A novel surgical technique to correct caudal and high dorsal septal deviations: L-shape cutting and suturing on the septal L-strut (L-septoplasty)

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Abstract

Objectives: In general, deviation of the L-strut of the nasal septum is more challenging to correct than the middle and has less favorable results. This study aimed to develop a technique to correct the L-strut while preserving nasal support effectively and introduce the L-septoplasty technique and its effects.

Methods: Patients with caudal and high dorsal septal deviations who underwent the L-septoplasty technique were retrospectively analyzed. Preoperative and three-month postoperative comparative assessments included the Nasal Obstruction Symptom Evaluation (NOSE) scale and minimal cross-sectional area (MCA).

Results: Thirty patients seen at a tertiary care center were included. NOSE scale scores improved from 47.2 to 13.6, which was statistically significant ($P < .001$). MCA increased from 0.43 cm$^2$ to 0.74 cm$^2$ ($P < .001$). During the 3-month follow-up period, deviation correction was well maintained in all patients, and no surgical complications, such as saddle nose deformity, occurred.

Conclusion: The L-septoplasty technique is effective in simultaneously correcting caudal and high dorsal septal deviations without any complications.

Level of evidence: 4.

Keywords

nasal obstruction, nasal septum, patient reported outcome measure, postoperative, surgical procedure

1 | INTRODUCTION

Overall satisfaction with septoplasty varies widely. Issues that may affect the results include rhinological problems such as allergic rhinitis or structural problems such as a narrow nasal valve or deviated nose.1 Additionally, the curvature position in the nasal septum also plays a significant role. In general, deviation of the L-strut of the nasal septum is more challenging to correct than the middle and has less favorable results.$^2$ There are various techniques to correct the L-strut, but there is no clear choice.$^3$–$^15$

The L-strut serves as a pillar to hold up the nose so that an over resection may cause saddle nose deformity.$^3$ If the L-strut curvature remains, the nasal valve narrowing is not resolved. A simple cross-hatching incision weakens the L-struts support and may result in even...
more deviation. Batten graft for straightening the caudal septum is useful but may make it too broad or worsen dorsal septal deviation. The authors introduced a partial cutting and suturing technique for a more effortless and effective caudal septal deviation solution. In this technique, a partial horizontal incision is made to the L-strut. The overlapped cut edges are sutured to straighten the caudal deviation while preserving about 2 mm of the caudal end. This technique prevents nasal tip lowering and makes suturing easier. Statistically significant improvement of the Nasal Obstruction Symptom Evaluation (NOSE) scale score and widening of the minimal cross-sectional area (MCA) has been achieved with this technique.

In long-term follow-up, the NOSE scale score remained statistically improved with minimal change from the immediate postoperative to the 3-month postoperative period. However, nasal symptoms have recurred in a few cases, with most of them with uncorrected high septal deviation. Thus, the authors developed a technique to effectively correct caudal and high dorsal septal deviations while preserving nasal support. This report is to introduce this L-septoplasty technique and its effects.

2 MATERIALS AND METHODS

This study was conducted after obtaining approval from the institutional review board of the Ulsan University Hospital, South Korea. Patients with caudal and high dorsal septal deviations who underwent L-septoplasty technique after conservative treatment failure such as nasal irrigation were analyzed. The participants were 30 patients who visited our Otorhinolaryngology department from January 2018 to October 2020 with a chief complaint of nasal obstruction. Informed consent was obtained from all patients. A retrospective chart review was used to analyze preoperative and 3-month postoperative assessments, including the NOSE scale and MCA measured by an acoustic rhinometry. Complications such as postoperative bleeding, septal hematoma, abscess, and perforation were investigated.

Excluded patients were those who also had rhinoplasty due to deviated nose and other combined procedures that could alter the nasal flow, such as endoscopic sinus surgery and adenoidectomy except turbinoplasty.

2.1 Surgical procedure

Hemitransfixion incision was made 1 mm behind the caudal margin on the concave side of the anterior septum. After elevation of the incision side's mucoperichondrial flap, the deviated septal bone and cartilage were selectively removed, preserving at least a 1.5 cm-long L-strut. In detail, the deviated septal bone was removed with cutting forceps or septal scissors. Deviated cartilage separated from the L-strut was partially removed with a sickle knife or No. 15 blade. The remaining flat parts were preserved as much as possible and attached to the opposite perichondrium. A horizontal incision at the most curved area on the caudal L-strut was made with the No. 15 blade. At the point 2 – 3 mm away from the caudal margin, the incision was turned vertically, extending to 1 mm from the end of the dorsal septum, creating an L-shaped incision (Figure 1).

Using a Freer periosteal elevator, the mucoperichondrial flap on the other side was elevated through the incision on the L-strut. The high dorsal septum's curvature was flattened as it was separated from the caudal septum and mucoperichondrium. In some cases, a greenstick fracture was made at the dorsal septal bony deviation.

The L-strut reconstruction was performed by connecting the periosteal tissue of the anterior nasal spine and center of the L-strut with a 5-0 polydioxanone suture to correct the caudal and high dorsal septal deviation. With a vertical suture, the overlapping dorsal septum was bound to the caudal septum being supported by the soft tissue. The overlapping horizontal portion of the caudal septum was then sutured with a horizontal suture (Figure 2). All sutures were buried in the septal mucosa to prevent crust formation or loosening. After confirming the caudal and dorsal septum's straightening and the nasal cavity's widening, the hemitransfixion incision was closed with a 5-0 synthetic absorbable suture (Vicryl Rapide; polyglactin 910; Figure 3).

2.2 Statistical analysis

A paired t test was used to compare the preoperative and three-month postoperative results of the Korean version of the NOSE scale score and MCA. Statistical significance was determined based on a \( P < .05 \). We used statistical software (SPSS Statistics ver. 24; IBM Corp., Armonk, New York) to analyze data.

3 RESULTS

Thirty patients were included; all were male, with an average age of 38.4 years. No patients were revision cases. Twenty-three patients underwent combined turbinate surgery such as radiofrequency tissue volume reduction, microdebrider-assisted inferior turbinate, turbin- nate outfracture, and turbino-phagy as well. The surgery lasted for 20-55 minutes and averaged 33 minutes (Table 1). The NOSE scale scores before and after the surgery were 47.2 and 13.6, respectively, which were statistically significant \( (P < .001) \). MCA widened from 0.43 cm\(^2\) to 0.74 cm\(^2\) \( (P < .001) \). All patients showed a straight caudal septum and a broadened nasal valve in the endoscopic finding. During the follow-up period, deviation correction was well maintained in all patients, and no surgical complications, such as saddle nose deformity, tip ptosis, septal perforation, septal hematoma, postoperative bleeding, or infection, occurred.

4 DISCUSSION

Caudal septal deviation narrows the internal nasal valve, which is the narrowest area in the nasal cavity, making its correction the most vital aspect of a successful septoplasty outcome. However, the caudal
The septum is part of the L-strut that supports the nose, making it difficult and risky due to saddle nose deformity. Furthermore, if the caudal septal deviation is under-corrected, long-term satisfaction after surgery decreases.

The authors developed a partial cutting and suturing technique for an easier and more effective method for correcting caudal septal deviation and published the positive results in a previous study. Symptom relief was confirmed for an average of 29 months of follow-up (not published). Several patients showed worsening NOSE scale scores than the 3-months postoperative outcomes, and most of them were found to have high dorsal septal deviation. The authors developed the L-septoplasty technique—a modification of the partial cutting and suturing technique to resolve this problem.

In a previous study, the NOSE scale score changed from 43.5 to 11.0 using the partial cutting and suturing technique, and the scores changed from 47.2 to 13.6 using the L-septoplasty technique. The MCA on the convex side widened from 0.49 cm² to 0.65 cm² in that study and changed from 0.43 cm² to 0.74 cm² using the new method.
This study was for patients with high dorsal septal deviation associated with caudal septal deviation, with severe deviations and symptoms. Excellent results were still achieved.

Unlike caudal septal deviation, only a few studies have addressed the correction of high dorsal septal deviation. Kang et al reported a modified mattress suturing technique for correcting high dorsal septal deviation at the keystone area.7 Lee et al introduced a method that placed wedge-formed septal cartilage or bone between the nasal cartilaginous septum and the perpendicular ethmoid plate.8 However, these methods could result in a recurrence of the deviation as the suture or wedge is absorbed. There are limitations when applying this technique to patients with severe septal deviation. Nasal septal deviation has a larger septum than the central plane of the nasal cavity, so pulling or pushing from one side is usually not an acceptable solution.

Alternatively, extracorporeal septoplasty is a method of creating a new L-strut by separating the L-strut and adjusting the length accordingly, resulting in a straight septum and more satisfying results.9 Most et al. reported the improvement of NOSE scale scores (from 68.2 to 21.1) using anterior septal reconstruction, a modified extracorporeal septoplasty technique.10 Nonetheless, these techniques need an open approach which takes more time and adds the burden of a columellar incision scar, making it difficult to apply unless accompanied by a deviated nose.11 In a study comparing results of open and closed septoplasty, NOSE scale scores showed better improvement in open septoplasty but without statistical significance.12

L-septoplasty technique is an endonasal technique that only needs a hemitransfixion incision on one side of the septum. Through the L-shape incision on the caudal septum, the opposite mucoperichondrial flap can be elevated; hence, the effect of soft tissue memory can be preventable. An L-shape incision and the overlapping septum provide the optimal L-strut length for the central nasal plane, so simultaneous correction of the caudal and high dorsal septal deviations can be achieved, resulting in favorable results. Partial resection of the L-strut or detachment of the bony-cartilaginous junction is not needed; therefore, the risk of saddle nose deformity is lower. With relatively easy suturing and no batten grafting, firm yet thin septal reconstruction is achievable.

There are some limitations to the L-septoplasty technique. It is challenging to apply this technique when the nasal septum is dislocated from the maxillary crest or when the caudal septum is completely angulated. Bony high septal deviation is also difficult to correct, although the careful application of a greenstick fracture can be helpful. When associated with a deviated nose, rhinoplasty and anterior septal reconstruction via an open approach are recommended.

5 Conclusion
The L-septoplasty technique is effective in correcting caudal and high dorsal septal deviations simultaneously. It employs a closed approach, unlike extracorporeal septoplasty or anterior septal reconstruction, requiring an open approach for the L-strut deviation correction. Further research is needed comparing this technique with other techniques and investigating the long-term outcomes.

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Conflicts of Interest
The authors declare no potential conflict of interest.

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