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Radiotherapy of Nasopharyngeal Cancer at Dr. Kariadi Hospital

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ABSTRACT

This study aims to determine the nasopharyngeal cancer radiation technique at Dr. Kariadi Hospital because people with nasopharyngeal cancer are not only young adult men under the age of 50 years, but now there are many cases of nasopharynx starting to attack adolescents in their teens and also elderly people. age above 50 years. The results showed that there was no special preparation for the radiation of nasopharyngeal cancer. The nasopharyngeal cancer radiation procedure goes through several stages, namely the stage of diagnosis and consultation, the positioning stage, immobilization and CT simulator, the counturing stage, the treatment planning system, the verification stage and the radiation stage. Radiation is carried out by Linac modality using the Intensity Modulated Radiation Therapy or IMRT technique so that the maximum dose will be obtained for the tumor and the minimum dose in healthy tissue. The total dose given is 70 Gy with 2 Gy / fractionation.

Keywords: nasopharyngeal cancer, radiotherapy, IMRT.

INTRODUCTION

Nasopharyngeal carcinoma (NPC) is a unique cancer of the head and neck area. It has a very different geographic incidence variation with more than ten times the incidence difference in high-risk populations compared to low-risk populations. No other head and neck cancer has this variation in incidence worldwide. It remains the most common cancer in young adult men under 50 years of age [1]. Diagnosis of nasopharyngeal carcinoma is made by biopsy of the primary tumor. This can usually be done under local anesthesia in an outpatient setting. Immediate visualization biopsy under general anesthesia may be required for diagnosis when the tumor is not visible or when the patient is unable to cooperate. It is not uncommon for the tumor to be submucosal and invisible. For suspicious cases of primary nasopharyngeal tumor with unseen tumor, most commonly involved random biopsy sites are warranted: pharyngeal recess (fossa of Rosenmüller) on the lateral and superior posterior nasopharyngeal walls, respectively. Fine needle aspiration of a suspicious neck mass may indicate metastatic nasopharyngeal carcinoma in regional lymphatics. This can be done before nasopharyngeal biopsy if the primary tumor cannot be detected clinically [2]. CT and MRI scans before and after treatment are generally recommended for NPC. A complete physical examination should include thorough palpation of the neck, examination of the cranial nerves, percussion and auscultation of the chest, possible palpation of the abdomen for liver involvement, and percussion of the spine and bones for possible bone metastases. CT and MRI of the head and neck are useful in the evaluation of tumor erosion into the bony base structures of the skull along with retropharyngeal and cervical lymphadenopathy. However, MRI is the preferred image in the staging evaluation of nasopharyngeal carcinoma [2].

Relatively inaccessible anatomy and radiosensitivity have made radiotherapy the main treatment at all stages of cancer. The endemic form of cancer is almost always associated with the Epstein Barr virus (EBV), making the EBV viral marker the first tumor marker clinically applicable to head and neck cancer. A large-scale population study has demonstrated the feasibility of using EBV DNA titres to perform population screening for NPC in at-risk populations with survival benefits [3].

The combination of chemotherapy and radiation significantly improves survival in NPC patients. Since then, chemotherapy has had a role gradually clarified by many clinical trials [4]. Different treatment regimens have been used widely in clinical practice or in clinical trials to achieve better efficacy. In addition, with the advent of intensity-modulated radiotherapy (IMRT), locoregional control has improved dramatically, and a 10% increase was reported in the IMRT group compared to those in the group receiving the conventional modality [5].

Radiotherapy intensity-modulation technique or IMRT is mandatory in this treatment. Gross tumor volume includes primary tumors and enlarged lymph nodes, the high-risk clinical target volume is defined as gross nasopharyngeal tumor volume plus a margin of 5–10 mm (2–3 mm posterior if adjacent to the brainstem or spinal cord) covering microscopic sites. high risk of extension and throughout the nasopharynx. Low risk clinical target volume is defined as a clinical high-risk target volume plus a margin of 5–10 mm (2–3 mm posteriorly if adjacent to the brainstem or spinal cord) including the skull base, clivus, sphenoid sinus, parapharyngeal space, pterygoid fossa, posterior nasal cavity, retropharyngeal node area and elective neck area from level IB to V. Radiotherapy was performed with 5 (F) weekly fractions of 70 Gy / 33 Fractions or 68 Gy / 30 Fractions (2.12 Gy or 2.26 Gy / Fractions). Concomitant chemoradiotherapy (CCRT) was given 3 weeks after the start of the last cycle of cisplatin and 5-fluorouracil (TPF) in intervals [6].

The overall survival rate for early stage NPC patients is around 90% or better [7], but for NPC patients who have progressed locoregally, it is still unsatisfactory. About 60–70% of newly diagnosed NPC patients come with stage III-IVB disease [8].

The author finds that many cases of NPC are not only in young adult men under the age of 50 years, but now there are many cases of NPC starting to attack adolescents in their teens and also elderly people over 50 years old, therefore the authors are interested in conducting research in this case. NPC with Linac modality uses the IMRT technique.

METHODS

The type of research in the writing of this paper is qualitative research with a case study approach which aims to study and analyze information about Nasopharyngeal Cancer Radiation Techniques at Dr. Hospital. Kariadi Semarang. As research subjects in this paper are Radiation Oncologists, Medical Physicists, and Radiographers at Dr. Kariadi Hospital Semarang. This research was conducted in the Radiotherapy Unit of the Radiology Installation at the Dr. Kariadi Hospital, Semarang. The research method used by the author is the method of observation by observing directly during the examination process, the method of in-depth interviews to obtain oral information from the respondents and the method of documentation study to document relevant data.

RESULTS AND DISCUSSION

After the patient fulfills all the administrative requirements according to the flow of new patient registration in the radiotherapy unit, the cervical cancer radiation procedure can be carried out in stages from the initial planning to the radiation and evaluation. The examination procedures for cervical cancer patients are as follows:

1. Patient Preparation

There are no special preparations for the radiotherapy radiation examination, but there are some general preparations that must be done. General preparations include the patient performing radiological examination protocols such as examinations, ultrasound examinations, blood laboratory CT Scan / MRI, and PA laboratory results. After the files and administrative requirements are complete, the patient will be irradiated according to the predetermined schedule.

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2. CT Simulation

Patients will be subjected to radiation planning in the CT Simulator room, according to Perez [2] the research is leading to the integration of a diagnostic CT scanner with what is essentially a three-dimensional (3D) treatment planning system, which leads to the concept of virtual simulation. Such systems are now referred to as CT simulators and consist of a CT scanner, a flattabletop patient position alignment system, including an orthogonal laser system, and a digital interface (DICOM) to a planning system equipped with virtual simulation software. The simulation software provides many advanced image display and manipulation features, including a b eam's-eye view, which allows anatomy to be viewed from a radiation beam perspective and allows field formation to be performed electronically in a graph display station, and the creation of digitally reconstructed radiographs. The modern CT simulation system combines a large diameter CT scanner specially designed for radiation oncology, with multislice capabilities, a high-quality, high-quality laser patient positioning / tagging system. In order to achieve the best therapeutic ratio, each step in the radiotherapy procedure (localization of gross tumor and target volume, immobilization, optimization of dose fractionation, determination of treatment technique, and accuracy of radiotherapy delivery) is important. For planning, the patient should be placed in a supine position with the head extended for adequate separation between the primary tumor / retrofaryngeal node and the upper neck node. The uvula and the occiput base should be in a plane parallel to the axis of the beam. The patient is immobilized with a thermoplastic mask that covers the head to shoulder area.

According to Oncolink [9], at this stage the radiation oncologist will determine the location of the body that will receive the radiation, then the best positioning and immobilization aid will be selected to reduce patient movement based on radiation techniques and objectives that can be applied always the same or reproducible in every radiation fraction. In addition to the location and position of the oncologist, the oncologist also determines the radiation dose that will be given to the patient. The main objective of radiotherapy is to provide the optimal dose to the target tumor volume but with the smallest dose to the surrounding organs at risk. To achieve this goal, the IMRT technique can be used. Accuracy and accuracy in providing radiation are the most basic things in radiation techniques. In order to achieve maximum accuracy and precision, precise positioning and immobilization is one of the main requirements. According to Susworo [10], the patient's comfortable position must be considered, this greatly determines the accuracy and accuracy of the radiation. Patients who are not in a comfortable position will result in a poor reproducible set up. Positioning the patient and using immobilization devices is one of the important processes in the simulation in the CT Simulator room. Positioning and immobilization between the CT Simulator room and the radiation room must be the same. In addition to positioning and immobilization, markers need to be install that aim to determine the reference point to help set up radiation. The complete CT Simulator data is then sent to the TPS for radiation planning.

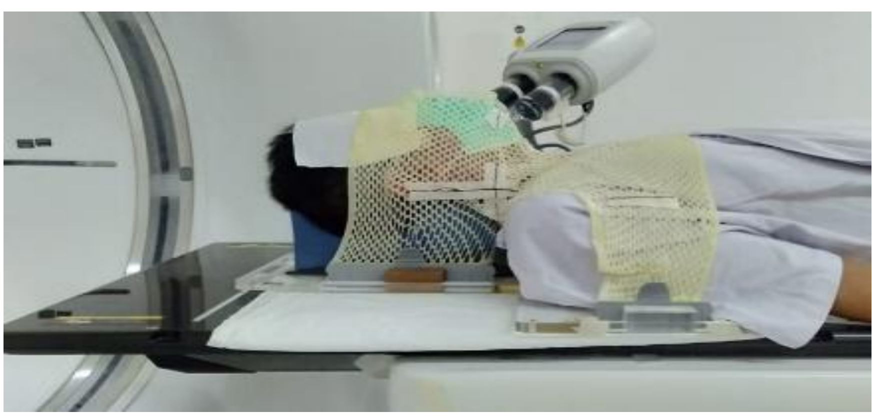

Figure 1: Position of the patient wearing a mask during the CT simulator for preparation radiotherapy nasopharyngeal

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3. Treatment Planning System (TPS)

The data entered from the CT Simulator will be analyzed and processed by doctors and medical physicists. According to Susworo [10] to obtain a homogeneous radiation dose on the tumor mass or to avoid critical organs, radiation planning is required based on the curve of each energy in a certain field area. The doctor delineates the target volume or counting, while the medical physicist will determine the direction of irradiation and the shift in the point of irradiation. According to Perez [2] The International Commission on Radiation Units and Measurements (ICRU) has recommended definitions of terms and concepts for radiation therapy treatment volumes and margins : The gross tumor volume (GTV) denotes demonstrable tumor. It includes all known gross disease including abnormally enlarged regional lymph nodes. In the determination of GTV, it is important to use the appropriate CT and/or magnetic resonance imaging (MRI) settings and, if appropriate, PET scan to give the maximum dimension of what is considered potential gross disease. The clinical target volume (CTV) denotes the GTV and subclinical disease (i.e., volumes of tissue with suspected tumor). The planning target volume (PTV) denotes the CTV and includes margins for geometric uncertainties. One also should account for variation in treatment setup and other anatomic motion during treatment such as respiration. Because the PTV does not account for treatment machine characteristics, the actual treated volume is that volume enclosed by an isodose surface that is selected and specified by the radiation oncologist as being appropriate to achieve the goal of treatment. It is impossible to design a radiation therapy treatment plan that limits the prescribed dose to the PTV only. Some tissues en route to the target or near the target also will be irradiated to the same dose as the target. The treated volume is, therefore, almost always larger than the PTV and usually has a somewhat simpler shape. The results of the Treatment Planning System will be transferred to the Linac data. The patient is given a total dose of 70 Gy irradiation with the IMRT technique.

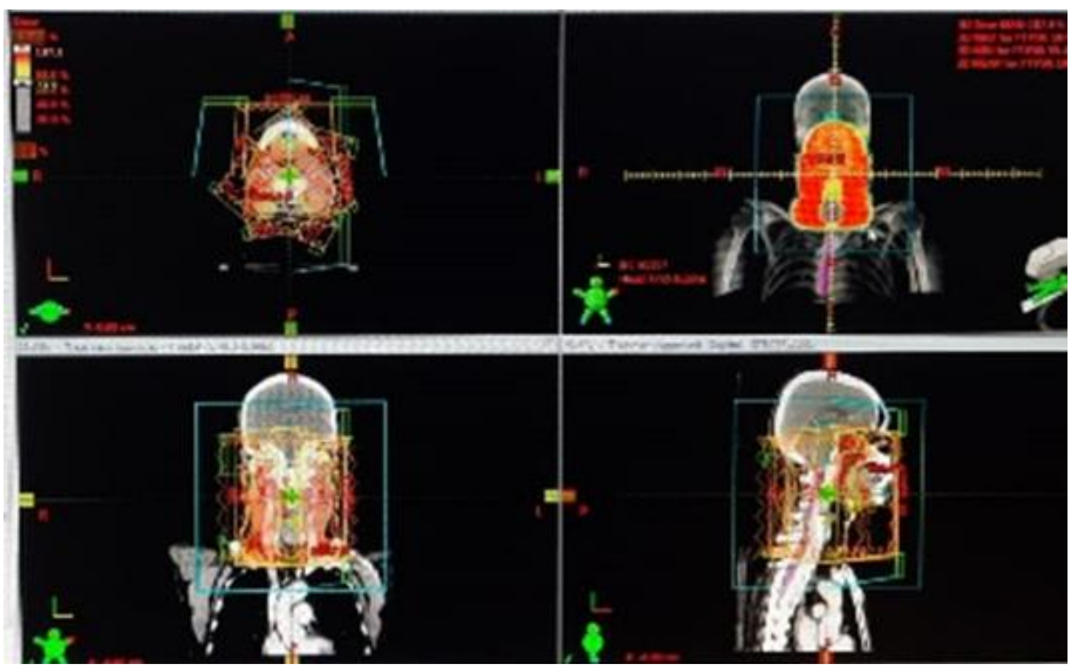

Figure 2: Results of the Treatment Planning System using the IMRT technique

4. Linac

External irradiation was carried out on the Linac modality. According to Khan's [11] Linear Accelerator or Linac, it is a device that uses high-frequency electromagnetic waves to accelerate charged particles such as electrons to high energy through a linear tube. The high-energy electron beam can be used to treat superficial tumors or it can be made to hit targets to produce X-rays to treat tumors that are located deeper. External radiation or

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teletherapy is a way of delivering radiation where there is a distance between the radiation source and the radiation target. With this technique a modality is placed that emits radiation on the target organ. Patient data from TPS are programmed in the Treatment Calendar. Before the irradiation is carried out, it will be verified first. Verification is a process to ensure that the tumor volume radiation is the same as the radiation performed in the radiation modality. Verification is done by comparing pictures or data from the therapy plan or treatment plan with the radiation that is done. Verification can use image information or data from both 2D and 3D systems which will be corrected in translation (x, y and z) or rotation (degrees). There are two steps of verification in radiotherapy, namely geometric verification to ensure radiation is in the right location and dosimetric verification to ensure that the correct radiation dose is given. After verification, obtaining approval from a radiation oncologist, then the radiation oncology is performed using the IMRT technique.

According to Perez [2] IMRT has replaced conventional radiotherapy in the treatment of nasopharynx in many institutions around the world. Radiation intensity can be modulated to deliver high doses to tumors with superior target volume coverage while significantly limiting the dose to approximately normal tissue following the initial process.

Radiation must be carried out routinely as planned, there should be no delay because it will result in decreased control of cancer and affect the survival of nasopharing cancer.

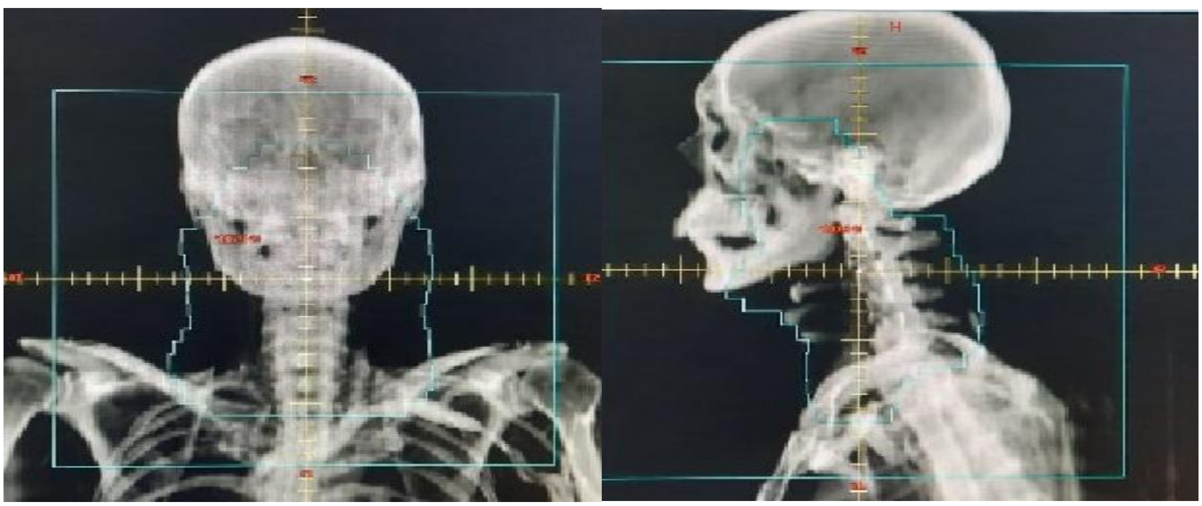

Figure 4: Anteroposterior and lateral portal images for verification

Figure 5: Position of the patient when external radiation by using Linac modality

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CONCLUSION

There is no special preparation for the examination of nasopharyngeal cancer radiation at Dr. Hospital. Kariadi, but there are general preparations for nasopharyngeal cancer radiation examinations, namely attaching supporting examination files such as ultrasound, blood laboratory, PA laboratory and CT Scan / MRI examination results. Procedure for examination of nasopharyngeal cancer radiation with the linac tool modality at Dr. Hospital. Kariadi went through several stages, namely the stage of diagnosis and consultation, the positioning stage, immobilization and CT simulator, the counturing stage, the treatment planning system (TPS), the verification and radiation stages. Radiation was carried out using the Linac modality with the IMRT technique. The total dose given is 70 Gy with 2 Gy / Fractionation.

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