



Alexandria University  
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**Dosimetric Comparison of Mixed Energy Intensity Modulated  
Radiotherapy and 3D conformal Radiotherapy Plans for  
Prostate Cancer**

Thesis submitted to the Medical Research Institute  
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In Partial Fulfillment of the Requirements for the degree of

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**In**

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## 7. SUMMARY

Prostate cancer is the most common cancer and second most common cause of cancer related mortality in men. Radiotherapy and surgery are considered as definitive treatment for prostate cancer beside to adjuvant chemotherapy or hormonal therapy. Three dimension conformal radiotherapy and intensity modulated radiotherapy requires focus of radiation fields according to tumor size description, position of tumor and tumor depth inside the body, these plans of radiation aims to treat target tumor with high radiation dose and reduce radiation dose to organ at risk to minimum . Each plan depend on factor to deliver dose includes two dimension planning or three dimension planning system, type of radiation energy , number of fields and its directions used , these factors effects quality of treatment and reduce side effects to surrounding organs such bladder , rectum and both head of femur.

These study used linear accelerator dual energy (Siemens), multi slice computed tomography and three dimension planning system and simulator.

The aim is to study Dosimetric Comparison of Mixed Energy Intensity Modulated Radiotherapy and 3D conformal Radiotherapy Plans for Prostate Cancer.

These study where done as following:

- Simulation is done for 40 prostate cancer patient in spine position, patient underwent computed tomography with 2 mm thickness in each slice, patient is asked to full their bladder and to empty their rectum, CT images is sent to treatment planning system.
- Target definition is done at images of CT for prostate and seminal vesicles and counterimg for bladder, rectum and femoral heads is done also.
- Three dimension conformal radiotherapy is used to deliver dose of 74 cGy to prostate as target and to spare organ at risk using multileaf collimator in three phases.
- In three dimension conformal radiotherapy 7 field technique is used in boost after using of box technique for phase one , for these 7 fields in each plan we used different arrangement for their energy ,and divided into three groups with enegies of 6 MV alone , 15 MV alone and mixed energies 6 + 15 MV .
- Intensity modulated radiotherapy is used to deliver 81 cGy to prostate as target and to spare organ at risk using 7 fields technique with modulated intensity for each beam for 2 phases .
- In intensity modulated radiotherapy fields arrangement where the same in conformal radiotherapy according to energy.

## Summary

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- Dose volume histogram analysis is done to all planes to compare which plan is better to achieve radiotherapy goals of minimizing dose to critical organs.
- Beams with energies more than 10 MV generate photon-neutron interaction leading to neutron contamination

These study shows that in 3D conformal radiotherapy , better distribution to dose and more spare to organ at risk in mixed energies plans where there was not a big difference between the use of mixed energies and energy 15 MV plans ,it also shows independent of intensity modulated radiotherapy on beams energy, where 6 MV plans and mixed energies plans gives better dose to target and more spare to organ at risk and also IMRT plans gives better dose distribution to prostate and decreased dose to organ at risk than 3D conformal radiotherapy.

The study recommended the use of mixed energies plans in three dimension radiotherapy to eliminate neutron contamination, the use of 6 MV & mixed energies plans in intensity modulated radiotherapy plans. And also intensity modulated radiotherapy Improved tumor control probability, Reduce radiation induced toxicity and Improved critical tissue spring