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Comparison of Triple plane dissection with conventional rhinoplasty surgery in patients with thick sebaceous skin

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ABSTRACT

Background: Comparison of Triple plane dissection with conventional rhinoplasty surgery in patients with thick sebaceous skin. *Materials and Methods:* This cross-sectional study was performed. All surgeries were performed by a surgeon. Variables such as surgeon and patient satisfaction, side effects were evaluated and the results were analyzed by SPSS software. *Results:* In this study, no difference was found between the two sexes in terms of the distribution of nasal skin thickness type in all patients (P = 0.213). The sex of the patients had an effect on the time of edema and ecchymosis, where women were more affected by edema and ecchymosis in terms of time (P = 0.014 and P = 0.042). Although no significant difference was observed between age groups regarding the type of nasal skin thickness (P = 0.076), but a scattered difference was observed between age and nasal skin type (P = 0.002). In terms of time of edema and ecchymosis, there was a significant difference between the age and age groups of patients, where younger people had less duration of edema and ecchymosis (P = 0.003 and P = 0.009). *Conclusion:* Due to the difference in thickness of different parts of the nasal skin, especially in the Middle East population, it is time for surgeons to use smart measures in each specific part of the nose for incision to minimize damage to the soft tissue structure of the region.

Keywords: Rhinoplasty, Triple Plane Dissection, Edema, Ecchymosis.

1. INTRODUCTION

For decades, cosmetic surgery has become one of the relatively important and popular fields in surgery, especially plastic surgery (Branford et al., 2016). In addition to aesthetic issues and patient satisfaction, cosmetic surgeons must address the problems that

may arise as a result of surgery in the future. Among these, skin and soft tissue injuries as well as irreparable damage to the bone and cartilage of the nose are very important. Topics such as edema, ecchymosis, deformity, maintaining free movement of the intercanine tip and related muscles, faster recovery, less trauma, and less need for subsequent reconstructive surgery currently assess the quality of plastic surgery on the nose (Esteves et al., 2017). In 2006, the skin of the nose was divided into three areas: zone I, zone II and zone II based on its thickness, and this nature was used for decision making on rhinoplasty (Burget & Menick, 1994). Defatting was one of the methods proposed in 2009 for better results in rhinoplasty in the Middle Eastern population because there is thicker skin in the nasal area and weak Alar cartilage along with the short middle and inner crura in this population; it can be the reason for the onion-shaped tip of the nose as a spherical deformity. It seems that this localized fat removal was better achieved by cutting the skin at the surface of the sebaceous tissue because the incision, at a deeper level, at the sub-SMAS level could affect the nasal muscles, which ultimately resulted in damage to the function and appearance of the nose. On the other hand, subcutaneous incisions in the zone I area can lead to skin damage, and prolonged ecchymosis. The least pressure on this area of the skin causes skin damage (Daniel, 2009). To expose the periosteum to the top of the nasal bone, it is best to lift the nasal SMAS directly in one step for possibility of cleanness and ossification if needed (Esteves et al., 2015).

Triple plane dissection surgery uses triple plane dissection to reach the area (Elshahat, 2013, Safe & Sadek, 2010). In the Columella area of the nose, a unilateral incision is made on the subcutaneous surface, while a bilateral incision is made in the septum area of the nose at the Sub Mucoperichondrial level. In the tip of the nose and the nasal crest above the alar cartilage, an incision is made in the subcutaneous surface. Subcutaneous incision of the alar cartilage area causes the SMAS area to continue to cover the alar cartilage. Since most triple plane dissection surgery is performed on people with thick nasal skin. During this surgery, defatting is also performed on the tip of the nose, and then the surgical incision surface should be diverted to the Sub-SMAS at the junction of the thick sebaceous skin,"Zone II", and the thin loose nonsebaceous skin, "Zone I, to expose the posterior cartilage of nasal crest. Once the nasal bone was reached, the incision surface becomes the sub periosteal. A surgical incision can be made in the midline of the SMAS layer covering the alar cartilages, and the SMAS layer dissected laterally from the outside of the perichondrium of the alar cartilage and left attached to the SMAS layer covering the sidewalls of the upper lateral cartilages. At this stage, the nasal septum is exposed by bilateral elevation of the mucoperichondrial and mucoperiosteal flaps (Safe and Sadek, 2010). Therefore, this study aimed to evaluate the idea of triple plane dissection in primary rhinoplasty in the thick sebaceous skin population, Iran in comparison with the classical method.

2. MATERIAL AND METHODS

This cross-sectional, analytical study was performed on individuals referred to the Rhinoplasty Center between 2017 and 2019. Inclusion criteria were: 1, obtaining informed consent; 2, Age over 15 years; 3, Sufficient information in patients' medical records. Exclusion criteria included: 1, People with specific skin diseases; 2, Serious complications in the operating room that cause the inability to examine the patient; 3, the unwillingness of patients.

Tools and data collection

Due to the retrospective nature of this study, all information was collected from patients' medical records. In case of simultaneous surgery, short-term complications, patients' satisfaction were recorded by telephone call and visits, and standard images of patients before and after surgery were evaluated and recorded in a questionnaire.

Procedure

In this study, a total of 70 patients underwent rhinoplasty by a surgeon. Thirty-five patients underwent primary rhinoplasty using the conventional method and 35 underwent triple plane dissection surgery. Patient information includes patient demographics, underlying conditions, skin classification, intraoperative and postoperative conditions; length of postoperative hospital stay, and short-term postoperative complications (e.g., edema, ecchymosis, impaired mobility of the nose) was recorded in a questionnaire for up to one year.

Patients were medically photographed before and after surgery at different standard angles with a special camera in the positions of front view, right lateral and oblique, as well as left oblique, and lateral. Ambient lighting conditions were standard for all photos. There was a division for the general satisfaction of the patients, including bad, good, very good and excellent items in the medical records, through which the patients' opinions were recorded. In the first month after surgery, a weekly visit for patients was performed by the relevant surgeon. The next visit was performed one month later and then every 2 months for up to six months the patients were visited.

The final visit took place six months later. At each visit, the patient's satisfaction with surgery, surgical complications, cosmetic goals from the surgeon's point of view and the surgeon's overall satisfaction with rhinoplasty were evaluated. Phone follow-up and reminders of subsequent visits for patients were routinely performed in this center for one year. Patients who had problems or ambiguities outside of the visit were further examined by telephone or in person.

Statistical analysis

This study was a retrospective study that did not require randomization and was out of Clinical Trial mode. Information on medical records and follow-up visits were entered into SPSS statistical software. Quantitative variables were reported by central indicators such as mean, median, minimum and maximum, as well as frequencies. Qualitative variables and comparison of patients' information in the two groups were performed by Chi-square test. In case of non-normally distributed variables, non-parametric statistical tests were used. In this study, like most medical researches, 95% confidence interval was considered and to achieve the study power of 0.8%, the first type error ($\alpha = 0.05$) and the mean value of 0.05 were used and the second type error was considered ($\beta = 0.2$).

Ethical considerations

Only patients who consented to participate in the study were included in the study by reviewing the patients' medical records. At any stage of the study, the patient could leave the study without any compulsion. No additional costs were imposed on patients. Since one-year follow-up of patients is a routine of this surgery, the patient did not have to attend the center more than usual. No discrimination was imposed on those who attended the study or those who were not interested in participating in the study. This research has been approved by the ethics committee of the University of Medical Sciences with the code number "IR.AJUMS.REC.1398.914".

3. RESULTS

In this study, a total of 70 people consisting of 8 men (11.4%) and 62 women (88.6%) were included in this study. The age of patients was between 18 and 48 years and the mean age of patients was 32.83± 9.42 years. Half of the patients were over 34 years old. Out of the total number of patients, 35 underwent surgery with triple plane dissection and 35 underwent classical surgery using conventional surgery. Among patients, 10 (14.3%) had N + 1 type of nasal skin which was slightly thick. In 33 patients (47.1%), the skin of the nose was relatively thick (N + 2) and 27 patients (38.6%) showed very thick skin (N + 3). The mean age of patients in the group under triple plane dissection was 32.83 ± 9.49) years (4 males and 31 females). The mean age of patients in the conventional surgery group was equal to triple values and the ratios of both men and women were equal to triple group (Table 1). The mean age of patients in the conventional surgery group was equal to Triple values and the quota of both men and women was equal to Triple group (Table 1). There was no difference between the sexes in all patients in terms of the distribution of nasal skin thickness type (P = 0.213). Although no significant difference was observed between age groups regarding the type of nasal skin thickness (P = 0.076), but a scattered difference was observed between age and nasal skin type (P = 0.002). There was no correlation between age groups (P = 0.206). Age groups showed no correlation in this regard (P = 0.206).

Table 1 Classification of patients based on nasal skin thickness at the nasal tip.

		Triple surgery	Classic surgery	Sig
Classification of the nasal skin	N+1	(11.4 %) 4	(17.1%) 6	0.792
	N+2	(48.6 %) 17	(45.7 %) 16	
	N+3	(40 %) 14	(37.2 %) 13	

In terms of patient satisfaction, a total of 1 case was dissatisfied, followed by satisfied (14.3%; 10 cases), completely satisfied (45.7%; 32 cases) and excellent (38.6%; 27 cases). The surgeon's satisfaction with the surgery was also excellent in 21 cases (30%), followed by very good (58.6%; 41 cases), good (10%; 7 cases) and dissatisfied (1.4%; one case). Among the patients in the conventional surgery group, the highest type of satisfaction was very good (45.7%; 16 cases). Eleven cases (31.4%) called the surgery excellent. Only in one case, physicians and patients in this group were not satisfied with the outcome of the operation. In 20 cases (57.1%), the surgeon was very satisfied with the result of the surgery (very good) and 8 cases gave an excellent score to the surgery. In the Triple group, the patient satisfaction level was very good or excellent at 91.4%. Surgeon satisfaction with triple surgery (97.1%) was very good or excellent. No dissatisfaction was seen in this group. There was no statistical difference in the level of patient satisfaction regarding gender and surgeon (P = 0.298 and P = 0.484) (table 2).

Table 2 Patient and surgeon satisfaction

		Triple surgery	Classic surgery	Sig
Patient satisfaction	Excellent	(45.7 %) 16	(31.4%) 11	0.317
	Very good	(45.7 %) 16	(45.7%) 16	
	Good	(8.6 %) 3	(20%) 7	
	Poor	0	(2.9%) 1	
Surgeon satisfaction	Excellent	(37.1%) 13	(22.9%) 8	0.122
	Very good	(60 %) 21	(57.1%) 20	
	Good	(2.9 %) 1	(17.1%) 6	
	Poor	0	(2.9 %) 1	

The mean total duration of surgeries was 120.83 ± 15.26 minutes, with the maximum surgery time of 145 and the minimum duration of 90 minutes. Most surgeries were performed within 100 minutes, the duration of conventional surgery was 123.91 ± 15.79 on average and the duration of triple surgery was 117.74± 14.28 minutes. The age of patients did not show a statistical relationship with the total duration of surgery. The frequency of edema and ecchymosis after surgery was not related to patients' age at all.

Edema and ecchymosis occurred in 59 patients (84.3%) with a mean duration of 8.97 ± 1.89 days and ecchymosis was 6.77 ± 1.25 days. The shortest time for edema was 6 and the longest was 14 days, which in the case of ecchymosis was between 5 and 9 days. In the triple group, 8 patients (20%) did not experience edema and ecchymosis, and 4 patients (11.4%) did not experience edema and ecchymosis in the conventional surgery group. Patients' gender had an effect on the time of edema and ecchymosis, so that women were more involved in edema and ecchymosis in terms of time (P = 0.014 and P = 0.042, respectively). Due to the huge difference in the number of men and women undergoing surgery, this issue cannot be generalized to the statistical community. In terms of edema and ecchymosis time, there was a significant difference between the age and age groups of patients, which showed that younger people had a shorter duration of edema and ecchymosis, but people over 40 years had edema and ecchymosis in 9 and 10 days (P = 0.003 and P = 0.009, respectively) (table 3 & figure 1).

Table 3 Duration of surgery, edema and ecchymosis after surgery

	Triple surgery (Mean±SD)	Conventional Surgery (Mean±SD)	Surgery total (Mean±SD)	P-value
Duration of surgery (Min)	117.74±14.28	123.91±15.79	120.83±15.26	0.536
Duration of edema (Day)	8.97±1.9	8.97±1.9	8.97±1.9	1.0
Duration of ecchymosis (Day)	6.77±1.26	6.77±1.26	6.77±1.26	1.0
Age (Year)	32.83±9.49	32.83±9.49	32.83±9.49	1.0

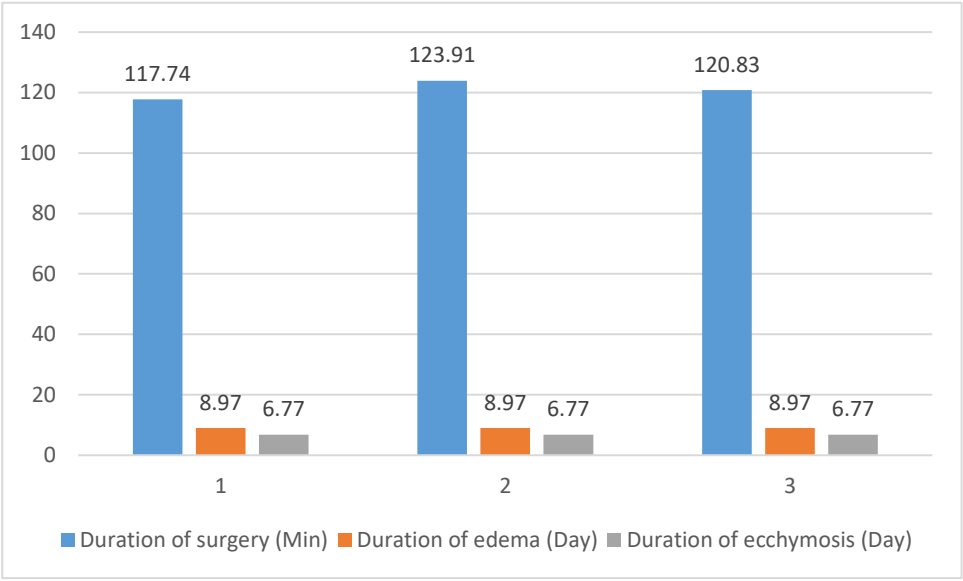

Figure 1 Duration of surgery, edema and ecchymosis in 3 groups, triple and conventional surgery and Surgery total

None of the surgeries required reoperation for correction. Only one patient required local injection of triamcinolone due to the size of the swelling in the tip of the nose. In total, only one case (2.9%) experienced partial irregularity in the SMAS incision surgery. The movements of the intercanine tip and the mobility of the nasal muscles were well maintained in all surgeries of the two groups.

4. DISCUSSION

There are different methods for accessing soft tissue and access to the cartilaginous-skeletal structure of the nose in cosmetic rhinoplasty surgery that can be used by cosmetic surgeons depending on the structure of the nose, especially the thickness of the nasal skin (Feizollah Niazi et al., 2018). In this study, we tried to compare the two classic methods and triple plane dissection in rhinoplasty, which were performed by reviewing the medical records of patients who underwent follow-up in the past year. In classical surgery, incisions are made in one or two surfaces of the soft tissue covering the nose.

Some surgeons use incisions in the subcutaneous surface of this soft tissue to reach the surface of the cartilage and bone of the nose, while some prefer the subcutaneous area of the nasal muscles in the subsmas layer, and some try to correct the shape of the nose with incisions in the subchondral and subperiosteal surfaces of the nasal bone (Whitaker & Johnson Jr, 2002; Yagmur et al., 2015). The recent study was planned by merging all three incisions at the three levels and considering the importance of each area of the skin and soft tissue of the nose undergoing incision and intervention. This method was first introduced to the community of cosmetic surgeons in the last decade and has since been considered as a method of choice by many physicians. But it depends on the surgeon's diagnosis and the type of nasal skin of the patients. Cosmetic surgeons in the Middle East have embraced the triple plane dissection method more than anywhere else in the world because of the thicker nasal skin in most people in the community, and the protrusion of the tip due to the accumulation of more fat. Patients also appear satisfied after this rhinoplasty procedure (Daniel, 2009). Many studies believe that the use of incisions in three surfaces of soft tissue of the nose has the least invasion of tissue in the region and therefore is lessly associated with inflammation, edema, ecchymosis and length of hospital stay and reconstructive surgery (Mao et al., 2008). One of the most important points that attract cosmetic surgeons to more non-invasive and better methods in rhinoplasty is the faster observation of the results of their work in the nose and also the least side effects due to nose manipulation. Less edema and ecchymosis in the surgical area, especially in the triple plane dissection method, can give the surgeon the opportunity to see the result of his work even immediately after surgery, and there is almost no need to wait any longer for this issue (Gruber et al., 2008).

On the other hand, full access to the surgical site can have the least complications, including irregularity in the skin, which is provided by a three-level incision (Gruber et al., 2011). According to the general belief in the community of cosmetic surgeons on the delicate and sensitive function of the SMAS muscle layer, normal nasal movements (movements of the intercanine tip, nasal tip) and lack of abnormal movements (Flaring) after surgery, the final repair of this muscle layer and its minimal manipulation are of great importance, which can be achieved during subsmas incision in triple plane dissection or subsmas surgery in its own way (Byrd et al., 2007). Some believe that the subcutaneous area of the nasal skin is the easiest part to perform a surgical incision, which is able to preserve the nasal muscular layer (SMAS) and thus ensure the preservation of nasal movements after surgery (Safe & Sadek, 2010). These surgeons believe that although the incision in the SSD area has the ability to maintain the movements and function of the nasal muscles, but the use of subcutaneous incision has been more successful in this area due to maintaining the strength (tension) of the muscles in the area after surgery, despite the reduction of the bony part of the nose (Whitaker & Johnson Jr, 2002). Since the thickness of the skin is not the same in all parts of the nose, especially in Middle Eastern societies, some surgeons, such as Elshahat in Egypt, believe that a specific approach should be taken into consideration in each part of the skin of the nose. He believes that defatting is best done with a subcutaneous approach on more protruding noses with more oily skin and the use of incisions in the subsmas can damage the muscle tissue and function of the area after defatting and is also aggressive. Aesthetically, it can also have unpleasant side effects.

The use of a subcutaneous incision in Zone I of the nasal skin, covering the nasal bone and upper external cartilage (Upper Lateral Cartilage), is capable of damaging the skin, leading to a prolonged ecchymosis. After the surgery, adhesive is used in this area of the skin of the nose and the least pressure on it can cause damage, especially in the subcutaneous incision (Elshahat, 2013). Opponents believe that incisions below the surface of the SMAS, the large connections between the SMAS, the muscles of the nose, the ligaments, and the cartilage of that area, make dynamic movements of the nose in interaction with the subcutaneous area. Therefore, maintaining SMAS function is a necessity in performing rhinoplasty. On the other hand, the rich vascular bed in this area is preserved by using a subcutaneous incision, and on the other hand, maintaining the integrity of the lymphatic system in the area also significantly prevents edema (Thaller et al., 1990). Although incisions in the subperiosteal surface do not damage the SMAS layer, they do not provide enough space for rhinoplasty surgery. Safe and Sadek believe that the thickness of the layer, that needs to

be removed before manipulating the cartilage and bone of the nose, is important, and thickness of this in the subsmas and SSD incisions can cause wrinkles above the tip of the nose after surgery. As a result, it is better to consider the subcutaneous area, where the flaps will be thin (Safe & Sadek, 2010). SMAS is a continuous muscle layer from the forehead to the lateral cartilage of the nose; therefore, it is best to maintain the function, including nasal movements at the tip and intercanine tip, as well as internal value through the SMAS layer, which requires incisions on other surfaces instead of the subsmas approach (Çakır et al., 2012, Saban et al., 2008). Although incisions within the subsmas surface exhibited less edema and very little skin necrosis, incisions on the SSD surface are capable of protecting more tissue and structures at the pericondrial layer including the smas and associated ligaments.

The incision from the surface of the subsmas ensures dynamic movements of the nasal muscles after rhinoplasty, which plays an important role in the function of the nasal valves, the quality of airflow in the nose, and the dynamics of respiration (Toriumi et al., 1996; Figallo & Acosta, 2001). Tardy also stated in 1993 that continuous thinning of the nasal subcutaneous tissue occurred by using the subsmas approach, especially in the thick sebaceous skin, during a 10-year follow-up period of rhinoplasty patients, leading to a decrease in the results obtained in rhinoplasty within 7 to 10 years (Tardy et al., 1993) and this event is minimized in rhinoplasty by using the SSD approach. Another advantage of the SSD approach in rhinoplasty, in addition to its minimal invasive activity, is the surgeon's ability to observe the surgical result immediately and directly, maintaining the integrity of the surgical site structures by repairing ligaments, and minimizing the possibility of scar formation as a result of this direct and instantaneous observation. On the other hand, numbness and tingling of the tip of the nose occurs after rhinoplasty and is caused by damage to the external nerve of the nose. In many patients, this nerve is located just below the SMAS layer, starting at the junction of the bone and nose cartilage and continuing down to the alar cartilage (Byrd et al., 2007). Fortunately, this nerve is not damaged in the SSD approach.

Unlike other approaches in which the surgeon needs to divide the nasal lip into its component parts in order to make the right decision in cutting, removal, final stitching or grafting, the SSD approach allows the surgeon to consider all the upper components of the peri- coin in the cartilage and periosteum as a complete structure with the least manipulation. When removing the soft tissue on the nose to reach the bone and cartilage of the nose, the SMAS layer can be damaged; either in distal of the interdomal area or above the anterior septal angle.

Surgeons are often reluctant to resect this soft tissue because SMAS is functionally effective in dilating and compressing the nostrils, and is directly involved in rotating the tip of the nose and indirectly affects the return of the tip of the nose upwards (Çakır et al., 2012). In this study, there was no difference between the two sexes in terms of the distribution of nasal skin thickness type in patients ($P = 0.213$). The issue of gender did not affect the level of patient and surgeon satisfaction ($P = 0.298$ and $P = 0.484$, respectively). However, the sex of the patients had an effect on the time of edema and ecchymosis, where women were more affected by edema and ecchymosis in terms of time ($P = 0.014$ and $P = 0.042$). Due to the huge difference in the number of men and women undergoing surgery, this issue cannot be generalized to the statistical community. Although no significant difference was found between age groups regarding the type of nasal skin thickness ($P = 0.076$), there was a scattered difference between age and nasal skin type ($P = 0.002$). This condition was present between patients' age and their satisfaction ($P = 0.001$), but did not show any correlation between age groups in this field ($P = 0.206$).

A significant difference was found between the age and age groups of patients in terms of time of edema and ecchymosis, where younger people had less duration of edema and ecchymosis, but people over 40 years of age had more edema and ecchymosis in 9 and 10 days ($P = 0.003$ and $P = 0.009$). The age of patients did not show a statistical relationship with the total duration of surgery. The frequency of edema and ecchymosis after surgery was not significantly related to the age of patients.

5. CONCLUSION

In comparison between the two groups of conventional surgery and tripple, there was no significant difference between the patients in the category of nasal skin thickness and these two surgeries did not show a statistical difference in terms of patient and surgeon satisfaction. The overall duration of surgery did not show a significant difference between the two groups. Even the incidence of edema and ecchymosis did not differ statistically between the two groups. The duration of edema and ecchymosis in patients did not show a statistically significant difference between the two surgical groups. Due to the difference between various parts of the nasal skin in terms of the thickness of this tissue, especially in the Middle East population, surgeons should use smart measures to use incisions in each part of the nose at a specific level for minimizing damage to the soft tissue.

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Authors' contributions

Conducted the experiments:	Abdolreza Khorshidifar, Abdollah Neisi
Conceived and the study:	Abdolreza Khorshidifar, Nader Saki
Analyzed the data:	Abdolreza Khorshidifar, Abdollah Neisi
Wrote the manuscript:	Abdolreza Khorshidifar, Nader Saki

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Conflict of Interest

The authors declare that there are no conflicts of interests.

Informed consent

Written & Oral informed consent was obtained from all individual participants included in the study. Additional informed consent was obtained from all individual participants for whom identifying information is included in this manuscript.

Ethics

This research has been approved by the ethics committee of the University of Medical Sciences with the code number "IR.AJUMS.REC.1398.914".

Data and materials availability

All data associated with this study are present in the paper.

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