



A Study on Septoplasty and Functional Septorhinoplasty in Children

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Received: 14 June 2024 / Accepted: 4 August 2024
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Abstract

Surgical techniques that are safe and effective in adults can produce bad results in children. The study was done To present the results of septoplasty and functional septorhinoplasty (FSR) in children in order to restore the anatomy and function of the nose. In a prospective study done in a tertiary care hospital between May, 2016 and November, 2022, twenty-five children (14 males and 11 females) aged 8 to 14 years having significant nasal obstruction due to deviated septum with or without external nasal deviation were included in this study. Septoplasty was done in 16 patients and FSR was done in 9 patients by endonasal technique. Surgical outcomes were evaluated by comparing preoperative and postoperative photographs, NOSE scores, anterior rhinoscopy and subjective satisfaction. The follow-up period ranged from 15 to 90 months with a mean follow-up period of 43 months. Out of the 25 patients, the mean NOSE scores preoperatively and postoperatively were 72 and 22 (a significant improvement of mean 50.00 with p-value of <0.05). Anterior rhinoscopy postoperatively showed that 19 patients (76%) had a straight septum while 6 patients (24%) had some residual deviation. Subjective patient satisfaction was “much improved” in 13 (52%) patients, and “improved” in 12 (48%) patients. In photographic evaluation of 9 patients with external nasal deviation the result was very good in 3, good in 5 and average in 1 patient. Septoplasty and FSR in children resulted in significant improvements in nasal airway and external nasal deviation.

Keywords Septoplasty · Septorhinoplasty · External nasal deviation · NOSE score

Introduction

Nasal septal surgery and rhinoplasty in children have always been controversial. Such debates arise from the different findings and views found in human and animal studies. Traditionally, most surgeons wait till an empirical age of 16 to 18 years to avoid the possible adverse effects. Many observations on the retarded growth of the nose following submucous resection of septum led to the restriction in surgery in children [1]. However, some studies reported that surgery

limited to certain areas of the bony and cartilaginous nasal framework is less likely to affect natural growth patterns.

The septum, maxilla, and premaxilla develop independently of one another and septoplasty can be done in pediatric patients with gross septal deformity successfully. Septal deviations usually worsen with the growth of the nose leading to infections of upper respiratory tract and middle ear cavity. Deviations of the caudal part of the septum are commonly found to cause symptoms. Dental problems, malocclusion, facial deformities, and pulmonary hypertension or cor pulmonale may develop when septoplasty is not performed during childhood [2]. However, dissection and removal of septal cartilage and bone should be conservative and minimal, and surgery should be restricted to the deviated part of the septum [3]. Lawrence (2012) mentioned that, septoplasty can be done in a 6-year-old child [4].

In western people, maximum growth of the nose is seen between ages 8 and 12 years in girls and at 13 years in boys. Gradual ossification occurs at the septal cartilage. The perpendicular plate of the ethmoid expands from an area near the anterior skull base in the anteroinferior direction [3]. In adults, about 60% of the septum is made of bony

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components. Septoplasty surgeries have been regularly done in children since the 1970s [4]. Some studies observed that, children undergoing septoplasty or FSR operations had craniofacial growth measurements similar to normative data, even after long-term follow-up [4, 5].

The aim of this study is to evaluate postoperative improvements in nasal airway and external nasal deviation following septoplasty or, FSR in children.

Materials and methods

Twenty-five children aged 8 to 14 years presenting with nasal obstruction due to deviated septum with or without external deviation of nose at ENT OPD willing to undergo surgery were included in this study. Patients with complaints of nasal obstruction because of deviated septum associated with hypertrophied turbinate, concha bullosa and allergic rhinitis, those who were unfit for general anesthesia and have previous history of undergoing septoplasty or rhinoplasty operation were excluded from this study.

It is a prospective study done at the Department of ENT of a tertiary care hospital. Age at surgery ranged from 8 to 14 years (mean age, 11.5 years) who underwent septoplasty or, FSR between May, 2016 and November, 2022. Fourteen of the patients were boys and 11 were girls. The follow-up period ranged from 15 to 90 months with a mean follow-up period of 43 months. Only septoplasty was done in 16 patients and FSR were done in 9 patients. In 9 patients of FSR, intranasal lateral osteotomies and percutaneous transverse osteotomies were done. All the cases were done by endonasal technique. The preoperative and postoperative NOSE (Nasal Obstruction Symptom Evaluation) score, anterior rhinoscopy, subjective assessment and preoperative and postoperative photographs were used to measure surgical outcomes.

Due ethical clearance was taken from Institutional Ethical committee. Informed consent was taken from all the patients and their parents.

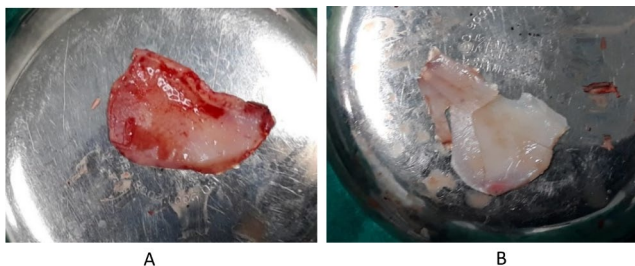


Fig. 1 Deviated excised cartilage (A) can be made straight by incisions (B) and replaced between the mucoperichondrial flaps and sutured with the remnant cartilage

Procedure

All surgeries were done under general anesthesia after proper pre-operative checkups and consent. During septoplasty in children, special precautions are taken to preserve the mucoperichondrium, the growth areas (e.g., caudal part of the septum), the anterior nasal spine, and the sutural junctions with the vomer and perpendicular plate. The septum in children is formed mainly by septal cartilage; the contribution of the vomer and perpendicular plate of ethmoid is less. During operation, septal cartilage should not be separated from the perpendicular plate, especially at the dorsal part because this area is important for the length and height of the nasal dorsum and septum. If there is caudal dislocation of septum, then it should be sutured into the columellar pocket created between the medial crura. When upper lateral cartilages are detached from the dorsal border of septum bilaterally, they should be restored to prevent deformity of the cartilaginous nasal dorsum [6].

During septoplasty, the pieces of removed septal cartilage are made straight and replaced in between the mucoperichondrial flaps because even after operative trauma, the septal cartilage has some regenerative capacity [7] (Fig. 1). Mucoperichondrium should not be torn during septoplasty as it is essential for cartilage regeneration and survival of transplanted cartilage. Both patient and parents should be informed that late results are unpredictable and some cases of septorhinoplasty in children may require a revision surgery in adult age. Septorhinoplasty can be done in children in selected candidates for greater functional and anatomic results. The surgery should be conservative and hump removal or other aesthetic procedures should not be done. Septum should not be separated from the upper lateral cartilages. Endonasal lateral osteotomies and percutaneous paramedian and transverse osteotomies can be done if indicated (Figs. 2, 3 and 4).

Results

25 patients presenting with symptoms of nasal obstruction due to deviated septum with or without external deviation of nose were taken up for surgery. The follow-up period ranged from 15 to 90 months with a mean follow-up period of 43 months. Of 25 patients, 14 (56%) were males and 11 (44%) were females, with the age range (at operation) from 8 to 14 years (mean age, 11.5 years). In 9 patients of FSR, intranasal lateral osteotomies and percutaneous transverse osteotomies were done. All the cases were done by endonasal technique.

Patients having both functional and aesthetic problems were 9 (36%). The preoperative and postoperative NOSE

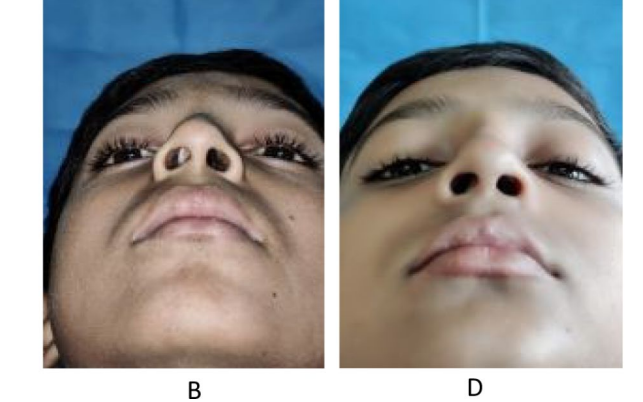


Fig. 2 A to D: (A and B) Preoperative and (C and D) postoperative views of caudal dislocation of septum with deviated nose in a 10-year-old child, corrected by septoplasty, percutaneous transverse and intranasal lateral osteotomies

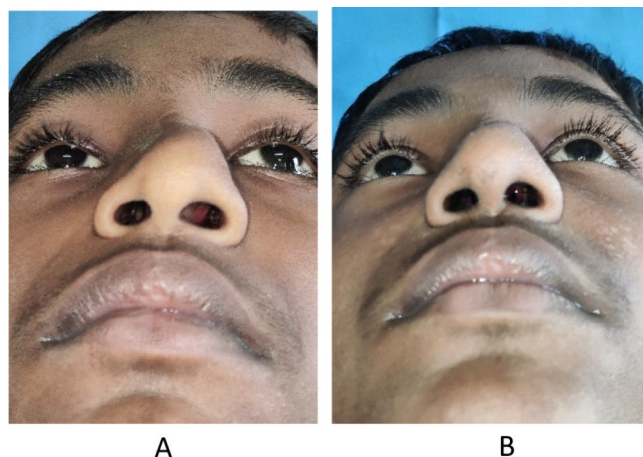


Fig. 3 A and B: (A) Preoperative and (B) postoperative views of deviated nose with DNS to left in a 10-year-old child, corrected by septoplasty, percutaneous transverse and intranasal lateral osteotomies

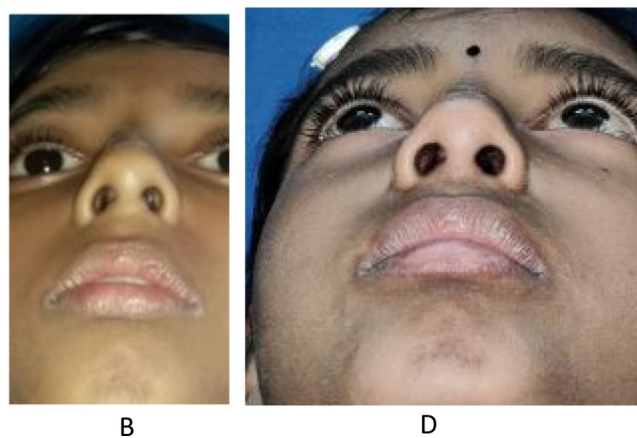
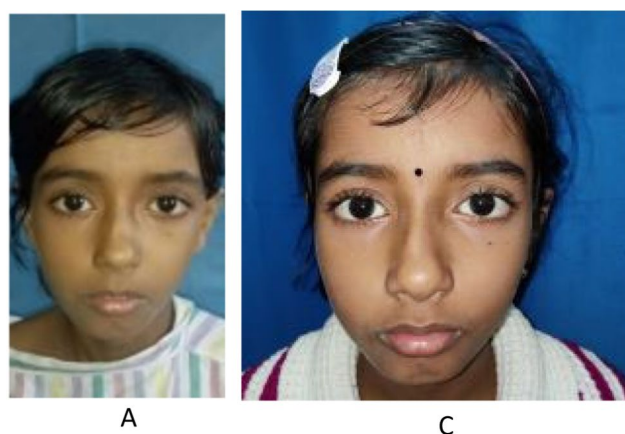


Fig. 4 A to D: (A and B) Preoperative and (C and D) postoperative views of deviated nose with DNS to right in a 10-year-old child, corrected by septoplasty, percutaneous transverse and intranasal lateral osteotomies

score, anterior rhinoscopy, subjective assessment and photographs were used to measure surgical outcomes. Nasal Obstruction Symptom Evaluation (NOSE) questionnaire consists of five self-rated items, each scored from 0 to 4. The score represents the sum of the responses to the five individual items and multiplying the sum by 5. The final score ranges from 0 to 100.

Out of the 25 patients, the mean NOSE scores preoperatively and postoperatively were 72 and 22 (a significant improvement of mean 50.00 with p-value of <0.05 using paired t test). Anterior rhinoscopy postoperatively showed that 19 patients (76%) had a straight septum while 6 patients (24%) had some residual deviation. Subjective patient satisfaction was “much improved” in 13 (52%) patients, and “improved” in 12 (48%) patients. In photographic evaluation of 9 patients with external nasal deviation the result was very good in 3, good in 5 and average in 1 patient. Three patients had postoperative synechia which were managed conservatively.

Discussion

The growth of the nose is faster during the first two years after birth and during puberty compared to other periods of life. The septal cartilage has two thicker areas or growth zones with different mitotic activity extending from the sphenoid. The “sphenodorsal” zone is present between the sphenoid and the nasal dorsum and contributes in the normal increase in height and length of the nasal dorsum. The “sphenospinal” zone is present between the sphenoid and the nasal spine and is responsible for the forward outgrowth of the premaxillary region [8]. The thinner part of septal cartilage does not contribute in the growth of the nose and face. Trauma, surgery, septal hematoma and septal abscess cause destruction of the growth zones during childhood and result in underdevelopment of both the nose and the maxilla.

Surgical techniques that are safe and effective in adults can produce bad results in children. Based on many clinical observations, guidelines have been developed for conservative septorhinoplasty in children to lessen the risk of growth inhibition or progressive malformations of the nose [9, 10]. Mucoperichondrial elevation and tunnelling on one or both sides of the septal cartilage and elevation of the soft tissue envelope from the nasal skeleton can be done safely as long as the nasal skeleton remains intact. Both endonasal and external approaches can be done but cartilage-splitting techniques should be avoided. Partial removal or full thickness incisions on the sphenodorsal zone will lead to inhibition of growth of the nasal dorsum and septum. Similarly damage to the sphenospinal zone will result in underdevelopment of the nasal spine and the maxilla. Scoring over deviated septal cartilage do not produce predictable results and thus should be avoided. Damage to the thinner central part of the septal cartilage does not inhibit growth of the septum. Separation of the septal cartilage from the perpendicular plate of ethmoid inhibits further growth of the nasal septum and dorsum. The fibrous connection between the septal cartilage and the nasal spine should not be removed as it holds the septum in the midline and plays a role in the forward outgrowth of the maxilla. Removal of the deviated premaxilla and vomer does not disturb the normal outgrowth of the nose [11]. In nasal injury, fractures of the septum are identified and a straight septum is reconstructed after mobilizing deviated or overlapping fragments of cartilage. In case of deficiency of septal cartilage, autologous conchal or rib cartilage can be used. Homologous cartilage is not capable of growth and may cause inhibition of growth when implanted in the growing septum. Different osteotomies of the bony nasal vault and alar base wedge resection can be done without causing growth inhibition. Upper lateral cartilages should not be separated from the septal cartilage as there will be outgrowth of the septum anterior to the upper

lateral cartilages leading to irregularities of the nasal dorsum. Hump reduction and the placement of spreader grafts disturb the T-bar structure of the cartilaginous vault and therefore should be delayed till the puberty. Grafts for dorsal augmentation may cause unpredictable results and thus should be avoided. Since the present study contributes significantly to the debate on septoplasty in children, we can review the results of work done in animals. Reports of different experimental works are divided to some extent. Procedures on the nasal septum with resection of the cartilage and tear of mucoperichondrium were found to cause significant deformity and growth retardation in rodents [12, 13]. Even after preservation of mucoperichondrium other authors have found the same results in rodents [14]. On the other hand, septoplasty preserving the mucoperichondrium, especially those with reimplantation of resected septal cartilage produced fewer [15–17] complications.

There is histological evidence of a reduction in the rate of growth of the septal cartilage by age 5 years and that deceleration starts by age 8 years [18].

The main problem in septorhinoplasty in children is not the age-specific anatomy but the inadequate wound-healing capacity of the septal cartilage. The tendency to integrated healing of the transected or fractured septal cartilage is very low, even when the perichondrium has been saved, and disconnected ends of the cartilage tend to overlap, leading to increasing or recurrent deviations [1].

In a study with 136 pediatric patients with nasal obstruction, 52 (38.2%) underwent septoplasty while 84 (61.8%) underwent FSR. There was a statistically significant decrease in NOSE score from preoperative 75 in septoplasty and FSR to postoperative 20 in septoplasty and 15 in FSR [19].

In a review study (2017) on pediatric rhinoplasty, aesthetic dissatisfaction (11.8%) and nasal obstruction (5.6%) were the main postoperative complications. Revision surgeries were done in 13.5% of the cases [20].

In another study (2013) rhinoplasty was performed on 64 Korean children between 4 and 17 years of age due to a deviated nose, flat nose, nasal mass, hump nose etc. Seventeen patients (26.6%) experienced esthetic dissatisfaction and 12.5% of the cases had postoperative nasal blockage. Revision surgery was done in 9.4% of the cases. The study indicated that surgeons should have a conservative attitude and apply strict indication in selecting pediatric rhinoplasty patients [21].

Conclusion

Septoplasty and FSR in children result in significant improvements in nasal airway and external nasal deviation. It is safe in children, with no major effects on craniofacial growth, if it is done in a conservative manner.

Acknowledgements Not applicable.

Declarations

Consent for Publication Not Applicable.

Competing Interests The authors declare that they have no competing interests.

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