THE GOULSTONIAN LECTURES ON THE ORIGIN AND RELATIONS OF NEW GROWTHS.

Delivered at the Royal College of Physicians.

By J. F. PAYNE, M.B.Oxon., F.R.C.P.,
Assistant-Physician to St. Thomas's Hospital.

LECTURE I.—Continued.

Comparison of Tumour-growth with Hypertrophy and Hyperplasia.

THE formation of new growths has, doubtless, many points of contact with the process by which existing parts of the body are increased in size. In the first place, those tissues or parts of the body which are specially disposed to hypertrophy are, with certain exceptions, also very liable to become the seat of tumours. For instance, no tissue is so constantly liable to hypertrophy as the adipose; and precisely here do we find very common and sometimes enormously large tumours. No doubt, the increasing skill and confidence of surgeons has made extremely large tumours less common of late years; but the largest tumour (so far as I know) on record is a fatty tumour, of which a drawing is preserved in the museum of the Harvard University at Boston. The description of it may be not without interest.

An enlarged drawing of a woman, in whom there was formed a tumour that was, perhaps, as large as any that has ever been recorded. The estimated weight of the tumour alone, at the time of her death, was not far from 275 lbs., and the weight of the patient without it was probably not 100 lbs. The age of the patient at the time of her death, in 1854, was 36 years. In 1838, being then in the sixth month of her first pregnancy, she was kicked in the right iliac region by a cow, and to this accident she always referred her troubles. She, however, went her full time, and was confined in June, suffering afterwards habitually from soreness of the side and weakness in the loins. In September, 1840, a second child was born. Six weeks before labour, she lifted a heavy kettle, swooned, and, on recovery, found a small tumour protruding from the vagina. Her health was delicate for the next eleven months. In 1841, she aborted at the third month, after a fright. Three days afterwards, she took cold, and had tenderness and fulness of the abdomen, the right side becoming so sensitive that the bed-clothes were oppressive.

In 1843, a dead child was born at the full period, and after a severe labour. The vaginal tumour at this time projected three or four inches beyond the labia, was one inch and a half to two inches in diameter, and its attachment was beyond the reach of the finger. Subsequently to this labour, the whole tumour sloughed off. Difficulty of passing the urine also followed, and the catheter was used for some months. During this attack, a soft immovable tumour was felt a little to the right of the linea alba, and almost filling the right side of the abdomen, and from that time the abdomen enlarged pretty rapidly for a year.

About four years after the tumour appeared in the abdomen, another showed itself in the right labium, extending to the nates. This last was soft and elastic, and, for a year or two, it could be returned within the pelvis or abdomen; but, subsequently, it enlarged *paripassu* with the abdominal tumour, and both fluctuated so distinctly that the case was thought to be one of dropsy. The tumours were tapped or incised eight times, but no fluid was discharged. The abdominal tumour had produced the most distressing dyspnoea, so that she could scarcely breathe except when on her hands and knees. As the tumour of the hip enlarged, however, the dyspnoea was relieved, as well as the general anasarca, and a numbness of the lower extremities, from which she had suffered much. At the urgent solicitation of the patient, the tumour upon the hip was opened and the finger passed in, but a soft tissue only was felt, very much like the omentum.

After the relief above referred to, the patient's health improved. She again became pregnant, and, in 1848, was delivered at the full period, artificial means being required, and the child dying during the labour. When this was over, she returned to her former condition.

Before this last pregnancy, when she was in a sitting posture, which she sometimes attempted, the abdominal tumour rested upon her thighs and as far as her knees; there being no marked increase of size before delivery, nor diminution afterwards. The tumour of the hip was fifteen inches long, ten inches in diameter at its longest part, and four inches in

diameter at the point of its connection with the perineo-ischiatic region.

About 1850, the patient weighed, on a platform-scale, 269 lbs. Her greatest weight before marriage, and when in full health, was 108 lbs.; and, her flesh being very much reduced, her own weight was estimated, at the above date, at 90 lbs., and that of the tumour at 179 lbs. From this time, or from the year before, she was confined entirely to her bed as long as she lived.

In June 1851, when Dr. Buckner saw her, the circumference of the abdomen was 7 ft. 8 in., and the distance from the ensiform cartilage to the pubes 3 ft. 6 in.; the form of the abdominal tumour being regular and very prominent, so that the outline, if continued, would be rather ovoid than round. The tumour of the hip extended along the thigh, and measured 2 ft. 6 in. in length and 18 in. transversely. The circumference, longitudinally, was 4 ft., and that of the neck of the tumour was 2 ft. 2 in. It was of a regular, elongated form, and considerably larger at the upper extremity than the lower. Some slight mammillary elevations, however, existed upon the surface, but these were subsequently found not to differ from the rest of the tumour in structure.

During the last year of the patient's life, there was frequently a pustular eruption upon the surface of the posterior or ischiatic tumour, leading to superficial ulceration; but this would in time dry up and heal. With this exception, and those already referred to, her general health was usually good, and her functions were well performed; menstruation being regular as to time and quantity, though painful during the last few years. Towards the close of 1853, the cutaneous affection increased, her health failed, and she died in January 1854.

A necropsy could not be had; but Dr. Smith, in order to get the body into something like a coffin, removed the ischiatic tumour in the presence of her husband. Within it was a cavity into which he passed his arm to above the elbow. The arm was then passed to about the same extent upward into the pelvis and abdomen; and, with the other hand upon the tumour externally, Dr. Smith satisfied himself that the abdominal viscera were intact, and that the tumour was external to the peritoneal cavity. The two cavities contained eight pints of fluid; the one in the ischiatic tumour being evidently, in the opinion of Dr. Smith, a process from that of the peritoneum; and the two tumours, though entirely distinct externally, being portions of one and the same growth. The communication between the peritoneal cavity and the prolongation from it he believed to be through the sacro-sciatic notch; but to this view of the case Professor Delamater thought that there were objections. The ischiatic tumour consisted mainly of a soft adipose structure, interspersed with delicate layers of fibrous tissue; and, in bulk, the tumour was large enough to fill a common wash-tub. After the removal of the tumour, the genital organs and the anus, which were fully in view, were found to be somewhat drawn to one side, but otherwise unchanged. The abdominal tumour was not examined; but there can be no doubt, as Professor Delamater remarked, that it was mainly adipose. Professor Delamater finally remarks, that "the continued growth of these tumours was unabated to the end"; and, basing his computation on the above estimated weight of the tumour, he says "we shall get 268½ lbs. as the ultimate of the solid and fluid constituents of these abnormal productions. Drs. Johns and Beach estimate the entire weight at 275 lbs., which I have no doubt is within the truth." (*Catalogue of the Warren Anatomical Museum*, p. 642. Boston: 1870.)

The tumour admirably illustrates several of the laws of new growths, which we have endeavoured to trace. It arose in a tissue specially disposed to hypertrophy, in a part of the body where hypertrophy of this tissue is particularly liable to occur, as witness the extraordinary development of the Hottentot women; and from its causing absolute rest, even the ordinary waste of fatty tissue was reduced to a minimum. These conditions do not certainly at all explain the gigantic development, but they must be regarded as subsidiary causes.

Again, we sometimes see that even the special parts of organs which are liable to hypertrophy are also liable to become the seat of new growth. In the skeleton, for instance, a remarkable proclivity to disease is observed in the long bones at the termination of the shaft, or close to the junction of the epiphysis.* This is the portion which becomes enlarged in rickets, and it is also the most frequent situation for tumours. Some remarkable cases of multiple exostoses growing from these parts of the skeleton are on record; and as they illustrate in a striking manner the transition from overgrowth to new growth, one may be worth quoting. It has been published by my friend, Mr. Arnott, in the *Pathological Transactions* for 1872.

* Virchow gives, as the usual position of cartilaginous exostoses, the upper end of the tibia and the lower end of the femur. In this case he suggests that the growth may come from the residual cartilage between the bone and the epiphysis, as most of these growths occur in young persons; but this would not explain the equally common occurrence of bony exostoses at the same parts. (*Die Krankheiten Geschwülste*, ii, 14.)

A girl, aged 18, in good health, observed a small swelling on the inner side of the knee, which was found to be a bony growth, of the size of a large hazel-nut, springing from the ridge leading to the internal condyle of the femur. On closer examination, similar tumours were found on the other side of the lower end of the bone, and in symmetrical situations on all the long bones of the leg. The patient died of the consequences of an operation to remove one of these tumours; and we had the opportunity of examining the skeleton. At the *post mortem* examination, I particularly noticed the situation of the extremely numerous exostoses, which grew from nearly every bone of the body. So far as could be traced, the skull, sternum, hands, and feet were free; but each of the long bones of the extremities had one or several growths springing from the typical situation which I have already indicated; that is, near the extremity, and close to the epiphysal junction. Each rib had similar growths in two situations, namely, near the costal cartilage in front, and near the head and tuberosity behind. The lateral processes of the lumbar vertebrae exhibited similar outgrowths, which were also found upon the sides of the vertebrae, and on several symmetrical parts of the pelvic bones.

Now, the overgrowth of bone here was so general, and so conspicuously confined to the typical situations in which general hypertrophy is seen, that it is surely not too much to regard the process as one which would have appeared as simple enlargement, had the bones been soft as they are at the time of life when rickets occurs. The question of rickets was raised, at the discussion which took place on this case, at the *Pathological Society*, and the obvious analogy was pointed out; at the same time, there was a general agreement that it could not be a case of this disease. Looking, however, at the very general distribution of the disease; at the fact that the red medulla of the spongy bone, which formed great part of the outgrowths, is probably concerned with blood-formation, and certainly has intimate relations with the general nutrition of the body, it is impossible not to see that there was a general disease, or condition of the body, of which the local disease was the manifestation. We may also remember that the age of the patient was just that at which the ossification of the epiphyses of the long bones, and that of the head and tuberosity of the ribs, takes place. This is a perfect example of the constitutional character of certain tumours, and of the absolutely imperceptible transition from hypertrophy to new growth.

In Mr. Arnott's words, "the tumours appear to be only exaggeration of normal development, at a time when it is at its acme of activity, by which the bones, during a sudden increase of growth, sprout out into fantastic displays of such growth." I confess I should describe this case as hypertrophy rather than new growth, thinking that the definite and peculiar form of the enlargements was due to the unequal resistance of the parts.

Lest I should be thought to have trespassed unduly on the field of the surgeon, let me select a very similar instance from among the diseases which traditional usage has assigned to our care. Enlargement of the lymphatic glands is well known to be an extremely common affection of the body, more especially during the period of growth, and this enlargement is sometimes merely transitory, sometimes chronic. The structure of the glands, thus enlarged, is not generally different from that of the normal glands. In another class of cases we have enlarged glands, in outward appearance, the same as these, but nevertheless differing, both in their minute structure and in their history. Either the newly-formed gland-tissue, by which hypertrophy is effected, is found to have an inadequate vitality, so that it speedily decays and becomes necrotic, in which case we call the change scrofulous; or else the newly-formed gland-tissue becomes hard, loses some of its cellular elements, and shows increase of the fibrous element between the cells, till there results a change, recognisable by external characters, as induration; and, by its minute anatomy, as increase of the intercellular substance, or stroma. These two conditions—scrofulous change and induration—are the ultimate stages of chronic enlargement, or hypertrophy, from which, to them, there is a perfectly gradual transition, and at particular stages of the disease it would be impossible to say, with certainty, what name ought to be applied. Whether the ultimate difference depends upon difference in the original structure of the body, or upon nutrition, or upon external influences, we are rarely able to say.

In all these cases the form of the gland is not altered, and it would be only by a somewhat strained use of terms that we could describe the enlarged organs as tumours. Let us now go a step further, and consider those cases in which the glands are not only enlarged, but in which, by thickening or inflammation of their capsules, and the connective tissue around them (periadenitis), the group of glands becomes adherent together, and a lobular mass is formed, which not only possesses sufficient physical coherence to be regarded as a definite tumour, but also has evidently a certain physiological unity, being subject to the same laws of morbid growth. Is it possible to avoid calling this a

tumour, or new growth? Certainly, in the present state of science, every one would call this a lymphoma, while we should call an enlarged gland simply a case of hypertrophy. Yet it is quite certain that our powers of observation, at least, do not permit us to draw any line between the two. Nor is there, as I believe, any anatomical difference. One supposed distinction is the presence, in some cases, of peculiar elements—myeloid, or giant-cells—but these elements are found in many, if not in most, simply hyperplastic conditions of lymphatic glands. (*Transactions of the Pathological Society*, vol. xix, p. 401, 1868.)

If we now go a step further, and examine another class of cases, we shall find that, in specimens not differing very greatly from those last mentioned, the enlarged glands are in a direct connection with masses of newly formed tissue around them, more distinct and prominent than the thickening of the capsule. These masses of newly formed tissue penetrate or infiltrate the neighbouring parts, and, so far as they reach, convert them into similar structure. This is, of course, not a case of adenitis, or periadenitis, but of an infective, or what is generally called malignant, tumour. Nevertheless, there are such cases, in which the structure of these adventitious masses differs little, if at all, from that of certain parts of healthy lymphatic glands (*Transactions of the Pathological Society*, vol. xxiii, p. 248, 1872): so that what is anatomically a kind of hypertrophy becomes, in its mode of extension, an actual new growth, and, in its effect on the body, malignant or infective. Lymphatic structure may, however, show another peculiar mode of occurrence which, nevertheless, we cannot but call hypertrophy. That is to say, the tissue, similar to that of lymphatic glands in other parts of the body, may also be increased. Take the case recorded by Dr. Moxon in the *Transactions of the Pathological Society* (vol. xx, p. 369, 1869), which is a type of numerous others, where growths of similar anatomical structure were found to occur simultaneously in the lymphatic glands, spleen, tonsils, and follicles at the base of the tongue. All these parts contain normally the same tissue, viz., that which is called cytogenous connective tissue, or adenoid tissue, and the occurrence of masses of the same kind in all may then be considered as a hypertrophy. In Dr. Moxon's words:—

"The disease of these organs is the same in all, consisting of a new formation, which resembles the lymphatic gland tissue, but that the elements were larger in size. The relation of the disease to the structure and function of the parts affected, plainly points it out as constitutional; by constitutional, I mean belonging to the parts in their relation to the other tissues; in other words, pertaining to their nature and use in the economy. So far, the case is parallel to the not uncommon occurrences of multiple melanoses of the skin, or multiple cancers of bone, either of which examples will give us instances of malignant disease attacking at many points the same system of tissues, and that under such circumstances that we cannot suppose the tumours to have spread from any one of the diseased spots to the rest by infection or transplantation."

I would only remark that, while agreeing with Dr. Moxon's interpretation of the simultaneous occurrence of the growths in similar, not identical organs, I wish also to lay stress on the fact of the growth being, in all cases, presumably a hypertrophy, and quite as justly comparable to the multiple exostoses just mentioned as to multiple cancers; though in this case there was also infection of the contiguous part of the lung, so that it was infective or infiltrating, as well as multiple or generalised.

These instances may suffice to show that hypertrophy may give rise to products which resemble the most pronounced form of new growth in their distinctness, or their generalisation, and even in their infectiveness.

I would further point out, that tumour-production is like hypertrophy in other respects, viz., that both processes occur with a certain frequency in particular organs, as well as in particular tissues. This is, however, true only of organs that are subject to certain kinds of hypertrophy. It is not functional hypertrophy, that is to say, such as hypertrophy of the heart and muscles. It might be enough to say that the striated muscular tissue is one not at all disposed to new growth; but then the question would arise, Why should it not be so? This may, I think, be answered in two ways, viz., either by the principle stated just now, that expenditure of force is antagonistic to excessive growth, or that highly specialised tissues have little germinative power; but it is enough to see that, when hypertrophy is produced by functional activity (whatever the mechanism may be), it will be proportional to functional activity, and there will be no surplus for abnormal growth. But there is another form of enlargement, which I should like to call nutritive hypertrophy, were it not that, if the word hypertrophy be taken in its original sense, the expression is tautology. What I mean is, overgrowth dependent on nutrition, not on function. Uncomplicated instances of this are very rare; but it is singular that the most extraordinary instance on record of hypertrophy of the heart is of this kind,

viz., that in the museum of St. George's Hospital, which weighed over four pounds, and where no cause of obstruction was discernible; but it is more constantly the case in such hypertrophies, for instance, as that of the thyroid gland, a part which is frequently the seat of new growth, as distinguished from enlargement.

Also, it is most strikingly true, that those parts which are subject to occasional or periodical enlargement, or on which the overgrowth is consequent to change, perhaps functional, in some other organ. Take, for instance, the uterus and mammary gland in women.

Whatever the mechanism may be, there is no doubt some mechanism by which these parts are especially disposed to abnormally rapid nutrition and activity of growth under particular circumstances. This machinery will, we know, from time to time, act blindly. The uterus will enlarge around a tumour, or a mole, and finally contract upon it, as in parturition; and the mammae will often enlarge sympathetically with various affections of the uterus, not necessarily with pregnancy. (*Lee's Lectures on Midwifery*, p. 169.) Can we doubt that some disordered action of this mechanism is an important factor in the production of tumours in these parts, and that the remarkable frequency of new growths in the mammae and uterus is partly thus to be explained?

[To be continued.]

CLINICAL LECTURE

ON

DISEASES OF THE EAR IN RELATION TO PYÆMIA AND CEREBRAL ABSCESS.

Delivered at St. George's Hospital.

By W. B. DALBY, F.R.C.S., M.B. Cantab.,
Aural Surgeon to the Hospital.

GENTLEMEN,—On December 30th, I was requested by Dr. Wadham to see a boy, C. H., 10 years old, who was admitted under him into the King's Ward on the day before, and who, among other things, was suffering from a discharge from the left ear; and it is in consequence of the important part which the ear-affection played in causing the boy's death, that I have the privilege of delivering the clinical lecture to-day. The child had been sent into the hospital, supposed to be suffering from ague, and I obtained from his mother the following account of his illness. Three months ago, he was in good health, when, during an ordinary cold, he became deaf in the left ear. He continued pretty well, with the exception of the impaired hearing, until two weeks before his admission, and at that time he had an attack of pain in the left ear, which, lasting for between two and three days, was succeeded by a purulent discharge, and, with the appearance of the discharge, complete relief from the pain. Three days subsequently to this, he had a shivering fit, and this was repeated each day for a week. Shortly after the first shivering, the pain in the ear returned, and very soon involved the side of the head; and he suffered so much in this respect, that he was put to bed, and kept there until his removal to the hospital. When I saw him, there was a purulent discharge from the left ear; the tympanic membrane was ulcerated away; he was very deaf on that side; he was suffering from a good deal of pain in the head, especially in the neighbourhood of the ear; there was extreme tenderness, on deep pressure, over the mastoid process; some redness, but no swelling; no tenderness in the course of the carotid sheath. Pulse, 128; temperature, 99.8. He had a dry, brown tongue. The nurse said he had not slept. He lay moaning with his hand to his head, and had all the appearance of a patient suffering from blood-poisoning. He had an occasional dry cough, but no abnormal sounds in the chest had been detected, except that, at the apex of the right lung, the respiration was harsh and the voice sounds increased.

On January 1st, the pain on the left side of the head was so severe, and the tenderness over the mastoid process so much increased, that I believed it probable that the inflammation had spread from the tympanum to the mastoid cells, and that possibly the presence of pus in these cavities might be aggravating the symptoms. This, however, was uncertain, inasmuch as there was no œdema, nor swelling of the integuments immediately over the bone. Notwithstanding these negative signs, I made an incision over the mastoid process, half an inch from where the ear joins the head. The periosteum and the bone beneath were healthy. I then made a small opening into the bone, the probe freely entering into the cells, in the direction of the tympanum, to the depth of an inch. No discharge of pus followed this, nor subsequently. Although, on the day afterwards, the pain in the head was somewhat better, his general condition remained unchanged. On the 7th, he had

more shivering and an occasional cough. Not to dwell any longer in recounting this case, he now developed all the signs of fluid in the right pleura, and, at no time losing consciousness, he died on the 17th.

At the *post mortem* examination, the chief points which call for remark are, that the anterior two-thirds of the right pleura were filled with pus containing flakes of lymph; in the lower lobes of the right lung were several abscesses (none of them near the surface of the lung), with ragged walls filled with foul pus. The surface of the brain was somewhat congested, but otherwise it was healthy. There was no thrombus of the lateral sinus. Between the roof of the left tympanum and the dura mater was a small quantity of tough lymph. Here is the temporal bone. You will notice that the tympanic membrane is absent; the cavity of the tympanum is full of pus, the ossicles are necrosed and lie loose; the roof of the tympanum is carious on either surface, and the roughness on the cranial surface extends back to the sulcus for the lateral sinus.

This boy died from pyæmia, and the starting-point of the disease was a suppurating surface in the cavity of the tympanum. I will just ask you to notice how an apparently trifling disorder may terminate fatally. The order of events is somewhat in this fashion. The boy has an ordinary cold; the catarrhal condition of the nares is continued up the left Eustachian tube into the tympanum; the tube becomes obstructed, and the tympanum distended with mucus, so the conduction of sound is interfered with. In the usual course of events, if this were not treated, the mucus would become inspissated, leaving behind more or less deafness; instead of this, by and by, inflammatory action proceeds another step; the non-purulent catarrh becomes purulent; the tympanum becomes full of pus; this makes for itself a way of escape by ulceration through the tympanic membrane; there is a discharge from the ear; the cavity of the tympanum is a suppurating surface; this is followed by caries of the bone, purulent absorption, pyæmic deposit, and death. More usual than pyæmia, as an immediate cause of death in cases of disease of the tympanum terminating fatally, is cerebral abscess. Out of seventy-six cases of this latter affection recorded by Sir W. Gull and Dr. Sutton (in Reynolds's *System of Medicine*), twenty-eight, or a little more than one-third, arose from ear-disease. The various appearances generally met with (and there are accounts of many in the *post mortem* books) are, pus between the cranial surface of the temporal bone and the dura mater, pus in the arachnoid cavity, abscess or abscesses in the cerebrum or cerebellum, and plugging of the lateral sinus (thrombosis). In these temporal bones from the museum, with most of them, the roof of the tympanum, you observe, is carious, as in the case before us. In one fatal case which I saw in the hospital in 1866, the disease had extended from the tympanum through the labyrinth and the internal auditory meatus. In other instances (and these are the most uncommon), the suppuration has been confined to the mastoid cells, the tympanic cavity remaining healthy, and the tympanic membrane entire. Where the seat of abscess is in the cerebellum, it is most usual to find the mastoid process diseased. And now, to go back again to the early history of these cases, and the way in which the ear-trouble may begin. Of all the causes which give rise to suppuration in the tympanum, scarlet fever and the other exanthemata are the most frequent; and next, perhaps, what is spoken of as idiopathic inflammation of this cavity, the meaning of this term (idiopathic), so far as I know, being, that it occurs without our knowing why or how. We meet with it as an affection characterised by severe pain in the ear, attended with more or less feverish symptoms, and succeeded by a rapid cessation of the pain and rupture of the tympanic membrane, as shown by its characteristic appearance, and a purulent discharge from the ear. Again, a non-purulent catarrh may, as in the case of this boy, merge into the purulent form. Lastly, and of this I have seen several cases, suppuration may be set up in the tympanum by an accidental rupture of the tympanic membrane. The first serious symptom with patients who die in the way we are considering is very generally a rigor; and this, when it often recurs, sometimes leads the friends of the patients to suspect that they are suffering from ague (as in the present case); but you will find that patients who are the subjects of cerebral abscess and meningitis, when once what we speak of as head-symptoms have set in, will exhibit a considerable variety of symptoms. Some are furiously delirious, others have convulsions, and others have epileptiform fits. I have seen all of these, but in most of the cases they have laid in a half stupid state for some days, evidently suffering from pain in the head, moaning sometimes, until they have become comatose and died. A few days generally suffice for the termination of these cases; but this varies very much, and one case has been recorded (in the article I have mentioned) in which the patient lingered for fifty-three days.

And now, gentlemen, there are some points in connection with this class of cases which are well worthy of your careful consideration. The first of these is to recognise the condition under which your patient is