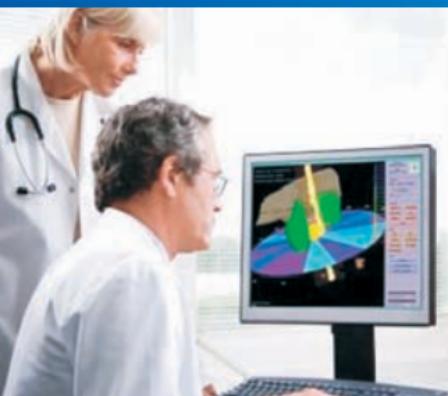


DEPARTMENT OF RADIATION ONCOLOGY

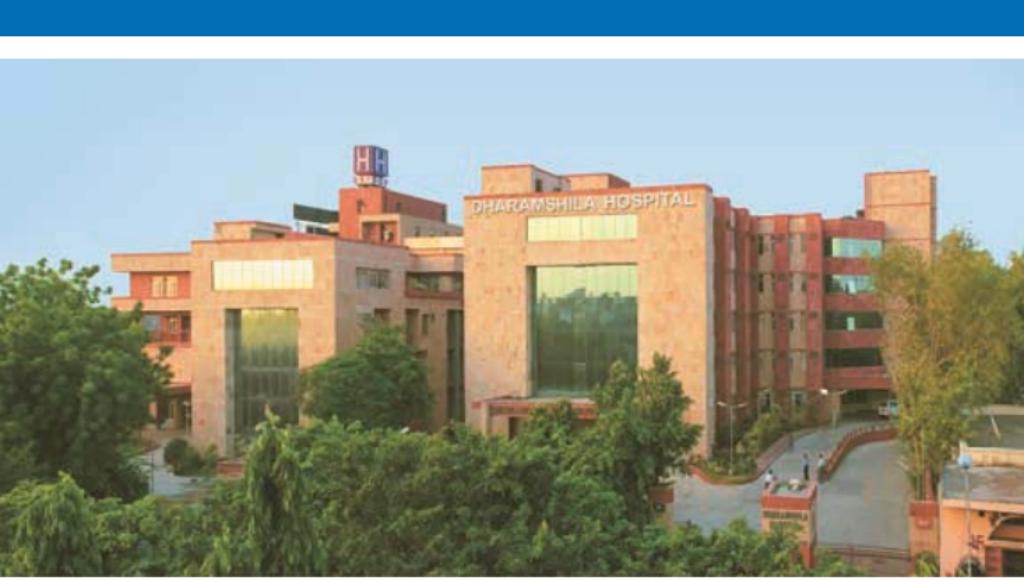


**Touching Human Lives with
State-of-the-art Technology**



**DHARAMSHILA
HOSPITAL**
YOUR PARTNER IN **CANCER** CARE

**India's First and only NABH Accredited Cancer Hospital
Laboratory Services are Accredited by NABL**



**Dharamshila Hospital
And Research Centre
(DHRC) is India's
First and only NABH
accredited Cancer
Hospital with NABL
Accredited labs.**

Dharamshila Hospital And Research Centre (DHRC) is India's First and only NABH accredited Cancer hospital with NABL Accredited labs. It is the largest cancer hospital of North India with a bed strength of 300. The hospital is fully equipped to handle complete cancer care, and provides facilities for Cancer Prevention, Early Detection, Diagnostic Workup, Radiotherapy, Surgery, Chemotherapy, Rehabilitation, Supportive and Palliative Care. DHRC has large number of cancer survivors who have successfully completed their treatment and are enjoying normal lives. We strongly believe that helping patients is more than just cancer care, it is human care. By innovations, we enhance human care standards because, **we care for life.**



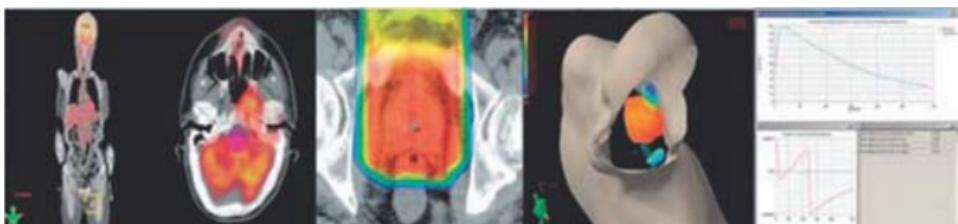
RADIATION THERAPY

Radiotherapy is a non-invasive modality of cancer treatment required by 50-60% of patients. It is least traumatic and most cost effective. It can be given alone as well as concomitantly with surgery / chemotherapy.

The radiation therapy has evolved to a large extent in the last decade with innumerable innovations in delivering safe, efficient and quality radiation with minimal dose in shortest time by using the VMAT technology. Radiation is usually given externally (Linear Accelerators) or internally (HDR Brachytherapy). Before radiation therapy is started, a detailed custom made computerised **Treatment Planning** is worked out for each and every patient.

TREATMENT PLANNING FOR RADIATION

It is an elaborate process requiring preparation of cast / mould for immobilization of the patient and Contrast CT Scanning at 3-5mm cuts of the tumour. CT images are directly transferred to the Treatment Planning System. On the basis of the images, contouring of the tumour is made on each section of CT scan along with critical structures. A prescription is worked out on the basis of tumour volume, nature of tumour and general condition of the patient. Physicist works out optimal field projection to the tumour area with minimal radiation to critical structures through Varian/Elekta Software developed for each type of treatment protocol like IMRT, IGRT, SBRT, SRS / SRT, VMAT and Respiratory Gating.



These plans are jointly evaluated by Radiation Oncologist and Physicist and the best plan is finalized for execution of treatment. Patient is then taken up for treatment. Once again the position verification (conformation of accurate treatment position) is done through 3D CT imaging or portal imaging on KV or MV basis which is incorporated in the Linear Accelerator.

TREATMENT DELIVERY

Radiation Therapy is given as a fractional treatment whereby the patient receives a daily dose of radiation, five days a week for six to seven weeks for radical treatment. On each daily treatment the position is verified and the Linear Accelerator is rotated around the patient so that the entire tumour receives an optimal radiation dose and normal tissues (around the tumour) receive minimum dose.



Elekta Synergy with VMAT

The geometry and intensity of the radiation field is adjusted to match the size and shape of the tumour and the type of cancer. Treatment beam is shaped using a Multileaf Collimator (MLC) within the Linear Accelerator head that functions like the aperture of a camera.

DEPARTMENT OF RADIATION ONCOLOGY

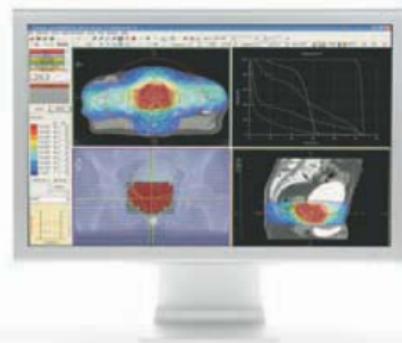
The Department of Radiation Oncology at Dharamshila Hospital And Research Centre was started with a Cobalt Machine in 1994 and High Dose Rate Brachytherapy was added in 1997. The Department has been continuously adding newer technologies by commissioning Siemen's Dual Energy Primus Linear Accelerator in 2002, Varian's Clinac DBX in 2005 with IMRT capabilities and has now added Elekta Synergy with VMAT in 2010 with IMRT, IGRT, SBRT and SRS / SRT, VMAT and Respiratory Gating capabilities. This constant pace of innovation yields the potential for greater accuracy, short treatment time, reduced integral dose (one tenth, to prevent damages to healthy tissues surrounding the tumour), increased tumour control probability and above all possibility of modulating the radiation intensity with single or multiple arcs.

Equipments available:

- Linear Accelerators (Elekta Synergy with VMAT and Varian Clinac DBX)
- Treatment Planning Systems (Eclipse, CMS Xio, MONACO, ERGO++ and Plato Sunrise)
- Remote Afterloading HDR Brachytherapy (Nucletron)
- Physics Equipment:
 - Various types of ion chambers
 - IMRT QA phantom
 - IMRT QA Software with film scanner
 - ArcCHECK for IMRT and VMAT plan verification
 - Radiation Field Analyser (RFA)
- Mould Room Equipments:
 - All types of thermoplastic sheets
 - Vaclok
 - All types of base plates
- CT Simulation with online transfer of images to TPS, ARIA and MOSAIQ online record and verify system.



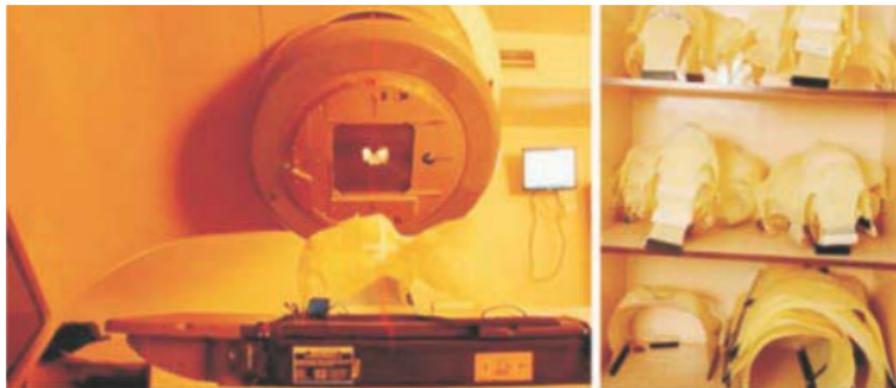
Clinac DBX



Treatment Planning on ERGO++ TPS



Remote Afterloading HDR Brachytherapy



Different types of Mould Room Equipments

HIGHLIGHTS OF LINEAR ACCELERATORS

Our Linear Accelerators have capability to deliver Intensity Modulated Radiation Therapy (IMRT), Image Guided Radiation Therapy (IGRT), Stereotactic Radio Surgery (SRS), Stereotactic Radio Therapy (SRT) and Stereotactic Body Radiation Therapy (SBRT), Volumetric Modulated Arc Therapy with 4,6,15, MV Photons and 4, 6, 8, 10, 12, 15 and 18 Mev Electrons. The cutting edge technology comes with the following features :

Volumetric Modulated Arc Therapy (VMAT)

It is a next generation arc therapy technique that has established new standards for Radiation Therapy by reducing the treatment delivery time to few minutes. This reduces the potential for patient motion and enables better patient comfort and tolerance. It is most suitable for very sick patients, elderly and children.

VMAT gives

- Full 40X40cm Uninterrupted Field Size
- Variable Gantry Rotation Speed
- Continuous Collimator Angle Optimizations
- Single or Multiple Super- imposing Arcs
- Coplanar or Noncoplanar Arcs
- Active Leakage Reduction

Multileaf Collimators with Dynamic Movement - Sophisticated IGRT and IMRT tools, including micro Multileaf Collimators for SRS, SRT and SBRT

Portal Imaging and CBCT for patient position verification

Record and Verify System

Database Storage about the treatment and its parameters

Very fast delivery of IMRT plans

Sequence Mode Imaging allowing true evaluation of patient motion during treatment position.

BENEFITS OF VMAT TECHNOLOGY

FOR PATIENTS

- Personalized, safe, efficient and high quality Radiation Therapy.
- Enhanced dose conformance as per tumour size, shape and Pathology.
- Reduced (1/10th) total radiation dose to prevent occurrence of second primary tumours.
- Reduced treatment time (1/6th) to prevent inconvenience.
- Minimal side effects/complications.
- Higher tumour control probability.

FOR PHYSICIANS

- Portal imaging and CBCT for patient position verification.
- Largest (40 X 40 cm) uninterrupted field size.
- Sequence mode imaging allowing true evaluation of patient motion during treatment.
- Image and treat patients at the same frame of reference, visualizing soft tissue details.
- Ultralow dose and 3D Volumetric Imaging to minimize treatment margins without compromising safety.
- Modulating radiation intensity with single / multiple superimposing arcs.
- 4D adaptive IGRT and fastest delivery of IMRT plans.

IMAGING AND POSITIONING

Our Linear Accelerators offer both MV, KV and XVI (CT) imaging at the time of treatment. High conformance radiation treatment modalities require precise positioning, immobilization and organ motion management. To address the issue of motion management, Dharamshila Hospital offers range of solutions for the entire body i.e. Body Fix, Active Breathing Coordinator, Head Fix, SRS / SRT frames etc.



Patient setup using Dynamic Multileaf Collimator

RADIATION APPLICATIONS

Intensity Modulated Radiation Therapy (IMRT)

This highly complex and promising technique was started at Dharamshila Hospital in 2005. Now, IMRT is being delivered through VMAT techniques in a continuous arc around patient effectively, from infinite delivery angles; reducing the integral dose to one tenth and treatment time to few minutes. *IMRT is used for tumours arising from Head and Neck, Brain, Lungs, Lymphomas and Gynaecological Cancers.*

Image Guided Radiation Therapy (IGRT)

IGRT has been evolved to enable clinicians to treat the tumours that move with internal motion. IGRT provides a very effective means for mitigating the risk of tumor motion. Real time image guidance and adaptive

radiation therapy involves constantly imaging the motion of the tumour during treatment delivery and changing beam delivery on the fly to compensate for undesired motion. *IGRT is most suitable for Tumours of the Prostate, Urinary Bladder and Mobile Portion of Tongue.*

Stereotactic Radio Surgery (SRS)/Stereotactic Radiotherapy (SRT)

SRS is a non-invasive procedure, *best suited for treating Intracranial Tumours, Vascular Malformations and Small Extracranial Lesions.* Significantly higher doses of radiation are delivered over significantly shorter treatment sessions (1-5). The benefit lies in the potential for better tumour control with higher doses, as well as the sharper dose profile used, targeting cancerous tissue while sparing surrounding healthy critical structures.

Stereotactic Body Radiation Therapy (SBRT)

It is mainly used for small tumours which lie very close to critical structures in the body where a high precision dose delivery is needed to Avoid long term morbidity. *SBRT is used for patients with Spinal, Paraspinal and Lung Tumours.*

Respiratory Gating

Respiratory Gating is mainly used for tumours in Chest which move with breathing. The movement of the tumour is controlled by breath control. *Respiratory Gating is suitable for Tumours of Breast, Lung etc.*

Brachytherapy

Brachy means near, therapy means treatment. Brachytherapy is delivered by placing the radiation sources (^{192}Ir) near the tumour. Our multichannel Microselectron HDR with TCS remote after-loading, system is a dedicated machine which delivers radiation in and around the tumour. Brachytherapy can be given as under :

- **Intracavitary** for Cancer Cervix, Cancer Uterus.
- **Intraluminal** for Cancer Oesophagus and Bronchus
- **Interstitial** for Breast Cancer, Soft Tissue Sarcoma (after initial surgery), Prostate, Pancreatic Tumour etc.
- **Surface Mould** for Superficial Cancers specially Skin Cancer.

PATIENT'S SURVEILLANCE DURING RADIOTHERAPY

Radiotherapy produces some side effects which are directly related to volume of tumour, dose of radiation and anatomical sites. All these side effects are temporary and subside on completion of radiotherapy. Weekly clinical evaluation follow-up is done by Radiation Oncologist to see the overall progress of treatment and any associated problems. On completion of treatment, patient is given the summary of treatment.

TEAM

The Department has a team of highly qualified, skilled and trained radiation oncologists, physicists, radiation technologists and mould room assistants. The entire team works together with other departments in a multidisciplinary approach, practicing evidence based medicine and follow international treatment protocols, to achieve best treatment outcomes.

FACILITIES AVAILABLE

Oncology OPDs		Physics Equipment	
Medical Oncology	G.I. Oncology	Various Types of Ion Chambers	
Radiation Oncology	Neuro Oncology	IMRT QA Phantom	
Surgical Oncology	Tumour Board	IMRT QA Software with film scanner	
Gynae Oncology	Pain Clinic	ArcCHECK for IMRT and VMAT plan verification	
Uro Oncology	Psycho-Social Counseling	Radiation Field Analyser (RFA)	
Cancer Screening		Mould Room Equipments	
Specialities/Superspecialities/OPDs		CT Simulation with on line transfer of images to TPS, ARIA and MOSAIQ online record and verify system.	
Cardiology	Internal Medicine	Surgery	
Dental	Nephrology & Urology	Seven Operation Theatres Complex	
Dermatology	Neurology & Neuro Surgery	Endoscopy Suite	
ENT	Ophthalmology	Post Op. Wards and Surgical ICU	
Endocrinology & Diabetology	Orthopaedics	Chemotherapy	
Gynae and Obst.	Paediatrics & Paed. Surgery	Normal & High Dose including Dose-intense & Dose-dense	
Gastroenterology	Plastic Surgery	Infusional Multiple & Single Drug	
Gastro Intestinal Surgery	Psychiatry	Bolus Chemotherapies	
General & Laparoscopic Surgery	Pulmonology	Intra-arterial Chemotherapy	
Health Checkup Packages		Targeted Therapies	
Radiodiagnosis and Imaging		Immunotherapy / Biological Therapies	
Gamma Camera for Nuclear Scans		Harmonal Therapies	
Digital Spiral CT Scanner		Neutropenic Care	
Mammography		Nutritional Therapy	
Ultrasonography		Palliative and Supportive Care	
Digital Radiography		Pharmacy	
CT and Ultrasound guided procedures		Blood Bank	
C-Arm		Packed Red Cells	Whole Blood
Cardiopulmonary Lab		Single Donor Platelets	Fresh Frozen Plasma
ECGs, TMT, Pulmonary Function Tests (PFT), Holter Test, Echocardiography with Colour Doppler		Platelet Concentrate	Stem Cells
Lab Investigations		Physiotherapy & Occupational Therapy	
Cytology	Tumour Markers	Audiology & Speech Therapy	
Histopathology	Haematology	Wards	
Cytopathology	Biochemistry	Super Deluxe	Deluxe
Frozen Sections	Clinical Pathology	Semi Deluxe	Single
Immunohistochemistry	Microbiology	Double	Semi Paying
Cytocentrifugation	Serology	Economy	Indigent
Linear Accelerators		ICU (Medical & Surgical)	
IGRAT, IMRT, 3D Coformal Treatment		Academics	
Stereotactic Body Radiation Therapy (SBRT)		DNB Programmes (Medical, Radiation & Surgery)	
Stereotactic Radio Surgery (SRS) and Stereotactic Radio Therapy (SRT)		Fellowship Programme for Head & Neck Oncology and Onco Pathology	
Volumetric Modulated Arc Therapy (VMAT)		Post Basic Diploma for Nursing Oncology	
Remote Afterloading HDR Brachytherapy		Diploma Courses for Technicians	
Treatment Planning Systems		Outreach Programmes on Cancer Awareness, Education & Detection	
(Eclipse, CMS Xio, Monaco, ERGO++ Plato Sunrise)		Continuous Medical Education	
		Cancer Information Literature	
Support Services		Research	
		Prayer Room, Peace Room	
		Guest House	
		Cafeteria, Dining Hall	
Dietary Services		Dietary Services	
		Kitchen, Dining Hall etc.	



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