International Journal of Scientific Research in Dental and Medical Sciences

www.ijsrdms.com

Evaluate the Implant Failure Rate of Radiotherapy Administered after Mastectomy in Breast Cancer Patients: A Systematic Review and Meta-analysis

Yasaman Shariati [a], Somaye Jamali [b], Majid Hajizadeh [b]

[a] *Department of General Surgery, Helia Clinic, Dubai, United Arab Emirates*
[b] *Department of Internal Medicine, The Royal Hospital, Muscat, Oman*
[c] *Department of Radiology, School of Medicine, Abadan University of Medical Sciences, Abadan, Iran*

ARTICLE INFO

Article history:
Received 10 August 2024
Received in revised form 28 August 2024
Accepted 01 September 2024
Available online 07 September 2024

Keywords:
Breast Implantation
Breast Implants
Breast Neoplasms
Mastectomy
Radiotherapy

ABSTRACT

Background and aim: It is currently unclear which risk factors lead to problems with breast implant reconstruction and failure of prosthetic reconstruction. The connection between radiation and complications has not yet been comprehensively investigated. This study explored the implant failure rate of radiotherapy administered after mastectomy in breast cancer patients.

Material and methods: For this systematic review and meta-analysis study, international databases such as MEDLINE (PubMed and Ovid), Web of Science, and Scopus were searched until August 2024 using keywords relevant to the study objectives. STATA/MP. v17 software was used to analyze data.

Results: The present study included twelve retrospective studies Among 5113 patients (5180 reconstructed breasts) with the mean age ranging from 36.7 to 55.6 years. Irradiated breasts were 0.32 times more vulnerable to developing capsular contracture than non-irradiated breasts (RR, 0.32; 95% CI, 0.04-0.61; p=0.03). The risk ratio of seroma was -0. 40 (RR, -0.40; 95% CI -0.78, -0.02; p=0.04) and The Reconstruction failure was associated with received radiotherapy (OR =0.44; 95% CI: 0.21, 0.66; p<0.01; I^2 = 83.87%, p<0.01).

Conclusions: According to the results of the present meta-analysis, post-mastectomy radiotherapy can increase implant reconstruction failure.

1. Introduction

One of the most common cancers in women is breast cancer, which accounts for 30% of all cancers in women and 15.5% of all cancer-related deaths in women.[1] Early detection of breast cancer is possible worldwide through screening and mammography. The earlier the diagnosis is made, the higher the treatment's chances of success.[1] The main surgical treatment for breast cancer is modified radical mastectomy, which causes breast deformities. Patients considering mastectomy should be offered immediate breast reconstruction (IBR) according to national and international guidelines.[2] Implant-based surgery is the most commonly used surgical technique for IBR.[3] According to the American Society of Plastic Surgeons, 60% of patients who undergo a mastectomy do not receive reconstructive treatment such as breast reconstruction, and fewer than 25% receive immediate reconstruction.[4, 5] Radiotherapy is an effective step in the treatment of breast cancer. It affects long-term survival and reduces the risk of dying from breast cancer by 1-5%.[6] When planning implant-based IBR, post-mastectomy radiotherapy (PMRT) is crucial.[7] PMRT can reduce recurrence and mortality in high-risk patients.[8] Radiotherapy leads to tissue remodeling and chronic inflammatory changes.[8] It can also lead to capsular contractures and tissue fibrosis, worsening the cosmetic outcome and potentially causing pain, psychological distress and tissue fibrosis.[9] Further ipsilateral revision procedures into the implant cavity increase the risk of wound complications and infections as they also impair wound healing and tissue repair.[10] Despite these side effects, it is generally accepted that PMRT does not preclude IBR in informed patients.[11] Much debate has been about when to exchange a permanent fixed-volume implant for a tissue expander originally used in PMRT.[12] Furthermore, the relationship between the time from PMRT to revision surgery and the time required for early radiation effects to wear off before attempting revision surgery is still under debate.[13, 14] The present systematic review and meta-analysis aimed to evaluate implant failure rate in irradiated versus non-irradiated breast cancer patients who had IBR.

2. Material and methods

Search strategy and Information sources

To evaluate the implant failure rate in patients with irradiated breast cancer compared to non-irradiated breast cancer with IBR, relevant keywords were searched in the international databases MEDLINE (PubMed and Ovid),

* *Corresponding author. Somaye Jamali*
E-mail address: *dr.somayejamali@yahoo.com*
Department of Internal Medicine, The Royal Hospital, Muscat, Oman
https://doi.org/10.30485/IJSRDMS.2024.488518.1616

Embase and Cochrane up to September 2024. (Table 1). The search engine Google Scholar was used with EBSCO, ISI, Elsevier, Web of Science, Cochrane Central Register of Controlled Trials and Scopus Wiley Online Library. The 27-point checklist PRISMA 2020[15] serves as the basis for this investigation.

Table 1. The search strategy used for each database.

NO.	Search Terms
	The search strategy used in MEDLINE (via PubMed)
1	(("Breast Neoplasms"[Mesh] OR "Triple Negative Breast Neoplasms"[Mesh]) OR ("Breast Neoplasms/surgery"[Mesh] OR "Breast Neoplasms/therapy"[Mesh])) OR ("Breast Neoplasms/radiotherapy "[Mesh] OR).
2	Breast Neoplasm OR Neoplasm, Breast OR Neoplasms, Breast OR Breast Tumors OR Breast Tumor OR Tumor, Breast OR Tumors, Breast OR Breast Cancer OR Cancer, Breast OR Cancer of Breast OR Cancer of the Breast OR Malignant Neoplasm of Breast OR Breast Malignant Neoplasm OR Breast Malignant Neoplasms OR Malignant Tumor of Breast OR Breast Malignant Tumor OR Breast Malignant Tumors OR Mammary Cancer OR Cancer, Mammary OR Cancers, Mammary OR Mammary Cancers OR Mammary Neoplasms, Human OR Human Mammary Neoplasm OR Human Mammary Neoplasms OR Neoplasm, Human Mammary OR Neoplasms, Human Mammary OR Mammary Neoplasm, Human OR Breast Carcinoma OR Breast Carcinomas OR Carcinoma, Breast OR Carcinomas, Breast OR Mammary Carcinoma, Human OR Carcinoma, Human Mammary OR Carcinomas, Human Mammary OR Human Mammary Carcinomas OR Mammary Carcinomas, Human OR Human Mammary Carcinoma.
3	"Mammaplasty"[Mesh] Entry Terms: Mammaplasties OR Breast Reconstruction OR Breast Reconstructions OR Reconstruction, Breast OR Reconstructions, Breast OR Mammoplasty OR Mammoplasties.
4	"Breast Implants"[Mesh]
5	Implants, Breast OR Breast Implant OR Implant, Breast OR Breast Prosthesis, Internal OR Breast Prostheses, Internal OR Internal Breast Prostheses OR Internal Breast Prosthesis OR Prostheses, Internal Breast OR Prosthesis, Internal Breast.
6	Surgical Procedures, Operative Plastic Surgery Procedures, Mammaplasty, Breast Implantation.
7	"Mastectomy"[Mesh]
8	"Radiotherapy "[Mesh]
	The search strategy used by Cochrane
1	"Breast Neoplasms" OR Breast Neoplasms/surgery" OR "Mammary Cancer" OR " Breast Cancer"
2	"Breast Implants" AND "Mastectomy" AND "Radiotherapy " AND "Breast Implantation"
	The search strategy used in Embase
1	(Breast) OR (Breast cancer) OR (Breast Neoplasms) OR (Breast surgery): ab, ti, kw.
2	Breast Implantation OR Breast Implants AND Mastectomy: ab, ti, kw.
3	Radiotherapy : ab, ti, kw.
4	chapter' OR 'conference abstract' OR 'conference paper' OR 'conference review' OR 'editorial' OR 'erratum' OR 'letter' OR 'note' OR 'preprint' OR 'short survey'/it (Filter)

Selection criteria

Articles published in English were the inclusion criteria for this research. The answers to the questions in the current study were based on the PICO strategy: Population (P): patients with breast implants; Intervention (I): irradiated breast (C): non-irradiated breast; Outcome (O): implant failure rate. Review studies and books, qualitative studies, animal studies, studies without comprehensive and relevant data, and Data not reported on breast cancer were excluded from the study.

The process of selection and data collection

Two researchers used a standard data collection form, previously created to minimize reporting, data collection errors, and omissions, to collect data from individual subjects. The original form prepared by the research team contained the following information: the author's name, the year of publication, the number of patients, the mean age, Smoking, Type of implant, implant volume, Radiotherapy and Type of adjuvant radiotherapy.

Heterogeneity and publication bias

The heterogeneity across studies was examined using the Chi-square ($\chi 2$) test and quantified by the I2 statistic. According to the I^2 value, heterogeneity was classified as low (less than 50%), between 50 and 74% means moderate heterogeneity, and above 75% is considered high heterogeneity.

Methodological quality

The included cohort studies were assessed for methodological quality using the Newcastle-Ottawa Scale (NOS).[16] Each study received a maximum of nine stars on this scale. Research was considered high quality if it received seven or more stars; if not, it was considered inferior.

Data analysis

The effect measure of choice was the odds and risk ratios with 95% confidence intervals. The results were reported using a fixed-effects model with the Mantel–Haenszel method. The data were analyzed at a significance level 0.05 using Stata software (version 17).

3. Results

Description of studies

The initial search found 943 articles. In the first phase, duplicate entries were found in 98 articles and were removed due to their titles. The studies that did not meet the inclusion criteria (n=689) were eliminated in the second step by screening the abstracts of 824 publications. In the third phase, 123 publications that lacked sufficient information or did not meet the inclusion and exclusion criteria were removed after examining the full texts of 135 articles. In summary, twelve articles were included (Fig. 1).

Study characteristics

All included studies used retrospective designs. Of 5113 patients (5180 reconstructed breasts), 1355 received radiotherapy, and 3721 were not irradiated. The mean age ranged from 36.7 to 55.6 years; 370 patients were current smokers. Table 2 provides a summary of study characteristics.

Bias Assessments

According to the NOS tool, the Risk of bias in the cohort studies was low (Table 3).

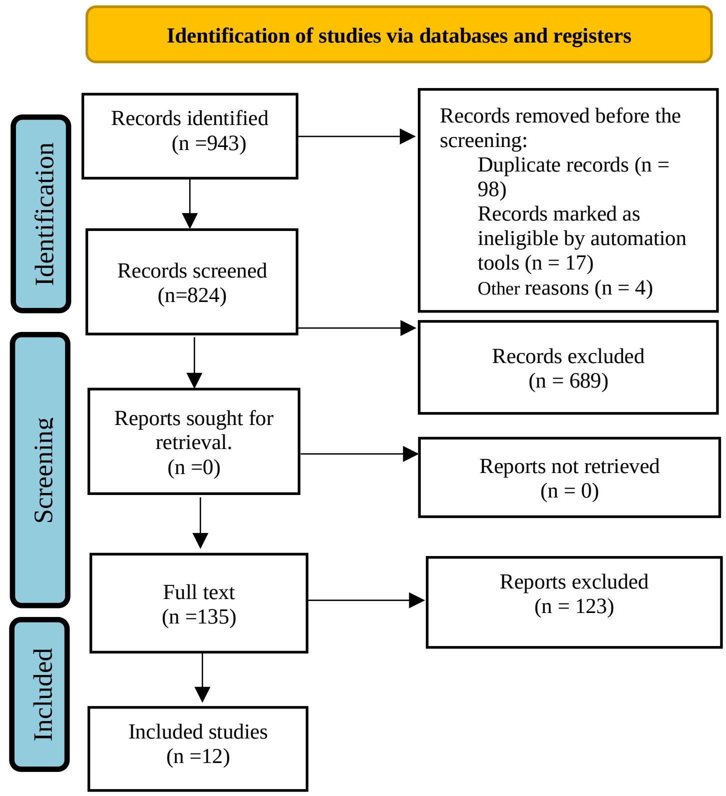

Fig. 1. PRISMA 2020 Checklist.

Table 2. Demographic characteristics of the included studies.

No.	Study. Years	Study Design	No. Patients	No. Breasts	Mean Age	No. Smoker Patients	Type of Implant	Implant Volume	Radiotherapy	
									Non-irradiated Group	Irradiated Group
1	Riina et al., 2024[17]	Retrospective cohort	190	190	NR	41	Immediate breast reconstruction	NR	100	90
2	Vinsensia et al., 2024[18]	Retrospective cohort	118	118	45	NR	Immediate breast reconstruction	335 ml	28	90
3	Doherty et al., 2023[19]	Retrospective cohort	2342	2342	49	NR	Implant-based, flap-based	NR	1964	378
4	Naoum et al., 2022[20]	Retrospective cohort	661	6	NR	194	Mastectomy and any reconstruction type	NR	352	309
5	Sun et al., 2022[21]	Retrospective cohort	275	280	36.7	9	Immediate prosthesis reconstruction, immediate-delayed prosthesis reconstruction	240 ml	216	59
6	Thuman et al., 2021[22]	Retrospective cohort	213	387	50.10	NR	Prepectoral reconstruction (n=190), submuscular reconstruction (n= 278)	NR	34	24

7	Sinnott et al., 2021[23]	Retrospective cohort	365	592	53.5	NR	Prepectoral implant-based breast reconstruction	NR	305	45
8	Frisell et al., 2020[9]	Retrospective cohort	475	542	51.2	65	Temporary expander (n=33), Permanent expander (n=434), Fixed-volume implant (n=68)	＜300 cc (n=151), 300–400 cc (n= 265), ＞400 cc (n=118)	288	223
9	Chiasson et al., 2020[24]	Retrospective cohort	201	376	51.38	15	LD myocutaneous flaps	NR	165	36
10	Polotto et al., 2020[25]	Retrospective cohort	186	202	55.6	23	Prepectoral breast reconstruction	NR	158	28
11	Elswick et al., 2018[26]	Retrospective cohort	54	93	48	11	Immediate two-stage prepectoral implant-based breast reconstruction	NR	93	39
12	Sigalove et al., 2017[27]	Retrospective cohort	33	52	50.6	12	Well-perfused skin flaps	NR	18	34

Table 4. Newcastle-Ottawa Scale (NOS) for cohort study.

Study	Item & Score								Total Scores
	The Exposed Cohort（1）	Selection of the non（1）	Ascertainment of Exposure（1）	Demonstration that Outcome of Interest was not Present at the Start of the Study（1）	Compare the Ability of Cohorts based on the design or Analysis (2)	Assessment of Outcome（1）	Was Follow-up long Enough for Outcomes to Occur（1）	Adequacy of Follow-up of Cohorts（1）	
Riina et al., 2024[17]	*	*	*	*	*	*	*	*	8/9
Vinsensia et al., 2024[18]	*	*	*	-	*	*	*	*	7/9
Doherty et al., 2023[19]	*	*	*	*	**	*	*	*	9/9
Naoum et al., 2022[20]	*	*	*	-	*	*	*	*	7/9
Sun et al., 2022[21]	*	*	*	*	**	*	*	*	9/9
Thuman et al., 2021[22]	*	*	*	*	*	*	*	*	8/9
Sinnott et al., 2021[23]	*	*	*	*	*	*	*	*	8/9
Frisell et al., 2020[9]	*	*	*	*	*	*	*	*	8/9
Chiasson et al., 2020[24]	*	*	*	*	*	*	*	*	8/9
Polotto et al., 2020[25]	*	*	*	*	*	*	*	*	8/9
Elswick et al., 2018[26]	*	*	*	*	*	*	*	*	8/9
Sigalove et al., 2017[27]	*	*	*	*	*	*	*	*	8/9

Infection

The infection risk ratio between irradiated and non-irradiated breasts was -0.01 (RR, -0.01; 95% CI, -0.23-0.21; p=0.93). The heterogeneity was moderate (I^2 = 74.52%, p = 0.00) (Fig. 2).

Capsular-contracture

Irradiated breasts were 0.32 times more vulnerable to developing capsular contracture than the non-irradiated breasts (RR, 0.32; 95% CI, 0.04-0.61; p=0.03). There was a significant difference between the irradiated and the non-irradiated breasts. The heterogeneity was low (I^2 = 0%, p = 0.99) (Fig. 3).

Nipple necrosis

In the fixed effect model low (I^2 = 0%, p = 0.69), the risk of nipple necrosis between irradiated and non-irradiated breasts did not differ significantly (RR, 0.02; 95% CI-0.03, 0.08; p=0.40) (Fig. 4).

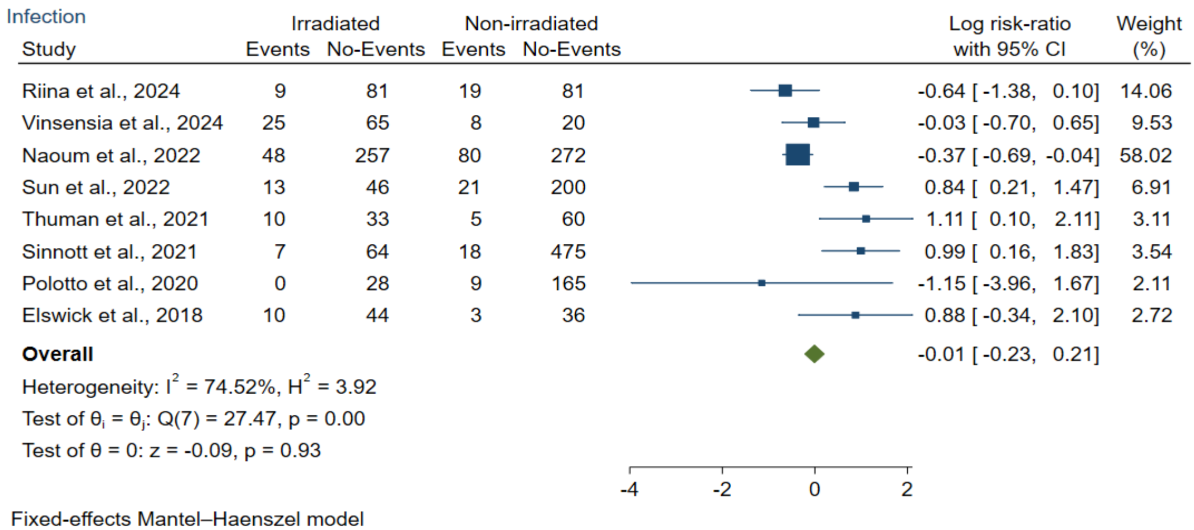

Fig. 2. The forest plot showed infection between the irradiated and the non-irradiated breasts.

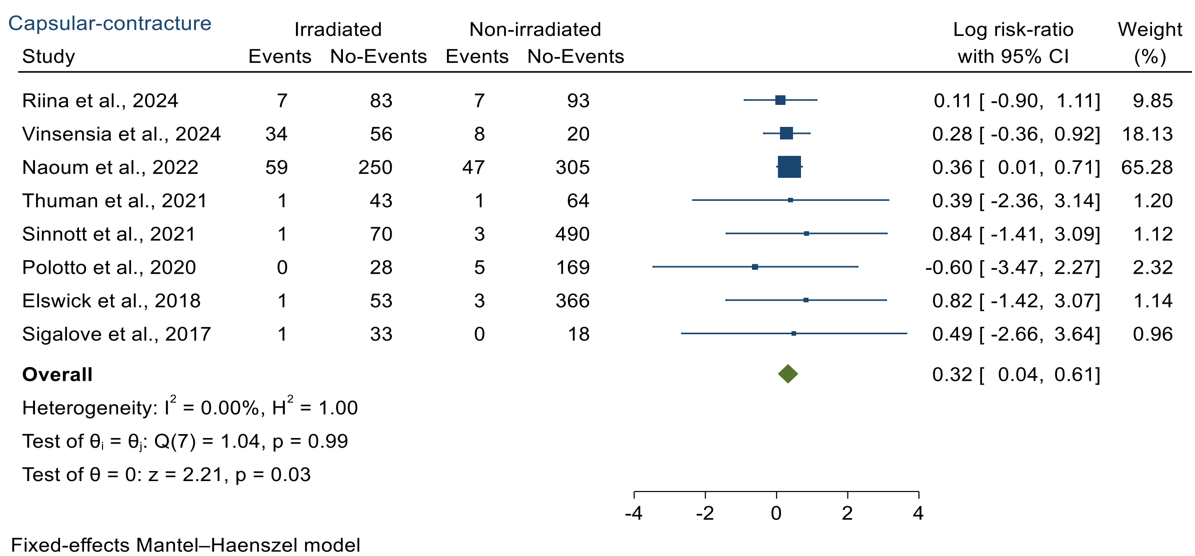

Fig. 3. Forest plots showed the risk of capsular contracture between the irradiated and the non-irradiated breasts.

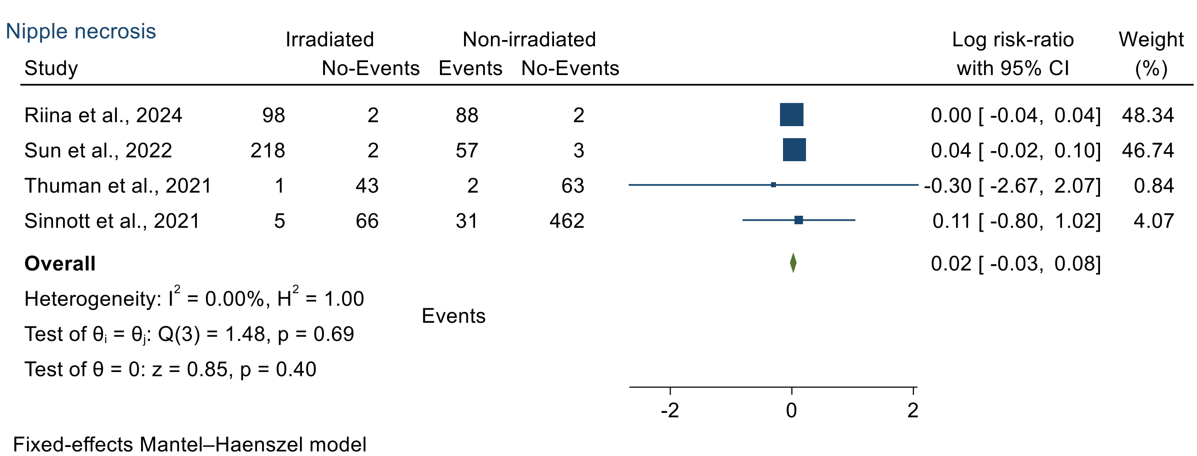

Fig. 4. The forest plot showed nipple necrosis risk.

Seroma

The risk ratio of seroma was -0. 40 (RR, -0.40; 95% CI -0.78, -0.02; p=0.04). There was a significant difference between groups in the fixed-effect model (I^2 = 72.77%, p = 0.00) (Fig. 5).

Hematoma

The hematoma risk ratio did not significantly differ between the two groups (RR, 0.25; 95% CI -1.24, 1.75; p=0.74), with low heterogeneity (I^2 = 0%, p = 0.95) (Fig. 6).

Reconstruction failure

The Reconstruction failure was associated with received radiotherapy (OR =0.44; 95% CI: 0.21, 0.66; p<0.01; I^2 = 83.87%, p<0.01) (Fig. 7). Meta-analysis showed that received radiotherapy was an independent risk factor associated with reconstruction failure.

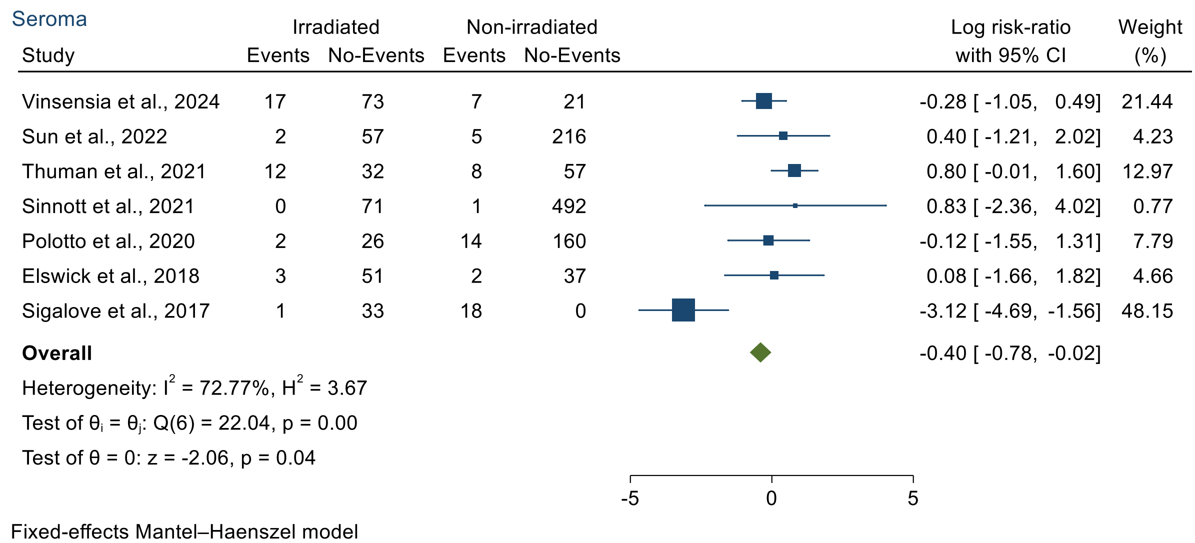

Fig. 5. Forest plot showed seroma between the irradiated and the non-irradiated breasts.

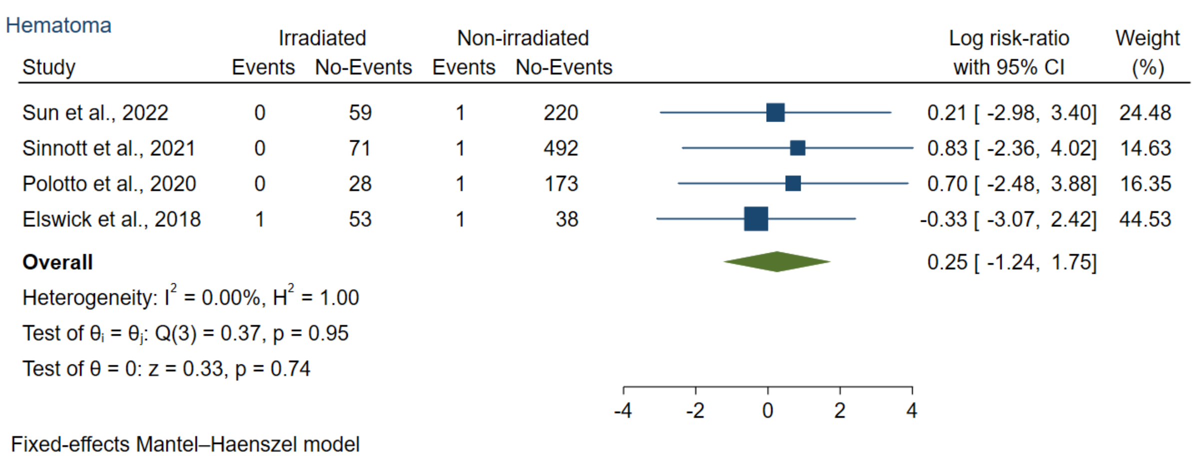

Fig. 6. Forest plot shows hematoma risk ratio.

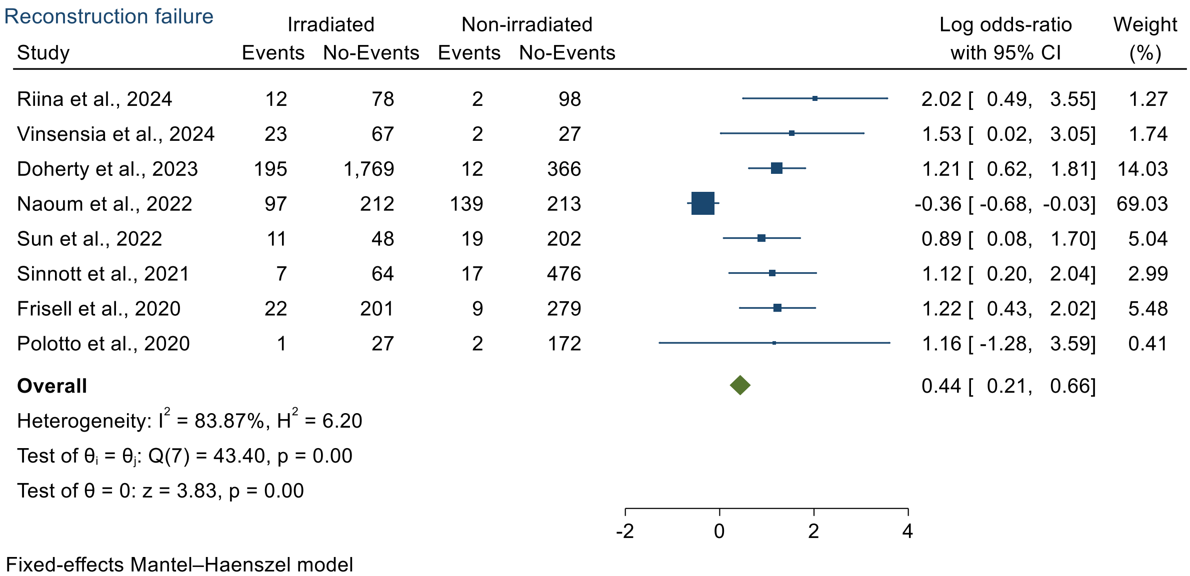

Fig. 7. Forest plot showed Reconstruction failure.

4. Discussion

In the last decade, there has been a gradual increase in the number of breast reconstructions after mastectomy for breast cancer, which is attributed to economic development.[28] Studies showed that PMRT is necessary in patients with positive lymph nodes.[29, 30] Whether the implant is an expander or a permanent prosthesis, radiotherapy may increase the risk of reconstruction complications and prosthesis failure due to severe complications.[20, 31] In addition to damaging blood vessel cells, radiotherapy can also reduce blood flow and cause tissue hypoxia. It also causes fibrosis and myofibroblast transformation, leading to capsular contracture.[32] Consistent with the results of previous research, the current study demonstrated that RT may increase the incidence of complications associated with breast prosthesis reconstruction.[33] Patients who received radiotherapy also had higher rates of certain specific complications, such as capsular contracture, seroma and implant reconstruction failure. Reconstruction failure occurred more frequently in patients who received radiation therapy; the rate of reconstruction failure increased 0.44-fold. Therefore, the influence of radiotherapy on the failure rate of prosthesis reconstruction is acceptable. One of the separate risk factors for complications related to reconstruction is radiation therapy.

According to the meta-analysis,[34] immediate prosthetic reconstruction may be associated with more complications than immediate, delayed reconstruction, particularly implant loss, reoperation, and flap necrosis. Poor outcomes were more likely to occur in patients with prepectoral implant-based breast reconstruction and Postmastectomy radiation therapy, according to a meta-analysis.[33] According to a study, the rate of reconstruction failure, reoperation and overall complications in prosthetic reconstruction after radiotherapy was high.[35] In immediate breast reconstruction after adjuvant radiotherapy, a study has documented poor cosmetic results and high reconstruction failure rates.[36]

PMRT results in acute toxicity manifested by desquamation, edema, and inflammation. These changes lead to delayed healing, seromas, and infections.[37] Radiation treatment alters the vascularity of the skin flap, covering it by creating a microvascular occlusion that allows the placement of prepectoral expanders. radiation therapy creates a microvascular occlusion that alters the vascularity of the skin flap covering it. The risk of extrusion, flap necrosis, and implant exposure increases when an inadequately vascularized skin flap is expanded.[38] The release of transforming growth factors by irradiated breasts results in long-term tissue changes. This leads to atrophy and fibrosis of the skin and underlying subcutaneous tissue, resulting in hardening, shrinkage, skin discoloration, and reduced breast volume. In addition, PMRT-induced soft tissue necrosis after reconstruction can lead to capsular contracture, implant loss, and breast contour distortion.[39] According to a systematic review and meta-analysis, higher rates of early and late complications were found in patients who underwent PMRT after immediate implant-based breast reconstruction.[40]

5. Conclusion

Post-mastectomy radiotherapy after breast reconstruction is associated with an increased risk of reconstruction failure. It should be noted that in patients requiring PMRT, the complication rate may be increased in those patients with surgical scars caused by high-dose radiation. Identification of these severe side effects should alert oncologists and plastic surgeons to the best preventative measures that can be taken to reduce side effects and preserve oncologic outcomes in patients undergoing PMRT and implant-based breast reconstruction.

Conflict of Interest

The authors declared that there is no conflict of interest.

Acknowledgments

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

References

[1] Safiri S, Noori M, Nejadghaderi SA, Sullman MJ, Bragazzi NL, Almasi-Hashiani A, et al. Burden of female breast cancer in the Middle East and North Africa region, 1990–2019. Archives of Public Health. 2022;80(1):168. https://doi.org/10.1186/s13690-022-00918-y.

[2] Heneghan HM, Prichard RS, Lyons R, Regan PJ, Kelly JL, Malone C, et al. Quality of life after immediate breast reconstruction and skin-sparing mastectomy–a comparison with patients undergoing breast conserving

surgery. European Journal of Surgical Oncology (EJSO). 2011;37(11):937-43. https://doi.org/10.1016/j.ejso.2011.08.126.

[3] Stefura T, Rusinek J, Wątor J, Zagórski A, Zając M, Libondi G, et al. Implant vs. autologous tissue-based breast reconstruction: A systematic review and meta-analysis of the studies comparing surgical approaches in 55,455 patients. Journal of Plastic, Reconstructive & Aesthetic Surgery. 2023;77:346-58. https://doi.org/10.1016/j.bjps.2022.11.044.

[4] Momoh AO, Griffith KA, Hawley ST, Morrow M, Ward KC, Hamilton AS, et al. Postmastectomy breast reconstruction: exploring plastic surgeon practice patterns and perspectives. Plastic and reconstructive surgery. 2020;145(4):865-76. https://doi.org/10.1097/PRS.0000000000006627.

[5] Matar DY, Wu M, Haug V, Orgill DP, Panayi AC. Surgical complications in immediate and delayed breast reconstruction: A systematic review and meta-analysis. Journal of Plastic, Reconstructive & Aesthetic Surgery. 2022;75(11):4085-95. https://doi.org/10.1016/j.bjps.2022.08.029.

[6] World Health Organization, "Global health estimates: Life expectancy and leading causes of death and disability," 2019. Accessed: Apr. 2, 2022. [Online]. Available: https://www.who.int/data/gho/data/themes/mortality-and-global-health-estimates.

[7] Kaidar-Person O, Nissen HD, Yates ES, Andersen K, Boersma LJ, Boye K, et al. Postmastectomy radiation therapy planning after immediate implant-based reconstruction using the European Society for Radiotherapy and Oncology-Advisory Committee in radiation oncology practice consensus guidelines for target volume delineation. Clinical Oncology. 2021;33(1):20-9. https://doi.org/10.1016/j.clon.2020.09.004.

[8] Montero A, Ciervide R, Garcia-Aranda M, Rubio C. Postmastectomy radiation therapy in early breast cancer: Utility or futility?. Critical reviews in oncology/hematology. 2020;147:102887. https://doi.org/10.1016/j.critrevonc.2020.102887.

[9] Frisell A, Lagergren J, Halle M, de Boniface J. Risk factors for implant failure following revision surgery in breast cancer patients with a previous immediate implant-based breast reconstruction. Breast Cancer Research and Treatment. 2020;184:977-84. https://doi.org/10.1007/s10549-020-05911-z.

[10] Stone HB, Coleman CN, Anscher MS, McBride WH. Effects of radiation on normal tissue: consequences and mechanisms. The lancet oncology. 2003;4(9):529-36.

[11] Reinders FC, Young-Afat DA, Batenburg MC, Bruekers SE, van Amerongen EA, Macaré van Maurik JF, et al. Higher reconstruction failure and less patient-reported satisfaction after post mastectomy radiotherapy with immediate implant-based breast reconstruction compared to immediate autologous breast reconstruction. Breast Cancer. 2020;27:435-44. https://doi.org/10.1007/s12282-019-01036-4.

[12] Lee KT, Mun GH. Optimal sequencing of postmastectomy radiotherapy and two stages of prosthetic reconstruction: a meta-analysis. Annals of surgical oncology. 2017;24:1262-8. https://doi.org/10.1245/s10434-017-5819-1.

[13] Cordeiro PG, Albornoz CR, McCormick B, Hudis CA, Hu Q, Heerdt A, et al. What is the optimum timing of postmastectomy radiotherapy in two-stage prosthetic reconstruction: radiation to the tissue expander or permanent implant?. Plastic and reconstructive surgery. 2015;135(6):1509-17. https://doi.org/10.1097/PRS.0000000000001278.

[14] Peled AW, Foster RD, Esserman LJ, Park CC, Hwang ES, Fowble B. Increasing the time to expander-implant exchange after postmastectomy radiation therapy reduces expander-implant failure. Plastic and reconstructive surgery. 2012;130(3):503-9. https://doi.org/10.1097/PRS.0b013e31825dbf15.

[15] Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. bmj. 2021;372. https://doi.org/10.1136/bmj.n71.

[16] Peterson J, Welch V, Losos M, Tugwell PJ. The Newcastle-Ottawa scale (NOS) for assessing the quality of nonrandomised studies in meta-analyses. Ottawa: Ottawa Hospital Research Institute. 2011;2(1):1-12.

[17] Riina MD, Berlin E, Taunk NK, Azoury S, Serletti J, Freedman GM. Complications of Post-Mastectomy Radiotherapy in Immediate Two-Stage Implant Reconstruction: Contemporary Outcomes at an Academic Hospital System. International Journal of Radiation Oncology, Biology, Physics. 2024;120(2):e330.

[18] Vinsensia M, Schaub R, Meixner E, Hoegen P, Arians N, Forster T, et al. Incidence and Risk Assessment of Capsular Contracture in Breast Cancer Patients following Post-Mastectomy Radiotherapy and Implant-Based Reconstruction. Cancers. 2024;16(2):265. https://doi.org/10.3390/cancers16020265.

[19] Doherty C, McClure JA, Baxter NN, Brackstone M. Complications from postmastectomy radiation therapy in patients undergoing immediate breast reconstruction: a population-based study. Advances in Radiation Oncology. 2023;8(2):101104. https://doi.org/10.1016/j.adro.2022.101104.

[20] Naoum GE, Ioakeim MI, Shui AM, Salama L, Colwell A, Ho AY, et al. Radiation modality (proton/photon), timing, and complication rates in patients with breast cancer receiving 2-stages expander/implant reconstruction. Practical radiation oncology. 2022;12(6):475-86. https://doi.org/10.1016/j.prro.2022.05.017.

[21] Sun L, Zhu W, Zhang J, Zhong B, Li S, Li H, et al. The risk factors and the relationship between radiation dose and complications and prosthetic reconstruction failure in patients with post-mastectomy breast implant reconstruction: a retrospective cohort study. Gland Surgery. 2022;11(11):1817-31. https://doi.org/10.21037/gs-22-633.

[22] Thuman JM, Worbowtiz N, Jain A, Ulm JP, Delaney KO, Herrera FA. Impact of radiation on implant-based breast reconstruction in prepectoral versus submuscular planes. Annals of Plastic Surgery. 2021;86(6S):S560-6. https://doi.org/10.1097/SAP.0000000000002882.

[23] Sinnott CJ, Pronovost MT, Persing SM, Wu R, Young AO. The impact of premastectomy versus postmastectomy radiation therapy on outcomes in prepectoral implant-based breast reconstruction. Annals of Plastic Surgery. 2021;87(1s):S21-7. https://doi.org/10.1097/SAP.0000000000002801.

[24] Chiasson KF, Kumbla PA, Restrepo RD, Soto E, Cohn AB. Immediate latissimus dorsi and prosthetic reconstruction in the setting of postmastectomy radiation: an analysis of 376 breast reconstructions. Annals of plastic surgery. 2020;84(6S):S364-8. https://doi.org/10.1097/SAP.0000000000002279.

[25] Polotto S, Bergamini ML, Pedrazzi G, Arcuri MF, Gussago F, Cattelani L. One-step prepectoral breast reconstruction with porcine dermal matrix-covered implant: a protective technique improving the outcome in post-mastectomy radiation therapy setting. Gland Surgery. 2020;9(2):219-28. https://doi.org/10.21037/gs.2020.01.16.

[26] Elswick SM, Harless CA, Bishop SN, Schleck CD, Mandrekar J, Reusche RD, et al. Prepectoral implant-based breast reconstruction with postmastectomy radiation therapy. Plastic and reconstructive surgery. 2018;142(1):1-12. https://doi.org/10.1097/PRS.0000000000004453.

[27] Sigalove S, Maxwell GP, Sigalove NM, Storm-Dickerson TL, Pope N, Rice J, et al. Prepectoral implant-based breast reconstruction and postmastectomy radiotherapy: short-term outcomes. Plastic and Reconstructive Surgery–Global Open. 2017;5(12):e1631. https://doi.org/10.1097/GOX.0000000000001631.

[28] Vangsness KL, Juste J, Sam AP, Munabi N, Chu M, Agko M, et al. Post-Mastectomy Breast Reconstruction Disparities: A Systematic Review of Sociodemographic and Economic Barriers. Medicina. 2024;60(7):1169. https://doi.org/10.3390/medicina60071169.

[29] Zhao JM, An Q, Sun CN, Li YB, Qin ZL, Guo H, et al. Prognostic factors for breast cancer patients with T1–2 tumors and 1–3 positive lymph nodes and the role of postmastectomy radiotherapy in these patients. Breast Cancer. 2021;28:298-306. https://doi.org/10.1007/s12282-020-01158-0.

[30] Tang Y, Zhang YJ, Zhang N, Shi M, Wen G, Cheng J, et al. Nomogram predicting survival as a selection criterion for postmastectomy radiotherapy in patients with T1 to T2 breast cancer with 1 to 3 positive lymph nodes. Cancer. 2020;126:3857-66. https://doi.org/10.1002/cncr.32963.

[31] Yoon AP, Qi J, Kim HM, Hamill JB, Jagsi R, Pusic AL, et al. Patient-reported outcomes after irradiation of tissue expander versus permanent implant in breast reconstruction: a multicenter prospective study. Plastic and reconstructive surgery. 2020;145(5):917e-26e. https://doi.org/10.1097/PRS.0000000000006724.

[32] Wang B, Wang H, Zhang M, Ji R, Wei J, Xin Y, et al. Radiation‐induced myocardial fibrosis: mechanisms underlying its pathogenesis and therapeutic strategies. Journal of Cellular and Molecular Medicine. 2020;24(14):7717-29. https://doi.org/10.1111/jcmm.15479.

[33] Awadeen A, Fareed M, Elameen AM. The impact of postmastectomy radiation therapy on the outcomes of prepectoral implant-based breast reconstruction: a systematic review and meta-analysis. Aesthetic Plastic Surgery. 2023;47(1):81-91. https://doi.org/10.1007/s00266-022-03026-y.

[34] Basta MN, Gerety PA, Serletti JM, Kovach SJ, Fischer JP. A systematic review and head-to-head meta-analysis of outcomes following direct-to-implant versus conventional two-stage implant reconstruction. Plastic and reconstructive surgery. 2015;136(6):1135-44. https:doi.org/10.1097/PRS.0000000000001749.

[35] El-Sabawi B, Sosin M, Carey JN, Nahabedian MY, Patel KM. Breast reconstruction and adjuvant therapy: a systematic review of surgical outcomes. Journal of surgical oncology. 2015;112(5):458-64. https://doi.org/10.1002/jso.24028.

[36] Lam TC, Hsieh F, Boyages J. The effects of postmastectomy adjuvant radiotherapy on immediate two-stage prosthetic breast reconstruction: a systematic review. Plastic and reconstructive surgery. 2013;132(3):511-8. https://doi.org/10.1097/PRS.0b013e31829acc41.

[37] Ribuffo D, Torto FL, Atzeni M, Serratore F. The effects of postmastectomy adjuvant radiotherapy on immediate two-stage prosthetic breast reconstruction: a systematic review. Plastic and Reconstructive Surgery. 2015;135(2):445e. https://doi.org/10.1097/PRS.0000000000000932.

[38] Wei J, Meng L, Hou X, Qu C, Wang B, Xin Y, et al. Radiation-induced skin reactions: mechanism and treatment. Cancer management and research. 2018:167-77.

[39] Clemens MW, Kronowitz SJ. Current perspectives on radiation therapy in autologous and prosthetic breast reconstruction. Gland surgery. 2015;4(3):222-31. https://doi.org/10.3978/j.issn.2227-684X.2015.04.03.

[40] Zugasti A, Hontanilla B. The impact of adjuvant radiotherapy on immediate implant-based breast reconstruction surgical and satisfaction outcomes: a systematic review and meta-analysis. Plastic and Reconstructive Surgery–Global Open. 2021;9(11):e3910. https://doi.org/10.1097/GOX.0000000000003910.

How to Cite this Article: Shariati Y, Jamali S, Hajizadeh M. Evaluate the Implant Failure Rate of Radiotherapy Administered after Mastectomy in Breast Cancer Patients: A Systematic Review and Meta-analysis. International Journal of Scientific Research in Dental and Medical Sciences. 2024;6(3):142-150. https://doi.org/10.30485/IJSRDMS.2024.488518.1616.