dimness of sight, and absence of the patellar reflex, indicate more extensive disease.

On microscopical examination, the spinal cord proves to be the seat of very widespread changes; and yet the parts affected are so constant throughout, that the affection cannot be looked upon as an indiscriminate one, but must be placed among the more complicated combined system-diseases. It will be seen by reference to Fig. 33 that the regions affected are (1) the lateral columns; (2) the posterior columns; (3) the direct pyramidal tracts; (4) the anterior root-zones; and (5) in a minor degree, the grey matter of the anterior cornu.

But it will also be observed that, in the neighbourhood of the grey matter everywhere, a zone remains healthy, and, in addition, a superficial tract of fibres situated between the crossed pyramidal and cerebellar tracts posteriorly, and the anterior root-zones anteriorly, is unaltered. The pathological changes throughout the diseased areas are the same, and must be considered to be those of chronic inflammation affecting mainly the nerve-fibres, and in a far less degree the neuroglia; in other words, they represent a form of chronic myelitis. In the regions referred to are seen increase in the nuclei of the neuroglia, and in the white corpuscles within the vessels, hyaline swelling of the neuroglia, distension of the neurilemma, and disintegration of the white substance of Schwann (Figs. 34, 35, 36).

Motor phenomena were those which were most strikingly affected during life, and sensory changes were far less marked. The pyramidal tracts, direct and crossed, and the anterior root-zones, are undoubtedly motor regions, while the columns of Goll are afferent, and connect centres below with centres higher up; hence the disease is principally an affection of the motor systems of fibres. The escape of the small superficial area in the lateral column from pathological changes is exceedingly interesting, and marks it out as a tract containing some particular set of nerves. Gowers first called attention to this small tract of fibres which appear to be afferent, and to degenerate centripetally. Several other writers have also mentioned it, among them Dr. Hadden, and Dr. Howard Tooth has a paper on it in the *St. Bartholomew's Hospital Reports* for 1885, vol. xxi.

The medulla oblongata, pons Varolii, crura cerebri, motor convolutions, anterior crural and optic nerves, and the triceps femoris muscle, were all examined microscopically. The optic nerves were found to be atrophied, and there was an excess of nuclei in the anterior crural nerve and in the triceps femoris; but with these exceptions, all the parts examined were free from disease.

I have detailed this case, rather than one of the more usual ones, where chronic affections are confined to less extensive systems of nerve-fibres, in order to show that disease is a very complex process, however much we may endeavour to simplify our notions of it, and likewise to point out in how modified a form disease of the pyramidal tracts presents itself, if there be in addition pathological changes in other regions of the cord.

Before leaving the subject which I have thus far been illustrating, namely, the relation between diseases of the cerebral motor system and the production of chronic muscular spasm, a few words must be added in answer to the question, Does spasm ever result from afferent stimuli reflected on to efferent fibres in the cerebral centres, or from diseases of the commissures? If we limit the term cerebral centres to the grey matter of the hemispheres and central ganglia, I know of no undoubted instances of reflex spasm in connection with them. Convulsions, which may be due to such causes, do not come within the scope of the present lectures; and had I the time to treat of them, I should shrink from casting a shadow upon ground which has been so brilliantly illuminated by the genius of Hughlings Jackson. Several cases of tumours of the corpus callosum have come under my notice, and they have been published by Dr. Bristowe in *Brain*, vol. vii. I cannot do better than quote the words of so distinguished a physician and pathologist in describing the symptoms which were observed in them. The chief characteristic features were:

"1. Their invagrescent character, a character which they possessed in common with other cases of cerebral tumour.

"2. The gradual coming on of hemiplegia for the most part resembling in its distribution the paralytic symptoms usually attending hæmorrhage into one of the hemispheres, or softening due to embolism.

"3. The association with the paralysis of one side of vague hemiplegic symptoms of the other.

"4. The supervention of stupidity, associated for the most part with extreme drowsiness, a puzzled inquiring look when awake, a difficulty of getting food down the throat, and cessation of speech.

"5. The absence of implication of the oculo-motor nerves, and of direct implication of other cerebral nerves; and lastly, death by coma."

From beginning to end of these cases, no muscular spasm occurred.

In the few remarks which the time at my disposal has allowed me to make on diseases of the pyramidal tract, and the part played by it in the production of spasm, I have tried to point out how numerous and varied the clinical phenomena may be, according to the level at which the pathological conditions occur, according to the method of attack—whether from within or from without—and according to the presence or absence of disease of other portions of the central nervous system.

I must now leave this division of my subject, and pass on, in the last lecture, to a consideration of the spinal motor system, and to so-called functional spasm.

TWO LECTURES

ON

TUMOURS OF THE LARYNX; THEIR PATHOLOGY, SYMPTOMS, AND TREATMENT, WITH ILLUSTRATIVE CASES.

Selected from a Course of Lectures delivered during the Winter Session of 1885-86 at the Glasgow Royal Infirmary.

By DAVID NEWMAN, M.D.,

Surgeon in charge of the Department for the Diseases of the Throat and Nose at the Royal Infirmary; and Surgeon to the Dispensary at the Western Infirmary, Glasgow.

LECTURE I.

GENTLEMEN,—The cases and specimens which form a text to my lecture to-day illustrate the differences between two classes of tumours of the larynx, the benign and the malignant. These may be separated from one another by their histological distinctions, and by their clinical characteristics.

In pre-laryngoscopic times, the diagnosis of a tumour in the larynx was limited to those cases in which the growth occupied the upper part of the laryngeal cavity, so as to be either visible to the eye when the tongue was depressed, or within reach of the finger. Isolated cases of laryngeal polypus were recorded, even as far back as the middle of the eighteenth century; but at that time, and for many years subsequently, the diagnosis of such tumours was most uncertain. It was only towards the middle of the present century that the diagnosis of these diseases became exact, and that attempts were made to extirpate laryngeal growths by the mouth; although one hundred years previously, it is true, Kaderik performed for the first time, successfully, the endolaryngeal operation. I will not attempt even briefly to trace the gradual development which has taken place during the last half century, in the diagnosis and treatment of the diseases we are now considering; but I think I may say, with confidence, that, whereas new formations in the larynx were formerly supposed to be of rare occurrence, and beyond the reach of the surgeon, they are now not only readily recognised during the life of the patient, but they may be successfully removed by surgical appliances. In fact, there is probably no other class of diseases in which the advantages of laryngoscopic examination have been more clearly demonstrated. Not only are tumours now known to occur more frequently than was formerly supposed, but there is even a tendency on the part of practitioners to believe that they prevail more commonly than is, on reference to statistics, actually found to be the case. You will find in practice that they constitute only a small proportion of the chronic maladies of the larynx, certainly not more than two or two and a half per cent.; so that, although the diagnosis of the individual case may be of the utmost importance to the patient, the number of cases which you will meet with in general practice is comparatively small.

Before proceeding further, I must request you to note clearly the characteristics which separate tumours from growths of inflammatory origin. In the former, the neoplasm has a tendency to persist and increase; while the latter tend always to disappear, to develop into a higher state, or to reproduce the tissue of their matrix. Tumours obey the laws which regulate the nutrition of normal tissues; but at the same time they have an independent life, or they may grow at

the expense of the tissue in which they are implanted; and, from the fact that they do not contain nerves, the regulation or control of their nutrition differs from that of other parts. It is in this isolation, as regards the life of tumours, that the difficulty of explaining their etiology really lies.

Not only does every constructive act require that nutritive material be brought to the tissues, but the tissues themselves require to possess a formative power, without the agency of which the nutritive material would remain unorganised. If cells are to increase numerically or in size, or if they are to develop into a higher state, they must possess nutritive and formative excitability. Besides this, there must be some normal check to the indefinite growth of proliferating cells. Should this check become inoperative, or inadequate to control the productive energy of the proliferating cells, or should the formative excitability of the part be unduly increased, a tumour may result. This abnormal growth of certain elements may either arise from an alteration in the resisting power of the surrounding parts, or it may be a consequence of disturbance of intrinsic conditions. In tissues not undergoing rapid changes of growth or development, the nutritive and formative energy must be in a state of balance with those forces which inhibit it. If this inhibitory force be disturbed, then the cells grow and multiply unduly. When the cell-proliferation is associated with increased functional activity, the condition which we describe under the term hypertrophy results; but, if the function of the part be not increased, then a tumour probably forms. In other words, hypertrophy is the consequence of increased functional activity, calling for increased nutritive activity; whereas, in tumours, the formative activity originates, independently of other causes, in the proliferating cells themselves.

The etiology of tumours is a question which is exceedingly involved, and one upon which little real light has up to the present been thrown. What is the effective cause of the production of a tumour? It is not possible at present to give a definite answer to such a question. In many cases, the cause is not apparent; and in others, the connection between the new formation and its alleged cause is remote.

Chronic catarrh of the laryngeal mucous membrane is one of the most fruitful causes of benign growths in the larynx; but probably both hyperemia and chronic catarrh are blamed more frequently than they deserve. May they not be, in many cases, the result rather than the cause of tumour? The etiological conditions of inflammatory processes and what has been called the tumour-dyscrasia are closely related to one another, especially in some forms of chronic inflammation and sarcomatous growth. In fact, it is very difficult to draw a line between the etiology of some forms of chronic inflammation and the production of tumours. I am quite willing to admit that mechanical irritation of the laryngeal mucous membrane, either as a consequence of over-use of the voice or from other sources, may act as a predisposing cause to tumours, either malignant or benign. Those individuals who, from their profession, require to over-exert their vocal organs, such as clergymen, public speakers, schoolmasters, etc., are very prone to the diseases I am now discussing. As in other parts of the body, so also in the larynx, long continued irritation may lead to the development of a tumour. Such causes of tumours have long been accepted; but it is also known that growths may form with absolutely healthy surroundings; or continued irritation and chronic inflammation may be present, and is present in multitudes of individuals, without leading to any new formation. Laryngeal growths may be congenital; and Dr. Arthur Edis has reported, in the *Transactions of the Obstetrical Society*, a case in which a child died from suffocation thirty-six hours after birth; and, on *post mortem* examination, a cyst, of the size of a hazel-nut, was found to occupy the larynx. The influence of sex is of importance. Men, from the fact that they are more exposed to vicissitudes of weather, irritating gases, and from the circumstance that, as a rule, greater demands are made upon their vocal organs, are more apt to be affected than women. The influence of age is of some importance also. Middle life—that is to say, between 30 and 50—is the period at which growths are most apt to form, if we exclude cases of cancer, which are most likely to appear in persons of advanced life.

The question of heredity is difficult to prove, but what is attributed to inheritance in the production of tumours in other parts of the body should, I think, be admitted in cases of tumours in the larynx. Syphilis and tuberculosis, only in so far as they lead to chronic hyperemia and catarrh, may be regarded as predisposing causes of tumours. These diseases generally, however, particularly the latter, lead to the death of the patient long before the catarrh has become sufficiently chronic to produce true tumours. Associated with tuberculosis, inflammatory new formations frequently develop, but these do not interest us at present.

In considering the pathology and symptoms of neoplasms of the larynx, I shall divide them into two important classes: first, benign, and second, malignant tumours. And I shall illustrate the subject by several specimens of malignant diseases, some of which have been excised during the life of the patient, while others have been procured from the *post mortem* room.

There is nothing in reference to tumours of more importance, and which excites more interest and attention on the part of the medical attendant, than the qualities which may be included under the terms malignant and benign. Not only does a malignant tumour, properly so-called, produce grave constitutional disturbance, but from the very first it is associated with danger to the life of the individual. Its rapid growth, its tendency to be multiple, its return after excision, and in many cases the facility with which the surrounding tissue and glands become involved in the neoplasm, all point to an unfavourable prognosis; and if the features which I have just indicated be associated with secondary formations in neighbouring or in distant parts, then the inevitable issue of the case is probably close at hand.

When I speak of a malignant tumour, I use the term only in a clinical sense. Many surgeons still employ the terms "malignant" and "cancerous" as if they were synonymous, whereas you know that malignancy is not characteristic of cancers only, but is equally pronounced in the sarcomatous growths. When you speak of a cancer, you mean a tumour of definite histological structure. A tumour may endanger the life of the host, by reason of its situation, without being, in the strict sense of the term, malignant; a malignant tumour may threaten life by exciting a general malady, the symptoms of which are anæmia, emaciation, profuse sweating, hæmorrhage, diarrhœa, etc., which ultimately cause death. To take an illustration from tumours in other parts of the body, an uterine fibroid, which is essentially in its structure an innocent growth, may cause death as a consequence of persistent hæmorrhage, or a fibroma in the brain may cost the patient his life from interference with the function of nerve centres, upon which it may accidentally press. Likewise in the larynx an innocent growth, such as a papilloma or myxoma, may kill purely by reason of its situation. If, however, it be removed, the patient is at once relieved, and the danger of recurrence is comparatively small. Roughly speaking, tumours are malignant in proportion to the vascularity of the soil in which they grow, to the number of mobile cells present in their interior and around them, to the richness of their lymphatic supply, and to their departure in structure from the type of a normal tissue.

The symptoms indicative of the presence of a tumour depend upon four circumstances—the nature, the situation, the extent of the new formation, and the intensity of the inflammation excited by its presence. The most important symptoms are interference with phonation, cough, pain, hæmorrhage, and obstruction to respiration, or to deglutition.

I will now take up these symptoms separately, but, in doing so, I desire to impress upon you the fact that the interference with function is only a vague indication of the nature of the disease; it is upon a laryngoscopic inspection that the diagnosis must rest.

Phonation is more or less interfered with in all cases, and in some aphonia may be the only symptom present. The voice may be altered in various ways, according to circumstances; in some cases it may only be changed in tone and in quality, in others it may present the characters described as "Punch voice," it may be reduced to a hoarse whisper, or it may be entirely lost. Interference with normal phonation, as a symptom, depends more upon the seat of the tumour than upon its size. In one of the cases which I will show you to-day there is a large adenoma, occupying the upper third of the larynx to such an extent that tracheotomy required to be performed; but still, as you will observe presently, the voice is not greatly altered. This depends upon the circumstance that the tumour is situated anteriorly and the vocal cords are not encroached upon. In another case, where the tumour was not a tenth of the size of the one I have just mentioned to you, the patient suffered from complete aphonia, and this is easily explained by the fact that the growth was situated on the margin of the right vocal cord. You will, therefore, understand that a very small growth in one situation may cause more marked interference with the voice, than a tumour of much greater size occupying another part of the laryngeal cavity. As a general rule, sessile growths of the vocal cords produce more disturbance than pedunculated ones, which hang in the larynx above the cords. The latter may, however, during inspiration, fall between the cords, and if phonation be attempted thereafter, it is found to be impossible. Growths situated below the cords may cause aphonia, by interference with the force of the current of expired air, especially if they be pedunculated; but, if sessile, subcordal tumours, when limited in size,

seldom cause loss of voice. The cases which I show you to-day will demonstrate fully the points I have just mentioned.

Cough is not a constant symptom, but as a rule the patient has an uncontrollable desire to clear his throat. Should an attack of catarrh occur, cough may become very distressing, and be accompanied by spasm of the larynx. Sometimes portions of the growth may be expectorated, and even the entire tumour may be detached during a paroxysm of coughing.

In non-malignant growths, pain and dysphagia are seldom pronounced features; whereas, in the early, but especially in the latter stages of malignant disease, both these symptoms are generally present. In cancer of the larynx, the pain is, as a rule, limited to the larynx during the early stage; but when the growth has increased in bulk, the pain radiates to the ear, forehead, and orbit of the affected side, probably on account of irritation of the sensory fibres of the superior laryngeal nerve, which irritation may be reflected along the auricular branch of the vagus. It is not unfrequent, however, in cases of benign tumours, for the patient to complain of discomfort and disagreeable sensations, although not amounting to actual pain. The feeling of the presence of a foreign body, and the constant desire to get rid of it, may be the only discomfort of which the patient complains.

Hæmorrhage arising from the presence of a tumour is almost pathognomic of cancer, especially when large in amount. It may be due to erosion of the walls of small blood-vessels from necrosis of the tumour-tissue, in which instance the hæmorrhage is usually copious. Usually, however, the quantity of blood lost is small, and only appears in the expectoration as streaks on the surface of the mucopurulent secretion.

Hæmoptysis from the bronchial tubes or lung may occur in the course of the disease from violent coughing, but the quantity of blood lost is seldom great, unless in malignant disease.

In a considerable percentage of cases, difficulty of respiration is present, but dyspnoea of a serious nature is less common than disturbance of phonation. In some cases, however, the difficulty in breathing suddenly becomes so urgent, that tracheotomy is required. This dyspnoea may be due to three causes: to mechanical obstruction from the presence of the growth, to spasm of the laryngeal muscles as a consequence of local irritation, or to an infiltration of the areolar tissue of the larynx with serous effusion. A growth may occupy the larynx for a considerable time, even for years, without leading to any serious impediment to respiration, when suddenly, without any apparent cause, the patient is seized with a dangerous complication, spasm of the glottis. In such cases, the stridor and dyspnoea are often considerable, but the spasm seldom leads to a fatal issue. When the growth is situated high in the larynx, and especially when the epiglottis is involved, deglutition is apt to be interfered with. When pedunculated tumours exist, the dyspnoea may be transitory and paroxysmal; and even when there is a large tumour in the larynx, such as there is in two of the cases which I will show you to-day, the obstruction to respiration may be very marked at one time, while at another breathing may be comparatively free.

Before considering the pathology, diagnosis, and treatment of neoplasms in the larynx, I will ask your attention for a few minutes to the cases which I have brought from the ward. I shall, in the first place, demonstrate to you three cases of benign tumours, and afterwards I will show you two in which the characters of malignancy are only too distinctly marked.

The first case is one of a large adenoma occupying the upper part of the cavity of the larynx. The patient, P. L., aged 62, first complained of the sense of a foreign body in his throat about Christmas, 1884, that is to say, about a year ago. At that time, there was no interference with speech, but, two months subsequently, the voice became slightly altered. From the time he first became aware that there was something the matter with his throat, the sense of the existence of a foreign body has steadily increased; but, even when admitted to the hospital at the end of September, speech was tolerably distinct, although altered in tone and quality. In the course of his illness, he has not at any time complained of pain or cough, nor is there any history of blood being observed in the expectoration. When the head is held in a natural position, there is not much obstruction to respiration, but when it is turned to the left side, or thrown backwards, the patient suffers from great dyspnoea. This is also the case when he lies in bed. About two months before admission, he began to suffer from difficulty in swallowing, but this symptom has at no time been really troublesome. On laryngoscopic examination, a tumour is found to occupy the upper part of the larynx on the left side. It is attached to the interarytenoid fold, to the left aryteno-epiglottidean

fold, and to the base of the epiglottis. It extends downwards into the cavity for a considerable distance, but on account of its size, a view even of the right vocal cord is prevented. The surface of the tumour is regular, and covered with congested and oedematous mucous membrane. To the finger or the probe it feels hard, and firmly fixed in its position; but, as far as can be ascertained, it does not involve the œsophagus or the pharynx. There is no ulceration. Shortly after the patient was admitted to the hospital, the obstruction to respiration became so marked, that it was found necessary to perform tracheotomy. Since the operation, the oedema and hyperæmia of the mucous membrane have disappeared, and the entrance for the passage of air to the lungs has become thereby so increased, that the patient can now breathe freely, even when the tracheal tube is closed.

Before making any comments upon this case, I will show you a young woman, who was sent to me from Helensburgh, and from whom I removed about a week ago a small tumour which was attached to the right vocal cord. I have placed a section of it under a microscope, and you may examine it for yourselves after the lecture. The history of this case is as follows. The patient is aged 27; her occupation that of a school-teacher, so that she requires to overexert her voice for several hours daily. In June, 1883, she became suddenly aphonic, and the complete loss of voice continued for about six weeks. Since that time, the voice has always remained rough and indistinct, so much so, that it necessitated her giving up her occupation. There is no cough, pain, expectoration, or dysphagia, nor was she even aware of the existence of a foreign body in her larynx, until she was apprised of the fact by me. On inspection by the laryngoscope, a small irregularly shaped tumour, of the size of a large pea, was found adhering to the margin of the right vocal cord, a little in front of its centre; and during attempted phonation, it was found to prevent complete approximation of the vocal ligaments. After the patient had been in the hospital for a few days, I removed the tumour by means of Morell Mackenzie's spoon-shaped cutting-forceps, and dismissed her two days afterwards, with directions to return for examination in a week or so, as I observed that the base of the tumour would require further treatment before a cure could be expected. On examining the case this morning, I found that, on the site of the tumour, there was a small granulating surface occupying an area equal to one-fifteenth of a square inch, and slightly elevated above the plane of the surrounding tissue.

Now, suppose that this case were left alone, and no further treatment adopted, the probability is that, within the next few months, the tumour would re-form, and the patient be in as bad a state as ever. What I propose to do now is to pass an electric cautery into the larynx, and with it destroy the little mass of granulations which I have just described to you. This is very easily done by the instrument I now show you; it is one of the most convenient contrivances for cauterising laryngeal growths. It is constructed, as you will observe, so that different electrodes or burners may be attached to the handle of the instrument, according as it is desired to cauterise the front, back, or sides of the cavity. The handle is connected with a secondary battery, and the circuit may be completed by pressing the little ivory knob. The cautery is introduced, and the electrode is brought into contact with the part to be destroyed; and when this has been done satisfactorily, the knob is pressed, the circuit completed, the electrode raised to a white heat, and retained in position for a second or two. Before applying the cautery to the larynx, it is well to spray the parts with a 5 per cent. solution of cocaine; by doing so, the sensibility of the mucous membrane is impaired, and manipulation is facilitated. Before the patient was brought here, I sprayed the larynx several times, at intervals of about five minutes, with a 5 per cent. solution of the hydrochlorate of cocaine; and now, as you will observe, the sensation of the larynx is so impaired that I may introduce instruments into the cavity without causing any disturbance. I will show you this case again in the course of a week, when you will find, I trust, that the voice is completely restored. At the present time, it is very much improved from what it was when she was admitted into the infirmary; in fact, it is almost normal. What I have done to-day is not so much for the purpose of improving the voice, as to prevent the possibility of the tumour recurring.

The next case is that of a woman, Mrs. McF., aged 48, from whom I removed a papilloma some time ago. I have brought her here, so that you may see how completely the voice may be restored after an endolaryngeal operation. The tumour was of considerable size, and led to complete aphonia, from the fact that it materially interfered with the approximation of the vocal ligaments. The growth was very soft in consistency, but, after its removal the patient made a rapid recovery, the voice was completely restored, and there is till the present time no evidence of recurrence.

These three cases illustrate to you the symptoms, course, and treatment adopted in benign tumours of the larynx. In the first case, the growth occupies the upper third of the cavity, and the most pronounced symptoms are difficulty in deglutition, and in breathing, simply as a consequence of the local obstruction. The interference with phonation is by no means marked. In the second and third cases, even although the neoplasms were much smaller in size than in the first case, yet on account of their situation, close to or between the vocal cords, aphonia was a marked symptom in both instances. In the second case, the tumour was situated on the margin of the right cord; and, in the third case, it rested upon the upper surface of the cord, and penetrated the mucous membrane of the ventricle, so that occasionally, during deep inspiration, it protruded and became entangled between the vocal ligaments.

I think I have now convinced you, by what you have seen, that, from the subjective symptoms alone, you cannot judge of the nature or situation of a laryngeal growth. It is only by a laryngoscopic examination that you can form a correct opinion on these points. These three cases illustrate the more common benign growths of the larynx; but, besides these, there are one or two others, to which I would like shortly to refer.

The following innocent growths are met with in the larynx—papillomata, fibromata, lipomata, echondroses, adenomata, myxomata, and cysts. You will observe that I have classified the growths according to their histological structure, and the first I wish to describe to you are the papillomata.

I have placed them first in order because they are of most frequent occurrence, and perhaps the larynx, of all parts of the body, is their commonest seat, especially during early life. In this situation, they are generally combined with adenomata. As regards their histological structure, they are composed of connective tissue, which serves as a support to blood-vessels, and capillaries, the surface being covered with epithelium. These tumours are simply enlarged papillae, at least in their simpler form, but in many instances they are combined with cysts, with hypertrophies, or with development of gland-tissues. In the larynx, they vary in size from a millet-seed to a walnut. Their most common situation is on the anterior two-thirds of the true cords, on the false cords, and on the aryteno-epiglottidean folds. They are generally adherent to the mucous membrane by a broad base, but may also be fixed by a pedicle. In many instances, they are multiple.

A few days ago, I saw a patient who had several tumours of this kind, but all small in size. There was one on the right anterior pillar of the fauces, another on the posterior wall of the pharynx, a third at the base of the epiglottis, and a fourth on the true vocal cords. This was an example of what might be described by French laryngoscopists under the term "polypoid diathesis;" for not only were warts present in the upper air-passages, but the patient had several on other parts of the body. I have placed under the microscope a section of the papilloma removed from the larynx of Mrs. McP., and you will be able to see for yourselves the structure of such formations. Papillomata vary, however, a good deal in appearance. In some instances they are large in size, with a cauliflower appearance, and present a mass of primary and secondary granulations, which show a tendency to spread. These vegetations are longer and more distinct from one another than in carcinoma or in epithelioma. And whereas in cancer the mucous membrane and the submucous cellular tissue are invaded by the morbid growth, in the papillomata the epithelial proliferation does not extend beyond the basement-membrane.

The specimen which I now hold in my hand is an example of a papilloma involving the upper part of the larynx and pharynx. The patient from whom it was removed suffered greatly from dysphagia, and, for some time previous to his death, he was unable to swallow even fluid food. The voice, however, was not much interfered with. You will observe, on examining the specimen, that the growth is attached to the back part of the arytenoid cartilages by a broad base, which, however, permits pretty free movement of the tumour; when removed, the tumour was about the size of a pigeon's egg, distinctly lobulated, and presented a papillomatous appearance; but now, from the action of the preserving fluid, it has diminished in bulk. The important point which I desire to demonstrate by this specimen is, that a very large tumour may occupy the upper part of the larynx without necessarily causing either aphonia or dyspnoea.

Fibromata, or fibrous polypi of the larynx, spring from the connective tissue of the mucous membrane, and are much slower in growth than the tumours I have just been describing; and, when removed, they show no tendency to recur. They are not so common as the papillomata, but may simulate them in appearance by taking on a

papillomatous form. They are usually sharply defined, smooth on the surface, hemispherical, pyriform, or globular in shape, paler in colour than the mucous membrane, and vary in consistency according to the texture of their component tissue; but, as a rule, they are hard, dense, and fibrous. On section you may see bundles of fibres, interlacing in every direction; and, if divided with a knife, some of the fasciculi may be seen in longitudinal, others in cross section. The vessels are not very abundant, except, perhaps, in the portions of the tumour where the connective tissue is loose. These growths are almost always single, and usually occupy the centre of the ligamentous portion of the cords, but they may arise from other portions of the larynx. If pedunculated, the growth is usually less vascular and softer in consistency than the pedicle. Their size is very variable, but they seldom exceed that of a large bean.

Lipomata are simple circumscribed masses of adipose tissue, with an independent vitality from the rest of the organism. In the larynx, they are extremely rare, only four cases having been recorded, namely, by Bruns, Tobold, Schrötter, and Wagner. In one case recorded by Bruns, the tumour grew from the posterior laryngeal wall, but such growths are, from their rare occurrence, of so little importance, that I shall not occupy your time by discussing the cases which have been published.

Growths built up on the type of cartilage sometimes arise from the pre-existing cartilages of the larynx, and should properly be named echondroses, as distinguished from enchondromata properly so called, which never arise from pre-existing cartilaginous tissue. These outgrowths arise from the cricoid and thyroid cartilages, and grow inwards towards the cavity of the larynx, where they appear as lobulated circumscribed nodules, or as smooth and diffuse swellings.

The adenomata are constructed after the type of secreting glands, and in various parts of the body assume characters according to the tissue in which they are developed. Adenomata must be carefully distinguished from simple hypertrophy of the glands, commonly associated with chronic catarrhal laryngitis. These hypertrophies, although they may resemble tumours in appearance, should be properly classed amongst the inflammatory new formations. The distinctions between hyperplasia arising from local irritation and true adenomata are that, in tumours, the gland-tissue is unable to perform any physiological function; and, further, the elements of the tumour do not bear a proper relationship to the surrounding tissue; whereas, in growths of inflammatory origin, there is, as a rule, in the early stage, an increase in the physiological activity of the gland-tissue, and the development always takes place where glands normally exist. I think it worth while directing your attention to these points, because I find that there is considerable confusion in the minds of some as to the nature of those little tumour-like bodies which form as a consequence of local catarrh. They are found as little nodular or papillary outgrowths, which may assume a polypoid form; in other instances, the ducts of the glands become obstructed, and lead to the formation of small retention cysts. In the development of such growths, the first change is a hyperplasia of the submucous connective tissue, followed by a development of epithelium and gland-tissue. If we exclude these inflammatory neoplasms from our classification of tumours, and place them amongst the hypertrophies, then I think I may safely say that the adenomata are rarely met with in the larynx. The case which I have shown you to-day is, therefore, all the more interesting on that account. On microscopic examination of a portion of the tumour removed for diagnostic purposes, I find that it presents the following structure.

The tumour is constructed upon the type of a compound racemose gland, closely resembling salivary gland-tissue in appearance. The cells do not stain well with logwood, are very granular in appearance, and large in size, but at no part of the sections I have examined under the microscope can I discover any tendency to destruction of the membrana propria. The nuclei are large, but not very pronounced. The acini are regular in size, and the basement-membrane is exceedingly delicate, so that they lie closely together. This structure was shown throughout all the sections examined.

The most frequent seats of origin of adenomata are the base of the epiglottis, the aryteno-epiglottidean folds, or the mucous membrane covering the posterior aspect of the cavity; that is to say, they most commonly develop in situations where glandular structures are normally abundant. They are generally lobulated or globular in form, and may be pedunculated, or, as in the case I have shown you, sessile. The mucous membrane covering them is, as a rule, normal in appearance, but the blood-vessels may be injected with blood, and so impart to the surface a deep red colour. They may cause sudden and complete obstruction from their liability to oedematous infiltration, especially if the larynx become inflamed. This was the reason why, in the case of L., I performed tracheotomy so early.

Myxomata are growths composed of mucous intercellular substance, in which are embedded stellate anastomosing cells and blood-vessels. It is difficult to separate them pathologically from fibromata which have become oedematous; and it is a remarkable fact that, while these growths are frequently met with in the nasal fossa, they seldom form tumours in the larynx. They consist of a capsule covered with mucous membrane, and including within it gelatinous material, which, on microscopic examination, is found to be made up of a hyaline substance, interlacing cells, and a fine reticulum of connective tissue. I have placed under the microscope the section of a tumour of this class. They are clinically non-malignant growths, and, when completely removed, rarely recur; but, if imperfectly excised, they may redevelop with fresh vigour. It is not necessary for me to make any further remarks, as these growths are of very rare occurrence, and do not present any features of special interest.

In this lecture, I have limited myself to the discussion of tumours which are in their clinical manifestations usually benign; but it is well to bear in mind that some of these tumours may present occasionally evidences of malignancy. I will demonstrate to you at the next lecture malignant tumours; and, in doing so, I shall direct your attention to some cases and specimens which illustrate the more important facts relating to such growths, as the cancers and sarcomata.

ABSTRACTS OF SIX LECTURES

ON THE

INTESTINAL CANAL AND PERITONEUM IN THE MAMMALIA.

Delivered at the Royal College of Surgeons.

By FREDERICK TREVES, F.R.C.S.,

Hunterian Professor at the Royal College of Surgeons; Surgeon to, and Lecturer on Anatomy at, the London Hospital.

LECTURES I, II, AND III.

THESE lectures are founded upon the systematic examination of the abdominal viscera of nearly 200 different species of mammals. For the greater part of the material, I am indebted to the kindness of Mr. Beddard, the prosector to the Zoological Society, and for the rest to Professor Stewart, for permission to make use of the valuable collection of undissected animals contained in the College stores. In the larger number of instances, the animals were injected before dissection; and, by the skilful aid of Mr. Ockenden, the prosector's assistant at the Zoological Gardens, I was able to obtain very perfect injections in even so large animals as the rhinoceros and hippopotamus.

The present work appeared to be justified by the fact that little has been written upon the abdominal viscera as they are disposed *in situ*, and still less has been contributed upon the subject of the peritoneum and its folds and fossæ in the mammalia. The descriptions of the stomach and intestine in the lower animals deal almost exclusively with the parts as they appear when separated from all their normal attachments. From such descriptions, the disposition of some portions of the intestine, notably of the colon, can hardly be deduced; and the same may be said of the mutual relations of one segment of the bowel and another.

It is hoped that these lectures will supplement the admirable account of the abdominal viscera of mammals, given some years ago by Professor Flower from this chair.

So far as I am aware, no attempt has yet been made to follow the stages of evolution by a reference to the intestinal canal. It will, however, I believe, be evident from the account that follows, that the order and progress of mammalian descent can be illustrated in a very striking manner by the anatomy of the intestinal canal. Illustrations bearing upon this subject have so far been mainly derived from data having reference to the skeleton and teeth. It is obvious that these parts of the body, as being little sensitive to casual change, must afford invaluable evidence upon all questions that affect the descent of the mammalia, and, so far as fossil-specimens are concerned, they alone can afford material for speculation. But inasmuch as the evolution of the animal species is largely dependent upon the food-environment, it would be expected that the alimentary canal should provide important data in respect to this subject. This canal is certainly highly organised, is, no doubt, sensitive to change, and is susceptible of rapid

specialisation. But the characteristics that follow therefrom are not difficult to recognise and to eliminate; and there then remain more rudimentary characteristics, which appear to me to be of the utmost value, and to speak with no uncertain voice.

In the present account, I shall avoid mere details of description, and shall deal principally with such facts as serve to illustrate these important questions.

Development of the Alimentary Canal in Mammals.—The first appearance is that of a simple straight tube, suspended by a vertical median fold. This tube becomes differentiated. The upper part dilates, and forms the stomach; the next portion increases rapidly, and forms a large loop with a narrow pedicle. This loop becomes the small intestine, and the ascending and transverse parts of the colon. The part below retains its connection with the median line, and becomes the descending colon and rectum. The connecting fold of peritoneum is named from above down the meso-gaster, the mesentery, the meso-colon, and the meso-rectum.

The parts of the alimentary canal, brought together at the pedicle or narrow stem of the great loop, are the duodenum and the transverse colon; and the close association of these two parts is never lost in the mammalian intestine in any case, or under any complications. Between these two closely allied parts runs the superior mesenteric artery. Two very important changes now take place: the gut above the pedicle just named forms a second loop—the future duodenum; and the great primary intestinal coil becomes twisted upon itself, so that the right side of the mesentery becomes the left, and the commencement of the colon is carried across the end of the duodenum. By reason of this twisting, the meso-duodenum and early part of the meso-colon are bent upon themselves, and thus is produced a remarkable vertical fold of peritoneum, that connects the duodenal bend with the meso-colon. This fold may be called the duodenal fold. It is present in all mammals that show the turning in the primary loop. It becomes faint in the higher primates, and is practically lost in man, where, however, it is met with as the fold of peritoneum that bounds the fossa duodeno-jejunalis. Finally, the spleen develops in the meso-gaster, and from a pouch of the meso-gaster below the spleen, the rudimentary great omentum is produced. In man, the meso-duodenum is lost; the true mesentery also disappears, and is replaced by a membrane with new attachments, to which, however, the term mesentery is always applied; the great omentum becomes complex, and the median meso-colon is lost.

The main features in the disposition of the alimentary canal in animals below man are the following: the meso-duodenum and duodenal fold are retained, the real mesentery and descending meso-colon are retained, the rest of the colon remains free, and the great omentum is comparatively simple.

Types of Intestine.—It has been many times pointed out, by comparative anatomists, that it is unsafe to surmise the function of an organ from its structure; and this observation is substantially illustrated by the alimentary canal. In the single family of the marsupials, the same simple globular stomach is found in the carnivorous dasyure, the leaf-eating phalanger, and the insectivorous bandicoot. If it be assumed that an ample or complex cæcum is an essential in the intestine of herbivora, then it is not difficult to point to certain herbivorous animals who have no cæca, as, for example, the hippopotamus.

Eliminating exceptional characters, and taking the average in a large series of cases, the following types of intestine may be stated.

The Carnivore's Intestine.—The stomach is quite simple, the duodenum is comparatively short. The intestine is short, and the colon is especially abbreviated. The cæcum is small, simple, and conical. The colon is peculiarly simple, and not sacculated.

The Herbivore's Intestine.—The stomach is complex. When of simple outward appearance, it may contain an elaborate gland, as in the wombat and beaver. The duodenum is long. The intestine is extensive, and the colon is especially lengthened and sacculated. The cæcum is large and capacious. The colon is usually complex.

The intestine of man is based rather upon the former than the latter type; and it remains for those who maintain that man should be a pure vegetarian, to explain the disposition of the canal in this usually omnivorous animal.

The Amphibia.—In the amphibia, the intestinal canal is disposed in the simplest manner, in the form of a single loop, suspended by a vertical median mesentery. The stomach is vertical and tube-like. There is no distinct duodenum, and the colon, as recognised in mammals, is not differentiated. Two arteries supply the stomach—one, the posterior gastric, follows the lesser curvature, and corresponds to the gastric artery of mammals; the other, the anterior gastric, runs to the greater curvature, passes in front of the pylorus, and occupies a dis-