Evaluation of Preoperative and Postoperative Patient Satisfaction and Quality of Life in Patients Undergoing Rhinoplasty: A Systematic Review and Meta-Analysis

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Background: Improvement of nasal aesthetics by means of rhinoplasty is a highly sought-after procedure and leads to increased patient confidence. The aim of the study was to provide a quantitative synthesis of existing data regarding the ability of cosmetofunctional rhinoplasty to improve patient satisfaction and quality of life measured by the Rhinoplasty Outcomes Evaluation scale.
Methods: Electronic databases were searched for studies evaluating quality of life following aesthetic rhinoplasty. Study results were pooled and analyzed using a random effects model. Effect size was estimated using standardized mean difference at a 95 percent confidence interval. Heterogeneity and benefit were assessed and reported using the I^2 and standard mean difference. Subgroup analyses were performed based on follow-up period and age group segregation.
Results: A total of 377 articles were retrieved, of which eight studies were included in the final analysis. Overall, patient satisfaction analyzed by pooling eight observational studies improved following cosmetofunctional rhinoplasty (standard mean difference, 5.87; 95 percent CI, 3.55 to 8.19; I^2 = 100 percent). In addition, further subgroup analyses revealed that maximum benefit was derived by younger patients (standard mean difference, 6.69; 95 percent CI, 3.65 to 9.74; I^2 = 99 percent) compared with older patients (standard mean difference, 3.48; 95 percent CI, 3.01 to 3.96; I^2 = 0 percent). Postoperative patient satisfaction levels showed maximum improvement during a follow-up period of 6 to 12 months (standard mean difference, 11.07; 95 percent CI, −8.79 to 32.12; I^2 = 100 percent).
Conclusion: Cosmetofunctional rhinoplasty improves patients' quality of life as evidenced by an improvement in Rhinoplasty Outcomes Evaluation scores. (*Plast. Reconstr. Surg.* 141: 603, 2018.)
CLINICAL QUESTION/LEVEL OF EVIDENCE: Therapeutic, IV.

Rhinoplasty is a complex procedure performed by skilled cosmetic surgeons to improve nasal function, appearance, and balance of facial features. It is considered to be one of the most technically demanding and frequently performed otorhinolaryngologic operations.[1,2] Especially in cases of cosmetic rhinoplasty, patient expectations and goals are thoroughly evaluated by the physician before surgical intervention. In addition, the profile of patients presenting to the clinic with aesthetic complaints is very different from that of patients who present with functional complaints.[3–10]

Several instruments have been developed to objectively quantify such parameters and to

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measure differences in patients' quality of life before and after surgery, which include the Nasal Obstruction Symptom Evaluation scale,[11] the Rhinoplasty Outcomes Evaluation,[12] the Glasgow Benefit Inventory, and the Derriford Appearance Scale.[13] A meta-analysis was conducted to validate the outcomes of functional rhinoplasty using the Nasal Obstruction Symptom Evaluation scale.[14] Despite the Rhinoplasty Outcomes Evaluation being one of the standardized and reliable methods of evaluating the quality of life following aesthetic rhinoplasty,[12] which has been reported by multiple individual studies, no meta-analysis has been performed to validate the outcomes of aesthetic rhinoplasty using the Rhinoplasty Outcomes Evaluation scale.

In this work, a meta-analysis was conducted comparing preoperative and postoperative patient satisfaction following aesthetic rhinoplasty using the Rhinoplasty Outcomes Evaluation scale, a validated instrument routinely used to assess patient satisfaction. Further comparison of outcomes was performed based on age and duration of follow-up.

PATIENTS AND METHODS

Search Strategies

This systematic review and meta-analysis was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines[15] and registered in PROSPERO. We planned to include observational studies and randomized controlled trials pertaining to the evaluation of quality of life before and after rhinoplasty from PubMed (MEDLINE), Embase, Cochrane Library, and Google Scholar, published until January of 2017. The articles were searched using the following search string: rhinoplasty AND (outcome OR prognosis OR satisfaction OR ("quality of life" OR "QoL")). The search was performed in the abstract and full texts of the available literature.

Data Collection and Screening

The articles retrieved using the search string were checked for duplication. Abstracts and full texts were screened by two independent reviewers for relevance. In the first round of screening, the articles were included if they (1) determined quality of life and patient satisfaction following aesthetic rhinoplasty; (2) used the Rhinoplasty Outcomes Evaluation scale; and (3) presented the overall Rhinoplasty Outcomes Evaluation score or

score for individual questions of the Rhinoplasty Outcomes Evaluation. The studies were excluded if they (1) evaluated only functional rhinoplasty; (2) were in any language other than English; (3) did not evaluate patient satisfaction and quality of life; and (4) used scales other than the Rhinoplasty Outcomes Evaluation for the evaluation of quality of life and patient satisfaction. The remaining articles were screened by two independent reviewers to ensure that they met the prespecified study inclusion criteria.

All the data points were collected in a prespecified Microsoft Excel (Microsoft Corp., Redmond, Wash.) template. Each article was scored based on the Methodological Index for Nonrandomized Studies criteria.[16] Only observational studies were included in the analysis because of the lack of randomized controlled trials reporting Rhinoplasty Outcomes Evaluation scores before and after rhinoplasty.

Rhinoplasty Outcomes Evaluation Scale Scoring

The Rhinoplasty Outcomes Evaluation scale consists of six questions, five of which evaluate nasal shape and the patient's perception of nasal appearance (physical, emotional, and social) and one of which evaluates breathing ability. Each question is scored on a scale ranging from 0 to 4, where 0 indicates "not at all" and 4 indicates "completely." The sum of the scores is recorded as a percentage, with lower scores indicating higher levels of patient dissatisfaction.[12]

Statistical Analysis

The data were arranged according to the baseline information with all the demographic details and individual or overall Rhinoplasty Outcomes Evaluation scores before and after aesthetic rhinoplasty. The change in Rhinoplasty Outcomes Evaluation scores was presented based on age group (≤30 years and ≥30 years) and duration of follow-up (≤6 months, 6 to 12 months, and ≥12 months). Patient characteristics were recorded as numbers, frequencies, and proportions. Descriptive statistics were used to quantify the change in Rhinoplasty Outcomes Evaluation scores. All continuous variables were presented as means, medians, and standard deviations. Magnitude of change in Rhinoplasty Outcomes Evaluation score (preoperative and postoperative) was presented in terms of standard mean difference and 95 percent confidence intervals. Differences among the subgroups were determined using the t test. The I^2 statistic was used to determine the heterogeneity

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in studies. Heterogeneity was considered substantial when I^2 was greater than 50 percent. A random effects meta-analysis model was used for I^2 values greater than 50 percent, and a fixed effects model was used for I^2 values less than 50 percent. Statistical analyses were performed using the R software suite, Version 3.3.2.

RESULTS

The database search yielded 377 articles, after which duplicates were eliminated. Screening of the abstracts and full texts of the original articles yielded 10 observational studies (four retrospective and six prospective), which were included in the final analysis (Fig. 1). Of these,
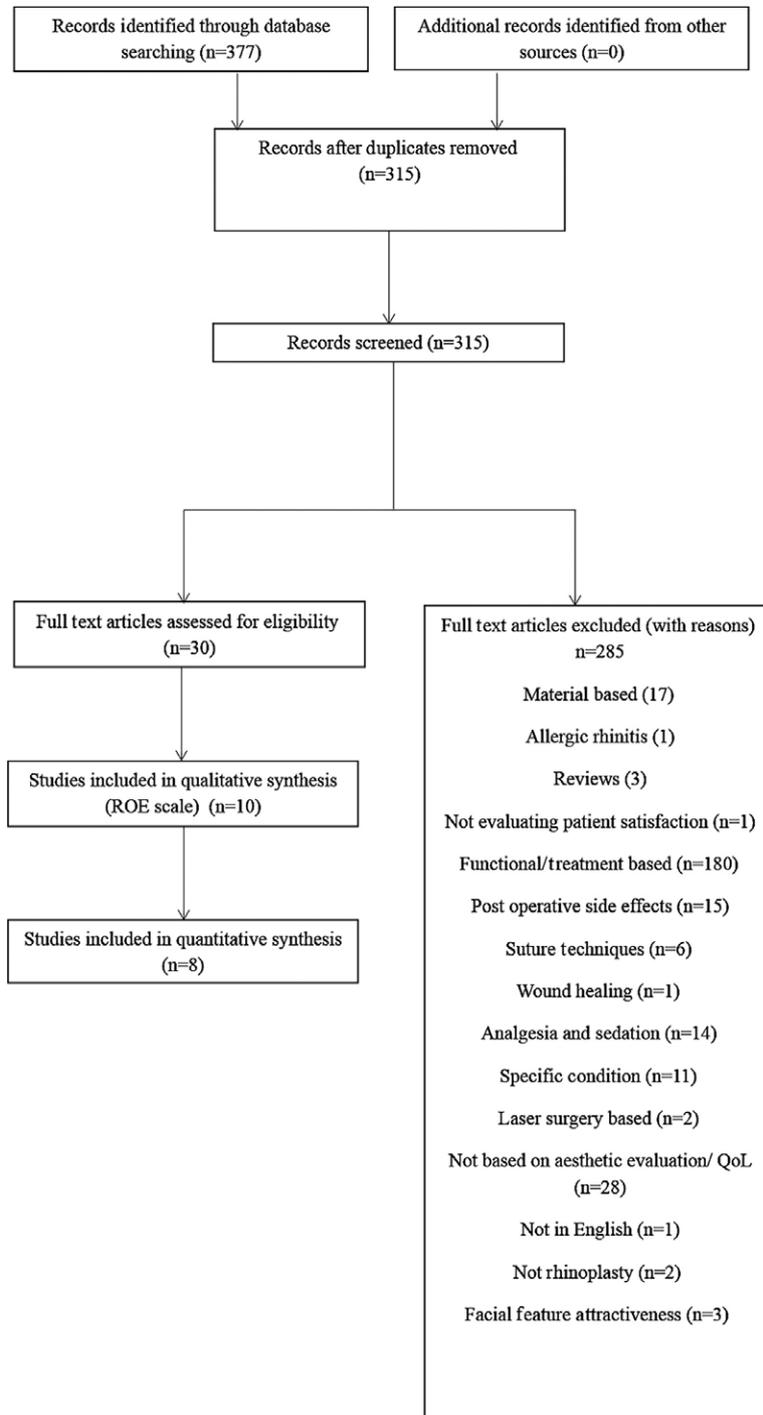

Fig. 1. Preferred Reporting Items for the Reporting of Systematic Reviews and Meta-Analyses flow sheet. *ROE,* Rhinoplasty Outcomes Evaluation.

four studies were from Turkey; three were from Brazil; and one each was from France, Germany, and the United States.[17–26] Two more studies were excluded from the quantitative synthesis because of unavailability of a complete data set.[25,26]

Study Characteristics

Baseline characteristics of studies[17–24] included in quantitative analysis are summarized in Table 1. The eight observational studies enrolled 888 adult patients (range, 35 to 268 patients), of which 719 were analyzed. Considering the fact that only studies that used the Rhinoplasty Outcomes Evaluation scale were included, nearly all studies had endpoints that were well aligned with the study aim. Overall quality assessment of included studies is presented in Table 2.

Change in Rhinoplasty Outcomes Evaluation Scores

At baseline, preoperative patient satisfaction scores measured by the Rhinoplasty Outcomes Evaluation ranged from 4.73 to 45.3. Postoperative scores ranged from 18.02 to 82.59. No study reported a decrease in patient satisfaction scores postoperatively. The mean differences in preoperative and postoperative Rhinoplasty Outcomes Evaluation scores are listed in Table 3.

A random effect model was used to determine the standard mean difference between postrhinoplasty and prerhinoplasty scores, because of significant heterogeneity reported among the eight studies (I^2 = 99 percent; τ^2 = 11.04; $p < 0.01$). The overall standard mean difference between postoperative and preoperative evaluation was 5.87 (95 percent CI, 3.55 to 8.19; $p < 0.0001$), which indicated a significant improvement in patient satisfaction following aesthetic rhinoplasty as measured by the Rhinoplasty Outcomes Evaluation. A plot summarizing the above data is presented in Figure 2.

Two studies reported outcomes at a follow-up period of less than or equal to 6 months with a pooled standard mean difference of 4.93 (95 percent CI, –1.02 to 10.89; I^2 = 99 percent). Two studies reported outcomes after a follow-up period of 6 to 12 months, with a substantially increased standard mean difference of 11.6653 (95 percent CI, –8.7860 to 32.116; I^2 = 100 percent). The remaining four studies reported outcomes after a follow-up period of greater than or equal to 12 months with a pooled standard mean difference of 3.6703 (95 percent CI, 3.1957 to 4.1449; I^2 = 58 percent). Overall, standard mean differences during all follow-up periods were consistent with a large clinical effect, with maximum benefit obtained during the 6- to 12-month follow-up period. Rhinoplasty Outcomes Evaluation scores after rhinoplasty were significantly higher than the scores before rhinoplasty in all follow-up groups ($p < 0.0001$), indicating positive improvement in quality of life following the procedure. Between-group comparison showed that Rhinoplasty Outcomes Evaluation scores were significantly higher in patients with follow-up duration of 6 to 12 months and greater than or equal to 12 months compared with follow-up duration of less than or equal to 6 months ($p < 0.0001$). A plot summarizing these data is presented in Figure 3.

Subgroup analysis by age group involved the measurement of patient satisfaction in patients aged 30 years or younger and 30 years or older. For both age groups, the change in Rhinoplasty Outcomes Evaluation score was significant after rhinoplasty compared with the values before rhinoplasty ($p < 0.0001$). Greater clinical effect was

Table 1. Characteristics of Included Studies

| Reference | Sample Size | No. Responding | | Follow-Up (mo) | Location | Presenting Deformity/Technique Used | |
		Male	Female			Deformity/Technique	No.
Cingi et al., 2011[22]	268	57	168	43	Turkey	Rhinoplasty	
Arima et al., 2011[17]	35	17	2	16	Brazil	Endonasal rhinoplasty for crooked nose correction	35
Arima et al., 2011[18]	53	7	21	25	Brazil	Reduction rhinoplasty	53
Arima et al., 2012[19]	112	29	32	51	Brazil	Primary rhinoplasty (closed approach)	112
Cingi and Eskiizmir, 2013[23]	191	103	88	≥12	Turkey	Deviated nose deformity	191
Baykal et al., 2014[20]	47	22	25	6	Turkey	Correction of NHD Correction of NHD plus NAD NAD	**16** **18** 13
Günel and Omurlu, 2015[24]	79	49	30	0	Turkey	External septorhinoplasty	79
Bulut et al., 2015[21]	103	32	37	12	Germany	Septorhinoplasty	103

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Table 2. Methodological Index for Non-Randomized Studies Scores for Included Studies*

Study	Clearly Stated Aim	Inclusion of Consecutive Patients	Prospective Collection of Data	Endpoints Appropriate to Aim of Study	Unbiased Assessment of the Study Endpoint	Follow-Up Period Appropriate to Aim of Study	Loss to Follow-Up <5%	Prospective Calculation of Study Size	Total MINORS Score
Cingi et al., 2011[22]	2	0	2	2	2	2	0	1	10
Arima et al., 2011[17]	2	2	0	2	2	2	0	0	10
Arima et al., 2011[18]	2	2	0	2	2	2	0	0	10
Arima et al., 2012[19]	2	2	1	2	2	2	0	0	11
Cingi and Eskiizmir, 2013[23]	2	0	2	2	2	2	2	0	12
Baykal et al., 2014[20]	2	0	2	2	2	2	2	0	14
Günel and Omurlu, 2015[24]	2	0	2	2	2	2	2	0	12
Bulut et al., 2015[21]	1	0	2	2	2	2	0	0	9

MINORS, Methodological Index for Non-Randomized Studies.
*Score per criterion: 0, not reported; 1, reported but inadequate; 2, reported and adequate. Ideal global score for noncomparative study is 16.

observed in younger patients (≤30 years), with a standard mean difference of 6.69 (95 percent CI, 3.65 to 9.74; I^2 = 99.5 percent) from the pooled analysis of six studies, which reported outcomes for this age group. For older patients (≥30 years), four studies reported outcomes, and the pooled analysis yielded a standard mean difference of 3.48 (95 percent CI, 3.01 to 3.96; I^2 = 0.0 percent). However, a significantly higher standard mean difference value was reported for younger patients (p = 0.041). A plot summarizing these data is presented in Figure 4.

DISCUSSION

Despite the fact that several independent studies have reported the effects of aesthetic rhinoplasty on postoperative quality of life, a quantitative consensus regarding its effect on patient satisfaction and quality of life is not yet available.[25] Therefore, to the best of our knowledge, this is the first meta-analysis to evaluate patient quality of life following aesthetic rhinoplasty using the validated Rhinoplasty Outcomes Evaluation scale. The studies were assessed using the Rhinoplasty Outcomes Evaluation scale as a representation of patient satisfaction because it is relatively easy to understand and can be administered preoperatively and postoperatively, making an accurate quantification of the improvement in patient satisfaction possible. However, because not all studies reported individual scores for each question on the scale, a parametric evaluation of preoperative and postoperative patient satisfaction could not be conducted, and data were presented on the improvement of the overall Rhinoplasty Outcomes Evaluation score.

Although results of our analysis concur with previously published studies reporting improvements in patient satisfaction following aesthetic rhinoplasty, recent social media reports suggest that, of all cosmetic operations, rhinoplasty is associated with some of the lowest levels of patient satisfaction.[26] This could be attributable to the plethora of complications of rhinoplasty, such as functional disturbances, risk of infections, and psychological disturbances caused by dissatisfaction following the procedure.[27] From a pooled analysis of eight studies, a significant improvement in patient satisfaction and quality of life was reported following aesthetic rhinoplasty (standard mean difference, 5.87; 95 percent CI, 3.55 to 8.19). There was no particular trend reported for greater improvement of Rhinoplasty Outcomes Evaluation in larger studies, as seen in functional

Table 3. Mean Change in Rhinoplasty Outcomes Evaluation Scores (All 10 Studies)

Reference	Study Design	ROE		Change
		Preoperatively	Postoperatively	
Meningaud et al., 2008[25]*	Prospective	40.66	70.7	30.04
Cingi et al., 2011[22]	Retrospective	4.73	18.08	13.35
Arima et al., 2011[17]	Retrospective/prospective	24.6 ± 11.3	76.1 ± 19.5	51.5
Arima et al., 2011[18]	Retrospective	28 ± 11.2	76.3 ± 17.6	48.3
Arima et al., 2012[19]	Prospective	27.2 ± 10.8	77.7 ± 17.2	50.5
Saleh et al., 2012[26]*	Retrospective	45.3	76.95	31.65
Cingi and Eskiizmir, 2013[23]	Prospective	19.77 ± 7.99	76.20 ± 17.46	56.32
Günel and Omurlu, 2015[24]	Prospective	45 (range, 33–80)	80 (range, 75–90)	35
Baykal et al., 2014[20]	Prospective	5.83	19.3	13.47
Bulut et al., 2015[21]	Prospective	42.2 ± 15.7	63.9 ± 18.9	21.7

ROE, Rhinoplasty Outcomes Evaluation.
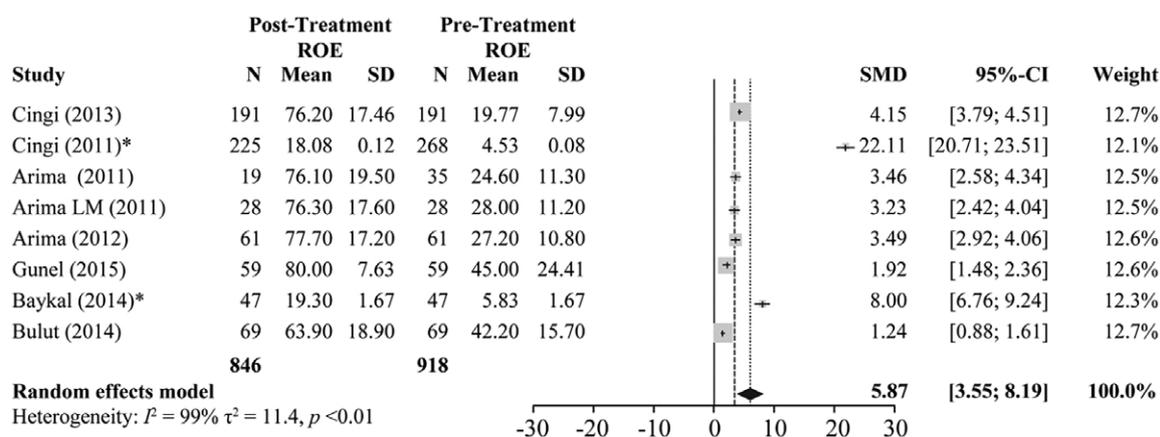*Excluded from evaluation of standard mean difference (SD not presented).

Fig. 2. Overall Rhinoplasty Outcomes Evaluation improvement. *ROE*, Rhinoplasty Outcomes Evaluation; *SMD*, standardized mean difference. *SD was statistically imputed.

improvement in a study by Floyd et al.[14] However, in this study, the extent of improvement in Rhinoplasty Outcomes Evaluation varied considerably between different subgroups categorized based on follow-up duration and patient age. Although the study reports maximum postoperative benefit (standard mean difference, 11.07) within 6 to 12 months of follow-up, a very high level of heterogeneity (I^2 = 100 percent) was observed between studies reporting outcomes during this period (two studies).[28,29] The results in two studies were statistically imputed,[18,20] which might have created a large difference between the groups. In addition, a very broad confidence interval (−8.79 to 32.12) was obtained, likely caused by pooling of a very small number of studies; therefore, these results must be interpreted with caution. In contrast, although the postoperative improvement in patient satisfaction over a period longer than 12 months was more modest (standard mean difference, 3.67), a lower level of heterogeneity (I^2 = 58 percent) and a narrower confidence interval (3.20 to 4.14) were observed in studies

reporting outcomes during this period (five studies),[15–17,21,24] making these results more robust. Younger patients (≤30 years) derived greater benefit from aesthetic procedures (standard mean difference, 6.69); however, the problem of high heterogeneity (I^2 = 99 percent) and confidence interval (3.65 to 9.74) was encountered in these studies. In contrast, although the benefit reported (standard mean difference, 3.48) for the other subgroup (≥30 years) was more modest, the results were more reliable because the heterogeneity between studies was very low (I^2 = 0 percent) and confidence intervals were narrower (3.01 to 3.96). The potential reason for better Rhinoplasty Outcomes Evaluation scores in younger patients was the probability of receiving higher levels of appreciation from their peer group on their facial appearance.

The Rhinoplasty Outcomes Evaluation scale is a helpful tool in the evaluation of preoperative and postoperative patient satisfaction following aesthetic rhinoplasty and allows physicians and patients to quantitatively evaluate the benefits
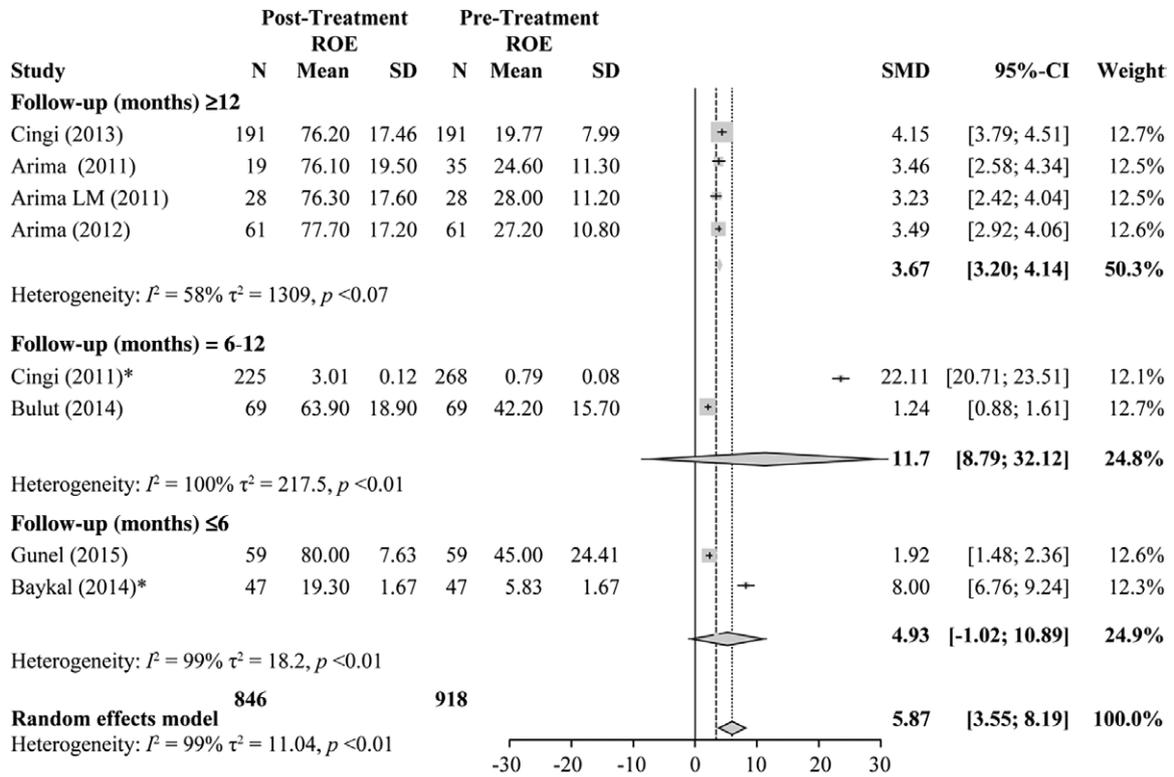
		Post-Treatment ROE			Pre-Treatment ROE					
Study	N	Mean	SD	N	Mean	SD		SMD	95%-CI	Weight
Follow-up (months) ≥12										
Cingi (2013)	191	76.20	17.46	191	19.77	7.99		4.15	[3.79; 4.51]	12.7%
Arima (2011)	19	76.10	19.50	35	24.60	11.30		3.46	[2.58; 4.34]	12.5%
Arima LM (2011)	28	76.30	17.60	28	28.00	11.20		3.23	[2.42; 4.04]	12.5%
Arima (2012)	61	77.70	17.20	61	27.20	10.80		3.49	[2.92; 4.06]	12.6%
								3.67	[3.20; 4.14]	50.3%
Heterogeneity: $I^2 = 58\%$ $\tau^2 = 1309$, $p < 0.07$										
Follow-up (months) = 6-12										
Cingi (2011)*	225	3.01	0.12	268	0.79	0.08		22.11	[20.71; 23.51]	12.1%
Bulut (2014)	69	63.90	18.90	69	42.20	15.70		1.24	[0.88; 1.61]	12.7%
								11.7	[8.79; 32.12]	24.8%
Heterogeneity: $I^2 = 100\%$ $\tau^2 = 217.5$, $p < 0.01$										
Follow-up (months) ≤6										
Gunel (2015)	59	80.00	7.63	59	45.00	24.41		1.92	[1.48; 2.36]	12.6%
Baykal (2014)*	47	19.30	1.67	47	5.83	1.67		8.00	[6.76; 9.24]	12.3%
								4.93	[-1.02; 10.89]	24.9%
Heterogeneity: $I^2 = 99\%$ $\tau^2 = 18.2$, $p < 0.01$										
		846			**918**					
Random effects model								5.87	[3.55; 8.19]	100.0%
Heterogeneity: $I^2 = 99\%$ $\tau^2 = 11.04$, $p < 0.01$										

Fig. 3. Rhinoplasty Outcomes Evaluation score improvement based on follow-up duration. *ROE*, Rhinoplasty Outcomes Evaluation; *SMD*, standardized mean difference. *SD was statistically imputed.
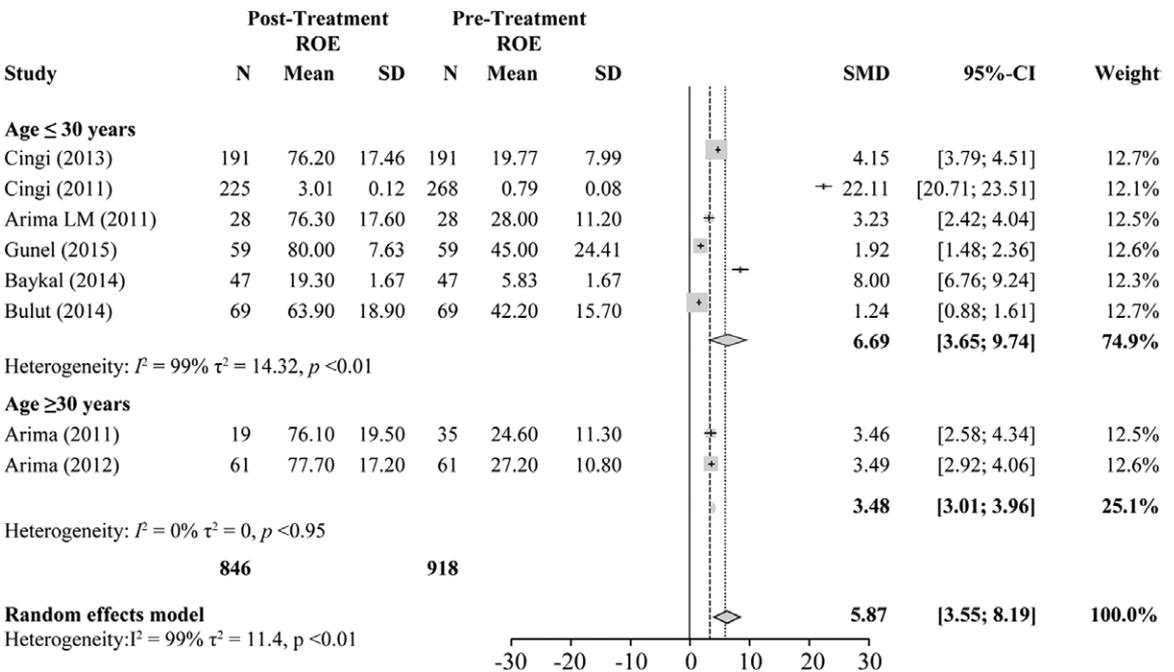
		Post-Treatment ROE			Pre-Treatment ROE					
Study	N	Mean	SD	N	Mean	SD		SMD	95%-CI	Weight
Age ≤ 30 years										
Cingi (2013)	191	76.20	17.46	191	19.77	7.99		4.15	[3.79; 4.51]	12.7%
Cingi (2011)	225	3.01	0.12	268	0.79	0.08		22.11	[20.71; 23.51]	12.1%
Arima LM (2011)	28	76.30	17.60	28	28.00	11.20		3.23	[2.42; 4.04]	12.5%
Gunel (2015)	59	80.00	7.63	59	45.00	24.41		1.92	[1.48; 2.36]	12.6%
Baykal (2014)	47	19.30	1.67	47	5.83	1.67		8.00	[6.76; 9.24]	12.3%
Bulut (2014)	69	63.90	18.90	69	42.20	15.70		1.24	[0.88; 1.61]	12.7%
								6.69	[3.65; 9.74]	74.9%
Heterogeneity: $I^2 = 99\%$ $\tau^2 = 14.32$, $p < 0.01$										
Age ≥30 years										
Arima (2011)	19	76.10	19.50	35	24.60	11.30		3.46	[2.58; 4.34]	12.5%
Arima (2012)	61	77.70	17.20	61	27.20	10.80		3.49	[2.92; 4.06]	12.6%
								3.48	[3.01; 3.96]	25.1%
Heterogeneity: $I^2 = 0\%$ $\tau^2 = 0$, $p < 0.95$										
		846			**918**					
Random effects model								5.87	[3.55; 8.19]	100.0%
Heterogeneity: $I^2 = 99\%$ $\tau^2 = 11.4$, $p < 0.01$										

Fig. 4. Rhinoplasty Outcomes Evaluation score improvement based on age groups. *ROE*, Rhinoplasty Outcomes Evaluation; *SMD*, standardized mean difference. *SD was statistically imputed.

of the procedure. Although other newer scales such as the Glasgow Benefit Inventory[30] and the 22-item Sino-Nasal Outcome Test[31] are available for the evaluation of postoperative patient satisfaction and health benefits, they do not assess the improvement in scores. Also, they are used for the evaluation of ear, nose, and throat outcomes, whereas the Rhinoplasty Outcomes Evaluation

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scale is a unique instrument specifically designed to evaluate patient satisfaction before and after aesthetic rhinoplasty.

This meta-analysis also has a few shortcomings for different reasons. First, all of the included studies were observational in nature, which is associated with inherent publication bias. Second, the included studies did not report individual scores for all six parameters of the Rhinoplasty Outcomes Evaluation scale; therefore, a parametric evaluation of preoperative and postoperative patient satisfaction could not be conducted and data on the improvement of the overall Rhinoplasty Outcomes Evaluation score were presented. Third, we imputed the standard deviation values for determining standard mean difference in two studies, which showed large variation. Therefore, these results should be interpreted with caution. Lastly, we could not analyze any postprocedural complications because of a paucity of such data in the included studies.

Although our results collectively demonstrate a definite improvement in patient satisfaction on the Rhinoplasty Outcomes Evaluation scale, high levels of heterogeneity between studies must be taken into account. In addition, dissatisfaction with nasal appearance is ultimately a subjective complaint, and any decision to treat will be based on the physician's evaluation of patient expectations and the ability of existing rhinoplasty procedures to align with them.

CONCLUSIONS

Patient satisfaction, as measured by the Rhinoplasty Outcomes Evaluation scale, substantially improves following cosmetofunctional rhinoplasty for up to 12 months and beyond. However, these results should be interpreted carefully because of high heterogeneity between studies and the potential for bias inherent in observational investigations.

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REFERENCES

1. Kim YJ, Park JW, Kim JM, et al. The functionality of facial appearance and its importance to a Korean population. *Arch Plast Surg.* 2013;40:715–720.
2. Little AC, Jones BC, DeBruine LM. Facial attractiveness: Evolutionary based research. *Philos Trans R Soc Lond B Biol Sci.* 2011;366:1638–1659.
3. Babuccu O, Latifoğlu O, Atabay K, Oral N, Coşan B. Sociological aspects of rhinoplasty. *Aesthetic Plast Surg.* 2003;27:44–49.
4. American Society for Aesthetic Plastic Surgery. Cosmetic surgery national data bank statistics: Quick sheet. Available at: http://www surgery org/ sites/default/files/2009stats.pdf. Accessed March 8, 2017.
5. Naraghi M, Atari M. A comparison of depression scores between aesthetic and functional rhinoplasty patients. *Asian J Psychiatr.* 2015;14:28–30.
6. Zojaji R, Javanbakht M, Ghanadan A, Hosien H, Sadeghi H. High prevalence of personality abnormalities in patients seeking rhinoplasty. *Otolaryngol Head Neck Surg.* 2007;137:83–87.
7. Ching S, Thoma A, McCabe RE, Antony MM. Measuring outcomes in aesthetic surgery: A comprehensive review of the literature. *Plast Reconstr Surg.* 2003;111:469–480; discussion 481–482.
8. Kosowski TR, McCarthy C, Reavey PL, et al. A systematic review of patient-reported outcome measures after facial cosmetic surgery and/or nonsurgical facial rejuvenation. *Plast Reconstr Surg.* 2009;123:1819–1827.
9. Rhee JS, McMullin BT. Measuring outcomes in facial plastic surgery: A decade of progress. *Curr Opin Otolaryngol Head Neck Surg.* 2008;16:387–393.
10. Rhee JS, McMullin BT. Outcome measures in facial plastic surgery: Patient-reported and clinical efficacy measures. *Arch Facial Plast Surg.* 2008;10:194–207.
11. Stewart MG, Witsell DL, Smith TL, Weaver EM, Yueh B, Hannley MT. Development and validation of the Nasal Obstruction Symptom Evaluation (NOSE) scale. *Otolaryngol Head Neck Surg.* 2004;130:157–163.
12. Alsarraf R, Larrabee WF Jr, Anderson S, Murakami CS, Johnson CM Jr. Measuring cosmetic facial plastic surgery outcomes: A pilot study. *Arch Facial Plast Surg.* 2001;3:198–201.
13. Rhee JS. Measuring outcomes in nasal surgery: Realities and possibilities. *Arch Facial Plast Surg.* 2009;11:416–419.
14. Floyd EM, Ho S, Patel P, Rosenfeld RM, Gordin E. Systematic review and meta-analysis of studies evaluating Functional Rhinoplasty Outcomes with the NOSE score. *Otolaryngol Head Neck Surg.* 2017;156:809–815.
15. Moher D, Shamseer L, Clarke M, et al.; PRISMA-P Group. Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015 statement. *Syst Rev.* 2015;4:1.
16. Slim K, Nini E, Forestier D, Kwiatkowski F, Panis Y, Chipponi J. Methodological index for non-randomized studies (minors): Development and validation of a new instrument. *ANZ J Surg.* 2003;73:712–716.
17. Arima LM, Velasco LC, Tiago RSL. Results evaluation in reduction rhinoplasty. *Intl Arch Otorhinolaryngol.* 2011;15:79–83.
18. Arima LM, Velasco LC, Tiago RS. Crooked nose: Outcome evaluations in rhinoplasty. *Braz J Otorhinolaryngol.* 2011;77:510–515.
19. Arima LM, Velasco LC, Tiago RS. Influence of age on rhinoplasty outcomes evaluation: A preliminary study. *Aesthetic Plast Surg.* 2012;36:248–253.
20. Baykal B, Erdim I, Kayhan FT, Oghan F. Comparative analysis of nasal deformities according to patient satisfaction. *J Oral Maxillofac Surg.* 2014;72:603.e1–603.e7.
21. Bulut OC, Wallner F, Plinkert PK, Prochnow S, Kuhnt C, Baumann I. Quality of life after septorhinoplasty measured with the Functional Rhinoplasty Outcome Inventory 17 (FROI-17). *Rhinology* 2015;53:54–58.
22. Cingi C, Songu M, Bal C. Outcomes research in rhinoplasty: Body image and quality of life. *Am J Rhinol Allergy* 2011;25:263–267.

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23. Cingi C, Eskiizmir G. Deviated nose attenuates the degree of patient satisfaction and quality of life in rhinoplasty: A prospective controlled study. *Clin Otolaryngol.* 2013;38:136–141.

24. Günel C, Omurlu IK. The effect of rhinoplasty on psychosocial distress level and quality of life. *Eur Arch Otorhinolaryngol.* 2015;272:1931–1935.

25. Meningaud JP, Lantieri L, Bertrand JC. Rhinoplasty: An outcome research. *Plast Reconstr Surg.* 2008;121:251–257.

26. Saleh AM, Younes A, Friedman O. Cosmetics and function: Quality-of-life changes after rhinoplasty surgery. *Laryngoscope* 2012;122:254–259.

27. McKiernan DC, Banfield G, Kumar R, Hinton AE. Patient benefit from functional and cosmetic rhinoplasty. *Clin Otolaryngol Allied Sci.* 2001;26:50–52.

28. Domanski MC, Cavale N. Self-reported "worth it" rating of aesthetic surgery in social media. *Aesthetic Plast Surg.* 2012;36:1292–1295.

29. Rettinger G. Risks and complications in rhinoplasty. *GMS Curr Top Otorhinolaryngol Head Neck Surg.* 2007;6:Doc08.

30. Konstantinidis I, Triaridis S, Printza A, Triaridis A, Noussios G, Karagiannidis K. Assessment of patient benefit from septo-rhinoplasty with the use of Glasgow Benefit Inventory (GBI) and Nasal Symptom Questionnaire (NSQ). *Acta Otorhinolaryngol Belg.* 2003;57:123–129.

31. Browne JP, Hopkins C, Slack R, Cano SJ. The Sino-Nasal Outcome Test (SNOT): Can we make it more clinically meaningful? *Otolaryngol Head Neck Surg.* 2007;136:736–741.