

Quality of life in children following nasal septal surgery: A review of its outcome

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ABSTRACT

Nasal septal surgery among children remains controversial because of its adverse effect on craniofacial development. Recent studies, however, have demonstrated that early nasal septal correction prevents the midfacial and nasal growth deformity that is the inevitable consequence of nasal septal abnormality. Nasal septal surgery in children has been reported to lead to significant improvement in quality of life. We reviewed the existing literature to evaluate the outcomes of pediatric nasal septal surgery.

KEYWORDS

Children, Deviated nasal septum, Septoplasty, Rhinoplasty, Quality of life

INTRODUCTION

Nasal septum deformity among the pediatric population ranges between 0.93% and 55%, and differs according to age and type of deformity.¹ Although septoplasty is a common procedure in adults, it is not routinely performed in children, usually being withheld until the child reaches adolescence because of concern over the adverse effects on nasal and facial growth.² The argument against pediatric septoplasty asserts that by resecting septal cartilage, disruption of the ventral and caudal projection of the nose may occur.³ Similarly, concerns have been raised that earlier nasal septal surgery may lead to disruption in function as well as in growth and facial development.⁴ Appropriate timing for septoplasty among children remains uncertain at present because completion of nasal growth occurs at the age of 16 years in males and 14 years

in females. However, some centres have recently opted for an earlier age for septoplasty when indicated, and if it is considered that the benefits outweigh the risks.²

Objective assessments of pediatric septoplasty have shown positive outcomes. In their prospective study, Can et al⁵ revealed that acoustic rhinometry is a useful objective tool for measuring septoplasty outcomes in children. However, objective measurements may not always reflect satisfaction among patients and are prone to examination bias. Subjective measurement of patient satisfaction using questionnaires to assess the quality of life (QoL) following nasal septal surgery is equally important in reflecting the outcomes. Although QoL may be arduous to quantify or describe, it encompasses several subjective perceptions of an individual's emotional, social and physio-psychological factors. This review aims to evaluate the outcome of nasal

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septal surgery in children in terms of QoL.

METHODS

A literature search was conducted by searching English-language articles published in Pubmed, Embase, Scopus and Cochrane Collaboration databases. We considered all relevant papers published during the period starting from January 1980 to March 2019. The following words were utilised either individually or in combination: septoplasty, septorhinoplasty, nasal septal surgery, deviated nasal septum, pediatrics, children, congenital, acquired, quality of life. Some of the information provided in the articles was counter-checked and compared with that in standard textbooks. Initially abstracts were reviewed followed by full text review if the article were relevant. Only studies with data for pediatrics patients; below 18 years of age post-nasal septal surgery, who were evaluated via subjective assessment tool were included. Articles were excluded if no clear information were mentioned on follow-up. The outcome was defined as the success of the intervention determined based on subjective evaluation of the patient’s nasal obstruction symptom. A good outcome is defined as significant improvement, a fair outcome as average improvements and bad outcome as no improvements in the QOL scores.

RESULTS

A total of 131 articles were retrieved from the electronic databases. Five articles concerning both short-term and long-term QoL after pediatric nasal septal surgery were selected (Table 1). Subjective assessment tools used in these studies include the Glasgow Children Benefit Inventory (GCBI),⁶ Visual Analogue Score (VAS),⁷⁻⁹ 5-item Sinus and Nasal QoL (SN-5),⁸ Nasal Obstruction Symptom Evaluation (NOSE),^{7,9,10} and EuroQol 5-Dimension Health Assessment (EQ5D) questionnaires.⁹ VAS is a subjective tool whereby patients can demonstrate their overall

satisfaction, with a score of 1 meaning least satisfied and 10 maximum satisfaction along a 10-centimeter line. SN-5 is a sinus- and nasal-specific QoL survey whereby five items are scored on a scale from 1 to 7. An overall score is calculated as the mean of all five items, ranging from 1 to 7, with higher scores indicating more severe symptoms. The NOSE scale is a specific scale based on symptoms whereby patients must score five different symptom-specific questions, with 0 meaning no problem and 4 a severe problem. These are then calculated with a total score ranging from 0 to 20, which is then multiplied by 5. The higher the score, the more severe are the symptoms. Stewart et al¹¹ devised the NOSE scale, a brief yet simple QoL instrument specific to nasal obstruction. The EQ5D is a general health-related QoL instrument that collects information along the five health domains of mobility, self-care, usual activity, pain/discomfort, and anxiety/depression using a Likert scale, and includes a general-health VAS from 0 (worst health imaginable) to 100 (best health imaginable).

The total number of patients in all these studies was 267. The number of procedures performed was 269 as there were two revision surgeries done in one study.⁹ There was a predominance of male patients in all studies. Studies included in this review comprise two retrospective and two prospective studies, and one of undefined methodology. Septoplasty was evaluated in two studies,^{6,7} and both septoplasty and septorhinoplasty were evaluated in the remaining studies.⁸⁻¹⁰ Pediatric nasal septal surgery was shown to improve QoL in all five studies. One patient had a nasal abscess and two patients underwent revision surgery.⁹ Other minor complications were mild synechia, residual septal deviation, pain, and hypersensitivity.^{6,7}

Quality of life assessment

In a survey study by Anderson et al⁶ on health-related QoL after septoplasty, the overall outcome was positive with

TABLE 1 Summary of studies

| Study | Year | Type of study | Subjective assessment tool | Total patients | Surgery | Follow-up done via | Outcome | Revision surgery | Complication |
|------------------------|------|----------------------|----------------------------|----------------------------|----------------------------|---|---------|------------------|--|
| Anderson ⁶ | 2015 | Retrospective cohort | GCBI | 29 (16 boys, 13 girls) | S + Turbinate surgery | Questionnaires | Good | N/A | Pain and hypersensitivity |
| Lee ⁸ | 2016 | Retrospective | NOSE + VAS + SN-5 | 28 (19 male + 19 female) | S + SR + Turbinate surgery | Questionnaires | Good | N/A | N/A |
| Manteghi ¹⁰ | 2018 | Prospective cohort | NOSE | 136 (94 males, 42 females) | S +FSR | Score with pre- and postoperative photos | Good | N/A | N/A |
| Yilmaz ⁷ | 2014 | N/A | NOSE + VAS | 35 (24 male and 11 female) | S | Anterior rhinoscopy + nasoendoscopy at 1 st and 3 rd week | Good | None | Mild synechia, residual septal deviation |
| Fuller ⁹ | 2018 | Prospective cohort | VAS + EQ5D + NOSE | 39 (19 male and 20 female) | FSR | Questionnaires | Good | 2 | Nasal abscess |

VAS, Visual Analogue Score; NOSE, Nasal Obstruction Symptom Evaluation; EQ5D, EuroQol 5-Dimension Health Assessment; GCBI, Glasgow Children Benefit Inventory, SN-5, 5-item Sinus and Nasal QoL survey; S, septoplasty; SR, septorhinoplasty; FSR, functional septorhinoplasty; N/A, not available

a statistically significant improvement on health-related QoL. Scoring was done based on the GCBI with the most significant subscore being physical. Correction of septal deviation led to improvement of nasal airflow and, hence, physical health.

A retrospective case series by Lee et al⁸ on short-term QoL after pediatric septoplasty employed SN-5 as well as a global QoL-based VAS, both preoperatively and postoperatively. Significant improvement of the overall score was noted postoperatively. Female patients exhibited better short-term outcome after surgery than male patients. Indications for nasal septal surgery in most cases were traumatic nasal fracture followed by nasal obstruction secondary to deviated nasal septum. Among others, minor indications included chronic rhinosinusitis, allergic rhinitis, and obstructive sleep apnoea.

A prospective cohort study was conducted by Manteghi et al¹⁰ on QoL before and after septoplasty and functional septorhinoplasty in pediatric patients using the NOSE scale. The results revealed a statistically significant improvement in disease-specific QoL in pediatric patients after septoplasty and functional septorhinoplasty. The NOSE and VAS scales were used by Yilmaz et al⁷ to evaluate the outcomes and effects of septoplasty on QoL in children. The NOSE scale was used to assess the change in nasal obstruction symptoms postoperatively and the VAS was used to analyse the overall contentment of both patients and parents postoperatively. There was significant improvement in the NOSE score three months after septoplasty. Patient satisfaction correlated with NOSE score one year after surgery. Otherwise no major postoperative complications were encountered, and no revision septoplasty was required in any of the patients. When we pooled all three studies using NOSE assessment tool in their evaluation,^{7,9,10} significant improvement of patients' symptoms correlating with patients' satisfaction was shown. Gender, prior nasal trauma or surgery along with allergic rhinitis showed no statistically significant effect on NOSE scores following nasal septal surgery.

DISCUSSION

Nasal growth

The bony component of the nose comprises the nasal process of frontal bone, nasal bones arising from the frontonasal process, and the nasal process of maxilla that arises from the first pharyngeal (or mandibular) arch. The midface region comprises membranous structures, frontonasal process, and the mandibular arch. Growth of the nose and midface continues until age 14 to 17 years. However, the nasal septum has been reported to grow until 36 years of age.¹²

Over the years, the shape of the nose changes with progression from infancy to adulthood. Nasal surgery in

children requires dedicated anatomical and physiological knowledge of nasal growth. The nasal septum is the growth centre of the face. Two growth zones are present, the sphenospinal and sphenodorsal zones.¹³ The sphenodorsal zone is responsible for normal increase in length and height of the nasal dorsum, whereas the sphenospinal zone, which is the driving force in forward outgrowth of the premaxilla region, is responsible for sagittal growth. Trauma or injury to the nose corresponds to the zone affected. For instance, saddle-nose deformity results from injury to the sphenodorsal zone, whereas the midface and premaxilla become deformed following injury to the sphenospinal zone.¹⁴ It is imperative that when executing corrective nasal septal surgery in children, caution is exercised to avoid devastating facial deformity that may require further surgery.

Compared with the adult nose, the nose in children is relatively underprojected and foreshortened while the cartilaginous component is more prominent. Hence, children are more prone to develop greenstick and avulsed fracture following mild trauma owing to the anatomical difference. It is also noteworthy that following trauma in children, nasal bone tends to splay and disarticulate, which may lead to underdiagnoses. Untreated nasal septal deformity eventually leads to soft-tissue contracture and fibrosis, which makes future correction challenging.¹⁵

Impact of surgery on facial growth

Despite the ongoing and seemingly never-ending debate, nasal septal deformity leads to mouth breathing as a result of the nasal obstruction. This leads to open mouth and lips, and a lowered tongue, eventually resulting in decreased maxillofacial muscle tone. Subsequently this affects growth of the midfacial region by causing maxillary hypoplasia, micrognathia, retrognathia, and protrusion of maxillary incisors. It has been shown that anterior lower vertical face height is increased while posterior face height is decreased.¹⁶ Recent anthropometric studies have revealed that pediatric patients have normal facial and nasal growth after septoplasty and reconstructive nasal surgery.¹⁷ By contrast, nasal and facial deformity has been reported in children with significant nasal obstruction after corrective septal surgery has been delayed.¹⁸ In addition, negative effects have been reported by several studies on organs responsible for somatic and psychic development, including voice perturbation and sleep disruption.^{19,20} Careful and conservative nasal septal and reconstructive surgery in the pediatric age group between 8 and 12 years has been proved to be successful, with no facial growth deformity.²¹ Follow-up in a group of children operated on 7 years earlier discovered no septal nasal deformity.²²

Indications and contraindications

Indications for pediatric septoplasty can be divided into absolute and relative, whereby absolute indication

includes septal abscess, septal haematoma, traumatic nasal deformity, dermoid cyst, and cleft lip nose, with the relative indication being nasal obstruction resulting from deviated septum.²³ Most studies of nasal septal deformity have demonstrated that increasing age is a risk factor,²⁴ perhaps attributed to the increasing possibilities of traumatic incidents with age. Trauma sustained during the delivery process could be a contributing factor for earlier presentation. Kawalski and Spiewak²⁵ reported 22.2% septal deformity in children born by spontaneous vaginal delivery, whereas only 3.9% was reported in children born via Caesarean section. Hence, it is imperative to identify these groups of patients earlier because intervention can help avoid multiple complications, especially of a pulmonary nature, later in life.

Outcome regarding quality of life

QoL after nasal septal surgery in adult patients has been extensively documented.²⁶ Comparatively, studies involving pediatric nasal septal surgery are still lacking. Amid the sparse reported cases, the focus has been mainly on the physical and anatomical analysis of nasal and facial growth after septal surgery.²⁷ However, objective measurements may not necessarily be representative of the QoL after surgery, because symptoms may not correlate with objective outcome measures. For this reason, subjective evaluation of the QoL is essential.²⁸

All five studies mentioned in this review demonstrate significant improvement following nasal septal surgery among pediatric patients. A study by Manteghi et al,¹⁰ the largest study with a prospective design evaluating disease-specific QoL, demonstrated statistically significant improvement after surgery. In children with nasal obstruction following trauma or external nasal deformity, corrective nasal septal surgery aids in re-establishing function and achieving a normal appearance. Obvious external nasal deformity may lead to social embarrassment among children, causing them to have low self-esteem at a very young age.

Although the appropriate age for nasal septal surgery remains imprecise, recent studies have reported no adverse effects on nasal and facial growth postoperatively. Nasal surgery has been performed by countless surgeons as an approach for skull-base surgeries. Transnasal transseptal surgery in children for skull-base surgery has been reported to be safe in children older than 4 years of age.^{29,30} Moreover, children with deviated nasal septum have been reported to develop dental abnormalities, malocclusion, palatal asymmetry, otological disease, and even upper respiratory infection.³¹ Another factor contributing to better outcomes is patient characteristics. Lee et al⁸ demonstrated that female patients have more satisfaction and improvement in symptoms compared with male counterparts. With regard to age, both younger and older children had equal improvement in symptoms. Open

versus closed surgical approaches demonstrated equal improvement, thus favouring the less invasive endoscopic approach.

Nasal septum deformity ought to be corrected early in children in order to avoid unnecessary facial deformity and provide harmonious growth of the nose and face. Nasal septal surgery among children contributes to significant improvement in QoL.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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