

and number of fractions always increases efficiency. In order to maximize the logistic benefits of HDR-BT while improving patient compliance and resource sparing, various fractionation regimens are used. Fractionation and dose adjustments of the total dose are radiobiologically important factors in lowering the incidence of complications without compromising the treatment results.

Aim: To compare patient outcomes and complications using two linear-quadratic model-based fractionation schemes of high-dose-rate intracavitary brachytherapy (HDR-IC) used to treat cervical cancer.

Materials and Methods: A prospective randomized study on 318 patients, with histologically proven advanced carcinoma cervix (stages IIB-IIIIB) was enrolled in the study. All patients received External Beam Radio Therapy (EBRT) 50 Gy in 25 fractions with concurrent chemotherapy (cisplatin 35 mg/m²) followed by IntraCavitary brachytherapy using high dose rate equipment. Patients were randomised after completion of EBRT into two arms: (1) Arm 1: HDR ICRT 6.5 Gy per fraction for 3 fractions, a week apart. (2) Arm 2: HDR ICRT, 9 Gy per fraction for 2 fractions, 1 week apart. On completion of treatment, patients were assessed monthly for 3 months followed by 3 monthly thereafter. Treatment response was assessed according to WHO criteria after one month of completion of radiotherapy. The RTOG criteria were used for radiation induced toxicities. We analyzed late toxicities in terms of Rectal, Bladder, Small Bowel toxicity and Vaginal Stenosis.

Results: Acute reactions in both the groups were comparable. None of the patient developed Grade 4 toxicity in our study and no toxicity related mortality was encountered. A slightly high frequency of late toxicity was observed in 9Gy Arm patients but was not statistically significant.

Conclusion: In our setup, HDR brachytherapy at 9 Gy per fraction in two fractions is safe, effective and resource saving method with good local control, survival, and manageable normal tissue toxicity.

Cervix: Oral Abstract

Identification of T- and B-cell epitopes in HPV-16 E7 gene isolated from cervical cancer patients

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Introduction: In India, cervical cancer is the most common cancer among females. Persistence infection with high risk human papillomaviruses (HR-HPV) is an etiological agent for cervical cancer development, especially HPV-16 is found to be exclusively high in cervical cancer cases in Indian population. The continuous expression and transforming ability of HPV E7 helps in progression of cervical cancer and other HPV related disease, which make E7 as a suitable targets for the development of therapeutic vaccines. **Objectives:** Identification of T- & B-cell epitopes HPV-16 E7 gene isolated from in cervical cancer patients.

Materials and Methods: A total of 80 cervical cancer tissue biopsies were collected and processed for DNA extraction, HPV diagnosis and genotyping. E7 gene of HPV-16 positive samples were amplified and sequenced. Epitopes in E7 gene sequence were predicted by online freely available tools.

Results: In the present study we got 72 samples (90%) were positive for HPV and out of which 68 samples (94.4%) were positive for the HPV-16. HPV-16 positive samples were sequenced and translated. IEDB server was used for epitope analysis; 12 potent epitopes for the MHC-I alleles were identified in isolated E7 gene of HPV-16. The most potent epitopes were MHGDTPTLHEYM for HLA-C*07:01; LLMGTLGIVCPI for HLA-A*02:01 and MHGDTPTLHEYML for HLA-C*07:01; having percentile rank 0.2 for all three and antigenicity score of 0.20011, 0.15358 and 0.10735, respectively.

Conclusion: This is an effective strategy to design immuno-therapeutics and therapeutic vaccine against HPV using E7 as target. These findings will be helpful in the development of effective vaccine for particular geographical region.

Cervix: Oral Abstract

Role of interstitial brachytherapy using template (mupit) in locally advanced carcinoma cervix

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Introduction: Locally advanced carcinoma cervix includes stages IIB, IIIA, IIIB and IVA. Interstitial brachytherapy has the potential to deliver adequate dose to lateral parametrium and to vagina. Hence, it is preferable in cases with distorted anatomy, extensive (lower) vaginal wall involvement, bulky residual disease post EBRT and parametrium involvement upto lateral pelvic wall.

Aim and Objective: To determine clinical outcome and complications (acute and chronic) in locally advanced carcinoma cervix, treated with interstitial brachytherapy using template (MUPIT - Martinez universal perineal interstitial template).

Materials and Methods: This study is a retrospective analysis of 37 cases of locally advanced carcinoma cervix (stage IIB-2, IIIB-30, IVA-5), treated with EBRT (dose-median 45Gy/25#) ± concurrent chemotherapy (CCT) - Inj. Cisplatin/Inj Carboplatin, followed by interstitial brachytherapy using MUPIT from December 2009 to June 2015. Initial treatment with EBRT ± CCT was followed by interstitial brachytherapy. Under spinal anaesthesia and epidural analgesia, MUPIT application was done. Straight and divergent needles (median 26, range 19-29) were inserted to cover parametrium adequately. Needle position was verified with planning CT scan and Brachytherapy planning was done. Dose was normalized to 5 mm box surface from outermost needle with optimization of dose to OAR (Bladder, Rectum and Sigmoid colon). Prescription dose -25Gy in 5#. Treatment was delivered by Microselectron HDR using Ir192 source. Treatment fractions were delivered twice daily with min 6 Hrs. gap in-between fractions.

Results: The median duration of follow-up was 25 months. Local control was achieved in 28 patients with residual disease in 7 patients and local recurrence in 2 patients. 10 patients had acute lower GI toxicity {Grade 1 (n=6), Grade 2 (n=4)}, 2 patients had acute Grade 1 bladder toxicity. 1 patient had grade 3 and 1 patient had grade 4 chronic bladder toxicity. Chronic rectal toxicity was seen in 10 patients {Grade 2 (n=4), Grade 3 (n=4), Grade 4 (n=2)}.

Conclusion: Local control was achieved in 28/37 patients (75.6%) and overall survival rate of 81.1% at median follow up of 25 months in patients with locally advanced carcinoma cervix and unfavorable prognostic factors.

Cervix: Oral Abstract

Pattern of distant metastases in treated cases of carcinoma cervix : An analysis

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Aims: To analyze pattern of distant failure, site of metastases, number of metastases and duration in patient with carcinoma of cervix treated with concomitant chemoradiation.

Materials and Methods: From May 2011 to December 2015, 73 patients of carcinoma cervix who treated with radical treatment (concomitant chemoradiation followed by 3 session of HDR brachytherapy) with distant metastases presented at Department of Radiotherapy-II, Pt BDS PGIMS, Rohtak were evaluated retrospectively.

Results: Most of the female with metastases were in age group of 50-59 years (82%), 12% were in age group >60 and 6% were in < 50 year age group. Initial stage of presentation was 40% (29/73), 48% (35/73) and 12% (9/73) in stage II, III and IVA respectively. Out of which 93% had squamous cell carcinoma histology and 7% were having adenocarcinoma at time of presentation. Among them 49/73 (67%) had solitary metastases, 19/73 (26%) had two metastatic sites and 5/73 (7%) had multiple metastatic sites. Commonest site of distant metastases was paraaortic lymphnodes in 40% of cases, followed by liver, lungs, brains, cervical lymph nodes and one case of cutaneous metastases was also seen. Paraaortic lymphnodes, liver and lung metastases

present in maximum number of patient with multiple metastases. Salvage chemotherapy given in 51 cases, palliative radiotherapy (30 Gy or 20 Gy) in 37 cases whereas in 5% of cases single session with 8 Gy was given.

Conclusion: A regular and long term follow up of patients with carcinoma of cervix is necessary to detect distant metastases. With early and proper diagnosis and treatment a better outcome could be achieved.

Cervix: Poster Abstract

Low dose radiation and chemotherapy significantly reduces hypoxic cell population in locally advanced cervix cancer- results of a phase II study

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Introduction: Tumor hypoxia is one of the major causes of high incidence of treatment failures to chemoradiation which is the standard of care in locally advanced cervical cancer. The necessity of newer treatment options that can circumvent hypoxia is highly relevant in this group. Use of low dose radiation to enhance the efficacy of cell cycle specific chemotherapy by mechanism of chemopotentialization is one of the elegant approaches reported in the literature. We have already published the feasibility, efficacy and tolerance of low dose radiation and chemotherapy in neoadjuvant setting in cervical cancer. In this report we evaluated the role of this novel treatment regimen in reducing the hypoxic tumor cell population in cervical cancer.

Methods: Total 24 patients with stage IIB-IIIIB squamous cell carcinoma cervix were treated with initial 2 cycles of paclitaxel and carboplatin and concurrent low dose radiotherapy prior to standard chemoradiation. Response was assessed clinically, radiologically (by MRI) and pathologically (four quadrant representative punch biopsy from the cervix) after 3 weeks of neoadjuvant treatment prior to chemoradiation. Immunohistochemistry of HIF-1 α was done in the biopsy samples to determine the proportion, intensity and scoring of hypoxic cells.

Results: The proportion of positivity of base line HIF-1 α was 42% (10 out of 24 patients). Low, moderate and high expressions were seen in 8%, 17% and 17% respectively. We observed nuclear positivity in 20%, and fine granular perinuclear cytoplasmic positivity in 80% cases. We failed to observe any association between expressions of HIF 1 α in relation to the distance from blood vessels in tumor cord. The average age of patients in hypoxia positive and negative groups were 51.7 vs 48.36 yrs ($p > 0.05$). There was no difference of mean hemoglobin level (11.3 to 11.1, $p > 0.05$) or MRI based tumor volume at baseline (57.1 vs. 52.4, $p > 0.05$) in HIF 1 α positive and negative groups respectively. Low dose radiation and chemotherapy significantly reduced the tumor volume in bulky hypoxic tumors. The tumor volume reduction rate (TVRR) was significantly higher in hypoxic group (TVRR_{HIF_neg} vs. TVRR_{HIF_pos} 68.9 vs. 86.3, $p = 0.02$, t-test). There was significant improvement of diffusion MRI derived apparent diffusion coefficient (ADC) in hypoxic tumors with low dose radiation and chemotherapy (0.75 vs. 1.27, $p = 0.12$, Wilcoxon signed-rank test). Median score of percentage of hypoxic cells after neoadjuvant treatment were significantly higher in patients who developed subsequent local recurrence than the rest of the group (77% vs. 5% $p = 0.009$, Mann Whitney U test).

Conclusion: Overall all HIF 1 positivity was 42% in the present study. A predominantly perinuclear pattern of HIF 1 staining was found in cervix cancer. Low dose radiation and chemotherapy significantly reduced the hypoxic tumor bulk in cervical cancer.

Cervix: Poster Abstract

Incremental Role of ¹⁸F-FDG PET with contrast enhanced CT (PET-CECT) in detection of recurrence of carcinoma cervix

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Purpose: To evaluate the role of ¹⁸F-FDG PET with contrast enhanced CT (PET-CECT) in early detection of recurrence in follow up patients of carcinoma cervix.

Methods: Patients with histopathologically proven carcinoma cervix who underwent chemotherapy, radiotherapy and/or surgery and on follow up

were recruited in the study. Fifty-two patients underwent ¹⁸F-FDG PET-CECT for detection of recurrence. The median age was 51.5 (average = 53.4) years. PET-CECT studies were evaluated and analyzed separately by an experienced nuclear medicine physician and a radiologist independently. The physicians were blinded for the patient history. PET-CECT results were validated with histopathological correlation, conventional radiologic imaging/follow up PET-CECT study and clinical follow up.

Results: Out of 52 patients, 34 patients were reported as positive for recurrence, 17 of these were having active local recurrence and 31 patients had regional lymph nodal metastases, 14 patients had distant metastases (out of them 6 patients had distant lymph node metastases, 6 had pulmonary metastases, 4 had skeletal metastases and two had liver metastases). Remaining 18 patients were reported as negative for recurrence. The lung was the most common site for distant metastasis. Patient were then further evaluated based on histopathological correlation, conventional radiologic imaging and follow up PET-CECT scan and five were found to be false positive and one patient was identified as false negative. The sensitivity, specificity, positive and negative predictive value were derived to be 96.7%, 77.3%, 85.3% and 94.4%, respectively. Accuracy was calculated to be 88.5%.

Conclusions: ¹⁸F-FDG PET-CECT is a very useful non-invasive modality for the early detection of recurrence and metastatic workup in patients with carcinoma cervix with a very high sensitivity and negative predictive value. It is also useful in targeting biopsy sites in suspected cases of recurrence.

Cervix: Oral Abstract

Evaluation of adequacy of conventional radiotherapy fields based on bony landmarks in cervical cancer patients using contrast enhanced CT

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Introduction: Cervical cancer is the second leading cause of cancer death in Indian women. Although, it is known that in Western women the conventional pelvic fields based on bony landmarks provided inadequate coverage for pelvic lymph nodes in cervical cancer; it remains unclear in Indian patients because of the pelvic anatomic discrepancies. In the present study, we have tried to evaluate the adequacy of conventional pelvic fields based on bony landmarks by using CECT using pelvic vessels as surrogate of lymph nodes.

Aims and Objectives: To evaluate the lymph node location in CECT pelvis using vessels as surrogate markers.

- To compare the data, so obtained, with the usual radiotherapy field; where bony landmarks are used to define the field.
- To evaluate the adequacy of radiation portal defined on bony landmarks in covering pelvic lymph nodes.

Materials and Methods: This study was conducted in the Department of Radiotherapy and Oncology, Regional Cancer Centre, IGMC, Shimla in patients suffering from carcinoma of cervix. Two dimensional radiation portals were designed on conventional simulator "Acuity." CECT pelvis was done in the same position along with same immobilization accessories used during conventional simulation. 2 mm thick slices were taken from L1 to mid femur. Using vessels as surrogates for lymph nodes and applying Tailors guidelines, adequacy of conventional GOG field was judged.

Results: Most of the parameters failed in this study, signifying inadequacy of GOG defined field in Indian population, detailed results will be discussed at the time of presentation.

Cervix: Oral Abstract

Audit on early stage carcinoma cervix primarily treated with radical surgery: A tertiary cancer care centre experience

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Introduction: Clinical staging is universally accepted for ca cervix. In early