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Investigation of the Short-Term Functional Outcomes and the Impact on Nasal Tip Shape of the Caudal Septal Batten Grafting Technique

Kaudal Septal Batten Greftleme Tekniğinin Kısa Dönem Fonksiyonel Sonuçlarının ve Burun Ucu Şekli Üzerindeki Etkisinin Araştırılması

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ABSTRACT

Objective: Septoplasty is a common rhinological intervention. We aimed to evaluate the effectiveness of septoplasty techniques applied to patients with septal deviation.

Materials and Methods: 300 patients admitted to our clinic in 2022 and 2023 and underwent septoplasty were involved and divided into two groups: The "Caudal", which used a caudal septal batten graft, and the "Classic", which involved the 2-5 region, where the caudal septum was not touched. The patients' conditions were evaluated by applying the NOSE scale preoperatively and postoperatively in the 1st and 3rd months.

Results: Our study included 223 patients who came for follow-up visits and consented to participate. The preoperative, postoperative 1st and 3rd month NOSE scale average scores of the "Caudal" group were 12.3±3.7, 5.4±2 and 2.8±1.2, respectively. In the "Classic" group, the values were 9.3±2.1, 5±1.4 and 3.3±1 and significantly different ($p<0.001$). When a comparison was made between the two groups, the changes in the postoperative 1st month were not found to be significantly different ($p=0.152$). In contrast, the preoperative and postoperative 3rd month results were different ($p<0.001$).

Conclusions: Septal batten grafts can be considered a useful endonasal technique in septoplasty surgery. Studies with more extended follow-up periods are needed.

Keywords: Batten graft, caudal septum, septoplasty

ÖZ

Amaç: Septoplasti en yaygın rinolojik cerrahi prosedürlerden birisidir. Bu çalışmada septum deviasyonu nedeniyle hastalara uygulanan septoplasti tekniklerinin etkinliğini değerlendirmeyi amaçladık.

Materyal ve Metot: 2022 ve 2023 yıllarında kliniğimize başvuran ve septoplasti operasyonu geçiren 300 hasta çalışmaya alındı. Hastalar septumdaki patolojinin özelliğine ve yapılan cerrahinin şekline göre; kaudal septal batten greft kullanılan "Kaudal" grup ve 2-5. bölgeyi içeren ve kaudal septuma dokunulmayan, Cottle metodu kullanılan "Klasik" grup şeklinde iki gruba ayrıldı. Hastalara preoperatif, postoperatif 1. ve 3. aylarda NOSE skalası uygulanarak durum değerlendirmesi yapıldı.

Bulgular: Çalışmamıza takip ziyaretleri için gelen ve katılmayı kabul eden 223 hasta dahil edildi. Kaudal grubun ameliyat öncesi, ameliyat sonrası 1. ve 3. aydaki NOSE ölçeği puan ortalamaları sırasıyla 12,3±3,7, 5,4±2 ve 2,8±1,2 olarak belirlendi. "Klasik" grupta ise değerler 9,3±2,1, 5±1,4 ve 3,3±1 olup anlamlı derecede farklıydı ($p<0,001$). İki grup arasında karşılaştırma yapıldığında ameliyat sonrası 1. aydaki değişiklikler anlamlı olarak farklı bulunmadı ($p=0,152$). Buna karşın ameliyat öncesi ve ameliyat sonrası 3. ay sonuçları farklıydı ($p<0,001$).

Sonuç: Dikkatli hasta seçimi ve doğru uygulama planlaması sayesinde septal batten greftler, günümüzün septoplasti cerrahisinde en yararlı endonazal tekniklerden biri olarak kabul edilebilir. Hastaların daha uzun takip süresi ile değerlendirildiği gelecek çalışmalara ihtiyaç duyulmaktadır.

Anahtar Kelimeler: Batten greft, kaudal septum, septoplasti

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INTRODUCTION

Nasal obstruction presents a pervasive and bothersome symptom, often stemming from physical blockages within the nasal passages and associated physiological issues like rhinitis and rhinosinusitis.[1] Treatment avenues encompass a range of medications, including antihistamines, decongestants, and steroids, alongside surgical interventions aimed at rectifying anatomical impediments.[1] Among these, the deviated nasal septum emerges as a significant culprit, particularly in caudal nasal septal deviation cases.[1-3] Given the intricate nature of the septal cartilage's structural support, addressing such deviations poses a challenge, compounded by the inherent resilience of cartilaginous memory.[1,4] The diversity of surgical techniques employed underscores the ongoing quest for effective management strategies tailored to the complexities of caudal septal deviation.[1]

Septoplasty stands as a cornerstone procedure within the realm of rhinological surgery, addressing not only functional concerns related to nasal airflow but also contributing to the aesthetic harmony of the nose. The intricate array of septal deformities presents a challenge, as no single technique can universally rectify the diverse deviations encountered. Convexity, concavity, and angulation represent prevalent deformities within the septal cartilage landscape.

Numerous conventional surgical methods, such as wedge resection, submucous resection, suture techniques, and cross-hatching incision, have shown limitations in achieving reliably consistent results in septoplasty procedures.[5,6] Despite initial correction attempts, septal deviation recurrence remains a common issue, often due to inadequate correction or excessive manipulation during surgery, leading to complications like loss of nasal tip support, collapse of the nasal valve, or saddle nose.[7] Recognizing the challenges and limitations associated with these traditional endonasal septoplasty techniques, there's a growing imperative to explore alternative approaches to improve surgical outcomes.

Our study aims to scrutinize the efficacy of various septoplasty techniques in patients seeking relief from nasal breathing difficulties attributable to deviated septum.

MATERIALS AND METHODS

Ethics Committee Approval: Our study was approved by the Sakarya University Ethics Committee (Date: 13.06.2022, decision no: 75). The study was carried out following the international declaration of Helsinki.

After obtaining local ethical committee approvals, our study was initiated. A total of 300 patients who presented to our clinic with complaints of nasal obstruction and were determined to require septoplasty based on examination and necessary imaging techniques in 2022 and 2023 were included in the study. Consent forms confirming participation in the study were obtained from each patient.

The patients were categorized into two groups according to the septal pathology's characteristics and the specific surgical procedure undergone:

"Caudal" Group: This group included patients who underwent septoplasty using caudal septal batten graft.

"Classic" Group: Patients in this group underwent septoplasty using the Cottle method, which involves the manipulation of the 2-5 region of quadrangular cartilage without affecting the caudal septum.

Patients underwent satisfaction assessments using the NOSE (Nasal Obstruction Symptom Evaluation) scale at preoperatively, 1st and 3rd months postoperatively. The gathered data underwent statistical analysis utilizing the SPSS 22.0 software package to evaluate satisfaction levels and potential differences between the two surgical groups.

The Surgical Procedure of Caudal Septal Batten Grafting Technique:

***Harvesting the Graft*:** Cartilage segments from the deviated portions are extracted to create a graft of equal length to the anterior septum, shaped in a strip -like form.

Graft Placement: The prepared graft is then placed onto the concave portion of the deviated caudal septum using permanent sutures.

Securing the Graft: Subsequently, the caudal septum is suspended superiorly and inferiorly from the nasal tip and subnasal region using anchor sutures in the midline. Eight sutures are used to secure the base, with fixation between the maxillary crest and anterior alar cartilage medial crura.

Completion: Once the graft is securely positioned and anchored, the procedure is finalized.

This technique aims to provide structural support and correction to the deviated caudal septum, thereby improving nasal airflow and addressing associated symptoms of nasal obstruction (Figure 1).

***Inclusion Criteria for the Study*:** Patients with the following characteristics were included in the study: age between 18 and 65 years; patients experiencing nasal obstruction attributed to septal pathology; patients with caudal septal deviation; patients without coagulopathy; and patients who expressed their readiness to take part in the study.

***Exclusion Criteria for the Study*:** Patients with the following characteristics were excluded from the study; patients who have undergone previous nasal surgery; patients who had mild septal deviation; patients with coagulopathy; patients unsuitable for general anesthesia; and patients with a desire for an

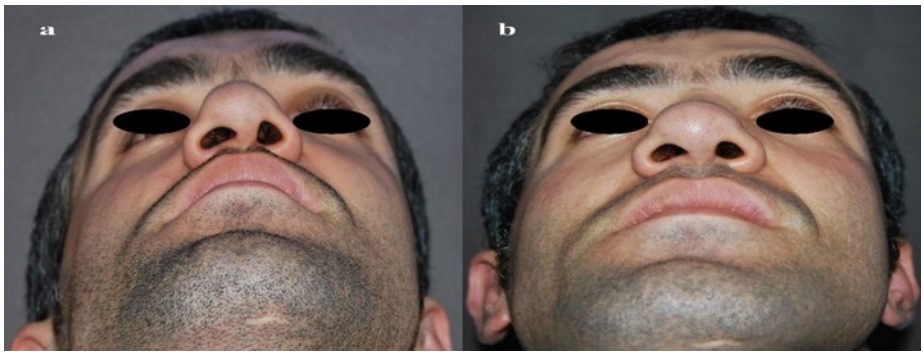

Figure 1. Photos of the patient who underwent caudal septal batten graft technique.
(a) Preoperative photo, (b) 3rd month postoperative photo

aesthetic nasal correction.

Statistical Analysis: Statistical analysis was performed using SPSS 22.0 (IBM, Armonk, NY, USA). A significance threshold of $p<0.05$ was used. Data from quantitative variables were represented as mean standard deviation (SD). Repeated measures ANOVA and paired sample t-tests were used for data analysis (preoperative and postoperative NOSE scores).

RESULTS

In our study, a total of 223 patients who attended all assessments and agreed to participate were included. In the "Caudal" group, there were 115 patients, comprising 41 females and 74 males, with a mean age of 37.5±13.5 years (range: 18-74). In the "Classic" group, there were 108 patients, including 37 females and 71 males, with a mean age of 38.8±13.3 years (range: 19-69). There were no statistically significant differences in age and gender between the two groups ($p>0.001$). Patient characteristics are given in Table 1.

In the "Caudal" group, the mean NOSE scale scores were found to be 12.3±3.7 preoperatively, 5.4±2 at 1 month postoperatively, and 2.8±1.2 at 3 months postoperatively. Significant differences were observed between the preoperative and postoperative time points ($p<0.001$). In the "Classic" group, the mean NOSE scale scores were 9.3±2.1 preoperatively, 5±1.4 at 1 month postoperatively, and 3.3±1 at 3 months postoperatively. Statistically significant differences were also observed between the preoperative and both postoperative time points ($p<0.001$) (Table 2).

When comparing the two groups, no significant difference was found in the changes in NOSE values at the postoperative 1-month assessment ($p=0.152$). However, significant differences were observed between the preoperative and postoperative 3-month results ($p<0.001$, $p<0.001$) (Table 2).

Table 1. Patients characteristics.

Variables		**Caudal Group (n=115)**	**Classic Group (n=108)**
Age, Mean±SD, (min-max), yr		37.5±13.5 (18-74)	38.8±13.3 (19-69)
Sex, n %	**Male**	74 (64.3)	71 (65.7)
	Female	41 (35.7)	37 (34.3)
Type of surgey	**Primary**	115	108
	Secondary	0	0
Follow-up (mean), **months**		1.3 (0.5-3.5)	1.4 (0.5-4)
Turbinate surgery	**Yes**	100	97
	No	15	11
Postoperative complication		0	0

n: Number; min: Minimum; max: Maximum; SD: Standard deviation.

Table 2. Statistical analysis of NOSE scores of the patient groups.

Scale	**Groups**	**Preoperative**	**Postoperative (1 month)**	**Postoperative (3 month)**	**p-values***
NOSE Scale	**Caudal**	12.3±3.7	5.4±2	2.8±1.2	p<0.001
(mean±SD)	**Classic**	9.3±2.1	5±1.4	3.3±1	p<0.001
	p values**	p<0.001	p=0.152	p<0.001	

NOSE: Nasal Obstruction Symptom Evaluation; p value*: Statistical analysis between the preoperative and both postoperative time points in the same group (One-way ANOVA); p-value; **: Statistical analysis of the preoperative and postoperative scores between groups (paired T-test); SD: Standard deviation.

DISCUSSION AND CONCLUSION

Previous studies have identified various caudal septal deviations, including deviations and displacements such as anterior subluxation, S or C-shaped deviations, and combinations of vertical and/or horizontal deviations.[8-11] Modification of caudal septal deviation is considered one of the greatest challenging health issues in septal surgery. While scoring, excision, swing-door techniques and extracorporeal endonasal septoplasty have been described for correcting deviations of caudal septum, these techniques may not suffice for high-level caudal septal deviations.[8,12,13] In our study, we performed unilateral batten graft application for high-level deviations of the caudal septum, where the caudal septum was dissected at the base, excess portions were excised, and the batten graft was applied.

Our study's findings indicate that dissection of the caudal septum at its base, followed by strip excision and unilateral batten graft placement, can effectively alleviate nasal obstruction symptoms. A notable reduction in postoperative NOSE scores (88.4) is apparent compared to preoperative scores (28.9). Approximately 65% of patients reported "significant improvement" in nose-related obstruction, while 28% reported "improvement." Additionally, postoperative nasal septum examinations revealed a straight septum in 79% of patients. In a study utilizing dissecting the caudal septum at its base and using unilateral batten grafts to correct the deviation of the caudal septum, authors observed improvement in nose-related obstruction manifestations in the patients and NOSE scores changed from 43.5 to 11.[2] In a study, it was reported that in cases of caudal septal deviation, in the period following anterior septal reconstruction, the preoperative NOSE scores declined from 68.2 to 21.1.[14] Hosokawa et al. reported that NOSE scores were 77.5 preoperatively and 5 postoperatively and the postoperative score was significantly lower than the preoperative score.[12]

Cheon et al. have recommended the use of caudal septal division and unilateral cartilage batten grafts for correcting deviations of caudal septum.[2] Following the division of the caudal septum, they positioned the cartilage pieces to overlap and then secured the batten graft onto the concave side with sutures. The overlapping of the cut pieces may cause the upper piece to protrude to one side, potentially hindering the creation of a completely straight septum. However, with the approach we employed, the removal of the projecting portion of either the upper or lower segment, followed by the insertion of the batten graft onto the concave side, led to a more aligned septum. Additionally, none of our cases showed any decrease in the height of the caudal septum or the subsequent development of a saddle nose deformity. This finding may be attributed to cartilage grafts and strip removal in our patients, which may lower the risk of bending.

The surgical method we described may have some potential drawbacks. Firstly, unilateral placement of the cartilage batten graft may cause unilateral narrowing of the nasal cavity. However, in our study, none of the patients experienced unilateral nasal cavity narrowing or associated nasal obstruction. This could be attributed to our positioning of the graft closer to the concave side and adequate cartilage thinning. Previous studies have noted slight constriction of the nasal passages and no significant nasal obstruction resulting from unilateral bone batten graft applications.[9,11] Secondly, a recurrence of deviation may occur due to the absorption of the graft. However, prior studies have shown minimal absorption due to the membranous structure of the ethmoid bone.[7] Thirdly, a potential disadvantage of the method could be the shortening of the caudal septum, leading to a saddle nose deformity. Nevertheless, none of our patients demonstrated a saddle nose deformity.

In conclusion, septoplasty techniques employed for septal deviations are effective surgeries that provide significant symptom improvement in patients in the near to mid-term. Particularly, using batten grafts represents a safe and successful surgical technique for correcting moderate to severe cartilaginous septal deviations that cannot be fully corrected with traditional methods. Given meticulous patient selection and thoughtful planning during implementation, septal batten grafts emerge as a highly advantageous endonasal technique within contemporary septoplasty procedures. Future studies evaluating patients over more extended follow-up periods are needed to assess the outcomes further.

Ethics Committee Approval: Our study was approved by the Sakarya University Ethics Committee (Date: 13.06.2022, decision no: 75). The study was carried out following the international declaration of Helsinki.

Conflict of Interest: No conflict of interest was declared by the authors.

Author Contributions: Concept – MG, OKE; Supervision – MG, EMG; Materials – OKE, EHA; Data Collection and/or Processing – OKE, EHA; Analysis and/or Interpretation – OKE, MG; Writing –OKE, MG, EMG, EHA.

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