases with FIGO stages IA to IIB. Oncology. 2020;98(2):91–7.
8 Schmeler KM, Pareja R, Lopez Blanco A, Humberto Fregnani J, Lopes A, Perrotta M, et al. ConCerv: a prospective trial of conservative surgery for low-risk early-stage cervical cancer. Int J Gynecol Cancer. 2021 Oct;31(10):1317–25.
14 Togami S, Kamio M, Yanazume S, Yoshinaga
12 Zhou J, Ran J, He ZY, Quan S, Chen QH, Wu
17 Zhao J, Cai J, Wang H, Dong W, Zhang Y,
16 Nanthamongkolkul K, Hanprasertpong J.
15 Olthof EP, van der Aa MA, Adam JA, Stalpers
13 Wang Y, Yao T, Yu J, Li J, Chen Q, Lin Z. Can pelvic lymphadenectomy be omitted in patients with stage IIA1 squamous cell cervical cancer? Springerplus. 2016 Aug; 5(1):1262–8.
18 Cai J, He X, Wang H, Dong W, Zhang Y, Zhao J, et al. Topographic distribution of lymph node metastasis in patients with stage IB1 cervical cancer: an analysis of 8314 lymph nodes. Radiat Oncol. 2021 Mar;16(1):54–63.
19 Balaya V, Guarni B, Magaud L, Bonsang-Kitzis H, Ngô C, Mathevet P, et al. Validation of the 2018 FIGO classification for cervical cancer: lymphovascular space invasion should be considered in IB1 stage. Cancers. 2020 Nov;12(12):3554–67.
20 Margolis B, Cagle-Colon K, Chen L, Tergas AI, Boyd L, Wright JD. Prognostic significance of lymphovascular space invasion for stage IA1 and IA2 cervical cancer. Int J Gynecol Cancer. 2020 Jun;30(6):735–43.
21 Li W, He F, Liu P, Duan H, Ni Y, Wang S, et al. Uterine corpus invasion in cervical cancer: a multicenter retrospective case-control study. Arch Gynecol Obstet. 2021 Mar;303(3):777–85.
22 He F, Li W, Liu P, Kang S, Sun L, Zhao H, et al. Influence of uterine corpus invasion on prognosis in stage IA2-IIB cervical cancer: a multicenter retrospective cohort study. Gynecol Oncol. 2020 Aug;158(2):273–81.
23 Matsuo K, Machida H, Blake EA, Takiuchi T, Mikami M, Roman LD. Significance of uterine corpus tumor invasion in early-stage cervical cancer. Eur J Surg Oncol. 2017 Apr;43(4):725–34.
24 Turan T, Kimyon Comert G, Boyraz G, Kilic F, Cakir C, Kilic M, et al. What is the impact of corpus uterine invasion on oncologic outcomes in surgically treated cervical cancer? J Obstet Gynaecol Res. 2021 Oct;47(10):3634–43.
25 Woo S, Atun R, Ward ZJ, Scott AM, Hricak H, Vargas HA. Diagnostic performance of conventional and advanced imaging modalities for assessing newly diagnosed cervical cancer: systematic review and meta-analysis. Eur Radiol. 2020 Oct;30(10):5560–77.
26 Haldorsen IS, Lura N, Blakker J, Fischerova D, Werner HM. What is the role of imaging at primary diagnostic work-up in uterine cervical cancer? Curr Oncol Rep. 2019 Jul;21(9):77–91.
27 Wang T, Gao T, Yang J, Yan X, Wang Y, Zhou X, et al. Preoperative prediction of pelvic lymph nodes metastasis in early-stage cervical cancer using radiomics nomogram developed based on T2-weighted MRI and diffusion-weighted imaging. Eur J Radiol. 2019 May;114:128–35.
28 Wu Y, Li Z, Hu Y, Hu J. Sentinel lymph node biopsy in cervical cancer: a meta-analysis. Mol Clin Oncol. 2013 Nov;1(6):1025–30.
29 Uliain Q, Han L, Wu Q, Zhao L, Wang Q, Tuo X, et al. Indocyanine green can stand alone in detecting sentinel lymph nodes in cervical cancer. J Int Med Res. 2018 Dec;46(12):4885–97.
30 Zhang X, Bao B, Wang S, Yi M, Jiang L, Fang X. Sentinel lymph node biopsy in early stage cervical cancer: patient’s consent. Medicine. 2021 Aug;100(34):e27035.
31 Wang XJ, Fang F, Li YF. Sentinel-lymph-node procedures in early stage cervical cancer: a systematic review and meta-analysis. Med Oncol. 2015 Jan;32(1):385–12.
32 Kadkhodayan S, Hasanzadeh M, Treglia G, Azad A, Yousefi Z, Zarifmahmoudi L, et al. Sentinel node biopsy for lymph nodal staging of cervical cancer: a systematic review and meta-analysis of the pertinent literature. Eur J Surg Oncol. 2015 Jan;41(1):1–20.
33 Wang L, Liu S, Xu T, Yuan L, Yang X. Sentinel lymph node mapping in early-stage cervical cancer: meta-analysis. Medicine. 2021 Aug;100(34):e27035.
34 Canaz E, Ozuyrek ES, Erdem B, Aldikactioglu Talmac M, Yildiz Ozaydin I, Akbayir O, et al. Preoperatively assessable clinical and pathological risk factors for parametrial involvement in surgically treated FIGO stage IB-IIA cervical cancer. Int J Gynecol Cancer. 2017 Oct;27(8):1722–8.
35 Li D, Cai J, Kuang Y, Cao J, Wang Z. Surgical-pathologic risk factors of pelvic lymph node metastasis in stage Ib-Iib cervical cancer. Acta Obstet Gynecol Scand. 2012 Jul;91(7):802–9.