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REVIEW FACIAL SURGERY

A Systematic Review and Meta-Analysis of Early Relapse After Facelift

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Abstract

Background Early relapse is an adverse outcome of facelift surgery. The rate of early relapse is an indirect measure of the longevity and efficacy of facelift techniques. However, early relapse after facelift is ill-defined, under-evaluated, and under-reported, and literature data on the subject are dispersed. In this systematic review, we aimed to analyze facelift studies using relapse-related outcomes (RROs). Our secondary aim was to highlight the importance of early relapse as an essential outcome measure.

Methods The study design was a systematic review of the English literature and meta-analysis of RROs after facelift surgery. RROs that occurred within the first 2 years after surgery were considered "early". Performance, analysis, and reporting were performed in accordance with the PRISMA guidelines. The systematic search was conducted using the PubMed database as of February 2020. Initial screening was performed using the keywords "facelift", "rhytidectomy", "surgical rejuvenation", "face lift", "rhytidoplasty", and "facial rejuvenation". Articles were excluded by using a set of inclusion and exclusion criteria.

Results RROs were reported only in 4.4% (19/433) of the papers that underwent full-text review. The frequency of RROs ranged between 0.2 and 50% among facelift papers. The weighted median rate of RROs after facelift surgery was found to be 2.4% in the meta-analysis.

Conclusions Future research on preventive measures will be successful upon acknowledgment of the actual prevalence of this problem. Consensus on its definition and objective criteria for its diagnosis are required for further progress.

Level of Evidence III This journal requires that authors assign a level of evidence to each article. For a full description of these Evidence-Based Medicine ratings, please refer to the Table of Contents or the online Instructions to Authors www.springer.com/00266.

Keywords Facelift · Recurrence · Relapse · Revision · Rhytidectomy

Introduction

In the modern era of facelift surgery, a wide range of techniques are being used to address aging-related facial changes. The ideal technique should have minimal morbidity, a low relapse rate, and longevity.

The relapse of facial deformity earlier than expected can potentially "break the deal" in the doctor–surgeon relationship. No individual wants to invest in a "one-year" facelift. The durability of facelift surgery becomes even more important when short-term results can also be instantly obtained with minimally invasive techniques. Therefore, even though early relapse has not been considered as a morbidity or complication in many facelift studies, it is definitely an adverse outcome with unfavorable consequences.

It is our responsibility to inform our patients of adverse outcomes. Only few plastic surgeons who were able to

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conduct outcome research on their own patient series can inform their patients about the relapse rate of their surgical technique. However, till now, there was no available data on the average rate of relapse-related adverse outcomes after facelift surgery for a general practitioner. Over the years, the authors have observed that most plastic surgeons, including themselves, were also unaware of the actual prevalence of early relapse after facelift surgery.

However, the definition of "early" relapse following facelift surgery is not clear from the literature. There are no objective diagnostic parameters for its evaluation other than subjective measures.

Most outcome studies focused on standardized postoperative problems such as hematoma, scar quality, neuropraxia, and necrosis rather than relapse or revisions. However, the efficacy, durability, and longevity of a facelift technique can only be effectively assessed by taking the early relapse rates into consideration. Only then can we refine our technique to achieve the best possible outcome.

In this systematic review and meta-analysis, we aimed to analyze facelift studies using relapse-related outcomes (RROs) and to highlight the importance of early relapse as an essential outcome measure.

Materials and Methods

The study design was a systematic review and meta-analysis of the English literature for RROs after facelift surgery. RROs that occurred within the first 2 years after surgery were considered "early". The systematic search was conducted by the senior author using the PubMed database as of February 2020. Initial screening was performed using the keywords "facelift", "rhytidectomy", "surgical rejuvenation", "face lift", "rhytidoplasty", and "facial rejuvenation". The search was kept as broad as possible during the initial screening. The initial keyword search yielded 8396 results. Article titles were screened to exclude irrelevant content that belonged to other fields of science and duplicated search results. Articles were then eliminated using a set of inclusion and exclusion criteria. Endnote X9 (Clarivate Analytics, USA) was used for search, data classification, and organization of the references.

Systematic Review

Inclusion criteria were as follows:

1. Articles that describe or review a facelift technique and report surgical outcomes including complications and/or adverse effects.
2. Articles with full-text access.

Exclusion criteria were as follows:

1. Articles that describe or review non-cosmetic procedures,
2. Articles related to brow lift, forehead lift, isolated neck lift, or isolated subperiosteal midface lift,
3. Animal studies,
4. Cadaveric studies,
5. Articles related to isolated thread lifting or non-surgical modalities of facelifting,
6. Articles written in languages other than English,
7. Articles without reported numerical outcomes,
8. Case reports, review articles, letters, discussions, editorials.

Systematic review of the literature yielded 152 eligible facelift articles in which outcomes and complications had been reported [1–152]. These articles were further assessed for data extraction and meta-analysis (Figure 1).

Data Extraction

Data extraction was performed on 152 articles that contained numerical data on adverse outcomes. Articles were screened for the mention of RROs such as; "relapse", "revisions", "pending revisions", "secondary facelift", and "tuck rate".

The absence of information was considered as missing data rather than zero relapse. The mention of relapse without numerical data was considered missing data. Absence of information on time of detection or timing of the revision procedure was also considered as missing data rather than zero "early" relapse. Descriptive statistics were used to determine the percentage of articles in which information on any type of relapse/revision was missing.

Articles that contained information on these parameters were further grouped for meta-analysis. Any information on the timing of diagnosis or revisional intervention was recorded. The total number of cases and percentages of RROs was recorded in an Excel datasheet.

RRO data extracted from individual articles are presented in Table 1. Performance, analysis, and reporting in this study were done in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines (PRISMA).

Assessment of the Risk of Bias

In meta-analyses, publication bias analysis should be performed to prove that a homogeneous selection was made, and that not only studies that support the researchers' hypotheses were included. Funnel plots, Classical Fail-Safe

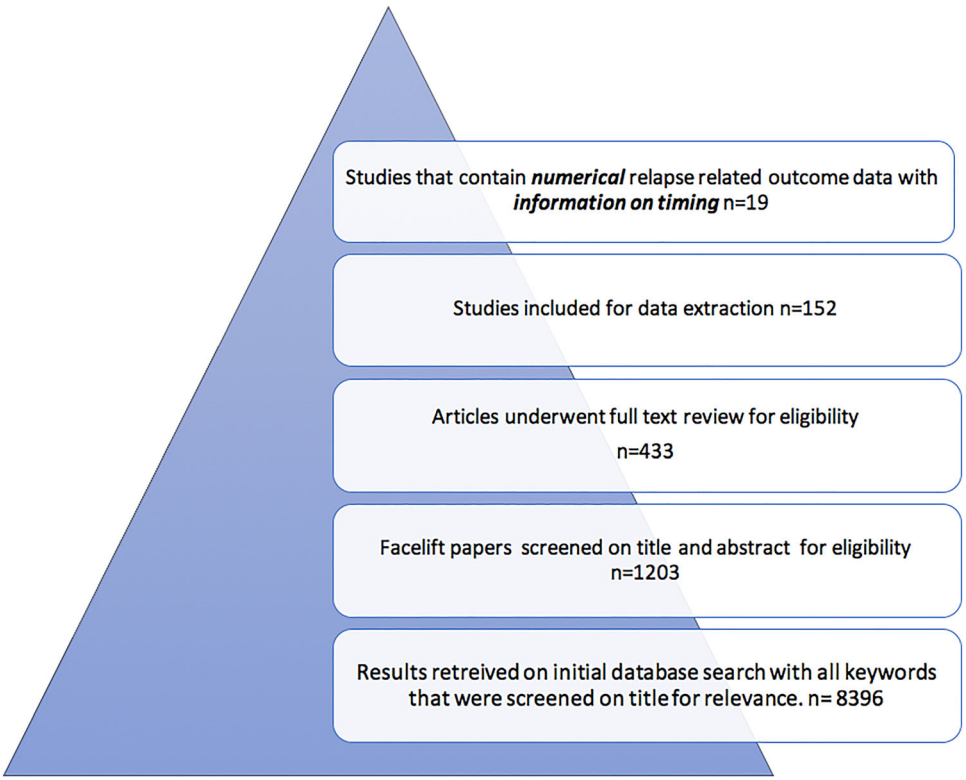


Fig. 1 Flow diagram depicting the systematic review of facelift literature

N, and Egger regression tests in the CMA (Comprehensive Meta-Analysis V2) program were used during the research process. The symmetrical distribution of a funnel plot indicates that there is no publication bias. The Classical Fail-safe *N* test provides information on how many more studies should be added to reject H_0 for the overall effect value calculated in the study. On the other hand, Egger's regression intercept value is a publication bias test which shows that the hypothesis established for meta-analysis does not significantly deviate from zero [153–157].

The funnel plot of the calculated effect sizes for the problem rates of facelift studies is presented in Figure 2. When the distributions of the effect sizes of each study were examined, it was observed that three studies did not fit with the symmetrical distribution. These studies were not excluded from the meta-analysis due to their sample size and importance in the literature. According to the Classical Fail-safe *N* test, if 6042 studies related to the problem caused by all facelift techniques are added, it was seen that the interpretation of the overall effect would change ($p < 0.01$). Egger's regression intercept values were calculated as − 2.65232 for all techniques ($p < 0.01$). When the three publication bias statistics were examined together, it was concluded that there was no publication bias.

Data Analysis

In this study, a meta-analysis was conducted to examine RROs caused by facelift surgery from a general point of view. The random effects model was chosen during the meta-analysis process because the surgical techniques (SMAS flap, SMAS plication, deep plane, etc.) varied between studies in the literature review. The CMA (Comprehensive Meta-Analysis V2) program was used in the analysis process. Effect sizes were calculated based on the problem rates experienced in individual application groups. Event rates were calculated and weighted for 19 studies in accordance with the criteria discussed (Table 2) [8, 31, 34, 48, 50, 51, 57, 60, 67, 71, 73, 74, 81, 95, 96, 109, 111, 112, 132, 133].

Results

Outcomes were reported only in 152 out of 433 facelift papers (35%) that underwent a full-text review. RROs were reported only in 4.4% (19/433) of the facelift papers that underwent full-text review. RROs were included in 12.5% (19/152) of facelift papers that reported numerical outcomes. Eighty-four percent (16/19) of papers that reported RROs were published after year 2005. The frequency of early RROs ranged from 0.2 to 50% in studies where they have been reported.

Table 1 Characteristics of the studies included

First author/ year	Patients	Type of surgery	Percentage of R.R.O. (%)	Relapse related outcomes
Baker [8]	749	Lateral SMASectomy short scar	2	Required mini-lift after 1 year
Castello [23]	327	Modified SMAS flap	0.6	Required revisional surgery for jowl relapse within 2 years
Conway [34]	325	Subcutaneous	1.25	Required revision due to relapse within the first year
Graf [48]	205	SMASectomy and FAME (finger-assisted malar elevation)	0.5	Required reoperation for persistent jowling
Guyuron [50]	578	Rhytidectomy	0.17	Reoperated due to exceedingly unsatisfactory result within the first year
Guyuron [51]	72	Super High-SMAS facelift	1.3	Revised due to dissatisfaction
Hopping 2005 [57]	200	*S*-lift and *S*-plus lift	5	Offered revisional surgery by the surgeon between 6 and 12 months
Ivy [60]	21	Lateral SMASectomy	4.8	Reoperation due to nasolabial fold relapse at 1 year
Jacono [67]	153	Deep plane	2	Tuck-up at 1 year
Jones [69]	133	SMAS platysma lift	3	Repeat cases at 18 months
Kamer [73]	634	Deep plane and SMAS flap	7.5	Tuck rate within 18 months
Kim [74]	450	Lower facelift with e-PTFE implant	0.9	Revision traction operations
Mani [81]	70	Deep plane facelift	1.4	Recurrent laxity at 18 months
O'Conell [96]	22	Bidirectional self retaining sutures	9	Additional tightening
Obourn [95]	95	Extended purse string rhytidectomy	3.2	Complete revision
Prado [109]	82	MASC lift and lateral SMASectomy	50	Needed tuck procedure after 2 years, (2.4% actually revised)
Rammos [111]	229	SubSMAS versus subcutaneous	4.4	Revision for inadequate result (5.6% subcutaneous vs 2.3% subSMAS)
Rawlani [112]	742	Modified deep plane	6.3	Relapse in the first 2 years requiring secondary facelift
Sundine [132]	299	High SMAS facelift	1.3	Secondary face lift due to early relapse <18 months

RRO Relapse-Related Outcomes

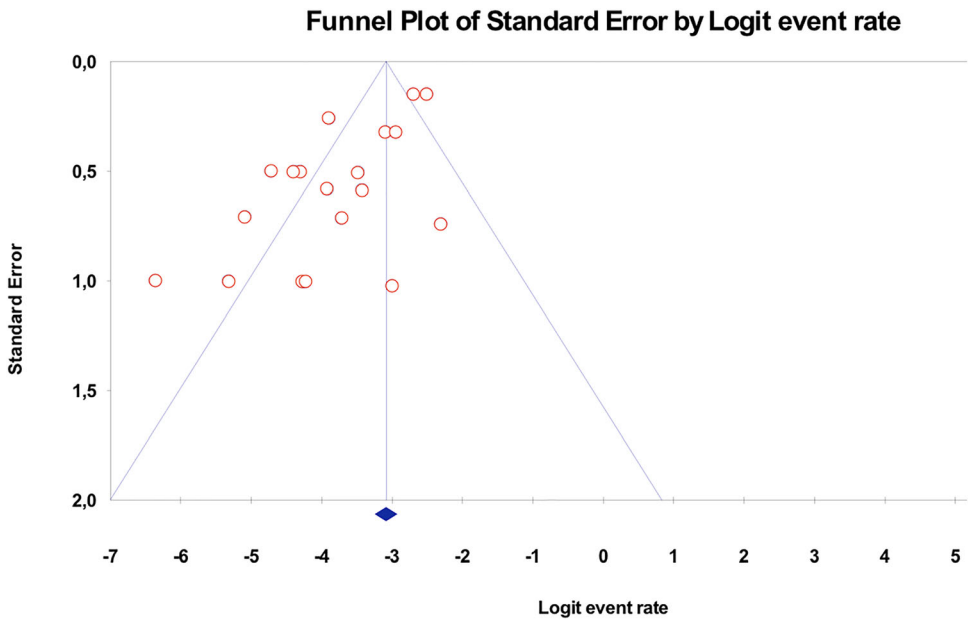
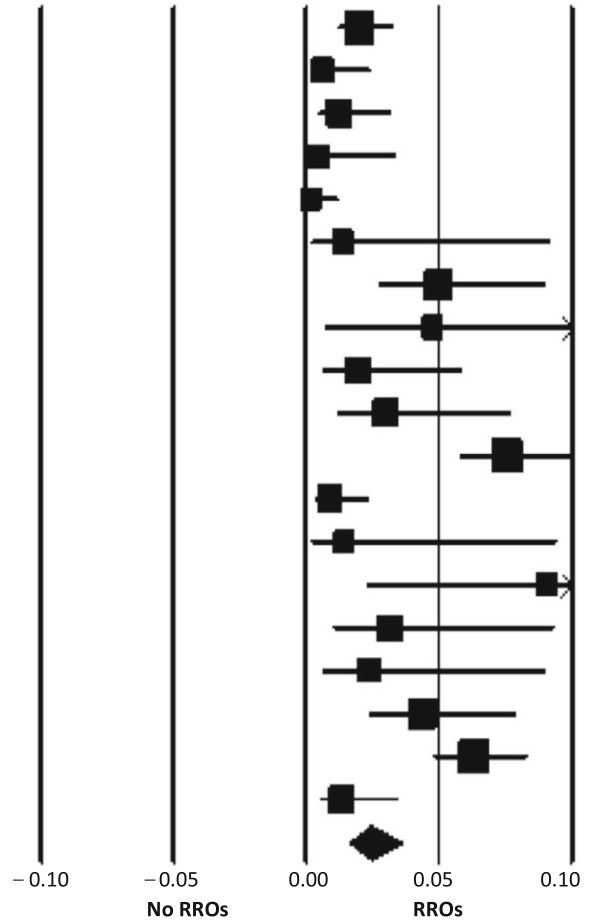


Fig. 2 The funnel plot of the calculated effect sizes for the problem rates of facelift studies

Table 2 The forest plot of problem rates in all facelift studies and their effect sizes

First author/year	Event rate	Effect size	Lower limit	Upper limit	*Z*-value	*p* value	Event rate and 95% CI
Baker [8]	0.020	0.2608	0.012	0.033	− 14.916	0.000	
Castello [23]	0.006	0.7093	0.002	0.024	− 7.168	0.000	
Conway [34]	0.012	0.5031	0.005	0.032	− 8.716	0.000	
Graf [48]	0.005	1.0024	0.001	0.034	− 5.305	0.000	
Guyuron [50]	0.002	1.0009	0.000	0.012	− 6.352	0.000	
Guyuron [51]	0.014	1.0070	0.002	0.092	− 4.233	0.000	
Hopping [57]	0.050	0.3244	0.027	0.090	− 9.075	0.000	
Ivy [60]	0.048	1.0247	0.007	0.271	− 2.924	0.003	
Jacono [67]	0.020	0.5831	0.006	0.059	− 6.709	0.000	
Jones [69]	0.030	0.5077	0.011	0.077	− 6.842	0.000	
Kamer [73]	0.076	0.1501	0.058	0.099	− 16.666	0.000	
Kim [74]	0.009	0.5022	0.003	0.023	− 9.386	0.000	
Mani [81]	0.014	1.0072	0.002	0.094	− 4.204	0.000	
O'Conell [96]	0.091	0.7416	0.023	0.300	− 3.105	0.002	
Obourn [95]	0.032	0.5867	0.010	0.093	− 5.835	0.000	
Prado [109]	0.024	0.7157	0.006	0.090	− 5.189	0.000	
Rammos [111]	0.044	0.3234	0.024	0.079	− 9.545	0.000	
Rawlani [112]	0.063	0.1507	0.048	0.083	− 17.873	0.000	
Sundine [132]	0.013	0.5034	0.005	0.035	− 8.544	0.000	
	0.024		0.016	0.036	− 17.221	0.000	



The 50% was the need for revision, subjectively assessed by the authors, in the study of Prado et al. This 50% rate was not used in the meta-analysis because it distorted the distribution and homogeneity of data in the research model. Instead, we used the 2.4% revision rate as the RRO in this study. Using the 50% RRO rate could have yielded a higher overall rate of RRO's but that would weaken the statistical strength of our meta-analysis.

The meta-analysis yielded an overall event rate of 0.024. *With this finding, it was concluded that **2.4 of every 100 patients** had relapse-related complications caused by facelift surgery.*

The rate of technical problems and the overall effect values calculated according to the forest plot and random effects model of the 19 studies included in the study were presented (Table 2). The random effects model was chosen in the research process because the surgical techniques vary in different groups according to the literature review. The average effect size in random effects model, confidence intervals, and heterogeneity of the data are displayed in Table 3.

In the meta-analysis, we have investigated the effect of different surgical techniques on RRO's. Unfortunately, due to the small sample size, selection bias and the heterogeneity of data comparisons between the deep plane, SMAS flap, SMAS plication, subcutaneous, mini-lift techniques did not reveal a statistically significant difference. It is concluded that plastic surgery literature has not yet created enough data to make surgical technique-based comparisons on RROs.

The factsheet summarizes the findings of this study (Table 4).

Table 3 Average effect size, confidence intervals and heterogeneous distribution value by effect model

Model	*N*	df	Hedges' g	^{2}		*Z*	Q^2	*p*
				Lower limit	Upper limit			
Random effects model	19	18	0.024	0.016	0.036	− 17.221	85.66	0.00

Discussion

Early relapse is an under-reported outcome of facelift surgery. We isolated only 19 facelift papers that reported RROs, accounting for only 4.4% of full-text facelift papers and 12.5% of facelift papers with numerical outcomes. Most facelift studies with outcomes have been published with a predetermined set of complications such as hematoma, paresthesia, necrosis, seroma, and poor scars, without any mention of RROs. Early relapse was not mentioned as an adverse outcome, even in most recent evidence-based medicine review articles [158]. Several studies have reported outcomes on thousands of cases without any mention of relapse [134, 140]. Early relapse was excluded even in meta-analyses of facelift complications [64]. Some authors have published surgical strategies to eliminate or reduce early relapse after facelift without any mention of their previous early relapse rates [88, 159, 160]. Some studies investigated the longevity of facelift results without any information on the rate of early relapse [79].

In our opinion, early relapse is of equal or even greater importance than some of the "classical" outcome measures such as transient neuropraxias or hematomas. RROs were more frequent than neuropraxias and hematomas in some studies [109, 112, 133]. However, prevention of early relapse was a much less studied objective in the literature when compared to hematoma prevention.

There is no consensus on the definition of early relapse after facelift in the English literature. It is unclear at which time point after facelift surgery should relapses be considered as "expected" rather than "early". There are no diagnostic criteria for early relapse. All previously published studies used the operating surgeon's clinical judgment as the basis for the diagnosis of early relapse. In our subjective opinion, one year is the ideal cutoff for the definition early relapse. However, if we had taken 1 year as the inclusion cutoff, then the number of eligible studies would have fallen down to 6/433 (1.4% of facelift papers), and performing a meta-analysis would have been impossible. For study purposes, we have set the inclusion cutoff to two years after surgery. We think that is reasonable because most early relapses that became evident within the first year were surveyed, studied or revised later.

Early relapse after facelift surgery is also most probably under-evaluated. Up to date, there is no prospective or randomized study which investigated early relapse rates after facelift surgery. Early relapse is most often reported through indirect outcome measures. Surgical revision is the most common RRO published in facelift papers. Some studies reported the actual rate of revisional surgeries, whereas others reported patient's requests for revision, the surgeon's offer of a revision, or pending revisions. However, the rate of revisions does not correlate with the actual rate of relapses. Many patients with early relapse after facelift surgery would not want a revision because they are often quite disappointed with the surgical process or their primary surgeon (Figure 3). The lack of correlation between early relapse and revisions has been concisely presented by Prado et al. They evaluated and compared two different short scar facelift techniques and found a 50% need for tuck procedures within 2 years. The actual rate of revisions in that study was 2.4% [109].

Table 4 Factsheet

1. Early relapse is an under-reported outcome of facelift surgery.
2. Early relapse is under-evaluated in outcome studies.
3. No objective diagnostic criteria for early relapse.
4. No consensus on the definition of early relapse.
5. Prevention strategies are under-studied.
6. The average rate of early relapse is 2.4% after facelift surgery.

The highest relapse rates were reported in studies that specifically and intentionally sought for it. Swanson counted persistent jowls or skin laxity requiring re-treatment as "complications" in his review of 225 personal facelifts. Twenty-one patients (9.3%) underwent additional surgery to treat persistent jowls, brow ptosis, or submental fullness [133].

Rawlani and Mustoe specifically investigated early relapse after primary facelift surgery and found a 6.3% early secondary facelift rate in their review of 742 facelift patients. They also outlined the potential causes and mechanisms of early relapse [112].

Since early relapse is an under-evaluated and an under-reported outcome in facelift publications, the actual rate of early relapse is probably higher than what we have found (2.4%) in this study.

Early relapse might be correlated with patient satisfaction. However, this potential correlation has not been proven in any previous study. Patient satisfaction is a

Fig. 3 A tale of two sisters. **A** Preoperative frontal view of a 58 years old, female patient, with advanced pan facial aging. **B** 1 year postoperative frontal view of the same patient after high SMAS facelift, hairline forehead lift, upper and lower blepharoplasty and multiplanar full face fat transfer. **C** Preoperative frontal view of a 61 years old, female patient with advanced skin laxity. **D** 3 months postoperative frontal view of the same patient after high SMAS facelift and upper blepharoplasty. These sisters were operated 1 day apart, by the same plastic surgeon, in the same operating room, using the same facelift technique (High SMAS flap, deep temporal fascia and lateral SMAS fixation using 3/0 polyester sutures). The elder sister had an early medial relapse at 3 months. She was so disappointed that she cancelled the planned second stage surgery (lower blepharoplasty, forehead lift and fat injections) and didn't accept the offer for a free revision facelift. Early relapse rates may not correlate with revision rates in facelift series

subjective outcome measure that can be influenced by many factors, such as complications, initial patient expectations, and interpersonal communication. On the other hand, early relapse can be objectively assessed, if there had been an established diagnostic criterion.

The aim of this study was to review the current state of our objective knowledge on early relapse rates after facelift surgery. Obviously, we don't know enough. Previous studies delineated the potential causes for early relapse after facelift surgery. Early relapse has many causes and it does not necessarily imply a technical failure. Nevertheless, plastic surgeons often do not prefer to write (in scientific papers) or speak (in conferences) about this outcome.

The major limitation in our study was the lack of standardized data in the literature for a more comprehensive meta-analysis. Ideally, meta-analyses should collect data from prospective randomized clinical trials. Such a study (early relapse vs face-lift) does not exist in the plastic surgery literature. Our sample for eligible studies is poor quality. That is simply because early relapse has been severely under-investigated. Therefore, the 2.4% event rate is not a scientifically dependable statistic. However, that is the only "median data" that can be calculated from the literature at its current state. These data, along with table 1, can be used to inform our patients peri-operatively about the possibility of early relapse as an adverse outcome of facelift surgery.

Another limitation is the researcher's bias, which cannot be reduced to zero in systematic reviews. We acknowledge that there might be some papers that we have missed. Nevertheless, this is the most comprehensive review, and the only meta-analysis on the subject in the English literature.

RROs have been reported in different terminologies. Some of the terms were revision, pending revision, extreme dissatisfaction, persistent deformity, need for revision, and relapse. However, these terms do not represent the same variable. Therefore, we have unified these outcome measures as "RROs" for analytic purposes. Lack of standardized data and the paucity of studies that reported RROs (19 only) impeded a meta-analytic comparison between different surgical techniques. Such a comparison would be significantly deviant, due to the selection bias.

Our study delineated some facts about early relapse after facelift surgery (Table 4). We strongly feel that early relapse must be an essential outcome measure in facelift studies. We cannot improve an adverse outcome if we keep on ignoring it. Facelift series should ideally be published with a minimum of 1 year follow-up, which we consider a sufficient length of time to assess and report early relapse.

Conclusion

Early relapse is an under-reported outcome of facelift surgery. Consensus on the definition and objective diagnostic criteria of the "early relapse" are required. Future research on preventive measures depends on the acknowledgment of the actual prevalence of this problem.

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Declarations

Conflict of Interest The authors declare that they have no conflict of interest to disclose.

Human or Animal Rights This article does not contain any studies with human participants or animals performed by any of the authors.

Informed Consent For this type of study, informed consent is not required.

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