

The Cottle sign: an aid in the physical diagnose of nasal airflow disturbances

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SUMMARY

Relatively inapparent nasal deformities causing nasal airflow obstruction may be overlooked during routine examination of the nose. One such deformity is narrowing of the liminal valve, which, in persons of Caucasian origin, is important in regulating airflow within the nose. Patients with obstruction of the liminal valve often relieve nasal obstruction by finding methods of enlarging the area of the liminal valve; lateral pulling of the cheek is one such method. It is also the basis of the Cottle test for detecting airflow obstruction of the liminal valve. The cheek is pulled away from the midline; the sign is said to be positive if the patient notices relief of nasal obstruction. The Cottle test is useful as a method of detecting abnormalities of the liminal valve, which must always be examined in cases of nasal respiratory obstruction.

SEVERE nasal airway obstruction may be the result of anatomic deformities that are readily apparent to the examining physician. Less obvious nasal deformities, which easily can be overlooked during a routine nasal examination, may also cause severe nasal airway obstruction. One such common but subtle deformity causing symptomatic nasal airway obstruction is narrowing of the limen vestibuli. First described by Mink (1903), this slitlike opening is the narrowest part of the nasal passage; it is defined as the triangular opening between the caudal end of the upper lateral cartilage and the nasal septum. The term, limen vestibuli, has many synonyms (Table 1): nasal or liminal valve, ostium internum, os internum, liminal chink, valve area, valve region, flow-limiting segment (FLS), and area 2. In this paper the term liminal valve (Figure 1) will be used.

NASAL VALVES

A valve is a structure that regulates or permits movement of fluid in one direction; in the nose, the fluid is air. Several nasal structures, however, can function as inflow valves (Table 2): the liminal valve itself, the erectile tissue of the turbinates (turbinal valve) (Figure 2), and the erectile tissue of the nasal septum (septal valve). The importance of these structures in regulating airflow depends in part on racial characteristics. For example, in the Caucasian, the liminal valve is considered to be the most important inflow regulator (Bridger, 1970; Bridger

Table 1. Synonyms for liminal valve

Os internum
Ostium internum
Limen vestibuli
"Liminal chink"
"Nasal valve"
"Valve area"
"Valve region"
Flow limiting segment
Area 2 *

* A full description of areas 1, 2, 3, 4 and 5 may be found in Hinderer K.H.: Fundamentals of anatomy and surgery of the nose. Birmingham, Alabama, Aesculapius Publishing Company, 1971.

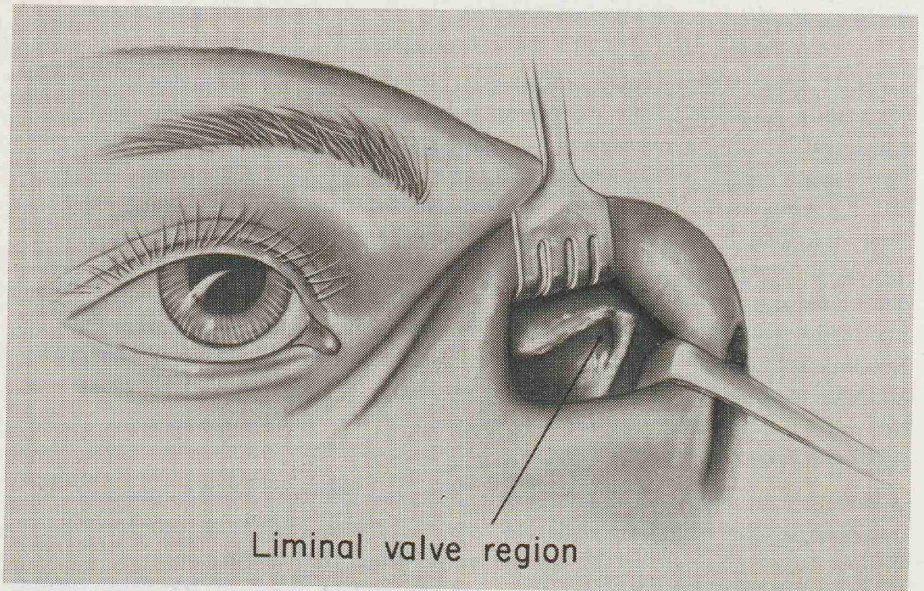


Figure 1. Liminal valve. In the leptorrhine (Caucasian) nose, region between caudal end of upper lateral cartilage and nasal septum is probably the most important inflow regulator of air.

Table 2. Nasal valves

Liminal valve
Turbinal valve
Septal valve

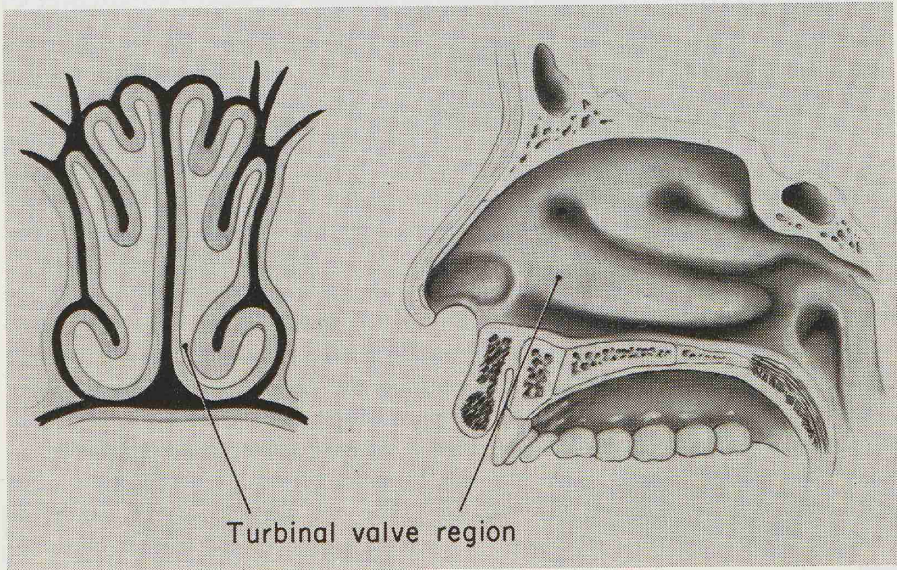


Figure 2. Turbinal valve. In the platyrrhine (black) nose, region between nasal septum and anterior part of inferior turbinate is probably the most important inflow regulator of air.

and Proctor, 1970). According to Bridger (1970), the area of this flow-limiting segment normally averages 55 mm²; Masing (1967) has calculated the area as being 64 mm². In the black person, the narrowest part of the nasal passage — the flow-limiting segment — is the area between the nasal septum and the anterior part of the inferior turbinate. Thus, in the black person the inferior turbinates probably constitute the most important inflow regulator (i.e., turbinal valve); in the Caucasian, the liminal valve is probably the most important airflow regulator, accounting for most of the inspiratory resistance to airflow (van Dishoeck, 1942, 1965; de Wit et al., 1965 and Hinderer, 1970).

In man, therefore, there is more than one nasal valve; and, depending upon the racial, morphologic characteristics of the nose, one "valve" may play a more pro-

minent regulatory role in nasal respiration than the other. Important ethnic variations in these nasal areas have been studied and described by Cottle (1955). For the normal physiologic state the situation could be summarized as follows: in the Caucasian (leptorrhine) nose, the more important airflow regulator is the liminal valve; in the black (platyrrhine) nose, the more important airflow regulator is the turbinal valve.

COTTLE TEST

The examining physician may relieve obstruction due to deformity of the liminal valve when he places a nasal speculum in the nasal vestibule; paradoxically, he may therefore overlook such an obstructing deformity during the very process of making a routine examination of the nose.

An obstructing deformity may be caused by almost any lesion. Our attention has been focused on the mechanisms that patients use to enlarge the area of the liminal valve and to temporarily relieve the annoying symptom of nasal obstruction.

Some patients have used the mechanism of pulling the cheek on the side of the valve obstruction laterally; the upper lateral cartilage is pulled away from the septum, the slitlike liminal valve thus being opened. Other patients have learned to open the liminal valve by elevating their upper lips into an unattractive (but effective) snarl.

These observations have led us to suggest a simple and useful clinical test for confirming the presence of an abnormality of the liminal valve. The test is performed as follows: While the patient breathes quietly, we simply draw the cheek laterally away from the midline, thus opening the region of the liminal valve (Figure 3). If the patient finds that this appreciably relieves the nasal obstruction, the Cottle sign is said to be positive; this is interpreted as an indication that an abnormality of the liminal valve is a significant factor in his symptomatic nasal obstruction. We have named this test the Cottle test, for Dr. M. H. Cottle, of Chicago, Illinois, who has established himself as a pioneer and teacher of rhinology.

If the liminal valve is occluded by scarring or synechiae due to previous trauma, the patient may have a "valve problem," with a false-negative Cottle sign. This indicates that the abnormality of the liminal valve, such as scarring of the upper lateral cartilage to the septum and the resultant airflow disturbance cannot be lessened by performing the Cottle test. A summary of interpretations of the positive and negative Cottle signs is provided in Tables 3 and 4.

A careful examination of the liminal valve is indicated in every patient with nasal respiratory symptoms, in order to rule out a pathologic process in this region. The liminal valve is best examined without the nasal speculum, which may distort the relationship of the caudal end of the upper lateral cartilage to the septum; when a nasal speculum is used it should not obscure the upper lateral cartilage. The tip of the nose is gently elevated with the examiner's finger and the inspection of the region of the liminal valve is examined with the aid of a good light source. The caudal end of the upper lateral cartilage should form an angle 10 to 15° with the septum. A smaller angle is consistent with symptomatic narrowing of

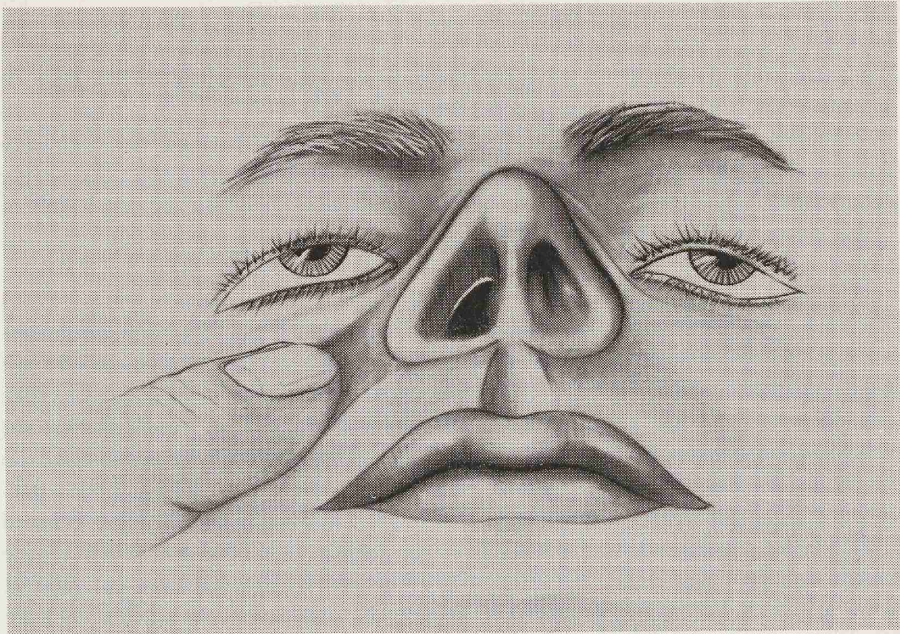


Figure 3. Method of performing Cottle test: cheek is pulled away from midline with index finger to open liminal valve region.

Table 3. Interpretation of positive Cottle sign and false-positive Cottle sign

Positive Cottle sign	False-positive Cottle sign
Liminal valve region abnormality	Can be seen with alar collapse

Table 4. Interpretation of negative Cottle sign and false-negative Cottle sign

Negative Cottle sign	False-negative Cottle sign
Normal liminal valve region with nasal abnormality in another area of the nose, or entirely normal nose	Synechia (webs, scars) of liminal valve region

this liminal valve; a larger angle may constitute "ballooning" and may also be associated with nasal symptoms.

To enable one to obtain an adequate view of the liminal valves in the male, it is frequently necessary to trim the vibrissae.

We believe that the Cottle test is an easy, reliable clinical method of diagnosing subtle, easily overlooked nasal deformities that can be responsible for severe symptomatic nasal obstruction. It is an aid in physical diagnosis of nasal airflow disturbances localized to the liminal valve.

RÉSUMÉ

Au cours de l'examen de routine du nez, il arrive de négliger des anomalies nasales relativement inapparentes produisant une obstruction au volume courant nasal. Une telle déformation est le rétrécissement de la valve liminaire qui, chez des personnes d'origine caucasienne, est importante pour la régularisation du volume courant dans le nez. Chez des patients démontrant un rétrécissement de la valve liminaire on peut soulager l'obstruction nasale par des méthodes permettant l'élargissement de la région valvulaire; une de ces méthodes consiste à tirer la joue latéralement. C'est aussi la base du test de Cottle pour détecter une obstruction du volume courant de la valve liminaire. La joue est tirée par rapport à la médiane. Le signe est positif si le patient remarque une amélioration de son obstruction nasale. Le test de Cottle est utile en tant que moyen de détection d'anomalies de la valve liminaire qui doit toujours être examinée lors d'investigations pour obstructions respiratoires des voies aériennes supérieures.

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