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ORIGINAL ARTICLE
Breast

Evaluating Breast Reconstruction Reviews Using A Measurement Tool to Assess Systematic Reviews (AMSTAR)

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Background: Breast reconstruction is an important aspect in breast cancer treatment.

Methods: A comprehensive search of MEDLINE, Embase, and the Cochrane Library of Systematic Reviews was performed. Systematic reviews and meta-analyses that focused on breast reconstruction and were published between 2000 and 2020 were included. Quality assessment was performed using A Measurement Tool to Assess Systematic Reviews (AMSTAR). Study characteristics were extracted, including journal and impact factor, year of publication, country affiliation, reporting adherence to Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) guidelines, number of citations, and number of studies included.

Results: The average AMSTAR score was moderate (5.32). There was a significant increase in AMSTAR score ($P < 0.01$) and number of studies ($P < 0.01$) over time. There were no significant correlations between AMSTAR score and impact factor ($P = 0.038$), and AMSTAR score and number of citations ($P = 0.52$), but there was a significant association between AMSTAR score and number of studies ($P = 0.013$). Studies that adhered to the PRISMA statement had a higher AMSTAR score on average ($P < 0.01$).

Conclusions: Systematic reviews and meta-analyses about breast reconstruction had, on average, a moderate AMSTAR score. The number of studies and methodological quality have increased over time. Study characteristics including adherence to PRISMA guidelines are associated with improved methodological quality. Further improvements in specific AMSTAR domains would improve the overall methodological quality. *(Plast Reconstr Surg Glob Open 2021;9:e3897; doi: 10.1097/GOX.0000000000003897; Published online 22 November 2021.)*

INTRODUCTION

In the United States, one in eight women suffer from breast cancer and may require breast surgery, which can lead to deformity of the breasts.[1] Breast reconstruction provides patients with the opportunity to retain their physical, emotional, and psychological well-being.[1] Thus, breast reconstruction is an important treatment option for breast cancer patients.

Breast reconstruction procedures are divided into two major categories: autologous techniques, which use the patient's own tissue to create a new breast, and alloplastic techniques, which use synthetic implants.[1] Not only does each strategy have its own inherent advantages and disadvantages, patient factors must also be taken into consideration, including timing of adjuvant therapy, recovery time, and comorbidities.[1] Therefore, the decision to undergo breast reconstruction and what techniques to use require an extensive discussion between the patient and their surgeon. These decisions should be guided by the medical literature, which can be summarized in the form of systematic reviews and meta-analyses that provide a comprehensive summary of studies and their corresponding outcomes. Systematic reviews and meta-analyses about

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Received for publication July 26, 2021; accepted August 28, 2021.

DOI: 10.1097/GOX.0000000000003897

Disclosure: *Dr. Ahmad is a consultant for Mentor Worldwide LLC and Allergan Inc. All the other authors have no financial interest to declare in relation to the content of this article.*

Related Digital Media are available in the full-text version of the article on www.PRSGlobalOpen.com.

breast reconstruction must be of high methodological quality to provide clinicians with the best information for clinical decision-making.

Multiple tools have been designed to assess the methodological quality of systematic reviews and meta-analyses. The Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) statement contains 27 items as criteria that help determine the transparency of reporting in systematic reviews and meta-analyses.[2] Similarly, A Measurement Tool to Assess Systematic Reviews (AMSTAR) is an 11-item checklist used to assess the methodological and reporting quality of systematic reviews and meta-analyses.[3]

AMSTAR has been previously used to evaluate the quality of systematic reviews and meta-analyses about breast augmentation.[4] To the best of our knowledge, no previous studies have assessed the quality of systematic reviews and meta-analyses focused on breast reconstruction. The primary objective of this study was to evaluate the methodological quality of reviews concerning breast reconstruction. The secondary objective was to discern whether study characteristics (eg, number of citations, impact factor of journal, year of publication, and adherence to PRISMA guidelines) were associated with the quality of systematic reviews and meta-analyses.

METHODS

This systematic review was performed following the PRISMA reporting guideline.[2] This study was designed prospectively, and the protocol was published on Open Science Framework registries (https://osf.io/nu3f4/).

Search Strategy

A comprehensive literature search of MEDLINE, Embase, and the Cochrane Library of Systematic Reviews was performed in April 2021 to identify all systematic reviews and meta-analyses published from January 2000 to December 2020 using key terms that pertained to breast reconstruction. The search strategies for each database are available in Supplemental Digital Content 1. (**See appendix, Supplemental Digital Content 1,** which displays the search strategies. **http://links.lww.com/PRSGO/B821**.)

Studies with duplicate titles were removed. Two authors (MY and JW) independently screened title and abstract to assess eligibility to move onto subsequent analysis. Any studies where the information available in the title and abstract was insufficient to determine eligibility were reviewed at full-text level. Studies were then screened independently by the aforementioned authors at full-text for inclusion. All discrepancies throughout the two-stage screening process were resolved through consensus.

Eligibility Criteria

Studies with a particular focus on breast reconstruction that were identified as systematic reviews or meta-analyses in the title and/or text, or reviews that specifically indicated a systematic search strategy to identify studies, were included for analysis. Studies that were non-English literature, non-human based studies, systematic reviews of systematic reviews, and other study designs (ie, case studies, narrative reviews, expert opinions, editorials, protocols, conference abstracts) were excluded.

Data Collection and Analysis

Independent data extraction was conducted by two authors (MY and JW). Discrepancies that arose were resolved through discussion and consensus. The included studies were assessed for their quality using the AMSTAR tool and further parameters were extracted, including journal and 2019 impact factor (Web of Science, Clarivate Analytics, Philadelphia, Pa.), year of publication, country affiliation of corresponding author, reporting adherence to PRISMA guidelines, number of Google Scholar citations (collected on May 17, 2021), and number of studies included. The findings and conclusions of included studies were also collected and synthesized based on general breast reconstruction, autologous breast reconstruction, allogeneic breast reconstruction, acellular dermal matrix-assisted breast reconstruction, adjuvant radiation and chemotherapy, and perioperative management of breast reconstruction.

Quality Assessment

The AMSTAR tool was used to assess the methodological quality of the included studies.[3] The 11-item measurement tool assigns a score of 0 or 1 for each criterion, with total scores ranging from 0 to 11 (Table 1). AMSTAR scores of 4 or less are classified as poor methodological quality, scores of 5–8 as moderate methodological quality, and scores of 9 or greater as good methodological quality. Two review authors independently selected "yes," "no," or "not applicable" for each criterion. Any discrepancies were resolved through consensus. One point was given to each criterion that received a "yes," whereas no points were awarded for "no" and "not applicable."

Microsoft Excel (Microsoft Corporation, Redmond, Wash.) was used to construct tables and graphs to summarize the results. Statistical analysis was performed with GraphPad Prism (version 7.0; GraphPad Software, Inc, USA). Pairwise correlations (AMSTAR score as compared with citation number, impact factor, publication year, number of studies included) were evaluated using

Table 1. AMSTAR Criteria

AMSTAR Criteria	Description
1	An "a priori" design was provided
2	Duplicate study selection and data extraction
3	Comprehensive literature search
4	Status of publication used as inclusion criteria
5	List of studies provided
6	Characteristics of included studies provided
7	Scientific quality of included studies provided
8	Scientific quality of included studies used appropriately in formulating conclusions
9	Appropriate methods used to combine findings of studies
10	Likelihood of publication bias assessed
11	Conflict of interest stated

the Pearson correlation coefficient (r). The difference in AMSTAR score by adherence to PRISMA guidelines was evaluated with a two-tailed T-test. *P* values of less than 0.05 were considered statistically significant.

Cohen kappa (κ) statistic was used to assess the interrater reliability, with values of 0.01–0.20 ("slight agreement"), 0.21–0.40 ("fair agreement"), 0.41–0.60 ("moderate agreement"), 0.61–0.80 ("substantial agreement"), and 0.81–0.99 ("almost perfect agreement"), respectively.[5]

RESULTS

Search Results

The literature search identified 10,461 studies, of which 3611 duplicates were removed (Fig. 1). A total of 6850 studies were then screened at title/abstract level, with 342 studies moving to subsequent full-text screening. Another 154 studies were excluded at this stage: 92 on the basis of not being a systematic review or meta-analysis, 44 for lack of focus on breast reconstruction, and 18 for duplicate titles. The final inclusion for this review included 188 studies (1.79%), the citations of which can be found in Supplemental Digital Content 2. (**See appendix, Supplemental Digital Content 2,** which displays the included studies. **http://links.lww.com/PRSGO/B822**.) Cohen's kappa was found to be 0.833, which indicated almost perfect agreement between the two reviewers and strong interrater reliability.

General Study Characteristics

General study characteristics are summarized in Table 2. The majority of our included studies were conducted in the United States (n = 75), with the second most in the United Kingdom (n = 20). Our studies came from 45 different journals; the majority were published in *Plastic and Reconstructive Surgery* (PRS, n = 22) and the *Journal of Plastic, Reconstructive and Aesthetic Surgery* (JPRAS, n = 22). The publication years ranged from 2006 to 2020, with the most in 2019 (n = 31) and second most in 2020 (n = 27). The number of studies included in each study ranged from 1 to 314, with an average of 24.9 studies. The average number of citations was 39.7, with a maximum citation count of 330. Of the 188 included studies, 91 studies (48%) adhered to PRISMA, whereas 97 (52%) did not. The number of studies that adhered to PRISMA per half decade were found to be zero of 13 between 2005 and 2010, 15 of 58 (26%) between 2011 and 2015, and 76 of 117 (65%) between 2016 and 2020. No studies were identified in this review from 2000 to 2004.

The findings of included studies were synthesized based on their topics and outcomes. The predominant topics among these studies were general breast reconstruction, autologous breast reconstruction, alloplastic breast reconstruction, acellular dermal matrix-assisted breast

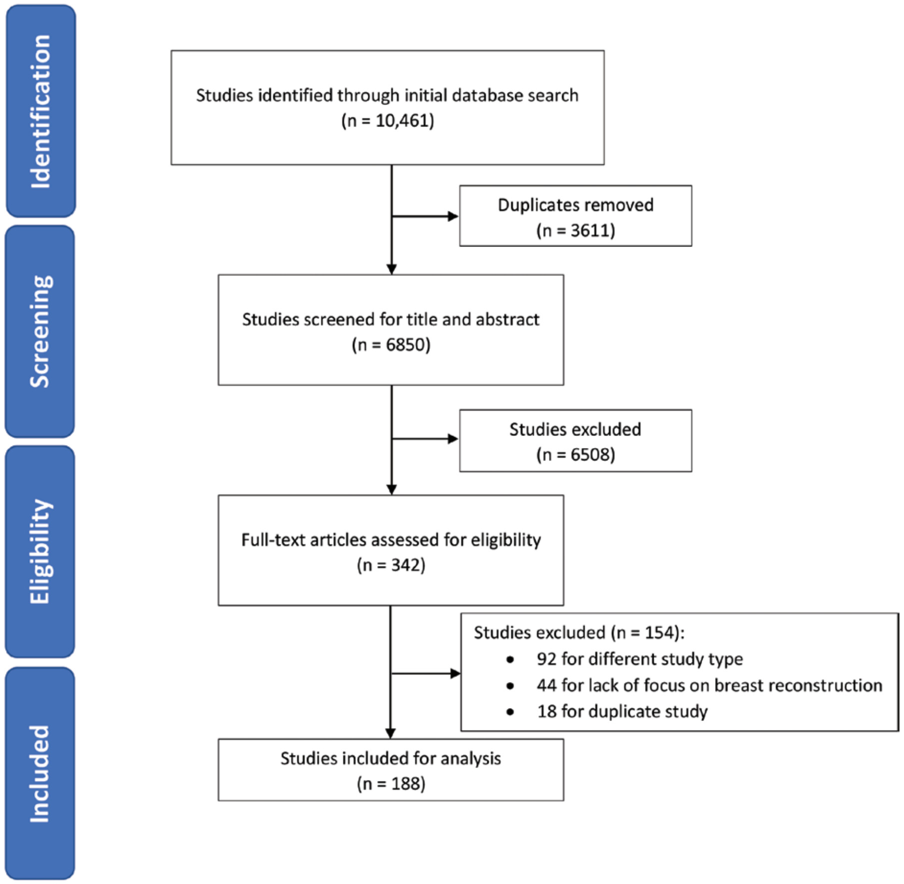

Fig. 1. PRISMA diagram demonstrating results of the literature search.

Table 2. Characteristics of Included Studies

Author	Journal	Impact Factor	Year	Country Affiliation (Corresponding Author)	Google Scholar Citations	No. Studies	PRISMA Adherence	AMSTAR Score
Piper	*Annals of Plastic Surgery*	1.354	2019	USA	0	11	No	3
Macarios	*Plastic and Reconstructive Surgery – Global Open*	N/A	2015	USA	22	3	Yes	3
Losken	*Annals of Plastic Surgery*	1.354	2014	USA	267	24	No	2
Khajuria	*Plastic and Reconstructive Surgery – Global Open*	N/A	2019	UK	10	16	Yes	8
Kim	*Plastic and Reconstructive Surgery*	4.235	2012	USA	330	48	No	6
Ricci	*Journal of Surgical Research*	1.841	2017	USA	68	20	No	8
Zhao	*Aesthetic Plastic Surgery*	1.798	2015	China	40	11	No	8
Lee	*Annals of Plastic Surgery*	1.354	2017	South Korea	22	17	No	6
Fischer	*Annals of Plastic Surgery*	1.354	2014	USA	18	31	No	7
Basta	*Plastic and Reconstructive Surgery*	4.235	2015	USA	56	13	Yes	7
Ho	*Annals of Plastic Surgery*	1.354	2012	USA	245	16	No	7
Steffenssen	*Annals of Plastic Surgery*	1.354	2019	Denmark	7	26	Yes	6
Qian	*Journal of Oncology*	2.206	2019	China	2	12	Yes	7
Atisha	*Annals of Plastic Surgery*	1.354	2009	USA	115	20	No	3
Phillips	*Plastic and Reconstructive Surgery*	4.235	2013	USA	84	81	No	5
Winocour	*Plastic and Reconstructive Surgery*	4.235	2016	USA	41	31	No	7
Corban	*Journal of Plastic, Reconstructive and Aesthetic Surgery*	2.39	2017	Canada	24	16	Yes	6
Wagner	*Journal of Plastic, Reconstructive and Aesthetic Surgery*	2.39	2019	USA	18	27	No	8
Momoh	*Annals of Surgical Oncology*	4.061	2013	USA	140	26	No	4
Lindenblatt	*Gland Surgery*	2.19	2019	Switzerland	12	95	Yes	5
Sousa	*Journal of Psychological, Social and Behavioural Dimensions of Cancer*	N/A	2019	Portugal	7	44	Yes	6
Phillips	*Eplasty*	N/A	2014	USA	32	24	No	4
Kelley	*Annals of Surgical Oncology*	4.061	2014	USA	75	20	No	5
Kristoffersen	*Journal of Plastic Surgery and Hand Surgery*	1.235	2016	Sweden	6	37	No	5
Winters	*Annals of Surgery*	10.13	2010	USA	107	34	No	5
Man	*Plastic and Reconstructive Surgery*	4.235	2009	USA	214	6	No	4
Ohkuma	*Plastic and Reconstructive Surgery*	4.235	2014	USA	55	13	No	6
Mallikarjuna	*European Journal of Plastic Surgery*	N/A	2017	UK	3	5	No	3
Valdatta	*Plastic Surgery International*	N/A	2014	Italy	31	20	No	5
Sibitany	*Plastic and Reconstructive Surgery*	4.235	2011	USA	225	9	No	4
Cabalag	*Gland Surgery*	2.19	2016	Australia	22	89	Yes	5
Paraskeva	*The Breast*	3.754	2018	UK	13	8	No	7
Sheckter	*Journal of Plastic, Reconstructive and Aesthetic Surgery*	2.39	2017	USA	10	13	Yes	7
Potter	*Annals of Surgical Oncology*	4.061	2010	UK	48	122	No	2
Groen	*Journal of Plastic, Reconstructive and Aesthetic Surgery*	2.39	2016	Netherlands	74	43	Yes	6
Retrouvey	*Plastic and Reconstructive Surgery*	4.235	2019	Canada	23	99	Yes	4
Hallberg	*Journal of Plastic Surgery and Hand Surgery*	1.235	2018	Sweden	43	51	Yes	9
Lee	*Microsurgery*	1.996	2015	South Korea	27	6	No	4
DeDecker	*European Journal of Obstetrics & Gynecology and Reproductive Biology*	1.868	2016	Belgium	44	23	No	5
El-Sabawi	*Journal of Surgical Oncology*	2.771	2015	USA	77	63	No	2
Siotos	*Journal of Plastic, Reconstructive and Aesthetic Surgery*	2.39	2018	USA	16	19	Yes	8
Endara	*Plastic and Reconstructive Surgery*	4.235	2013	USA	176	48	No	5
Shea-Budgell	*Plastic Surgery*	0.754	2014	Canada	22	7	No	2
Hansson	*Journal of Plastic Surgery and Hand Surgery*	1.235	2018	Sweden	8	54	Yes	7
Wu	*The Breast*	3.754	2018	China	2	9	Yes	8
Shridharani	*Journal of Reconstructive Microsurgery*	1.841	2010	USA	34	20	No	3
Vania	*Acta Chirurgica Belgica*	0.803	2019	Indonesia	0	6	No	4
Offodile	*Annals of Surgical Oncology*	4.061	2017	USA	6	9	Yes	9
Egeberg	*Journal of Plastic, Reconstructive and Aesthetic Surgery*	2.39	2012	Denmark	79	5	Yes	5
Loo	*Plastic and Reconstructive Surgery – Global Open*	N/A	2018	UK	10	21	No	6
Samargandi	*Microsurgery*	1.996	2017	Canada	5	8	Yes	8
Zhang	*European Journal of Surgical Oncology*	N/A	2016	China	60	31	No	8
Lee	*The American Journal of Surgery*	2.125	2016	South Korea	19	18	No	4
Li	*European Journal of Surgical Oncology*	N/A	2019	China	18	16	No	8
Lanitis	*Annals of Surgery*	10.13	2010	UK	178	9	No	8
Parikh	*Breast Cancer Research and Treatment*	3.831	2017	USA	18	4	Yes	8
Hoppe	*Eplasty*	N/A	2011	USA	83	8	No	2
Heidermann	*Plastic and Reconstructive Surgery – Global Open*	N/A	2018	USA	19	9	Yes	5
Jepsen	*Journal of Plastic, Reconstructive and Aesthetic Surgery*	2.39	2019	Sweden	3	24	No	8
Teunis	*Microsurgery*	1.996	2013	Netherlands	79	8	No	6
Flitcroft	*Psycho-Oncology*	3.006	2017	Australia	20	12	Yes	5
Siotos	*Annals of Plastic Surgery*	1.354	2018	USA	7	8	Yes	4
Magill	*Journal of Plastic, Reconstructive and Aesthetic Surgery*	2.39	2017	UK	31	7	Yes	5
Salgarello	*Aesthetic Plastic Surgery*	1.798	2011	Italy	34	33	Yes	3
Rocco	*Cochrane Database of Systematic Reviews*	7.89	2016	Italy	56	6	No	9
Daar	*Annals of Plastic Surgery*	1.354	2018	USA	11	95	Yes	3
King	*European Journal of Plastic Surgery*	N/A	2019	UK	1	3	No	2
Thiessen	*European Journal of Obstetrics & Gynecology and Reproductive Biology*	1.868	2019	Belgium	10	14	No	5
Chatterjee	*Journal of Surgical Oncology*	2.771	2018	USA	27	14	No	5
Schaverien	*Microsurgery*	1.996	2014	UK	43	8	No	5

(*Continued*)

Table 2. (*Continued*)

Author	Journal	Impact Factor	Year	Country Affiliation (Corresponding Author)	Google Scholar Citations	No. Studies	PRISMA Adherence	AMSTAR Score
Giordano	*Journal of Plastic Surgery and Hand Surgery*	1.235	2013	Finland	28	5	Yes	5
Lee	*Annals of Plastic Surgery*	1.354	2016	South Korea	74	17	No	5
Herly	*Journal of Plastic, Reconstructive and Aesthetic Surgery*	2.39	2018	Denmark	20	23	Yes	7
Gnaneswaran	*European Journal of Plastic Surgery*	N/A	2016	Australia	11	3	Yes	4
Offodile	*Breast Cancer Research and Treatment*	3.831	2018	USA	65	9	Yes	6
Tan	*Frontiers in Oncology*	4.848	2019	China	8	10	No	6
Soteropulos	*Journal of Reconstructive Microsurgery*	1.841	2019	USA	8	56	Yes	4
Sebai	*Plastic and Reconstructive Surgery*	4.235	2018	USA	21	5	Yes	6
Schulein	*Journal of Plastic, Reconstructive and Aesthetic Surgery*	2.39	2018	Germany	0	314	No	3
Khansa	*Plastic and Reconstructive Surgery*	4.235	2013	USA	55	70	No	2
Berlin	*Medical Decision Making*	2.309	2019	USA	3	17	No	5
Sailon	*Annals of Plastic Surgery*	1.354	2009	USA	46	8	No	3
Zehra	*Breast Cancer*	2.695	2019	Ireland	7	16	Yes	7
Smith	*Journal of Plastic, Reconstructive and Aesthetic Surgery*	2.39	2018	USA	33	13	No	3
D'Souza	*Cochrane Database of Systematic Reviews*	7.89	2011	Bahrain	117	1	No	9
Song	*PLOS ONE*	2.74	2014	China	45	11	Yes	8
Panayi	*Journal of Reconstructive Microsurgery*	1.841	2017	USA	58	33	Yes	9
Mossa-Basha	*Journal of Reconstructive Microsurgery*	1.841	2016	USA	5	10	No	6
Grant	*Plastic and Reconstructive Surgery – Global Open*	N/A	2014	Canada	5	10	No	3
Kim	*Plastic Surgery*	0.754	2015	Korea	17	9	No	3
Schaverien	*Journal of Plastic, Reconstructive and Aesthetic Surgery*	2.39	2013	UK	92	25	No	6
Shin	*Medicine*	1.552	2016	Korea	9	19	Yes	8
Aygin	*Breast Cancer*	2.695	2018	Turkey	12	7	Yes	5
Gieni	*The Breast*	3.754	2012	Canada	95	10	No	7
Rodriguez-Unda	*Journal of Plastic, Reconstructive and Aesthetic Surgery*	2.39	2015	USA	23	3	Yes	5
Flitcroft	*Quality of Life Research*	2.773	2017	Australia	29	30	Yes	6
Chen	*Breast Cancer*	2.695	2018	China	30	5	Yes	7
Jeong	*The Breast*	3.754	2018	Korea	32	11	Yes	4
Krastev	*British Journal of Surgery*	5.676	2018	Netherlands	19	59	Yes	6
Wang	*Aesthetic Plastic Surgery*	1.798	2014	China	54	13	No	8
Banuelos	*Annals of Plastic Surgery*	1.354	2019	USA	2	25	Yes	6
Kang	*Journal of Reconstructive Microsurgery*	1.841	2017	USA	3	14	No	1
Singh	*Annals of Surgical Oncology*	4.061	2019	USA	10	18	Yes	6
Satteson	*Gland Surgery*	2.19	2017	USA	25	23	Yes	4
Tokita	*Plastic and Reconstructive Surgery – Global Open*	N/A	2019	USA	3	7	Yes	8
Claro	*Annals of Surgical Oncology*	4.061	2015	Brazil	18	60	Yes	9
Krastev	*Annals of Surgical Oncology*	4.061	2012	Netherlands	57	20	Yes	2
Wazir	*Anticancer Research*	1.994	2016	UK	18	11	No	3
Lee	*Annals of Surgical Oncology*	4.061	2017	Korea	16	8	No	5
Carr	*Cancer Nursing*	1.85	2019	Canada	8	17	No	3
Cordova	*Gland Surgery*	2.19	2019	Australia	18	42	Yes	4
Korus	*Plastic and Reconstructive Surgery*	4.235	2015	USA	9	110	Yes	2
Lee	*Journal of the American College of Surgeons*	4.59	2009	USA	156	28	No	6
Oh	*European Journal of Surgical Oncology*	N/A	2016	Australia	41	42	No	4
Wade	*Journal of Plastic, Reconstructive and Aesthetic Surgery*	2.39	2017	Italy	28	14	Yes	10
Lee	*Microsurgery*	1.996	2016	Korea	17	21	No	3
Oliver	*Medicine*	1.552	2019	USA	6	11	Yes	4
Rochlin	*Journal of Surgical Oncology*	2.771	2014	USA	35	11	No	2
Preminger	*Journal of Cancer Education*	1.576	2010	USA	17	7	No	3
Lee	*Journal of Surgical Oncology*	2.771	2015	Korea	50	20	No	5
Quinn	*Gland Surgery*	2.19	2016	Australia	36	62	Yes	4
Nazerali	*Annals of Plastic Surgery*	1.354	2017	USA	4	27	Yes	3
Javaid	*Journal of Plastic, Reconstructive and Aesthetic Surgery*	2.39	2006	UK	69	10	No	3
Shah	*Annals of Surgical Oncology*	4.061	2012	USA	46	33	Yes	3
Barry	*Breast Cancer Research and Treatment*	3.831	2011	Ireland	247	11	No	3
Berbers	*European Journal of Cancer*	7.275	2014	Netherlands	88	37	No	1
Aboushi	*Clinical Surgery Journal*	N/A	2018	USA	0	5	No	3
Potter	*Journal of the National Cancer Institute*	N/A	2010	UK	95	134	No	5
Tsoi	*Plastic and Reconstructive Surgery*	4.235	2014	Poland	93	14	Yes	10
Beugels	*Journal of Plastic, Reconstructive and Aesthetic Surgery*	2.39	2017	Netherlands	36	32	Yes	7
Jordan	*Plastic and Reconstructive Surgery*	4.235	2016	USA	48	51	No	4
Weissler	*Plastic and Reconstructive Surgery*	4.235	2018	USA	20	37	Yes	6
Salibian	*Plastic and Reconstructive Surgery – Global Open*	N/A	2016	USA	60	6	Yes	4
Barnsley	*Plastic and Reconstructive Surgery*	4.235	2007	Canada	38	8	No	6
Potter	*British Journal of Surgery*	5.676	2015	UK	68	69	No	7
Alipour	*Breast Cancer Research and Treatment*	3.831	2015	Iran	11	17	No	5
Guyomard	*The Breast*	3.754	2007	UK	129	28	No	4
DeLong	*Plastic and Reconstructive Surgery*	4.235	2019	USA	5	9	Yes	3
Tsoi	*Journal of the American College of Surgeons*	4.59	2014	Canada	43	15	Yes	9
Maass	*Annals of Surgical Oncology*	4.061	2015	Canada	19	120	No	1
Fang	*Breast Cancer Research and Treatment*	3.831	2013	Taiwan	91	17	No	8

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Table 2. (*Continued*)

Author	Journal	Impact Factor	Year	Country Affiliation (Corresponding Author)	Google Scholar Citations	No. Studies	PRISMA Adherence	AMSTAR Score
Xavier-Harmeling	*Breast Cancer Research and Treatment*	3.831	2015	Netherlands	51	14	No	6
Lam	*Plastic and Reconstructive Surgery*	4.235	2013	Australia	130	12	No	4
Wormald	*Journal of Plastic, Reconstructive and Aesthetic Surgery*	2.39	2013	UK	51	17	No	8
Agha	*Annals of Plastic Surgery*	1.354	2015	USA	10	35	Yes	8
Yang	*PLOS ONE*	2.74	2015	China	38	14	No	6
Pu	*Medicine*	1.552	2018	China	22	15	No	7
Newman	*Aesthetic Plastic Surgery*	1.798	2011	USA	73	12	No	2
Jansen	*Plastic and Reconstructive Surgery*	4.235	2011	Canada	101	14	No	4
Phan	*Gland Surgery*	2.19	2019	Australia	6	13	Yes	3
Siotos	*Plastic and Reconstructive Surgery*	4.235	2019	USA	8	11	Yes	7
Knackstedt	*European Journal of Plastic Surgery*	N/A	2019	USA	1	17	No	4
Lee	*Annals of Surgical Oncology*	4.061	2015	Korea	88	23	No	4
Brennan	*European Journal of Surgical Oncology*	N/A	2013	Australia	103	28	No	4
Agha	*Journal of Plastic, Reconstructive and Aesthetic Surgery*	2.39	2015	USA	100	35	Yes	10
Berthelot	*Plastic and Reconstructive Surgery – Global Open*	N/A	2019	UK	1	19	Yes	7
Ireton	*Plastic and Reconstructive Surgery*	4.235	2014	USA	48	60	No	3
Flitcroft	*Supportive Care in Cancer*	2.635	2017	Australia	18	21	Yes	4
Christopoulos	*Annals of Plastic Surgery*	1.354	2020	UK	0	13	Yes	8
da Silva Neto	*Journal of Surgical Oncology*	2.771	2019	Brazil	3	9	Yes	8
Toyserkani	*Journal of Plastic, Reconstructive and Aesthetic Surgery*	2.39	2020	Denmark	18	9	Yes	5
Li	*Annals of Plastic Surgery*	1.354	2020	China	4	15	Yes	7
Chi	*Annals of Plastic Surgery*	1.354	2020	USA	0	11	Yes	6
Spera	*Annals of Plastic Surgery*	1.354	2020	USA	3	7	Yes	7
Khajuria	*British Journal of Surgery Open*	5.676	2019	UK	3	12	Yes	8
Reghunathan	*Annals of Plastic Surgery*	1.354	2019	USA	3	22	Yes	5
Anbiyaiee	*World Journal of Plastic Surgery*	N/A	2020	Iran	1	5	No	5
Eltahir	*Plastic and Reconstructive Surgery*	4.235	2020	Netherlands	6	10	No	7
Tondu	*Journal of Plastic, Reconstructive and Aesthetic Surgery*	2.39	2020	Belgium	1	31	Yes	4
Jo	*Microsurgery*	1.996	2020	Korea	1	24	No	4
Fuertes	*Gland Surgery*	2.19	2020	Spain	3	10	Yes	4
Cao	*Medicine*	1.552	2020	China	0	20	Yes	6
He	*Plastic and Reconstructive Surgery – Global Open*	N/A	2020	USA	0	18	Yes	6
Pruimboom	*Cochrane Database of Systematic Reviews*	7.89	2020	Netherlands	4	9	No	9
Hershen-house	*Journal of Plastic, Reconstructive and Aesthetic Surgery*	2.39	2020	USA	1	44	Yes	6
Balasubrama-nian	*Clinical Breast Cancer*	2.647	2020	Ireland	0	5	Yes	6
Abbate	*Breast Cancer Research and Treatment*	3.831	2020	USA	5	13	Yes	6
Abdou	*Journal of Reconstructive Microsurgery*	1.841	2020	USA	1	10	Yes	4
Mangialardi	*Plastic and Reconstructive Surgery – Global Open*	N/A	2020	Italy	0	12	Yes	4
Kiely	*Journal of Plastic, Reconstructive and Aesthetic Surgery*	2.39	2020	UK	2	21	Yes	9
Mangialardi	*Plastic and Reconstructive Surgery – Global Open*	N/A	2020	Italy	0	18	Yes	7
Oliver	*Aesthetic Plastic Surgery*	1.798	2020	USA	3	15	Yes	3
Vania	*Acta Chirurgica Belgica*	0.803	2020	Indonesia	0	6	No	5
Hai	*Plastic and Reconstructive Surgery – Global Open*	N/A	2020	USA	2	11	Yes	7
Liu	*Aesthetic Plastic Surgery*	1.798	2020	China	5	18	No	5
Ellis	*The Breast*	3.754	2020	Australia	1	6	Yes	5
Parmeshwar	*Annals of Plastic Surgery*	1.354	2020	USA	1	9	Yes	4
Knackstedt	*Journal of Reconstructive Microsurgery*	1.841	2020	USA	0	28	Yes	3

reconstruction, adjuvant radiation and chemotherapy, and perioperative management of breast reconstruction patients. The conclusions derived from these studies were classified as relating to complications, patient-reported outcome measures, objective outcomes, and other conclusions. These conclusions and the recommendations offered have been collated into Table 3, along with the average AMSTAR score of all studies used to make that conclusion. However, it is important to note that this synthesis does not necessarily imply that all conclusions are accurate or adopted to clinical practice. This synthesis serves to summarize the conclusions from included reviews, but it is acknowledged that some conclusions are claimed using weak evidence and low AMSTAR scores, thus reflecting poor methodological quality.

Overall Methodological Quality of Included Studies

The average AMSTAR score was 5.32 ± 2.06, ranging from 1 of 11 to 10 of 11. Of the 188 studies, 72 demonstrated poor methodological quality (AMSTAR score of ≤4), 104 demonstrated moderate methodological quality (AMSTAR score of 5–8), and 12 demonstrated good methodological quality (AMSTAR score of ≥9). The criterion with the most adherence was criterion 6, characteristics of included studies provided (n = 170, 90%), followed by criterion 11, conflict of interest stated (n = 165, 88%) (Fig. 2). In contrast, the criterion with the worst adherence was criterion 4, status of publication used as inclusion criteria (n = 10, 5%), with the second least being criterion 5, list of studies provided (n = 22, 12%).

Factors Associated with Methodological Quality

Because the impact factor for some journals could not be found in Web of Science, studies published in these journals were removed from the analysis between AMSTAR score and impact factor. There were no significant correlations between AMSTAR score and impact factor (Fig. 3; $P = 0.038$; $r = 0.16$; 95% CI, 0.0094–0.31), and AMSTAR score and number of citations (Fig. 4; $P = 0.52$; $r = 0.047$; 95% CI, −0.0073 to 0.0037). Conversely, AMSTAR score and number of studies were significantly associated (Fig. 5; $P = 0.013$; $r = 0.18$; 95% CI, −0.021 to −0.0025). Also, the number of studies (Fig. 6; $P < 0.01$; $r = 0.96$; 95% CI, 1.81–2.52) and AMSTAR score (Fig. 7; $P < 0.01$; $r = 0.82$; 95% CI, 0.085–0.22) both significantly increased each year. Studies that adhered to the PRISMA statement had a higher average score compared with those that did not ($P < 0.01$) (Fig. 8).

DISCUSSION

By providing a concise summary of the available evidence, systematic reviews and meta-analyses are consulted by clinicians to identify and apply best practices. However, when addressing the same research question, some systematic reviews and meta-analyses have been found to

Table 3. Summary and Synthesis of Conclusions Identified within Included Studies*†

Topic	Complications	Patient-reported Outcome Measures	Objective Outcomes	Other Conclusions
General Breast Reconstruction	–Combined implant and autologous reconstruction does not put a patient at increased risk of flap-related complications[1,120] [3] –There is no consensus on frequency of complications following nipple-areolar complex reconstruction[24] [5] –The incidence of surgical site infections is increased in patients undergoing reconstruction following mastectomy compared with patients only undergoing mastectomy for breast cancer treatment[56] [8] –Patients undergoing bilateral breast reconstructions experienced a significantly lower rate of fat necrosis and postoperative flap complications compared with unilateral reconstruction[80,172] [4] –Obese women undergoing breast reconstruction surgeries were more likely to experience complications and had a higher chance of reoperation[87,121,131,171] [5.25]	–Patients receiving oncoplastic reconstruction after breast conservation therapy reported higher satisfaction and psychosocial well-being (improved depression and anxiety) than breast conservation therapy alone[3,43,83,93,97,111,113,137,150] [4.44] –There is no consensus on the effect of nipple-areolar complex reconstruction on quality of life, but patients with nipple reconstructions reported high satisfaction[24,104,137,183] [4.5] –There is low-quality evidence regarding health-related quality of life after breast reconstruction surgeries[25] [5] –Cosmetic assessment tools for breast reconstruction are inconsistent and subject to bias, requiring the development of a standardized and validated methodology[34,112,128,140,145] [3.6] –Clinical decision aids improve self-reported satisfaction with breast reconstructions[81] [5] –After months, patients who underwent reconstruction after prophylactic mastectomy experienced stiffness, numbness, and new breast-related sexual problems[93] [5] –Patients with nipple-sparing mastectomy were more satisfied with the surgery than those requiring nipple reconstruction[104] [4]	–Re-excision rate, local breast cancer recurrence, and positive margin rate were all reduced in patients receiving oncoplastic reconstruction after breast conservation therapy compared with conservation therapy alone. The specific type of reconstruction performed does not influence these outcomes[3,41,42,43,52,55,146] [5.57] –There is no standard pattern of breast sensation return following breast reconstruction[46,130] [5] –Similar oncological safety and complication rates of breast reconstruction among 60 years or older women compared with younger patients[114] [4] –Breast reconstruction after mastectomy does not result in a greater incidence of postmastectomy pain syndrome when compared with mastectomy alone[166] [5]	–There are few decision aids available for women when deciding on whether to undergo a breast reconstruction following breast cancer surgery[32] [7] –The use of existing decision aids shows reduced decisional conflict and regret after undergoing a breast reconstruction surgery[32,61,81,110,119] [4.6] –Most studies evaluating cost-effectiveness of breast reconstruction compared technologies within a specific method or two different methods of reconstruction[33] [2] –Barriers to accessing breast reconstruction tend to be influenced by an institution's ability to accommodate the patient's needs, surgeon's attitude towards reconstruction, and the patient's ability to afford the service[36,61,66,110,141,154,158] [4.43] –The type of reconstructive surgery performed has changed over time, shifting from TRAM to DIEP flaps[79] [3] –Women deciding on undergoing breast reconstruction postmastectomy cared most about consistency of views between physician and patient[96] [6]

(Continued)

Table 3. (*Continued*)

Topic	Complications	Patient-reported Outcome Measures	Objective Outcomes	Other Conclusions
Autologous Breast Reconstruction	–Use of a latissimus dorsi flap is associated with lower incidences of device loss, infection and reoperation compared with implant-based reconstructions in previously irradiated breasts[9] [7] –Profunda artery flaps are considered a safe and reliable alternative to DIEP flap reconstruction, with a high success rate and low complication rate[13,170] [5.5] –Conflicting evidence regarding whether free TRAM or DIEP flaps are associated with higher complication rate[26,49,80,83,98,100,157,173] [4.88] –There were no major complications or local breast cancer recurrence following autologous fat grafting for breast reconstruction, and minor complications were often handled with conservative treatment[39] [5] –Pedicled TRAM flaps are associated with more frequent complications than free TRAM flaps[47,80,98,183] [3.75] – Thoracodorsal and internal mammary vessels as recipient vessels for abdominal-based free flap reconstruction are equally safe[51] [8] – DIEP donor-site complication rates are comparable to that of elective abdominoplasties, with even lower seroma rates[64] [3] – Obesity (BMI > 40) is associated with a significantly higher rate of overall complications at both the recipient and donor site in free autologous reconstruction[70,73,80,92,100,173] [6] – Autologous reconstruction offered a more favorable outcome in terms of morbidity compared with implant-based[125,129] – Low quality evidence suggests that bilateral DIEP flaps are associated with an increased risk of total flap failure compared with unilateral flaps[144] [8]	–Patients receiving DIEP flaps reported a higher quality of life compared with implant-based reconstruction[4] [8] –Patients undergoing free TRAM, pedicled TRAM, and DIEP flaps showed similar ability to perform activities of daily living[14] [3] –Data regarding donor site aesthetic following DIEP flap reconstruction is lacking[20] [5] –Autologous fat grafting showed high satisfaction rates[35,39,155] [7] –Pedicled TRAM flaps are noninferior to free TRAM flaps in terms of aesthetic and satisfaction outcomes[47] [4] –Transverse upper gracilis flap with vertical extension modification appears to have more desirable aesthetic characteristics compared with transverse upper gracilis and longitudinal gracilis myocutaneous flaps[102] [1] –Autologous reconstruction can offer improved cosmetic and satisfaction outcomes comparedwithimplant-based[124,125,150,161,168] [4.2]	–Range of motion of flexion and abduction after latissimus dorsi flap reconstruction are significantly impaired at 3 months postop[12] [6] –There was no significant difference in postoperative abdominal function between pedicle and free TRAM flap reconstruction[14] [3] –Use of a DIEP flap showed increased postoperative abdominal flexion compared with free TRAM flap, whereas pedicled TRAM showed the greatest deficit in postoperative rectus and oblique muscle function[14] [3] –The use of autologous fat grafting in reconstruction appears to be safe as breast cancer recurrence rates were not increased compared with standard autologous reconstruction[35,99,107,108,155] [5.4] –Internal mammary node metastasis identified during recipient site preparation for postmastectomy reconstruction is rare, so routine biopsy of internal mammary nodes is not warranted[89] [3] – Pedicled TRAM flaps do not require microsurgery, and are associated with reduced operative time and shorter hospital stay compared with free TRAM and DIEP flaps[98,173] [5] –Transverse upper gracilis flaps with vertical extension modification require less revisional procedures and allow for larger volume harvest while maintaining adequate flap vascularity compared with transverse upper gracilis and longitudinal gracilis myocutaneous flaps[102] [1] –The use of omentum for breast reconstruction is possible for total reconstruction with large defects or when muscular or perforator flaps are unsuitable 106 [9] – Successful pregnancy and labour can be expected after reconstruction with a TRAM flap[136] [5]	–DIEP flaps were found to be more cost-effective than implant-based reconstruction[4] [8] –Age, smoking, obesity, PMRT, delayed reconstruction, physiotherapy, and axillary lymph node dissection may influence shoulder function after latissimus dorsi flap reconstruction[12] [6] –Pedicled TRAM flaps are more cost-effective than free TRAM flaps[47,183] [4.5] –Vicryl mesh for immediate reconstruction appears to be an effective and less expensive alternative to ADMs[95] [5] –Flap perfusion can vary widely between patients and even within patients with DIEP flap reconstruction depending on perforators chosen, and no universal model explains DIEP flap perforasome all the time[116,157] [3] –Bipedicled DIEP flaps are recommended in large-breasted women with inadequate abdominal tissue availability[159] [8] –Thoracodorsal artery perforator flaps are very versatile, as they can be converted into muscle-sparing latissimus dorsi flaps in cases of tiny perforator vessels, maintaining low morbidity at the donor site[179] [4]

(*Continued*)

Table 3. (*Continued*)

Topic	Complications	Patient-reported Outcome Measures	Objective Outcomes	Other Conclusions
Allogeneic Breast Reconstruction	– Timing of implant placement (immediate versus delayed) does not show a significant impact on most postoperative complications, but delayed implant placement showed a significantly lower infection and reoperation infection rate[1,10,17,53,85,91,127,175] [5.5] – Though prepectoral and subpectoral reconstructions have similar overall complication rates, the prepectoral technique is still preferred due to the creation of a more natural breast shape and fewer capsular contractures[54,69,162,177] [6.5] – The risk of short-term complications is no greater when a dermal sling is applied compared with other forms of implant-based reconstruction in women with large volume and ptotic breasts[59] [8] – Surgical site infections after implant-based reconstruction are most commonly due to *Staphylococcus* species, followed by *Pseudomonas*[101] [6] – Textured implants showed a lower risk of capsular contractures, displacement, and infection compared with smooth implants[121] [4]	– One-stage breast reconstructions provide a similar aesthetical outcome to two-stage reconstructions[53] [4] – Little is known about associated patient-reported outcomes and aesthetic outcomes following the use of dermal slings for implant-based reconstructions[59] [8] – Submuscular reconstructions result in more discomfort than the standard prepectoral technique[69] [5] – Silicone implants demonstrated higher physical and psychosocial function compared with saline implants[121] [4] – There is weak evidence suggesting that implant-based reconstruction is becoming a less favorable approach for breast reconstruction in terms of satisfaction[139] [9] – Prepectoral immediate implant-based reconstruction shows better aesthetic outcomes compared with subpectoral[177] [6]	– Allogeneic grafts, typically including ADM, bone allograft, or extracellular matrix collagen, for nipple reconstruction have similar nipple projection compared with autologous grafts[16,182] [5] – There is no significant difference in local recurrence rates or metastatic disease between prepectoral and subpectoral implant-based reconstructions[54] [8] – Delayed breast reconstruction with lymph node transfer does not worsen breast cancer-related lymphedema and might even improve symptoms[62] [4] – Submuscular reconstruction can result in hyperanimation and a less optimal breast position compared with a prepectoral technique[69] [5] – Immediate implant-based reconstruction showed comparable breast cancer recurrence rates with mastectomy alone[94,167] [6] – There were no associations between silicone implants and risk of cancer or systemic disease[121] [4]	– There is limited evidence to support the use of dermal slings with implant-based reconstruction, but they have been described with both permanent implants and tissue expanders[44] [7] – One-stage reconstructions are associated with a lower financial burden than two-stage[53] [4] – There is a lack of high-quality evidence to draw conclusions about the best implant to use in breast reconstructions[65] [9] – Pre-shaping of skin envelope helps to enhance local neovascularization[169] [4]
ADM-assisted Reconstruction	– ADM-assisted reconstruction has a higher complication profile, specifically with seroma, infection, and flap necrosis) than submuscular tissue expander reconstruction[5,7,11,18,21,31,57, 58,84,131,148,153,171,181] [5.07] – Sterile and aseptic ADM showed similar complication rates, including infection rate, seroma, and explantation, when used for prosthetic reconstruction[1] [3] – FlexHD, DermaMatrix, and ready-to-use AlloDerm have similar risks of postoperative complications compared with freeze-dried AlloDerm[8,45] [7] – The use of acellular bovine pericardium as an ADM for implant-based reconstruction is safe[28] [3] – Strattice exhibited slightly higher overall pooled complication rates compared with AlloDerm and Surgimend[50] [6]	– ADM use in tissue expander/implant-based reconstruction can enhance cosmesis by preventing both inferior and lateral displacement of the expander[7] [8] – ADM adjuncts in single-stage direct-to-implant reconstructions showed improved cosmesis compared with non-ADM, two-stage reconstructions[31,84,138] [3.67] – ADM-assisted reconstruction demonstrated equal patient satisfaction with standard submuscular implant-based reconstruction[138] [3]	– Average follow-up time for patients undergoing human ADM assisted reconstruction was significantly shorter than with submuscular tissue expander reconstruction[5] [6] – ADM-assisted reconstruction showed a shorter time to complete breast reconstruction compared with standard submuscular techniques, and the patient may subsequently experience less postoperative pain with increased intraoperative fill volumes[30,57,84,153] [3.25] – There is a lack of data on the risk of breast cancer recurrence and the delay of adjuvant treatment with regards to ADM-assisted reconstructions[37] [9]	– ADM adjuncts in single-stage direct-to-implant reconstruction require lower initial costs compared with non-ADM, two-stage reconstruction[31] [5]

(*Continued*)

Table 3. (*Continued*)

Topic	Complications	Patient-reported Outcome Measures	Objective Outcomes	Other Conclusions
Adjuvant Radiation and Chemotherapy	– PMRT with any form of implant-based reconstruction has a significantly increased complication rate, including capsular contractures and reconstructive failure.[6,19,23,29,40,63,73,80,117,118,120,123,125,131,133,143,147,151] [4.5] – PMRT is associated with a higher incidence of adverse events compared with adjuvant chemotherapy for breast cancer[40] [2] – Neoadjuvant chemotherapy does not increase complication rates after immediate breast reconstruction[86] [8] – The risk of serious complications did not significantly differ between PMRT application to tissue expanders versus implants[109] [5]	– The evidence around the effect of PMRT for postmastectomy reconstruction on cosmetic outcomes is conflicting[6,63,103,137] [5.75] – Patients receiving PMRT to a permanent implant reported reduced satisfaction scores[6,63] [6.5] – Delayed reconstruction is recommended when PMRT is required, as it offers a superior aesthetic outcome compared with immediate reconstruction with PMRT[118,121,123,126] [2.5]	– Timing of radiotherapy (before or after reconstruction) did not show any effect on overall success and failure rate of autologous reconstruction[19,23,126,165,176] [4.8] – Neoadjuvant radiotherapy and PMRT for breast cancer showed similarly low locoregional recurrence[103,165] [7]	– Immediate implant-based reconstruction does not delay chemotherapy or radiotherapy administration to a clinically relevant extent[142,167] [5.5]
Perioperative Management of Breast Reconstruction	– Lowest rate of postoperative infection seen in patients who received less than 24 hours of postoperative antibiotics, with no data to support prolonged postoperative antibiotic use following breast reconstruction[15,22,184] [5.33] – SIEV superdrainage reduces the risk of flap congestion, but has little influence on flap survival following DIEP flap reconstruction[38,90] [3.5] – Temporarily discontinuing antiestrogen therapies before reconstruction may minimize risk of complications, specifically thrombotic flap complications and total flap loss[56,164] [7.5] – CT angiography results in a significant decrease in partial and total flap loss, and may reduce donor site morbidity when used for preoperative planning compared with Doppler ultrasounds[60,115] [8] – No evidence to support that tranexamic acid use is associated with risk of thromboembolic events in patients undergoing mastectomy and/or breast reconstruction[67] [2] – No consensus on the most effective way to prevent thromboembolic events in women undergoing microsurgical reconstruction[152] [4] – There is weak evidence suggesting that implantable Doppler and near infrared spectroscopy were both superior to conventional clinical assessment in detecting free tissue transfer failure[156] [7] – Limited evidence suggests that laser-assisted indocyanine green angiography allows for diagnosis of perfusion complications, reducing the risk of skin necrosis and need for surgical re-intervention[160,174,187] [7]	– Patients undergoing breast reconstruction may benefit from a preoperative assessment for psychosocial and sociodemographic variables to improve postoperative quality of life and identify which patients are more likely to benefit from a reconstructive procedure[21] [6] – Limited evidence shows that nerve coaptation following reconstruction improves the patient's quality of life by providing a more substantial and earlier sensory return, though higher-level studies are needed to verify this finding[130,133] [5.5]	– There is strong evidence to suggest that preoperative CT angiography can reduce operation time and postoperative morbidity compared with Doppler ultrasounds[27,88,115,180] [7.75] – Tranexamic acid plays a role in preventing intraoperative blood loss and drainage output after breast reconstructions[67] [2] – Limited evidence suggests that dynamic infrared thermography is a valuable asset for preoperative perforator selection in providing information on blood flow and functional characteristics of clinically relevant vessels; higher-level studies are needed to verify this finding[68] [5] – Continuous wound infusion of local anesthetic agents for postoperative abdominal pain in microsurgical lower abdominal flap reconstruction reduces the need for systemic opioid use[71,188] [4] – Enhanced recovery after surgery protocols result in improved outcomes (eg, reduced length of stay, reduced postoperative opioid consumption) after breast reconstructions[74,75,76,77,78,163,188] [5] – Paravertebral and transversus abdominis plane blocks reduce acute and postoperative pain, improve postoperative nausea and vomiting, and reduce opioid consumption[105,163,178,188] [5.25] – There is a lack of evidence supporting mammography screening for breast cancer recurrences following postmastectomy breast reconstruction[134,186] [5.5]	– The use of general anesthesia is recommended over regional anesthesia for breast reconstruction surgeries. There is not enough evidence to suggest that paravertebral blocks are better than the current anesthetic methods[48] [9] – There is some evidence that dynamic infrared thermography is easy to use, cost effective, and harmless for preoperative perforator selection[68] [5] – Enhanced recovery after surgery protocols result in reduced healthcare expenditures[74] [4] – Enhanced recovery after surgery protocols typically include preoperative counseling, limited preoperative fasting, thromboprophylaxis, a focus on multimodal, opioid-sparing analgesia, goal-directed fluid management, prompt catheter and drain removal, and early diet advancement[77] [4]

*Citations included can be found in Supplemental Digital Content 2, http://links.lww.com/PRSGO/B822.

†The average AMSTAR score of studies used for each conclusion can be found in square brackets "[ ]" following the citations.

ADM, acellular dermal matrix; DIEP, deep inferior epigastric artery perforator; PMRT, postmastectomy radiotherapy; SIEV, superficial inferior epigastric vein; TRAM, transversus rectus abdominis myocutaneous.

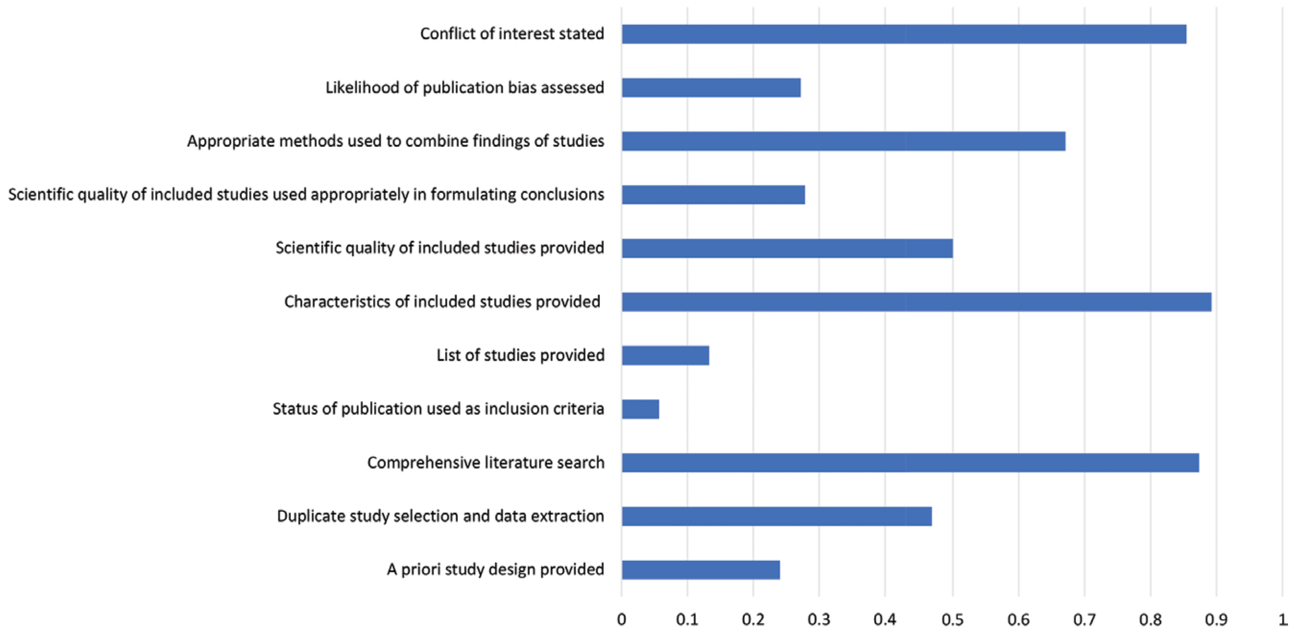

Fig. 2. Percentage of systematic reviews and meta-analyses adhering to each AMSTAR criteria.

draw conflicting conclusions, which may lead clinicians astray when deciding on the optimal management plan for their patients.[6] To address this, Shea et al developed the AMSTAR tool, an 11-item checklist used to assess the methodological and reporting quality of systematic reviews and meta-analyses.[3] The AMSTAR tool has been identified as the best criteria available for appraising systematic reviews[7] and has good psychometric properties for evaluating systematic reviews of both randomized and nonrandomized studies.[8] Given that breast reconstruction is an important aspect of breast cancer management and the number of studies in this area continue to grow, a quality assessment of systematic reviews and meta-analyses is necessary to provide clinicians with the best information for clinical decision-making. The primary goal of this study was to assess the methodological quality of systematic reviews and meta-analyses in breast reconstruction surgery. The secondary goal of our study was to identify associations between AMSTAR score and study characteristics.

In the present study, a significant increase was identified in both the number of studies per year and the methodological quality per year in systematic reviews and meta-analyses on breast reconstruction. This represents an improving body of evidence on breast reconstruction in both quantity and quality. These findings can be contrasted to several studies that have previously assessed methodological quality of systematic reviews and meta-analyses in plastic surgery. Samargandi et al found that among reviews in PRS, there was a significant increase in studies over time, but no increase in AMSTAR score.[9] Because the study served as a representative sample of plastic surgery literature, their findings indicated that peer-review processes in plastic surgery-related journals was inadequate, and that expertise in epidemiological methods is required for review of such studies. Additionally, McGuire et al identified an increase in both frequency and methodological quality of meta-analyses in plastic surgery.[10] Despite this, their results indicate that overall evidence was still low. The findings of this study, combined with our recent evaluation of the methodological quality of meta-analyses about breast augmentation,[4] are similar to the findings reported by McGuire et al.[10] Although significant improvements

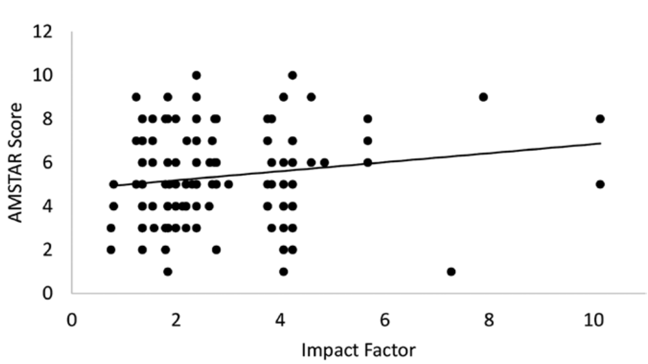

Fig. 3. AMSTAR score when compared with journal impact factor.

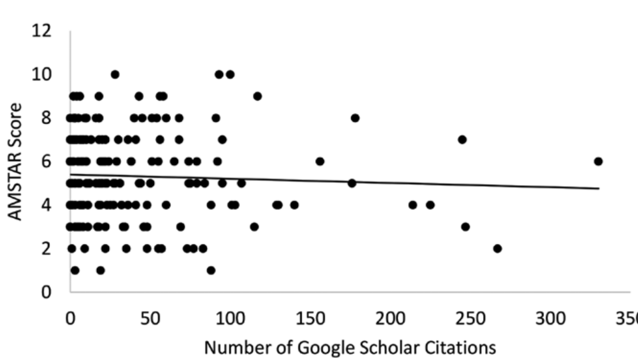

Fig. 4. AMSTAR score when compared with number of Google Scholar citations.

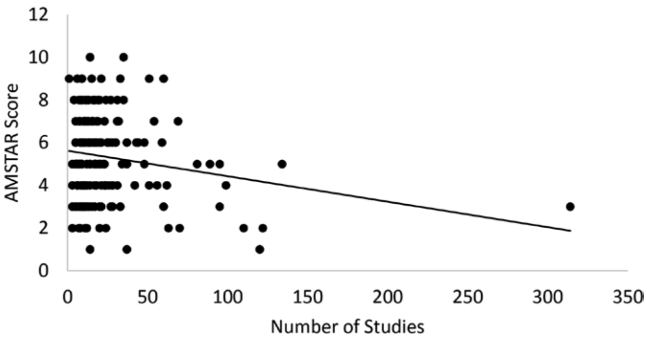

Fig. 5. AMSTAR score when compared with number of included studies.

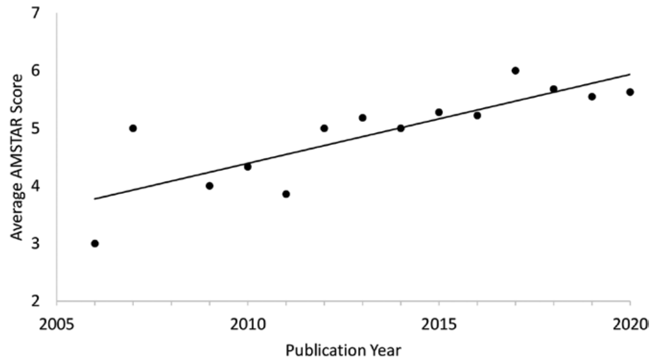

Fig. 7. Change in average AMSTAR score per year.

have been made in the quality of systematic reviews and meta-analyses in recent years, the methodological quality of evidence still requires improvement.

The average AMSTAR score was 5.32 among our included studies, indicating an overall moderate quality of systematic reviews and meta-analyses published in breast reconstruction. This finding is concerning as systematic reviews and meta-analyses are placed at the top of the level-of-evidence pyramid and represent the highest level of evidence-based medicine. The moderate quality indicates that systematic reviews and meta-analyses on breast reconstruction are often designed inappropriately and necessitate higher quality reviews. Although the methodological quality of breast reconstruction reviews has improved over time, these studies have only been able to score on average less than half of the total 11 points of AMSTAR. The lack of adherence to these criteria has implications that may compromise the validity of study findings. For example, if a study does not adhere to criterion 1, an "a priori" design was provided, there are concerns regarding post hoc analyses that may favor positive results. To avoid this, researchers should register their protocols on platforms including Open Science Framework or PROSPERO, to inform readers that their study was designed prospectively. Furthermore, there was large variability within included studies, with scores ranging from 1 to 10. Despite the average AMSTAR score being of moderate quality, approximately 38% of included studies are still of poor methodological quality, whereas 6% of them are of good quality. The abundance of low methodological quality studies conveys risk to clinicians as they may apply findings to surgical practice when such conclusions are pervaded by bias.

Through the AMSTAR analysis, it was found that most studies (n = 163) met criterion 3, comprehensive literature search. This is an important finding in that the majority of the breast reconstruction literature involves search strategies across multiple databases. Systematic reviews and meta-analyses require this to encompass the entirety of a topic and provide high-level evidence.[11] However, only 10 studies used grey literature as sources in their search strategy, thereby meeting criterion 4, status of publication used as inclusion criteria. Publication status of studies is important to include, as published trials are generally larger and demonstrate a greater treatment effect than those published in grey literature.[12] As such, reviews in breast reconstruction should continue using multiple databases, but also include grey literature in their search strategy to present all available data and prevent the introduction of publication bias.

The AMSTAR criterion that was most adhered to was criterion 6, characteristics of included studies provided (n = 170). This allows for improved reporting transparency, as

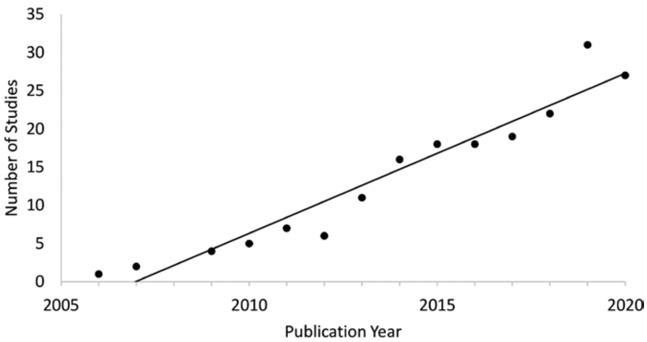

Fig. 6. Number of studies in breast reconstruction per year.

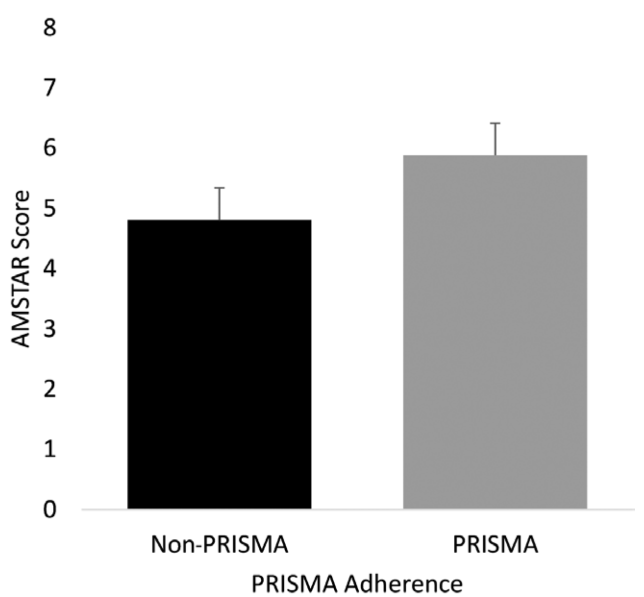

Fig. 8. AMSTAR score when compared with PRISMA adherence.

readers can identify the specific parameters that were collected from each included study and subsequently collated to form the conclusions of the review. Conversely, few studies met criterion 5, list of studies provided (n = 22), as they failed to provide a list of excluded studies. The lack of adherence to this criterion makes the systematic review or meta-analysis less reproducible as others cannot verify whether the appropriate studies were identified through the screening process. This lack of reproducibility may disguise potential errors in experimental design or statistical approaches, thereby weakening the strength of conclusions drawn by the study.[13]

Approximately half the included studies (n = 96) met criterion 7, scientific quality of included studies provided. However, this is contrasted by the fact that only about a quarter of the included studies (n = 50) adhered to criterion 8, scientific quality of included studies used appropriately in formulating conclusions. The fact that few of the included studies performed a quality assessment is concerning, as the conclusions of these reviews may be formed on low-level evidence with high degrees of bias. Furthermore, the lack of consideration for quality of evidence when formulating conclusions may mislead clinicians to believe there are no biases among the included studies due to poor design. Therefore, it is important that future reviews in breast reconstruction not only conduct quality assessment of included studies, but also address the quality in their conclusions. By doing so, readers can recognize the quality of studies when applying study findings to clinical practice.

We also found that the majority of studies (n = 130) met criterion 9, appropriate methods used to combine findings of studies, but only 56 studies adhered to criterion 10, likelihood of publication bias assessed. This may be due to the fact that studies with less than 10 articles or studies that could not pool due to heterogeneous results are not feasible for publication bias tests. However, it is still important for these ineligible studies to address the inability to test for publication bias, thereby improving transparency and methodological rigor. Similarly, for studies that are eligible for publication bias assessments, it is important to conduct these tests as publication bias can lead to misguided clinical practice and research.[14]

Interestingly, AMSTAR score was negatively correlated with the number of studies included. This is surprising because certain AMSTAR criteria cannot be met with a limited number of included studies, such as criterion 10, likelihood of publication bias assessed, which requires 10 studies to be able to assess for publication bias. Garg et al has noted that increasing the number of included studies would help strengthen the conclusions of systematic review and meta-analysis by powering statistical tests and allowing for pooled results from multiple studies.[15] However, the negative correlation between the number of included studies and AMSTAR score suggests that the strength and validity of conclusions does not predict methodological rigor.

Articles adhering to PRISMA guidelines were found to have higher average AMSTAR scores than those not adhering to PRISMA guidelines. This finding is not surprising because both sets of criteria are used to assess the quality of systematic reviews and meta-analyses, with AMSTAR focusing on the methodological quality and PRISMA on reporting transparency. These findings are in line with the results of a similar study by Fleming et al, who noted that AMSTAR and PRISMA scores are significantly correlated.[16] It is also interesting to note that adherence to PRISMA has substantially increased in each half decade of our 20-year search. Since the introduction of the QUOROM statement in 1999 and its update and renaming to the PRISMA guideline in 2007, studies report and journals require the adherence of systematic reviews to PRISMA guidelines.[17] This is the case for specific plastic surgery journals such as JPRAS. Therefore, PRISMA guidelines are recommended to be implemented as criteria for publication to help improve the quality of studies being published.

Some of the major conclusions identified from our synthesis of study findings are summarized in Table 3, including the conclusion that breast reconstruction following breast conservation therapy generally improved patient satisfaction and psychosocial well-being compared with mastectomy alone, that timing of implant placement (delayed versus immediate) in allogeneic breast reconstruction does not show a significant impact on postoperative complications, that acellular dermal matrix-assisted reconstruction has a higher complication profile compared with standard submuscular expander reconstruction, and that enhanced recovery after surgery protocols significantly reduced a patient's length of hospital stay and postoperative opioid use. However, it is important to remain cognizant of the fact that not all conclusions identified in Table 3 are accurate or valid. This may be attributed to the low-quality primary studies from which the reviews drew their conclusions, rendering these conclusions suboptimal or invalid despite being a well-designed and conducted review. This is seen in a study by Pruimboom et al, which identified the benefits of indocyanine green angiography in reducing postoperative complications and reoperation rate compared with clinical evaluation.[18] This study achieved an AMSTAR score of 9, indicating good methodological quality, with adherence to criterion 7, scientific quality of included studies provided and criterion 8, scientific quality of included studies used appropriately in formulating conclusions. Despite the high-quality design and execution, their quality analysis identified low-quality evidence regarding the use of indocyanine green angiography, with only nonrandomized cohort studies used to draw their conclusions, and they highlighted the need for randomized controlled trials to fully elucidate the clinical utility of this technique. They concluded that despite the initial benefits identified in their study, they cannot confidently decide whether indocyanine green angiography or clinical assessment is best to use for breast reconstructions.[18] Also, the reviews themselves may not be conducted appropriately, as reflected by the average AMSTAR scores associated with each conclusion in Table 3. For example, our analysis identified a study by Berbers et al that scored 1 of 11, one of the lowest scores among our included studies.[19] This study found that implant placement after radiotherapy resulted in higher complication rates with more implant failures compared with placement before radiotherapy. However, of the 11 AMSTAR criteria, these authors only adhered to criterion 11, conflict of interest stated. Without adhering to any of the other criteria, there are significant implications that may render their conclusions inapplicable. For example, without adhering to criterion 2, duplicate study selection and data extraction, there may be bias introduced in the selection of studies to be included and interpretation bias during data extraction, ultimately resulting in an inaccurate representation of the data available. As such, clinicians using the conclusions from this study may be misguided in recommending implant placement before radiotherapy despite the possibility that certain complications were not accounted for in the analysis presented by Berbers et al.[19]

Clinicians may not have the time to familiarize themselves with all of the new and evolving research methodologies such as the AMSTAR criteria. The purpose of this study was to make clinicians aware of the necessity for well-designed systematic reviews and meta-analyses and the potential biases that may be introduced when certain AMSTAR criteria are not adhered to. In the case of systematic reviews and meta-analyses focused on breast reconstruction, we have identified the AMSTAR criteria with the least adherence, and it is important for clinicians to understand the impact of nonadherence on the internal validity of these types of studies. Additionally, researchers must remain cognizant of these factors when designing and conducting systematic reviews and meta-analyses and should recognize that tools, such as PRISMA and AMSTAR, exist to guide proper study design and reporting of conclusions.

Limitations

A limitation of the present study is the restriction of reviews that were focused on breast reconstruction. This limited the number of studies that were included given that it excluded studies incorporating multiple study designs[20] and those that focused on outcomes or interventions pertinent to surgeries including breast reconstruction.[21] Further, impact factor could not be retrieved from Web of Science for several journals and as a result these were removed from analysis. Although the trend was insignificant between AMSTAR score and journal impact factor, the lack of representation from journals without impact factors may favor results of journals with high impact factors instead. Furthermore, there is potential of a downward bias in AMSTAR score due to the interpretation of AMSTAR criterion 9, appropriate methods used to combine findings of studies, and criterion 10, likelihood of publication bias assessed. Both of these criteria can be reported as "not applicable" based on qualitative research questions and lack of pooling respectively. Studies found not applicable would decrease the average score in these criteria even though they do not qualify based on study design alone. As such, it may be more appropriate to remove these studies when analyzing adherence to specific AMSTAR criteria.

CONCLUSIONS

In summary, there was considerable range in AMSTAR scores of reviews in breast reconstruction, with an average of moderate quality. The AMSTAR criterion with the highest adherence was criterion 6, characteristics of included studies provided, whereas the one with the lowest adherence was criterion 4, status of publication used as inclusion criteria. There was a significant increase in the number of publications and quality of reviews over time. There was also a significant correlation between AMSTAR score and number of included studies. Reviews that reported adherence to PRISMA guidelines had a greater AMSTAR score on average, indicating higher methodological quality. The overall moderate quality identified indicates a need for better designed systematic reviews and meta-analyses to guide clinical decision-making for breast reconstruction. Researchers should become acquainted with the AMSTAR criteria and ensure each criterion is met when designing and conducting systematic reviews and meta-analyses. Journals should also consider making adherence to the AMSTAR criteria and PRISMA guidelines, when possible, a necessary component for submission and publication of systematic reviews and meta-analyses to ensure proper study design and reporting of results. When implementing findings from these studies into clinical practice, clinicians should keep the AMSTAR criteria in mind and recognize the implications of nonadherence to each specific criterion on the conclusions drawn.

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