From December 10th to the 17th the wound gradually became smaller, and the depression was less marked. One ligature was removed. On the 13th she sat up for the first time, and on the 15th port wine was commenced.

The patient completely recovered, became pregnant, and was safely delivered of a son on April 6th, 1876, the labour being natural. Nothing at all was remarkable during the period of gestation.

THE STATE OF THE ARTERIES IN BRIGHT'S DISEASE.

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THE ophthalmoscope is of service to the physician, among other uses, because it enables him to see the termination of a minute artery and vein, and to gain direct evidence of their condition, such as is to be obtained in no other way. When the retina is free from local disease, there is no reason to believe that the retinal artery and vein differ in their condition from other arteries and veins of the same size, and, therefore, any marked change in their state, apart from cerebral or ocular disease, may be taken as evidence of a similar change throughout the vascular system.

The object of the following paper is to bring forward certain facts concerning the retinal vessels in Bright's disease, and I believe the facts warrant this conclusion; that, in chronic Bright's disease, the arteries of the retina are sometimes of normal size and sometimes very distinctly lessened in size; that this diminution in size depends upon contraction; and that this visible contraction stands, as a rule, in direct proportion to the tension of the arterial blood, as measured by the incompressibility of the radial pulse.

A few words are necessary as to the manner in which the size of the arteries is estimated. Their condition can only be seen under considerable magnifying power. Examination by the indirect method does not, as a rule, give sufficient enlargement unless a lens of very long focus be employed, as in Carter's demonstrating ophthalmoscope. Now and then, if the eye be hypermetropic and the vessels very distinct, the indirect examination with a lens of three or four-inch focus will suffice; but, as a rule, it is necessary to employ the direct method of examination. If the pupil be small, it must be dilated with atropine, since it is often necessary to trace the vessels for some distance from the disc.

There is unfortunately no method of applying any gauge to the vessels; their size must be estimated by the eye. The change in size may be judged of absolutely or by comparison with the veins. For an absolute estimate of their size, familiarity with their normal appearance under direct examination is, of course, necessary. Further, as the degree of magnification varies with the refractive power of the eyeball, this must be allowed for. It may generally be estimated by noticing the apparent size of the disc.

The change in the size of the arteries is frequently such as to be recognised at once; there is no need for comparison with the veins. The reduction in size may be so considerable, that even the primary branches of the central artery are so small that their double contour is recognised with difficulty, and it may be unrecognisable even by direct examination, the arteries being, as in one example I have to show, visible only as lines.

In other cases where the diminution in size is slighter, it can be most conveniently estimated by comparing the arteries with the veins. The distribution of the arteries and veins corresponds approximately, not exactly. Sometimes two arteries accompany one vein, sometimes one vein corresponds with two arteries. But in each eye there are usually some single branches of arteries and veins which have an identical course and distribution, run side by side, and are available for comparison. When this is the case, it will be found that, as a rule, the width of the artery is about two-thirds or three-quarters that of the vein. When the artery bears less proportion to the vein than this, it is usually due to one of three causes: 1. General venous distension, as in cyanosis; 2. Impediment at the sclerotic ring, by which the entrance of blood into the arteries is impeded, and its exit from the veins is also hindered, in which case the arteries are narrow and the veins distended, as in certain stages of optic neuritis; 3. Contraction of the arteries. In the two former cases, the veins are, of course, abnormally large, and their abnormal size is generally easy of recognition. In the latter case, the veins may be normal in size or may be smaller than natural. If they be smaller, the diminished proportionate size of the arteries is of still greater significance. It is neces-

sary, therefore, to be familiar with the normal size of the veins, in order to estimate the size of the arteries by comparison. From their darker colour, their size is easily noted, and the size of the arteries is readily estimated by comparison.

The arteries may be of normal size upon the optic disc, and yet present very marked reduction in size on the retina, a little distance from the disc. An artery may leave the disc beside a vein to which it bears its normal proportion, and, after a little course, without giving off any visible branch, may diminish to one-half or one-third of the size of its accompanying vein.

From what has been said, it will be obvious that these changes in the relative size of the vessels possess most significance when the retina has not undergone the special changes to which it is liable in chronic Bright's disease. Exudation within the sclerotic ring, compressing the vessels, alters their relative and absolute dimension, as I have stated. This is well seen in ordinary optic neuritis. I believe that it is rare in Bright's disease for the neuritic change to be sufficient to produce this effect. Certainly, in cases of albuminuric retinitis, the actual contraction may often be recognised as something quite out of proportion to the retinal change.

As I have said, the rule that, when the arterial tension is increased, the retinal arteries may be seen to be contracted, is general, but not universal. This is in accordance with what might be expected from the various conditions which are known to influence, on the one hand, blood-tension, and, on the other, arterial contraction. Moreover, local influences may cause local modifications. The most notable exceptions to the rule, which I have met with, have been in cases of local retinal disease.

The following are some of the facts on which the conclusions described have been based. The incompressibility of the radial pulse was employed as the estimate of arterial tension. When practicable, my own estimate has been corroborated by a sphygmographic tracing, or by an independent opinion.

On opposite sides of a ward in University College Hospital, there recently lay two patients (under the care of Dr. Reynolds), whose cases illustrated in the most marked manner the relation of blood-tension and the state of the retinal arteries. The one case was that of a man, fifty-eight years of age, whose illness had commenced gradually, with shortness of breath and weakness, two years before. Slight oedema of the legs had existed for only one month before his admission. His urine contained one-third of albumen; had a specific gravity of from 1,005 to 1,008, and contained numerous casts, granular and hyaline, with some degenerated epithelium, both free and within the casts. His retinae were normal in appearance; the arteries of full size, presenting not the slightest evidence of contrac-

Fig. 1.

tion. His pulse was full, but very soft and compressible. There was no evidence of cardiac change. The other case was that of a man, aged 46, whose symptoms resembled those of the first. They began

with shortness of breath and swelling of the legs nine months before. His urine had a specific gravity of 1,007 to 1,010, and contained from one-third to one-half albumen; its quantity was from two to four pints, and it contained many casts, granular, hyaline, and epithelial. His retina presented evidence of slight disease. The optic discs (Fig. 1) had softened outlines, and their surface was reddish-grey, paler in the vicinity of the vessels. There was little, if any, swelling. The veins were smaller than normal; in the left eye, one only approached the average size. The arteries presented a greater reduction in size than in any case I have seen. Even on direct examination, they were visible only as lines, no double contour being recognisable, although they were quite distinct. A few minute white dots existed in each eye near the macula lutea, and in each there were a few small extravasations. The vessels were similar in the two eyes. The disc in the right was a little less grey than in the left. Vision: R.=one-sixth; L., one-twentieth. There was no peripheral limitation of the fields of vision. The pulse was extremely hard; the artery felt like whipcord under the finger, and was almost absolutely incompressible. The strongest pressure which could be put upon it with a Marey's sphygmograph did not modify its character. The accompanying tracing (Fig. 2) was taken under the highest available pressure (about four hundred grammes).

Fig. 2.

The sepia drawing now passed round represents the fundus oculi in a case of chronic Bright's disease, the sequel of an acute attack 12 years previously, the patient having in the meantime had at least two other acute attacks. The urine was loaded with albumen and contained granular and fatty casts. The retina presents abundant soft-edged white areas and also many striated extravasations; most of these had appeared during the preceding ten days. The disc is concealed by oedema. The veins are of normal size; the artery at the papilla is rather smaller than natural, its branches being not more than half the size of the veins; but, a little distance beyond the limits of the papilla, they disappear. The veins can be followed distinctly on the retina, but the arteries can only be seen as dim lines here and there. It may be suggested that this appearance is due only to the opacity of the retina; but the fact that they can be dimly seen here and there as lines suggests that their indistinctness is due in part only to the opacity of the retina, in part also to their reduction in size. The greater extent of this reduction on the retina than on the disc suggests that it is not due to their obstruction at the lamina cribrosa, but to their active contraction. The facts of other cases give support, I think, to this view. This patient's pulse was also very hard and incompressible. He insisted on going out of the hospital, but died comatose a few days afterwards. A post mortem examination was obtained by Dr. Burton, one of the resident assistants at the hospital. The kidneys were found lessened in bulk, increased in consistence, and moderately granular on the surface. The heart was hypertrophied.

The next two sketches (Figs. 3 and 4) represent the optic disc of a

Fig. 3.

Fig. 4.

patient (under the care of Dr. Ringer) suffering from acute Bright's disease passing into a chronic state. The first was made six weeks after the onset. The retina presented a few small hæmorrhages, white dots around the macula lutea, with a few large white areas. The arteries and veins were normal in size, the former being just two-thirds the diameter of

the latter. The pulse was soft and compressible, giving no evidence of increased blood-tension. When the second sketch was made, six weeks later, the patient's general condition had improved, the albumen in the urine was less, but the casts had become fatty; the retinal changes had become considerably less; the white areas had lessened. The retinal arteries, however, presented distinct diminution in size compared with their previous condition. The veins were apparently of the same size as when the former sketch was made, while the arteries had diminished to one-half the size of the veins. The pulse also presented a marked alteration. It had become distinctly harder and less compressible. The change seemed to have taken place only a short time before the sketch was made; for, on my calling the attention of the resident assistant to its character, it struck him at once as quite different from that which had been its character a short time before.

I have repeatedly formed, from an inspection of the retinal vessels, an opinion as to the arterial tension, which, I afterwards found, on examining the pulse, was correct. In order, however, to obtain some evidence which might be without even unconscious bias, I asked my friend Dr. Coupland to be good enough to examine the pulse in a series of cases of Bright's disease whilst I examined the retinal vessels. Each wrote down independently the result of the examination. Five cases were examined, and the results agreed in four. In one case, they differed; but in this the fact that there were many retinal hæmorrhages may, as I have already said, explain the absence of arterial contraction, although the pulse was hard. The following are the details of these examinations.

CASE I.—Arteries small, about one-half the diameter of the veins; moderate contraction (retina healthy, except for a few hæmorrhages; disc clear); pulse moderately tense, *i.e.*, moderately incompressible.

CASE II.—Arteries one-half the size of the veins; moderate contraction (retina perfectly normal); pulse incompressible (about as the first case).

CASE III.—Arteries nearly two-thirds the size of the veins; very little contraction (many extensive retinal hæmorrhages); pulse markedly incompressible.

CASE IV.—Arteries less than half the size of the veins; great contraction (retina normal, disc clear); pulse very incompressible.

CASE V.—No diminution in the size of the arteries; retina healthy; pulse soft and compressible.

Thus, in the case in which the retinal arteries were smallest, the arterial tension was greatest; that in which the arteries and the retina were normal presented no excess of arterial tension; the two others, in which there was a moderate contraction of the arteries, presented a moderate increase in the arterial tension.

There is, of course, nothing new in the fact that the retinal arteries are small in Bright's disease; it has long been remarked as a common feature in albuminuric retinitis, and is shown plainly in the best illustrations of this change (as in those of Liebreich). But it is usually regarded as a consequence of the retinal change, and the points on which I would insist are that it occurs also quite independently of the retinal change, and stands commonly in direct relation to another condition—the blood-tension.

It is hardly necessary for me to point out the bearing of this conclusion on the theory of Dr. George Johnson, which ascribes the increased tension of the blood in Bright's disease, in part at least, to contraction of the minute arteries. It constitutes, I think, a direct proof of the correctness of that theory, which has hitherto derived its chief support from indirect inference from pathological facts. If the tension of the arterial blood and the arterial contraction occur in common proportion, they must stand in a causal relation to one another. But the blood-tension cannot be the cause of the arterial contraction, because it is well known from physiological experiments that the tendency of increased blood-tension is, through the depressor nerve, to cause relaxation of the arterioles. But, on the other hand, as the immediate effect of contraction of the arterioles must be an increase in the arterial blood-pressure, it is reasonable to conclude that such is the sequence of events in the phenomena under consideration; that, although the two phenomena may be in part the result of a common cause (altered state of the blood), the contraction of the arteries, seen in those of the retina and inferred to exist elsewhere, is, in part at least, the cause of the increased blood-tension.

The practical use of inspection of the retinal vessels is perhaps less than its pathological value, but it is, I think, considerable. It is true we can generally ascertain the amount of arterial tension more readily and more surely by feeling the pulse than by looking at the retinal vessels. But sometimes the incompressibility of the pulse cannot readily be estimated, on account of its smallness and the amount of subcutaneous fat or oedema. In these cases, retinal inspection may be useful. Moreover, as

affording definite information regarding the pathological processes in different cases of Bright's disease, it will, I think, have considerable value; and some facts which have come under my observation, at present too few and isolated for more than mention, make me hope that ultimately it may help us better to distinguish between morbid states included under the term and at present imperfectly distinguished.

THE DISSEMINATION OF ZYMOTIC DISEASE AMONGST THE PUBLIC BY TRADESPEOPLE.*

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THE subject of this paper will, doubtless, be regarded as one of an alarming character by the public at large, as highly objectionable by tradespeople, as very important by medical men in general, and as one of the highest interest and concern by medical officers of health.

The necessity of preventing trades from being so conducted as to be injurious to public and private interests is admitted on all hands. We have not only Acts of Parliament which regulate the employment of dangerous substances used in trades, such, for example, as the Petroleum Act, the Pharmacy Act, the Acts relating to explosive compounds, as gunpowder and nitro-glycerine; but we have Acts which, although imperfect in their nature, regulate to some degree factories, coal-mines, bakehouses, workshops, etc. The employment of labour in such trades as lucifer-match-making, fustian-cutting, the manufacture of mineral acids, of earthenware, glass, and metals, of percussion-caps, cartridges, paper, staining of prints, bleaching and dyeing, etc., is to a certain extent controlled. The first-named Acts, as also the Alkali Act, are designed to shield the public at large from the risk of an exposure to hurtful and poisonous substances, whilst the others are directed more especially to the prevention of injury to the health of those engaged in them, and to the non-employment of those who are physically unfit to be exposed to such unwholesome avocations. The protection of the public health by the regulation of offensive trades, such as those of blood, bone, tripe, and soap-boiling, and tallow-melting, is relegated to the Public Health Act of 1875, under which power is also given to compel the consumption of smoke in certain cases.

The existence of all these legal enactments shows conclusively that the principle of the regulation of trades has been deemed by the legislature to be sound, wholesome, and expedient.

Legislation has proceeded on the assumption that, if a trade be so managed as to be injurious to the health of those engaged in it, or to the public generally, or in such a manner as to be a nuisance, *alias* an excessive annoyance or danger to the public, the best practicable means of preventing the evil shall be adopted. The several Rivers Pollution Bills have been drawn with this self-evident desideratum steadily in view. The Rivers Pollution Bill that will sooner or later succeed in running the gauntlets of the Lords and Commons, will undoubtedly be thus framed;† and the Air Pollution Bill, which, I fear, is in the very far distance, must be supported on this basis, if ever it is to be a reality. The liberty-loving people of this free country would never be able to submit to such interference with, and control over, their modes of carrying on business for less important considerations than those of national health and wealth.

Admitting, then, the facts (1) that, in the interests of the public, it is highly desirable that trades should be supervised for public health purposes, and (2) that certain legal enactments at present exist of a very imperfect and limited character, having for their object the regulation of certain trades, so that they shall not be injurious to health, is it not a matter of logical necessity that, if it can be shown that there exist other trades not yet provided for, which are actively engaged every now and then in sowing broadcast the seeds of preventable disease, some remedy for such an anomalous state of things cannot be with any sense of consistency and justice longer withheld?

To prove to medical men, and especially to those amongst them who are engaged in the public health service of the country, that zymotic disease is disseminated by tradespeople amongst their unsuspecting customers, is really to waste time and to assume an ignorance of facts which they are constantly deploring. My object in addressing the Association on this subject is rather to suggest to and consult with those

medical men who are attending this gathering, as to the best mode in which the existing sanitary law could be so altered and modified as to protect the public from the dangers to which they are exposed in this direction. As these lines will be read, however, by many who do not belong to the medical profession, it will be useful for me to narrate briefly a few instances of the spread of zymotic disease by tradespeople amongst those whom they serve which have come under my immediate notice.

CASE I. Scarlet Fever in a Public-house.—Scarlet fever was exported from London into a public-house in Essex. Whilst the children of the publican lay ill of this disease in the bedroom, their mother, who was in constant attendance on them, descended to serve each customer who called to partake of refreshment. I, as medical officer of health, advised the temporary closure of this house of call, but my recommendations were unheeded. From that house, as was naturally to be expected, the fever spread into the surrounding parishes and deaths resulted. There was no legal power to compel a cessation of business during the presence of this communicable disease in the house. It was found that the publican could not be punished under Clause 126 of the Public Health Act of 1875.

CASE II. Outbreak of Typhoid Fever from Polluted Milk.—An outbreak of enteric fever occurred in a portion of the town of Brentwood. Whilst the houses of the families affected were provided with different modes of disposal of excrement, some draining into private cesspools and others discharging into the town-sewer, and whilst the water employed by all, with one exception, proved on analysis, although derived from different sources, to be very pure, there was one condition in common. They all, with one exception, drank milk from the same dairy, and the dairyman washed out his cans with water which was most offensive sewage-water. The exception to the rule was the case of a young man who did not deal with this dairyman, but who drank of the same water as that with which he manipulated his milk. I could not learn that anyone besides this young man employed this water for drinking purposes. I myself saw the milk-vendor milking his cows into a pail which resembled a filthy pig's bucket. His dairy where the milk was stored in large pans was situated virtually in a bedroom redolent of organic matter. My surprise was great to find that milk could be preserved for even a short time in a sweet state in such impure air. Why, I ask, should the lives of our children, who are the great milk-consumers, and our own lives be exposed to such dangers, when nothing would be easier than to have dairy establishments under proper sanitary control, in the same way as we at present have slaughter-houses?

CASE III. A Village School distributing Measles.—Measles appeared in a parish under my supervision. On investigation, it was discovered that the day-school was the centre from which it spread; for the children of the schoolmaster, who lived at the school, fell sick of the disease one after another and imparted it to the children who daily attended the school. I recommended that the schools which were busily engaged in infecting the parish should be temporarily closed.* The managers refused, on the plea that they should lose the Government grant, to secure which a certain number of attendances are necessary, although, when a school is closed by reason of the presence of epidemic disease, a reduction in the number requisite to secure the grant is allowed. There existed no legal power to compulsorily close the schools. Contrary to my advice, they were kept open, and they disseminated the disease in a most successful manner throughout the whole parish, which suffered severely.

CASE IV. Small-pox in a Public-house and Restaurant.—A traveller who was temporarily lodging in a public-house exhibited an eruption, which proved to be that of small-pox of a confluent kind. On entering the door of this house of public resort, I could distinctly recognise the peculiar smell characteristic of the disease. In the bar where men were drinking, the odour was still stronger. Trade was going on as usual. No remonstrance had any effect on the publican. There was no exposure of the sufferer, and it could not be proved that there was any exposure of infected articles. From this house the disease spread, and no legal means existed whereby the calamity could be prevented. The public were frightened some time ago by a report of the discovery of a bad case of small-pox lying in a shake-down bed in the kitchen of an eating-house in London. Some strong feelings were aroused as to the dangers to which people are exposed; but the circumstance was soon forgotten, and made no lasting impression on the public mind.

CASE V. Enteric Fever spread by a Tailoring Establishment.—A case of enteric fever appeared in the family of a tailor who lived in a small

* Read before the Public Medicine Section at the Annual Meeting of the British Medical Association in Sheffield, August 1876.

† Since writing the above, the Act of 1876 has, by the consent of all parties, been allowed to pass with a view to a settlement of the question. It insists on the adoption of "the best practicable and available means" for counteracting the evils with which it is supposed to war.

* The mere exclusion of the children belonging to an infected family from school will sometimes prevent the spread of such diseases as measles and scarlet fever. When several families of a parish are infected, the closure of the public school will be generally found the most effective method of limiting their diffusion.