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Evaluation of Aesthetic and Oncological Outcomes of Immediate Versus Delayed Reconstruction in Patients of Breast Cancer: A Meta-analysis

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Abstract

Background: With a lifetime probability of up to 10 %, breast cancer is considered the most prevalent type of cancer among women. One of the key elements for achieving successful reconstruction is the optimal timing. It is still debated to take a decision choosing between the immediate and the delayed reconstruction.

Aim and objectives: The goal of the present research was the evaluation of both the aesthetic and oncological results of reconstruction: the immediate versus the delayed, in patients having breast cancer.

Methods: A search in literature was conducted in publications of PUBMED, ScienceDirect, EMBASE, Google Scholar, and the Cochran Library for publications between the years 2012 and 2022 which provided data about breast reconstruction: immediate versus the delayed, regarding aesthetic result and/or oncological safety.

Results: This meta-analysis comprised a total of 10 papers. It included 4021 breast cancer patients. 762 patients got delayed reconstruction, while 3259 individuals underwent rapid breast reconstruction. Comparing the results of the reconstruction procedure: immediate vs. delayed, using a meta-analysis have revealed significant enhancements in patient satisfaction, sexual health, and psychological well-being.

Keywords: Breast cancer, Delayed reconstruction, Immediate reconstruction

1. Introduction

Annually, over 2 million new cases of cancer breast are identified making it the most frequent type of cancer in females' worldwide.¹

Each year, more than 22 000 newer cases are being identified in Egypt, it accounts for 33 % of female cancer cases.²

In a ratio of 1 : 8 women may develop cancer breast over their life, putting all women at risk. Although the etiology is ambiguous, various external and endogenous risk factors have been uncovered.³

Several elements can affect a patient's decision regarding the type of surgery they should have. Example for these elements: the breast size-to-tumor burden ratio, stage, the disease's multicentricity, age, the patient's family history,

radiotherapy availability, and the patient's personal preferences. This must be managed by a team of professionals.⁴

In order to maximize results and reduce post-operative complications, the decision-making for breast reconstruction procedures entails choosing the optimal timing, method for treating the contralateral side, and reconstruction technique.⁵

The time of reconstruction must take into account the patient's overall health, smoking habits, the necessity for adjuvant therapy, surgical risk factors, the accessibility and quality of flap sites of donor, and the contralateral breast.⁶

During the mastectomy, the immediate reconstruction has become an accepted and oncologically safe procedure and safes women from the deforming effects of mastectomy. The most suitable

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candidate for an immediate reconstruction is a patient who is having a mastectomy for breast cancer early-stage (stage I), which is likely to avoid the need for radiotherapy. Immediate reconstruction can give excellent aesthetic results that may be achieved with utilizing a mastectomy skin-sparing envelope. During the procedures of immediate reconstruction, it is much simpler to correctly align with the other breast, leading to a decreased need for contralateral breast procedures.⁷

An immediate procedure also offers psychological, social, financial, and time-saving advantages. However, the success of an immediate reconstruction is directly dependent on the native skin flaps' quality left by the oncologic specialist. If the patient requires postoperative radiation, the results of an immediate autologous reconstruction can change considerably, including flap shrinkage, hyperpigmentation, contraction, and asymmetry. The complications are even higher in irradiated implant reconstructions; these include skin necrosis, infection, and capsular contracture.⁸

After the mastectomy, delayed reconstruction may be carried out months or years later. Prior to reconstructive surgery, it gives the patient enough time to make decisions, psychologically recover from their diagnosis breast of cancer and mastectomy, then evaluate the entire pathology. It prevents any potential adjuvant treatment delays as well as any negative consequences for the reconstruction.⁹

Owed to losing the skin envelope of breast and the necessity to replace a large portion of the wall skin of chest, which is frequently damaged and rigid, it might be challenging to reconstruct a curved and ptotic breast. There is also a greater need for procedures to the opposite breast to maintain symmetry.¹⁰

In this research, our goal was to assess the aesthetic and oncological results of immediate vs. delayed reconstruction in patients with cancer breast.

2. Methodology

2.1. Data sources and search strategies

Meta-analysis and systemic review by applying the preferred reporting items (for both meta-analysis and systemic review) Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement was done.¹¹

Searching the literature was conducted in ScienceDirect, PUBMED, Google Scholar, EMBASE, and the Cochran Library. We restricted the searching to the published English articles only from 2012 to 2022. Data bases were approached through the

Egyptian Knowledge Bank. The search was conducted in September 2022.

The key words included 'breast cancer', 'mastectomy', 'breast reconstruction', 'delayed', 'immediate', 'oncological' and 'aesthetic'. The keywords were combined with the Boolean operators 'AND' and 'OR'.

After accomplishing the primary (1st) search through all the selected databases, inclusion and exclusion criteria were applied for assessing both the articles' titles and abstracts. In case of these criteria could not be evaluated from either the title or abstract alone, the article's full text was surveyed.

Moreover, the relevant articles' references were hand-searched for identifying further pertinent reports.

2.2. Eligibility criteria for the study

The selected studies should fulfill the inclusion criteria as follows: prospective, retrospective or cross sectional studies. They should include diagnosed female patients of breast cancer and total mastectomy candidates. After mastectomy, comparison between immediate and delayed breast reconstruction is made. They should include report on at least one of the outcome measures and extractable data from complete publications.

Exclusion criteria included exclusion of studies with partial mastectomy female patients or breast conserving surgery. Also, exclusion of Abstracts, letters, editorials and expert opinions, reviews with no original data, meta-analysis, case reports and studies that have no control. Non-English language studies were excluded too.

2.3. Data collection and data items

A form was used to extract data from each study with the following parameters according to a pre-specified protocol: 1st author, the year of publication, the study's type, patients' total number, patients' age, stage of breast cancer, reconstruction's type, adjuvant treatment, cancer recurrence rate, quality of life after reconstruction, patients' body imaging before and after reconstruction, anxiety and depression before and after reconstruction and patient satisfaction before and after reconstruction.

2.4. Statistical analysis of the data and synthesis of results

Data were computerized and analyzed by means of MedCalc software package version 20.100. The confidence interval (CI) was established at 95 % and

P values of less than or equal 0.05 were considered a statistical significance. The statistical heterogeneity was evaluated by means of *I*² (observed variance for heterogeneity) and *Q* (Total variance for heterogeneity). The quantitative data were reported as the Mean and the standard deviation (SD) while the qualitative Data are reported as total Number and number of event.

3. Results

3.1. Search results

Through database searches, a total of 597 potentially relevant research reports were identified. 425

possibly relevant studies were found and examined after 172 duplicate studies were excluded. After abstract and title screenings, 378 papers were disqualified because they were case reports, reviews, letters to the editor, conference abstracts only, or they did not compare immediate and delayed breast reconstruction next to mastectomy. For a more thorough full-text assessment, 47 studies with potential were still available. The inclusion criteria were not met by 37 studies, hence they were excluded. There were no additional studies that qualified after scanning the references and full texts. Last but not least, this meta-analysis included 10 studies [Fig. 1](#).

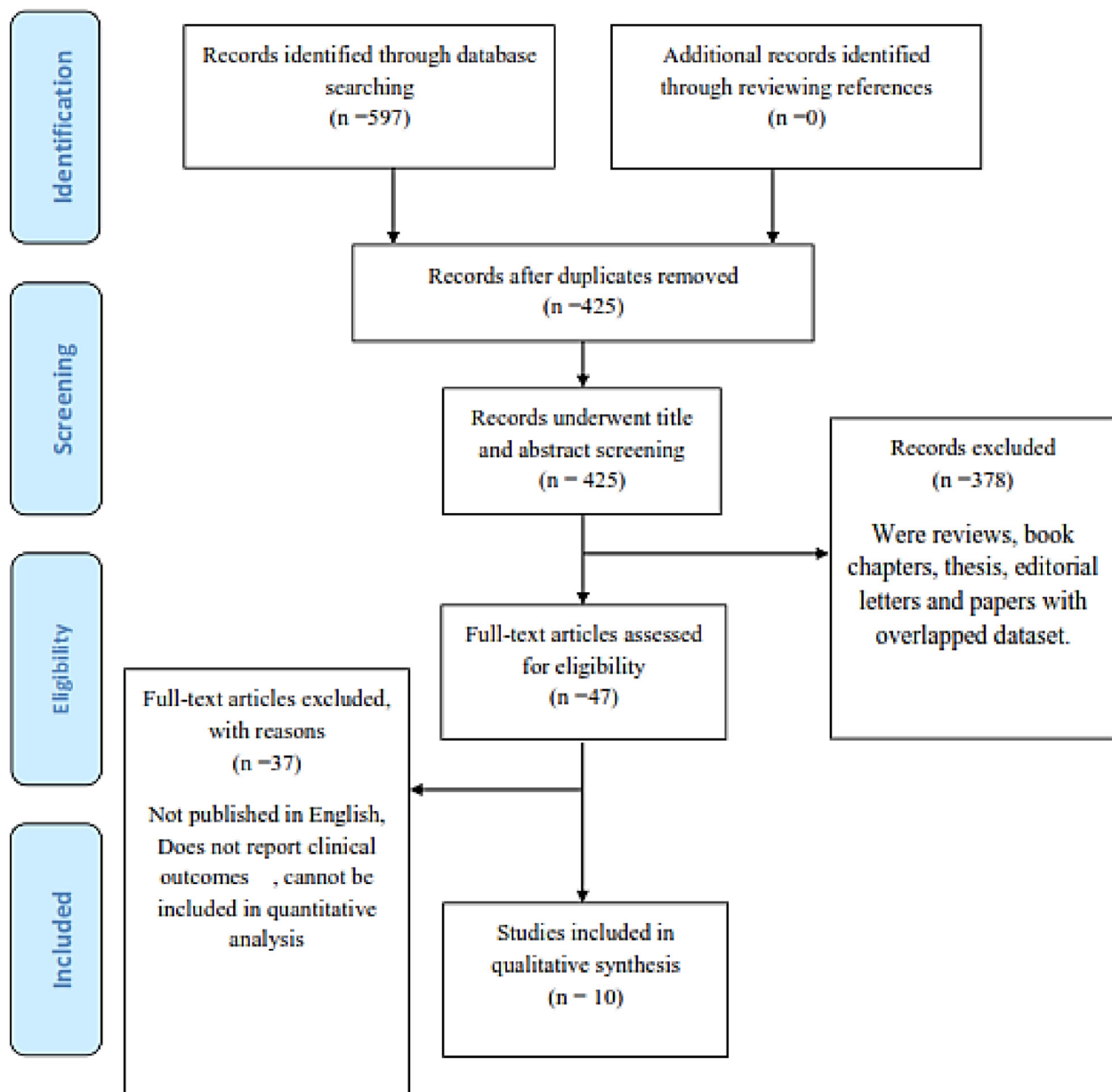


Fig. 1. PRISMA flow diagram showing process of studies selection. PRISMA, Preferred Reporting Items for Systematic Reviews and Meta-Analyses.

3.2. Study characteristics

10 studies were included: 4 were retrospective, 4 were prospective and 2 were cross sectional studies as shown in [Table 1](#).

3.3. Characteristics of the participants

The participants were 4021 women with mean age 48.4 years; 3259 patients had postmastectomy immediate breast reconstruction and 762 patients had delayed reconstruction as shown in [Table 2](#).

3.4. Oncological outcome

Recurrence and death during study period mentioned in only one study by Maalouf et al., 2017 showed that recurrence was in 4/30 in immediate group versus 2/32 in delayed group and death due to cancer was 2/30 in immediate group versus 1/32 in delayed group as showed in [Table 3](#).

3.5. Meta-analysis

3.5.1. Satisfaction after reconstruction

Six studies assessed satisfaction after reconstruction and showed significant increase in satisfaction in immediate versus delayed reconstruction [Table 4](#), [Fig. 2](#).

3.6. Psychosocial well-being after reconstruction

Six studies assessed psychosocial well-being after reconstruction and showed that there was significant improvement in immediate reconstruction versus delayed reconstruction [Fig. 3](#), [Table 5](#).

4. Discussion

Breast reconstruction is regarded as a crucial stage in breast cancer treatment since it not only gives a newer form of breast but also improves the patient's standard of living and body image while alleviating the an emotional anxiety that comes with a surgical mastectomy.²²

Table 1. The included studies' characteristics.

Article number	Article file	Country of origin	Year	Study design
1	The immediate versus the delayed autologous breast reconstruction in women having postmastectomy radio-therapy: A paradigm shift ¹²	USA	2022	retrospective
2	Quality of life of patients after immediate or delayed autologous breast reconstruction ¹⁵	Netherlands	2018	cross-sectional
3	Results of immediate vs. delayed breast reconstruction: Results of a multicenter prospective research ¹⁴	USA	2018	prospective
4	The effect of autologous breast reconstruction by applying DIEP flap on the oncologic efficacy of radiotherapy ¹⁵	Canada	2017	retrospective
5	Should Immediate Autologous Breast Reconstruction be regarded in females who need PostMastectomy Radiotherapy? A Prospective Analysis of Outcomes ¹⁶	USA	2017	prospective
6	Comparing both Preoperative Quality of Life in Breast Reconstruction, Breast Aesthetic and nonbreast Plastic Surgery Patients: A Cross-Sectional study ¹⁷	Brazil USA	2016	Cross-sectional
7	A Comparison of psychological response, sexuality, body image, and quality of life between immediate and delayed autologous tissue breast reconstruction: A prospective long-term outcome study ¹⁸	Canada	2016	retrospective
8	Comparison of delayed and immediate tissue expander breast reconstruction in the setting of postmastectomy radiation therapy. ¹⁹	USA	2015	retrospective
9	Quality of life before reconstructive breast surgery: a preoperative comparison of patients with immediate, delayed, and major revision reconstruction ²⁰	USA	2013	prospective
10	Alterations in psycho-social functioning one year prior to mastectomy alone, delayed breast reconstruction, or immediate breast reconstruction ²¹	Canada	2012	prospective

Table 2. Characteristics of the participants according to timing of reconstruction.

Article number		Number	Mean age
1	Immediate reconstruction	36	51.6
	Delayed reconstruction	89	51.5
2	Immediate reconstruction	133	50.7
	Delayed reconstruction	198	51
3	Immediate reconstruction	1806	49.9
	Delayed reconstruction	151	29.5
4	Immediate reconstruction	30	50
	Delayed reconstruction	32	47
5	Immediate reconstruction	108	
	Delayed reconstruction	67	
6	Immediate reconstruction	141	
	Delayed reconstruction	12	
7	Immediate reconstruction	30	
	Delayed reconstruction	76	
8	Immediate reconstruction	834	48.6
	Delayed reconstruction	59	50.9
9	Immediate reconstruction	117	49.5
	Delayed reconstruction	21	50.7
10	Immediate reconstruction	24	46.2
	Delayed reconstruction	57	51.6

Table 3. Oncological outcome among immediate and delayed reconstruction.

	Number	Recurrence	Death
Immediate reconstruction	30	4	2
Delayed reconstruction	32	2	1

Despite the advances achieved, excellent outcomes in immediate reconstruction procedures next to adjuvant radiotherapy remain challenging to attain. Numerous tissue changes that radiotherapy procedures bring about, such as impaired vascular perfusion and severe fibrosis, which finally give rise

to a broad range of problems, dictate the reconstruction challenges that emerge after treatment.²³

According to a meta-analysis performed by Bargon and colleagues in 2022, immediate autologous breast reconstruction postmastectomy has a minor likelihood of regional, local, and loco-regional recurrence of breast cancer than delayed autologous post-mastectomy breast reconstruction.²⁴

In a systematic review conducted by Shen and colleagues discovered no difference between the recurrence rates next to both breast reconstruction techniques: immediate and delayed.²⁵

Also, 8 cohort reports totaling 2990 patients having cancer breast were included in a meta-analysis by Gieni and colleagues.²⁶ Their results have shown no noteworthy differences in the local recurrence between immediate breast reconstruction (IBR) next to mastectomy and mastectomy solaly.²⁶

According to the current study, Maalouf and colleagues indicated that patients who had IBR and those who had the delayed technique underwent similar rates of cancer recurrence and mortality due to cancer.¹⁵

In 2016, the work of Kuroda and colleagues have evaluated the aesthetic outcomes using 3 different procedures in, which included 94 patients with mastectomy and IBR. The self-report of the patient, the perspectives of four impartial experts (2 plastic surgeons and 2 breast surgeons from separate organizations), and an assessing program were all utilized. They came to the conclusion that IBR could improve patient's quality of life and also, could produce satisfying outcomes when assessed using both subjective and objective methods.²⁷

Table 4. Meta-analysis for Satisfaction after reconstruction.

Number of study	Immediate reconstruction		Delayed reconstruction		SMD	SE	95 % CI
	No.	Mean ± SD	No.	Mean ± SD			
2	133	70.2 ± 13.6	198	70.9 ± 14.8	-0.0487	0.112	-0.269 to 0.171
3	1806	65.1 ± 18.1	151	66.2 ± 20.6	-0.0601	0.0847	-0.226 to 0.106
5	108	66.5 ± 14.3	67	75 ± 12	-0.628	0.158	-0.941 to -0.316
6	141	63.3 ± 22.7	12	31.6 ± 18.9	1.405	0.31	0.793 to 2.017
7	30	60.8 ± 13.2	76	70.6 ± 15.9	-0.64	0.219	-1.074 to -0.207
9	117	59.26 ± 20.21	21	38.05 ± 13.46	1.089	0.245	0.605 to 1.573
Total (fixed effects)					-0.058	0.057	-0.170 to 0.054
Total (random effects)					0.135	0.229	-0.314 to 0.584
Test for heterogeneity							
Q							64.3654
DF							5
Significance level							<0.0001*
I ² (inconsistency)							92.23 %
95 % CI for I ²							85.84–95.74

CI, Confidence interval; I², Observed variance for heterogeneity; LL, Lower limit; Q, Total variance for heterogeneity; SMD, Standardized Mean Difference; UL, Upper Limit.

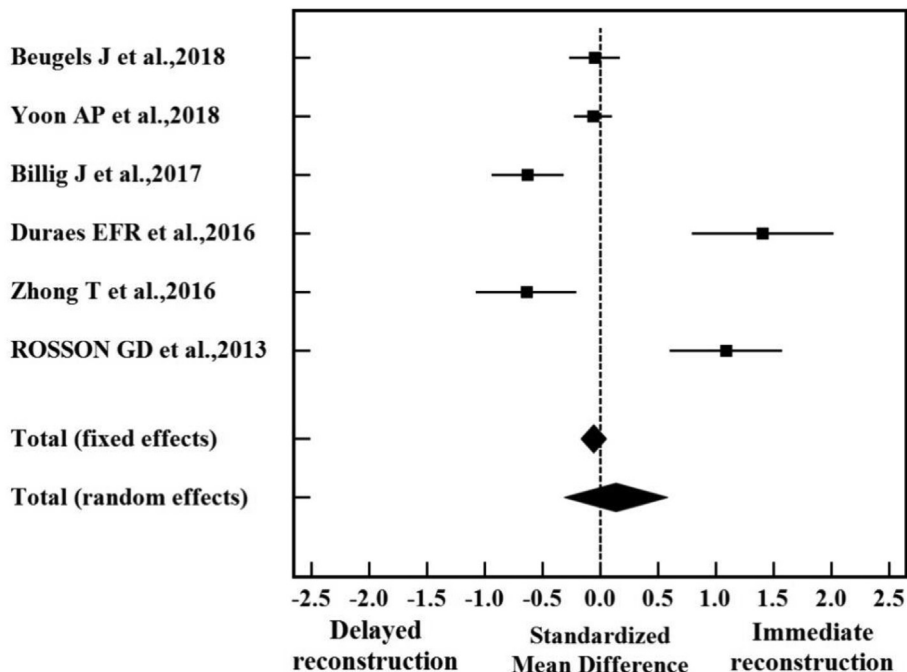


Fig. 2. Forest plot for Satisfaction after reconstruction.

Beesley and colleagues in their work, 27 patients have been interviewed. These patients had experienced breast reconstruction next to mastectomy. They indicated 4 main elements influencing the patient's assessment: the subjective cosmetic results of both feeling and looking normal, relations with

their clinicians were respectful and trusting, the fact that reconstruction brought their cancer journey to an end and post-operative complications were the four main factors that influenced patient evaluation. They demonstrated how patients' subjective assessments were influenced by elements other than

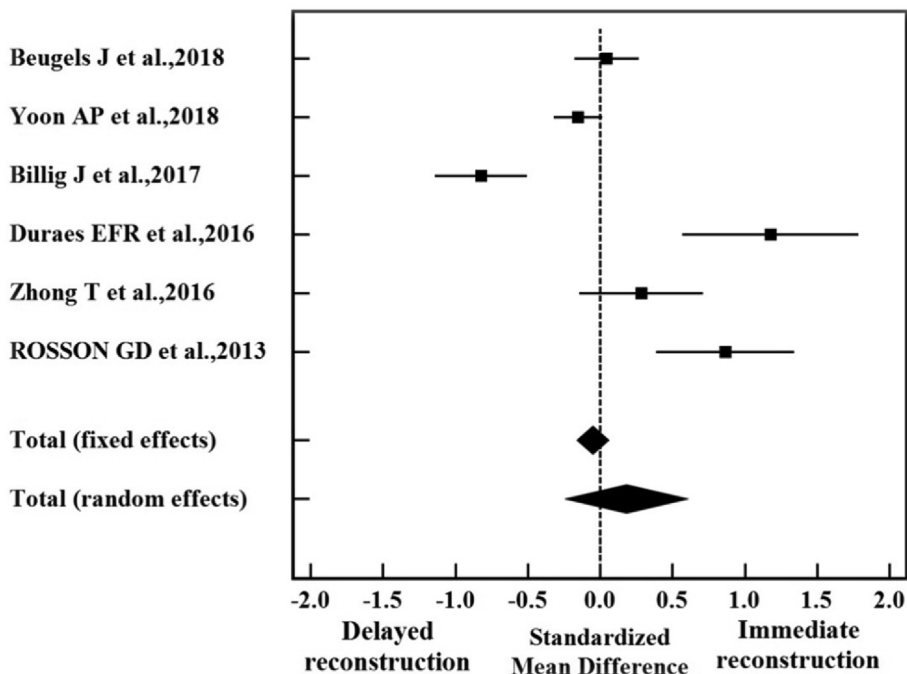


Fig. 3. Forest plot for psychological well-being after reconstruction.

Table 5. Meta-analysis for psychological well-being after reconstruction.

Study	Immediate reconstruction		Delayed reconstruction		SMD	SE	95 % CI
	No.	Mean \pm SD	No.	Mean \pm SD			
2	133	75.6 \pm 17.5	198	74.9 \pm 13.5	0.0459	0.112	−0.174 to 0.266
3	1806	74.4 \pm 19.0	151	77.3 \pm 21.4	−0.151	0.0847	−0.317 to 0.0151
5	108	71.9 \pm 13.6	67	82.6 \pm 11.9	−0.821	0.161	−1.139 to −0.503
6	141	73.1 \pm 16.8	12	53.2 \pm 17	1.178	0.307	0.572 to 1.784
7	30	79.7 \pm 21.3	76	74 \pm 19.2	0.286	0.215	−0.141 to 0.712
9	117	69.13 \pm 17.19	21	54.45 \pm 14.59	0.867	0.241	0.390 to 1.345
Total (fixed effects)					−0.0504	0.057	−0.162 to 0.0614
Total (random effects)					0.182	0.217	−0.244 to 0.608
Test for heterogeneity							
Q	58.0015						
DF	5						
Significance level	<0.0001*						
I ² (inconsistency)	91.38 %						
95 % CI for I ²	84.00 to 95.35						

CI, Confidence interval; I², Observed variance for heterogeneity; LL, Lower limit; Q, Total variance for heterogeneity; SMD, Standardized Mean Difference; UL, Upper Limit.

cosmetic, and some patients even discounted cosmetic.²⁸

In a sizable retrospective research, Al Ghazal and colleagues have assessed the psychological benefits of the immediate vs. the delayed reconstruction in 577 individuals. They discovered that individuals with IBR had much lower rates of depression than patients with delayed reconstruction. Additionally, they demonstrated that patients who underwent IBR felt noticeably a lesser amount of distress and had greater overall psycho-social well-being than patients that had delayed reconstruction.²⁹

In our study, the meta-analysis of the obtained findings revealed that patients who underwent IBR experienced considerably lower levels of anxiety and depression than those who underwent delayed reconstruction. The group receiving IBR had much superior psychological health. Immediate reconstruction had a noticeably greater prevalence of postoperative problems. However, patients who had reconstruction reported considerably advanced levels of body image, sexual health, and patient satisfying outcomes.

4.1. Conclusion

Oncologically, the technique of immediate breast reconstruction is reliable and safe as well as yielding positive outcomes. Nevertheless, careful consideration should be given to patient selection.

Immediate reconstruction technique seemed to retain the preoperative psycho-social functioning of patients. However, delayed reconstruction technique significantly enhanced these measures. These findings lead us to the conclusion that both mastectomy reconstruction techniques: immediate and

delayed, offer worthwhile quality of life advantages to the patients who decide on these treatments. Moreover, patients decide on to delay reconstruction after mastectomy out of individual preference or owing to a clinical necessity should rest assured that this technique is safe and can offer comparable benefits to quality of life and body image immediately following reconstruction.

Consent for publication

I confirm that every author has consented to submit the work.

Availability of data and material

Available.

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Conflicts of interest

No conflicts of interest.

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