



The impact of postmastectomy radiotherapy on breast reconstruction: knowledge is power

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Comment on: Jagsi R, Momoh AO, Qi J, *et al.* Impact of Radiotherapy on Complications and Patient-Reported Outcomes After Breast Reconstruction. *J Natl Cancer Inst* 2018;110.

Received: 10 February 2018; Accepted: 06 March 2018; Published: 28 March 2018.

doi: 10.21037/abs.2018.03.02

View this article at: <http://dx.doi.org/10.21037/abs.2018.03.02>

The paper entitled *Impact of Radiotherapy on Complications and Patient-Reported Outcomes After Breast Reconstruction* by Jagsi *et al.* is the first to examine the impact of postmastectomy radiotherapy (PMRT) on both autologous and implant-based reconstructions using the BREAST-Q (1). This was a large prospective study from 2012–2015 sponsored by the Mastectomy Reconstruction Outcomes Consortium. Patients were stratified by the type (autologous *vs.* implant-based) and timing of reconstruction (immediate *vs.* delayed) and whether PMRT was administered (irradiated group $n=622$, unirradiated group $n=1,625$).

There was a degree of selection bias as immediate breast reconstruction was performed less commonly in patients receiving PMRT (83.0% *vs.* 95.7%, $P<0.001$). A higher percentage of those having autologous reconstruction received by radiation (36.7% *vs.* 25%, $P<0.001$). Breast complications at 2 years were found in 38.9% of irradiated patients with implant reconstruction, 25.6% of irradiated patients with autologous reconstruction, 21.8% of unirradiated patients with implant reconstruction, and 28.3% of unirradiated patients with autologous reconstruction.

Multivariable analysis for predictors of breast complications showed bilateral treatment and higher body mass index to be predictive of developing a complication, with a statistically significant interaction between radiotherapy receipt and reconstruction type.

Among irradiated patients, autologous reconstruction was associated with lower rates of complications than implant-based reconstruction at 2 years [odds ratio (OR) =0.47, confidence interval (CI): 0.27–0.82, $P=0.007$]. The interaction was also significant for satisfaction with the

breasts at 2 years ($P=0.002$), with larger adjusted differences between autologous and implant-based approaches (63.5, CI: 55.9–71.1, *vs.* 47.7, CI: 40.2–55.2, respectively) in irradiated patients. The differences in satisfaction with the breasts were higher for unirradiated autologous than implant-based reconstruction (67.7 *vs.* 60.5) but was not statistically significant.

The administration of PMRT markedly impacted reconstructive failure in implant-based reconstruction at 2 years (irradiated 18.7% *vs.* non-irradiated 3.7%).

Reconstructive failures were not included in the PROM analysis. The authors concluded that autologous reconstruction appeared to yield superior patient-reported satisfaction and lower risk of complications than implant-based approaches in those receiving PMRT.

There is abundant data that radiation increases surgical morbidity after implant-based breast reconstruction (2–5). Barry and Kell performed a meta-analysis of 11 studies evaluating the impact of PMRT on breast reconstruction. They had similar findings as reported by Jagsi *et al.* Patients receiving PMRT after implant reconstruction had significantly increased risk of complications (OR =4.2, 95% CI: 2.4–7.2) compared to those that did not receive radiation (2). Autologous reconstruction was associated with less morbidity (OR =0.21, 95% CI: 0.1–0.4) in the setting of PMRT than implant reconstruction.

The data regarding the impact of PMRT on autologous reconstruction is not as robust. Early studies of TRAM flap exposure to PMRT found significant rates of flap fibrosis and fat necrosis, often necessitating remedial surgery (6–8). In recent years, some studies have reported more favorable outcomes with immediate autologous breast

reconstruction with subsequent PMRT (9-12). Mirzabeigi *et al.* retrospectively reviewed 407 immediate abdominal free flap reconstructions (no PMRT 280, PMRT 127) (12). The use of PMRT resulted in a higher incidence of volume loss and fat necrosis but the revision rates were similar. Rochlin *et al.* reviewed 11 studies evaluating the impact of PMRT on autologous reconstruction (13). There was an increased odds of fat necrosis when flaps were directly radiated (OR 3.13, P=0.005) but there were no significant differences in revisions, contour irregularities, or aesthetic results.

The impact of radiation therapy on breast reconstruction from the patients' perspective is less well documented. Albornoz *et al.* performed a multicenter study that evaluated patient reported outcomes in implant based breast reconstruction with or without radiation using the BREAST-Q (14). Six hundred thirty-three patients completed the questionnaire after implant reconstruction, 414, which did not receive radiation, and 219 that received radiation (preoperative RT 47, postoperative RT 172). Patients that received postoperative RT had a significant reduction in all domains (Satisfaction with Breasts, Satisfaction with Outcome, Psychosocial well-being, Sexual well-being, and Physical well-being) in univariate analysis. Multivariate analysis confirmed the negative impact of radiotherapy on Satisfaction with Breasts domain (P=0.03) when adjusted for patient and treatment factors.

These results confirmed the findings of a similar study using the BREAST-Q by Eriksson *et al.* (3). The authors also found that RT significantly impacted all questionnaire domains when administered in the setting of implant reconstruction. These authors also reported the impact of RT on reconstructive failure: no RT 6%, preoperative RT 25%, and postoperative RT 15% (P<0.001). Like the Jagsi's paper, patients with reconstructive failure were not included in the questionnaire analysis. Eriksson noted the large majority of women who were successfully reconstructed would choose breast reconstruction again regardless of whether they received radiation or not. They concluded that autologous reconstruction should be considered in the setting of RT, especially in previously irradiated patients. The reported high satisfaction rates showed that implant-based reconstruction is not contraindicated in the setting of radiotherapy.

Billig *et al.* evaluated the impact of PMRT on abdominal free flap reconstruction (IBR 108, delayed reconstruction 67) as part of the Mastectomy Reconstruction Outcomes Consortium study (15). They found no significant

differences in complications or satisfaction in BREAST-Q domains between the immediate and delayed reconstruction groups similar to the results reported by Jagsi *et al.* (1).

Jagsi and her co-authors are to be congratulated on an outstanding study that provides the most important information to date regarding patient satisfaction with breast reconstruction after PMRT. Autologous reconstruction yields superior patient reported outcome measures and lower risk of complications than implant-based reconstruction among patients receiving PMRT. Importantly, patients who plan on having autologous reconstruction can be reassured that the addition of PMRT would not impact their outcomes.

Many surgeons try to avoid radiating implant-based reconstructions whenever possible. Many patients have insufficient donor sites for autologous reconstruction and others have no desire to undergo a long, complex free flap reconstruction. Patients must be informed that despite an increase in reconstructive failure and capsular contracture, the majority achieves good results with implant-based reconstruction followed by PMRT.

Acknowledgments

Funding: None.

Footnote

Provenance and Peer Review: This article was commissioned by the editorial office, *Annals of Breast Surgery*. The article did not undergo external peer review.

Conflicts of Interest: The author has completed the ICMJE uniform disclosure form (available at <http://dx.doi.org/10.21037/abs.2018.03.02>). The author has no conflicts of interest to declare.

Ethical Statement: The author is accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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doi: 10.21037/abs.2018.03.02

Cite this article as: Carlson GW. The impact of postmastectomy radiotherapy on breast reconstruction: knowledge is power. *Ann Breast Surg* 2018;2:8.