

Assessment of Thyroid Absorbed Dose during Breast Radiotherapy with TLD and Treatment Planning Methods and Its Relation with Radiotherapy Field

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Abstract- Three dimensional breast radiotherapy is the most common method carried out in all radiotherapy centers of the world including Iran. The objective of this study is to investigate the thyroid absorbed dose during breast radiotherapy with TLD and treatment planning methods and its relation with radiotherapy field. Thirty female patients with breast cancer were included in this study. All patients were candidates for radiation therapy for breast and lymph node regions. Three-dimensional treatment planning system was then designed using the Eclipse software. For each patient, a treatment was designed for both medial and lateral tangential fields and the anterior supraclavicular. Three TLDs were putted for each patient to measure dose received by thyroid gland. The thyroid absorbed dose during breast radiotherapy with TLD and treatment planning methods and its relation with radiotherapy field were assessed. Results indicated that the dose received by the thyroid lobes in same side was significantly higher than the dose received by thyroid lobes in contrary side ($P<0.05$). The dose received by thyroid lobe in same side from supraclavicular field was higher than the dose received from tangent field ($P<0.05$), and the received dose from tangent field was reversely proportional to vertical distance from upper edge of the tangent field ($P<0.05$). Conclusively, the dose received by thyroid from supraclavicular field is higher than the dose received from tangent field.

Index Terms- Breast Cancer, Radiotherapy, Thyroid, TLD.

I. INTRODUCTION

BREAST cancer is a prevalent cancer occurring in women [1]. In the world, breast cancer is the fifth most common cause of cancer death. In 2005, breast cancer caused 502,000 deaths (7% of cancer deaths; almost 1% of all deaths) in the world. Among all women in the world, breast cancer is the most common cancer [2]-[4]. Radiation therapy or radiotherapy, is therapy using ionizing radiation, generally as part of cancer treatment to control or kill malignant cells. It may also be used as part of adjuvant therapy, to prevent tumor recurrence after surgery to remove a primary malignant tumor. The subspecialty of oncology that focuses on

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radiotherapy is called radiation oncology. Radiation therapy is commonly applied to the cancerous tumor because of its ability to control cell growth. To spare normal tissues (such as skin or organs which radiation must pass through to treat the tumor), shaped radiation beams are aimed from several angles of exposure to intersect at the tumor, providing a much larger absorbed dose there than in the surrounding, healthy tissue [5]-[6].

Three dimensional breast radiotherapy is the most common method carried out in all radiotherapy centers of the world including Iran. The objective of this study is to investigate the thyroid absorbed dose during breast radiotherapy with TLD and treatment planning methods and its relation with radiotherapy field.

II. MATERIAL AND METHODS

Thirty female patients with breast cancer were included in this study. After obtaining informed consent, the CT scan with computer simulation was used as a diagnostic scan CT in patients. All patients were candidates for radiation therapy for breast and lymph node regions. Three-dimensional treatment planning system was then designed using the Eclipse software. For each patient, a treatment was designed for both medial and lateral tangential fields and the anterior supraclavicular. For most patients, the shield for thyroid lobe was embedded in line with supraclavicular field. Three TLDs (one in contrary side for entire treatment time, one in same side only during tangent radiotherapy and one during supraclavicular radiotherapy) were putted for each patient to measure dose received by thyroid gland. To evaluate the effect of body dimensions, the distances from upper edge of the tangent field and the center of supraclavicular field to LTD putted on thyroid were measured. The doses received by TLDs and their relations to radiotherapy field were analyzed.

III. RESULTS

The dose received by the thyroid lobes in same side was significantly higher than the dose received by thyroid lobes in contrary side ($P<0.05$). The dose received by thyroid lobe in same side from supraclavicular field was higher than the dose received from tangent field ($P<0.05$), and the received dose from tangent field was reversely proportional to vertical distance from upper edge of the tangent field ($P<0.05$). There was nonsignificant increase in the dose received by thyroid with shield compared to the thyroid lobes without shield.

There was not also significant difference in received dose by thyroid between patients with high, medium and short stature.

IV. DISCUSSION

In our study, we have shown that the dose received by thyroid lobe in same side from supraclavicular field was higher than the dose received from tangent field, and the received dose from tangent field was reversely proportional to vertical distance from upper edge of the tangent field. There are other reports indicating that received radiation by organs adjacent to breast during breast cancer radiotherapy may result in developing cancer in adjacent organs [7], [8]. Studies show that thyroid cancer may develop after breast cancer radiotherapy [9]-[11]. Risk of hypothyroidism also is increased in patients receiving radiotherapy out of breast cancer [12]-[15]. .

V. CONCLUSION

During breast radiotherapy, thyroid lobes receive a dose of radiation. The dose received by thyroid from supraclavicular field is higher than the dose received from tangent field. It is suggested that thyroid function to be assessed following breast radiotherapy to find any abnormal change in thyroid function and structure.

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