Changes in Breast Radiotherapy: Prone Positioning and Hypofractionation

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Breast cancer management has drastically changed since the 1990s. Many patients with breast cancer now can opt to conserve their breast through a lumpectomy and radiation (breast conservation therapy), rather than a full mastectomy. Advances in the techniques of delivery and length of breast radiotherapy have been rapidly evolving. This article attempts to summarize some of those changes for nurses caring for patients with breast cancer during radiation therapy.

The American Cancer Society (2013) estimated 232,340 new cases of invasive breast cancer will be diagnosed among women in the United States in 2013. Many patients diagnosed with breast cancer will require radiation therapy as an integral part of their cancer management. Breast conservation therapy (BCT) involves a lumpectomy (partial mastectomy) followed by breast irradiation. BCT allows patients to keep the integrity of their own breasts without compromising local control of the breast cancer.

Breast Conservation Therapy

Fisher et al. (2002) reported evidence gathered during a 25-year period that showed BCT can be the appropriate therapy for women with breast cancer who have negative surgical margins. Women in this pivotal trial were treated with lumpectomy and radiotherapy over five weeks without increased recurrence rates, proving that lumpectomy followed by irradiation continues to be appropriate therapy for women with breast cancer. The historical trial confirmed the merit of breast conservation radiotherapy. Historically, breast radiation following lumpectomy always was delivered in the supine position, which has the patient lying face up; the prone position, however, involves the patient lying face down, sometimes with the hands behind the head or neck.

Darby, McGale, Taylor, and Peto (2005) reported that U.S. cancer radiotherapy regimens from the 1970s–1980s appreciably increased mortality 10–20 years following treatment from heart disease for left-sided breast cancer and lung cancer in the ipsilateral lung. During the study time frame, 1973–2001, women were treated with radiation in the supine position. A subsequent study update in 2013 demonstrated a proportional increase in the rate of coronary events per Gy of radiation to the heart, even for women without a baseline cardiac risk at the time of radiation (Darby et al., 2013). In the 25 years since the advent of BCT, radiation therapy delivery methods have vastly improved, lowering the amount of irradiation to the heart and lungs during treatment (Formenti et al., 2007).

Radiotherapy Positioning

When patients are treated with breast radiotherapy in the traditional supine...
position, the breast tissue being targeted wraps around the curved chest wall. Unfortunately, although this method targets the mammary tissue that needs treatment, it also captures some lung or heart tissue within the field of radiation (see Figure 1). The radiation oncologist must then try to find ways to block or buffer the heart and lung from the radiation.

Prone breast radiotherapy positions the patient to receive treatment while lying on the stomach. That method allows breast tissue to be isolated because gravity pulls the breast through a void in a mattress or positioning table, moving it away from the back of the chest wall (see Figure 2). Therefore, the radiation beam misses a larger volume of the heart and lung. The technique is more effective in sparing the heart and lung than the previous supine method, which requires blocks, wedges, and intensity-modulated radiation therapy to try to buffer these critical organs (Formenti et al., 2007). The newer prone technique for radiation positioning, pioneered at the NYU Langone Medical Center, has vastly improved patient outcomes, such as reducing cardiac and pulmonary potential complications from breast radiation for women with breast cancer (Formenti, DeWngaert, Jozsef, & Goldberg, 2012). This method is not contraindicated for tumors close to the chest wall; however, each case is carefully reviewed for maximum patient benefit.

To deliver prone breast radiation, the patient must be immobilized on a special mattress with the targeted breast hanging freely through the opening in the mattress. Two examples of commercially available prone tables and breast boards are shown in Figure 3. No absolute contraindications exist for prone positioning, although some patients with severe neck pain may be less comfortable in this position. Rarely, the heart may move closer in the prone position, in which case a second supine simulation may be needed to deliver treatment in the optimal position for the patient’s individual anatomy (Lymberis et al., 2012).

**Nursing Care: Prone Position**

Patient teaching about the advantage and benefits of the prone technique is best shown visually. The figures in this article are valuable teaching aids. They can help the patient make the connection about her positioning during radiation treatment and serve as guides to demonstrate the interventions to minimize short- and long-term effects of radiation.

The prone position can reduce anticipated skin reactions. When a patient is treated in the supine position, the breast rests against the upper abdomen skin in the inframammary fold. Skin resting on skin serves to bolus or inadvertently attract more radiation dose to the skin in the area. Patients then are likely to develop wet desquamation or skin peeling that can leave the skin raw and weeping, causing pain (see Figure 4). The serous fluid discharge from that skin reaction requires occlusive dressing wound care to heal the skin and prevent infection. Patients who develop moist desquamation are more susceptible to secondary infections of the skin and may require analgesics to relieve pain associated with desquamation (Huppert, Jozsef, DeWngaert, & Formenti, 2011).

Patients who experience moist inframammary desquamation may need to alter their activities of daily living and clothing choices. Patients may not be able to wear a bra comfortably for many days or even weeks. That can contribute to missed time from work, isolation from social situations, and the need for pain management.

When treated in the prone rather than the supine position, the acute complication of inframammary desquamation from radiation is rare. The most likely skin reaction is a grade 1 radiation dermatitis (a macular rash resembling prickly heat) (Formenti et al., 2007) (see Figure 5). For treatment in the prone position, the main symptom reported, if any, is pruritus (Formenti et al., 2007). Pruritus usually is limited to the upper inner quadrant of the breast rather than the inframammary fold. Managing skin changes in the upper...
inner quadrant is much easier because the patient may still comfortably wear a bra or support garment. In addition, skin change reactions can easily be concealed with a scoop neck shirt or closed blouse; no bulky gauze dressings are needed because no oozing occurs.

For prone breast radiation, skin care management includes daily application of a light emollient cream and rarely requires analgesics, occlusive dressings, or a need for alteration in clothing choices. In the rare case that a patient complains of pruritus, it can be controlled by adding an over-the-counter 1% hydrocortisone cream daily as needed, usually during the final week of treatment (Bostrom, Lindman, Swartling, Berne, & Bergh, 2001). That simple strategy to manage skin reactions allows patients during and immediately after treatment to continue employment and daily activities, which may be a huge undocumented cost savings to the patient, society, and the healthcare system.

Hypofractionation

Hypofractionation lowers the number of fractions (doses) of radiation by increasing the radiation dose per day. Many radiation oncologists are challenging the standard BCT daily dose of radiation (1.8–2 Gy), typically prescribed during a five-to-six week period. Researchers have shown evidence of equivalency and superiority with hypofractionation in preventing ipsilateral breast cancer relapse in the treated breast (Owen et al., 2006; Whelan et al., 2010).

The Radiation Therapy Oncology Group (RTOG) and many independent groups are studying optimal or customized methods of hypofractionating the radiation dose based on the stage of tumor, presentation, and desired target to treat (RTOG, 2013). That research has evolved, in part, from the success of the prone position minimizing radiation doses to the heart and lung (Formenti, DeWyngaert, et al., 2012; Formenti et al., 2007; Huppert et al., 2011). Three weeks of radiation now is generally an accepted, appropriate method to treat early (stage I–II) invasive breast cancer (Whelan et al., 2010).

Results from a major randomized prospective trial evaluated an increased dose to 42.5 Gy in 16 fractions (2.67 Gy per day) compared to 50 Gy in 25 fractions (2 Gy per day), with more than 10 years of follow-up data (Whelan et al., 2010). Results showed equivalency in recurrence rates (6.2% versus 6.7%) (Whelan et al., 2010). Formenti et al. (2007) showed even lower recurrence rates by incorporating a concurrent boost to the three-week regimen while carefully studying two boost methods, a daily boost versus a weekly boost. Another retrospective analysis demonstrated that the concurrent boost is more convenient and cosmetically pleasing to patients compared to the sequential boost given at the end of treatment (Raza et al., 2012).

Studies show that partial breast radiotherapy (five fractions with 6 Gy external radiation) can be delivered safely in the prone position, with recurrence rates at 1% (Formenti, Hsu, et al., 2012). Currently, that technique is reserved for women who are postmenopausal, stage I, lymph node-negative, and with limited amounts of ductal carcinoma in situ on pathology. The prone position technique has few side effects compared to older methods of delivery or other invasive delivery methods.

Conclusion

As a component of BCT, breast radiotherapy treatment in the prone position is proving to be safe and effective, sparing...
the negative impact of radiotherapy to the heart and lungs. In addition, breast radiotherapy in the prone position can limit skin reaction and allow more flexibility in radiation dosing, scheduling, and patient recovery time. Breast radiotherapy delivered in the prone position is altering standard-of-care guidelines. Oncology nurses need to be aware of newer breast radiation techniques, adjusted treatment schedules, and strategies for effective patient teaching.

References


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