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Septal plasty in children: influence on nasal growth

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SUMMARY

The results of a septoplasty because of a nasal obstruction were studied in 261 children, their ages ranging from 4 to 14.
No arrest of nasal growth after the septoplasty and osteotomies was recorded. Histological examination revealed a cartilaginous regeneration at the borders of the resected septal cartilage in 15 cases in which a second rhinoplasty was necessary because of a new nasal obstruction. Often the cartilaginous growth was undirected and excessive leading to a new septal deviation. In 80 per cent of our cases good functional long-term results were obtained by one rhinoplasty only which was performed according to the techniques of Cottle and Masing.

KRIEG (1900), Freer (1902) and Killian (1908) were among the first to perform septal surgery in children. However, the disadvantages of submucous septum resection caused septal surgery in children to be postponed until the age of 16. After Metzenbaum's description of a more conservative technique (1929) septal surgery in children has increasingly been practised. Based on observations of a few children Jennes (1964) demonstrated that no inhibition of nasal growth could be seen up till eight years following septoplasty. His clinical observation has been supported by others such as Cottle (1939, 1964), Gray (1965), Huizing (1966), Farrior (1970), Masing (1971), and Pirsig et al. (1974).

Apart from some investigations on the newborn's nose (Patrzek, 1890; Hillenbrand, 1930; Gray, 1965, 1972 and Krajina, 1969) histological studies of the influence of trauma or surgery on the tissues of the growing human nose were not performed until 1974 (Pirsig and Knahl, 1974; Pirsig, 1975; Pirsig and Lehmann, 1975). The aim of this research was to study the histological alterations of the growing nose after trauma or septoplasty.

Some of the main alterations of septal tissue after trauma or surgery are:

a) In soft tissue: Scar formation with possible inhibition of the growing cartilage; mucosal atrophy; alterations of the vascular and nerve supply with disturbance of nasal reflexes (hyperplasia of the turbinates).
b) In cartilage: Necrosis; replacement by fibrous tissue or cartilage; formation of new cartilage (sometimes ectopic).

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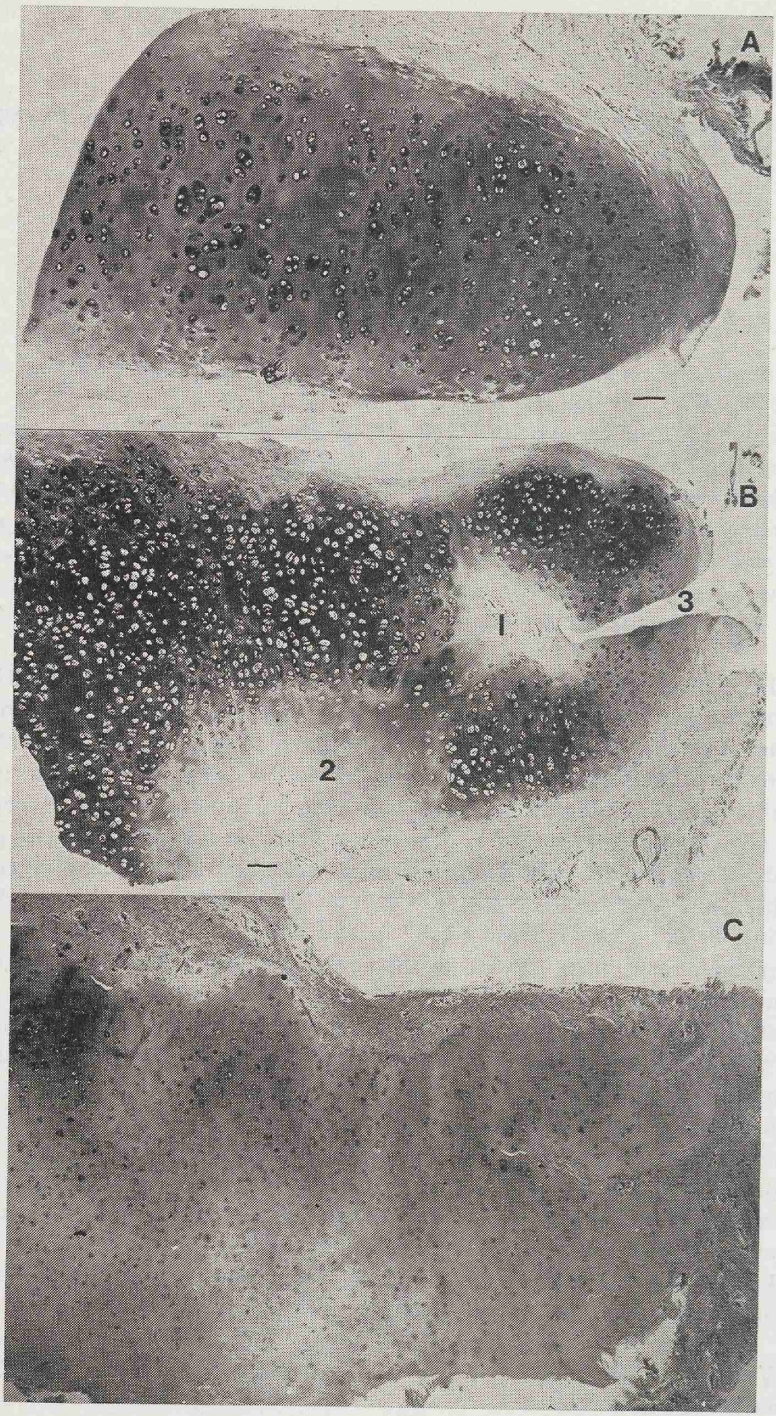
A
B
1
2
3
C

Figure 1. Horizontal sections through the caudal end of the septal cartilage (Hematoxylin-eosin; bar: 0.1 mm) of a

A: 13 years old boy, showing a normal structure.

B: girl of 12 with a 2-year-old nasal trauma.
1. Defect filled with granulation tissue
2. Defect incompletely replaced by new cartilage
3. A fresh surgical lesion through the anterior septal pole with young chondrocytes.

C. a boy of 12 years and 7 months. His first septoplasty was performed at the age of 11 years and 5 months. Regenerated cartilage is seen at the resected border of the caudal end.

c) In bone: Resorption; fibrous or bony union of fracture lines; hypoplasia; hyperplasia (crests, hump).

These findings are based on the observation of 261 children treated at our hospital within a period of 6 years (table 1).

The present report will be confined to some remarks on the histological alteration of the septal cartilage in 65 children. A septoplasty was performed in 50 children because of an old nasal trauma. The other 15 underwent a second septoplasty 1 till 4 years after the first because of a new nasal obstruction.

Septoplasty was performed according to the techniques of Cottle and Masing with slight modifications adapted to the individual conditions. A preliminary report on the results of 92 cases was given in 1974 (Pirsig and Knahl). In agreement with most authors we start septoplasty in children with a chronic nasal obstruction at the age of four (table 1).

The main indication is a disturbed nasal breathing due to internal and/or external nasal deformities caused by injury in 75 per cent of our cases.

Age in years	4	5	6	7	8	9	10	11	12	13	14	Total
Boy	—	4	5	16	24	15	22	28	23	22	29	188
Girl	2	3	4	4	6	5	6	10	12	7	14	73
Total	2	7	9	20	30	20	28	38	35	29	43	261

Table 1. Age of 261 children with chronic septal problems treated by septoplasty and/or pyramid surgery at the E.N.T.-Department of the University Hospital Hamburg in the period between 1970 and 1976.

Traumatization of the septal cartilage may result in loss, incomplete or complete regeneration of the cartilage. All these long-term reactions of the growing cartilage may occur in the same specimen (Figure 1 B). In most cases incompletely regenerated cartilage and scar tissue were found. Often these parts or regenerated cartilage cannot be used for septal reconstruction and have to be discarded and replaced. An incomplete defect of the cartilage may be completely repaired by new hyaline cartilage. In case of a complete defect of the cartilage after trauma or surgery a complete cartilaginous healing was never observed. A small fibrous

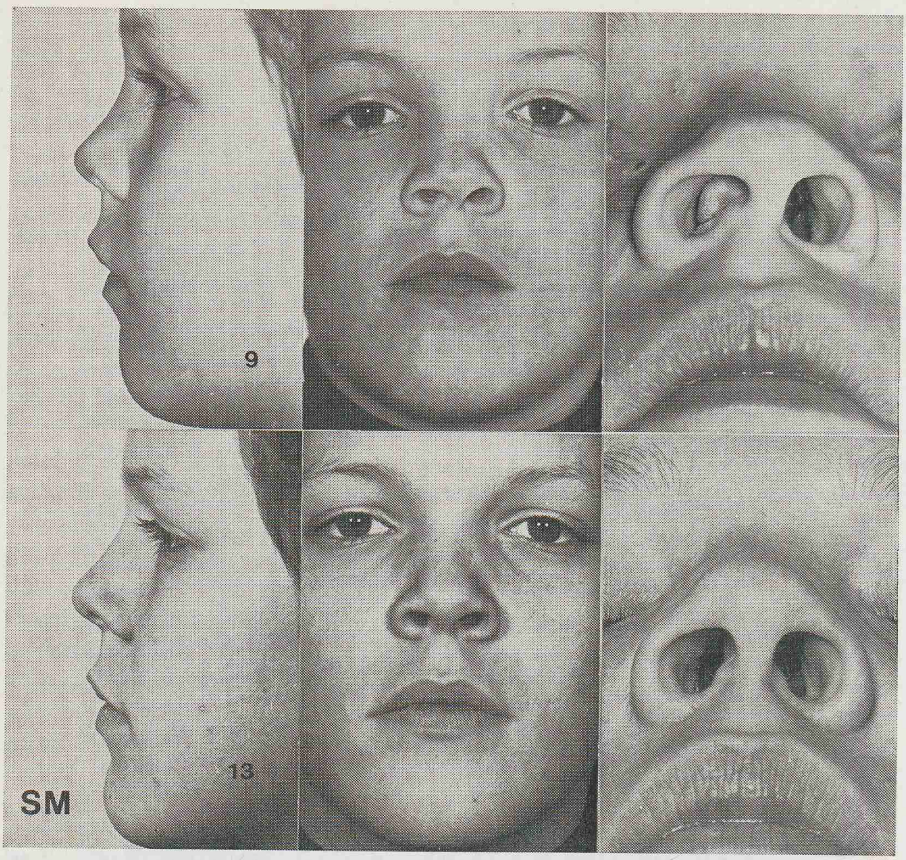

Figure 2. A boy who had a trauma of the premaxillary region at the age of 1 which resulted in a "second" anterior septum and a deformity of frontal teeth and palate. A septoplasty was done at the age of 8 years and 11 months. A follow-up examination 4 years later showed a normal shape and function of the nose.

bridging of at least 0.2 to 0.3 mm width will always persist between the regenerated borders of the septal cartilage (Pirsig and Lehmann, 1975).

In some cases where injury occured within the early years of life newly formed compounds of cartilage beside the traumatized septal cartilage were found, thus imitating "second" septum (Figure 2). This ectopic cartilage looks like normal young cartilage except for its undirected growth and the granulation tissue between the cartilaginous islands (Figure 3). Cartilaginous regeneration arises from interstitial growth and from appositional growth from the perichondrium. It is therefore important to preserve as much perichondrium as possible during septoplasty and to prevent infection which may destroy the perichondrium as in a septal abscess.

This cartilaginous regeneration following septoplasty was observed in all 15

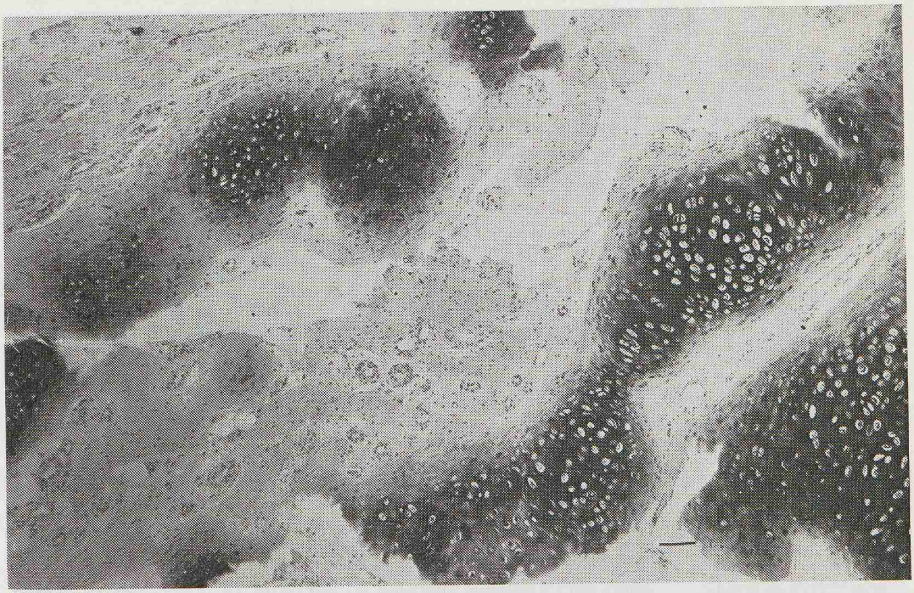

Figure 3. A boy SM of 8 years and 11 months. A section through the "second" anterior septum consisting of islands of regenerated cartilage and connective tissue with numerous blood vessels (Hematoxylin-eosin; bar: 0.1 mm).

children with a second nasal operation. In all biopsies of the resected cartilaginous borders a formation of new cartilage was found (Figure 1 C). If regenerative growth fits into the septal structure the result is a good nasal function and shape. This was observed in 80 per cent of our rhinoplasties in children (Figures 2, 4, 5 and 8).

In some cases an excess of new cartilage at the resected borders was noticed. This undirected and excessive cartilaginous growth led to a new nasal obstruction and was one of the causes of a functional failure of septoplasty in about 15 per cent of our children (Figures 6 and 7). Other causes were an insufficient technique and allergic rhinitis. In some cases, however, the reasons for an unsatisfying result could not be found as for example in the following case. A girl had a severe nasal trauma as a baby (Figure 6). Septoplasty with correction of the caudal end was performed because of an obstruction in both nasal halves at the age of 6 years and 7 months. One month later a check-up showed a normal shape and good function of the nose, a hard palate like a gothic arch, frontal teeth protruding, and a short upper lip; 9 months later a hump became visible in the bony pyramid. At the age of 9 the girl grew rapidly, and the hump accordingly. At this time nasal breathing became obstructed again by a bending of the septal cartilage. The question is whether this bony hump is the late result of her nasal trauma as a baby or an effect of the septoplasty — although the posterior part of the septum and the bony pyramid were not touched — or the

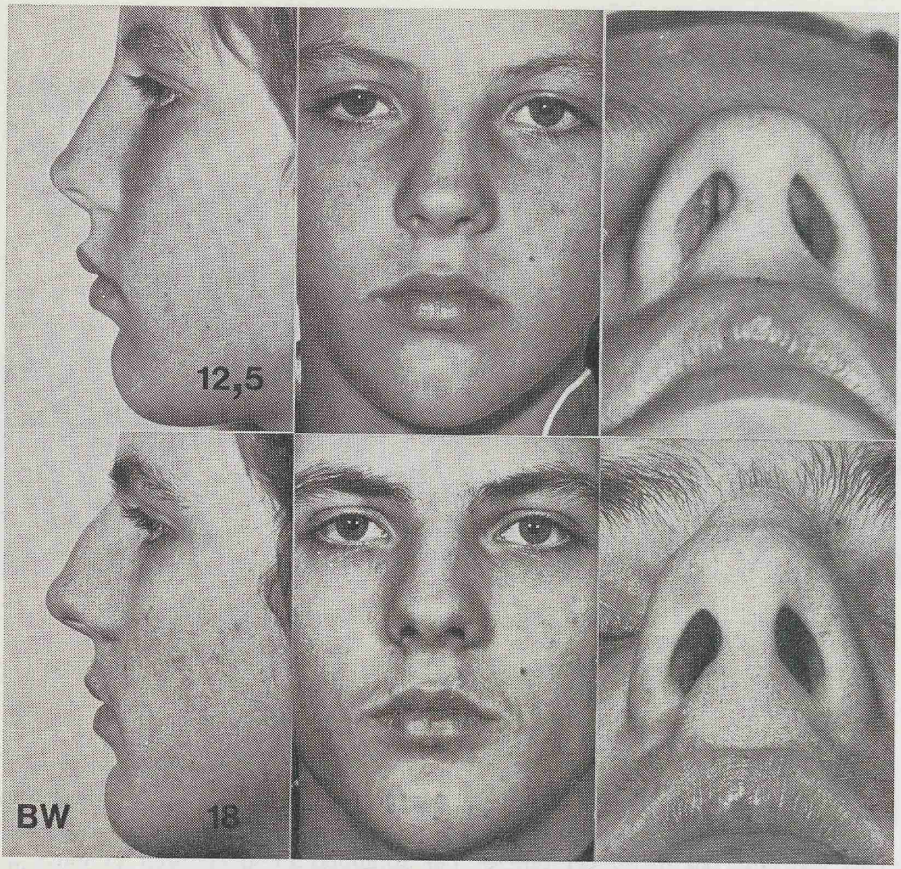

Figure 4. A boy who had a nasal trauma at the age of 8. A septoplasty was done at the age of 12 years and 6 months. A follow-up examination 6 years later showed a normal function of the nose with a straight septum and a bony hump ("from father").

influence of genetic factors. The family hump is also seen in the picture of the girl's mother. It is also visible in the girl's elder sister.

In some cases septoplasty has to be combined with nasal osteotomies to improve functional results. Figure 7 shows a boy who underwent septoplasty at the age of 6 years and 4 months because of a total obstruction of the right nasal fossa by a broken caudal end of the septum. The bony pyramid showed a slight deviation to the right which became more evident two years later. This deviation and an excess of cartilaginous growth in the reconstructed septum caused a new nasal obstruction. A second septoplasty with paramedial, lateral and transverse osteotomies was necessary. At present, at the age of 13 years and 4 months, this boy has an unobstructed nasal breathing (sport-swimmer!) and a normal looking nose with a little bony hump. The paramedian osteotomies — which were per-

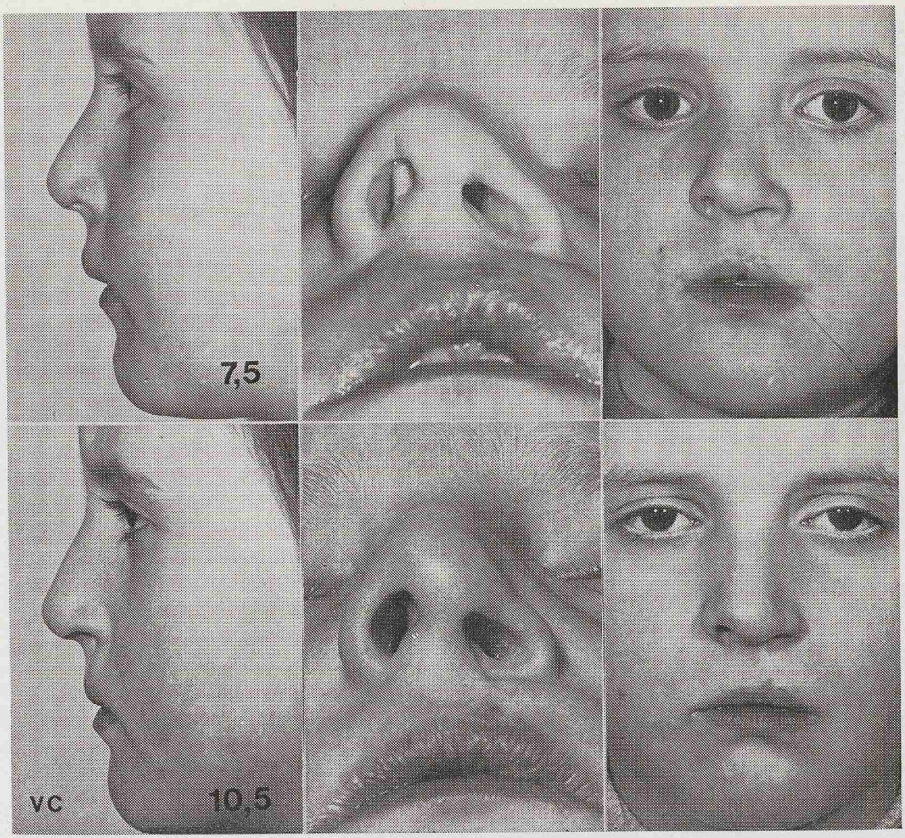

Figure 5. A girl who had a corrected lip-palate-cleft and nasal trauma at the age of 4. A septoplasty was done at the age of 7 and a half. A follow-up examination 3 years later showed an improved nasal shape and free nasal breathing. Tip correction will be postponed until 16 years.

formed via a hemitransfixion incision — as well as the lateral and the transverse osteotomies do not touch the growth centers of the bony nasal pyramid. This may be one of the reasons why no inhibition of nasal growth by osteotomies was found within a period of seven years.

Most of our patients with septoplasty and osteotomies were between 11 and 13 years old. Our youngest patient was a girl of three and a half years old. She came with an "depressed" nose two weeks after a frontal trauma. Beside septoplasty bilateral transverse osteotomies and one paramedian osteotomy had to be performed in order to rearrange the multiple fractures. The girl showed no sign of any functional problem or cosmetic deformity at a follow-up examination when she was 10 years old (Figure 8). Our clinical and histological examinations of children with rhinoplasties allow the conclusion that in absence

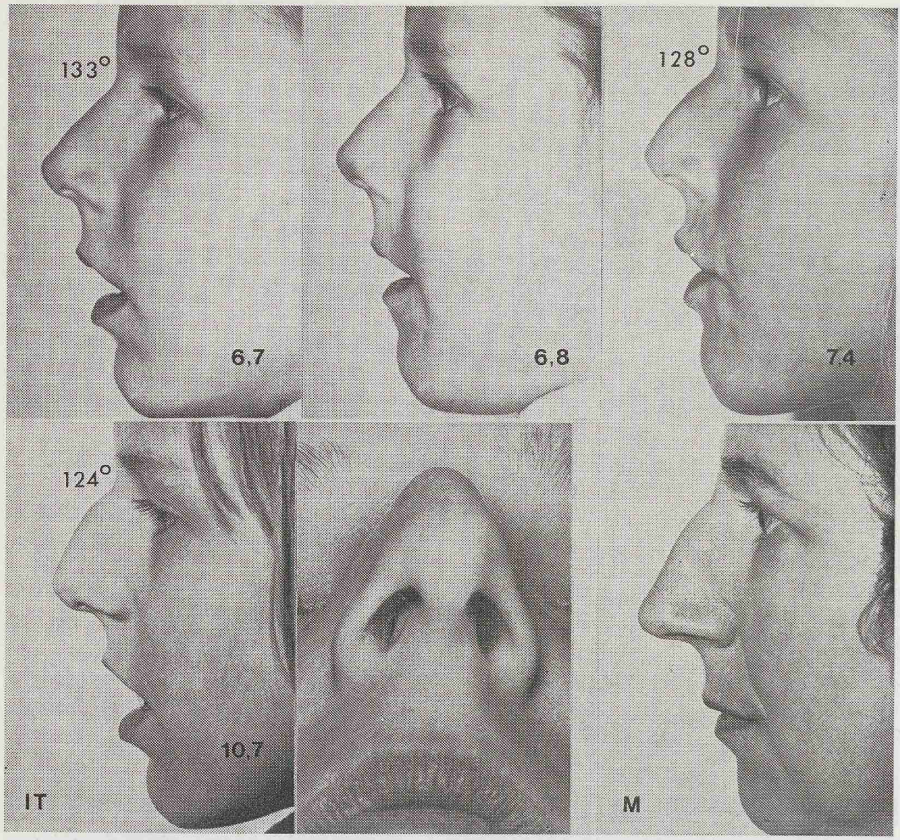

Figure 6. A girl who had a severe nasal trauma as a baby. A septoplasty was done at the age of 6 years and 7 months. The first follw-up examination was at the age of 6 years and 8 months. The second and third at the age of 7 years and 4 months, resp. 10 years and 7 months. They revealed an increasing bony hump and new nasal obstruction because of excessive septal growth. Mother's nose has a bony hump, too (M).

of infection the growth of nasal cartilage and bones will not be significantly inhibited by septoplasty and osteotomies. In some cases, however, we observed an excessive and undirected growth of the septal cartilage which could lead to new nasal obstruction.

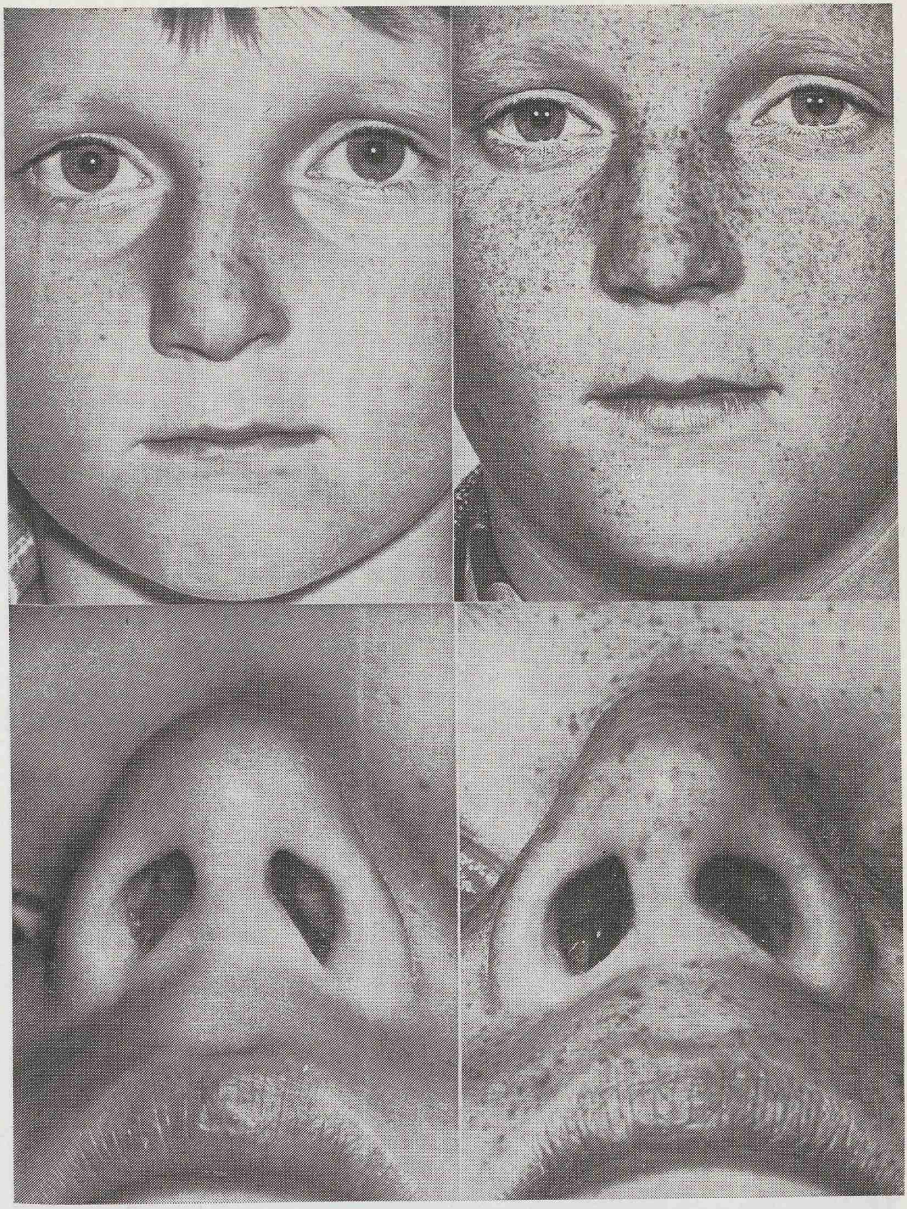

Figure 7. A boy who had a nasal trauma at the age of 2 resulting in a total obstruction of the right nasal fossa. A septoplasty was done at the age of 6 years and 4 months. A second septoplasty with osteotomies at the age of 9. A follow-up examination at the age of 13 years and 4 months showed a normal function of the nose and a little bony hump.

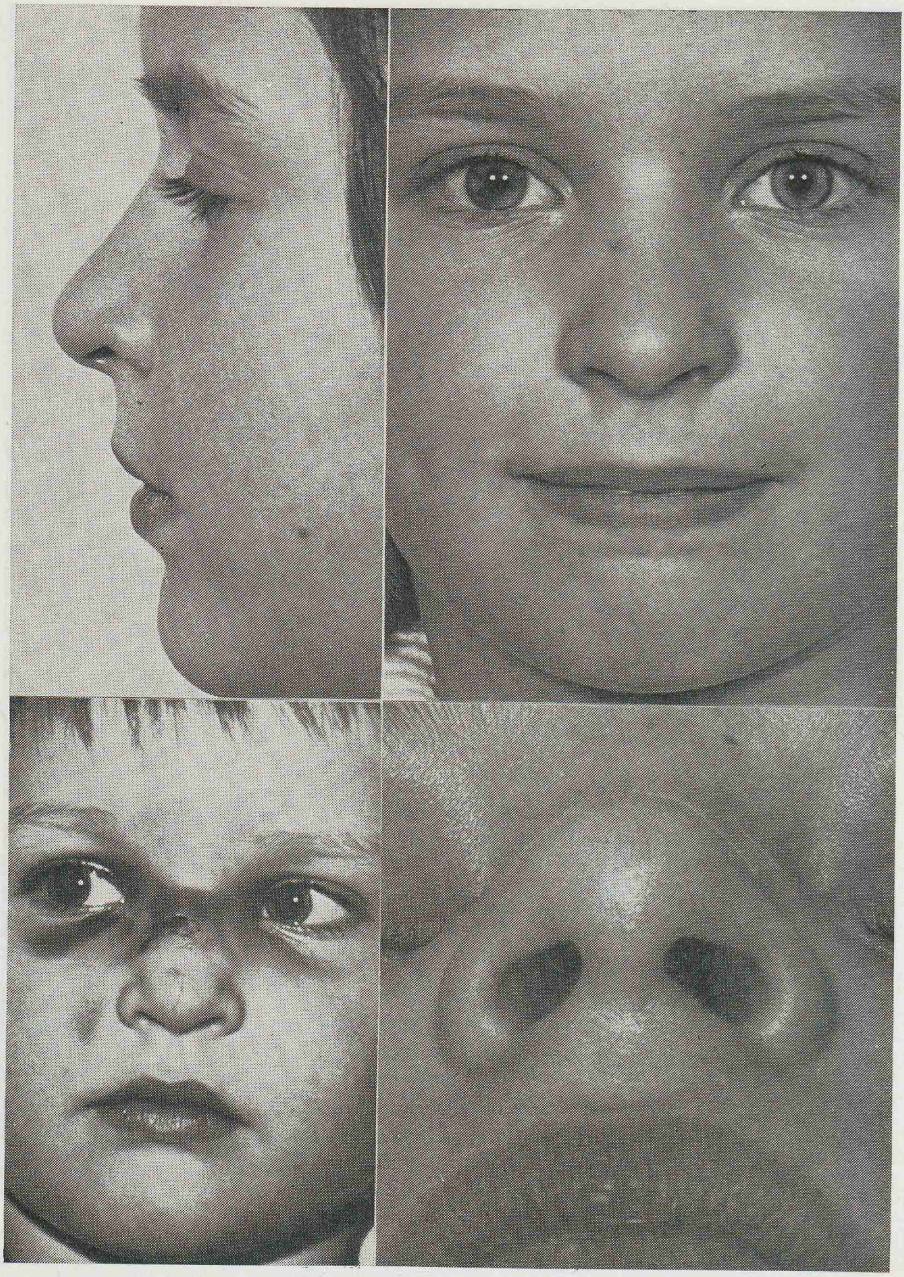

Figure 8. A girl with an open-book fracture of the nose. A septoplasty and osteotomies were done at the age of three and a half. A follow-up examination at the age of 10 showed a normal function and shape of the nose.

ZUSAMMENFASSUNG

Verlaufskontrollen an 261 Kindern (4—14 Jahre), die 1970 bis 1976 wegen behinderter Nasenatmung mit einer Septumplastik behandelt wurden, ergaben keine Hemmung des Nasenwachstums durch die Septumplastik, die zum Teil durch Osteotomien ergänzt wurde. Auch histologisch liess sich ein Weiterwachsen des korrigierten Septumknorpels bei 15 Patienten nachweisen. Die Knorpelbiopsien wurden bei Revisions-Septoplastiken gewonnen, die bei einigen Kindern wegen erneuter Nasenobstruktion notwendig waren. In diesen Fällen zeigte sich oft ein ungerichtetes und überschiessendes Knorpelwachstum des korrigierten Septums. Bei 80% der Fälle ist für die Wiederherstellung der normalen Nasenfunktion eine Rhinoplastik erforderlich.

RÉSUMÉ

Les auteurs exposent les résultats obtenus par une rhinoplastie réalisée chez 261 enfants âgés de 4 à 14 ans et présentant une obstruction nasale.
Ils ne constatent aucun arrêt du développement nasal après la septoplastie et les ostéotomies. L'analyse histologique a montré une régénération du cartilage aux bords de la zone resséquée, dans une régénération du cartilage aux bords de la zone resséquée, dans 15 cas où une seconde rhinoplastie s'est avérée nécessaire en raison d'une nouvelle obstruction nasale. Souvent, une croissance cartilagineuse excessive a été à l'origine de la nouvelle déviation septale.
Dans 80% des cas, les auteurs obtiennent un bon résultat à long terme avec une seule rhinoplastie, pratiquée selon la technique de Cottle et Masing.

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