Cancer Therapy & Oncology
International Journal
ISSN: 2473-554X

Juniper Publishers
key to the Researchers

Research Article
Volume 14 Issue 1 - July 2019
DOI: 10.19080/CTOIJ.2019.14.555885

Cancer Ther Oncol Int J

Efficacy and Tolerance of Extended Field Radiation Therapy in Uterine Cervical Cancer Patients with Para-Aortic Lymph Node Metastasis

Sandeep Purohit[1], Meenu Gupta[1]*, Upasana Baruah[2], Mamta Goyal[3], Vipul Nautiyal[1], Saurabh Bansal[1], ManjuSaini[3] and Mushtaq Ahmad[1]

[1]*Department of Radiation Oncology, Cancer research Institute, Swami Rama Himalayan University, India*

[2]*Department of Gynaeoncology, Cancer research Institute, Swami Rama Himalayan University, India*

[3]*Department of Radiology, Swami Rama Himalayan University, India*

Submission: June 03, 2019; **Published:** July 08, 2019

***Correspondence Author:** Meenu Gupta, Professor Department of Radiation Oncology, Cancer research Institute, Swami Rama Himalayan University, Dehradun, India

Abstract

Aim: To determine the response and toxicity of extended field radiation therapy and concurrent chemotherapy on uterine cervical cancer patients with para - aortic lymph node metastasis.

Methods: Forty patients with cervical cancer with para -aortic lymphadenopathy metastasis were treated by photons on LINAC with extended field radiotherapy (46-50Gy/23-25#) along with weekly concurrent cisplatin (35mg/m2) followed by 3 sessions of weekly intra-cavitory brachytherapy (7Gy per session by HDR Ir-192) at our institution. The primary endpoint was to assess efficacy in terms of response to the treatment. The secondary endpoint was to assess tolerance of treatment in terms of toxicities (hematological and non-hematological).

Results: Complete clinical response in pelvis and para-aortic disease were observed in 28(70%) and 27(67.5%) patients. Partial clinical response in pelvis and para-aortic disease were observed in 11(27.5%) and 12(30%) of patients. One patient did not respond to the treatment and had progression of disease. Anemia grade 1-2 was seen in 22(55%) patients. Neutropenia grade 1-2 was seen in 10(25%) of patients. Thrombocytopenia grade 1 was seen in only 2(5%) of patients. None of the patient had grade 4 hematological toxicity. Grade 1 diarrhea was seen in 19(47.5%) patients, grade 2 in 7(17.5%) patients and grade 3 in 4(10%) of patients.

Conclusion: Extended field chemoradiotherapy is an effective and beneficial first line treatment for cervical cancer patients with paraaortic lymph node metastasis. Addition of concurrent chemotherapy to extended field radiotherapy (EFRT) resulted in the potential acceptable acute hematological and non-hematological toxicities and can be considered as standard of care with more randomized trials.

Introduction

In Indian subcontinent, cervical cancer is major public health problem where it ranked as the most frequent cancer in women. [1] There is a subset of cervical cancer patients who present with para-aortic lymph nodes (PALN) metastasis during initial diagnosis either detected clinically (radiological features) or surgically (pathological confirmation). The progressive increase in the prevalence of PALN metastasis was noted with more advanced International Federation of Gynecology and Obstetrics (FIGO) stages; 5%, 16% and 25% for FIGO stage IB, II and III respectively. The presence of para-aortic lymphadenopathy metastasis confers an unfavorable prognosis. Within those with para-aortic lymphadenopathy metastasis, prognostic factors identified to affect overall survival are patient's age, diameter of primary lesion and number of lymph nodes metastasis [2]. The clinical stage is not influenced by the presence of pelvic lymph node (PLN) involvement although it is strong prognostic factor [3,4].

The major pattern of recurrence in cervical cancer patients with PALN metastasis after extended field radiotherapy (EFRT) is distant failure [5]. Patients with PALN metastasis usually undergo chemoradiotherapy that encompasses the pelvic and para-aortic region [6]. However, the dose delivered to the gross PALN by using conventional RT techniques has been limited by concerns about toxicity, as many as 9-50% and 12-34% of patients exhibit severe acute and late toxicity, respectively [7]. Studies from Asian region showed a proportion of patients who underwent concurrent chemotherapy with EFRT managed to achieve long term remission. This was because not all distant

metastasis to PALN equaled to having systemic disease [8]. Studies have demonstrated a positive effect on overall survival using EFRT and concurrent chemotherapy as compared with radiotherapy alone [9]. The purpose of this study was to investigate the efficacy and tolerance of EFRT plus concurrent chemotherapy as first line treatment for cervical carcinoma with PALN metastasis.

Material and Methods

Study was approved by the ethics committee of the University. 40 subjects were recruited from the Cancer Research Institute, with a primary diagnosis of cervical cancer with metastasis to para-aortic lymph node after taking written and informed consent.

Study Design: Observational hospital-based study.

Inclusion Criteria:

i. Age ≤65 years

ii. ECOG Performance Score≤ 2 [10]

iii. Histopathologic findings – Squamous cell carcinoma (SCC), adenocarcinoma or adenosquamous carcinoma.

iv. Para-aortic lymph node involvement

v. Hemoglobin ≥ 9 gm/dl

vi. Total leukocyte count ≥ 3 thousand/cumm

vii. Platelet ≥ 1 lakh/cumm

viii. Serum Creatinine ≤ 1.2 mg/dl

Exclusion Criteria

a. Distant nodal metastasis in mediastinal or supraclavicular lymphatics

b. Previous history of uterine surgery

c. Previous history of radiotherapy or chemotherapy

d. Patient with visceral metastasis

Study Protocol

This study consisted of 40 patients with cervical cancer with para -aortic lymphadenopathy metastasis who were treated with concurrent chemotherapy and Extended field radiotherapy (EFRT) at our institution. The procedure for staging included a detailed history, and a physical examination, common laboratory tests, chest radiographs, and cystoscopy/proctoscopy, if necessary. All patients underwent contrast enhanced computed tomography CT abdomen and pelvis to evaluate para aortic lymph node involvement. The presence of lymph nodes larger than 1 cm in the short axis dimension and central necrosis was regarded as criteria for metastatic disease. All treatment fields were simulated, and portal verifications were done on the treatment unit. CT Simulation done for conformal planning. Patients were kept on fasting for minimum 4 hours prior to planning CT scan. For intravenous contrast, 100 ml of omnipaque was used. After preparation, patients were made to lie down supine on couch in CT simulator. Knee rest was used as positioning device to maintain position reproducibility. The distal aspect of cervico-vaginal disease was marked with radio-opaque seeds.

CT scan was obtained from T8-T9 interspace to upper third of femur, with 10 mm slice thickness and after that reconstructed into 3 mm slice thickness. These images were then transferred to treatment planning system (TPS) workstation (Oncentra master plan) and contouring was done. Organ at Risk (OAR) delineation: OAR includes bowel, bladder, rectum and bone marrow and these were contoured according to the Radiation therapy oncology group (RTOG) normal tissue contouring guidelines [11]. Clinical Target Volume nodal (CTVn) included involved nodes and relevant draining nodal groups (common iliac, internal iliac, external iliac, obturator and presacral, para-aortic LN). CTV primary (CTVu and CTVp) finally included the uterus (CTVu) and the parametrium (CTVp). CTV primary for intact carcinoma cervix consists of gross tumor volume of the primary tumor (GTV primary), uterine cervix, uterine corpus, parametrium, vagina and ovaries.Total Target Volume CTVn and the CTV primary were combined and named as total CTV, which was further given a margin of 10 mm all around for the total PTV to account for setup errors and internal organ motion. Internal Target Volume margin given over CTVu for uterine motion was added to the total PTV and this was taken as the total target volume (final PTV) to be treated. Thus, in the final PTV, the margin from the uterine surface remained same as given for ITV, i.e 15mm in both anteroposterior and superior-inferior direction.

The final PTV was manually or automatically trimmed up to 3mm from the skin surface, if necessary, to spare skin, provided that the CTV was still included entirely within the PTV. The following bony landmarks were used for assisting the plans: For pelvis, Box technique with parallel opposing fields for all patients were used. AP/PA Extended field for para-aortic irradiation superior border was extended upto T11-T12 or T12-L1 interspace covering the entire PALN, 2 cm from the front of the vertebral body or enlarged lymph nodes as the anterior border, and the midline of the vertebral body as the posterior border, respectively. Inferior border of pelvic field limited by transverse line below the obturator foramen or 2 cm below the most distal vaginal disease, included the introitus when necessary. Lateral border of AP/PA pelvic field kept 1.5 – 2.0 cm lateral to widest true pelvic diameter unless the distal 1/3 of the vagina was involved; then the inguinal lymph nodes were also treated.

For pelvic Lateral portals, superior and inferior borders were identical to the AP-PA fields. Anterior border was defined by a line drawn anterior to the symphysis pubis and at least 1 cm anterior to common iliac nodes at L4-L5. Posterior border of pelvic lateral portal was defined by a line through the

How to cite this article: Sandeep P, Meenu G, Upasana B, Mamta G, Vipul N. Efficacy and Tolerance of Extended Field Radiation Therapy in Uterine Cervical Cancer Patients with Para-Aortic Lymph Node Metastasis. Cancer Ther Oncol Int J. 2019; 14(2): 555885. DOI: 10.19080/CTOIJ.2019.14.555885

posterior sacrum to include the cervical disease with a margin of 2 cm. External EFRT using a 6MV LINAC with a total dose of 46-50Gy/23-25# (2.0 Gy per fraction), 5 fractions a week, was given. For concurrent chemotherapy, weekly Cisplatin (35 mg/m2) was given followed by intracavitary brachytherapy 7 Gy per session given weekly for 3 session by high dose rate (HDR) Iridium 192 brachytherapy. Follow-up was done weekly during chemoradiotherapy along with evaluation at 6 weeks, 3 month and 6 months from start of treatment. Response rate was the primary end point for analysis. We defined treatment response by performing history taking, physical and pelvic examination and imaging studies such as CECT abdomen and pelvis scan at 6 weeks after completion of all treatments.

Acute treatment related toxicities from the start of the treatment to 3 months following the completion of treatment were evaluated. Patients were assessed every week during treatment for toxicities. Eastern cooperative oncology group (ECOG) toxicity criteria was used for monitoring and documentation of hematological toxicities. The Radiation therapy oncology group (RTOG) toxicity criteria was used for radiation-induced toxicities. Response to therapy defined by RECIST 1.0 criteria (Response Evaluation Criteria in Solid Tumors), based on the comparison of CT findings before and 6 weeks after the end of therapy [12] and patients were categorized into following response groups.

i. **Complete response:** If there was complete regression of primary lesion.

ii. **Partial Response:** If there was more than 50% regression in primary lesion in maximum diameter.

iii. **No Response:** If primary lesion regressed less than 50% in maximal diameter.

Data Management and Statistical Analysis

Statistical analysis was conducted utilizing SPSS version 20.

Results

Table 1: Baseline patient characteristics.

Characteristics	Total Patients
Age (year)	
Median	55
Range	34-65
Tumor Size	
Median	5.5cm
Range	2-9cm
Pelvic Lymph Node Size	
Median	2.2cm
Range	1.0-4.0cm
Para-aortic Lymph Node Size	
Median	1.6cm
Range	1.0-2.5cm

The baseline patient characteristics are outlined in Table 1. The median age at diagnosis was 55 years, and the mean age was 53.8 years. The median cervical tumor, pelvic and para-aortic nodal sizes were 5.1cm (range, 2-9 cm), 2.2 cm (range, 1.0-4.0 cm) and 1.6 cm (1.0-2.5cm) respectively. 28(70%) patients received EBRT 50Gy dose to pelvis and para-aortic region and 12(30%) received EBRT 46Gy to pelvis and para-aortic region. All patients received brachytherapy with dose 7 Gy in 3 sessions by HDR Ir192 intracavitory technique. Of 40 patients, 30(75%) patients received 4 cycles of concurrent chemotherapy with EBRT. 100 percent patients showed complete compliance for clinical and imaging evaluation.

Table 2: Acute toxicities of treated patients.

Acute Toxicities	Grade 0	Grade 1	Grade 2	Grade 3	Grade 4
Gastrointestinal					
Diarrhea	9(22.5%)	19(47.5%)	7(17.5%)	4 (10%)	1(2.5%)
Vomiting	31(77.5%)	6(15%)	3(7.5%)	0	0
Genito urinary	10(25%)	26(65%)	4(10%)	0	0
Hematological					
Anemia	17(42.5%)	18(45%)	4(10%)	12.5(%)	0
Neutro penia	30(75%)	8 (20%)	2(5%)	0	0
Thromboc ytopenia	38(95%)	2(5%)	0(%)	0	0

The acute toxicities are summarized in Table 2. Grade 1 diarrhea was seen in 19(47.5%) patients, grade 2 in 7(17.5%) patients and grade 3 in 4(10%) patients. One patient experienced grade 4 diarrhea, mainly due to lean and thin built. 9 (22.5%) of 40 patients experienced grade 1 or 2 vomiting. Genito-urinary toxicity with frequency and burning micturition were grade 1 in 26(65%) patients and 4(10%) had grade 2 toxicity. The most common hematological toxicity observed was anemia, with grade 1-2 seen in 22(55%) patients. Neutropenia, grade 1-2 was seen in 10(25%) patients. Thrombocytopenia grade 1 was seen in only 2(5%) of patients. None of the patient had grade 4 hematological toxicity. Total duration of treatment was between 6 weeks and 8 weeks in 37(92.5%) of cases. 3(7.5%) patients completed their treatment between 8 weeks and 10 weeks. Of these 3 patients, one patient developed ureteric stone for which she underwent lithotripsy, other 2 patients were delayed due to grade 3 and 4 gastro-intestinal toxicity.

Table 3: Acute toxicities of treated patients.

Response to Treatment	Complete Response	Partial Response	No Response
Clinical examination			
Per speculum exam	28(70%)	12(30%)	0
Radiological			
Pelvic disease	28(70%)	11(27.5%)	1(2.5%)
Para-aortic disease	27(67.5%)	12(30%)	1(2.5%)

How to cite this article: Sandeep P, Meenu G, Upasana B, Mamta G, Vipul N. Efficacy and Tolerance of Extended Field Radiation Therapy in Uterine Cervical Cancer Patients with Para-Aortic Lymph Node Metastasis. Cancer Ther Oncol Int J. 2019; 14(2): 555885. DOI: 10.19080/CTOIJ.2019.14.555885

On per vaginum examination, 28(70%) patients had no residual disease seen on subsequent follow up while 12(30%) patients had residual disease seen in cervix. On comparing imaging, complete response in pelvis and para-aortic disease were observed in 28(70%) and 27(67.5%), respectively with no significant residual disease. Partial clinical response in pelvis and para-aortic disease were observed in 11(27.5%) and 12(30%), respectively of patients with significant reduction in size of pelvic disease and lymph nodes. One patient did not respond to the treatment and had progression of disease with metastasis to lung after 4 months and was started on palliative chemotherapy. Response to treatment shown in Table 3 and (Figures 1 & 2). The median follow-up time was 28 months (range, 5 to 62 months). Thirty-five patients (87.5 %) were alive at the last follow-up. 15 patients (37.5 %) had recurrence that was documented clinically or by imaging at last the follow-up.

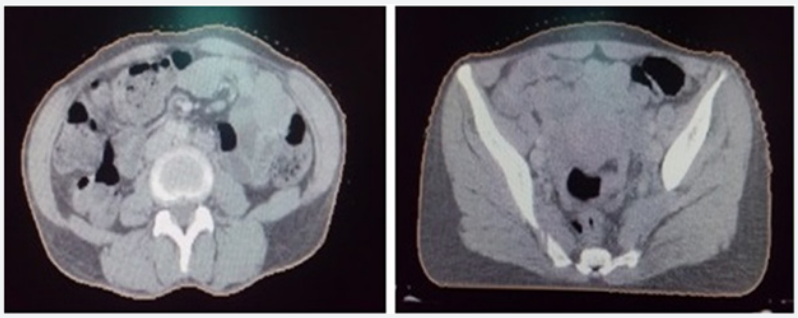

Figure 1: Enhanced axial Computed Tomographic Scan in a patient with cancer cervix involving pelvic and paraaortic lymphnode. (Pre-Radiotherapy).

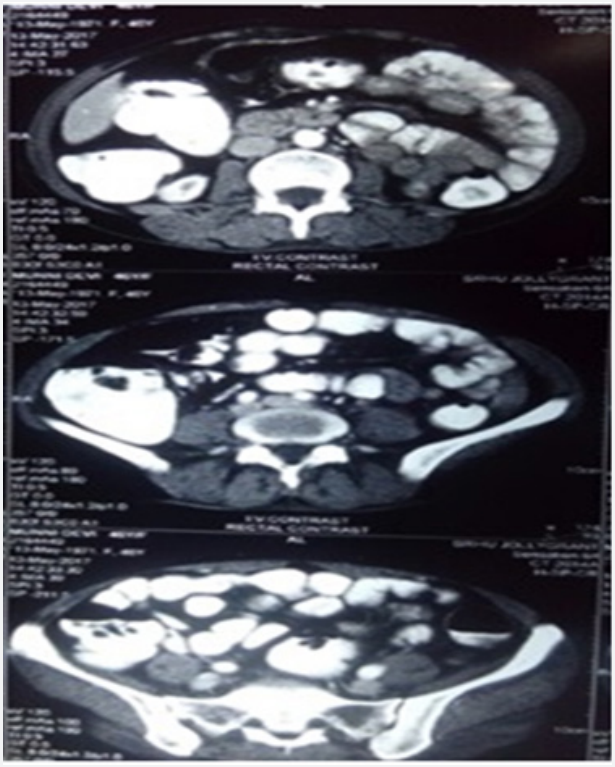

Figure 2: Computed Tomography showing complete response after chemoradiotherapy.

Discussion

Extended field radiotherapy (EFRT) has become an efficient treatment for uterine cervical cancer with involved para-aortic lymph node. Stryker et al. reported that cisplatin-based chemotherapy may be beneficial [13]. Many studies have continued to report favorable outcomes, despite more acute severe hematologic and gastrointestinal toxicity. Imaging in the form of contrast enhanced CT has a vital role to play in assessing the local spread of disease as well as nodal status. In this study metastatic para-aortic nodal status was assessed using radiological criteria namely short axis of lymph node of 1 cm with central necrosis and irregular margins. Selman et al. pooled a total of 5,042 patients for meta-analysis on diagnostic accuracy of tests for lymph node status in primary cervical cancer. They found high specificity of 97.6%, 93.2%, and 92.3% with relatively low sensitivity of 74.7%, 55.5%, and 57.5% on PET, MRI, and CT, respectively [14].

This study showed that majority of tumor size was between 4 cm and 6 cm, accounting for 62.5% of cases. In a study by Nedovic et al, > 5 cm tumor size was seen in 77% of patients. In a study by Xiaotian Han, they noticed that 3.5 cm was the most appropriate cut off point statistically for PALN [15]. In a study by Huang et al, no PALN involvement was found in patients with tumor size < 2 cm or negative pelvic lymph node (PLN) metastasis [16].

In this study, out of 40 patients with radiological para-aortic lymph node positive patients, there were 37 pelvic radiologically lymph node positive patients. In the majority of cases, PALN metastasis is correlated with positive PLN, and skip metastasis is lower than 4%, similar with our results, as was observed in study done by Sakuragi et al. [17]. Since study was based on radiological assessment for positive lymph node metastasis, it cannot be a reliable predictor for lymph node metastasis.

Para-aortic field in our study were taken as T11-T12 or T12-L1 interspace covering the entire PALN as the superior border, till L4-L5 interface as inferior border and it was similar to radiation fields taken in the study by Yoon et al [18]. As first line treatment ,75% of our patients received 4 cycles of weekly

How to cite this article: Sandeep P, Meenu G, Upasana B, Mamta G, Vipul N. Efficacy and Tolerance of Extended Field Radiation Therapy in Uterine Cervical Cancer Patients with Para-Aortic Lymph Node Metastasis. Cancer Ther Oncol Int J. 2019; 14(2): 555885. DOI: 10.19080/CTOIJ.2019.14.555885

concurrent chemotherapy with Cisplatin. 25% of patients received less than 4 cycles of concurrent chemotherapy because of thin built and moderate performance status. It was less when compared to NCI Canada trial by Pearcey et al which observed 100% compliance with 5 cycles of concurrent chemotherapy with Cisplatin [19]. The randomized phase III RTOG 0116 study has shown that combination of cisplatin chemotherapy with extended field and intracavitary irradiation for para-aortic or high common iliac nodal metastasis from cervical cancer is associated with significant acute and late toxicity. In the present study, the number of grade 3 and 4 acute complications were lower with grade 3 diarrhea in 10% and grade 4 diarrhea in 2.5 % of patients [20].

Grade 1 neutropenia was observed in 20% and grade 1 thrombocytopenia in 5% of patients in this study. No grade 3 neutropenia or thrombocytopenia was observed. It was similar to observation in GOG 120 study done by Rose et al. [21]. Non hematological toxicities in this study including gastrointestinal toxicity in the form of diarrhea was observed as grade 1 in 47.5% and grade 2 in 17.5% of patients. In the study by Zhang et al, 62.2% experienced grade 1 and 6.2% grade 2 gastro-intestinal toxicity [22]. Genito-urinary complications, grade 1, observed by authors in present study was 65% which was more than 40% in a study by Vishwanathan et al and 43% on GOG 99 study [23]. The whole treatment time in our study was between 6 and 8 weeks in 92.5% while it was similar in a study by Chen et al. [24]. 7.5% of patients in present study completed treatment between 8 and 10 weeks due to development of grade 3 or 4 acute gastro-intestinal toxicity. Response to therapy defined by RECIST 1.0 criteria (Response Evaluation Criteria in Solid Tumors), based on the comparison of CT findings before and 6 weeks after the end of therapy showed 70% complete response and 27.5% partial response with 1(2.5%) patient showing progression of primary disease with bilateral lung metastasis and this patient received 6 cycles of palliative chemotherapy. Patient was asymptomatic on follow up. For para-aortic lymph node metastasis, 67.5% patients showed complete response and 30% patients showed partial response. 2.5 % patient showed no response to treatment in para aortic region. Patients were on subsequent follow up of 3 months and 6 months after the start of treatment and had similar response at the end of 6 months. In a study by Yoon et al, seventy patients (77.8%) had complete response and 20 patients (22.2%) had partial response in primary gross disease. For para-aortic lymph node metastasis only, complete response was observed in 75 patients (83.3%) and partial response in 15 patients (16.7%).

The most common gynecologic complications of pelvic radiation are ovarian failure in premenopausal patients and vaginal atresia or stenosis. According to a study by Brandt et al, incidence ranges from 20% to 88% of patients. In our study, grade 1 vaginal atresia was seen in 87.5% of patients on follow up of 3 months. Proctitis was observed in 5% of patients in our study which was similar, about 5%, to finding seen in a study by Vishwanathan et al. This study is limited by a small sample size, a single institution study and a short observation period. Results of this study deserves consideration and large randomized multiinstitutional trials are needed to further verify the effectiveness of EFRT and concurrent chemotherapy.

Conclusion

Extended field radiotherapy with concurrent chemotherapy is an effective first line treatment for cervical cancer patients with para-aortic node metastasis. Addition of concurrent chemotherapy to extended field radiotherapy (EFRT) results in the potential acute but manageable hematological and non-hematological toxicities. However, ultimate perfect techniques with more precise delivery of pelvic and para-aortic radiation can reduce bowel and rectum toxicities with adequate dosimetery advantage.

References

1. World Health Organization (February 2014). Fact sheet No. 297: Cancer 34: 91.
2. Hong In Yoon, Jihye Cha, Ki Chang Keum (2015) Treatment outcomes of extended field radiation therapy and the effect of concurrent chemotherapy on uterine cervical cancer with para-aortic lymphadenopathy. Radiation oncology 312: 501-512.
3. Stehman FB, Bundy BN, Di Saia PJ, Keys HM, Larson JE, et al. (1991) Carcinoma of the cervix treated with radiation therapy. I. A multi-variate analysis of prognostic variables in the Gynecologic Oncology Group. Cancer 67: 2776-2785.
4. Toita T, Nakano M, Higashi M, Sakumoto K & Kanazawa K (1995) Prognostic value of cervical size and pelvic lymph node status assessed by computed tomography for patients with uterine cervical cancer treated by radical radiation therapy. Int J Radiat Oncol Biol Phys 33: 843-849.
5. Grigsby PW, Perez CA, Chao KS, Herzog T, Mutch DG, et al. (2004) Radiation therapy for carcinoma of the cervix with biopsy-proven positive para-aortic lymph nodes. Int J Radiat Oncol Biol Phys 49: 733-738.
6. Grigsby PW, Heydon K, Mutch DG, Kim RY & Eifel P (2001) Longterm follow-up of RTOG 92-10: cervical cancer with positive para-aortic lymph nodes. Int J Radiat Oncol Biol Phys 51: 982-987.
7. Varia MA, Bundy BN, Averette HE, Rose PG, Connelly P (1998) Cervical carcinoma metastatic to para-aortic nodes extended field radiation therapy with concomitant 5 fluorouracil and cisplatin chemotherapy: a Gynecologic Oncology Group study. Int J Radiat Oncol Biol Phys 42: 1015-1023.
8. DS Chi, RM Lanciano, AP Kudelka (2001) In Cancer management: 16: 89-95.
9. Fulcher AS, O Sullivan SG, Segreti EM, Kavanagh BD (1999) Recurrent cervical carcinoma: typical and atypical manifestations. Radiographics 19: 103-106.
10. Hong (2015) Treatment outcomes of extended-field radiation therapy and the effect of concurrent chemotherapy on uterine cervical cancer with para-aortic lymph node metastasis, Radiation Oncology 10: 18-25.
11. Gay HA, Barthold HJ, O'Meara E, Bosch WR, El Naqa I, et al. (2012) Pelvic normal tissue contouring guidelines for radiation therapy: A Radiation Therapy Oncology Group consensus panel atlas. International Journal Radiation Oncology Biology Phys 83: e353-e362.

How to cite this article: Sandeep P, Meenu G, Upasana B, Mamta G, Vipul N. Efficacy and Tolerance of Extended Field Radiation Therapy in Uterine Cervical Cancer Patients with Para-Aortic Lymph Node Metastasis. Cancer Ther Oncol Int J. 2019; 14(2): 555885. DOI: 10.19080/CTOIJ.2019.14.555885

12. Therasse P, Arbuck SG, Eisenhauer EA (2000) New guidelines to evaluate the response to treatment in solid tumors. European Organization for Research and Treatment of Cancer, National Cancer Institute of the United States, National Cancer Institute of Canada. J Natl Cancer Inst 92: 205-216.

13. Stryker JA, Mortel R (2000) Survival following extended field irradiation in carcinoma of cervix metastasis to para-aortic lymh nodes. Int J Gynecol Oncology 79: 399-405.

14. Selman TJ, Mann C, Zamora J, Appleyard TL, Khan K (2008) Diagnostic accuracy of tests for lymph node status in primary cervical cancer: a systematic review and meta-analysis. CMAJ 178: 855-862.

15. Han Xiaotian (2017) Predictive factors of para-aortic lymph nodes metastasis in cervical cancer patients: a retrospective analysis based on 723 para-aortic lymphadenectomy cases. Oncotarget 8: 51840- 51847.

16. Huang H, Liu J, Li Y, Wan T, Feng Y, et al. (2011) Metastasis to deep obturator and para-aortic lymph nodes in 649 patients with cervical carcinoma. Eur J Surg Oncol 37: 978-983.

17. Sakuragi N, Satoh C, Takeda N, Hareyama H, Takeda M, et al. (1999) Incidence and distribution pattern of pelvic and paraaortic lymph node metastasis in patients with Stages IB, IIA, and IIB cervical carcinoma treated with radical hysterectomy. Cancer 85: 1547-1554.

18. Hong (2015) Treatment outcomes of extended-field radiation therapy and the effect of concurrent chemotherapy on uterine cervical cancer with para-aortic lymph node metastasis, Radiation Oncology 10:18-25.

19. Pearcey R, Brundage M, Drouin P (2002) Phase III trial comparing radical radiotherapy with and without cisplatin chemotherapy in patients with advanced squamous cell cancer of the cervix. J Clin Oncol 20: 966–972.

20. Small W, Winter K, Levenback C (2007) Extended-field irradiation and intracavitary brachytherapy combined with cisplatin chemotherapy for cervical cancer with positive paraaortic or high common iliac lymph: results of ARM 1 of RTOG 0116. Int J Radiat Oncol Biol Phys 68: 1081-1087.

21. Rose PG, Bundy BN, Watkins EB (1999) Concurrent cisplatin based radiotherapy and chemotherapy for locally advanced cervical cancer. N Engl J Med 340: 1144-1153.

22. Zhang (2012) Definitive extended field intensity-modulated radiotherapy and concurrent cisplatin chemosensitization in the treatment of IB2-IIIB cervical cancer. J Gynecol Oncol 25: 14-20.

23. Keys HM, Roberts JA, Brunetto VL (2004) A phase III trial of surgery with or without adjunctive external pelvic radiation therapy in intermediate risk endometrial adenocarcinoma: A Gynecologic Oncology Group study. Gynecol Oncol 92: 744-751.

24. Gay HA, Barthold HJ, O'Meara E, Bosch WR, El Naqa I, et al. (2012) Pelvic normal tissue contouring guidelines for radiation therapy: A Radiation Therapy Oncology Group consensus panel atlas. International Journal Radiation Oncology Biology Phys 83: 353-358.

DOI: 10.19080/CTOIJ.2019.14.555885

How to cite this article: Sandeep P, Meenu G, Upasana B, Mamta G, Vipul N. Efficacy and Tolerance of Extended Field Radiation Therapy in Uterine Cervical Cancer Patients with Para-Aortic Lymph Node Metastasis. Cancer Ther Oncol Int J. 2019; 14(2): 555885. DOI: 10.19080/CTOIJ.2019.14.555885