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A Comparison of the Aesthetic Appeal and Functional Consequences of Spreader Flaps and Grafts in Patients with Humps Larger than Three mm

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Abstract

Introduction: Rhinoplasty is the effective procedure for altering and reconstructing the nose. In many cases, surgeons use a spreader graft to prevent nasal airway obstruction in nasal hump reduction. There are limitations related to using the spreader technique. The aim of this study was to compare the aesthetic appeal and respiratory effects of using and not using spreader (graft or flap) in patients with rhinoplasty with humps larger than three mm.

Methods: This is a double-blind, randomized, placebo-controlled clinical trial. The study population consisted of patients who had undergone rhinoplasty from 2019 to 2021. Sixty patients were randomly divided into two control groups (spreader graft and spreader flap) and one non-intervention group (no spreader). The research recorded the patients' satisfaction with aesthetic appeal and respiratory function in 2-, 6- and 12-month follow-ups.

Results: The intervention type had no effect on rhinomanometric indices, cottle sign, obstruction, restriction and satisfaction with nasal respiratory function in 2-, 6- and 12-month follow-ups. However, there was a significant difference between control and non-intervention groups in terms of frequency distribution of satisfaction with nasal beauty ($P < 0.05$). Fifteen percent of the patients in the spreader graft group, 20% in the spreader flap and 70% in the non-intervention group were totally satisfied with the aesthetic appeal.

Conclusion: Compared to using a spreader, not using it in the rhinoplasty in patients with humps larger than three mm could increase satisfaction from nasal surgery.

Keywords: Spreader, spreader flap, rhinoplasty, hump

Introduction

Among the types of cosmetic surgeries, rhinoplasty is one of the most popular. Iranians are no exception (1). Today, rhinoplasty is the best known procedure for beautifying and improving the shape of the nose (2). Iran ranks first in the world in the field of rhinoplasty. A quarter of individuals who undergo rhinoplasty are not satisfied (3). While rhinoplasty, if carried out professionally, enhances appeal, boosts self-confidence, and improves respiration, it is a double-edged sword; like any other surgery, it can cause complications and difficulties (4). In general, the complications of rhinoplasty are categorized into two groups: late and early complications. Early complications may arise during surgery up to four weeks later. Additional complications follow: Early side effects include bleeding and infection. Late complications are more likely to arise and are generally associated with postoperative failure to achieve the desired aesthetic or functional purposes (5). Among the most common complications of rhinoplasty are breathing difficulty, nasal deformities, nasal congestion, sinus pressure through the cold months, increased bone growth and changes in patients' sense of smell, skin and soft tissue complications such as atrophy, swelling, fibrosis, numbness, cysts and subcutaneous granulomas (4, 6).

To evaluate the results of surgery and select the most appropriate procedure, in addition to aesthetic value, maintaining the physiological function of the nose as a respiratory organ is key. Caused by deviated septum, nasal obstruction is one of the complaints voiced by patients referring for rhinoplasty (7). Evidence shows that about 20 to 30% of patients complain about mild to severe nasal obstruction after rhinoplasty (7, 8). The results of a research by Bracaglia showed that the main complaint of 70% of patients for reoperation is related to respiratory problems (9, 10). The objective method for assessing the severity of airway obstruction and respiratory problems in rhinoplasty patients is to perform a paraclinical rhinomanometric test that shows the physiology of the respiratory function (7, 8).

Cartilage grafts play an important role in plastic and reconstructive surgery and are used in various operations such as rhinoplasty, ear repair and other reconstructions (11, 12). Cartilage transplantation was first performed by Bert in 1865 (13). Mangoldt used cartilage transplantation in rhinoplasty in 1900 (14). In the 1990s, the number of patients using cartilage grafts in rhinoplasty was much higher compared to the previous decade, and the number of complications and secondary rhinoplasty surgeries were greatly reduced (15).

There are currently several procedures for performing cartilage grafts in rhinoplasty. Spreader graft and autospreader flap are two of the most common surgical procedures (7). Depending on form of the nose and patients' desire to undergo surgery, one of the above methods is performed. In a study aimed at coming up with a reasonable and pragmatic classification of upper lateral cartilage, Hafezi et al. reported that in cases of severe concavity, they added a piece of cartilage as a spreader graft (16). Individuals may usually request rhinoplasty for several reasons. The most common cause of nasal hump is anatomical deformities or nasal septum deviation (NSD), which can be congenital or traumatic. Such abnormal conditions are usually associated with cosmetic problems and dysfunctions that require surgery (17).

Nasal hump is often treated through surgery in most Western rhinoplasty literature and is referred to as reduction rhinoplasty. Most nasal humps in Asian countries are small, often accompanied by a low nasal dorsum and underprojection of the nasal tip. Nasal hump removal in Asians is conceptually and technically different. Therefore, it requires reliable and new surgical procedures (18).

The nasal hump surgery procedure is administered to reduce the bulge on the nose caused by anatomical defects. In most cases, nasal hump must be surgically removed. To do this, surgeons detach the upper lateral cartilage spreader from the hump and then pull it inward. This procedure helps in achieving the desired height. In addition, the nasal bone may be carved to reach the proper size. It is usually necessary to cut the nasal bone to prevent an open roof. In this case, surgeons can remove the back parts of the nasal bone. To do that, nasal bone is fractured, and doing so makes it possible to change its position. In many cases, surgeons use a cartilage for spreader grafts to prevent nasal airway obstruction. Evidence shows that there are limitations to using the spreader graft procedure. The procedure cannot effectively stabilize and lateralize the lateral wall of the nose, thus impairing its function (19). The aim of this study was to compare the aesthetic appeal and respiratory side effects of using and not using spreader (graft or flap) in patients with rhinoplasty with a hump of more than 3 mm.

Methods

The present study is a double-blind, randomized, controlled clinical trial. The patients, the rheumatometer and the individual analyzing the study data were blinded. The study population consisted of patients who volunteered for rhinoplasty and referred to one of the teaching hospitals affiliated with Ahvaz Jundishapur University of Medical Sciences from 2019 to 2021. Patients were randomly divided into control (using a spreader graft or a spreader flap) and non-intervention groups (not using a spreader, we sutured the upper

lateral cartilages at the level of the septum), and a total of 60 patients (20 in each group) underwent surgery. Inclusion criteria were having no clinical problems and consent to participate in the study. Exclusion criteria were structural problems such as: Nasal obstruction, a deformed nose, difficult conditions in surgery, patients' unwillingness to participate in the study, new clinical conditions, and barriers to intervention and no access to patients undergoing reoperation. Before individuals were included, the researchers explained conditions to the patients. After obtaining informed oral and written consent, we included them. Prior the surgery, the patients completed a checklist of demographic and clinical information based on historical and clinical examination. Demographic information includes: Age, sex, history of previous surgery and trauma. The researchers questioned and recorded their reason(s) for referral. Clinical findings were recorded in a checklist. These included complaining and not complaining about nasal obstruction and its severity (mild, moderate, severe) based on the Breathing Quality Score scale, severity of nasal septal deviation in examination (mild, moderate and severe) and preoperative shortness of breath. In addition, we performed the rhinomanometry test for all the patients after the surgery by anterior active rhinomanometry. Then, we recorded and reported the results, including NARt and Ft, in a checklist for demographic and clinical information. To compare the treatment results, the three groups underwent surgery by one team. The rhinomanometric test was performed for all patients in one center by a specialist. Two, six and 12 months after the surgery, we re-examined the patients and asked them about cottle sign, nasal obstruction, nasal restriction, satisfaction with nasal function and satisfaction with rhinoplasty (dissatisfaction, relative satisfaction, complete satisfaction). Since no similar study was carried out in the field, the researchers performed a pilot study. To do this, we selected 10 patients from each group, and no spreader graft was performed in rhinoplasty patients with a hump of more than three mm. The researchers measured the final sample size based on the mean for main outcomes with an 80% power and 0.05 alpha according to the following formula. Finally, 20 patients were selected.

In order to statistically analyze the results, the researchers used the following descriptive statistics: Frequency distribution, mean and standard deviation and minimum and maximum values. The Shapiro-Wilk test data was used to evaluate the supposed normality. If the data were normal, we performed one-way analysis of variance and the two-sample independent t-test. Otherwise, we administered the non-parametric Kruskal-Wallis test. The Chi-square test was conducted to compare the frequency distribution of qualitative variables for each group. Significance level was less than 0.05. We used SPSS software (version 22) to analyze the data.

Ethical concerns

Before including the participants in the study, we explained the research objectives, and how it was going to be conducted. Written consent was obtained and the patients were assured that their information would remain confidential. The proposal of this study was approved by the Research Ethics Committee of Ahvaz Jundishapur University and the Iranian Clinical Trial Registration Center (Ethics Code: IR.AJUMS.HGOLESTAN.REC.1399.071, Clinical Trial Code: IRCT20201109049320N1). Spreader graft surgery is a procedure approved for rhinoplasty, which is routinely performed in plastic surgery wards around the world. Placing patients randomly in either group and not doing a spreader graft did not cause serious complications. The cost of surgery and treatment was paid by the research team and patients did not bear any financial burden in the process.

Results

As shown in Table 1, 75% of the spreader graft group were female and 25.0% were male. Seventy percent of the flap and non-intervention groups were female and 30% were male. The results of the Chi-square test demonstrate that at the beginning of the study, the three groups were homogeneous in terms of gender.

Table 1: Frequency distribution of gender variables for each group

Variable		Group			P-value
		Non-intervention	Spreader flap	Spreader graft	
Gender	female	14(70.0%)	14(70.0%)	15(75.0%)	0.921
	male	6(30.0%)	6(30.0%)	5(25.0%)	

Table 2 presents the mean age scores in the spreader graft, the spreader flap and the non-intervention groups as 24.8, 25.7 and 24.2 years, respectively. The results of the Kruskal-Wallis test indicate that at the beginning of the study, the three groups were age-homogeneous. The test also revealed that at the beginning of the study, the three groups were homogeneous in terms of the RTI, MFH, RPI and TPI variables (Table 2).

Table 2: Average distribution of age, and the RTI, MFH, RPI, TPI variables for each group

Variable	Groups	Frequency	Mean	Standard deviation	The least	the most	Kruskal-Wallis statistics	P-value
Age	Spreader graft	20	24.75	5.803	18	36	0.860	0.650
	Spreader flap	20	25.70	5.948	18	40		
	Non-intervention	20	24.15	5.797	18	37		
RTI	Spreader graft	20	38.55	14.855	28	99	0.651	0.722
	Spreader flap	20	35.95	4.591	28	45		
	Non-intervention	20	34.80	4.324	28	42		
MFH	Spreader graft	20	53.400	6.4840	42	66.0	0.306	0.738
	Spreader flap	20	53.850	6.9682	42	68.0		
	Non-intervention	20	52.250	6.5604	42	63.0		
RPI	Spreader graft	20	9.96	1.263	8	12	0.240	0.787
	Spreader flap	20	10.02	1.323	8	12		
	Non-intervention	20	9.75	1.272	8	12		
TPI	Spreader graft	20	23.65	2.907	19	29	0.203	0.817
	Spreader flap	20	23.70	3.114	19	30		
	Non-intervention	20	23.15	3.031	19	28		

The table below presents results that indicate no significant difference between the control and non-intervention groups in terms of mean distribution of NARt and Ft. In other words, the intervention type had no effect on NARt and Ft (Table 3).

Table 3: Mean distribution of NARt and Ft variables according to the three groups under study

Variable	Groups	Frequency	Mean	Standard deviation	The least	The most	ANOVA statistics	P-value
NARt	Spreader graft	20	0.2680	0.09169	0.14	0.52	0.249	0.780
	Spreader flap	20	0.2565	0.06738	0.14	0.38		
	Non-intervention	20	0.2515	0.06556	0.14	0.36		
Ft	Spreader graft	20	275.0350	9.77478	262.02	292.06	1.465	0.481
	Spreader flap	20	270.0965	15.17993	232.10	292.06		
	Non-intervention	20	275.9185	9.47259	262.02	292.06		

The results of Table 4 suggest a significant difference between the control groups (spreader graft and spreader flap) and the non-intervention group in terms of frequency distribution of: cottle sign, nasal obstruction, nasal restriction and satisfaction with nasal function in the 2-, 6- and 12-months follow-ups. This indicates that the intervention type has no effect on cottle sign, nasal obstruction, nasal restriction and satisfaction with nasal function in the follow-ups.

The results from Table 4 suggest a significant difference between the control groups (spreader graft and spreader flap) and the non-intervention group in terms of frequency distribution of: satisfaction with nasal beauty in the follow-ups ($P < 0.05$). In the 6-month follow-up, only 5% of the patients in the spreader graft and spreader flap groups were completely satisfied with the surgery. However, in the non-intervention group on which no action was taken, 35% of the patients were fully satisfied with the aesthetic appeal. Forty percent of the patients in the spreader graft group and 35% in the spreader flap group were dissatisfied. In the non-intervention group, 20% of the patients were dissatisfied with the aesthetic appeal.

In the 12-months follow-up, 15% of the patients in the spreader graft group and 20% in the spreader flap group were completely satisfied with the aesthetic aspect. However, 70 % of the patients in the non-intervention group were fully satisfied with beauty (Table 4).

Table 4: Frequency distribution of the variables for each group in the follow-ups

Variable/ Follow-up		Group			P-value
		Spreader graft	Spreader flap	Non-intervention	
Cottle sign- 2 months	Positive	14(70/0%)	13(65.0%)	15(75.0%)	**0.788**
	Negative	6(30.0%)	7(35.0%)	5(25/0%)	
Cottle sign- 6 months	Positive	8(40.0%)	9(45.0%)	7(35.0%)	**0.812**
	Negative	12(60.0%)	11(55.0%)	13(65.0%)	
Cottle sign- 12 months	Positive	7(35.0%)	7(35.0%)	9(45.0%)	**0.754**
	Negative	13(65.0%)	13(65.0%)	11(55.0%)	
Nasal congestion -2 months	One way	12(60.0%)	11(55.0%)	12(60.0%)	**0.995**
	Two way	4(20.0%)	5(25.0%)	4(20.0%)	
	None	4(20.0%)	4(20.0%)	4(20.0%)	
Nasal congestion -6months	One way	7(35.0%)	8(40.0%)	6(30.0%)	**0.734**
	Two way	6(30.0%)	3(15.0%)	3(15.0%)	

	None	8(40.0%)	9(45.0%)	10(50.05)	
Nasal Congestion -12 months	**One way**	6(30.0%)	6(31.6%)	6(30.0%)	**0.983**
	Two way	3(15.0%)	3(15.8%)	2(10.0%)	
	None	11(55.0%)	10(52.6%)	12(60.0%)	
Nasal obstruction -2 months	**Light**	6(30.0%)	6(30.0%)	8(40.0%)	**0.977**
	Medium	4(20.0%)	4(20.0%)	2(10.0%)	
	Intense	2(10.0%)	2(10.0%)	2(10.0%)	
	None	8(40.0%)	8(10.0%)	8(40.0%)	
Nasal obstruction -6 months	**Light**	7(35.0%)	9(45.0%)	6(30.0%)	**0.760**
	Medium	6(30.0%)	5(25.0%)	5(25.0%)	
	Intense	4(20.0%)	1(5.0%)	4(20.0%)	
	None	3(15.0%)	5(25.0%)	5(25.0%)	
Nasal obstruction -12 months	**Light**	8(40.0%)	9(45.0%)	6(31.6%)	**0.748**
	Medium	4(20.0%)	2(10.0%)	3(15.8%)	
	Intense	1(5.0%)	3(15.0%)	1(5.3%)	
	None	7(35.0%)	6(30.0%)	9(47.4)	
Satisfaction with nasal function -2 months	**Full**	8(40.0%)	8(40.0%)	8(40.0%)	**0.602**
	Relative	7(35.0%)	9(45.0%)	5(25.0%)	
	Dissatisfaction	5(25.0%)	3(15.0%)	7(35.0%)	
Satisfaction with nasal function -6 months	**Full**	7(35.0%)	8(40.0%)	10(50.0%)	**0.898**
	Relative	8(40.0%)	8(40.0%)	6(30.0%)	
	Dissatisfaction	5(25.0%)	4(20.0%)	4(20.0%)	
Satisfaction with nasal function -12 months	**Full**	8(40.0%)	8(40.0%)	11(55.0%)	**0.730**
	Relative	8(40.0%)	9(45.0%)	5(25.0%)	
	Dissatisfaction	4(20.0%)	3(15.0%)	4(20.0%)	
Satisfaction with the beauty of the nose -2 months	**Full**	2(10.0%)	2(10.0%)	4(20.0%)	**0.383**
	Relative	10(50.0%)	10(50.0%)	13(65.0%)	
	Dissatisfaction	8(40.0%)	8(40.0%)	3(15.0%)	
Satisfaction with the beauty of the nose -6 months	**Full**	1(5.0%)	1(5.0%)	7(35.0%)	**0.044**
	Relative	11(55.0%)	12(60.0%)	9(45.0%)	
	Dissatisfaction	8(40.0%)	7(35.0%)	4(20.0%)	
Satisfaction with the beauty of the nose -12 months	**Full**	3(15.0%)	4(20.0%)	14(70.0%)	**0.001**
	Relative	10(50.0%)	11(55.0%)	6(30.0%)	
	Dissatisfaction	7(35.0%)	5(25.0%)	0(0.0%)	

Discussion

The present study sought to compare the aesthetic appeal and respiratory side effects of using and not using spreader (graft or flap) in patients with rhinoplasty with a hump of more than three mm. Our results confirm a significant difference between the two groups of spreader graft and spreader flap in the 6-month and 12-month follow-ups. Moreover, there was a significant difference in the spreader flap and non-intervention groups in terms of satisfaction: a higher level of satisfaction with beauty was found in the non-intervention group compared to the spreader graft and flap groups. Dissatisfaction with aesthetic appeal in the non-intervention group was lower compared with the graft and flap groups. In the 12-month follow-up,

the non-intervention group did not report any dissatisfaction with the aesthetic appeal. There was no statistically significant difference between the non-intervention and control groups in other indicators. Avashia et al. reported that spreader flaps deliver smoother dorsal aesthetic lines and open the internal nasal valve (20).

The results of statistical tests indicate that the three groups were homogeneous in terms of gender, age, RTI, MFH, RPI and TPI at the beginning of the study. Okhovat et al. suggest that rhinomanometry can be an important, objective indicator for evaluating the rhinoplasty outcome (21). The present study suggests that in the groups, intervention type had no effect on NARt and Ft rhinomanometric indices. In other words, the mean distribution of rhinomanometric indices remained unchanged with or without spreader grafts.

Our results confirmed that in the groups, intervention type had no effect on cottle sign in 2-, 6- and 12-month follow-ups. Intervention type had no effect on nasal obstruction and nasal restriction in 2-, 6- and 12-month follow-ups. Hassanpour et al. suggest that in both spreader graft and autospreader surgery procedures, the overall resistance of the nasal airways increase which is statistically significant. However, airway resistance level is not statistically different (22). Omrani et al. found no statistically significant difference in flow and nasal resistance between the two groups undergoing spreader graft and flap autospreader procedures (23).

The intervention type in our study had no effect on satisfaction with nasal function in 2-, 6- and 12-month follow-ups. meanwhile, Hassanpour et al. reported in their study that 64% of patients were completely satisfied with the two methods of spreader graft and autospreader, 26% were relatively satisfied and 10% were dissatisfied in terms of satisfaction and functional issues (22). A study by Sazgar et al. shows how autospreader flap is an effective procedure for maintaining and reconstructing the middle vault and dorsal aesthetic line in nasal humps smaller than 2 mm (24).

Our results show that intervention type has no effect on satisfaction with nasal aesthetic appeal in the 2-month follow-up and the month after surgery. However, in the 6- and 12-month follow-ups, a significant difference was found between the two control groups of spreader graft, spreader flap and the non-intervention group in terms of frequency distribution of satisfaction with nasal beauty. This indicates that satisfaction with the aesthetic appeal in the non-intervention group on which no action was taken, was higher than the spreader graft and flap groups. Dissatisfaction with the aesthetic appeal in the non-intervention group was lower compared to the graft and flap groups. In the 12-month follow-up, the non-intervention group did not report dissatisfaction with nasal beauty. Contrary to our results, Hassanpour et al., found that 36% of patients were completely satisfied with the aesthetic appeal when the surgery was performed with spreader graft and autospreader, 50% were relatively satisfied and 14% were dissatisfied (22). Heidari et al. reported in their study that both spreader and autospreader procedures can be used to preserve the internal valve at a normal level. It also helps maintain the cosmetic line of the nasopharynx and have a similar effect, and respiratory failure is a side effect of both procedures (25). On the contrary, our study found higher satisfaction level when spreader graft or spreader flap is not used. However, we found no statistically significant difference in the nasal function with or without the procedures.

Conclusion

Not using a spreader graft and spreader flap in rhinoplasty in patients with humps larger than three mm can increase the satisfaction with nasal beauty. However, compared to other surgical procedures, these do not make a difference in the complications associated with the surgery (such as nasal obstruction and restriction). The patients in both non-intervention and control groups were followed up in our study in three time periods: 2, 6 and 12 months. Time affects nasal function and satisfaction with nasal beauty.

Therefore, it is suggested that further studies be done with more follow-ups. Rhinoplasty is a relative procedure with many definitions in societies; reiterating the same research in other communities may yield different results.

Abbreviations

Radix Tip Ideal (RTI)

Midfacial Height (MFH)

Radix Projection Ideal (RPI)

Tip Projection Ideal (TPI)

Nasal Airflow Resistance total (NARt)

Flow total (Ft)

Competing interests

The authors declare that they have no competing interests.

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