SOCIETIES' PROCEEDINGS

ROYAL SOCIETY OF MEDICINE—SECTION OF LARYNGOLOGY

February 7th, 1936

President—LIONEL COLLEDGE, F.R.C.S.

CASES

Atrophic Rhinitis treated by Cartilage Grafts.

—W. A. MILL.

Female, aged 53. Nasal obstruction with crusting and anosmia for many years.

October, 1935 : Costal cartilage grafts to each side of the septum with great broadening of the septum and narrowing of the airway. Condition very much improved.

DISCUSSION.

C. HAMBLEN THOMAS said that he thought it was better to use decalcified bone in such a case instead of cartilage taken from the patient ; the bone could be obtained ready prepared, and by this means an operation on the ribs was avoided.

ALEX. R. TWEEDIE asked if nasal obstruction was actually present (as mentioned in the notes) before the operation, or if this symptom represented the usual complaint of patients with intranasal atrophy. He ventured to remind Members of the value of the glycophilic treatment for such cases, as developed by Benians and Hayton (*Journ. Laryng., Rhinol. and Otol.*, 1919, xxxiv., 325).

DOUGLAS GUTHRIE said that the reason why these patients complained of obstruction was that the nasopulmonary reflex was disturbed. The impingement of inspired air upon the nasal mucous membrane was the first stimulus demanded by the complex respiratory mechanism and this stimulus was diminished when the nasal cavity was abnormally wide and roomy.

L. GRAHAM BROWN said that he had performed a similar operation for unilateral cases of atrophic rhinitis, taking a piece of septal cartilage and putting it on the wider side, and from that he had had fair success.

The PRESIDENT said that nearly always these patients were much relieved by painting with 10 per cent. glucose in glycerine, and though this patient was very much improved, it seemed scarcely worth while to operate for the condition.

W. A. MILL (in reply) said that this patient was still washing out her nose, and using glucose and glycerine, and she was now much better,

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as she could now smell things, which she could not do before. At the operation, cartilage was put under the perichondrium on each side. As a rule the result was as in this case for some months, and then the atrophic condition returned to some extent. Two years ago he had shown a girl with a good-looking nose as a first result, but later the nose had again become more roomy. Generally in these cases there was considerable permanent benefit.

Post-cricoid Carcinoma.—LIONEL COLLEDGE.

Female, aged 51. First seen *April 4th*, 1934. Had dysphagia for several years. Worse during previous three months. Endoscopy showed an early post-cricoid carcinoma. No glands palpable.

April 26th, 1934: Epithelioma the size of a threepenny piece removed by lateral pharyngotomy, without removal of great cornu of hyoid bone and without dividing superior laryngeal nerve. Skin-flap implanted behind larynx. Complete segment of pharynx removed.

June 13th: Plastic operation to close pharynx. Patient now swallows much better than for years before the operation.

DISCUSSION.

HAROLD BARWELL said that the patient gave a history of dysphagia for many years, having had difficulty in swallowing any food which was not minced or finely divided. This was a fairly common trouble with middle-aged women, and the question was whether such people were specially prone to develop post-cricoid carcinoma.

V. E. NEGUS said he could answer the question as to whether cases of chronic inflammation could become carcinomatous. He had two cases with chronic hypopharyngitis, with difficulty in swallowing for some years. He examined both patients by means of a direct œsophageal tube on many occasions and dilated the œsophagus. There were granulations, also ulceration and web formation. After each dilatation the patients were much improved; the mucous membrane healed and became smooth, and swallowing could be carried out without difficulty. He had to do that repeatedly, because the condition recurred. In one of the cases, after two years, there was a small nodule, which proved to be epithelioma. He removed a segment of the œsophagus, but the patient died because she had only 40 per cent. of hæmoglobin. If he had been able to restore the blood-content by repeated transfusions she might have survived. In the other case, for eighteen months there had been no sign of carcinoma, and then a small squamous-celled nodule had appeared. There again he excised the top of the œsophagus, and the patient was now well; she had no secondary anæmia.

He had another patient who had had difficulty in swallowing for twenty-two years because of a similar hypopharyngitis. She had repeated dilatation, and improvement occurred, but the condition was now as bad as ever, with a good deal of superficial ulceration, but there was no evidence of carcinoma. The right course was to excise that segment of the œsophagus before carcinoma developed.

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HERBERT TILLEY thought the case came within the category of those recorded some fifteen years ago by Rose Paterson and Brown Kelly, in which they emphasized that post-cricoidal carcinoma was not infrequently preceded by dysphagia associated with marked anæmia and glazing of the palatal and pharyngeal mucous membranes. The youngest case of the kind he had seen was in a girl aged 21.

C. HAMBLEN THOMAS said he had a woman patient who could swallow most things, including solids, but for twenty years she had always had to have her meat minced. She came complaining of a lump in the throat following influenza, and she was found now to have post-cricoid carcinoma.

EWART MARTIN mentioned two similar cases in which there had been difficulty in swallowing for some years before any neoplastic condition was discovered. The first was in a girl, aged 18, who was examined in 1914 because of a difficulty in swallowing, but nothing abnormal was found at that time. She was examined seven years later, again with a negative result, and there was a further negative result in 1925. In 1928 a post-cricoid carcinoma was found. The second patient had complained of difficulty in swallowing for ten years; in fact during that time she had not taken a solid meal. Fourteen months ago she was found to have a post-cricoid carcinoma. An operation similar to that performed by the President was carried out, and the patient could now swallow solids comfortably.

DONALD WATSON said that Professor Witts had stated that dysphagia was a common accompaniment of anæmia, and he (the speaker) wondered whether the irritation of the anæmic mucous membrane caused by the swallowing of food had any influence on the cause of cancer. Curing the anæmia invariably cured the dysphagia.

The PRESIDENT (in reply) said that these patients generally gave a long history of dysphagia; some had been examined again and again, with negative results.

In answer to Mr. Negus, he confessed that he had operated twice in cases in which he thought there was a malignant change. In one of these gastrostomy would have been needed at once; the other patient had a great degree of dysphagia, with the Plummer-Vinson syndrome, and there was superficial ulceration, which he thought was malignant. In neither case was there malignant change. Both were relieved by the operation of resection of the upper end of the œsophagus and turning in a skin flap, thus making a tube. One continued to attend for several years, but he had not seen her lately; the other had done well, and he still saw her. The condition was probably pre-cancerous.

The youngest patient he had seen with post-cricoid carcinoma was aged 20. The growth had a high degree of malignancy.

Late X-ray Reaction in the Larynx.—W. M. MOLLISON.

A woman, aged 47, has suffered from progressive loss of voice for one month; she can now only whisper.

In 1924, about eleven years ago, on account of exophthalmic goitre, she had treatment with X-rays, with good result. Last

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year (1935) she was depressed, and was found to be suffering from myxœdema. Treatment with thyroid extract by the mouth produced rapid improvement.

Examination now shows much scarring of the skin of the neck with petechial areas in the region of the larynx, no doubt the result of the X-ray exposures. The patient complains of shortness of breath now and then. The nose and pharynx are normal. The larynx is reddened generally. The left vocal cord is fixed in a partially adducted position. The right cord moves slightly, but does not abduct sufficiently to provide really free respiration through the glottis. The ventricular bands are also reddened. Around the anterior commissure is a small collection of " granulations ".

It is suggested that this condition is a delayed result of X-ray exposures given eleven years previously. The condition of myxœdema was diagnosed only one year ago, though it is possible it had been coming on for longer.

In view of the narrow glottis and amount of inspiratory stridor, a permanent tracheotomy has been advised.

Rhinosporidiosis.—J. P. MONKHOUSE (introduced by F. C. ORMEROD).

A man, aged 26, attended hospital, complaining of nasal obstruction and a blood-stained discharge from the right side. He stated that he had been in India and had had two previous operations for the same trouble. A tumour was found growing from a pedicle attached to the base of the anterior end of the right inferior turbinate, the anterior portion of which had already been removed.

Microscopical examination showed the typical double-walled cysts containing granular bodies.

The condition was first mentioned by Seeber in 1900, but was described more fully by Major O'Kinealy in 1903. Logan Turner has studied and described the structures and life history of the sporozoon.

The Mechanism of the Bronchial Movements and the Naso-pulmonary Reflex

By MAXWELL ELLIS* (London)

MY attention was first directed to the problem of bronchial movements over two years ago, when I was working with Dr. Chevalier Jackson in Philadelphia. The clinical material included many asthmatics who came periodically for the removal of thick secretion in the depths of the lungs. In these patients, with their exaggerated respiratory efforts, I was able to note the

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amount of movement undergone by the bronchial tree, and the next step was to record this movement.

Anatomy

The usual textbooks give too brief an account of the disposition of the muscle in the bronchi for an appreciation of the part played by it in the dynamics of the tubes. There have been many workers in the field, the earliest of note being Reisseisen (1822) working by a hand-lens with scalpel-and-forceps dissection, but most of my information has been derived from Miller's series of papers published during the last forty years. Inside the fibrocartilaginous plane of the trachea are bundles of smooth muscle-fibres bridging transversely across the gaps in the tracheal cartilages attached to their inner edges. There is a certain amount of branching of these bundles, connecting rings above and below. A few of these oblique strands become longitudinal, especially at the bifurcation. Thus the muscle forms a network which is continued in the larger bronchi, except only that as the cartilaginous hoops become plaques, the muscle occupies more of the area of the tube and loses its insertion into the cartilage. The bundles become more spiral in direction and are grouped in "geodetic lines" (Miller, 1921), enclosing lozenge-shaped spaces. As the smaller bronchi are reached, the muscle bundles, although smaller in bulk, are more numerous and form a relatively greater proportion of the tubes, while still maintaining their network arrangement. Beyond the orifices of the atria, around which fibres are gathered in a sphincter-like manner, the muscle ceases. In the same morphological layer as the muscle are elastic fibres following closely the arrangement and direction of the muscle bundles, and the whole can be regarded as a unit—the myo-elastic sheet. Macklin (1929) gives a good account of this structure, together with a full bibliography.

Dynamic Properties

Movements of the bronchial tubes have been studied in various ways, and were also deduced by Reisseisen from his anatomical studies. He stated that as the lung extends peripherally during inspiration, the bronchi must elongate, and that they must shorten during the shrinking of the lung in expiration. Keith (1909) described the dragging downwards of the lung root by the crura of the diaphragm, and the consequent elongation of the upper lobe bronchi. This change in length has been observed through the bronchoscope by Ingals (1905) and Jackson (1917), and the vertical movement of the carina has been recorded and measured by Weingaertner (1920). Bullowa and Gottlieb (1920) used radio-opaque oils in the bronchial tree to portray it. Its existence is now beyond doubt. The mechanism is the inspiratory suction

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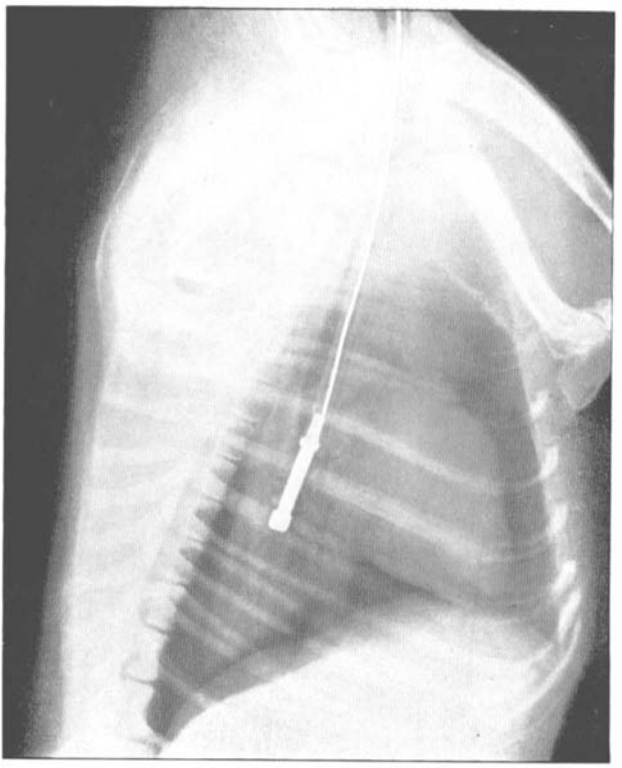


Fig. 2.

Dog of 5·0 kg. A skiagram of the thorax with the instrument in position. For this slide I am indebted to the skill of Dr. Edward Chamberlain, of Temple University Hospital, Philadelphia.

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effect of the chest wall and the diaphragm on the total volume of the lung, thus elongating the bronchi. Shortening occurs passively as the air escapes in the expiratory phase and the lung shrinks in volume.

There are, in addition to movements in a longitudinal direction, alterations in calibre, which have been observed through the bronchoscope (Ingals and Jackson). The tubes are dilated in inspiration, and they contract down again during expiration. Elongation alone should tend to narrow the tubes during inspiration, but actually there is dilatation at the same time as elongation. The mechanism of this rhythmic dilatation will now be discussed in the description of my experiments.

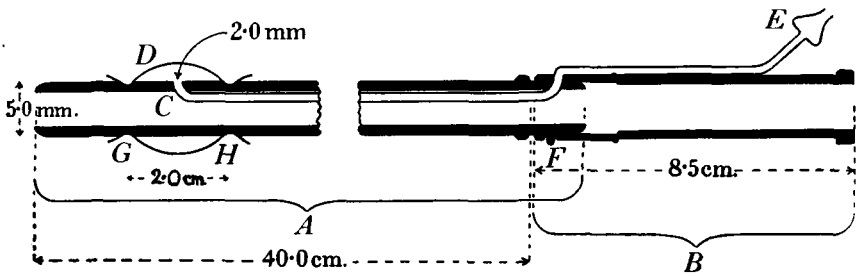


FIG. 1.*

Horizontal section of the instrument, which is essentially a brass tube 48·5 cm. long and 5·0 mm. external diameter, with an inner tube of 2·0 mm. external diameter. One end of this latter tube opens, as shown, into the area *C*, where a rubber cylinder *D* is attached, and the other end is drawn outwards into a side tube *E*. The instrument is constructed in two sections (*A* and *B*), for a reason which will appear later. These are connected by a bayonet-joint *F* in such a way that, when it is fully closed, the lumen of each tube is continuous and airtight, as proved by blowing air through *E* which inflates the rubber cylinder, and through the main tube which does not do so. At first, it was thought that the central section, between *H* and *F*, should be flexible, and, in the earlier instruments, it was constructed of gum-elastic. Subsequently this was found to be unnecessary and the thickness of the gum-elastic encroaching on the lumen, was a disadvantage. The later instruments, therefore, were made entirely of thin brass. The outer tube can be closed off, but is usually allowed to remain open to allow of free circulation of respiratory air in the portion of the lung distal to the rubber cylinder.

EXPERIMENTAL METHOD

An instrument has been designed which can be inserted through a specially made bronchoscope into any given portion of a main bronchus of a dog (Ellis and Livingstone, 1935) (Fig. 1). This instrument is essentially a balloon for the recording of circumferential changes, and it is inflated after introduction into the bronchus (Fig. 2). The balloon is traversed by a hollow tube extending beyond it so that a certain amount of expiratory exchange can go

* Fig. 1 is reproduced by kind permission from the *Journal of Physiology*, 1935, lxxxiv., 225.

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on in the distal portion of the lung. By avoiding atelectatic changes in the lung, and by keeping the balloon only loosely inflated, the function of the lung is disturbed as little as possible. A sensitive method of recording the alterations in shape of the balloon is necessary, and a volumetric method was selected. It is found by calculation that changes in volume of the order of 0·1 c.cm. must be clearly shown, and a small Brodie bellows was eventually chosen as the recording medium, to fulfil this condition.

Records obtained with this instrument show clearly to what extent the tube does alter locally in calibre with each respiratory movement. Some previous methods have consisted in measuring the total increase or decrease in volume of a lobe of the lung (Dixon and Brodie, 1903), the intrapleural pressure (Jackson, 1913), or the intratracheal pressure (Sandmann, 1890). Apart altogether from technical considerations of how far such methods can be considered actually to register intrabronchial variations in size, the experimental animals were always in very abnormal conditions, and usually kept alive by artificial respiration. The method described above is very sensitive, and gives a satisfactory portrayal of intrabronchial variations in calibre in more normal circumstances.

Changes in Calibre

In this example of a record obtained with the instrument (Fig. 3) the changes produced by pilocarpine and adrenaline are well defined, showing the delicacy of the recording apparatus. Clearly shown also are the expansion and contraction of the bronchus with each respiratory movement, the former occurring with inspiration and the latter during expiration. These rhythmic movements may be produced in the bronchus mechanically by the suction of the chest wall, as mentioned above; they may be intrinsic; or they may be the result of nervous impulses. The last hypothesis has been advanced in Starling's *Principles of Physiology* (1933), where it is stated that the bronchial musculature may receive nervous impulses to contract, and that this active movement assists the elastic tissue to rid the lung of air in the expiratory phase. If this were so, it would mean that, in man, bronchial muscle performs rhythmic contractions at the rate of at least fifteen a minute. Such a function of smooth muscle is unparalleled elsewhere in the body, and the same objection could be raised to the second hypothesis. Moreover, after bilateral division of the vagosympathetic trunks in the neck, the rhythm not merely persists, but the bronchi undergo a greater contraction and a greater expansion with each respiratory movement than previously (Fig. 4). In numerous records it has been observed that the bronchial movements reduplicate exactly the respiratory movements, and I am convinced that they are

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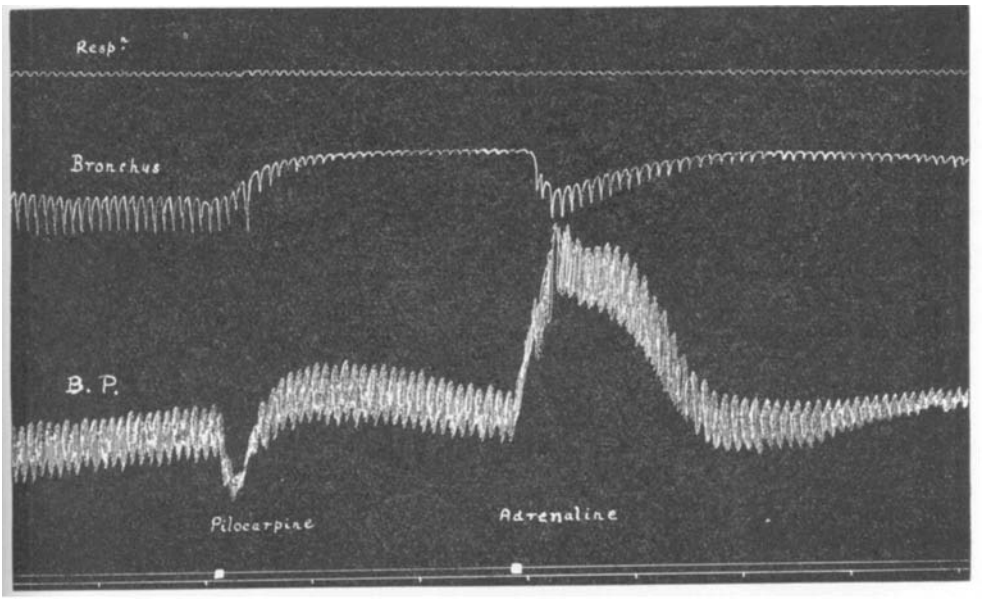


FIG. 3.
Dog of 8·2 kg. Records of the respiratory movements of the thorax and the blood pressure, and a record from the right bronchus. The movements synchronous with the respiratory movements are shown, and also the effect of bronchial contraction produced by 0·5 mg. pilocarpine, together with the transitory bronchial relaxation following the injection of 4·0 mg. adrenaline.

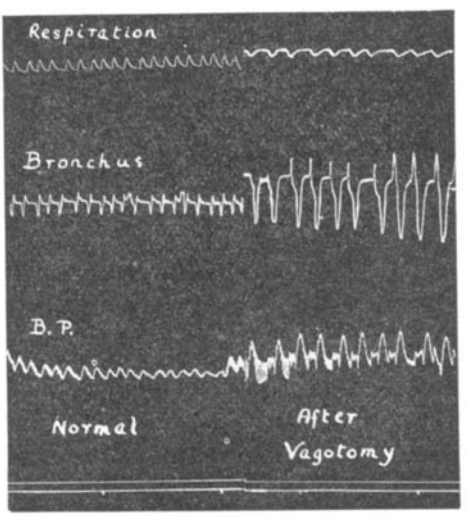


FIG. 4.
Dog of 7·0 kg. A record showing the increased bronchial movements (synchronous with those of respiration) after bilateral vagotomy.

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produced indirectly by the thoracic and abdominal muscles. The mechanism is the same as that responsible for the length changes of the bronchial tubes, and is the increase in volume of the thorax in inspiration, the periphery of the lung closely following the excursion of the chest wall and the diaphragm. The decrease in pressure thus created in the lung substance causes air to flow into the bronchial tubes, dilating them. The arrangement of the structures in the walls of the bronchi allows of this flexibility—the isolated plaques of cartilage in the fibrous coat and the loose submucosa permitting an inspiratory dilatation. The network nature of the myo-elastic coat explains how shortening and narrowing can go hand in hand.

I believe that the function of the bronchial muscle is to maintain a certain tone in the bronchial tubes, preventing their entire collapse or uncontrolled expansion, and I have as yet found no experimental evidence for assigning it a more active part.

Peristalsis

Certain of the earlier experimental workers with animals have described "peristaltoid" movements in the bronchi, similar to those in the gut (Einthoven, 1892; and Dixon and Brodie, 1903). More recently, Bullowa and Gottlieb (1920 and 1922) and others have described similar movements in animals and man, visualizing them by injecting radio-opaque oil into the bronchial tree and observing the movements carefully with a fluoroscopic screen. The records shown by the former group are all inconclusive and obtained in a manner already indicated as doubtful. The latter group are creating highly artificial conditions in the interior of the bronchi, and observation of slight changes of breadth in the bronchi under the fluoroscopic screen is not easily made, as there is no means of measurement.

The volume of the interior of the bronchial system is termed by physiologists the "dead space", and Henderson (1915) has shown that this volume varies and that the variation has occasionally been observed to have a rhythm with a period of several minutes. This is the best evidence I know of for the existence of peristalsis in the bronchi. There is one further supporting piece of work which is supplied by Lewis (1924) who observed rhythmic contractions in tissue-culture preparations in the respiratory portion of chick embryos, and also a wave-like motion passing along the tubes. All the evidence is thus seen to be indirect; even the last piece of work quoted really means that it is possible for smooth muscle to contract rhythmically (which is well known), but is not proof that such a phenomenon actually occurs in the complete and naturally living organism.

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On anatomical grounds, I would not consider the bronchial musculature adapted to peristaltic movements. It does not at all resemble the intestinal musculature either in arrangement or power, and is indeed a very flimsy structure, nor has it normally the same functional need of such movements. If they occurred, I would have expected to see in my records phases of relaxation and contraction

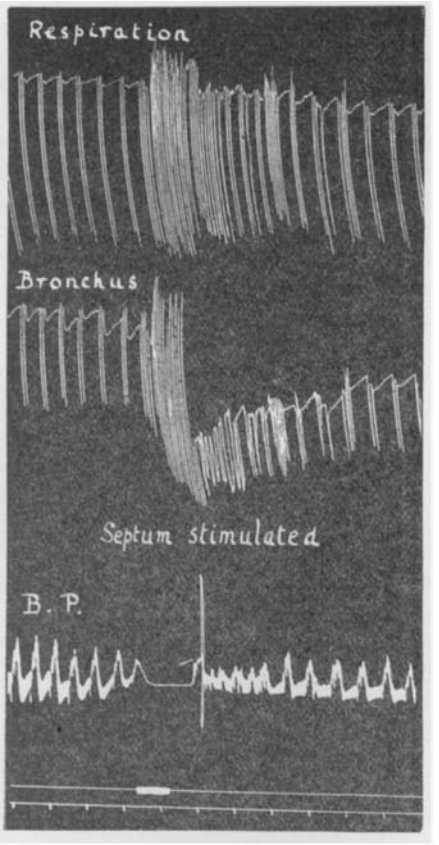


FIG. 5.
Dog of 8·75 kg. A record showing the exaggeration of the respiratory movements produced by an electrical stimulation of the right side of the septum.

apart from those accompanying the respiratory movements. I have as yet obtained no records of such a phenomenon. I believe that variations in the tone of the smooth muscle occur, and I have a few records showing this. A true picture of peristalsis could only be obtained by records from two fixed points in the same tube, and such a record has not yet been demonstrated.

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Reflex Effects

It has for long been a subject of interest to physiologists to examine the effects on respiration of stimuli applied to different parts of the organism. An obvious place from which to try to initiate reflex respiratory effects is the nasal mucous membrane, and over sixty years ago Kratschmer (1870) conducted a classical investigation on these lines, which was for long neglected. He demonstrated that stimulation of the nasal mucous membrane by various irritant gases caused an expiratory cessation of respiration. This has been subsequently confirmed by other workers who also checked his assertion that the sensory arc of the reflex was the trigeminal nerve. Sandmann (1890) showed an increase in the intratracheal pressure during this stimulation of the nasal mucosa, and averred that this indicated a broncho-constriction. Houssay and Cruciani (1929) using cross-circulation dogs after the method of Heymans, and measuring the intrapleural pressures by Jackson's method (above), also concluded that a broncho-constriction occurred when the nasal mucous membrane was irritated with ammonia. I have already stated my objections to such indirect methods of recording bronchial movements, and although my own results are partially in agreement, they do not coincide. It is easy in the dog to evoke reflex bronchial movements with irritant gases, but milder mechanical or electrical stimuli are not so successful. Fig. 5 shows that an electrical stimulus which was quite uncomfortable on my own tongue merely produced an exaggeration of the respiratory movements, when applied to the right side of the dog's septum. Dilute ammonia vapour blown into the right nostril occasioned a stoppage of the respiratory movements in the expiratory position in most cases, often followed by a gradual contraction of the lumen of the bronchus, which lasted a few minutes. Sometimes, however, bronchial contraction comes on very quickly and disappears soon after the removal of the stimulus (Fig. 6). This type of stimulus is exceptionally strong and is not encountered in ordinary life. I have found it difficult to initiate reflex movements in the bronchus with slight degrees of irritation of the nasal mucosa, but the canine and human nasal cavities differ widely in their structure and function. Whereas the dog's nose is organized largely for olfactory purposes, man is only poorly endowed with this sense. The mucous membrane of the nose of the dog, although supplied with common sensation by the trigeminal nerve, does not at all resemble the Schneiderian membrane of man, and the latter may be more responsive to stimuli and to a greater extent the site of origin of distant reflexes. However, I have had no opportunity of carrying out these experiments on the human subject and have no objective evidence to offer. I can merely say that stimulation of my own septum with an electrical current gave me no sensation of constriction in the

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chest, but I do not know how much bronchial constriction is necessary to provide such a subjective sensation.

I think that the tone of the bronchial muscle can be influenced reflexly, and that the nasal mucous membrane is a site from which such reflexes start, but a severe stimulation is usually required. Pain and defence reactions with accompanying blood-pressure changes then complicate the experimental results.

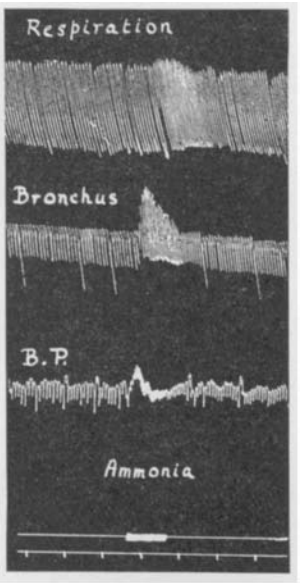


FIG. 6.

Dog of 5·92 kg. A record showing bronchial contraction as well as an increase in the rate of respiration following stimulation of the right nasal cavity with dilute ammonia vapour.

SUMMARY

I have discussed the structure and dynamic function of the bronchial tubes, and have shown records of movements of alterations in calibre, obtained from the interior of a large bronchus of a dog. I have demonstrated that they are synchronous with the respiratory movements, and are distinct from other rhythmic movements which sometimes occur and which I do not think are true peristaltic waves.

Powerful stimuli applied to the nasal mucous membrane can evoke reflex respiratory and bronchial changes, the nature of which, however, is still obscure. The many loose ends in this paper, some of which I am still in the process of unravelling, are an indication of how little we know of the normal mechanics of the bronchial tubes. That such an investigation would be not entirely of

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theoretical interest is clear when the ravages caused by asthma and other spasmodic respiratory diseases are considered.

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DISCUSSION.

EWART MARTIN said that in examining bronchi with the bronchoscope one noticed not only the movement on inspiration and expiration, but also the contraction of the bronchi. When warm air was blown down the bronchoscope, the small bronchi gradually contracted; when moisture was added to the air the bronchi began to dilate. Possibly this was due to the fact that the air respired through the nose was constantly carrying moisture to the bronchi. When the bronchoscope was in position the required moisture was not being supplied and consequently the mucous lining might become œdematous, giving the appearance of contraction, though on examination apparently the whole bronchus was contracted.

The ciliary movement could be demonstrated even by bronchoscopic examination and might give the idea of peristaltic movement, such as had been described in Mr. Maxwell Ellis's paper. There was no doubt that where there was an excessively dry mucous membrane of the nose there was a similar condition of the trachea and bronchi, with an added want of movement. Over-cocainization would give a similar appearance, so that experimental work on these lines with a bronchoscope should be carried out under a local anæsthetic, and as little cocaine as possible should be used.

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Royal Society of Medicine

T. A. CLARKE said that a number of papers had been published in France on the nasopulmonary reflex, which was said to be homolateral. He thought that this would be a better explanation of lung disease on the same side as sinusitis than the previously suggested lymphatic spread. He asked whether Mr. Ellis's work had confirmed the homolateral nature of the nasopulmonary reflex.

H. V. FORSTER said he understood that there was a unilateral nasopulmonary reflex, which might spread, under continued stimulation, to the other side of the thorax, but he had been interested to read that experiments on the effect of such stimulation within the nose had been carried out on laryngectomized patients.*

ALEX. R. TWEEDIE said he had once had the opportunity of " direct " inspection of the bronchi in a patient who, during an intranasal operation under a local anæsthetic, had such a severe asthmatic attack with loss of consciousness, that bronchoscopy was undertaken in order to exclude the possibility of some foreign body causing obstruction. Such direct examination was conducted with perfect ease and, although no foreign body was found, he had been impressed by the appearance in the secondary bronchi, which seemed to be occupied almost completely with swollen mucous membrane.

C. A. FRANCIS said that Mr. Tweedie's remark about swollen bronchial mucous membrane was interesting, as that might partly explain the action of adrenaline. It undoubtedly relieved nasal congestion in hay fever if a few minims were injected hypodermically ; in a few minutes the nasal passages were clear, the mucous membrane was tightly contracted, and one could see blanching mucous membrane in the pharynx. Therefore it was reasonable to suppose that a similar action occurred in the smaller bronchi.

MAXWELL ELLIS (in reply) said that he had not had the opportunity of trying the effect in man of any of the reflexes he had described, and he was pleased to hear that Dr. Martin was doing so. He had stated that he thought that the maintenance of tone was the chief function of the bronchial muscle. If this were so, reflexes produced locally from the surface of the overlying mucous membrane were to be expected, but he had not yet investigated this aspect of reflex behaviour.

He doubted the validity of the work quoted by Mr. Clarke. On theoretical grounds, the sensory side of the arc, the trigeminal nerve, ended in the medulla, where it would seem that spread to both sides was almost inevitable and that impulses would travel down both vagal nerves to the bronchi. He had on several occasions observed the right bronchus to show movements of contraction following stimulation of the left nasal cavity. Statements as to homolateral nasal reflexes were usually made in connection with the treatment of asthma, and were of the kind that cessation of the attack followed the cauterizing of a spot on the septum. He would like more objective evidence than this before being convinced of the existence of such reflexes.

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* " Researches on the reflex influence of each lung from its corresponding nasal cavity," A. Sercer (Zagreb), *Acta Oto-laryngol.*, xiv., 1-2.

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