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## Pediatric rhinoplasty: A discussion of perioperative considerations and systematic review



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### ABSTRACT

**Objectives:** Pediatric rhinoplasty has traditionally raised numerous concerns, including its impact on growth as well as the psychological sequelae of undergoing a potentially appearance-altering procedure. Our objective was to critically evaluate available individual patient data relevant to pediatric rhinoplasty, and further discuss perioperative considerations.

**Methods:** A systematic review was conducted using PubMed/MEDLINE databases. Data extracted and analyzed from included studies included patient demographics, surgical indications, operative approaches, outcomes, complications, revision rates, and other clinical considerations.

**Results:** Seven studies encompassing 253 patients were included, with age ranging from 7 months to 19 years. Two-thirds of patients were male. 41.7% reported antecedent trauma, and common overall surgical indications included “functional aesthetic” (24.5%) followed by cleft lip nasal deformity (15.8%). The majority (79.1%) underwent open approaches, and 71.1% of patients underwent concomitant septal intervention. The most frequently used grafting materials were septal cartilage (52.8%) and conchal cartilage (16.5%). Surgical outcomes were heterogeneous among these studies. Complication rates were only specified in 5 of the 7 studies and totaled 57 patients (39.6%). Aesthetic dissatisfaction (11.8%) and postoperative nasal obstruction (5.6%) were the most commonly reported complications. Revisions were performed in 13.5%.

**Conclusion:** Rhinoplasty is safe in the pediatric population, although revisions rates appear greater than those reported in adults. This study of 253 represents the largest pooled sample size to date; nonetheless, non-standardized outcome measures, minimal long-term followup data, and lack of discussion regarding psychological sequelae all contribute to the need for further high-quality studies evaluating this topic.

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## 1. Introduction

Nasal maturation occurs from designated growth centers and with specific periods of accelerated growth. The sphenodorsal zone

and sphenopsinal zones are the growth centers of the nose and work to increase the length and height of the nasal bones and outgrowth of the maxilla, respectively. Multiple studies, including those in monozygotic twins, have supported this idea by demonstrating growth inhibition of the nasal skeleton and maxilla when trauma has been sustained to these areas [1–3]. Nasal growth continues until early adulthood with specific windows of accelerated growth, the two most significant of which are in the first 2 years of life and during puberty [4]. The end of nasal growth is at

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approximately 12–16 years of age in girls and 15–18 years of age in boys [5–7]. For these reasons, nasal surgeons have traditionally exercised caution, delaying elective nasal surgery until 15–16 years of age in girls and 17–18 years of age in boys. When nasoseptal intervention is taken in pediatric patients, the importance of conservative cartilage resection with a submucosal approach and preservation of mucoperichondrial flaps is emphasized. This has been supported by study in multiple animal models and in different clinical settings [8–13].

With all of these considerations in mind, there have virtually no large-scale analyses looking at considerations specific to rhinoplasty and detailing complications in this patient population. Hence, our objective was to fill this void in the literature and synthesize available patient information regarding pediatric rhinoplasty. Specifically, our objectives were to perform a systematic review evaluating indications, surgical approaches, patient demographics, complications, and outcomes of pediatric rhinoplasty in the literature.

## 2. Methods

### 2.1. Search strategy

A systematic review was carried out in accordance with the guidelines set forth by the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) statement. Pubmed and MEDLINE databases were searched using the term “Pediatric Rhinoplasty” to identify articles related to the subject of interest. The results were limited to the English language and those providing information on the rhinoplasty operation. Abstracts were reviewed initially and if deemed relevant, full text was obtained and reviewed for extraction of data. References of articles remaining after exclusion were examined to identify any remaining relevant studies.

### 2.2. Selection criteria

Only studies with primary data for pediatric patients (age < 19) who underwent rhinoplasty were included. Articles were excluded if they assessed septoplasty alone and if rhinoplasty was only one of the operations being discussed to address the specific clinical condition. For example, in some studies, local excision, bicoronal exposure, endoscopic approaches, and rhinoplasty were all presented as different options to address variants of a clinical condition. In such studies, demographic data was presented comprehensively for all patients as a whole. Due to this fact, meaningful extraction of data specific to rhinoplasty was not possible and such studies had to be excluded.

### 2.3. Data extraction

Data from selected studies was then extracted. Variables collected included study type, publication year, number of patients, gender, age, surgical approach, specific procedures performed, types of grafts used, history of nasal trauma, surgical indications, outcomes, complications, revision rate, follow up time, and department of origin. The data was organized and analyzed in Microsoft Excel (Microsoft Corp, Redmond, WA).

## 3. Results

The literature search yielded 142 abstracts and titles. No previous systematic reviews or controlled trials were identified in the literature. Seven studies met the inclusion criteria and allowed extraction of meaningful data related to the rhinoplasty operation

alone (Fig. 1). The years of publication ranged from 1985 to 2016. Three studies were published based on data obtained from pediatric otolaryngology departments, 3 from general otolaryngology departments, and 1 from a plastic surgery department. All the studies were retrospective reviews originating from a single institution. Six out of 7 studies identified follow up time for the patients studied. Three of these studies provided a mean follow up time, which was 2.39 years. In one of these studies, the follow up for all patients was 90 days [18]. The remaining 3 studies did not provide a mean follow up but did provide a range, which varied from 3 months (0.25 years) to 13.1 years. A total sample size of 253 patients was obtained and used for data collection.

### 3.1. Patient characteristics

Patient age was reported in 6 out of 7 studies with an overall range of 7 months (0.58 years) to 19 years of age. Three studies reported the mean age and age range of patients reviewed while the remaining 3 only reported age range. Five out of the 7 studies identified patient gender. Per these studies, a total of 144 males (67%) and 71 females (33%) underwent the rhinoplasty operation. History of antecedent trauma was reported in 5 out of 7 studies and a total of 60 patients out of 144 total reported patients (41.7%) had sustained trauma prior to surgical intervention (see Tables 1 and 2).

### 3.2. Surgical indications

Indications for operative intervention were identified in all 7 studies. The most common indications for surgery were cleft lip nasal deformity (40 patients, 15.8%), septal deviation (35 patients, 13.8%), nasal dermoids (21 patients, 8.3%) and deviated nose (21 patients, 8.3%). Other less common indications included nasal valve collapse (15 patients, 5.9%), nasal bone fracture (12 patients, 4.7%), traumatic nasoseptal deformity (7 patients, 2.8%), unilateral choanal atresia (5 patients, 2%) and multiple others as identified in Table 3. In one study, indications were noted as functional in 9 patients (8.5%) and functional aesthetic in 62 (58.5%) without providing further detail [16] (see Table 4).

### 3.3. Surgical procedures performed

Open rhinoplasty was by far the most common procedure performed in the patient population with 200 patients (79.1%) undergoing this approach. The remaining 53 patients (20.9%) underwent closed rhinoplasty. Four studies commented on whether concomitant septal surgery was undertaken and a total of 177 of these patients (80.5%) were noted to have septal intervention. The use of graft materials was commented on in 6 studies. One study commented that septal cartilage was used if it was available but did not provide information on how many cases it was used [14]. Abdominal fat was used a grafting material in 3 patients to reconstruct the nasal tip following resection of nasal tip dermoid cyst [15].

There were 115 patients (52.8%) who had septal cartilage grafts used in their rhinoplasty operation and conchal cartilage grafts were used in 36 patients (16.5%). Processed fascia lata (42 patients, 19.3%), perforated PDS foil (17 patients, 17.8%) and rib grafts (11 patients, 5.1%) were used in addition to multiple other grafting materials as outlined in Table 5.

### 3.4. Outcomes and complications

Surgical outcomes were reported in 6 out of the 7 studies. There was no standardization of presented outcomes, so measures were quite heterogeneous in the studies analyzed. In addition, the largest

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