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Comparative Study between Hyaluronic Acid and Fat in Rhinoplasty: A Systematic Review

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Abstract

The aim of this article is to provide high-quality evidence on patient satisfaction and complications of two non-surgical rhinoplasty procedures. All available online literature up to 2021 were searched utilizing keywords and MESH search phrases also used in the online databases. In addition, the reference lists of the systematic reviews included in the study were manually searched. The studies with greatest evidence were included to assess patient satisfaction and complication. Critical evaluation of the articles was done and MINORS scale was used for bias determination. Temporary redness in the skin, fluid accumulation, discoloration of skin, and post-procedure discomfort were all transient problems in all of the investigations. Vascular limitations and hematoma were identified as rare consequences. Non-surgical rhinoplasty treatments are both a good and less intrusive alternative to traditional rhinoplasty. However, there is a scarcity of experimental and prospective studies, so more number of trials to be carried out to determine the precision, efficacy, and adverse effects of non-surgical rhinoplasty.

Keywords: Autologous fat, Dermal fillers, Hyaluronic acid, Non-surgical rhinoplasty

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Introduction

In United States, rhinoplasty is very common esthetic operation.[1] Nasal abnormalities are difficult to control, especially after rhinoplasty, because of postsurgical edema as they may persist from 6 to 8 months. Minor asymmetries, depressions, and irregularities in the contour could last much longer. A further surgical operation is required in around 20% of rhinoplasties to attain the desired esthetic outcome. Post-operative abnormalities can also occur and are pretty much common, these include saddle nose, or inverted V deformities, deviations, and nasal valve disruptions, supratip and alar contractions are all common post-operative abnormalities.[2] Despite these risks, in 2010, the Society of Plastic Surgeons of America told that rhinoplasty is very demanding operations, and most popular among men. Various procedures can be used to treat nose abnormalities after surgery.

Nonsurgical rhinoplasty can typically fix minor defects or inconsistencies after rhinoplasty, especially in patients who decline a surgical revision.[3] Non-surgical rhinoplasty has grown in favor as a key alternative for changing nasal appearance, thanks to the emergence of minimally invasive techniques. The fillers, either synthetic or autologous, are injected in the deficient parts of nose, followed by external shaping to refine the filler's position and form. Conventiontionally, dermal filler injections have been used to treat facial rhytids. Fillers like hyaluronic acid can be injected into the skin in an office environment to produce rapid and long-lasting esthetic results.[4,5]

The most widely used materials are hyaluronic acid and calcium hydroxyapatite; however, autologous fat or cartilage can also be used.[6,7] The advantage of a synthetic material is that it eliminates the necessity for a donor site where as fat or cartilage requires one.

The shape of the nose can also be redefined by external moulding using injectable fillers and autologous materials (such as fat or cartilage),[6] heterogeneous (collagen from bovine origin), and alloplastic materials (silicone, spheres of methyl methacrylate, hyaluronic acid, calcium hydroxyapatite, and polytetrafluoroethylene).[8]

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Most commonly employed are hyaluronic acid and calcium hydroxyapatite because they do not require a donor site or cause additional morbidities. They also have standard office procedures that do not require general anesthesia or sedation. However, incidences of necrosis following the injection of alloplastic fillers have been seen.

Alloplastic and heterogeneous injections should be avoided in favor of autologous fillers like fat grating. Fat injection shows low chance of morbidity, lower risk, and been used in facial soft tissue repairs for over 20 years.[9] The advantages of autologous fat injection augmentation include its easy availability, biocompatibility, entails modest invasion, low morbidity of the harvesting site, and natural appearance as final outcome. Fat grafts, on the other hand, are known to be uncertain procedures.[10] Although major problems are uncommon, a few cases have resulted in lifelong blindness as a result of fat emboli.[11,12] The injection of fat camouflages minor to moderate visual flaws and not very marked nose deformities. There is no consensus on the benefits and drawbacks of fat injection despite the fact that fat injection for rhinoplasty has growing popularity for improving the aesthetics of nasal form. This study compares the satisfaction after the procedure, post-operative complication, and esthetic outcomes of fat injection against hyaluronic acid in rhinoplasty.

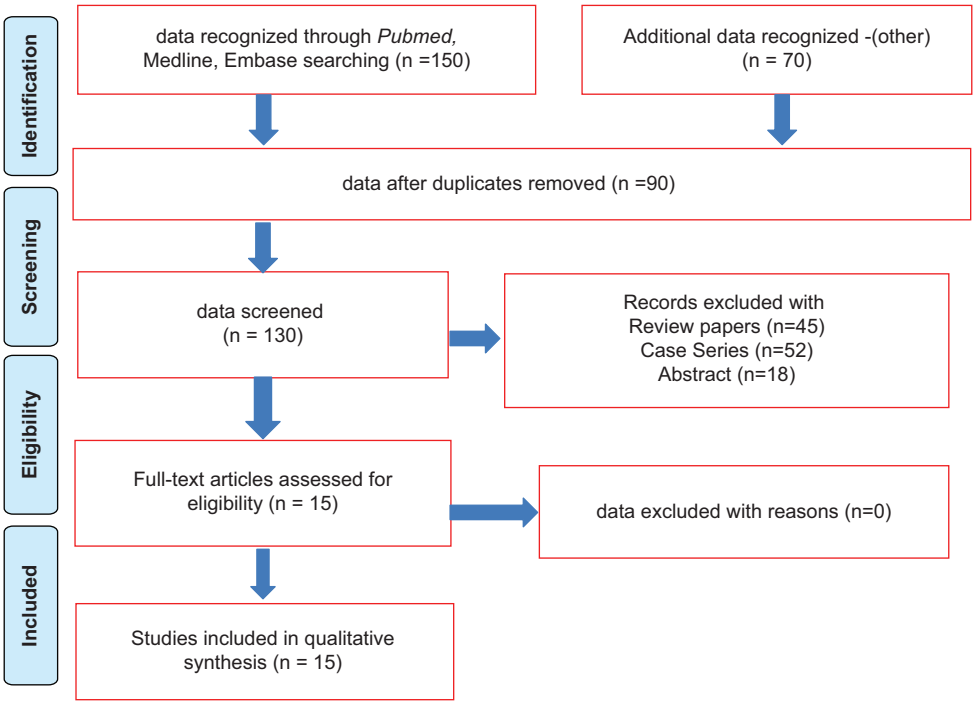

Figure 1: PRISMA flowchart

Table 1: PICO format

S.No	*Category*	*Search items*
1	Population	Patient with rhinoplasty
2	Intervention	Autologous fat
3	Comparison	Hyaluronic acid
4	Outcome	Assessment of esthetics, patient's satisfaction, and complications

Table 2: Search strategy

Initial search	220
Duplicates and non-relevant	90
Case reports and series	52
Reviews	45
Abstract	18

Aim

The primary aim of this review was comparative systematic review between fat and hyaluronic acid in rhinoplasty. The secondary aim of this review was to set recommendations for carrying out further studies.

Objectives

The objectives of the study were to assess

- Which methods were used for rhinoplasty?
- Comparison between fat and Hyaluronic acid in rhinoplasty on the basis of esthetic outcome, patient satisfaction and complications.

Methods

The search protocol is designed based on the PRISMA guidelines 2020.

Search Strategy

The electronic search databases which were used include Embase, MEDLINE, Google Scholar, Scopus, Cochrane, and PubMed databases along with manual searching of bibliography of relevant articles as well as textbooks. Two reviewers selected the relevant articles independently, depending on the criteria fulfilled. They discussed on disagreement until any consensus was reached [Table 2 and Figure 1].

PICO-format and MeSH vocabulary were used for better search and identification of correct studies. These included ("Hyaluronic acid" [MeSH] AND "Autologous Fat" [MeSH]) AND ("Non-Surgical Rhinoplasty" [MeSH] AND ("Dermal Fillers" [MeSH]). A critical analysis was done. The quality of selected studies was checked using a specific scale [Table 1].

Inclusion Criteria

The following criteria were included in the study:

1. Studies of peer reviewed journals till 2021
2. Randomized and controlled trial
3. Case–control study
4. Quasi Trials
5. Cohort study
6. Single-arm Intervention
7. All the articles published till November 31, 2021 were included in the study
8. Complete articles which were in English language.

Exclusion Criteria

The exclusion criteria were:

1. Retrospective studies
2. Animal studies
3. case reports and case series
4. Reviews
5. Cross-sectional studies

Table 3: Data for autologous fat injection for augmentation rhinoplasty

Study	*Population*	*Intervention*	*Complications/ Satisfaction*	*Overall efficacy*
Kornstein and Nikfarjam (2015), USA[13]	FG Group-24 women and 2 men were included, with the mean age-44.15 year. The mean age in FG+R Group was 39.10 year and consisted of 2 men and 17 women	26 patients-fat grafting 19 patients-fat grafting plus rhinoplasty	No adverse event	Superior aesthetic outcome
Baptista *et al*. (2013), France[3]	The mean age group-53 year (women)	20 patients underwent intervention	No complications	Filling the defect with fat-simple and reliable imperfections following secondary to rhinoplasty-can correct imperfections. It is more precise and less traumatic
Xu *et al*. (2019), China[14]	The study did not mention mean age (8 females and 1 male)	9 patients were included (secondary rhinoplasty)	Complications-infection and capsular contracture. mean dose of 1.0 mL-A high degree of satisfaction	Can be used in short nose deformity, and subsequent injections needed
Gabrick *et al*. (2019), USA[15]	Mean age 35.6 year (range: 16–76 years); 38 (61%)-female 24 (39%)-male	Primary rhinoplasty-62 patients	Complications rates were very low	Ecchymosis-less chances
Monreal (2011), Spain[16]	33 patients	33 patients (the experience covers nose treated primarily, nose not treated by surgery, treatment of post-rhinoplasty deformities, and combination fat grafting and rhinoplasties)	Patient satisfaction-good, side effects-virtually no	Effective and reliable technique
Kao *et al*. (2016), USA[9]	Study included patients without mentioning Mean age (180 women and 18 men)	198 patients-primary rhinoplasty	Complications-no	Structural fat grafting considered a reliable treatment outcomes-acceptable
Ozer and Colak (2019), Turkey[17]	The mean age for 14 patients (women)-44.9–11.9 years (range: 33–65 years)	14 patients	No major complications	PRP+micro-fat grafting with soft harvesting-restore volume and improves skin quality
Maia and Lukash (2019), NY[18]	Age, 15–19 years	22 patients (all primary)	High degree of satisfaction. Complications-No	Rhinoplasty+autologous fat grafting-very satisfactory aesthetic outcomes with less time, cost, and risk

Table 4: data for hyaluronic acid dermal fillers for augmentation rhinoplasty

Study	*Population*	*Intervention*	*Complications/Satisfaction*	*Overall efficacy*
Amore *et al*. (2015) Italy[19]	212 patients aged 26–63 years	HA fillers–14 types density-medium-high	All patients were satisfied without any complications	Aesthetics–overall superior
Bektas *et al*. (2020) Turkey[20]	62 patients aged 20–52 years	HA brands used-1 out of 3 Out of 3.	No major complications along with patient satisfaction	NR
Han *et al*. (2015) C hina[21]	280 patients aged 18–36 years	HA	No complications and patient satisfaction	NR
Jung (2019) Republic of Korea[22]	96 patients aged 22–48 years	(HA) Hyaluronic acid filler	No major complications along with patient satisfaction	NR
Liew *et al*. (2016) Australia[23]	29 patients aged 20–61 years	Juvéderm VOLUMA (HA)	Filler displacement, injection site reaction	NR
Rauso *et al*. (2017) Italy[24]	52 patients aged 18–61 years	20-mg/mL HA filler was used which was smooth, cohesive, and viscous	No complications and 100% satisfaction	NR
Rho *et al*. (2017) Korea[25]	40 patients aged 20–44 years	HA used-A cross-linked hyaluronic acid gel with 0.3% lidocaine	No complications and 100% satisfaction	NR

6. Abstracts
7. Technical reports
8. Expert opinions
9. Articles with incomplete data and patients with presence of any lesions were excluded from the study.

The references of selected articles were also analyzed for additional studies.

Selection

The study selection was done in a three step process. The inclusion and exclusion criteria as well as appropriate studies were selected followed by which the titles were reviewed based on them. For all the selected titles, abstracts were obtained and reviewed, from which appropriate abstracts were selected based on the criteria. For all the selected abstracts, full text articles were obtained and analyzed, and the final set of articles was obtained keeping in mind the selection criteria.

Data Extraction

The complete data from studies were collected and presented into an Excel format after determination of final study sample. This included: Publication year, name of first author, study design, total number of subjects, patient's satisfaction, complications, and esthetic outcomes of the subjects using hyaluronic acid and fats.

Quality Assessment

To check the methodological quality of including articles, a quality assessment using validated MINORS was carried out. This modality was used to review surgical research, in which randomization is non-attainable. Studies on rhinoplasty are generally have small study groups as it has very low incidence rate. It seemed to be beneficial to review the available literature and find out suitable answer of the particular field. After considering all these MINORS, it was chosen for the quality assessment to evaluate the articles. Based on this scale, the articles were segregated into two groups – Comparative studies and non-comparative, having different scoring for two groups. Scores for the item of this scale were: 0 (not reported), 1 (reported but inadequate), or 2 (reported and adequate). The global ideal score: Comparative studies – 24 and non-comparative studies – 16. Scoring was done by first author (A.L.) and consulted the second author (M.C.) in case of doubt. Two main reviewers (A.L and M.C) judged the statistical evaluation of comparative trials and if in doubt, they consulted a professional statistician.

Results

On initial search, 220 articles were obtained. Out of a total of 220 articles of the database search, after removal of duplicates and elimination based on eligibility criteria, 15 studies were included for analysis.

Synthesis of Results

Narrative synthesis has been provided for the findings obtained from the studies. The data extracted have been presented in the tabular form for autologous fat injection for augmentation rhinoplasty [Table 3].

Narrative synthesis has been provided for the findings obtained from the studies. The data extracted have been presented in the tabular form for hyaluronic acid dermal fillers for augmentation rhinoplasty [Table 4].

Risk of Bias Assessment

Under Quality Assessment Part I, selection risk, reporting, and any other kind of bias are assessed whereas in Part II, performance risk, attrition, and detection bias are assessed using Cochrane Tool. Risk of bias – categorized as "high," "low," or "unclear."

In the following tables, low risk, unclear, and high risk are denoted as 1, 2, and 3, respectively [Tables 5 and 6].

Table 5: Risk of bias assessment-autologous fat

Authors name	*Selection bias random sequence generation*	*Allocation concealment*	*Reporting bias*	*Others*	*Performance bias blinding participants and personnel*	*Blinding outcome*	*Attrition bias*
Kornstein and Nikfarjam (2015), USA[13]	1	1	1	1	1	2	3
Baptista *et al*. (2013), France[3]	1	1	1	1	1	1	1
Xu *et al*. (2019), China[14]	1	1	1	1	1	1	1
Gabrick *et al*. (2019), USA[15]	1	2	1	1	1	2	1
Monreal (2011), Spain[16]	1	1	1	1	2	2	1
Kao *et al*. (2016), USA[9]	1	1	1	1	1	1	1
Ozer and Colak (2019), Turkey[17]	1	1	2	1	1	2	1
Maia and Lukash (2019), NY[18]	1	1	1	1	1	1	1

Table 6: Risk of bias assessment-hyaluronic acid dermal fillers

Authors name	*Selection bias random sequence generation*	*Allocation concealment*	*Reporting bias*	*Others*	*Performance bias blinding participants and personnel*	*Blinding outcome*	*Attrition bias*
Amore *et al*. (2015) Italy[19]	1	1	1	1	1	2	3
Bektas *et al*. (2020) Turkey[20]	1	1	1	1	1	1	1
Han *et al*. (2015) China[21]	1	1	1	1	1	1	1
Jung (2019) Republic of Korea[22]	1	2	1	1	1	2	1
Liew *et al*. (2016) Australia[23]	1	1	1	1	2	2	1
Rauso *et al*. (2017) Italy[24]	1	1	1	1	1	1	1
Rho *et al*. (2017) Korea[25]	1	1	2	1	1	2	1

Discussion

Rhinoplasty can be performed by filler technique, a cosmetic technique that, which simulates any other cosmetic surgery and is conducted to address a patient's aesthetic problems while also improving their psychological and social well-being. Since a result, patient satisfaction is a critical indicator for evaluating these operations, and it is receiving traction as patients who is interested in these procedures are smart and demand data-driven decisions. Even if the surgeon is satisfied with the results and recuperation, the procedure is deemed a failure if the patient is not content with the outcome. Surgical and non-surgical rhinoplasties have received patient satisfaction documented in the present and past literature, recognizing the importance of this. Non-surgical rhinoplasty has a upper hand and receives a high degree of satisfaction.[26]

Higher percentage of patient satisfaction were reported by Amore *et al*.[19] Bektas *et al*.[20] Han *et al*.[21] Liew *et al*.,[23] and Rauso *et al*.[24] and the percentage were 79.2%, 92%, 93.2%, 93.1%, and 98%, respectively. In recent years, there has been a larger propensity toward minimally invasive procedures, which could explain the high levels of satisfaction. The fast results, no post-operative downtime, reversible outcome, and a less expensive alternative to surgical rhinoplasty, are the advantages of filler rhinoplasty, may have contributed to it being the preferred therapy and a higher level of satisfaction with the results. Non-surgical rhinoplasty is an effective procedure due to lower immunogenicity and longer durability of injectable fillers.[26]

Nasal volume augmentation and correction with autologous fat has grown more popular. Nasal lipofilling is a non-invasive cosmetic procedure that involves injecting autologous fat grafts into the nose.[27]

For enhancing the nose contour and repairing the deformations, various synthetic materials and autologous grafts have been employed. It was seen that alloplastic materials, containing the non-biodegradable fillers, have longer lifetime and have a much longer time of efficacy. Difficulties in these materials are foreign body reactivity and its implications. Complex removal surgery may be required in the event of major difficulties, which can lead to CSF leaks, scarring, deformity of nose, and poor esthetic results.[27]

Extensive defects in the noses requiring bony and cartilaginous alterations, such as crooked noses, broad noses, and dependent nasal tips will require surgery in the near future as non-surgical rhinoplasty cannot modify the nose's essential structure.

Conclusion

Surgical rhinoplasty is one of the most prevalent cosmetic procedures. It has proven to be a successful and effective method; but, due to postoperative complications such as persistent edema or small nose abnormalities, the ultimate desired outcome may be compromised. The subdermal hyaluronic acid injections and autologous fat injections in the repair of nose abnormalities can be utilized with great success.

This systematic review gives useful evidence-based information about the non-surgical rhinoplasty based on its targeted research topic and robust approach. It has also exposed the scarcity of prospective as well as experimental trials which contain high-quality data on the success and complications of non-surgical rhinoplasty. The future research should focus on multicenter based large randomized and prospective studies to offer appropriate evidence of the technique's dependability, accuracy, effectiveness, and longevity.

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