Pediatric Septorhinoplasty

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KEYWORDS

• Septorhinoplasty • Nasal surgery • Septoplasty • Children

KEY POINTS

- In the appropriately selected patient, septorhinoplasty can benefit a pediatric patient presenting with significant nasal trauma, abscess, or mass that would likely result in a progressive deformity in the growing nose or with negative functional or psychosocial effect.
- Clinical and experimental observations suggest that a conservative approach to pediatric septorhinoplasty is warranted.
- The long-term results of scoring and incisions in the cartilaginous nasal septum to realign the septum are not predictable, and intercartilaginous incisions should be avoided when possible.
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INTRODUCTION

Performing nasal surgery on children has been the subject of controversy among facial plastic surgeons. Specifically, the indications for and timing of septorhinoplasty in children have been debated for the last several decades. Additionally, the extent of surgery and the appropriate approach and techniques to be used in children with congenital or acquired nasal deformities have been disputed. Central to the ongoing argument is that any surgical intervention in the growing nose can possibly cause severe growth inhibition that may not be evident until the child has achieved adult stature. Numerous observational and experimental studies on animal models and in clinical practice dating back to the early 1960s have attempted to elucidate normal nasal growth patterns. Implicit in these studies is that any surgical intervention should minimize disruption of these patterns of development of the bony-cartilaginous structures of the nose.

PATTERNS OF GROWTH IN PEOPLE

The external nose of the child has several characteristics that are distinct from that of the adult. Children typically display a larger nasolabial angle with a shorter, less projected dorsum. The nasal tip is also relatively flat and poorly projected with a short columella and round nares.[1,2] The present understanding of the nasal bony-cartilaginous framework that underlies these differences and the subsequent patterns of growth can largely be attributed to an interdisciplinary research group on craniofacial development in Amsterdam and Rotterdam. This group has demonstrated that infants, when compared to adults, have a greater cartilage-to-bone ratio. Newborn septal cartilage reaches from the nasal tip to the skull base. Similarly, early in life, the upper lateral cartilages extend under the complete length of the nasal bones. The pediatric bony structures are relatively underdeveloped when compared with those of adults, with an absent

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perpendicular plate and rudimentary vomer.[3,4] As the child grows, the upper lateral cartilages regress and the cartilaginous septum gradually ossifies. This ossification process results in the formation of the perpendicular plate, which then merges with the vomer between 6 and 8 years of age.[5]

The growth centers of the nose have been designated as the sphenodorsal zone and the sphenospinal zone. These zones are thought to increase the length and height of the nasal bones with the outgrowth of the maxilla, respectively. Trauma to these areas has been shown experimentally to interrupt growth in a predictable pattern and can lead to progressive nasal deformity.[1,2] Clinical evidence of traumatic growth inhibition of the nasal skeleton and maxilla was also demonstrated by Grymer and colleagues[6] in comparative observational studies of monozygotic twins.[7]

Nasal growth appears to continue until early adulthood with specific windows of accelerated growth. The 2 most significant nasal growth spurts occur in the first 2 years of life and during puberty.[1] The end of the nasofacial growth spurt was found to be at 12 to 16 years in girls and 15 to 18 years in boys.[8–10] For this reason, nasal surgeons often wait to perform elective nasal surgery until 15 to 16 years of age in girls and until 17 to 18 years of age in boys. Although the vast majority of growth appears to be complete by this age, a large-scale study in Switzerland of 2500 individuals showed some increase in nasal length and projection in women until 20 years and in men until 25 years of age, which may contribute to delayed postsurgical distortion.[1,11]

EARLY SURGICAL EXPERIENCE

Septorhinoplasty was described in children as early as 1902.[12] Resultant nasal deformities such as saddle nose deformities and growth inhibition with maxillary retrusion would later be noted as early as 1916.[13] Subsequent publications echoed the cautionary message. In 1958, Gilbert and Segal warned against resection of the quadrilateral keystone area of the immature nasal septum, and Farrior and Connolly in 1970 similarly recommended delaying septorhinoplasty in children until after growth was complete.[14,15] These clinical observations and practice recommendations inspired a plethora of experimental studies. The goal of these studies would be to examine the mechanisms of growth inhibition and the interventions that result in minimizing further growth distortions.

ANIMAL STUDIES

Although experimental animal studies involving nasal septal resection date back to as early as the 1850s, the most frequently cited early studies are from Sarnat and colleagues in the 1960s.[16,17] Sarnat and his group designed a series of experiments in growing rabbits in which the caudal aspect of the cartilaginous septum and overlying mucoperichondrium was resected with resultant underdevelopment of the snout and relative mandibular prognathism.[18] Significantly, Sarnat's experiments involved through-and-through resection of as much as the anterior half of the septum without preservation of overlying mucosa or mucoperiochondrial flaps.[16] His experiments, however, were the launching point for numerous investigations of nasoseptal interventions in various animal models. To date, conclusions have been drawn on the growth patterns and the role of trauma and surgical interventions on disrupting growth in rabbits, canine pups, baboons, and ferrets, to name a few. These studies highlighted the significance of submucosal and selective cartilage resection with careful preservation of mucoperichondrial flaps.[19–24] Unfortunately, animal studies have not been performed on animals simulating the conservative cartilage resection often required to straighten the nasal septum in children with nasal obstruction. These experiments may improve the predictive value of animal studies on nasal growth after pediatric nasal surgery.

CLINICAL STUDIES

Because of the aforementioned animal studies, the practice of pediatric septoplasty and septorhinoplasty has proceeded with caution. Evaluation of clinic results is largely limited by small sample size, variation in approach and technique, and lack of long-term follow-up. Keeping these limitations in mind, the literature does suggest that septorhinoplasty can be performed with minimal growth inhibition when performed selectively with specific indications. Using anthropometric measurements, external septoplasty has been shown to not affect most aspects of nasal and facial growth, when the mucoperichondrium is left intact and no large cartilaginous resections are made. One caveat, however, is that nasal dorsal length was noted to be decreased in multiple studies, although the difference was not statistically significant in these studies within the average follow-up period of 2 to 4 years.[25–27]

Although many surgeons have used results of animal studies to advocate delay in surgical