

Section of Laryngology

President—A. J. WRIGHT

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Snoring

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THIS short paper is a plea for the more serious consideration of a complaint which is often a distressing physical and mental handicap. It may ruin a happy marriage, and in some parts of the U.S.A. it is considered justification for divorce. Up to date it has been treated as a comic pastime, and the unfortunate adult sufferers (and even more the agonized relations and associates) have to bear with it in fear of ridicule.

There is almost no world literature on the subject except for the Japanese observers who have devoted some time to it. But we can gain some useful information on the matter from recent work by anatomists and orthodontists who have been studying the mechanism of palatoglossal movements and their relationship to mouth breathing. I am indebted to Dr. J. Whillis, Mr. Gwynne Evans and Mr. A. Nove for most helpful personal conversations.

Definition.—Noisy respiration during sleep may be produced during inspiration and expiration by various structures in the respiratory tract. I propose to limit snoring to sounds made by vibrations in the soft palate and posterior faucial pillars during sleep. This definition excludes sounds made by laryngeal structures including the epiglottis, by the tongue, cheeks, lips or nostrils. Snoring is usually produced during inspiration through the mouth. Sometimes, however, breathing is through the nose (Negus says this occurs in some "gifted individuals"). A short inspiratory snore through the nose with the mouth open may be called a "snort" and some persons are addicted to a series of snorts.

Snoring is involuntary: it stops as soon as consciousness is regained.

Mechanism.—Whillis has shown very clearly by means of a pharyngoscope that the vibrating part in a snore is the thin edge or velum of the posterior faucial pillars. He proved that a reservoir of air is necessary in the nasopharynx: if this space is completely filled the velum cannot vibrate. He also demonstrated that the velum is set in vibration during respiration (usually inspiration) when a "critical point" or position is reached in the relative position of the tongue and soft palate. But not only is it *position* that influences the vibrating parts, it is the *texture* of the velum, and this depends on the tone of the musculature of the glossopharyngeal arch, and the thickness of the tissues (especially the mucosa). The actual pitch of the sound is determined by the so-called "flutter-ratio" of the faucial pillars: Strauss likens the physics to a fluttering flag in a wind—any increase in the force of air intensifies the noise but does not change the pitch. This depends on the density, elasticity, and size of the vibrating part.

Position of the soft palate.—When sucking, the infant's soft palate is in close apposition to the back of the tongue (fluid being squirted intermittently back into the pharynx). A suckling is therefore unlikely to snore during sleep, as the relation between tongue and soft palate is unlikely to change. When the chewing habit develops the soft palate is raised away from the tongue. If mouth breathing occurs for any reason, the palate is free to vibrate. In adults the position is regulated by the tone of the muscles as well as the amount of airway in the nose. Nove maintains that a short ramus of the mandible makes the palate lie away from the dorsum of the tongue.

Position of the tongue.—This plays some part in determining the "critical point". If during mouth breathing the dorsum is arched, or falls back, then it will be near to the velum of the fauces. The position of the head may govern that of the tongue. Sleeping on one's back is considered a common cause of snoring, because the tongue falls back more readily. The act of swallowing (the mechanism of which is so admirably described by Negus, 1942, *Proc. R. Soc. Med.*, 36, 85) actually inhibits that of snoring; there may be complete cessation or resumption, depending on whether the tongue returns to the snoring or "critical" position, and also whether the reflexes to be described are inhibited.

With regard to the position of the tongue there seems to be no influence from the presence or absence of teeth or dentures in the production of snoring. On the other hand an orthodontic "monoblock" or "Andresen" splint can mould the dental alveolar pattern (probably without changing the basal bone one) and so lead to less mouth breathing.

Tone of the glossopharyngea musculature.—This has a governing role for the "critical point", as it decides the positioning and elasticity of the parts. Gwynne Evans and Whillis agree that there is a "central reflex" determining the control of the muscle groups, i.e.

muscle behaviour is patterned by the C.N.S. These patterns are inherent developments of inborn conditioned reflexes, predestined in foetal life. An inhibition of central control will thus upset the muscular balance. Gwynne Evans associates immobile palatolingual with immobile orofacial musculature, as in so-called "adenoid facies".

It can be put forward as a plausible explanation of snoring that during sleep there is a fall in adrenal secretion: this leads to a rise in parasympathetic over sympathetic action, and therefore a diminution of tone in the palatal structures.

In sleep there is said to be a rhythmic variation of depth: at first considerable depth, then lighter sleep and then before waking another increase in depth. If this is true one would expect snoring to occur more readily early in sleep and then just before waking. Actually severe sufferers snore all the time.

In anæsthetized patients it has been said that a real snore does not occur—but this is not true—at any rate sounds just like snoring are heard. Dr. Vevers of the Zoological Society has told me that he has heard a chimpanzee snore under an anæsthetic.

Other factors influencing the position and tone of the glossopharyngeal structures.—Certain conditions other than that of nasal obstruction lead to slight œdema of the palatal mucosa, or loss of tone in the muscular velum. Slight pharyngitis from working indoors, and from smoking, obesity, plethoric tendencies, and allergic manifestations have all been listed as aggravating causes. One observer has described snoring as one of the diagnostic signs of leprosy of the pharynx; if this were so, one would expect any granulomatous condition in the pharynx to lead to snoring. That a mobile palate is essential for snoring is utilized by speech therapists in the "snorting test" in training cleft-palate patients.

I must mention that in America some prominence is given to the psychological aspect of causation. An article entitled "Does a contented person snore?" shows the trend of thought. It is considered that some snorers stop the habit when on holiday, and others have cycles of snoring periods regulated by psychological and endocrine factors. Personally I think this unlikely, but Gwynne Evans' theory of "central reflexes" makes it not impossible for basal or even higher centres to decide if and when we snore.

Ætiology.—At first thought it appears that the explanation of snoring would be simple enough. Any organic condition causing nasal obstruction would lead to mouth breathing, and a snore would be unavoidable. But this is not so: mouth breathers do not all snore. Causes must be divided into organic and functional or, better, dysfunctional, and although the main predisposing cause may be organic there is usually a dysfunctional cause as well.

A. *Organic causes.*—(1) *Nasal obstruction:* It is often the minor degrees of obstruction which lead to enough mouth breathing to initiate snoring, e.g. slight deflection of the septum, collapsed *alæ nasi*, or moderate mucosal congestion.

Dr. Vevers tells me that although he has never heard a wild wolf snore, many domestic dogs, all descended from the wolf, do so. He imagines this occurs in breeds with malformation in the nose and nasopharynx, caused by such conditions as achondroplasia, as seen in pekinese, &c.

(2) *Pathological changes in the pharynx* may make the soft palate and faucial pillars more liable to be in a suitable physical state for snoring to be initiated.

B. "*Functional derangements*"—or "*Dysfunctions*"—of the "central reflex" governing the tone of the glosso-pharyngeal musculature.

Age-groups.—There are three main eras of snoring: in the child, the adult and the elderly person. In children the majority are cured by removal of their adenoids and tonsils. The exceptions to cure include the persistent mouth breathers of "functional" origin and those with infective or allergic rhinosinusitis.

The adult who starts snoring usually does so from some organic cause. Women snorers appear to be as numerous as men.

The largest group of sufferers are elderly men and women. Lack of tone seems to be the fundamental cause.

TREATMENT

A. *Irrational methods.*—Chief amongst these is amputation of the uvula, which used to be a popular practice. Removal very rarely gives much relief, but it may modify the degree and pitch of the snore.

B. *Rational methods.*—(1) *Remove or prevent nasal obstruction*, and so allow for cessation of mouth breathing. In some instances simple decongestive nasal drops before retiring will allow a peaceful night. In others various nasal operations may have to be performed. Benadryl is useful for some persons.

(2) *Change position of head* to prevent tongue falling back. Many persons snore only when on their backs, and on some occasions the uncomfortable procedure of a cotton reel sewn into the back of the pyjamas is efficacious.

(3) *Alter position of tongue, soft palate and/or jaws*, by breathing, swallowing and phonetic exercises, or by orthodontic "splints". The former aim at training the central nervous system to regain proper neuromuscular control. The latter alter the shape of the mouth and thus try to guard against the tongue and fauces falling into the "critical" position.

In *all* these three groups it is necessary to regain proper central control of the soft palate, and break the habit of an inverted reflex.

(4) *Keep mouth closed during sleep*: This is done by wearing an "Andresen" splint (which is well tolerated by most children, but less so by an adult) or by the simple expedient of a strip of adhesive plaster across the corner of the mouth. After a short time this is well tolerated by many patients. An adequate nasal airway is of course essential.

C. *Altering texture of soft palate and faucial pillars*.—Injection of a sclerosing solution into the pillars is advocated by Jerome Strauss, though this enthusiastic surgeon has not been able to claim a high percentage of cures so far.

However, I feel we surgeons may have helped many potential future snorers by our effort at removal of their tonsils and adenoids—leaving them with nothing but a fixed fibrous band instead of nice mobile soft palate and faucial pillars!

CONCLUSIONS

Snoring is a symptom of unbalanced breathing, caused by a combination of several physical conditions, some brought about by pathological and other by physiological disorders. Remedies must aim at preventing all these causes and not only one.

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Film Showing Organic Disorders of the Larynx.

G. H. Bateman said that some months ago he had shown the Section a film illustrating bronchial neoplasms which Dr. Paul H. Holinger, of St. Luke's Hospital in Chicago, had taken. Dr. Holinger had now sent him a film entitled "Organic Disorders of the Larynx", which had been prepared from Dr. Holinger's own cases and had been sub-edited and annotated for showing to medical students and speech therapists. He had had the opportunity recently of talking with Dr. Holinger about his method of taking films by indirect laryngoscopy. The patient sat upright facing the operator who used the same camera and apparatus as was used for the direct pictures. The laryngoscopic tube was used and a mirror obliquely disposed at the end of this tube. Thus the mouth did not appear in the films as the view is confined to the mirror and its reflections. In direct laryngoscopy the mirror was removed and the laryngoscope tube introduced in the ordinary way, with the patient having his back to the surgeon. All the pictures were taken under local anæsthesia.

The result of this change of position of the patient is that the right cord will be on the right of the screen in the direct pictures and on the left in the indirect pictures.

A considerable range of pathological conditions of the larynx is shown and the treatment mentioned though no details of treatment are given in the film. The colour is very accurate and the film is an admirable method of demonstrating the pathology of the larynx to students.

Bell Telephone Film of the Laryngeal Movements.

V. E. Negus showed a film taken by indirect laryngoscopy with an ultra-rapid camera. The pictures were taken at 4,000 frames per second and slowed down to normal rate so as to show the laryngeal movements in slow motion. Mr. Negus said that this film differed from the beautiful film they had just seen in that it showed the normal mechanism instead of diseased states.

Many of those present, like himself, had no doubt made use of the stroboscope, from which a great deal of help could be obtained in observing the laryngeal mechanism. On the evidence of the stroboscope was based a certain amount of the criticism he would make of the film. The stroboscope consisted of a perforated disc so rotated in front of a lamp that the light could be interrupted a certain number of times per second; the speed could be altered at will. If the speed were 200 times per second, for example, it was possible to illuminate the larynx at exactly the same rate as that of the sound produced. If the pitch were at the rate of 200 vibrations per second the vocal cords for 1/400th of a second would be moving towards the mid-line and for 1/400th of a second away from the mid-line. If only one phase were illuminated the cords appeared to be stationary. By varying the speed