

Secondary Repair of Unilateral Cleft Lip Nasal Deformity with Guide Sutures

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Abstract

The objective of this study is to explore the method and curative effect of secondary repairing nasal deformity of unilateral cleft lip by using guide suture. In an attempt to do so, 5 cases were put under research. The 5 cases of unilateral cleft lip with nasal deformity were repaired by using a certain method to reduce surgical intervention in the pterygoid cartilage by suspending the suture with a Guiding device after the lateral crus of the greater alar cartilage is fully detached from the margin of the piriform aperture. The cases were followed up for 6 - 12 months, as the results revealed that all the incisions healed in the first stage after the operation. In addition to that, both the bilateral alar cartilage and nostril of 5 patients were symmetrical. Furthermore, the sum of absolute values of bilateral nasal aperture differences was less than 3 mm, as the appearance of all angles was satisfactory. The rhinoplasty incision was limited to ill side nostril margin and inside ill side the nostril. The patient's healthy side nostril and columella showed no scar incision. To sum up, the secondary repair of unilateral cleft lip nose deformity by using the Guiding device with a minimally invasive suspension suture of greater pterygoid cartilage after the lateral crus of the greater alar cartilage is fully detached from the margin of the piriform aperture is a good method for anatomic reduction of alar skin, cartilage and mucosa on the side of cleft lip with good clinical effect.

Level of Evidence: IV.

Keywords: Cleft Lip; Nasal Deformity; Repair Surgery; Surgical Flap; Rhinoplasty

Introduction

Cleft lip is a complex embryonic malformation; in fact it is a comprehensive, three-dimensional deformity which often involves skin, muscle, mucous membrane, cartilage and bone. Because the children were still small at the time of primary repair of cleft lip, the anatomical structures were not fully developed. As they grow, the remaining deformity is constantly enlarged; the uneven sur-

gical techniques of the first stage surgeons and the deformity of the bone and muscle development of cleft lip make the secondary repair stage more crucial. In this crucial stage, the repair of nasal deformity is an important yet difficult point that can not be ignored. In the past, there have been a variety of surgical methods for secondary deformity of cleft lip, which are summarized as follows: elevation of nasal columella, anatomical reduction of alar cartilage,

adduction of abducted lateral alar foot, drooping alar part resection and rhinoplasty including autogenous cartilage and xenon raft materials [1-4].

Aim of the Study

The aim is to obtain a more symmetrical nostril, raise a low and flat columella, and narrow the lateral crus of the alar.

Materials and Methods

General information

In this investigation, the data of 5 patients, 3 males and 2 females, aged between 12 and 30 years old suffering from secondary unilateral cleft lip nasal deformity who were followed-up for 6 - 12 months were retrospectively analyzed from January 2012 to January 2019. Concerning their nasal deformity, all patients had different degrees of columella deviation, lateral alar crus abduction, alar depression, nostril transverse diameter larger than that of the healthy side and depressed nasal floor. In addition to that, all of them were accompanied with nasal septum deviation. Furthermore, both the treatment and the follow-up of the 5 patients were strictly in line with ethical requirements. All procedures were performed by the same surgeon.

Surgical methods

The secondary repair of unilateral cleft lip nasal deformity followed different procedures. After applying anaesthesia, the upper lip's deformity was corrected through reconstructing the middle structure of the patient following the original scar condition where the deformity was repaired.

An incision was made at the affected side of the nostril margin, extending to the lateral margin of the nasal vestibular cartilage. No incision was made at the healthy side of the nostril margin and columella.

Afterwards, the attachment of the muscles at the lateral crus of the alar to the ectopic muscles around the piriform foramen was fully released, as the lateral crus of the alar Nasi was tightly sutured. At this time, the lateral crus of the alar moved inward under the external force.

During this surgery, the skin and mucosa were cut along the design line to expose the alar cartilage. The skin surface and vestibule surface of alar cartilage were fully dissociated, and the connection between alar cartilage and lateral nasal cartilage was separated.

The lateral crus of the greater alar cartilage is fully detached from the margin of the piriform. After high-pressure disinfection, the common stainless steel guiding device was used. Thereafter, a guided suture was utilized to correct the deformity of the alar cartilage on the affected side under the premise of normal mucosal restoration and satisfactory nostril shape adjustment, as well as placing the suture device under the skin with a self-made Guiding device. Afterwards, the suture was firmly sutured on the nasal bone periosteum through the skin suture which was done using a 1-0 suture. In addition to that, the guiding device pulled the suture out of the incision, as the other end was sutured on the alar cartilage of the affected side which was lifted up after its knotting. Take out the guiding device after operation. In the same way, the affected alar cartilage was sutured to become a healthy one. Depending on the degree of deformity, one site can be fixed several times, and the bilateral alar cartilage can be repaired with knot. Moreover, the diseased cartilage was attached to the skin and mucosa, while the silicone nasal tube was supported on the affected side for 14 days after operation.



Figure 1-3: The nostrils are in front of each other before operation.

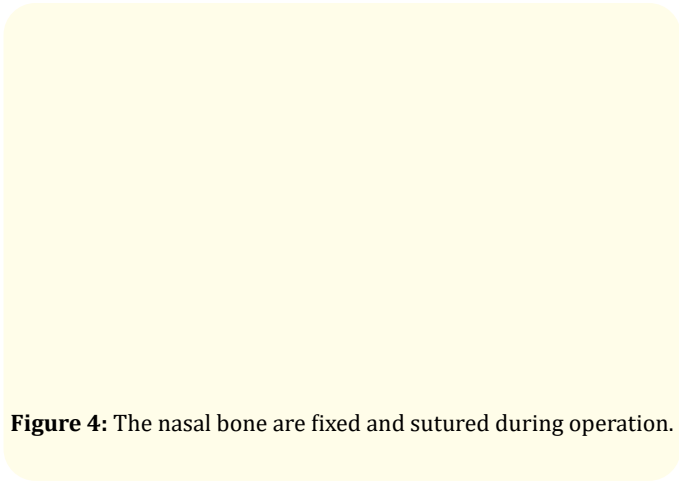


Figure 4: The nasal bone are fixed and sutured during operation.

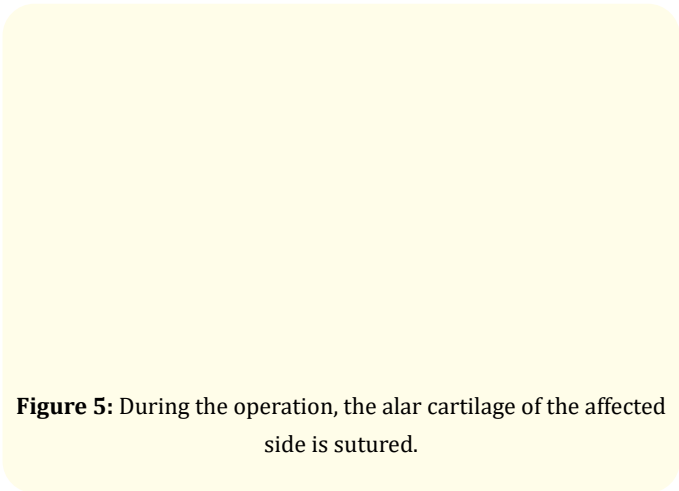


Figure 5: During the operation, the alar cartilage of the affected side is sutured.



Figure 6-8: 6 months after operation.

Figure 9: Stainless steel guiding device.

Figure 10: Schematic diagram of the operation, the affected greater pterygoid cartilage and the contralateral alar cartilage and the contralateral nasal bone are sutured at the fornix to raise the nasal alar.

Evaluation method

In an attempt to evaluate the postoperative effects, both objective and subjective dimensions were utilized as the evaluation time was selected in the final follow-up.

The subjective indexes were formulated depending on the nose morphology and appearance. In the experience of the 5 patients, five professional doctors evaluated and scored the nasal shape of the patients after the operation including the symmetry of bilateral alar and nostril, the nasal shape of frontal and lateral view. They evaluated the results as follows; 1 point indicated that the results

were satisfactory, i.e. bilateral alar and nostril were symmetrical and the appearance of the side and head up position was satisfactory; 2 points meant that the bilateral alar and nostrils were basically symmetrical, and the three-dimensional appearance was satisfactory; and 3 points represented poor bilateral symmetry and unsatisfactory appearance. Moreover, the average score was the final score.

However, the objective indicators were in the head up position, the measurement of the length and transverse diameter of bilateral nostrils, and the sum of absolute values of bilateral differences. In other words, 1 represented the sum of absolute values of bilateral differences < 3 mm; 2 points meant the difference of 3 - 5 mm; 3 points indicated the difference > 5 mm. Furthermore, the lower the score of each item, the more satisfied the effect. The total score of 2 - 3 points represents a satisfactory effect, 4 points represents acceptable and 5 - 6 points represents poor effect.

Result

Typical case

The case is an 25-year-old male patient with a secondary lip and nose deformity. After he left cleft lip surgery, she was treated with a guiding device to repair the secondary nasal deformity of unilateral cleft lip. Six months later, the nostril on the cleft lip side was equal to the healthy side, its shape was good, and the bilateral alar was basically symmetrical.

Besides, the incisions of the 5 patients healed in one stage. In addition to that, they were followed up 6 months after operation, and the final evaluation was selected at the last follow-up. They likewise had symmetrical nasal alar and nostril shape, satisfactory appearance in front, side and head up position. The sum of absolute value of bilateral nasal aperture difference was less than 3 mm, and the total score was 2-3 points.

Discussion and Conclusion

Secondary nasal deformity of cleft lip is a kind of complex deformity that involves muscle, cartilage, maxilla, skin and mucosa. It mainly manifests the collapse of the affected nasal alar, lateral alar crus lateral inferior displacement, nasal tip flattening, columella deviation, broad and concave nasal base on the cleft side. After repeated exploration by scholars at home and abroad, the pathogenesis is summarized as follows. This condition has internal factors

including the lateral crus of alar cartilage and the defects of nasal cartilage development on the affected side resulting cleft lip and nasal deformity. However, the external factors, i.e. the shape difference of cleft lip side bone, depend on a comprehensive nasal plastic method to solve the problem. To deal with such condition, the nasal alar and the skin and mucosa inside the nasal cavity are rotated inward to raise the nasal alar through anatomic reduction of the deformity alar cartilage. This method has achieved good clinical results.

Due to the abnormal development of alar cartilage and muscle in cleft lip patients, the traction of external force leads to nasal deformity. Besides, the cleft lip nasal tract and nasal bundle muscle fiber attach to the lateral side of the nasal alar. Moreover, the traction causes the alar to move outward when contracting leading to the nasal septum defect of patient's the nasal muscle, the columella's deviation due to unbalanced muscle force on both sides, and the columella base collapse. In addition to that, displacing the alar cartilage ventrally, posteriorly and distally under the traction of deformity tissue leads to nasal deformity. At the same time, the hypoplasia of maxilla, especially the lack of bone in piriform foramen, is also an important factor of nasal deformity.

Therefore, cleft lip secondary nasal deformity is a complex deformity caused by a variety of reasons and comprehensive effects. Among the secondary nasal deformities of cleft lip, nasal alar collapse and ptosis are the most direct and serious deformities. However, it is impossible to solve all the problems by only one method. In the past, there have been various surgical methods for this deformity. The inverted U-shaped incision was designed on the cleft side of the nasal alar to solve the sagging deformity of the cleft nasal alar. Z-plasty was performed in the cleft nasal vestibule to improve the tension of vestibular mucosa caused by the original method. The nasal alar margin soft tissue was excised to obtain the bilateral symmetrical alar margin. The method of V-Y advancing mucosal cartilage flap was used to improve the nasal alar collapse caused by cartilage heterotopic [5-11].

Furthermore, the previous methods indeed have their own advantages and disadvantages. First of all, although the simple crescent shaped resection of the nasal alar margin can make the bilateral alar appear symmetrical intuitively in the preoperative design, the tissue quantity of the inner lining of the nasal vestibule is often insufficient due to the elevation of the affected side of the nasal alar

and correction of the columella's deviation. Moreover, the inverted U-shaped nasal alar margin incision can make the nasal columella and vestibular mucosa on the affected side rotate to the medial side which increases the tissue quantity of the side lining of the columella. Besides, the ectopic attachment of the alar cartilage and nasal muscle in the piriform aperture often leads to the over tension of the reconstructed nasal vestibular mucosa. On this basis, Z-plasty was added to eliminate the traction effect, yet it is still difficult to achieve satisfactory results. It was solved by v.y.-pushing mucosal perichondrium flap in nasal vestibule; however, due to the heterotopic attachment of alar cartilage on the cleft side, the skin and lining mucosa of cleft lip are in a different position from that of the healthy side. As well as, in the past, the operation was traumatic and the effect was not ideal. In all previous procedures for the correction of cleft lip nose deformities, both the healthy and affected nostril margins must be incised simultaneously. The columella must be incised. The alar cartilage and periosteum of the nasal bone are fully exposed. So you can get a good fixation. However, extensive stripping of the subcutaneous tissue can cause extensive scarring under the skin. Scar was left after healing of the nostril margin incision and columella incision on the right side. It can cause new pain to the patient. Especially for children, if the incision can be reduced to achieve the same surgical effect, it is very beneficial to his future surgery and recovery.

In this study, the skin and alar cartilage of the affected side of the nose were separated, and then specialists repositioned the relationship between the two according to the basic conditions of the patient's nose. Therefore, combined with the advantages of previous methods, they can easily move the ectopic attachment of the lateral alar crus of the affected side to a symmetrical position with the uninjured side. Thereafter, the alar cartilage was fixed in a normal position because of the complete separation of the skin surface of alar cartilage. Besides, guided suture technology was used to minimally invasive suture the medial rotation to raise the affected side of the nasal alar to raise the nasal tip. In this way, the factors causing the heterotopic traction of alar cartilage of the affected side were completely removed, and then it was sutured with the contralateral alar cartilage and the uninjured nasal bone in the vault to raise the nasal alar and form the nasal tip. At the same time, the affected alar cartilage was restored to a near normal position. Since the surgical incision was only in the affected nostril margin and the affected nostril margin, there was no incision in the unin-

jured nostril margin and no incision in the nasal column. The blood flow to the skin is preserved to a maximum extent. Wounds heal faster than traditional surgery. Scar is relatively small, especially for younger patients.

The pathological anatomy of the nose in normal people has been studied in the investigation. As a result, scholars found that there was a joint like structure between the normal alar cartilage and the nasal septum cartilage, which formed the normal shape of the nasal cavity. In the mechanism of cleft lip nasal deformity, the piriform foramen was abducted and the alar muscle and alar cartilage were pulled to the lateral. This caused a pseudo dislocation of the joint, the collapse of the alar, dislocation of the alar cartilage and nasal septum cartilage, detachment of the alar cartilage and nasal bone outward and downward. Therefore, specialists can reconstruct the structure similar to the joint by fixing the alar cartilage of the affected side with the normal alar cartilage and suspending and suturing the affected alar cartilage with the healthy nasal bone. The cartilage mucosal flap of the alar cartilage can be rotated to achieve the effect of anatomical reduction which can be very long-lasting.

We often get asked after unilateral cleft lip surgery. Why my child is unilateral cleft lip, only one side nose has deformity. However, there were scars on both sides of the nostril rim and columella after surgery. We often have no answer. It is also unknown whether bilateral dissection will affect the development of alar cartilage on the healthy side. When a child is older, we can't tell whether the shape of the nose on the healthy side is a result of surgery or a natural development of the child. Traditional alar cartilage reduction surgery requires two nostrils to be completely opened, some also need a columella incision to completely expose the nasal cartilage, or the affected side alar cartilage and the healthy side alar cartilage and the healthy side nasal bone which can be sutured in the fornix to raise the nasal alar. This operation is very traumatic. Since the process of cleft lip and nasal deformity has been fully understood, this large surgical incision is no longer needed as patients heal very quickly, and the effect of surgery lasts. In addition to that, scholars believe that in unilateral cleft lip surgery, they should not make excessive surgical separation for the normal side of the nose, which is contrary to the principles of plastic surgery.

Conventional nasal plastic surgery, to do in the bilateral nostril margin incision, and some even in the columella incision. Too many surgical incisions can block the blood supply to the skin of the nose. Especially in younger patients. This will cause delayed wound heal-

ing, wound infection, affect the normal growth and development of the nose. Furthermore, the incision in the operation was not designed at the outer edge of the nostril but inside the ill side nostril, as it was made along the edge of ill side alar cartilage. In this way, as the ill side alar cartilage moves to the healthy side and the nasal bone, the surgical incision can be completely hidden inside the ill side nostril achieving a better cosmetic effect. Besides, the incision cannot be seen outside and the wound heals rapidly.

In the operation, scientists have likewise developed and tried various guided minimally invasive surgical instruments. They found that all kinds of guiding instruments are either too large or very expensive while using the surgical instruments. The operation was also very inconvenient and difficult to be popularized in clinical practice. Furthermore, the most commonly used guiding device was utilized occasionally. Besides, it can be sterilized repeatedly because it is made of stainless steel. Its hardness and diameter are very suitable for them to operate on facial organs. It is very flexible as it can be broken into different shapes. In addition to that, they were very satisfied that the cost of the operation is very low as it can achieve the effect of expensive surgical instruments.

Cleft lip surgery is very important because it aims at reducing the patients' trauma. Cleft lip patients have congenital deformity and using the traditional open surgery may cause a great damage. Besides, the incision is also very long. However, the effect and the minimally invasive surgery method is the same. Moreover, due to the large-scale dissection of the nasal cavity during the traditional operation, a large number of scar hyperplasia will be produced after the nasal surgery. After the operation, there will be a lot of bleeding; as well as, the soft tissue will be very hard. The operation must be carried out under general anaesthesia, and the minimally invasive surgery can be completed only under local anaesthesia. Furthermore, our operation is very simple, it leaves almost no scars, its effect is similar to the open rhinoplasty surgery, and the patients accept to operate easily.

In this surgery, doctors must pay attention when using guide needle suture from the skin surface of nasal alar and nasal tip junction through cartilage and mucosa fixation. In addition to that, it is often difficult to accurately insert the needle from the original hole. When the needle is inserted again, it may cause dents on the skin surface. Furthermore, the guide needle suture has many disadvantages including: the guide needle often hooks other subcutaneous tissues, so it is difficult to accurately fix the suspension point on the

periosteum, and it may likewise cause skin depression. As well as, because the suture is not firmly fixed on the periosteum, it may be loose after operation; therefore, it may lead to recurrence of deformity making the operation more difficult. Hence, it is likewise very crucial to have adequate dissection of the surgical area of the nose.

It has been believed that the alar cartilage should be fully attached and fixed to the skin and mucosa of alar Nasi after reduction. If necessary, the number of sutures should be increased to ensure firm fixation, which can avoid the loosening of suspension line. It is a simple, effective and minimally invasive method to correct secondary nasal deformities after unilateral cleft lip surgery. The lateral crus of the greater alar cartilage is fully detached from the margin of the piriform is very important. If the great alar cartilage on the affected side the lateral foot does not detach from the edge of the piriform aperture, the great alar cartilage does not detach from the skin surface.

The effect of direct guide suture is ineffective.

It is only after separation of the cartilage that the fixation can be restored to a new position.

The effect of surgery is lasting.

Dedication

Thanks to Professor Li Senkai for his research and development of the guided suture method and his own teaching of guided suture technology.

Thanks to Professor Yin ningbei for his research on the improvement of bionic biomechanical surgery for cleft lip. This operation method was further improved under the inspiration of his research.

Conflicts of Interest

The authors declare that they have no conflicts of interest to disclose.

Ethical Approval

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

Informed Consent

For this type of study informed consent is not required.

Dr Haidong Li and Dr Shikang Gao contributed equally to the writing of this article.

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