

## Inspiratory nasal obstruction

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### SUMMARY

*Inspiratory nasal obstruction or collapsing alae is caused by a sucking in of the caudal cartilaginous parts of the nose; this is followed by a partial or complete stoppage of the inspiratory air.*

*The nose usually assumes a pinched appearance together with a widening of the nostrils during the inspiratory phase, in cases where the collapse is confined to the upper laterals. Weakening of the upper laterals can result from development anomalies, or atrophy of the tissue with aging. Fractures of the nasal framework may cause displacement or buckling, with subsequent thickening or scar formation. This will again result in poor function. In other cases both the upper and lower lateral cartilages become involved with a resulting collapse of the lobule, producing a slit-like appearance of the nostrils.*

*Examination of patients with inspiratory nasal obstruction will often reveal poor support of the upper laterals, deformity of the lower nasal cartilage, columella and nasal spine or dislocation of the caudal parts of the septal cartilage, all of which cause obstruction to the inspiratory air.*

*Collapsing alae should be treated by nasal reconstruction, with removal of the obstruction and stabilization of the nasal framework. In children, it has been possible to enhance symmetric growth, and at times, increase growth-potentials by re-alignment of the cartilaginous structures of the nose.*

INSPIRATORY nasal obstruction is a condition in which the framework of the nose is too weak to resist the negative pressure occurring during respiration. The collapse sometimes involves the upper lateral cartilages only, sometimes both the upper and lower nasal cartilages, causing the nasal walls to be sucked in and the nostrils to assume the appearance of a slit.

The cartilaginous vault of the nose is formed by the paired upper laterals, two wing-like projections fused to each other and to the cartilaginous septum in the midline. In the caudal area the cartilages are no longer attached to the septum, and are so thin that they are capable of following the respiratory movements. The lower nasal cartilages, each consisting of a lateral and medial crus, encircle the upper laterals. The cartilages overlap and override each other by 2—3 mm. Therefore disturbances of the upper laterals are inclined to influence the functioning of the alae. The two structures together form a telescopic mechanism which is supported by both skin and a sheet of connective tissue.

We are all familiar with the various kinds of noses and easily distinguish two very differing types, namely the short broad nose and the long thin one. The short one is usually of a very strong construction with considerable overlapping of the nasal cartilages, and with ample support of the lower laterals and cartilaginous dorsum. This construction is very stable and is capable of resisting many traumata with little likelihood of a development of alar collapse.

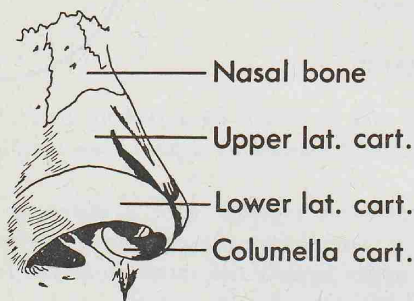


Figure 1

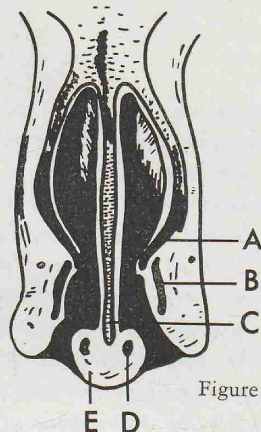


Figure 2

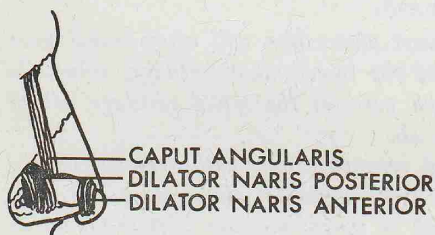


Figure 3

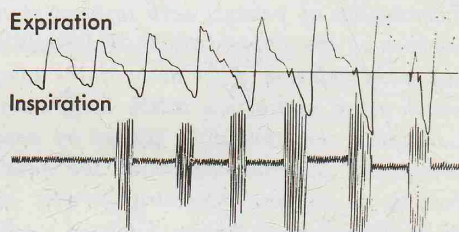


Figure 4

Figure 1. The nasal framework consisting of the nasal pyramid, the cartilaginous vault and the lower nasal cartilages.

Figure 2. A. Upper lateral cartilages.  
B. Lower lateral cartilages.  
C. Septum.  
D. Mesial crus of lower lateral cartilages.  
E. Columella.

Notice the telescopic overlapping of upper and lower lateral cartilages just opposite the narrow part of the nose.

Figure 3. Dilator naris anterior brings about a closer relationship between upper and lower cartilages.

Dilator naris posterior takes hold of the dorsal and ventral ends of the alae and draws them away from the septum.

Figure 4. Respiratory curves and electric action potentials from the alae muscles showing that the muscles are active only during the inspiratory phase. (Van Dishoeck: *Acta Otolaryng.* 25 : 285, 1937).



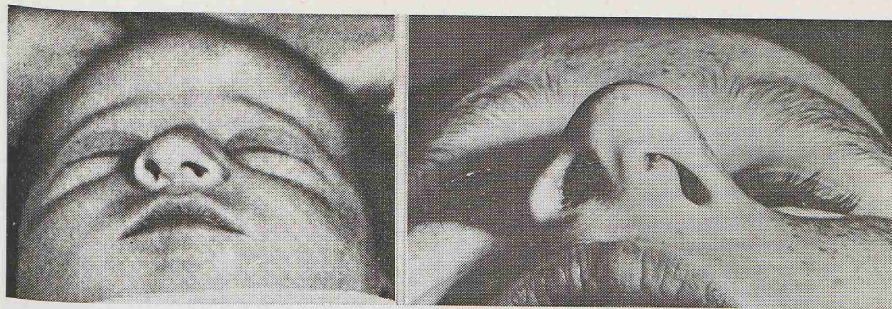


Figure 5 a.

Figure 5 b.

- a. Septum dislocation in new-born resulting from trauma during birth.  
b. Septum dislocation in a child - 12 years old - resulting from a birth trauma.

The other nasal type is of a long sleeve-like shape with a very narrow nasal bridge and, in addition, angles to the septum; which is too acute. The upper cartilages are often paper thin and the support of the lower cartilages is rather precarious, especially when the nose is exposed to trauma or atrophy due to increasing age.

In other cases a more uniform overgrowth of the nasal cartilages has taken place. This is characterized by deformities such as nose on tension, drop nose and hanging columella.

Asymmetric changes in the position of the upper and lower nasal cartilages are often seen as sequelae following dislocation of the septum in the newborn, normally resulting from passage through the birth canal, or from stumbling and falling on the nose, when the baby has still to learn the painful effects of doing so. As the dislocation happens at an early age, it may have great influence on the development and growth potentials of the nose, sometimes causing rather marked nasal alterations, such as twisted or corkscrew shaped deformities.

In adult patients, asymmetric deviations of the cartilaginous vault usually have their origin in fractures of the nasal pyramid. Loose fragments of the long part of the nose, especially when caused by side blows, become depressed and move into the nasal cavity. Due to very solid attachment between upper cartilages and the long vault, the cartilage has a tendency to follow the movements of the loose fragments, thus causing obstruction and ala collapse on the same side.

## SYMPTOMS

In case of ala collapse the case history is extremely important, and can at times ensure the correct diagnosis.

It is often advantageous to commence the questioning of the patient on points regarding reduction in the nasal passage in general, thereby permitting the patient to concentrate on his problems.

In this manner the case history may be supplemented by the patient's own observations of his or her condition.





Figure 6. A "cork-screw" deformity following a trauma at the age of 3.



Figure 7. A "deflector nose" following a traumatic injury resulting in alar collapse.



It is important to find out whether the mouth breathing is constant or periodic; and whether it first occurs under certain specific circumstances or at certain stages of varying activity. Thereafter he or she should be questioned about a dry mouth accompanied by coughing, and clearance of the throat on waking. Whether or not the patient suffers from dyspnoea at night, possibly accompanied by irritation, or a feeling of a lump in the throat and necessitating some kind of drink on the bedside table.

Normally it is easy to obtain information from married patients, or their partners, concerning the patient's snoring, sleeping with an open mouth and the details of the position normally adopted during sleep. At times the patient's condition during sleep can be so noisy and restless as to be such a nuisance to a partner that they have to have separate bedrooms, or to cause matrimonial disharmony. The feeling of stenosis on inspiration, dryness of the nose, sometimes accompanied by crust formation and nose picking, are more specific symptoms suggesting the presence of ala insufficiency. A very common symptom is sniffing; some patients are aware of this, others are not; this can be a plague to the family or friends.

A few patients discover that pulling out one cheek will alleviate the discomfort and facilitate falling asleep. Other patients use balls of cotton wool covered in vaseline. These are inserted into the top of the vestibule, and have some effect, particularly during the daylight hours. Some insert various other things into the nares; these are often related to their own ingenuity or their profession; for example, gardeners have been known to cut small sections from a common garden hose and insert them into the nose and they are thus able to replace them as and when desired.

## DIAGNOSIS

If the collapse involves both upper and lower cartilages or even the latter alone, the entire cartilaginous structure collapses, and the nostrils appear as slits with each inspiration. On the other hand, if the collapse is confined to the upper lateral cartilages, the central portion of the nose assumes a pinched appearance, the nostrils dilate markedly, and the exaggerated activity of the ala muscles is clearly visible. In either case, the degree of collapse is in direct proportion to the effort demanded with each inspiration.

The relationship between the degree of collapse and the depth of inspiration is of considerable diagnostic importance. Generally speaking, if the collapse occurs during quiet breathing, the fault is probably an inherent weakness of the cartilage, which is so yielding as to be unable to withstand the normal negative pressure of inspiration. If, on the other hand, collapse occurs only on deep inspiration, the cartilages may not necessarily be at fault. In such circumstances they may collapse secondarily owing to constrictions in the vestibule. The cause of this is, that the entrance of air is impeded in the narrow passage thereby increasing the negative pressure to such an extent that the cartilage, even though normal, may be unable to resist it.

Increasing the patency of the aperture (for example by forcing a concave ala

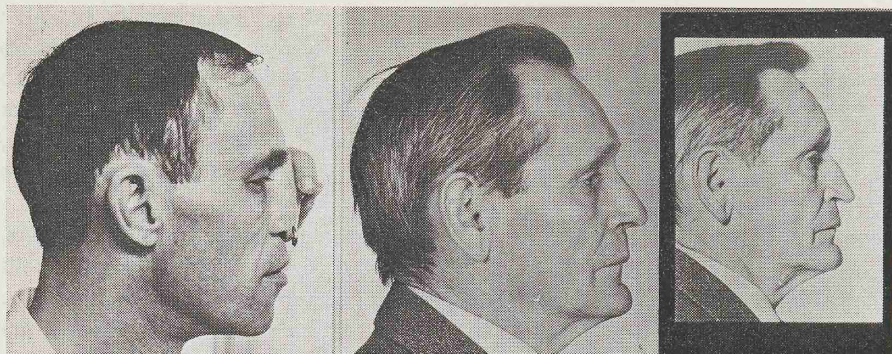


Figure 8 a.

Figure 8 b.

a. A collapsing nose following a conventional submucous resection.

b. A saddle-shaped deformity and a very acute angle between columella and the upper lip and a septal perforation with atrophy of mucosa following a submucous resection.

outward with a probe) will frequently temporarily relieve the collapse by normalizing the intranasal pressure.

Obviously, since collapsed alae may result from an infinite variety of causes, it would be impossible to describe the surgical procedures necessary for the correction of every factor. However, if one familiarises oneself with the basic operations about to be described, one can easily improvise procedures to meet the specific needs of each case.

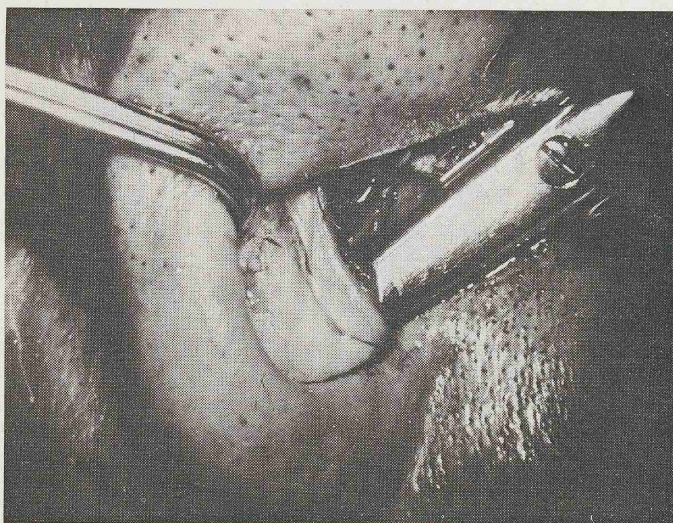


Figure 9 a.

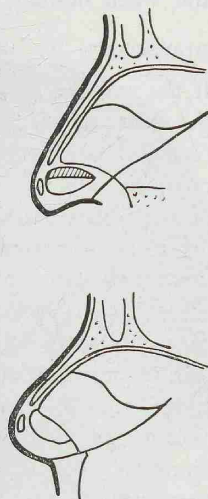


Figure 9 b.

a. Removal of a strip of the vestibular skin and exposure of the lower lateral cartilage.

b. The nose seen from the inside; the denuded lower lateral cartilage is drawn over the upper lateral cartilage in a sliding manner.



## DEFORMITIES OF THE UPPER NASAL CARTILAGES

The caudal parts of the upper lateral cartilages may be inspected from the nostrils. They project 2—3 mm into the vestibule and form a furrow, the so-called "cul-de-sac". The caudal part of the upper laterals is normally thin and pliable and separated distally by a narrow cleft from the septum, thus making it possible for the cartilage to follow the natural movements during respiration. In pathological cases the edges of the cartilage are found to be irregular, thickened and stiff, thus stretching the lining mucous membrane.

When intercartilaginous incisions are made in the vestibules, these pathologic conditions are revealed. Sometimes the cartilages are curled back on themselves, the so-called "returnings", or caudal edges are fractured and become thick irregular scar tissue. In such cases the cartilage must be trimmed, loosened and thinned, and the scar-tissue removed. The cartilages are severed from the septum in the midline, intraseptally or intranasally, by cutting the cartilage and the mucous membrane at the same time. This brings about normal resiliency.

The so-called long nose has a forward tilting of the alae with the angle between the columella and the upper lip being too acute. The deformity may result from congenital weakness of the upper lateral cartilages or an atrophy of the nasal tissues due to increasing age. In traumatic cases with sequelae following surgery, the lower half of the nose is weakend and broadened and collapses easily against the upper lip. This is due to a lack of cartilaginous support and secondary scar formation. These changes are usually followed by obstructed nasal passages and patients often volunteer the information, that relief is afforded by drawing the flesh adjacent to the ala outward and upward, or by raising the tip of the nose. In order to strengthen such a weak construction it is necessary to shorten the nose by opening the valve area and duplicating the nasal cartilages. This duplicating may be accomplished by exposing the upper lateral cartilages and removing the skin lining from a part of the lower nasal cartilages; after which the denuded cartilages are made to slide over each other, thus making it possible for the raw surface to grow together and develop strong adhesions.

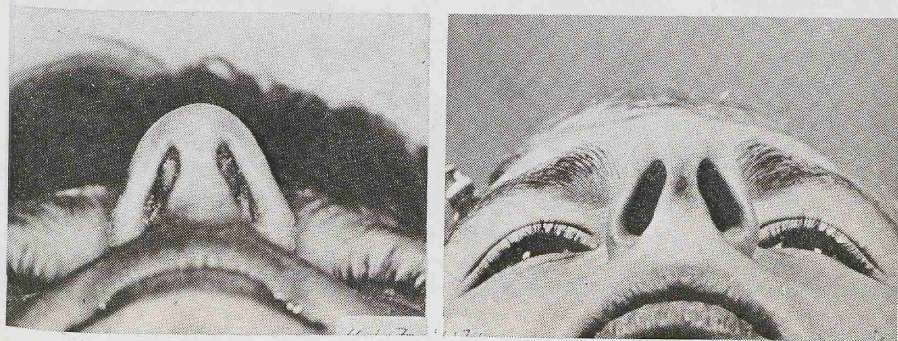


Figure 10. Constriction of the vestibules caused by inward concavity of the nasal alae; before and after operation.

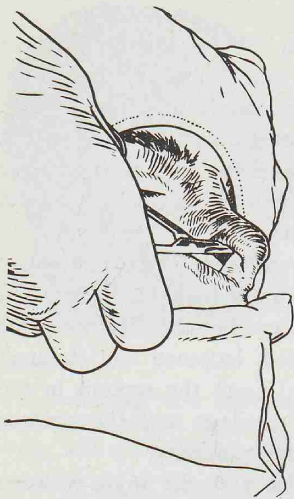


Figure 11 a.

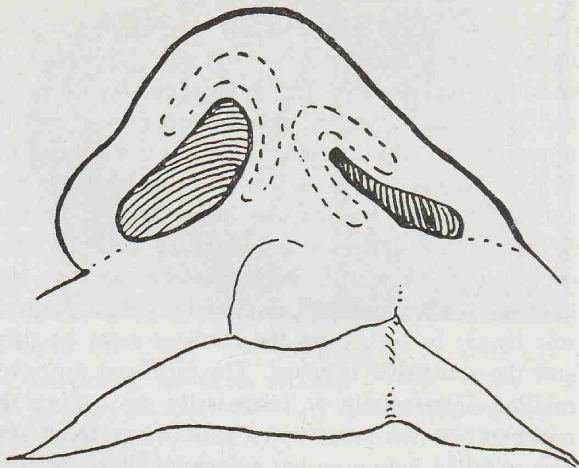


Figure 11 b.

a. Excision of the fibro-fatty tissue from the columella.

b. Irregularity of the lower nasal cartilages in a case of cleft lip and cleft palate.

#### DEFORMITIES OF THE NASAL LOBULUS

The caudal part of the nose surrounding the vestibules and the cartilaginous framework, built up of the lower nasal cartilages is called the "lobulus". This part of the nose is, to a great extent, a functional and anatomic entity, which creates funnels to lead the inspired air into the internal nares, or valve area, which is the narrowest part of the entire nasal passage.

Any constriction of the vestibules causes an increased negative pressure above

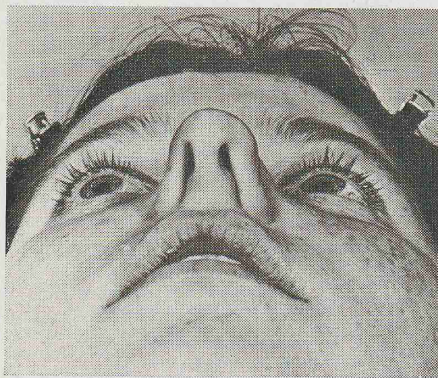


Figure 12 a.

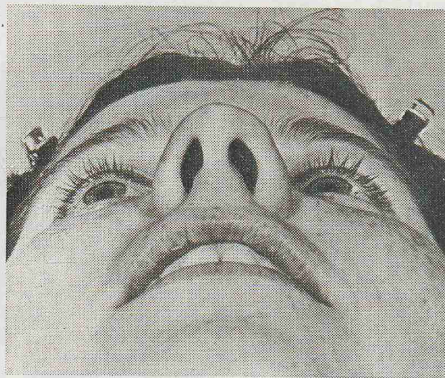


Figure 12 b.

a. Ala collapse resulting in a slit-like deformity.

b. The same slit-like deformity normalized without interfering with the columella.



the stenosis, as the inspired air cannot enter the valve quickly enough to equalize the pressures. The increased negative pressure in such cases may be sufficient to cause a complete collapse of the alae, together with disturbances of all the usual air currents.

The columella shows such various abnormalities as dislocations of the medial crura, too much tissue between them, retraction or prominence of the columella in relation to the alae.

In order to lengthen the columella and diminish its width it is occasionally sufficient to remove the connective tissue between the medial crura. In cases of retracted columella with an abundance of scar tissue, or in case of hare-lip deformities, complete mobilization of the cartilages is required in order to restore the columella to its normal position, or balance the medial crura by turning up the depressed side of the nose.

A deformity at the base of the columella, encroaching upon the bottom of the vestibules, is often brought about by a thickening or dislocated nasal spine, sometimes embedded in layers of scar tissue. In our experience, haematomas and fractures are often overlooked or ignored. In cases of acute trauma to the nose, with only slight indications of a hairline fracture of the spine, the damage may be almost invisible on the X-ray film. Our standard procedure with sequelae in such cases is to expose the nasal spine and separate it from scar tissue; after which it is carved and reshaped; it is also possible to change the nasolabial angle during the process. The importance of the columella as a hindrance to inspiration is

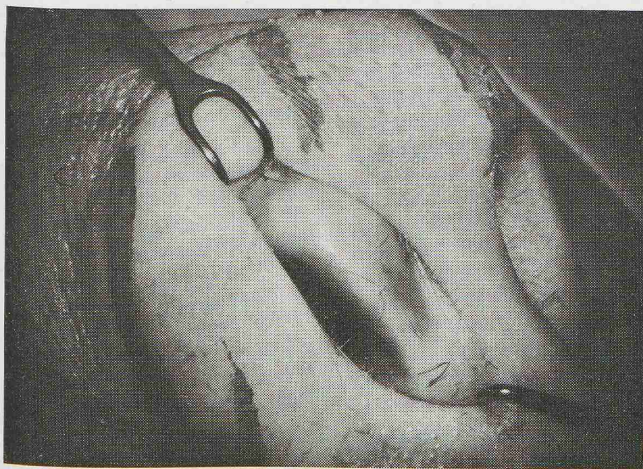


Figure 13 a.

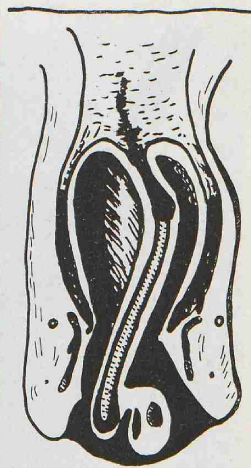


Figure 13 b.

- a. A septal dislocation protruding through the right nostril. The septum is squeezed between the upper lateral cartilages and the nasal spine. There is a very acute angle between the septum and the upper cartilage on the right side.
- b. A schematic drawing showing the deflection and angulation of the septum in the same case.



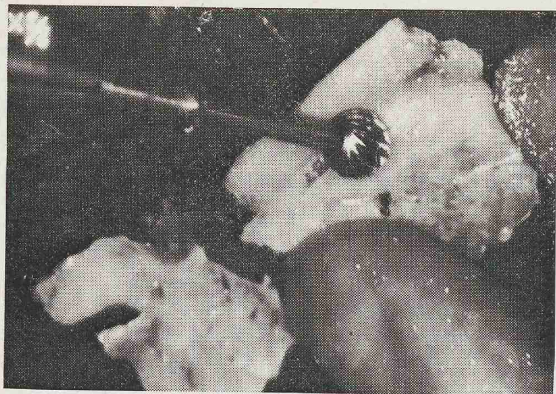


Figure 14 a.

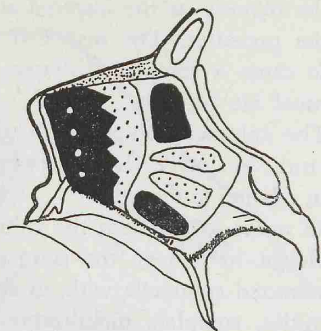


Figure 14 b.

- a. Grinding and smoothing the removed septal bone and cartilages for re-implantation.
- b. The caudal part of the septal cartilages has been replaced by a bony strut. Battens of cartilage and bone are inserted between the mucoperiosteal flaps in the posterior region. The bridge of the nose is raised by padding and stuffing with crushed cartilage.

surely overestimated. Some rhinologists consider that the columella assumes a great deal of importance on its functioning as flaps during expiration. In quite a few operative procedures the columella must, however, be elongated and the caudal part of the septum, together with the cartilaginous dorsum, trimmed; especially when we wish to superimpose the lower nasal cartilage on

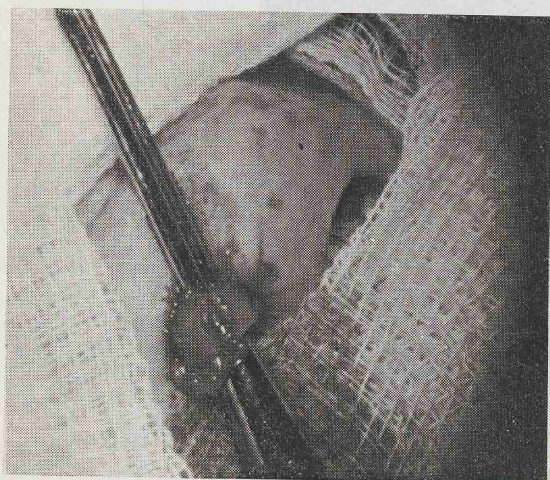


Figure 15 a.

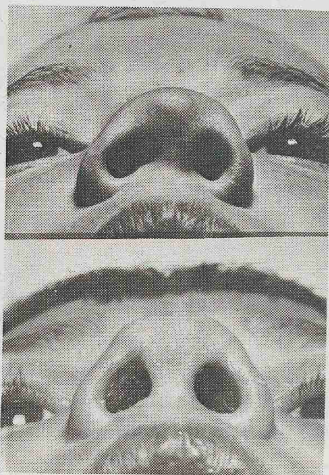


Figure 15 b.

- a. The lower nasal cartilages exposed at the junction between the lateral and mesial crura. The cartilage cut through and separated from the surrounding tissue in order to allow further growth.
- b. A patient before and 3 weeks after cutting the cartilage.



the upper laterals; turn up the nasal tip or make the nasal construction shorter and more stable.

Dislocation of the caudal edge of the septal cartilage, with consequent narrowing of one side of the nose, is a very complicated abnormality, usually involving several nasal structures.

The caudal edge of the septum can be clearly seen within one of the nares and is in a restrained condition between the lateral cartilage above and the nasal spine below. At the same time there is a very acute angle between the septum and lateral cartilage together with considerable deformation of the nasal spine, which may be embedded in scar tissue.

The bony septum is often deformed posteriorly and at times lies at an angle to the cartilaginous septum. The lower edge of the cartilaginous septum can be thickened and irregular with pronounced bulging of the inferior area which may then lie in a horizontal plane above the nasal crest.

In the case of septum dislocation it may be necessary to break through the osteocondrosis and remove the osseus septum together with the nasal crest and sometimes an inferior strip of the cartilaginous septum. The removed part of the septal skeleton can afterwards be carved and straightened before re-implantation. Many deviations, asymmetries, anomalies of the cartilaginous vault and the septum may still be present in such cases. Re-alignment of the upper cartilages and the creating of a new cleft between the septum and the upper laterals must be attended to, in order to ensure a good functional result.

In a few cases, an injury at an early age may cause the development of the nasal tip or nasal boundaries to be stopped or retarded. The nose remains short and the nares remain child-like in appearance and of a rounded shape. If the patient can be treated in time, it is recommended that the junction between the medial and lateral crura of the lower nasal cartilages be exposed. The cartilages are then detached from the tissues of the vestibule and the nasal tip, and then cut, thus



Figure 16 a.

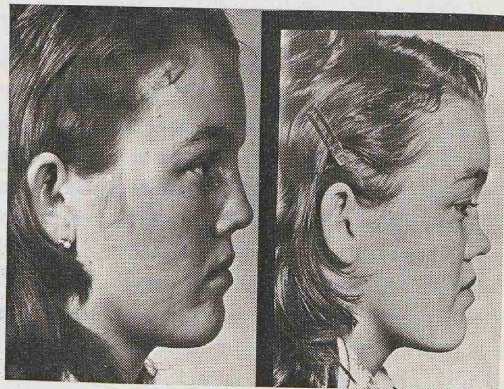


Figure 16 b.

- a. A girl with hypoplasia of the nose following a trauma at the age of three. Deformity corrected by using an L-shaped graft as above.





Figure 17 a.



Figure 17 b.

- a. A 63-year-old lady with an ugly deformity corrected by nasal reconstruction and restoration of the nasal contour.

providing new growth potentials. In older patients this treatment must be supplemented with prostheses which are enlarged by adding new plastic layers to the outer surfaces.

#### INSPIRATORY NASAL OBSTRUCTION CAUSED BY DESTRUCTION OF THE NASAL CARTILAGE AND SOFT TISSUES

In modern rhinoplasty the trend is to preserve active tissue and blood supply, expose, mobilize and reposition the cartilaginous framework and preserve the stability of the nasal construction.

Care must be taken when handling the mucous membranes, as roughness can lead to adhesions, scar formation and the obstruction of the valve area. In some cases this might necessitate treatment by circular excision of the thick scar tissue followed by skin transplantation.

Resection of supporting cartilaginous structures may give very nice primary results, but too much resection may be followed by ugly deformations and functional disturbances, due to contracting scar tissue. In the so-called "pinched nose" there is a falling in of the lower nasal cartilages and the only thing left for the patient will then be prosthetic treatment.

It is worth noting that plastic surgery based upon abandoned principles is still



responsible for collapsing noses, with scar formation, atrophy and perforation of the septum. Often the only remedy in such cases is to provide the nose with supporting material such as an L-shaped bone graft of cancellous bone capable of supporting the cartilaginous dorsal vault.

Autotransplantation of bony grafts has, however, its hazards and complications, therefore the tendency within rhinoplasty in later years has been to carry out careful reconstruction with stabilization of the nasal skeleton and meticulous re-implantation of previously removed cartilage and bone. Auto- or homotransplanted cartilage has been employed for restoration of the nasal contour. This at the same time prevents retracting scar-formation between the skin and nasal skeleton and simultaneously counteracts open roof syndrome.

#### RÉSUMÉ

L'obstruction nasale inspiratoire apparaît lorsque les structures du nez sont trop faibles pour résister à la pression négative.

Le collapsus intéresse souvent le seul cartilage supérieur latéral, mais l'ensemble des cartilages latéraux peut également se déprimer en donnant à la narine la forme d'une fente. Ils forment un mécanisme télescopique recouvert par la peau et une couche de tissu conjonctif.

Certains types de nez offrent des conditions favorables à ce phénomène: nez long et étroit, nez "en tension", pointe tombante, columelle pendante et toutes conditions dans lesquelles l'angle de la valve est trop étroit.

Des modifications asymétriques des structures peuvent être responsables: dislocation septale possible dès la naissance avec ses conséquences sur la croissance; déviation de la voûte cartilagineuse, généralement post-traumatique. La symptomatologie est passée en revue insistant sur l'intérêt de certains détails à l'interrogatoire: variation de la gêne avec la position, "signe du coton", "signe de la joue". Le diagnostic est en effet important et doit être détaillé pour une bonne sanction thérapeutique. On distinguera le collapsus global, la dépression localisée du nez "pincé" avec dilatation narinaire, et ce qui revient enfin à l'insuffisance musculaire.

Les défauts du cartilage supérieur latéral sont analysés: retournement, lésions post-traumatiques, atrophie.

L'analyse chirurgicale du lobule permet d'envisager les cartilages alaires, la columelle, l'état du bord caudal du septum et de l'épine nasale. On insiste sur le fait que la dislocation septale s'accompagne souvent de déviation du septum osseux. Pour un bon résultat fonctionnel, le but est le réalignement de toutes les structures du nez qui dépendent les unes des autres.

La rhinoplastie moderne doit tendre à la préservation des tissus et de leur vascularisation. La résection des structures cartilagineuses de soutien peut donner de jolis résultats initiaux mais, trop souvent, elle est suivie par des déformations affligeantes et des perturbations fonctionnelles.

Il est important de noter que la chirurgie plastique basée sur des principes abandonnés, est encore responsable de nez collabés, cicatriciels et atrophiques. Dans ces cas, le seul remède est souvent la greffe osseuse en forme de L avec ses aléas

et ses complications. Par conséquent, la tendance actuelle de la rhinoplastie est d'entreprendre une reconstruction soigneuse avec stabilisation de l'architecture nasale par la réimplantation méticuleuse du cartilage et de l'os enlevés initialement.

#### ACKNOWLEDGEMENT

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