Received: 12 April 2021 | Accepted: 19 April 2021

DOI: 10.1111/jocd.14173

JCD Journal of Cosmetic Dermatology WILEY

REVIEW ARTICLE

Non-surgical rhinoplasty using hyaluronic acid dermal fillers: A systematic review

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Abstract

Background: Non-surgical rhinoplasty using hyaluronic acid dermal fillers is a cosmetic procedure that has been becoming increasingly popular among patients wanting to correct nasal deformities or nasal irregularities, in the recent years.

Aim: This systematic review aims to provide quality evidence about the success of non-surgical rhinoplasty procedures in terms of patient satisfaction and complications.

Methods: A systematic electronic literature search using keywords and MESH search terms over the PubMed/Medline, Cochrane Central, Scopus, and EBSCO online databases was conducted from November 2005 to February 2021. Additionally, the reference lists of included systematic reviews were hand searched. Data collected included patient satisfaction and complications from prospective and experimental studies providing highest level of evidence. Articles were critically appraised, and MINORS scale was used to assess the risk of bias.

Results: Based on the search criteria, 2896 citations were found. After removing duplicates and screening for relevance, 23 citations were finalized for full-text review, of which 12 articles were excluded and 11 articles were included in the study. The average satisfaction of patients amongst the studies was found to be >90%. In all the studies, transient edema and erythema, post-injection pain, and bruising were some temporary complications. Rare complications that were reported were vascular impairments and hematoma.

Conclusions: Non-surgical rhinoplasty is a good, minimally invasive alternative over conventional rhinoplasty. There is however a paucity of quality data in the form of experimental and prospective studies regarding the accuracy, effectiveness, and complications of non-surgical rhinoplasty.

KEYWORDS
dermal fillers, hyaluronic acid fillers, Non-surgical rhinoplasty, systematic review

1 | INTRODUCTION

Though beauty has been articulated to lie in the eyes of the beholder, it has also always been a measure of social value. Historically, vanity has been associated with the desire to undergo cosmetic procedures. In recent times, it has been elucidated that the motivations of patients behind pursuing cosmetic procedures are more complex. Factors such as increased social awareness; improved accessibility to quality medical facilities; technological advancements; influence of media and evolutionary interests; acceptance of cosmetic treatments; growing sociocultural emphasis on beauty and the outbreak of minimally invasive procedures (eg, Fillers injections and botox) have been the major contributors toward the rising demand for cosmetic surgeries and procedures among individuals across the globe.[1,2] A recent study by Shome et al observed the influence of selfies and a socially driven looks-oriented culture to have increased the desire among the youth to go under the knife.[3] The American Society for Dermatologic Surgery conducted a survey which revealed a strong digital influence in seeking cosmetic procedures, with social media being ranked sixth among the factors influencing the decision to seek a cosmetic treatment. It also reported that the percentage of people considering cosmetic treatment has more than doubled from 30% to 70% since 2013.[4] The British Association of Plastic Surgeons too reported a rise in surgical procedures performed every year.[5]

The nose is set in the center of the face harmonizes and brings balance to the person's face. A perfectly structured nose enhances the beauty of the entire face. Thus, "Rhinoplasty" or "nose shaping" is one such cosmetic surgical procedure which remains among the top five most popular cosmetic surgeries. But, in the recent years, this has been demonstrating a downward trend which could be ascribed to it being an operation with high risks and potentially limited predictability of the aesthetic results.[6] Moreover, functional disturbances, dissatisfaction with the final results, and botched outcomes due to surgical complications leading to revision rhinoplasties are the reasons for reluctance in seeking this procedure for aesthetic concerns.[7] The thin soft tissue skin envelope of the nose results in undesirable outcomes even with the smallest changes and makes cosmetic rhinoplasty one of the most challenging procedures.[8] A study found the revision rate of rhinoplasty much higher than other cosmetic procedures at 9.8% while the complication rate of 7.9% and patient dissatisfaction rate of 15.4% was also reported.[9]

Because of these drawbacks, noninvasive cosmetic surgeries are gaining popularity, with patients seeking soft tissue fillers including non-surgical rhinoplasty or liquid rhinoplasty with hyaluronic (HA) filler.[6,10] The advantages of less invasive nature, minimal downtime, and reversible or temporary results non-surgical rhinoplasty make it the treatment of choice for several patients. The fillers are a valuable tool as they can easily camouflage certain nasal irregularities in patients who do not want to or are ineligible to undergo surgical rhinoplasty, correct any minor post-rhinoplasty defects in appropriate patients, and can be used in patients who have minor defects for which surgery is not justified.[11] Hyaluronic acid injection rhinoplasty is a popular procedure which entails injecting hyaluronic acid into the deep dermis or subcutaneously and provides instant improvement.[12]

The results obtained after injecting hyaluronic acid fillers are very subjective to each patient and generally last between nine months and two years, depending on the filler used during treatment. The advantages which give liquid rhinoplasty an edge over other procedures are quick, noninvasive in nature, minimal recovery time, ease of minor corrections, use as an adjunct to nasal surgery, no risk of general anesthesia, lower cost per treatment, improved facial symmetry and most importantly the reversibility of the procedure in case of patient dissatisfaction.[13] On a thorough literature search, several studies of non-surgical rhinoplasty were found, but there was paucity of quality evidence in the form of systematic review. There is a prior systematic review on non-surgical rhinoplasty.[14] However, it attempts to cover a wide range of parameters and study designs thus limiting its evidence about the focused question of success of this procedure in terms of patient satisfaction and complications. Therefore, this systematic review was conducted with an aim to provide evidence about patient satisfaction and complications of this procedure with rising popularity which would guide clinicians for carrying out evidence-based practice.

2 | MATERIALS AND METHODS

This systematic review addresses a focused research question and has been structured in agreement with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA)-E 2012 checklist which is an evidence-based set of items aiming to improve reporting quality of systematic reviews and meta-analyses.[15]

2.1 | PICOS question

Participants/ Population (P): Patients who have undergone non-surgical rhinoplasty using hyaluronic acid (HA) fillers.

Intervention (I): Non-surgical rhinoplasty with hyaluronic acid (HA) fillers.

Comparator(s)/control (C): None.

Outcome (O): Assessment of results, patient satisfaction and complications post non-surgical rhinoplasty procedure.

Study Design (S): The only studies which have been considered in this systematic review are those adopting Experimental, Interventional, or Prospective study designs (Randomized Controlled Trials/ Non-Randomized Trials/ Quasi Trials / Single Arm Interventions) and original research papers to ensure that the highest level of evidence is included.[16]

2.2 | Search strategy for the electronic database search

An electronic literature search over the PubMed/Medline, Cochrane Central, Scopus, and EBSCO online databases was conducted from their respective dates from a period of November 2005 to February 2021. Free text words and MeSH terms were utilized, comprising of headings of ("hyaluronic acid"[MeSH Terms] OR ("hyaluronic"[All Fields] AND "acid"[All Fields]) OR "hyaluronic acid"[All Fields]) AND ("filler"[All Fields] OR "fillers"[All Fields]) AND ("rhinoplasty"[MeSH Terms] OR "rhinoplasty"[All Fields] OR "rhinoplasties"[All Fields]) Terms which were searched were: hyaluronic acid: "hyaluronic acid"[MeSH Terms] OR ("hyaluronic"[All Fields] AND "acid"[All Fields]) OR "hyaluronic acid"[All Fields]; filler: "filler"[All Fields] OR "fillers"[All Fields] and rhinoplasty: "rhinoplasty"[MeSH Terms] OR "rhinoplasty"[All Fields] OR "rhinoplasties"[All Fields].

After the literature search, the title screening was conducted followed by the screening of abstract and keyword for the relevant articles. The articles which were shortlisted for possible inclusion for the study were subjected to full-text screening. The full text of the articles was read, and the final inclusion of studies was carried out according to inclusion and exclusion criteria. References of the included studies were also searched to identify any relevant study for possible inclusion in the review. All the screenings were performed by two independent reviewers. In cases when the consensus was not reached, a third reviewer was approached for final determination for inclusion of the study (Figure 1).

2.3 | Inclusion and exclusion criteria

The studies of interest which were included in this systematic review were Randomized Controlled Trials, Non-Randomized Trials, Quasi

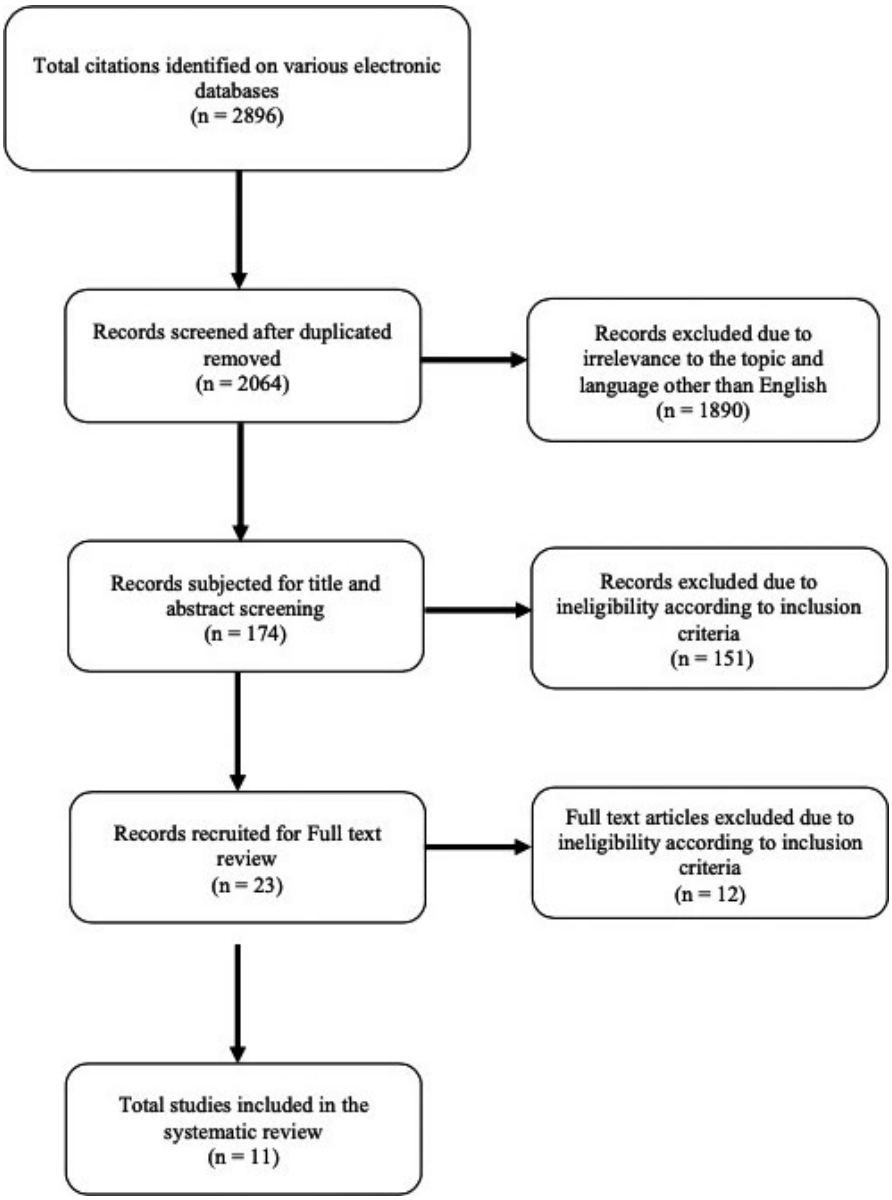

FIGURE 1 Flow diagram depicting the selection process of the study

TABLE 1 Characteristics of the studies included in the review

Sr. No.	Author and Country	No. of Patients	Age (years)	M/F	Filler used
01.	Amore R et al. (2015) Italy[15]	212	26–63 years	50/162	14 different fillers based on HA were used, some with and without lidocaine, but all were of a medium-high density. 0.1–0.3 ml
02.	Bektas G et al. (2020)[18]Turkey	62	20–52 years	8/54	1 of 3 brands of HA filler (Allergan, Dublin, Ireland; Merz Aesthetics, Raleigh, NC; Neauvia, Lugano, Switzerland)
03.	Han X et al. (2015)[19]China	280	18–36 years	0/280	HA
04.	Jung GS (2019)[21] Republic of Korea	96	22–48 years	7/89	hyaluronic acid filler (Teosyal® PureSense Ultra Deep, Teoxane Lab, Switzerland)
05.	Liew S et al. (2016)[22]Australia	29	20–61 years	3/26	Juvéderm VOLUMA [Allergan plc, Dublin, Ireland] with lidocaine injectable gel) Day 0 (maximum of 2.0 ml) and then 4 weeks later (maximum of 1.0 ml), if required.
06.	Rauso R et al. (2017)[23]Italy	52	18–61 years	9/43	20-mg/mL smooth, cohesive, and viscous HA filler (JuvedermVoluma) was used. Volume range of the HA filler injected was between 0.2 and 1.5 ml (0.8 ml on average)
07.	Rauso R et al. (2020)[24]Italy	148	16–61 years	36/112	1 of 5 brands of HA filler (Allergan, Dublin, Ireland; NyumaPharma, Arona, Italy; Merz Aesthetics, Raleigh, NC; Neauvia, Lugano, Switzerland; Teoxane, Geneva, Switzerland) The filler volume ranged from 0.4 to 1.2 ml (average, 1 mL).
08.	Rho K et al. (2017)[25]Korea	40	20–44 years	0/40	A cross-linked hyaluronic acid gel product containing 0.3% lidocaine (YVOIRE volume plus; LG Life Sciences, Seoul, Korea) was used in all cases.
09.	Santorelli A et al. (2019)[16]Italy	62	17–68 years	5/57	All study subjects were treated in the nose with either VYC–20 (Voluma; 20 mg/mL HA) or VYC–17.5 (Vo- lift; 17.5 mg/mL HA) from the Vycross range of HA-based products (Allergan, Dublin, Ireland).

Parameters assessed	Results	Adverse events
Results, degree of patient satisfaction, and adverse reactions.	79.2% patients were fully satisfied, 11.3% were fairly satisfied and 9.5% were dissatisfied.	Adverse events were transitory edema post-treatment, which regressed in 1–4 days.
Patient satisfaction	57 patients were fully satisfied with results. 2 patients said that they felt a slight enlargement at tip of nose, but they were satisfied with results.	Transient redness in 2 patients vascular impairments in 3 patients
A three-party evaluation was applied 1 month postoperation, including excellent, satisfactory, moderate, and dissatisfactory.	A 1-month follow-up showed a 93.2% satisfactory rate (excellent or satisfactory) among patients, 90.5% among plastic surgeons, and 94.1% in the third-party evaluation.	No major vascular complication occurred, including visual loss and flap necrosis.
The satisfaction score was assigned using a questionnaire with a scale ranging from 1 to 5	The mean patient satisfaction scores were 4.8 ± 0.8 (standard deviation) points immediately after the operation and 4.7 ± 0.7 points at 3 months postoperatively. No serious adverse events occurred during the course of the treatment	Two patients experienced temporary mild erythema, and two patients had mild ecchymosis after the treatment
Patient satisfaction	27 (93.1%) patients scored themselves as satisfied or very satisfied with their nose appearance, with 2 (6.9%) documenting a neutral opinion (grade =0)	There were no serious complications or complications leading to early termination. All the complications were localized to the injection site and were principally transient cases of swelling, erythema, bruising, or pain/discomfort
The assessment of the result was done subjectively by the patients using a questionnaire, in which the patients were asked to rate their degree of satisfaction in terms of result and treatment convenience based on a four-point scale characterized by four emoticons	Of 52 patients, 51 rated the result as “very satisfied,” the remaining patient scored “satisfied”	None
Patient satisfaction was evaluated on a visual analogue scale (VAS) in which 0 represented the worst possible aesthetic outcome and 100 was the best.	No patient indicated a score of <75. Ninety-six patients gave scores of 100, 29 patients rated the effect from 90to 100, and 25 patients indicated a score of 80–90. The remaining 8 patients gave a score of 75–80	1 patient had vascular impairment after filler injection involving the left ala and the mid-third of the vault on the left side.
Quantitative volume measurements were made using the 3D imaging software that compared the volume between the pretreatment image and the post-treatment images of the nose.	Increment in nasal volume and nose height was also found after 2 weeks.	None
The impact of treatment was assessed using the license-free anthropometric software, Face Master. Treatment efficacy was also measured using patient-re- ported satisfaction with the appearance of their nose. This was assessed pre-treatment and at 1 month post-treatment on a scale of 0 (lowest possible satisfaction) to 10 (highest possible satisfaction).	Objective assessments using Face Master demonstrated meaningful changes in key nasal angles. On a scale of 0–10, all patients rated their satisfaction as improved post-treatment. Mean satisfaction increased from 2.4 ± 1.7 (range 0–5) pre-treatment to 9.4 ± 0.8 (range 8–10) after treatment. This equated to a mean improvement of 7.1 ± 2.1 (range 3–10).	Three patients (4.8%) experienced both pain and edema post-treatment; two others (3.2%) had hematoma in the nasal dorsum

(Continues)

TABLE 1 (Continued)

Sr. No.	Author and Country	No. of Patients	Age (years)	M/F	Filler used
10.	Segreto F et al.[17](2019) Italy	70	27 ± 4.5 years	9/61	Juvederm 4 (Allergan plc, Dublin, Ireland) was used in all cases. The quantity of injected HA ranged from 0.2 to 0.9 cm3.
11.	Xue K et al. (2012)[11]China	50	Not Reported	Not Reported	The hyaluronic acid used is Restylane−2 (Q-Med, Uppsala, Sweden). Patients were injected with 1 to 1.5 ml of filler material.

TABLE 2 List of studies excluded with reason for exclusion

SR. NO.	Study	Reason for exclusion
01.	Bertossi et al. (2020)[26]	Retrospective Study
02.	Bravo et al. (2018)[27]	Narrative Review
03.	Coimbra et al. (2015)[28]	Retrospective Study
04.	Heden (2016)[29]	Retrospective Review
05.	Helmy (2018)[30]	Retrospective Study
06.	Kassir et al. (2020)[31]	
07.	Ramos et al. (2020)[32]	Descriptive Study
08.	Robati et al. (2018)[33]	Retrospective Study
09.	Sahan et al. (2017)[34]	
10.	Schuster (2015)[35]	
11.	Williams et al. (2019)[36]	Systematic Review
12.	Youn et al. (2016)[13]	Retrospective Study

Trials, Single Arm Interventions, and Cohort studies. Only those studies utilizing hyaluronic acid fillers for non-surgical rhinoplasty on humans or cadavers have been included in this review. Summary of study characteristics that were included has been illustrated in Table 1,[12,17-27] which includes authors; country where the study has been conducted; no. of patients; age and gender of the patients; fillers used; parameters assessed; and results and adverse effects.

The studies which have been excluded include Retrospective studies, Narrative Reviews, Systematic Reviews, Case Reports, Technical Reports, Expert Opinions, and Descriptive studies. The studies with only their abstracts accessible and those in any language other than English have also been omitted. An attempt was made to distinguish any unpublished studies and to contact the authors of published studies for additional information. The studies excluded have been shown in Table 2, [14,28-38] along with the reasons for their exclusion.

2.3.1 | Risk of bias assessment

The quality assessment according to the following quality assessment tools was conducted by two examiners (VK and AJ), and it was supervised by a third author (DS) for accuracy. Any disagreement was resolved by consensus among the authors. Each study was checked through a critical evaluation procedure for its internal and external validity, and only those articles with good and fair internal and external validity were considered. Furthermore, depending on the study design, the critical appraisal was done for each article following the Template for intervention description and replication (TIDieR) checklist and guide, the SPIRIT (Standard Protocol Items: Recommendations for Interventional Trials) statement, and the CONSORT (CONsolidated Standards of Reporting Trials) 2010 guidelines.[39-41]

To assess the risk of bias in Randomized Controlled Trial study designs, the Cochrane RevMan 5 software (Version 5.4) was used.[42] The standard seven point parameters in this tool included checking for random sequence generation, allocation concealment, blinding of participants, blinding of outcome, attrition bias, reporting, and other biases. For non-randomized/ uncontrolled trials, the methodological index for non-randomized studies (MINORS) scale was used to assess the risk of bias.[43] (Tables 3 and 4).

2.3.2 | Assessment of heterogeneity

Heterogeneity of the data was discerned by computing the I^2 value. For the included studies, this value was found to be 0.88 indicative of a considerable high level of heterogeneity. Thus, owing to the inconsistency, a meta-analysis could not be carried out.

3 | RESULTS

The exhaustive literature search over various electronic databases identified a total of 2896 citations. After removing duplicates, 2064 citations were screened for relevance with our study and a total of 1890 citations were excluded due to the irrelevance to the topic of study and/or language other than English. Finally, a total of 174 citations were subjected to title and abstract screening which led to finalize a total of 23 citations for full-text review. A total 12 articles were excluded in the full-text review, and 11 articles were included

Parameters assessed	Results	Adverse events
The rhinoplasty module of FACE-Q was administered to all patients preoperatively and 15 days postoperatively.	Two (2.8%) patients required a re-touch after 15 days for further dorsal correction. There was a statistically significant difference between preoperative and postoperative values in all domains and overall scores of the rhinoplasty module of FACE-Q.	None
Not Reported	Most of the patients were pleased with the result. Only one patient was unsatisfied and complained about an "uneven surface on nasal dorsum,"	Not Reported

in the study. Figure 1 depicts the flow of the selection strategy of the present study.

Table 1 exhibits all various studies that were excluded after full-text review and the reason for their exclusion. 11 studies were recruited in the study, and their data were extracted and are presented in Table 2. A total of 1101 patients were treated in these 11 studies with hyaluronic acid filler for non-surgical rhinoplasty. One study did not disclose the age and gender of the included patients. A total of 127 males were included in 10 studies (127/1051, 12.08%), and 924 females were recruited among the 10 studies (924/1051, 87.92%). All the patients ranged from 18 to 68 years of age.

Different formulations of hyaluronic acid filler were used among the studies with a volume of injection ranging from 0.1 to 1.5 ml. Various techniques were used for the purpose of injection. Amore et al. [17] suggested the use of an Italian technique for reshaping the tip of nose. Han et al.[21] proposed the use of blunt and sharp needles, and Jung GS [23] suggested the use of dual plane technique. With variety of techniques and different hyaluronic acid filler formulations, the average satisfaction of patients among the studies is found to be above 90%.

Regarding complications, only 3 patients had vascular impairments and 2 patients had hematoma. No other patients had any serious complications. Transient edema and erythema, post-injection pain, and bruising were some temporary complications which were evident in all the studies.

4 | DISCUSSION

There has been a paradigm shift toward evidence-based medicine and surgery in the recent times. Evidence-based medicine can be best described as "the judicious use of the best current evidence in making decisions about the care of the individual patient."[44] An evidence-based surgical approach entails incorporating patients' circumstances or predicaments, identifying knowledge gaps and framing research questions to fill those gaps, and conducting efficient literature searches followed by critical appraisal of this research evidence. Finally, all this is evidence acquired which is directed toward patient care.[45] Systematic reviews provide a scientific way of analyzing the research available. According to the Centre for Evidence Based Medicine, systematic reviews provide the highest level of evidence regarding prevention, diagnosis, prognosis, and effects of treatments of a disease.[46] An in-depth literature search about non-surgical rhinoplasty revealed numerous studies implementing various study designs. However, there was no systematic review conducted to guarantee the highest possible level of evidence for this innovative and popular cosmetic procedure.

The nose, a three-dimensional anatomical structure sculpting the central facial aesthetics, is the first thing noticed about a person. Facial balance is the key in the perceptions of beauty and attractiveness. The facial balance is completely dependent on the nose and any disproportionality stands out evidently. This has made rhinoplasty among the most sort-out cosmetic procedure by the patients and a challenging procedure for the surgeon.

Filler rhinoplasty is a cosmetic procedure which like any other cosmetic surgery is a patient-centric procedure performed to satisfy the patients' aesthetic concerns and improve their psychological and social quality of life. Thus, patient satisfaction is a metric of paramount importance for the evaluation such procedures and is gaining credence as the patients who undergo such procedures are highly sophisticated and demand data-driven decisions.[47] The procedure is considered to be a failure in spite of the surgeon being satisfied with the results and recovery if the patient is not appeased by its outcome.[48] Acknowledging the importance of this, several studies have assessed patient satisfaction after both surgical rhinoplasty and non-surgical rhinoplasty. Predominantly, a high degree of satisfaction was reported in patients who had undergone non-surgical rhinoplasty.

In the study by Amore et al., 79.2% patients were fully satisfied, 11.3% were fairly satisfied, and 9.5% were dissatisfied.[17] Even higher percentage of 92%, 93.2%, 93.1%, and 98% of the patients were satisfied with the outcome in Bektas G et al, Han X et al, Liew et al and Rauso R et al. studies, respectively, in different countries around the world.[20,21,24,25] Jung GS et al assessed satisfaction scores using a questionnaire on a scale on 1–5 and found the mean score of 4.8 ± 0.8 immediately after the operation and 4.7 ± 0.7 points at 3 months postoperatively.[23] The mean improvement of 7.1 ± 2.1 in the satisfaction scores was noted pre-treatment and post-treatment by Santorelli A et al. [18] Rauso et al's study in Italy utilized the visual

TABLE 3 Risk of bias assessment

Author (Year)	Clearly stated aim	Inclusion of Consecutive Patients	Prospective Data Collection	Endpoints appropriate to study aim	Unbiased assessment of study end points	Follow-up period appropriate to study aim	<5% lost to follow up	Prospective calculation of sample size	Adequate control group	Contemporary Groups	Baseline equivalence of groups	Adequate statistical analysis	Total minors score
Amore R et al. (2015)[15]	2	2	2	2	2	2	2	0	NA	NA	NA	NA	14/24
Bektas G et al. (2020)[18]	1	2	2	2	2	2	2	0	2	2	1	NA	18/24
Han X et al. (2015)[19]	2	2	2	2	2	2	2	0	NA	NA	NA	NA	14/24
Jung GS (2019)[21]	2	2	2	2	2	1	2	0	NA	NA	NA	NA	13/24
Liew S et al. (2016)[22]	2	2	2	2	2	2	2	0	NA	NA	NA	2	16/24
Rauso R et al. (2017)[23]	2	2	2	2	2	2	2	0	NA	NA	NA	2	16/24
Rauso R et al. (2020)[24]	2	2	2	2	2	2	2	0	NA	NA	NA	2	16/24
Rho K et al. (2017)[25]	2	2	2	2	2	2	2	0	NA	NA	NA	2	16/24
Santorelli A et al. (2019)[16]	2	2	2	2	2	2	2	0	NA	NA	NA	2	16/24
Segreto F et al.[17](2019)	2	2	2	2	2	2	2	0	NA	NA	NA	2	16/24
Xue K et al. (2012)[11]	2	2	2	2	2	2	2	0	NA	NA	NA	0	14/24

TABLE 4 Risk of bias assessment

Author (Year)	Revisits Primary Outcome	Score 1	Score 2	MINORS Quality Score	Score 3	Risk of Bias (Low/High)
Amore et al. (2015)[15]	Yes	A	B	14/24	B	LOW
Bektas et al. (2020)[18]	Yes	A	C	18/24	A	LOW
Han et al. (2015)[19]	Yes	A	B	14/24	B	LOW
Jung (2019)[21]	Yes	A	C	13/24	B	HIGH
Liew et al. (2016)[22]	Yes	A	C	16/24	A	LOW
Rauso et al. (2017)[23]	Yes	A	C	16/24	A	LOW
Rauso et al. (2020)[24]	Yes	A	B	16/24	A	LOW
Rho et al. (2017)[25]	Yes	A	C	16/24	A	LOW
Santorelli et al. (2019)[16]	Yes	A	C	16/24	A	LOW
Segreto et al.[17](2019)	Yes	A	C	16/24	A	LOW
Xue et al. (2012)[11]	Yes	A	C	14/24	A	LOW

analogue scale to evaluate the satisfaction levels on a scale of 0–100 and reported majority of the participants giving a full score of 100. These high levels of satisfaction could be attributed to greater proclivity toward minimally invasive procedures in the recent years. Additionally, several advantages of filler rhinoplasty such as immediate results, absence of postoperative downtime, reversible results, and cheaper alternative of surgical rhinoplasty could have resulted in it being the preferred treatment as well as greater satisfaction with its outcome. The advent of injectable hyaluronic dermal fillers demonstrating less immunogenicity and greater longevity has made non-surgical rhinoplasty a viable alternative to surgery.

Even though fillers are usually safe, some complications may arise such as infections and cellulitis, skin necrosis, immunoreactions, granuloma formations, and more severe adverse reactions as ophthalmic and retinal artery occlusion or embolization.[49] Vascular complications (either due to intravascular injection or the compressive effect of the filler on local vessels) have been a concern in case of cross-linked hyaluronic acid (HA) dermal fillers.[50] Among the studies included in this systematic review, majority of them either did not report any complications or reported transient mild complications. Amore R et al. reported transient edema which regressed within 1–4 days.[17] Temporary erythema and ecchymosis were reported in few patients by Jung GS et al and Bektas G et al.[20,23] Liew et al observed no serious complications and noted localized and transient complications of swelling, bruising, erythema, and pain/discomfort.[24] Santorelli A et al's study stated that 4.8% patients experienced both pain and edema and 3.2% had hematoma in the nasal dorsum.[18] Vascular impairments were reported only by Bektas G et al. and Rauso R et al. However, understanding the basic anatomical knowledge of the midface and the vascular system is fundamental in minimizing these complications.

5 | CONCLUSION

In the recent years, non-surgical rhinoplasty has been emerging as the popular treatment choice for aesthetical enhancement and corrections of the nose driven by its numerous advantages over the conventional rhinoplasty, especially lower costs, rarity of complications, minimally invasive nature, and reversibility of the procedure. These have resulted in higher patient satisfaction associated with this procedure.

We at The Esthetic Clinics have found a significant change in the ratio between surgical and non-surgical rhinoplasty treatments, given that more and more patients are wary of the downtime and the risks post surgical rhinoplasty. We believe that as the quality of the injection techniques and the quality of the fillers improve and become longer lasting, more and more patients will want to undergo non-surgical treatment, as compared to surgery. However, this does come with a caveat. Non-surgical rhinoplasty cannot change the basic structure of the nose and as such noses requiring significant bony and cartilaginous changes like crooked noses, dependent nasal tips, and broad noses still will continue to need surgery, for the near foreseeable future.

This systematic review on non-surgical rhinoplasty, with its focused research question and robust methodology, provides valuable gold standard evidence-based comprehension about this cosmetic procedure for clinicians and researchers. It has further revealed the scarcity of quality data in the form of experimental and prospective studies regarding the accuracy, effectiveness, and complications of non-surgical rhinoplasty. Future studies are thus recommended to provide adequate evidence of reliability, effectiveness, and longevity of this technique in the form of multicenter large randomized and prospective controlled studies.

CONFLICT OF INTEREST

The authors state no conflict of interests.

AUTHOR CONTRIBUTIONS

Dr. Vaibhav Kumar, Dr Anuj Jain, Dr Swarali Atre, Dr. Komal Doshi, and Dr. Sapna Vadera involved in manuscript writing. Dr. Debraj Shome contributed to conceptualization. Dr. Rinky Kapoor involved in review and critique.

PROPRIETARY INTEREST STATEMENT

None of the authors have a financial interest in any of the products, devices, or drugs mentioned in this article.

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How to cite this article: Kumar V, Jain A, Atre S, et al. Non-surgical rhinoplasty using hyaluronic acid dermal fillers: A systematic review. *J Cosmet Dermatol*. 2021;00:1–11. https://doi.org/10.1111/jocd.14173