Role of Bhabhatron in Cancer Care in India

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Abstract

Health care has been one of the thrust activities of Department of Atomic Energy. Various radioisotopes, produced from nuclear reactors, are being used for cancer treatment. Radiotherapy, using cobalt-60 is the most cost-effective and the most relevant method of cancer treatment in India. However, there is acute shortage of radiotherapy machines in the country, due the high cost of imported machines. Bhabhatron was developed to meet the demand for affordable telecobalt machines. Compared to any imported unit, the indigenous machine is cheaper and superior in features. Bhabhatrons are installed in many cancer hospitals in the country.

***Keywords**: Bhabhatron, telecobalt, cancer treatment, teletherapy*

Introduction

Department of Atomic Energy (DAE) has given high priority to health care, especially for cancer treatment. DAE has been funding cancer hospitals for cancer research and setting up of treatment facilities. Many radioisotopes, produced in research reactors and power reactors in the country, are being used for diagnosis, treatment of diseases and sterilisation of medical products. DAE has also been in developing tools and techniques for treating the killer disease. Bhabhatron, the indigenous telecobalt machine, is one of the successful products developed by Bhabha Atomic Research Centre (BARC), Mumbai for cancer treatment.

Cancer is a major health problem in India. There are about 25 lakh cancer patients in the country. Every year, about eight lakh new cases are detected and more than five lakh patients die, due to this dreaded disease. Moreover, the cancer incidence in the country is expected to double in next 15 years. Established methods of cancer treatment are radiotherapy, surgery and chemotherapy. A majority of the patients need radiotherapy during the course of treatment. Being the most cost-effective, teletherapy using cobalt-60 is the most relevant method of cancer treatment in a developing country like India.

There are only a limited number of teletherapy units in the country. Many of them are old, needing immediate replacement. Most of the cancer treatment facilities are located in urban areas, while the vast rural areas remain untouched. Many states and more than 80% of the districts in the country do not have any teletherapy machine. Although, more than two-third of cancer patients need radiation therapy, only about one-third of them receive the therapy, due to the shortage of therapy units and urban-centric distribution of radiotherapy centres. This alarming shortage is due to the lack of affordable telecobalt machines. Therefore, there is an immediate need to increase the number of teletherapy units to at least three-fold. Bhabhatron was developed to meet the growing demand for affordable high-performance telecobalt machine.

Fig. 1 A patient being treated in Bhabhatron

Bhabhatron

The first unit of Bhabhatron was installed at Advanced Centre for Treatment, Research and Education in Cancer (ACTREC), Navi Mumbai in 2005. First patient was treated in the machine on June 5, 2005 (Fig. 1). In addition to treating more than 50 patients daily, the machine was used for blood irradiation and cancer research. Source capacity (250 RMM), source to axis distance (80 cm) and maximum field size (35 cm x 35 cm) of Bhabhatron are same as those of the best telecobalt machines in the world. Bhabhatron provides many superior features. One of the unique features of Bhabhatron is its fully closable collimator, providing improved radiation safety. Computer control of Bhabhatron makes it more user-friendly and safer. However, the major advantage of Bhabhatron is its low cost, making it affordable to many cancer hospitals.

Fig. 2 Bhabhatron-II

Bhabhatron-II

Based on the operational experience of the first machine, BARC has developed Bhabhatron-II, an advanced telecobalt machine (Fig. 2). The machine has better performance parameters and improved user interface. Its lower power consumption and battery back-up makes it suitable for rural India. First unit of Bhabhatron-II was installed at Indian Red Cross Society Cancer Hospital (IRCS), Nellore, Andhra Pradesh. The then Honourable President of India, Dr A. P. J. Abdul Kalam dedicated Bhabhatron-II to the service of the nation in 2006.

BARC has transferred the technology of Bhabhatron to a private industry, for commercialisation. Now Bhabhatrons are installed in many cancer hospitals; so far, twelve machines are installed and more are under fabrication. Based on the Programme of Action for Cancer Therapy (PACT) of IAEA, Government of India is donating one Bhabhatron-II to Socialist Republic of Vietnam. The unit will be shortly commissioned at Can Tho Oncology Hospital, Vietnam.

Related Developments

BARC has developed a container for transportation of telecobalt sources, which has to meet stringent safety requirements. After regulatory approvals from AERB, the container is being used for transportation of telecobalt sources.

BARC is developing a Radiotherapy Simulator for diagnosis and localisation of tumours. The simulator is similar to a teletherapy unit, but uses diagnostic X-ray as the source of radiation. It can localise the target volume, delineate affected region and define irradiation field with respect to the target volume and organs at risk. The simulator also helps in choosing the radiation beam and aiming it to the target.

Conclusion

Bhabhatrons are installed in many cancer hospitals in the country. Compared to any imported telecobalt machines, the indigenous machine is cheaper and superior in features. Bhabhatron can play a major role in meeting the growing demand of good quality and affordable machines. Hospitals across our vast country, including smaller hospitals located in semi-urban areas, would be able to afford and run these units. The development is expected to result in reduction in cancer treatment cost and wide spread of treatment facilities in India and other developing countries.