

A Novel Technique for Autologous Supratip Augmentation: Septal Gap Graft

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Background: Although it has been common to use artificial implant to augment nasal dorsum in Asian rhinoplasty, the demand for not using it is increasing due to the long-term complications of implants. However, if only the tip is raised without raising the dorsum with implant, it is difficult to avoid supratip depression, so it is difficult to obtain good cosmetic results. The authors would like to report good results, performing an augmentation rhinoplasty that raises the supratip area using the nasal septal cartilage without using an implant.

Methods: Septal gap graft was used in 22 patients undergoing nasal tip surgery from January 2019 to April 2021. Septal gap graft refers to a graft that increases the height of the supratip area by using septal cartilage. Firstly, the authors perform a septal extension graft using the septal cartilage, then the authors fix the lower lateral cartilage in an ideal position, and lastly the authors heighten the nasal tip with onlay graft. The height difference between the nasal bone and the nasal tip, is solved by placing the septal cartilage. Before, during and after surgery, photometric analysis was done by taking clinical pictures.

Results: Through the septal gap graft, the supratip depression index was decreased and the nasal tip projection was increased. It was confirmed that the septal gap graft was well maintained at long-term follow-up, and the patients' postoperative satisfaction was also high.

Conclusions: The authors presented a new technique for augmentation rhinoplasty in Asians. Septal gap graft can be used safely and effectively to raise supratip area without using implant.

Key Words: Asian rhinoplasty, augmentation, autologous, depression, septal cartilage, supratip

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Unlike Caucasian rhinoplasty, rhinoplasty in Asia is often aimed at solving low dorsum. To this end, implants that do not have donor site morbidity and are easy to produce better results are widely used.¹ Although, implants such as silicone and expanded

polytetrafluoroethylene (expanded polytetrafluoroethylene; Gore-Tex, W.L. Gore and Associates, Newark, DE), which are commonly used for dorsum, can increase the nasal height, but they cause problems such as inflammation, exposure of the implant, and contracture in the long term.^{2,3} Also, when such a problem occurs, the nose may become irreversible, leading to desperate results for the patient.

Therefore, there is a growing demand to shape the nose without using an implant, and accordingly, a method of increasing the height of dorsum by using the autologous dermis and rib cartilage is also being considered again.⁴ However, as is known, the use of autologous dermis has a problem that it is difficult to predict the shape in the long term due to absorption, therefore, it feels too high at the early stage after surgery, or it becomes much lower than desired as time passes after surgery.¹ In addition, due to the characteristics of soft tissue, there is a limitation in that the definition of the nose is poor, so it is difficult to clearly create a dorsal aesthetic line.

The use of autologous costal cartilage has the disadvantage of requiring a lot of rib cartilage for sufficient use, and limitation that the donor morbidity such as pain and scar.⁵ In addition, it is difficult to create an appropriate shape and feel of the nose due to warping, as costal cartilage itself bends, and very hard texture.^{1,6}

As not all Asian patients have a flat nose, there are cases where only tip plasty is performed without raising the nasal dorsum. However, this is not common, and if the patient has a low dorsum, it is often necessary to use an implant even if he does not want to use it. If the height of the tip that patients want is higher than the extension line of the existing nasal dorsum, the result cannot be satisfactory.

Usually, if tip is positioned higher using septal extension graft and onlay graft than the extension line of the existing nasal dorsum, excessive supratip depression appears on the line leading from the dorsum to the tip, resulting in a height difference (Fig. 1A-B). Some supratip break is the aesthetically pleasing configuration for nasal tip, but excessive supratip depression can be considered undesirable.⁷

When using an implant, the caudal end of the implant can fill the volume of the supratip depression, reducing the difficulty in creating a smooth nose line. However, even in this case, it is necessary to fill the empty space between the implant and the upper lateral cartilage with cartilage or soft tissue.⁸ This is to prevent supratip depression due to collapse of the implant.

Therefore, when the implant is not used, large amount of cartilage or tissue is required to solve the excessive supratip depression, and it is difficult to handle this. Until now, there has been insufficient discussion on solving the depression of the supratip region by autologous cartilage or tissue without implants.

The "Septal Gap Graft" devised by the authors is a graft that increases the height of the dorsum between the nasal bone and the nasal tip, that is, at the supratip depression, by using septal cartilage in patients with strong resistance to foreign material usage. Through this, we could create a line of the nose that naturally connects from the dorsum of the nose to the tip. Therefore, in this clinic, a septal

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gap graft was performed to obtain good results, and this is to be reported.

MATERIALS AND METHODS

Patients

From January 2019 to April 2021, a total of 22 patients (6 males and 16 females) were subjected to septal gap graft. The ages of the patients ranged from 19 to 48 years, with an average age of 26.5 ± 6.90 years. All 22 patients had primary rhinoplasty. All patients who had reluctance to foreign materials were included as indications. Among them, if the height of the sellion was desired to be increased, they were excluded from the inclusion group of the septal gap graft.

All patients underwent septal extension graft^{9,10} using septal cartilage, and onlay graft using ear cartilage was also performed. Reductive rhinoplasty was performed in 13 patients.

Computed tomography (CT) scan Evaluation

All the patients were subjected to preoperative CT scan to check the amount of septal cartilage. Septal gap graft was performed when the size of the patient's septal cartilage was greater than 25×30 mm on preoperative CT scan (Fig. 1C).

Photometric Evaluation

Clinical pictures were taken before surgery, during surgery (just before septal gap graft was performed), and 3 months after surgery. And glabella, sellion, pronasale, subnasale, and pogonion were marked on the pictures (Fig. 1D). After that, the nasal tip projection index and supratip depression index were measured. The "Nasal Tip Projection Index" is the value obtained by dividing the lengths of the pronasale and subnasale by the distance to the glabella and pogonion. The "Supratip Depression Index" is the value obtained by dividing the distance between the skin and the lower quarter of the straight line connecting the sellion and pronasale by the distance to the sellion and pronasale (Fig. 1D). If the skin is outside the straight line connecting the sellion and pronasale, that is, in the opposite case of depression, the value is expressed as a negative number. One measurer measured 3 times and set the mean value as the measured value. Statistical analysis was performed to determine whether there was any difference between the values measured before, during, and after surgery through paired *t* test (The Statistical Package for the Social Sciences, version 19.0, IBM, Armonk, NY).

Satisfaction Survey

Six months after surgery, satisfaction surveys were conducted through an online questionnaire, "5 (very satisfied)," "4 (satisfied)," "3 (moderate)," "2 (unsatisfied)," and "1 (very dissatisfied).

Septal Gap Graft

All patients were operated under general anesthesia. The surgery was performed by the open rhinoplasty method. After the transcolumella incision of the V-shape, the incision was continued along the anterior margin of the medial crus, the caudal margin of the alar dome, and the caudal margin of the lateral crus of the lower lateral cartilage. Dissection was performed to the supraperichondrial plane, and the lower lateral cartilage was completely exposed so that the skin could be sufficiently stretched. The lower lateral cartilage was sufficiently released for caudal rotation, including the scroll area (between the upper lateral cartilage and the lower lateral cartilage), and the hinge area (between the pyriform aperture and the lateral crus). After dissecting the medial crus of the lower

lateral cartilage and exposing the septal cartilage to the subperichondrial plane, the septal cartilage was harvested leaving about 10 mm of L-strut.

At this time, the size of the harvested septal cartilage should be at least 15×20 mm to be able to perform both septal extension graft and septal gap graft. In addition, if the thickness is less than 1 mm, the septal cartilage alone does not have enough power to support the nasal structure, so it was used as a septal gap graft in 2 layers.

The thickest part of the harvested septal cartilage was cut into about 5×20 mm and used as the septal gap graft, and the remaining septal cartilage was used as the septal extension graft.

The septal extension graft was fixed to the L-shaped caudal septum by using a 4-0 nylon round as a batten type. Both dome of the lower lateral cartilage was advanced caudally and anteriorly, and then fixed with the anterior edge of the septal extension graft with a 4-0 nylon round to position the tip. Cavum conchal cartilage was harvested through posterior approach, and tip onlay graft or shield graft was performed.

At this time, the gap between the dorsum and the tip caused by the increase of the nasal tip was augmented with a septal gap graft. Graft was done parallel to the dorsum using a septal cartilage of about 5×20 mm (Fig. 2). The end of the septal gap graft was trimmed to prevent the cartilage boundary from appearing on the outside. The cephalic margin of the graft was fixed to the upper lateral cartilage, and the caudal margin was fixed to the cephalic border of both lower lateral cartilages using 6-0 nylon cutting. The dead space under the graft was filled with extra cartilage or autologous tissue to increase support.

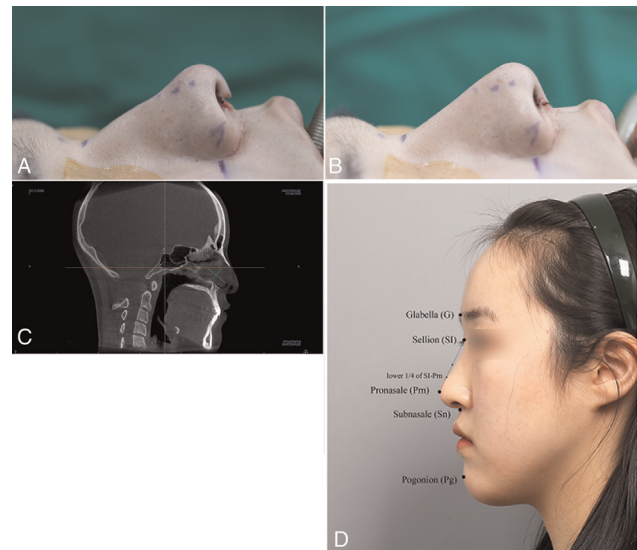


FIGURE 1. (A) When the septal extension graft and tip work are performed without an implant, a depression occurs in the line from the dorsum to the tip, and this could be solved by autologous septal cartilage. (B) A picture after a septal gap graft. Excessive supratip depression was resolved, resulting in a smooth line. (C) Preoperative CT scan. The amount of septal cartilage can be predicted through CT scan before surgery, and septal gap graft was performed when the length of the major axis and minor axis of septal cartilage was more than 25×30 mm. (D) The points and measured indices. Glabella (G), the most prominent point in the midline between the brows; Sellion (SI), the deepest point of the nasofrontal angle at the intersection of forehead slope and nasal slope; Pronasale (Pmn), the most prominent point on the nasal tip; Subnasale (Sn), the point beneath the nose where the columella merges with the upper lip in the midsagittal plane; and Pogonion (Pg), the most anterior point on the chin. Indices used. Supratip Depression Index, ("A"/SI-Pmn) $\times 100$ (%); Nasal Tip Projection Index, (Sn-Pmn/G-Pg) $\times 100$ (%); "A," distance between the skin and the lower quarter of the straight-line connecting SI and Pmn.

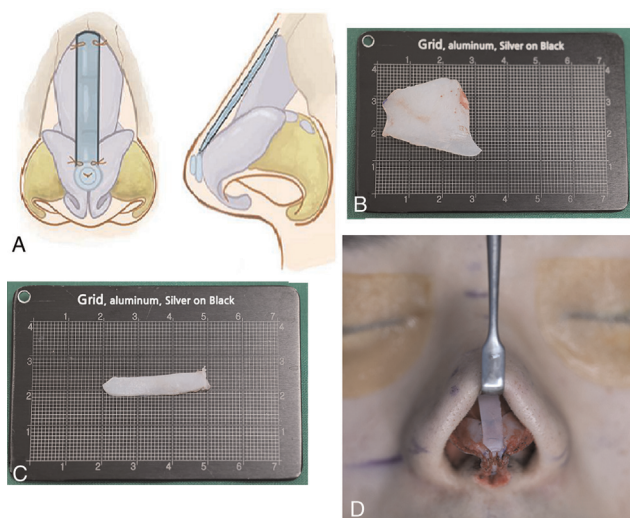


FIGURE 2. (A) Illustration for septal gap graft. It is usually implanted in the cephalic-caudal direction between the upper lateral cartilage and the nasal tip. (B) The size of harvested septal cartilage was 25 × 30 mm. Compared to other cases, the size of the cartilage was large. (C) For the septal gap graft, a septal cartilage of about 6 × 29 mm was prepared in the thickest part. (D) A septal gap graft was performed during surgery. In this case, the amount of cartilage was sufficient, so it was possible to lengthen the septal gap graft to the tip.

RESULTS

The average follow-up period was 13.2 months (3 to 29 months). There were no graft-related complications, such as caudal and cephalic deviation of nasal tip, irregularity, infection, graft exposure, and migration. In addition, there was no case of supratip depression due to the failure of maintaining the septal gap graft. As a result of the satisfaction survey, the average of the satisfaction score was 4.2 ± 0.81, 9 people were very satisfied (41%), 10 were satisfied (45%), 2 were moderate (9%), and 1 was unsatisfied (5%). One unsatisfied appealed for recurrence of hump, so humpectomy was performed again.



FIGURE 3. (A) Preoperative views. (B) Postoperative views 3 months after surgery.

There were statistically significant differences in the supratip depression index during and after surgery and the nasal tip projection index before and after surgery (Supplementary Digital Content, Table 1, <http://links.lww.com/SCS/D431>). Supratip depression index decreased after surgery, and nasal tip projection index increased after surgery. Representative cases are shown in Figures 3 and 4.

DISCUSSION

The important point in Asian rhinoplasty is to raise the dorsum and the tip of the nose. Implants are mostly used, as they are easy to handle and are good for obtaining a sufficient height. Especially, silicone implants are inexpensive and have the advantage of being similar in hardness to soft tissues to produce natural results. However, it is not possible to be free from problems such as contracture, inflammation, and exposure in the long term, and if the contracture comes severely due to inflammation, it leads to a very catastrophic situation.

Due to the limitation of implants, there is increasing demand for nose surgery that does not use implant. However, in the augmentation rhinoplasty using the autologous dermis, it is difficult to predict the shape in the long term due to the absorption of tissue over time and to create a clear dorsal aesthetic line. Using autologous costal cartilage has a high donor morbidity, and it is difficult to produce the proper shape and feel of the nose due to the warping and rigidity of the costal cartilage itself.

Instead of using a single piece of costal cartilage, using diced costal cartilage wrapped in fascia has the advantage of reducing warping and rigidity.^{11,12} However, if there is enough septal cartilage, using wrapped diced costal cartilage still has high donor site morbidity. In addition, it is considered as a limitation that it is not technically easy to place the implant by securing symmetry, or to make a smooth transition in the sellion and nasal tip.¹² It is also difficult to maintain the shape of the dorsum because the fascia is absorbed and it is bothersome to remove the diced cartilage 1 by 1 in secondary rhinoplasty.

Thus, patients with a high reluctance to the side effects of implants prefer a method of raising only the tip of the nose without raising the dorsum of the nose. Even when using an implant,



FIGURE 4. (A) Preoperative views. (B) Postoperative views 12 months after surgery.

autologous cartilage or additional silicone implant has been inserted underneath the implant to solve the supratip depression in Asians. Accordingly, it is becoming important to solve the unsmooth height difference of the supratip depression caused by raising the tip of the nose without implants. Although many papers have been published on the modifications of the septal extension graft,^{13–18} the modifications in most papers refer to dorsally extension of the spreader graft and are still not a solution to supratip depression.

The authors devised a “Septal Gap Graft” that can smooth out excessive supratip depression. To the best of our knowledge, this paper is the first paper in that supratip depression can be resolved by autologous cartilage without implants. Septal cartilage has enough strength to maintain its structure, so it can stably support the shape of the nose.

In order to objectively confirm the effect of the septal gap graft, the supratip depression index and nasal tip projection index in the lateral pictures were compared before, during, and after surgery. The measurements can vary from person to person and according to the size of the picture.¹⁹ By measuring each value as a ratio to the length of the baseline in the photograph, supratip depression and nasal tip projection could be measured more objectively. As a result, the postoperative value of the supratip depression index decreased, and the nasal tip projection index increased. The decrease in the supratip depression index means that the supratip depression is smoothed and improved, and the increase in the nasal tip projection index also indicates that the nose tip is raised, resulting in the patient’s desired nose shape.

According to a meta-analysis paper published by Peled et al.,²⁰ infection rates and rates of implant removal were 2.4% and 6.5%, respectively, in rhinoplasty using silicone implant. The great advantage of performing tip plasty and septal gap graft without an implant is that both patients and surgeons can be free from infection, contracture, and implant exposure, which are the complications caused by the implant over time. In this paper, as a result of follow-up for an average of 13 months, there was no case of infection or graft failure among 22 patients.

Unlike Caucasians, Asian nose skin and soft tissues are usually thick. Therefore, only trimming the margin of the septal gap graft can avoid a problem of palpability, and there was no case of palpability in this study. However, if the skin of the nose and soft tissue are thin, it is necessary to prevent palpability by covering the septal gap graft with autologous soft tissue.

Septal gap graft can be used when patients are reluctant to insert the implant in nose and do not want to increase the height of the sellion. If the height of sellion is too low, the height of the tip cannot be increased enough only with tip plasty and septal gap graft, which can lead to patients’ dissatisfaction. So, the implant should be used in such cases. However, if the height of the rhinion (the most caudal point of the nasal bone) is high even if the height of the sellion is low, good results can be obtained by inserting the conchal cartilage into the sellion area, whereas performing the tip plasty only. Clear criteria should be studied further whether a dorsal silicone implant is required because the results of the tip plasty alone are not satisfactory.

Septal gap graft can only be possible under the premise that septal cartilage is sufficient. In our experiences, both septal gap graft and septal extension graft can be performed only when the harvested cartilage amount is more than 15 × 20 mm. Therefore, assuming that 10 mm L-strut is left on the septal cartilage, the criterion can be established that septal gap graft can be performed only when the size of the septal cartilage is more than 25 × 30 mm before surgery.

The amount of septal cartilage was predicted through CT scan before surgery. From 10 fresh cadaver studies,¹⁹ the average size of septal cartilage was 22.1 × 28.0 mm, and only 2 out of 10

cadavers were satisfactory to the 25 × 30 mm standard. However, according to the same paper, L-strut can be removed leaving only 5 mm in 3 conditions: (1) if the septum is not separated from the upper lateral cartilage, (2) if the L-strut is firmly attached to the anterior nasal spine, and (3) if the septal extension graft is well placed on the anterior nasal spine. Assuming that only 5 mm is left, 7 out of 10 cadavers are satisfactory to the 25 × 30 mm standard,¹⁹ and the septal cartilage can be sufficiently harvested for septal gap graft in most cases. In this regard, additional research is needed.

If the septal cartilage is very small, weak, or bent, a similar purpose can be achieved in the supratip area by grafting sufficient ear cartilage, or by overlapping septal cartilage. However, ear cartilage may not be structurally supportive as much as septal cartilage. Further research is needed on this as well.

This paper has its limitations of the number of cases and the follow-up period. The follow-up period ranged from 3 to 29 months, with an average of 13.2 months, and it was confirmed that the shape of the septal gap graft was well maintained during that period, so that the supratip depression did not occur. However, due to the nature of rhinoplasty, it is necessary to observe the result of a longer follow-up period and larger patient groups.

CONCLUSIONS

The authors presented a new technique for flat nose surgery in Asians. Septal gap graft is an effective and safe way to solve supratip depression without implant in flat nose surgery.

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