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Official Annual Meeting of Indian Brachytherapy Society

8TH ANNUAL CONFERENCE OF INDIAN BRACHYTHERAPY SOCIETY 2018 (IBSCON 2018) PROCEEDINGS

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The 8th Annual Conference of Indian Brachytherapy Society (IBS), 2018 (IBSCON 2018) was conducted by the Department of Radiation Oncology, Tata Memorial Hospital, Mumbai and Indian Brachytherapy Society at Mumbai from 10th to 12th August 2018. The Theme of the conference was **"Brachytherapy in uncommon sites – how do I do it!"**.

The pre-conference workshop was conducted at the Tata Memorial Hospital, Mumbai on 10th August 2018. The theme of the workshop was **"Patient safety, brachytherapy incidents-lessons learnt, and regulations related to brachytherapy in India"**. The workshop was the first of its kind in India to be conducted in collaboration with the Atomic Energy Regulatory Board (AERB). The workshop focused on the various regulatory aspects of brachytherapy from commissioning of equipment to patient treatment. Experts from across the country deliberated on diverse topics including design and utilization of Cobalt-60 as a brachytherapy treatment source, dosimetric aspects, cost-effective analysis of different brachytherapy sources, Indian experience with the indigenous e-licensing of radiation applications (e-LORA), various brachytherapy-related incidents in the past, need for formal brachytherapy auditing practice, and experience with the failure mode effects analysis (FMEA). Approximately, 120 delegates including radiation oncologists, residents, medical physicists, and physics residents, brachytherapy trade delegates registered for the workshop and actively participated during a workshop discussion.

Brachytherapy being the most conformal and time-tested form of radiation therapy, has much evolved in the recent past, in terms of applicators, imaging, software, and QA tools. Although there is plethora of evidences favoring the utility of brachytherapy in breast, prostate, and cervical cancers, there are many other sites, where brachytherapy has shown promise but have not become popular. In order to rekindle and reckon brachytherapy in uncommon sites like nose and nasal cavity, neck nodes, pediatric cancers, sarcomas, etc., IBSCON 2018 dedicated to these sites a theme called **"Brachytherapy in uncommon site"** with experts who shared practical tips and tricks. The conference was conducted at the iconic Choksi auditorium, Tata Memorial Hospital, Mumbai. The conference was attended by 150 delegates, which included radiation oncologists, medical physicists, resident physicists, resident doctors, radiation therapy technologists, brachytherapy trade representatives, and allied health students.

The scientific program offered an exciting assembly of brachytherapy experts from India who shared their skills and experience in rare sites. Professor Bhalavat from Jupiter Hospital, Thane, delivered the 'key note address' and the audience were enthralled by the length and breadth of his experience and passion in keeping brachytherapy alive in a time and age, where modern external beam radiotherapy innovations are more eminent. During the inaugural ceremony, Shri Bhardwaj, Chairman of AERB, addressed the gathering and emphasized the role of AERB in ensuring nuclear and radiation safety.

Details of various sessions are shown in the scientific program below. On the 1st day of the conference, leading experts in the field demonstrated their experience in brachytherapy for skin cancer, eyelid malignancies, neck nodes, adult extremity sarcomas, and pediatric orbital brachytherapy. Interactive sessions during the day allowed participants to clarify practical and technical queries. Also, various vendors of brachytherapy equipment presented on developments and innovations from the manufacture's perspective. The 1st day concluded with the general assembly of the IBS. The 2nd day of the conference included presentation and discussion on intraluminal brachytherapy for esophageal and tracheal-bronchial malignancies. During the conference, around 10 selected abstracts were discussed during the best paper and poster discussion sessions.

Indian Brachytherapy Society would like to acknowledge the department of the Radiation Oncology, Tata Memorial Hospital, Mumbai for hosting the 8th Annual Conference of IBS 2018. We also sincerely thank the IBS Activities 2018 sponsors including IBSCON 2018 Elekta, Varian KTPL, and KRS for their generous contribution towards Annual IBS activities including the IBSCON 2018. Finally, IBS would thank the national faculty, IBS Executive Committee, all the IBS members, and others for their contribution in making IBSCON 2018 a grand success!

IBSCON 2018: "Brachytherapy in uncommon sites – how do I do it!"

10th August 2018: Pre-conference Workshop
Theme: "Patient safety, brachytherapy incidents-lessons learnt & regulations related to brachytherapy in India"
Workshop Coordinators: S.V. Jamema (TMC) & G. Sahani (AERB)

	Topic	Speaker/Panelists
01.00–01.30 p.m.	Registration	
01.30–02.00 p.m.	Brachytherapy (^{60}Co and ^{192}Ir) room planning	D. Deshpande
02.00–02.25 p.m.	Regulatory aspects in brachytherapy	G. Sahani
02.25–02.50 p.m.	e-LORA experience from brachytherapy physicist's perspective	D. Mukherjee
02.50–03.20 p.m.	Incidents in brachytherapy – Lessons learnt	S.K. Shrivastava
03.20–03.40 p.m.	Coffee break	
03.40–04.05 p.m.	^{60}Co versus ^{192}Ir source for brachytherapy – dosimetric aspects and cost-effective analysis	S. Deshpande
04.05–04.25 p.m.	Is there a need for brachytherapy dosimetry audit in our country – challenges?	S.D. Sharma
04.25–04.50 p.m.	Application of FMEA in HDR brachytherapy	S.V. Jamema
04.50–05.30 p.m.	Panel discussion: patient safety, brachytherapy incidents-lessons learnt & regulations related to brachytherapy in India Moderator: Shobha Jayaprakash	S.D. Sharma, G. Sahani, S. (Ghosh) Laskar, R. Upreti, N. Kumar & BT Supplier's representatives from Varian, Elekta & KTPL
	Day 1: 11th August 2018	
08.15–08.45 a.m.	Registration	All
08.45–09.00 a.m.	Welcome address	
09.00–09.10 a.m.	Program overview	U. Mahantshetty
09.10–11.00 a.m.	**Session I: Brachytherapy in uncommon head and neck sites**	Chairs: R.L. Bhalavat
09.10–09.35 a.m.	Brachytherapy for neck nodes	D.N. Sharma
09.35–09.55 a.m.	Brachytherapy for eyelid cancers	S. (Ghosh) Laskar
09.55–10.35 a.m.	Surface mould brachytherapy • Oral cavity • Ear and nasal cancers	 A. Mukherjee A. Budrukkar
10.35–11.00 a.m.	Challenges in BT planning	R. Upreti
11.00–11.30 a.m.	Interactive session	All
11.30–11.50 a.m.	**Inauguration** • Welcome remarks • Introduction of the Chief Guest • Annual report by IBS secretary • Opening remarks by IBS President • Inaugural address by chief guest • Vote of thanks	 S. Banavali S.K. Shrivastava U. Mahantshetty R.L. Bhalavat S.A. Bhardwaj J.P. Agarwal
11.50–12.30 p.m.	**Session II: Key note address** **Chairs: U. Mahantshetty, V. Srtinivasan**	R.L. Bhalavat
12.30 –01.30 p.m.	**Lunch break**	
01.30–03.30 p.m.	**Session III: Sarcomas & pediatrics**	Chairs: S. Saha, S. De
01.30–02.00 p.m.	Brachytherapy for adult sarcomas	S. Sharma
02.00–02.30 p.m.	Practical tips and tricks for pediatric tumor sites	S. Laskar
02.30–03.00 p.m.	Challenges in brachytherapy planning	Ms. Dheera
03.00–03.30 p.m.	Interactive session	
03.30–04.30 p.m.	**Session IV: Developments & innovations from manufacture's perspective**	Chairs: M. Umesh, D.D. Deshpande
03.30–03.45 p.m.	Varian	
03.45–04.00 p.m.	Elekta	
04.00–04.15 p.m.	Bebig/KTL	
04.15–04.30 p.m.	BRIT	
04.30 – 05.00 p.m.	**Session V: Poster review**	
05.00 -05.30 p.m.	IBS General Body meeting	All IBS members

Day 2: 12th August 2018		
08.45–09.00 a.m.	Registration	All
09.00–10.30 a.m.	**Session VI: Intraluminal BT for esophageal cancers**	J.P. Agarwal, R.L. Bhalavat
09.00–09.30 a.m.	ILRT in esophageal cancer – more than palliation	M. Mehta
09.30–10.00 a.m.	Endo-luminal brachytherapy	N. Mummudi
10.00–10.30 a.m.	Challenges in BT planning	R. Mhatre
10.30–11.00 a.m.	Interactive session	
10.30–12.45 p.m.	**Session VII: Poster & best paper presentation**	Chairs: S. Agarwal, V. Ananad
12.45 p.m.	Valedictory function	

Abstracts for presentations

Best oral paper presentation session

Combined external beam radiotherapy and vaginal brachytherapy versus vaginal brachytherapy in stage I, intermediate-, and high-risk cases of endometrium carcinoma

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Purpose: Randomized trials on the effect of external beam radiotherapy (EBRT) with or without vaginal brachytherapy (VBT) for endometrial carcinoma are very few. In view of this, the current study was conducted with the hypothesis: whether the escalated dose of 26 Gy (VBT alone) in comparison with various major international trials (PORTEC-2) has any difference in rates of disease-free and overall survival with fewer adverse effects in low resource setting like India.

Material and methods: An open-labelled, non-inferiority, randomized control trial was undertaken at a regional cancer center among patients with stage IA or IB with high- and intermediate-risk endometrial carcinoma. A total of 50 patients were divided equally among two arms of combined EBRT with VBT (arm I) and VBT alone (arm II). A dose of 50-50.4 Gy in 25-28 fractions of EBRT with 2 fractions of VBT 6.5 Gy each were delivered to patients in arm I and 4 fractions of VBT 6.5 Gy each to patients in arm II, and were followed-up for 60 months.

Results: During the median follow-up of 36.5 months, two patients developed loco-regional recurrence in arm II, three (arm II), and one (arm I) developed distant metastasis. The 5-year survival rates for arms I and II were 96.0% vs. 92.0% overall, and 88.0% vs. 84.0% disease-free, respectively, and were not found to be statistically significantly different (Table 1). Dermatological, gastro-intestinal toxicities, and cystitis were lower in the VBT group compared to combined group (Figure 1).

Conclusions: VBT alone is as effective as EBRT + VBT in ensuring loco-regional control and achieving comparable survival rates, with fewer toxic effects for patients with stage I intermediate- and high-risk endometrial carcinoma. The dose escalation did not make a difference in the survival rates and was like in the other major trials (PORTEC-2).

Table 1. Comparison of disease-free survival and over-all survival among both the arms

Survival		Events/total	Estimated 5-yr (%; 95% CI)	Hazard ratio (CI)*	Log-rank, *p*-value*
Disease-free survival	Arm-I	1/25	96 (77.0-99.0)	1.00	0.30
	Arm-II	3/25	88 (68.0-97.0)	2.30 (0.23-23.05)	
Overall survival	Arm-I	2/25	92 (72.0-98.0)	1.00	0.39
	Arm-II	4/25	84 (63.0-95.0)	1.97 (0.36-10.86)	

**Adjusted for FIGO staging and grades (FIGO – International Federation of Gynecology and Obstetrics)*

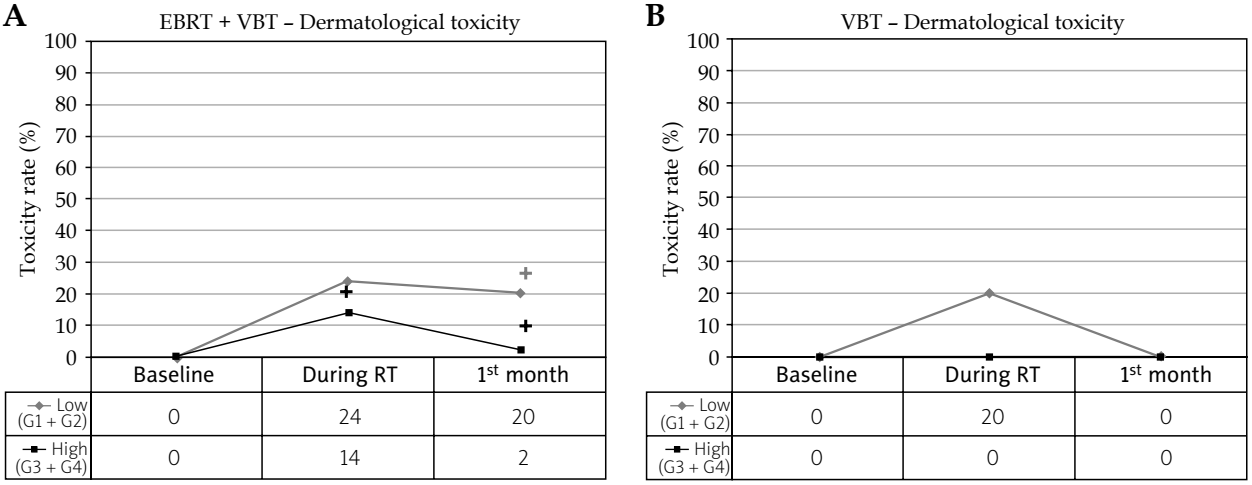

Fig. 1. A-B) Dermatological toxicity in arm I and II

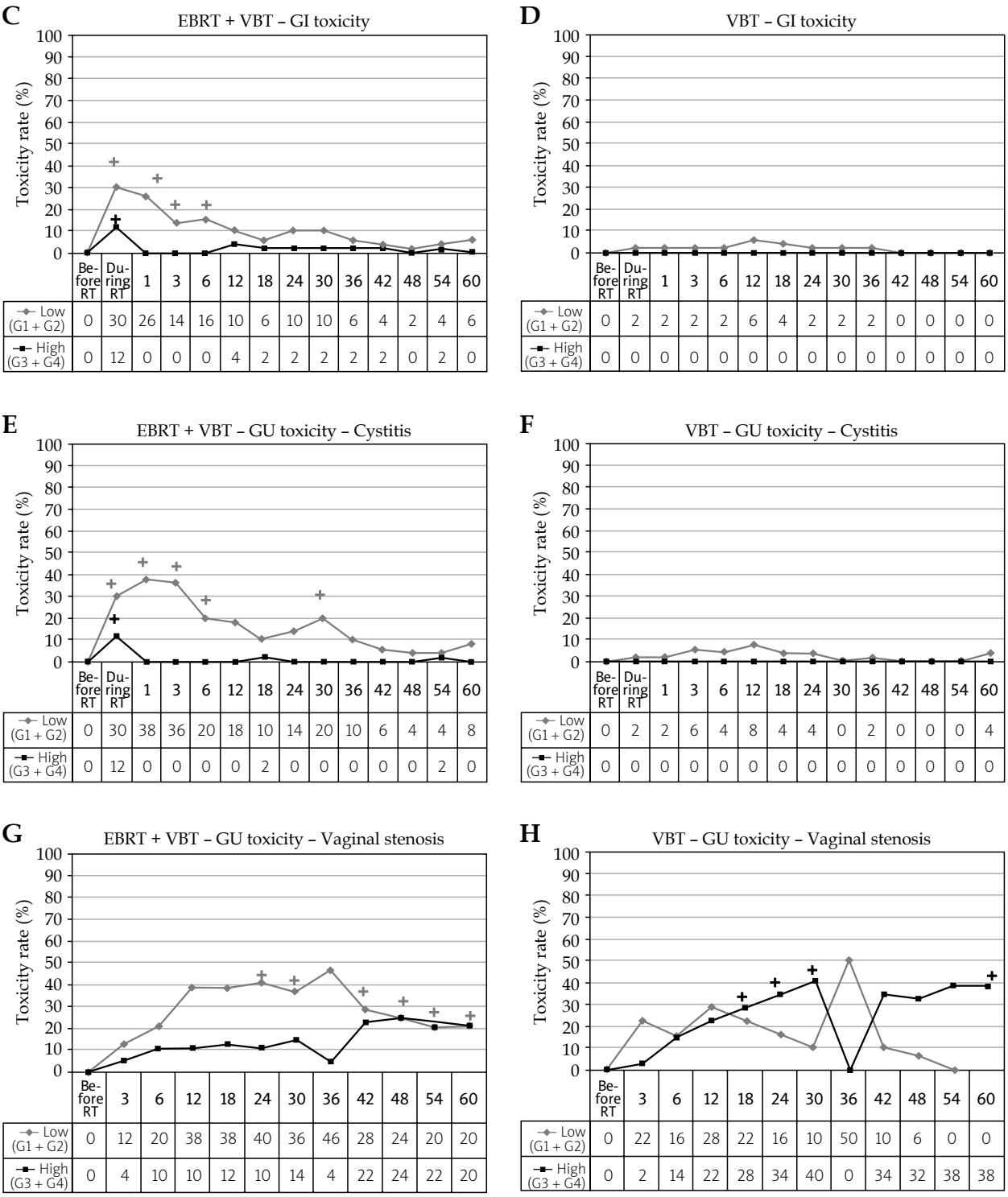

Fig. 1. Cont. **C-D)** Gastro-intestinal toxicity in arm I and II; **E-F)** Genito-urinary toxicity (cystitis) in arm I and II; **G-H)** Genito-urinary toxicity (vaginal toxicity) in arm I and II

Rectal toxicity in intracavitary brachytherapy for carcinoma cervix with retroverted uterus: A retrospective analysis

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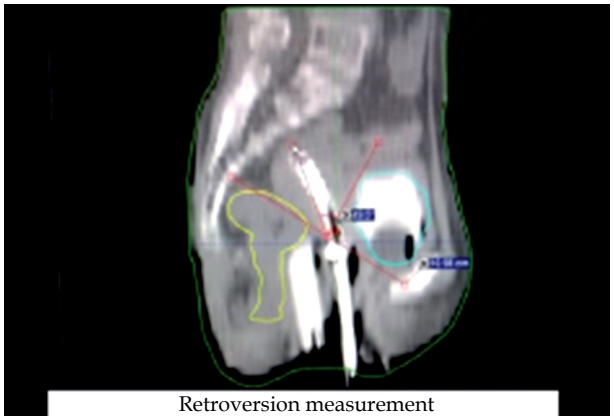
Purpose: Intracavitary brachytherapy for cancer cervix with retroverted uterus has been both a procedural and therapeutic dilemma for a long time. This study was designed to associate applicator type and geometry with rectal dosimetry and incidence of clinical rectal toxicity, so in a center like ours without USG guidance, alternative factors predicting long-term rectal sequelae of ICBT could be developed and followed.

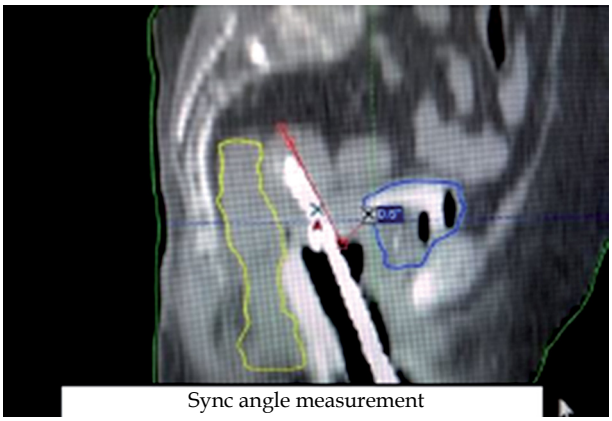
Material and methods: A total of 16 patients of cervix cancer with retroverted uterus were treated in our institution between January 2013 till December 2016 by EBRT ± concurrent CT followed by ICBT. Point A/HR CTV D_{90}, degree of retroversion of uterus, applicator types, tandem angle, range of sync between tandem angle and uterine axis, insertion length, separation length, uterine perforation, mean rectal D_{2cc}, D_{1cc}, $D_{0.1cc}$, converted to EQD_2 was correlated with clinical incidence of rectal toxicity as measured by the CTCAE version 4.0 and grade of RP, as measured by colonoscopic exam if done.

Results: The use of Fletcher type applicator in increasing degree of retroversion resulted in both higher mean D_{2cc}, D_{1cc}, and $D_{0.1cc}$, and increased incidence of grade 3 and 4 rectal toxicity than Manchester type. Independent of the applicator types range of sync between tandem axis and uterine axis was identified as better predictor for improved therapeutic ratio, including target organ coverage and rectal sparing than tandem angle alone in terms of dosimetry but this association was not reflected in terms of clinical rectal toxicity. Tandem length > 4 cm and empty bladder was associated with lesser rectal dose irrespective of applicator type and tandem angle; in addition, Fletcher type with full bladder was associated with both higher rectal dose and increased grade 3 and 4 rectal toxicity.

Conclusions: Overall Manchester type applicator results in better treatment outcome in ICBT for cervix cancer with retroverted uterus. However, larger sample and proper EBRT rectal dose calculation is needed for validation.



Retroversion measurement



Sync angle measurement

Intraluminal brachytherapy boost after external beam radiotherapy in carcinoma esophagus

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Purpose: Concurrent chemoradiotherapy (CTRT) is the standard of care for unresectable esophageal cancer patients. Radiotherapy dose escalation by external radiotherapy (EBRT) accompanies severe acute and late morbidities. By means of intraluminal brachytherapy (ILBT), dose escalation is possible with relative sparing of normal structures. Aim of the study was to evaluate the response to EBRT followed by ILBT boost for unresectable esophagus cancer patients.

Material and methods: Fifteen patients of carcinoma of the mid/lower esophagus, received concurrent CTRT. Barium swallow for response assessment was repeated 2-3 weeks after EBRT. All patients received two sessions

Table 1. Clinical parameters (n = 15)

	No of patients
Age at presentation	
< 50	5
> 50	10
Gender	
Male	8
Female	7
H/o addiction	10
Co-morbidities	9
Histology	
SCC	13
Adenocarcinoma	2
EBRT dose	
40 Gy/20#	9
35 Gy/15#	6
Concurrent chemo	8

of ILBT (6 Gy in 2 fractions), one week apart. Universal plastic bougie was inserted on OPD basis. A margin of 2 cm was given to residual tumor in superior and inferior direction. Dose was prescribed at 8 mm from midline and treatment was delivered by a high-dose-rate ^{60}Co source (Figure 1). Response evaluation was done at 1 and at 3 months after treatment completion.

Results: Clinical parameters are shown in Table 1. Baseline dysphagia score was grade I, II, III, and IV in three, five, five, and two patients, respectively. Treatment was well tolerated. All patients had symptomatic relief and no patient developed grade III toxicity. Ten patients completed three months follow-up (minimum follow-up: one month). Dysphagia score at one-month follow-up was grade I, II, and III in ten, three, and two patients, respectively. No patient had grade IV dysphagia after treatment. Two patients had persistent cough. Both patients were managed conservatively after once trachea-esophageal fistula was ruled out.

Conclusions: ILBT can deliver high tumoricidal dose to tumor with potential improvement in the therapeutic control and relative sparing of normal tissue. It can also be used as an alternative to stent placement for dysphagia palliation, especially when disease volume is not high and long-term palliation is likely to occur.

Endo-luminal brachytherapy with induction chemotherapy and definitive chemoradiation: A systematic overview of technique, symptomatic consequences overall survival, and toxicities

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Purpose: Remote areas and low-cost centers in rural India do not have access to surgical infrastructure and qualified personnel to operate locally advanced esophageal carcinoma. Further, esophagus carcinoma has a terrible response despite multimodality treatment. This study examines if dose escalation with endo-luminal brachytherapy after induction chemotherapy and definitive chemo-radiation is feasible in this case. Objective: To evaluate dysphagia-free interval, overall survival, and toxicity profile in endo-luminal brachytherapy in locally advanced esophagus cancer with induction chemotherapy and definitive chemo-radiotherapy.

Material and methods: 31 patients with biopsy proven locally advanced esophageal cancer stage IIA-IVA with negative node status were enrolled in the study at Vydehi Hospital, Bangalore from January 2006. Patients received ILRT 5 Gy/2#, following definitive external beam radiation therapy 50.4 Gy/28# with concomitant 3-weekly CDDP/5-FU, following six cycles of cisplatin. Swallowing status was established in follow-up. Overall survival was censored at death or last follow-up. Statistical analysis was performed using SPSS.

Results: All 31 patients completed the treatment. Median age of recruitment was 62.5 years. 3.22% had T2N0M0 disease, 87.09% had T3N0M0 disease, and 9.6% had T4N0M0 disease. 87.09% had squamous cell carcinoma histology; 12.91% had adenocarcinoma histology; 83.97% received chemotherapy. 96.77% completed radiation therapy according to protocol. 35.48% of the patients are still alive. Median dysphagia-free survival was 10.5 months and median overall survival is 18 months. 25.8% developed dysphagia after dysphagia-free interval. 6.4% had worsening of dysphagia. Two patients developed CHF after 4 years, whereas one patient developed left breast fibrosis at 4 years.

Conclusions: Endo-luminal brachytherapy with induction chemotherapy and definitive chemo-radiation is a feasible option in the absence of conventional alternatives.

Assessment of role of intraluminal brachytherapy as a palliative treatment in advanced esophageal cancer

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Purpose: This study aims to assess an improvement in dysphagia, associated complications, and overall and disease-free survival with intraluminal brachytherapy (ILRT) as palliative care in advanced esophageal cancer.

Material and methods: Thirty-four patients were treated with high-dose-rate ILRT with or without external radiation therapy from 2009 to 2017 at our institute. Patients were assessed for various parameters including disease stage, length of lesion, KPS, and as per grade of dysphagia at presentation. The patients received median dose of 6 Gy at 1 cm off axis for 2 fractions, one week apart. Fourteen patients were treated radically, and 20 patients post-EBRT. Multivariate analysis was used to assess the predictors for dysphagia improvement. Remissions of dysphagia and other clinical and radiological factors were assessed in the first month post-treatment, and then in the third, sixth, and twelfth months. The survival rate was compared with some chosen clinical factors using a log-rank test and the Kaplan-Meier method.

Results: Patients were followed-up as per standard institute protocol. Median dysphagia-free survival was 12 months. Stricture was seen in 3 patients and ulceration noted in another 2 patients. However, no tracheoesophageal fistula or procedure related complications were noted. Complications were seen in the post-EBRT group. The overall survival in the cohort was 12 months and was better post-EBRT as compared to radical ILRT ($p < 0.001$). On multivariate analysis, stage of disease ($p = 0.02$), size of lesion ($p = 0.018$), and grade of dysphagia ($p = 0.023$) were found to be predictors for improved outcomes with the use of ILRT in palliation.

Conclusions: Brachytherapy in the form of ILRT in advanced esophageal cancer provides good palliation with minimal complications, and improved survival and quality of life to patients.

Best poster presentation session

Pediatric rhabdomyosarcoma and role of interstitial brachytherapy: Single institute case report

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Purpose: Rhabdomyosarcoma (RMS) is most common childhood soft tissue sarcoma, accounting for 5% of all pediatric malignancies, and extremity RMS constitutes 20% of all pediatric RMS. Children with non-metastatic RMS can be cured in more than 70% of cases with appropriate multimodality therapy. We present a case report, since brachytherapy forms an integral part of treatment in extremity RMS.

Case details: A four years boy presented with a painless soft tissue swelling over right upper arm from 5 months and underwent excision with histopathology showing spindle cell variant RMS with focal pleomorphism. IHC was positive for desmin, myogenin, and SMA, while negative for S-100, CD 34, and EMA. PET CT showed residual disease but no evidence of metastasis. He received neoadjuvant chemotherapy with vincristine, ifosfamide, and etoposide. On examination, there was nodularity palpable at operated site, so in view of strong clinical suspicion, he was taken for revision surgery and placement of interstitial catheters over tumor bed. Ten catheters were placed in single plane covering the tumor bed. High-dose-rate (HDR) brachytherapy was started after 7 days, and 34 Gy in 10 fractions were delivered with 2 fractions daily, with a minimum gap of 6 hours.

Results: On dosimetric assessment, volume of CTV was 22.4 cc. D_5 was 5.2 Gy, D_{10} was 6.6 Gy, D_{50} was 3.9 Gy, and D_{90} was 2.6 Gy. V_{50}, V_{100}, and V_{150} were 100%, 79.4%, and 33%, respectively. Patient was followed-up as per institutional protocol and after 6 months, he was found to be disease-free. No significant toxicity was noted.

Conclusions: HDR brachytherapy is an integral part of multimodality therapy for treating extremity RMS with a good local control and minimum side effects.

Dosimetric evaluation of brachytherapy of carcinoma cervix: An in-house phantom study

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Purpose: Radiation dose assessment is done with the quantification of doses received by the reference point and projecting this to a given depth. A more realistic and accurate way is with the help of humanoid phantoms. An anthropomorphic heterogeneous female pelvis phantom suitable for dosimetric evaluation of various brachytherapy applications for the treatment of carcinoma cervix, in which different dosimeters could be used was fabricated.

Material and methods: Computed tomography (CT) images were obtained as per departmental protocols; delineated structures and external contour were altered or smoothed in shapes as required for milling. The electron density of the materials chosen for fabrication was based on HU to electron density calibrations.

Results and discussion: Physical and dosimetric properties: the phantom was simple to assemble and could be repositioned with no discernable displacement. The CT numbers of the phantom materials and those of the delineated regions on the CT of the patient used to model the phantom were sampled using the Eclipse planning system and indicates agreement. ICBT treatment planning and measurements using the fabricated phantom: the dose measured with TLDs were compared with TPS calculated dose in different locations in the phantom like point A, bladder, rectum, left femoral head, and right femoral head. The average measured dose agreed with the TPS calculated dose.

Conclusions: The fabricated phantom is a representative female pelvis, realistic in size and anatomy, and suitable for the evaluation of cervix cancer treatments. The materials chosen approximates tissue, organ, and bone densities, and allows for distinguishable structures in treatment planning. The fabricated phantom can accommodate TLDs and ion chamber for measurements; however, provision can be made to use film, chemical dosimeters, and OSLDs. The dosimetric evaluation confirms that the fabricated phantom can be used for the verification of dose delivery in intra cavitary brachytherapy.

Can brachytherapy help organ preservation in penile cancer: A single institute case report

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Purpose: Incidence of penile cancer ranges from 0.7-2.3 cases per 100,000. Standard treatment for localized tumor in early stage is partial amputation. Organ preservation can be considered in penile cancers, which can help improve the quality of life of these patients with high-dose-rate brachytherapy. BRT can also help reduce toxicity compared to EBRT to surrounding urethra and

uninvolved penile regions. We present such a case treated with BRT.

Material and methods: A 54-year old male presented in our OPD with a painless, non-healing ulcer over glans penis, and on staging investigations was staged as cT1a N0 M0, squamous cell carcinoma of glans penis. Patient underwent circumcision and was taken for penile brachytherapy. Total 5 catheters were placed after assessing the tumor volume. The patient was taken for planning CT scan on same day after procedure. The plan that delivered the best dose to clinical target volume was selected for final treatment. The dose to skin, entry and exit points of catheters were monitored and were kept within normal range. Patient received 42 Gy in 14 fractions over 8 days, twice daily, at least 6 hours apart.

Results: Patient was followed-up as per institution protocol and after 12 months, he was disease-free on clinical and imaging evaluation. On dosimetric assessment, V_{100}, V_{150}, V_{200} were 85.6%, 29.5%, and 11.9%, respectively. D_{2cc} and D_{5cc} were 61.2%. D_{80}, D_{90}, and D_{100} were 103.4%, 96.4%, and 61.2%, respectively. Organs at risk assessed included the shaft of penis and penile urethra, and doses were less as compared to similar EBRT plans. The patient on follow-up had no significant toxicity related to penile and urethral strictures/fibrosis.

Conclusions: Interstitial brachytherapy is an established treatment option in management of early stage penile malignancies, which helps in providing organ preservation and improve quality of life.

Clinical outcome with high-dose-rate surface mould brachytherapy in carcinoma of hard palate. Single institute experience

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Purpose: Surface mould brachytherapy (SMB) is a useful tool.

Case details: A 52-year-old male, known case of right buccal mucosa, treated with surgery and adjuvant radiation therapy in June 2017, presented with small painless ulcerative lesion over central portion of the hard palate in April 2018. He was staged clinically and as per the advised imaging as localized early T1 or T2, node negative lesion in hard palate. He was planned for surface mould brachytherapy. Patient mould was prepared with followed by three-dimensional CT planning carried out with the mould in situ. Number of catheters used were 5. Treatment was delivered using HDR Ir192 source to a dose ranging from 40 Gy with 400 Gy per fraction, using bid regimen in 5 days.

Result: The patient was followed-up as per institute protocol. After 3 months follow-up, the patient was loco regionally controlled. The dosimetric parameters for the normal organs at risk were assessed through dose volume histograms and found to be within the prescribed safety limits.

Conclusion: Surface mould brachytherapy can be considered as an effective treatment modality in recurrent or early hard palate tumor with improved dosimetry and sparing of normal organs at risk.

Does graphical optimization increase vaginal morbidity? A retrospective single institutional dosimetric analysis of vaginal dosimetry in cervix patients treated with image-guided brachytherapy

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Purpose: Optimizing the dose to high-risk clinical target volume (HRCTV) and keeping the various normal tissue doses like D_{2cc} to rectum, bladder, and sigmoid within acceptable limits has been the cornerstone of image-guided brachytherapy practice. Graphical optimization is a commonly used optimization technique in modern computerized brachytherapy planning. This study aimed to analyze vaginal dose in cervix patents who were planned by use of graphical optimization in image-guided brachytherapy.

Material and methods: 60 treatment plans of 12 patients were retrospectively evaluated. These patients underwent external beam radiation therapy (EBRT) to a dose of 46 Gy in 23 fractions, followed by brachytherapy (BT) to a dose of 28 Gy in 4 fractions. An anatomical vaginal reference point was defined at the level of the posterior – inferior of symphysis (PIBS), plus two points ± 2 cm (mid/introitus vagina). For BT, extra points were selected for the upper vagina at 12/3/6/9 o'clock at the level of vaginal surface and at a depth of 5 mm. Vaginal reference length (VRL) was defined from top of vagina to PIBS.

Results: The mean values of total equivalent dose of 2 Gy (EQD_2) at PIBS and ± 2 cm were 51.79 Gy (38.21-67.12 Gy), 98.06 Gy (51.51-199.63 Gy), and 19.72 Gy

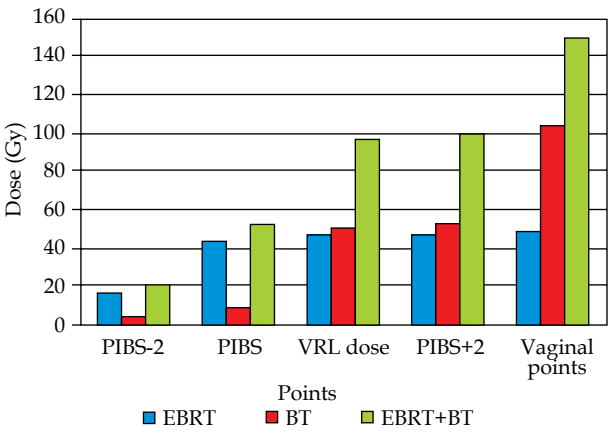

Fig. 1. Dose vs. various reference points

(4.86-52.24 Gy), respectively. Vaginal surface doses were 168.95 Gy (97.45-254.89 Gy), 163.98 Gy (118.55-268.02 Gy) at 3/9 o'clock and 156.36 Gy (90.13-290.36 Gy), 107.55 Gy (49.45-214.57 Gy) at 12/6 o'clock, respectively. Mean VRL was 4.97 cm (2.87-7.38 cm). The doses resulting from both EBRT and BT along with total EQD_2 value for all above points are shown in Figure 1.

Conclusions: No significant increase in vaginal doses was observed in the studied cohort of patents who had undergone a graphical optimization-based treatment planning. It is important to notice the vaginal dose points along with other critical structures during the graphical optimization.