SOCIETIES' PROCEEDINGS

ROYAL SOCIETY OF MEDICINE—SECTION OF LARYNGOLOGY

May 7th, 1937

President—LIONEL COLLEDGE, F.R.C.S.

Multiple Metastasizing Melanomata.—NORMAN PATTERSON.

W.S., aged 38, male.

13.4.37 : Five weeks ago noticed several small dark nodules on left side of neck. Three weeks ago noticed that urine was dark. Two weeks ago noticed many small nodules over the body and limbs. Sight good. Occasional attacks of vomiting. No hæmatemesis or melæna.

On examination.—There are pigmented areas in the mouth, pharynx, and larynx, small dark areas on the posterior third of the tongue, a large patch on the epiglottis, and numerous patches on the arytenoids and aryteno-epiglottic folds. The nasopharynx appears to be free from pigmentation. There are also bilateral nasal polypi. The trachea, bronchi, and œsophagus have not been examined.

Identification of pigment from urine : Melanin.

Blood-count : Hæmoglobin = 102% ; colour-index = 0·98.

Microscopical diagnosis.—Two nodules of very pigmented secondary spindle- and polygonal-celled melanotic carcinoma in subcutis of arm.

Carcinoma of Tongue, followed by Cystic Adenoma of Thyroid—NORMAN PATTERSON.

E.P., female, aged 67.

8.8.32 : Infiltrating carcinomatous tumour of right side of base of tongue and lower pole of tonsil. No enlarged glands in neck.

10.8.32 : Local excision of growth by diathermy.

12.8.32 : External carotid ligatured, owing to hæmorrhage in bed of wound.

5.2.37 : Presented herself with swelling in the right side of the neck, deep to the sternomastoid. The swelling was firm, appeared to be attached to the deep structures, and did not move on swallowing ; its surface was somewhat nodular. It was thought to be

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a recurrence in the glands of the neck, but when the patient was operated on, 17.2.37, the tumour was found to be associated with the thyroid gland, and was easily removed.

Histological report.—" Fibrous-walled cyst and a calcareous nodule surrounded by fibrosis apparently from a nodular colloid goitre. Variability in shape and size of vesicles, epithelium frequently cubical; moderate fibrosis and focal lymphocytic infiltration in surrounding thyroid tissue."

Subsequent course satisfactory. No signs of any growth at site of original carcinoma.

Laryngectomy for Carcinoma of Larynx, with Development of Secondary Gland nearly Five Years after Original Operation.—NORMAN PATTERSON.

F.D., male, aged 66.

7.8.32: Anterior portion of right cord, anterior commissure, anterior two-thirds of left cord, and inferior laryngeal surface of epiglottis were involved. Left cord fixed. No glands palpable in neck.

10.8.32: Laryngectomy performed, including removal of the epiglottis, and upper two tracheal rings. Recovery uneventful.

Histological report.—Squamous-, polygonal- and trabecular-celled carcinoma of larynx.

7.4.37: For two months has noticed lump, gradually increasing in size, on left side of neck.

On examination.—Large, firm and very adherent swelling, lower part of neck deep to sternomastoid. No other glands palpable.

14.4.37: The swelling was removed by a dissection which included removal of a section of the sternomastoid and the underlying and adherent jugular vein, which was divided just above the entrance of the thoracic duct, well below the tumour, and again above the tumour, about half-way up the neck. On examination of the specimen the outer wall of the vein was seen to be invaded. No other enlarged glands could be palpated.

Histological report.—Squamous- and prickle-celled trabecular secondary carcinoma of neck, replacing lymphatic gland.

The Evidence of Comparative Anatomy on the Structure of the Human Larynx

By V. E. NEGUS

THE human larynx has undergone many changes in the course of evolution, and is now a complicated organ. It is possible, however, to study its component parts in the light of comparative anatomy

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and thus to derive information as to the reasons for the various structural details.

The position of the larynx, low in the neck, is one peculiar to man ; there is a gradual descent from infancy to adult life. Changes in the pituitary and occipito-vertebral angles have an influence, but not one of supreme importance. A similar position of the head in relation to the vertebral column is present in the higher apes, without a corresponding alteration in the level at which the larynx is placed.

The factor of greatest importance is recession of the jaws, with consequent backward and downward displacement of the tongue. As the larynx must necessarily lie behind the tongue, it is forced to occupy a lower position in man than in a gorilla, for instance, in whom there is a protruding snout.

In reptiles, birds, and most mammals, the head is in line with the axis of the vertebral column and the mouth is projecting ; in such animals the larynx lies opposite the base of the skull. One consequence of the low position of the larynx in man is the formation of a capacious pharynx, of great value for phonation.

The size of the larynx in man is small in relation to his body-weight. It is also small in proportion to the size of the trachea, thus producing a choked point on the airway, with less facility for rapid exchanges of gases in the lungs, than in more active species. Owing to his greater intelligence, man does not require the strength or speed of animals and does not suffer from his narrow airway in the struggle for existence.

In the fœtus and the child the larynx is relatively bigger, if compared with the trachea ; it is somewhat funnel-shaped and resembles, in this respect, the larynx of the dog tribe, amongst other animals. It is also larger in the male after puberty, than in the boy or female.

The laryngeal aperture, in relation to the axis of the pharynx, is not at a right angle, as in reptiles and birds, and not in line with the trachea, as in fast-running deer and many other animals ; it is set obliquely. Consequently there is friction as air passes to the lungs. In the process of development from embryo to fœtus there is a gradual tilting of the laryngeal aperture, until in the adult it is inclined towards the opening of the nasopharynx.

The scaffolding consists of thyroid and cricoid cartilages, the one movable on the other, with consequent advantages in deglutition and phonation. There is an added facility in opening and closing the laryngeal aperture, because the margins of the glottis are made up of short arytenoid cartilages and long membranous folds.

In reptiles and birds there is a single crico-thyroid plate, while in marsupials the thyroid and cricoid cartilages are fused. In both

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types the arytenoids are long, and closure of the laryngeal aperture is attained mainly by lateral coaptation of the cartilaginous margins, rather than by forward movement of the arytenoids, as in man.

The extrinsic muscles cause the larynx to move during deglutition and phonation, and to partake in the peristaltic wave executed by the pharyngeal muscles. In such animals as the chameleon the pharynx is capacious and the larynx very small; it is easy to learn from this species that the larynx merely partakes in the movements of the pharynx. In man the larynx is large in relation to the pharynx and thus the primitive mechanism is obscured.

The epiglottis of man is almost functionless. It is not in apposition with the soft palate, as in most animals, in which it serves as an accessory organ of olfaction. In man the olfactory sense is not of importance and it is not of vital significance if the inspiratory air current enters by the mouth. In such animals as herbivora, such an occurrence would be dangerous to life, as the sense of smell would be diminished when the mouth was open. In an animal such as the horse there is a powerful hyo-glosso-epiglottic muscle to move the large epiglottis, but in man there is merely a ligamentous relic in the position of these contractile fibres.

The arytenoid cartilages of man are short, because of the relatively slight necessities of respiration; the membranous folds are long in proportion. The larynx itself is relatively small, and the two factors combined produce a choked point on the airway. In some fast-running animals the larynx is large and forms a funnel-shaped dilatation at the upper end of the trachea, whilst in others the arytenoids are long and produce wide dilatation of the glottis. The derivation of the arytenoids from lateral cartilages can be studied in the embryo and can be compared with the adult form of some amphibians. The presence of rigid bars in the glottic margins is of assistance in opening the glottis during respiration.

The intrinsic muscles are divided into a sphincteric and a dilator group. Comparison with the muscular sphincter of the Dipnoi or lung-fish, amphibians, reptiles and birds, allows an understanding of the division of the sphincter into separate muscles to be obtained. It is easy to see how the lateral crico-arytenoid, thyro-arytenoid and inter-arytenoid muscles are all parts of a sphincteric girdle, and have a synergic action in deglutition and phonation. Many fibres run from one muscle into another.

The dilator group of man is represented by the posterior crico-arytenoid muscles, which work in opposition to the sphincteric group. They do not pull on the tips of the arytenoid cartilages, as in reptiles and birds—thus causing the glottis to assume a triangular shape, with the apex placed posteriorly—but are attached

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to the muscular processes and work in two ways. They rotate the glottic processes of the arytenoids outwards, but there is also a second action, not usually recognized, namely separation of the bodies of the arytenoids by the pull of lateral fibres of the muscles. This movement is made possible by the laxity of the crico-arytenoid joints, and is not seen in lower animals. The result of the combined actions is that the glottis, when open during respiration, assumes the shape of a triangle with the apex placed anteriorly.

The cartilages of Santorini are backwardly curved, to give partial attachment to the anterior wall of the œsophagus. The object of this attachment is made clear by comparison with certain animals, as for instance, herbivora. When the larynx closes during deglutition the crico-pharyngeal sphincter relaxes and the mouth of the œsophagus is pulled open by its attachment to the cartilages of Santorini, so as to assume a funnel shape. In man there is, in addition, partial attachment of the œsophagus to the back of the cricoid cartilage, so that the mechanism described is not of great importance.

The laryngeal ventricle divides the primitive thyro-arytenoid fold into two divisions—upper or ventricular band, and lower, or vocal cord. It has no vocal function, but is merely a recess left by separation of the two folds ; this is well illustrated by comparison with the Japanese deer (*Cervus sika*) and other animals, in some of which there is merely a shelf-like depression between the inner and outer divisions of the thyro-arytenoid muscle.

The vocal cords of man have margins of a moderate degree of sharpness ; they act as a valve of considerable efficiency—inferior, however, in respect of prevention of air entry, to the similar structures of lemurs, monkeys, and apes. The valve is required in animals which climb, and in man it shows signs of retrogression. The result is an improvement in respect of phonation, as a wider range of tones can be executed by the human vocal cords than by the sharp-edged folds of apes, for instance. The tones, also, are more mellow. Short cartilages and long folds are essential if a wide range of sound is to be produced. In reptiles or birds the long arytenoid cartilages preclude efficient phonation at the larynx. In birds the vocal necessities are supplied by the provision of a syrinx at the bifurcation of the trachea.

The ventricular bands are free-edged and valvular and are capable of retaining air in the lungs at times when straining is called for to raise the intra-abdominal pressure. Very few animals have folds of a similar valvular nature, the probable reason being the lesser degree of mobility of their ribs.

The saccule is small and insignificant, as compared with that of some apes. In man it seldom reaches above the upper margin of

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the thyroid cartilage, but in chimpanzees it is continuous with air sacs which extend into the axilla for purposes connected with the rebreathing of air.

The aryteno-epiglottic folds form the mesial boundary of the lateral food-channels, along which liquids may pass, even when the laryngeal aperture is open. In man the folds are neither high nor efficient, but in infants the channel is relatively better formed and permits of simultaneous deglutition and respiration. The lateral channel is seen to advantage in the cetaceans and herbivora, in which large quantities of liquid or semi-liquid food has to pass into the œsophagus.

The cartilages of Wrisberg support the aryteno-epiglottic folds and are tall and slender; they help to fill in the gap between the epiglottic and arytenoid cartilages.

Conclusions.

The larynx of man is efficient for protection of the lungs. There is a sphincteric muscle-girdle to close the laryngeal aperture and there are also upstanding ary-epiglottic folds to provide lateral food-channels and thus prevent inundation by liquid while the aperture is open.

For combined respiration and deglutition, efficiency is slight in the adult but better in the infant. The powers of olfaction are slight in man, as reflected in the inefficiency of his epiglottis and its lack of apposition to the soft palate.

Respiration is not served to the degree of efficiency seen in many animals. The larynx of man is always a choked point on the airway, whenever the needs of respiration are considerable. The airway is tortuous and provides various points of friction, thus providing yet another check to the efficiency of gaseous exchanges in the lungs.

There is no mechanism for respiration at times when no fresh air is entering by the nose and mouth, as there is in some mammals, certain reptiles, and most birds.

Phonation is well served by flexible and long vocal cords, capable of varied degrees of elasticity. The presence of a capacious pharynx, owing to the low position of the larynx, gives man considerable advantages. His powers of speech are greatly assisted by the lack of contact between the larynx and the soft palate and the consequent ability to emit sounds both by mouth and nose.

When all the structural details are considered the conclusion is that the larynx of man is not specialized for any one function, but is an extremely versatile and efficient organ.

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