Case
A pleasant 61-year-old woman presented to her family doctor after her good friend was diagnosed with breast cancer. She suffers from hypertension and Raynaud’s, but denies any cardiovascular disease or diabetes. At the time of her surgical consultation, she was taking Diovan 80/12.5mg, Adalat 30mg XL, and ASA 80mg OD. The patient had an aunt who was diagnosed with breast cancer in her sixties, with no other significant family history. The patient was morbidly obese, but otherwise had an unremarkable physical exam with the exception of a small palpable lump in the lower outer quadrant of the right breast, which was firm and mobile. No lymphadenopathy was detected. She underwent her first mammogram, serving as her baseline mammogram, and a small abnormality was detected in the inferolateral aspect of the right breast (Figure 1). A follow-up ultrasound and biopsy were performed (Figure 2). Histological examination of the biopsied tissue indicated that the patient had invasive ductal carcinoma of the right breast.
The patient was counselled regarding her surgical options. She was offered a right partial mastectomy followed by radiation treatment, or a total mastectomy. She was also informed about the sentinel lymph node biopsy procedure, as well as the axillary lymph node biopsy that may be necessary if the sentinel lymph node biopsy was positive for metastasis. The patient was also educated on the sequence of events following surgery, including some routine investigations and a referral to medical radiation oncology. The patient decided to proceed with a partial mastectomy, understanding that radiation treatment must follow surgery.

The surgery was performed and the tumour was determined to be 1.5 centimetres in diameter with a Grade I Nottingham score. Sentinel lymph node biopsy showed no metastasis. The distance of the closest margin of the tumour was less than 1mm from normal tissue, so the anterior margin was re-excised a few days later as a cautionary measure. The final pathology report showed fibrofatty tissue with a few small ducts and one larger duct with hyperplastic epithelium. Also present were small clusters and tubules of bland atypical cells. Haematoxylin and Eosin stains were performed, as well as Immunoperoxidase stains. The results were compatible with low grade invasive carcinoma of mammary ductal origin.

As an alternative to whole breast radiation, the patient was informed of balloon brachytherapy using a MammoSite balloon catheter. The patient opted to undergo this procedure, which entailed implanting a silicone balloon connected to a catheter with an inflation channel and a port for the insertion of a high-dose brachytherapy source. Radiation treatment for this type of procedure generally consists of an $^{192}$Ir source connected to a computer-controlled high-dose-rate remote afterloader being inserted into the balloon to deliver the prescribed dose of radiation. The balloon catheter was implanted into the patient and was
inflated to its maximum capacity of 70mL with normal saline (Figure 3). The surgery was performed at Western Memorial Regional Hospital in Corner Brook, Newfoundland, after which the patient was transferred to the Health Sciences Centre in St. John’s, Newfoundland to receive a 5-day course of radiation.

Figure 3. Post-operative CT scan of right breast. White arrow indicates brachytherapy balloon filled with normal saline.

Discussion

Breast conservation therapy (BCT) is an attractive treatment option for patients with Stage I and II breast cancer.\(^2\) BCT for early-stage breast cancer involves the surgical removal of the tumour followed by whole-breast radiation.\(^3\) Long-term studies have indicated that disease-free survival for breast conservation therapy is similar when compared to mastectomy.\(^4,5\) Based on the cosmetic advantages and the similar survival rates, balloon brachytherapy is an ideal treatment option for patients wishing to avoid a total mastectomy.

Patient selection criteria for balloon brachytherapy as determined by the American Society of Breast Surgeons is patient age of 50 years or over, invasive ductal carcinoma or ductal carcinoma in situ, 2 cm tumour size, negative microscopic margins with surgical margins of excision of at least 2 mm, and N0 nodal status.\(^1\)

In comparison to multi-catheter brachytherapy, balloon brachytherapy has several advantages. Balloon brachytherapy has been shown to be superior to interstitial high-dose radiation brachytherapy in planning target volume coverage.\(^6\) While both therapies deliver high-dose radiation to the patient in one week or less, interstitial implants using multiple catheters require additional expertise and training. Furthermore, numerous puncture sites are required for multi-catheter brachytherapy, which can lead to suboptimal cosmetic outcome and infection.\(^1\)

Balloon brachytherapy confines radiation treatment to a limited volume of breast tissue adjacent to the lumpectomy cavity, which allows for a higher dose of radiation per fraction, decreasing treatment time.\(^6\) This makes balloon brachytherapy an ideal treatment option for patients from smaller
communities. Conventional radiation therapy following lumpectomy generally takes 5 weeks to complete. For a patient from a small town, this requires undergoing daily radiation treatments in a larger centre, potentially far away from the patient’s place of residence. The patient treated in this case resided over 600 km from the closest breast cancer radiation treatment centre. Balloon brachytherapy enabled the patient to undergo a 5-day course of radiation treatment as an alternative to 5 weeks of radiation. In the context of the patient’s illness experience, instead of having to relocate to St. John’s, Newfoundland for 5 weeks, the patient was able to stay in St. John’s for 5 days to complete her radiation treatment and then return home. Ultimately, this treatment option allows for less time away from home and a higher quality of life during treatment.

Conclusion

BCT with balloon brachytherapy is an excellent treatment option for patients fitting the selection criteria. This therapy has very good cosmetic results along with a reduced post-operative radiation treatment time while maintaining the efficacy of a total mastectomy. This allows for patients to receive treatment while limiting the interference in their everyday lives that comes with 5-week whole-breast radiation courses, resulting in an increased quality of life. Where patients from rural communities once may have chosen a total mastectomy instead of undergoing BCT due to the five weeks of radiation, balloon brachytherapy and the associated reduced treatment time enables these patients to opt for BCT in lieu of a total mastectomy.

References


Inspiration

Location: Western Memorial Regional Hospital in Corner Brook, Newfoundland.
Program: Non-credit elective.