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Open questions in nasal surgery in children

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Intrinsic and extrinsic factors influence the growing nose. As the modes of action of these factors are only poorly understood, it is often impossible to separate the different influences in analyzing the nasal deformity of an adult: Are these nasal alterations due more to trauma, previous surgery, infection, malnutrition, hormonal excess, hereditary influences, or a combination of these factors? Studies of identical twins, one of whom had nasal lesions during growth, would help to answer some of these questions, but they are not available except for some casuistics. In this abstract I shall confine to some problems concerning surgery of the fixed traumatic deformity of the nose in children. Problems concerning the acute nasal injury in childhood have been treated in our symposium in Stockholm (Pirsig, 1983).

First we have to ask about the natural history of the untreated nasal trauma. Gray (1983) followed up children whom he had examined as newborns, at 5 and 8 years of age. Concerning septal deviations Gray found that all untreated deviations present at birth were still present in the same degree or had increased during nasal growth. Only in the group with septal correction at birth were noses with predominantly straight septa seen at the time of follow-up.

Among our adult patients for rhinosurgery we examined several cases with a history of nasal or midfacial injury, the date of which could be exactly traced through childhood. By means of photographs from family albums we were able to follow the development of the midfacial region over the years of growth. Thus we could register the changes of the injured, but untreated nasomaxillary complex. Together with other data the analysis of 20 cases without nasal allergy and congenital nasal anomalies led to the following conclusions: the alterations of the nose some months after midfacial injury may look unimportant. Especially, alterations of the bony pyramid and the premaxillary region were rarely visible in the first decade compared to the adult's state. Rapid and important changes appeared during the puberal growth spurt. From these results we may conclude that the

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definite damage of an often meaningless looking nasal injury in childhood is not predictable before the end of the puberal growth spurt. There is another study of the facial and nasal development of adult patients who sustained a serious untreated injury to the nose during childhood (Brain and Rock, 1983). Measurements of lateral skull radiographs of these patients indicated reduced downward and forward growth in the maxilla, and the altered angulations for certain planes in the middle and lower thirds of the face. Could these alterations of the face have been prevented by a proper treatment of the acute facial injury in childhood, as it is demonstrated by Gray's findings? Are these alterations of the midfacial areas an effect of permanent mouth breathing or of trauma alone or of the combination of both?

One argument for functional rhinosurgery in childhood is that this therapy may prevent or reduce the alterations of facial growth induced by permanent mouth breathing. It is surprising that the question: "Does permanent mouth breathing result in aberrant facial growth?" cannot adequately be answered, because nearly all studies on this subject have inadequately defined and controlled samples and methods which do not allow firm conclusions. Few studies could demonstrate that permanent mouth breathers have longer, narrower, and more retrognathic faces in comparison to subjects who breathe through the nose. But even in these studies the question of a cause-and-effect relationship between mode of respiration and facial development is not answered.

One argument against septal surgery in childhood is based on the hypothesis that the septal cartilage is considered to be a primary growth center of the midfacial region. Loss or destruction of this primary growth center by congenital defects, septal abscess or radical submucous septal resection in childhood will end up in an arrested growth of the surrounding parts of the septal cartilage. The nasal region is built up of 24 bony and cartilaginous units originating from the frontonasal segment and from the paired branchial arches. The interrelationship of these skeletal units has not yet been investigated in humans. Therefore adult patients were examined with predominantly circumscripted nasal defects caused by nasal injury in early childhood (Pirsig, Haase, Sander: unpublished paper). The exact history of diseases in childhood, documented by facial photographs, ENT and orthodontic examinations, dental models, cephalometric radiographs, reports on nasal and/or maxillary surgery, and biopsies of nasal tissues during surgery were analyzed. Most impressive were unilateral defects or arrests of growth. The analysis of 30 patients led to the surprising conclusion: At least the nasal bones, the septal cartilage, the lower lateral cartilage, the premaxilla and the maxilla may grow nearly independently from each other. From these findings of the partial independency of growth of single skeletal units within the nasomaxillary complex, we may conclude that conservative septal surgery will not induce the arrest of

growth of the surrounding skeletal units. This conclusion is supported by many cases of long-term results following septoplasty in childhood (Pirsig, 1984).

One of the most controversial subjects concerns the timing of surgery on the growing nose. Nasal development within the two first decades is more rapid in the two postnatal years and in the time of the puberal growth spurt. Most data on this time-course of facial growth have been collected by authors investigating patients with clefts of the middle face. Despite of these data, we do not know the best time for surgery of the nose. Should we operate in the rapid periods of growth or not? When is the best age to perform surgery to eliminate any essential influence on facial growth? There are only some answers to be found in literature for example, the catastrophic late-results of tip surgery in the first year of life in infants with clefts of the maxilla and palate, or a higher rate of recurrent septal deviations in those children who underwent septoplasty during their puberal growth spurt. The discussions concerning the zones of postnatal growth in the human naso-maxillary complex, and especially in the nasal septum are very controversial. Is the septum growing in a diffuse way under the surface of the perichondrium and periosteum? Are there special zones which are more prepared for growth than others? The few papers of growing nasal structures give no answer to these questions and do not allow conclusions whether surgery can be done in special nasal areas, and if so, which late-effects will arise from these surgical interventions. Observations of congenital malformations of the midface and experiments in growing animals, mostly rodents in which septal parts were resected, give arguments for two opposite hypotheses on the role of the nasal septum as to its significance in midfacial growth. On the one hand the nasal septal cartilage is depicted as a primary growth site, capable of exerting a propulsive force on the inferiorly situated midfacial skeletal structures to which the septal cartilage is connected (Scott), while on the other hand the nasal septum is thought of as a structurally complex member of the facial framework whose growth is secondary to and compensatory for prior passive translation of midfacial bones (Moss, 1976).

As no data on the metabolic and proliferative potential of the human septal cartilage were available, a group at the University of Ulm (Vetter et al., 1984a, b) studied cell replication, matrix synthesis, cell density, capacity of chondrocytes for clonal proliferation, and activity of some enzymes as cathepsin B, β-hexosaminidase, acid and alkalin phosphatase in the septal cartilage of different age groups. It could be demonstrated that the septal cartilage is a complex part of the midface, organized in a very distinct, mostly unknown way, displaying partial age dependency, strict local distribution and predominance of either matrix synthesis, cell replication or proliferative capacity. Opposite to previous suggestions the posterior area of the septal cartilage could not be found to be a zone of growth, but

an area with chondrocytes waiting to be transformed into bone by enchondral ossification.

Early it was realized that the radical submucous septal resection propagated by Killian and Freer mostly ended up with poor late results when performed in children. Within the last two decades less radical techniques to correct the septum termed conservative septoplasty, have been developed. Long-term cases have been published with both good and poor results concerning the alterations of the growing midfacial region (see 5 for literature). As nasal injury often affects more than the nasal septum alone conservative septoplasty leaves behind some of the pathological conditions in the altered nasomaxillary complex. Therefore in some cases this incomplete surgery will end up in a recurrent septal deviation one day.

Recently some more aggressive methods (exchange technique, alar surgery, external approach) have been advocated - even to be used in children - to overcome the insufficiencies of the conservative septoplasty. However, no long-term results are available telling us the influences of these techniques on facial growth. Therefore it is prudential to follow the rules of conservative septoplasty in children until a better understanding of the essentials of normal and pathological growth of the naso-maxillary complex enables us to modify details of surgical techniques in children.

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