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Original Research Article

Acceptance of advanced radiation therapy in a remote new radiotherapy facility of central India: an analytical observational study

Gopa Ghosh[1]*, Ganesh Patel[2], Ankit Agarwal[1], Aniket Goenka[3], Rashmi Jain[1]

[1]Department of Radiation Oncology, Chirayu Medical College and Hospital, Bhopal, Madhya Pradesh, India
[2]Department of Radiotherapy and RM, Institute of Medical Sciences, BHU, Varanasi, Uttar Pradesh, India
[3]Department of Medicine, Chirayu Medical college and Hospital, Bhopal, Madhya Pradesh, India

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***Correspondence:**
Dr. Gopa Ghosh,
E-mail: gopaghosh571@yahoo.in

ABSTRACT

Background: For more than 50% of cancer cases requiring radiotherapy, some 500-odd radiation facilities in India widely cater to urban areas and big towns. Few studies indicate that one of the potential strategies to limit geographic disparity is to build cancer centers in areas of need or to develop compact fully mobile linacs to facilitate access of rural population and reduce travel. This study was designed to evaluate feasibility of an advanced radiation center at the block/tehsil level, asses acceptance of new technologies, evaluate compliance to treatment in terms of daily attendance and treatment breaks, compare total duration of treatment among various techniques.
Methods: Histopathologically proven cancer cases from May 2016 to December 2022 reported in a new tehsil-level tertiary radiotherapy facility in central India were included in this observational study.
Results: Total of 2869 cases from various sites were evaluated and advised to be treated with radiotherapy in the department of radiation oncology from May 2016 to December 2022. Over a while shift in trend from 3D CRT to IMRT with image guidance and from 2021 few cases of SBRT to metastatic sites have been observed amongst physicians and patients with reduced toxicity along with improved patient compliance.
Conclusions: Advanced radiation treatment at semi urban/tehsil level is well accepted and feasible.

Keywords: Advanced radiotherapy, Decentralize radiation, Feasibility

INTRODUCTION

Globally cancer cases are expected to rise by more than 50% and cancer deaths is expected to be more than 40%. India with an incidence of 14.6 lacs cases in 2022, 1 in 9 people is likely to develop cancer in his/her lifetime.[1]

For more than 50% of cancer cases requiring radiotherapy, some 500 plus radiation facilities in India, majority are catering to urban areas and big towns. Hence rural and remote area patients have to travel long distances and be away for a very extended period which deters acceptance and compliance to treatment significantly.[2,3] Few studies also indicate that one of the potential strategies to limit geographic disparity is to build cancer centers in areas of need or to develop compact fully mobile linacs mounted on semitrailers that would facilitate access of rural population and reduce travel burden but still, no comprehensive evaluation is possible to analyze mobile radiation oncology systems.[4,5] Several researchers have concluded that rural residents are 1.6 times more likely to have an incompletely staged disease and less likely to receive indicated radiotherapy and decentralisation of radiotherapy facilities is still the most viable step to bridge the need and access gap.[6-8] Our radiotherapy facility is a tehsil/block level semiurban/ rural tertiary center located outside the city limits of Bhopal, offering advanced radiation treatment techniques like IMRT, IGRT, VMAT, SBRT and treating

primarily the rural population of Central India. The first vital beam which is a cost-competitive radiotherapy platform version of Trubeam introduced in April 2015 after necessary regulatory clearance and FDA approval for clinical use was installed in our hospital in February 2016.[2] After commissioning on March 2016 treatment with this machine of cancer patients started in May 2016. This study was designed to evaluate acceptance of new technologies like IGRT, VMAT, SBRT, evaluate compliance to treatment in terms of daily attendance and treatment breaks, compare the total duration of treatment among various methods as compared to 3D CRT.

The first vital beam for clinical use in India was commissioned and has been operational in our center since May 2016. Hence, we conducted the study to evaluate the acceptance and feasibility of advanced radiotherapy facility in tehsil/block level of India. Analyse acceptance of new techniques like IMRT, VMAT, SBRT in a hospital treating majorly the rural population and evaluate compliance in terms of daily attendance and treatment breaks among various techniques.

METHODS

Histopathologically proven 2869 cancer cases from May 2016 to December 2022 were reported in a new tehsil level tertiary radiotherapy facility of central India which is located in semi urban village outside the city limits of Bhopal in Chirayu Medical College and cancer hospital were included in this analytical observational study after institutional research committee approval. The decision to recruit a patient to a particular technique was based on the decision of the treating physician and the patient's choice.

Inclusion criteria

Inclusion criteria were patients treated with radiotherapy between May 2016 and December 2022.

Exclusion criteria

Exclusion criteria were patients treated with modalities other than radiation.

This study was approved by institutional Research committee. Ref number- cmch/OBGY/2019, Research project number- 2019/27date7.7.19.

RESULTS

This observational study was designed to evaluate acceptance and compliance to new technology among physicians and patients reporting to a new radiotherapy setup of our institute. A total number of 2869 cases of various sites presented in our institute from May 2016 to December 2022 were assessed and advised radiotherapy. Most of the cases were of head and neck cancer and cervical cancer. Total number of patients who presented from central India received radiotherapy with various techniques was 2858, majority were from rural population. Over a period of time shift in trend from 3D CRT to IMRT with image guidance was noted. From 2021 few cases who received SBRT at metastatic sites have been observed. Due to the increasing trend of acceptance of newer radiation techniques amongst physicians and patients with reduced toxicity, patient compliance was also good as reflected in acceptable breaks in the treatment course which was attributed to comprehensive counselling of the patients other than the conformal techniques.

Table 1: Site-wise distribution of cases.

Site	2016	2017	2018	2019	2020	2021	2022
Head and neck	138	206	214	170	132	210	250
Gynecological	38	48	59	42	27	59	72
Breast	69	82	65	57	15	22	29
Lung	20	19	16	9	5	2	4
Git	37	30	32	23	22	25	21
Gevitominary	16	15	5	4	9	8	15
Soft tissue sarcoma	3	5	8	2	4	3	6
Lymphoma	8	5	8	6	3	1	4
Leukemia	3	5	3	0	0	0	0
Skin	0	0	2	0	4	5	3
Bone	1	8	6	1	2	5	3
CNS	20	30	13	19	10	22	30
Testis	0	0	0	0	2	0	9
Others/palliative	15	51	62	25	61	20	22
Total	368	504	493	358	296	382	468
Grand total	2869						

Table 2: Technique wise distribution of cases.

Technique	2016	2017	2018	2019	2020	2021	2022
3D-CRT	236	364	307	133	75	36	14
IMRT/IMRI with image guidance	110	111	146	170	181	279	359
V-MAT	17	25	40	55	40	67	93
Total	363	500	493	358	296	382	466

Table 3: Average total duration of radiation treatment with various techniques site-wise.

Site	3D-CRT	IMRT	IGRT	RAPIC-ARC
Head and neck	50	46	44	51
Brain	30	43	40	43
Gastrointestinal	35	50	45	40
Genito urinary	35	-	43	38
Lung	40	67	46	-
Gynaecologic	35	43	-	-
Breast	33	45	-	-
Oesophagus	48	50	-	40

Overall duration of radiotherapy (RT) is between 40-60 days for various sites and is approximately similar for all techniques.

Analysis of choice of technique

Following were the reasons for choosing a particular technique in descending order: i) insurance cover or government funds like Ayushman Bharat; ii) affordability of self-financed; iii) awareness of various techniques.

Figure 1: Choice of technique in descending order.

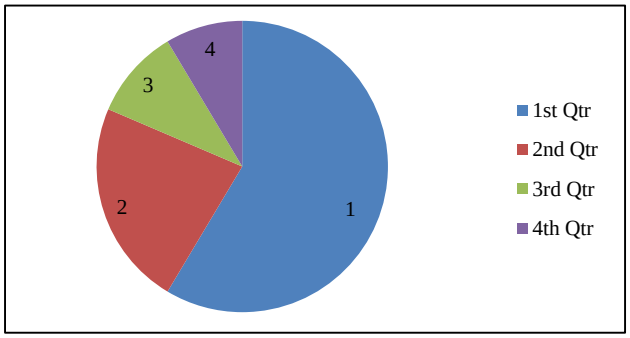

Figure 2: Reason for delay in treatment in decreasing order.

Reason of delay in treatment in decreasing order

Following are the reasons for delay in treatment in descending order: i) arrangement of finances; ii) insufficient counselling regarding relation between treatment duration to outcome; iii) fear of toxicity due to radiotherapy; iv) patient waitlist.

DISCUSSION

The incidence rate of cancer in India for the year 2022 was estimated to be 100.4/1,00,000 (1 in 9 is likely to develop cancer in his/her lifetime.[1] Hence, the availability of quality and affordable comprehensive cancer care and radiotherapy facilities is critical to cope with the rising incidence rate of cancer in India. Our present analytical study was conducted to evaluate acceptance and compliance of new radiotherapy technology and techniques among physicians and patients presented to an advanced radiotherapy setup for a period of 7 years, after the commissioning of a new cost-effective and cost-competitive technology package offering high-quality, high-throughput radiation therapy in March-2016, wherein data was analyzed in terms of techniques, reasons of delay and treatment breaks.[2]

In low middle-income countries (LMIC) like India it is believed that optimal RTU (radiotherapy utilization rate is >55% and may reach 70-80% in some situations. However, paradoxically the actual figure is nearly 25% hence Munshi et al in their study suggested unavailability, inaccessibility of RT facilities can be addressed by the judicious location of RT facilities and new installations.[3]

Dutta et al also evaluated in their study the existing gaps in RT infrastructure in LMIC's and additional

requirements to address the 2030 agenda for sustainable developments by the limited nations proposed, tele radiotherapy network (TRINET) as a viable and cost-effective option to create RT infrastructure and capacity building.[4]

Price et al in their simulation study assessed feasibility of a fully mobile radiation oncology system (FMRO) that enables relocation of a compact linac which could increase access to care and reduce travel times for patients using Monte Carlo simulation but still, there is no comprehensive evaluation of the feasibility of a fully mobile radiation oncology (FMRO) system that could give a flexible relocation option of a compact linac on a weekly or daily basis. They concluded technological success and economic viability of a FMRO depend on presenting technical, logistics, and quality assurance challenges.[5]

Hubler et al in their study proposed that hospital-associated radiotherapy interruption (HARTI) disproportionately affects socioeconomically disadvantaged urban patients and also affects middle-income suburban patients independent of race and insurance.[6]

Similarly, Wakefield et al analysed in their study that interruption of RT treatment disproportionately affects financially and socially vulnerable patients.[7]

Johnson et al cited in their study on treatment and survival that rural residents are 1.6 times more likely to have incompletely staged disease and less likely to receive radical RT, hence policies should be cognizant of where the people live and their socioeconomic status.[8]

All of the above and our present study emphasize the need for measures to address the geospatial and socioeconomic disparities in radiation treatment of cancer. The present study has the limitation of a lesser number of similar studies at present to draw more valid conclusions.

CONCLUSION

Recent technological advancements have increased the efficacy of radiotherapy, leading to effective management of cancer patients with improved outcomes. The main focus of each method is to image and delineate accurate tumour volume, maximize target volume coverage while sparing the OARs. Planning strategies like fusion with MRI and CT-PET have revolutionized radiotherapy treatment. To summarize feasibility of advanced radiotherapy in tehsil at semi-urban/rural level is well accepted and attainable. Radiotherapy facilities at periphery should.be analyzed as a potential strategy to span the need and access gap.

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REFERENCES

1. Kumar KS, Chaturvedi M, Das P. Cancer incidence estimates for 2022 and projection for 2025. Result from National Cancer Registry Programme, India. Indian J Med Res. 2022;156(4-5):598-607.
2. Vitalbeam™ radiotherapy. Infirmary cancer care. Available from: https://www.infirmaryhealth.org/infirmary-cancer-care/cancer-treatment-options/vitalbeam-radiation-therapy/. Accessed on 1 May 2023.
3. Munshi A, Ganesh T, Mohanti BK. Radiotherapy in India: history, current scenario and proposed solutions. Indian J Cancer. 2019;56(4):359-63.
4. Datta NR, Rogers S, Bodis S. Challenges and opportunities to realize "The 2030 Agenda for Sustainable Development" by the United Nations: implications for radiation therapy infrastructure in low-and middle-income countries. Int J Radiat Oncol Biol Phys. 2019;105(5):918-33.
5. Price AT, Canfield C, Hugo GD, Kavanaugh JA, Henke LE, Laugeman E, et al. Techno-economic feasibility analysis of a fully mobile radiation oncology system using monte carlo simulation. JCO Glob Oncol. 2022;8:e2100284.
6. Hubler L, Wakefield DV, Makepeace L, Shaban-Nejad A, Pisu M, Schwartz DL, et al. independent predictors of hospital-associated RT interruption. Adv Radiat Oncol. 2022;7(6) :101041.
7. Wakefield DV, Carnell M, Dove AP, Edmonston DY, Garner WB, Hubler A, et al. Location as destiny: Identifying geospatial disparities in radiation treatment interruption by neighborhood, race, and insurance. Int J Radiat Oncol Biol Phys. 2020;107(4):815-26.
8. Johnson AM, Hines RB, Johnson III JA, Bayakly AR. Treatment and survival disparities in lung cancer: the effect of social environment and place of residence. Lung Cancer. 2014;83(3):401-7.

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