

Intraoperative Radiotherapy promoting early Breast Cancer Detection: An observational Review

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Abstract

Aim: The lack of structured breast cancer awareness programs (BCAP) in developing countries coupled by the scarcity of radiation oncology centers limit the available surgical options. The aim of this study is to Probe the use Intraoperative radiotherapy (IORT) treatment as a stem to initiate positive impact on early disease detection and propagate breast conserving surgery (BCS).

Materials and Methods: This observational review was undertaken at King Fahd hospital of the university, AL Khobar, Eastern province of Saudi Arabia between 2012- 2016. All patients diagnosed with breast cancer were reviewed. Strict recruitment criteria were adopted for patients to receive IORT. Selected candidates were only those who were eligible and consented to undergo BCS and IORT. Special emphasis was placed on demographic data, tumor size at the initial presentation, post Neo-adjuvant chemotherapy response, post-pathology cavity size and applicator size used.

Results: The total number of patients diagnosed with breast cancer were 330 out of which 69 (20%) patient were eligible for IORT. Age ranged from 31-75 years with the Median age 50 years. Applicator sizes used ranged from 2.0-5.0. Tumor size ranged between 0.6-4.0 centimeters. 1 (1%) was post pathology case with excision performed two weeks prior to presentation. 0-1 in 8(11%), 1.1-2 in 22(31%), 2.1-3 in 24(34%), and 3.1- 4.0 in 15 (21%) patients. 7(10%) patients received Neo-adjuvant chemotherapy with positive response and were included. The applicator sizes available ranged between 1.5-5.0 centimeters. Applicator sizes were size 2.0 in 2 (3%), size 2.5 in 10 (14%), size 3.0 in 18(26%), size 3.5 in 16 (23%), size 4.0 in 10 (14%), size 4.5 in 6 cases (9%) and size 5.0 in 7 cases (10%). Smaller applicator sizes 2.0-3.5 centimeter in diameter were used in 46 (66%) of cases suggesting that smaller lesions are currently been diagnosed.

Conclusion: The introduction of Intraoperative radiotherapy (IORT) intended as boost therapy is a break through treatment of early breast cancer. While developing countries remain disadvantaged by the lack of adequate radiotherapy centers to cover its population needs, IORT can offer an alternative solution for a selected subset of women with early breast cancer as an exclusive or boost therapy. Its positive impact on the early detection is well illustrated in this observational study. In addition, its use supported the promotion of BCS in early breast cancer thus, it braced a positive impact on early detection strategies.

Keywords: IORT, Intrabeam, Applicators, Early detection.

Introduction

The fast pace of urbanization in many developing countries coupled with the imposed changes in life style has resulted in many alterations in disease patterns. Breast cancer has shown increasing incidence over the last decades with young age and advanced disease at the initial presentations [1]. The unpopular Breast Cancer Awareness programs (BCAP) are focused on didactic educational lectures with repetitive information. These programs usually dish out basic knowledge on breast cancer, early detection methods,

and risk factors, however; they generally fail to fully disseminate information or disclose treatment options [2]. Radiotherapy as an integral treatment modality in cancer therapy that dictates its demand. In developing countries and countries with limited resources these facilities are scarce. They are expensive to establish, upgrade, and maintain. Stringent plans are needed to estimate the disease burden to be able to appreciate the cost that may be incurred by advanced disease [3]. The increase prevalence of breast cancer in our communities in recent years coupled by cultural stigma and the limited surgical options of liberal adoption of mastectomies alienate women from presenting with early disease [4]. In culturally

driven communities introducing IORT as boost or exclusive therapy has finally caught women's attention. IORT information circulated through health education programs initiated interest in promoting breast conserving surgery BCS for early breast cancer.

Materials and Methods

This observational review was undertaken at King Fahd hospital of the university, AL Khobar, Eastern province of Saudi Arabia between 2012- 2016. All patients diagnosed with breast cancer were reviewed. Strict recruitment criteria were adopted for patients to receive IORT. Selected candidates were only those who were eligible and consented to undergo BCS and IORT. Special emphasis was placed on demographic data, tumor size at the initial presentation. Those with post Neo-adjuvant chemotherapy treatment and post pathology excision were included. Emphasis was placed on the cavity size and applicator size used. The applicator sizes available ranged between 1.5-5.0 centimeters. Wide local excision with 1-2cm gross margin was adopted in all surgical procedures. Cavity size is measured and the corresponding applicator size was chosen. Intraoperative ultrasound was used to confirm the contact of the target tissue with the applicator. ZIESS INTRABEAM PRS 500 with XRS4 delivering uniformly 20 Gy. to the target tissue.

Results

The total number of patients diagnosed with breast cancer were 330 out of which 69 (20%) patients fulfilled the strict criteria and were eligible for IORT. Age ranged from 31-75years with the Median age 50 years. 1 (1%) was post pathology case with excision performed two weeks prior to presentation. Tumor size reported uniformly by ultrasound was between 0.6-4.0 centimeters 0-1 in 8(11%), 1.1-2 in 22(31%), 2.1-3 in 24(34%), and 3.1- 4.0 in 15 (21%) patients. **Figure I** 7(10%) patients received Neo-adjuvant chemotherapy with positive response and were included.

Applicator sizes available ranged from 1.5-5.0 centimeter in diameter. **(Figure II) (a,b)** Applicator used were size 2.0 in 2 (3%), size 2.5 in 10 (14%), size 3.0 in 18(26%), size 3.5 in 16 (23%), size 4.0 in 10 (14%), size 4.5 in 6 cases (9%) and size 5.0 in 7cases (10%). To our surprise smaller applicator sizes 2.0-3.5 centimeter in diameter accounted for 46 (66%) of cases confirming that smaller lesions are currently been diagnosed. **(Figure III) (a,b)**.



Figure I: Applicators and the Radiation source.

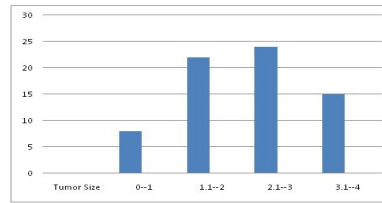


Figure II (a,b): Tumor Size.

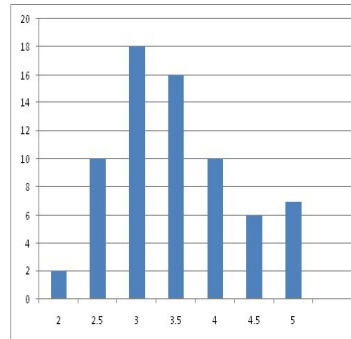


Figure III (a,b): Applicator Sizes used.

Discussion

Breast cancer continues to be ranked first among females worldwide [5]. It is estimated annual number of cases diagnosed globally with breast cancer exceeds 1 million and this number is expected to increase to 1.5 million by the end of the decade because of the major increase in the number of diagnosed cases in countries with limited resources [6]. Due to the suboptimal early detection strategies in developing countries the average tumor size at the time of the initial presentation is reported as more than 4 centimeters in diameter [7].

Therefore, it is understandable that mastectomy is still advocated as the first treatment option by many surgeons and oncologists in developing countries. The cultural influence of body image stigma inflicted by the liberal adoption of mastectomies further distant women from seeking early treatment, hence delayed presentations. Wide local excision is infrequent, it is practiced cautiously with major reservations.

While radiotherapy remains an integral adjuvant component in the treatment of segmental breast resections, yet, the scarcity of the radiotherapy centers in many developing countries limits the surgical options offered. Concerns over the global increase of cancer burden have been voiced by the International Atomic Energy Agency (IAEA). As the cancer burden increase, the long term high cost incurred by the treatment of advanced disease and palliative care reciprocally increase. The least prepared developing countries take the brunt and the consequences. As the economy dictates, the number of Radiation Oncology centers worldwide is scarce and mainly clustered in developed countries [8].

Emerging alarming reports indicate that 57% of cancer cases occur in low and middle income countries with 50% - 90% of underprivileged patients requiring radiotherapy are deprived from access to radiation facilities [9]. The late presentation of the young women in the reproductive age is both disturbing and disruptive. Partial treatment contributes to advanced disease and high mortality for a potentially treatable cases [10].

Extensive efforts have been probed in an attempt to improve breast cancer management options in developing countries thereby encouraging women to present early. Sporadic and individual efforts are commendable yet, they function in a limited scale that do not significantly contribute to reality.

The introduction of the modern modality of IORT as targeted treatment for early breast cancer appears as a breakthrough. It expected to provide a practical, convenient and efficient method of treatment both as an exclusive or boost therapy suitable for healthcare facilities in countries with limited resources. The encouraging results from this observational study of IORT have prompted women who would normally shy away with breast masses, resist disclosure and refuse treatment to present early.

Despite the lack of structured awareness programs in our communities in this encouraging study the tumors size at the initial presentation ranged between impalpable masses of 0.6-4 centimeters in largest diameter. Women were more willing to receive neo-adjuvant chemotherapy in order to be able to undergo BCS. The applicator sizes used were smaller in 46 (66%) of cases than the predicted sizes for treatment. Further, the easy handling of IORT equipment in the conventional operating rooms shattered all known barriers and concerns to radiation exposure and safety.

IORT is an efficient, convenient, cost effective, sparing or shortening the patients the long sessions of external beam radiation while providing equally effective outcomes [11,12].

Conclusion

While developing countries remain by the lack of adequate radiotherapy centers to cover its population needs, IORT can offer an alternative solution for a selected subset of women with early breast cancer as an exclusive or boost therapy. Its positive impact on the early detection is well illustrated in this observational study.

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