high esteem for the philosopher, and his appreciation of science, in which he was himself no superficial student, and appointed Laplace to an important post among his ministers; but he soon discovered his mistake. The man of abstract science—the profound mathematician—was found entirely incompetent, not from want of knowledge, but from an excess of accuracy which compelled him to investigate personally every subject which came under his notice, with such minuteness as to arrest the progress of business, and to blind him to the relative importance of various points submitted for his judgment,—defects which ill suited the practical and impatient temper of his imperious master. He was soon suspended; and the commentary of his patron was, that “Laplace, though a mathematician of the highest rank, looked at no question in its true point of view. He was always searching after subtleties; all his ideas were problems, and he carried the spirit of the infinitesimal calculus into the management of business.”

I fear it will be thought that I have been tedious and desultory in these introductory observations, and that I have dealt in trite platitudes which have but little direct relation to the immediate subject of these lectures. It may be so; yet I wished to say these things, and I trust that I have not misapprehended the purpose of the founders of this professorship, nor presumed upon the liberty which my position confers, in supposing that it is neither inconsistent nor irrelevant that I should avail myself of this public opportunity, to give expression to my opinion on questions which I consider to be of vital interest, not only in the cultivation of surgical diagnosis, but in the influence they exercise on the progress of surgery as a science.

In medicine, empiricism has its justification in necessity; but, in surgery, it is without such apology, and degenerates from its original and worthy meaning to that popular and degraded interpretation which modern conventionalism has applied to it. Empirical surgery is a paradox, or, if be not so, it is an imposture. I do not mean to affirm that experiment in surgical practice is never to be justified; but he who undertakes so serious an experiment as an operation, without a reasonable belief that benefit will result to his patient, and without a careful consideration and rational explanation of the grounds of that belief, assumes a responsibility which ignorance and temerity may explain, but cannot excuse.

It is true that the successful cultivation of surgery demands not only careful and patient observation, but independence of thought tempered by cautious reflection. Without this qualification self-reliance becomes rashness, and ceases to be that resource which it should be to the surgeon in diagnosis, as it is his unfailing stay in action. Such, at least, Sir, is the lesson I have been taught; or, to speak more correctly, the model which has been set before me by the great masters of our art, from whom it has been my privilege to learn; and by him in particular whose name I have already mentioned incidentally in this lecture as my own honoured master. Mr. Travers is above any eulogy to which I can give expression; but I may be excused for offering this passing tribute of respect to one for whose memory I retain an affectionate reverence, and whose philosophic mind must leave its lasting impress on our profession.

In an eminent degree did John Hunter strive, by his example, to give a scientific tone to surgery. This was the great object for which he lived; this, the great result of his laborious life. He condescended to every detail; he accumulated his materials, shaped them, and put them together; and thus reared an edifice, which is not only an imperishable memorial of the genius of the builder, but an enduring protest against an impatient thirst for fame, and the use of illegitimate means in the effort to secure it.

SUPPURATION IN THE CORNEA.—M. Hoffmann of Berlin, after cutting away the cornea with a knife dipped in a solution of lunar caustic, and keeping this membrane in aqueous humour at an elevated and equable temperature, found that the stellated cells along the divided parts remained unchanged, but that masses of new round and long cellular forms were scattered throughout the whole of the corneal tissue. In the course of from twelve to twenty-four hours these newly formed cells were observed to change their form and position, and to throw off particles which ran together. A piece of cornea irritated by lunar caustic was then placed in blood, and it was observed that the stellate cells remained unchanged in form, and took no part in the suppuration. M. Hoffmann finally irritated the cornea of a live frog, and injected cinnabar into one of the upper lymph-sacs; within four days, a circle of cinnabar was plainly seen with the naked eye around the inflamed cornea. It was found, on closer examination, that the cinnabar had been taken up by the white corpuscles of the blood, and also by the newly formed cells (pus-cells) in the inflamed corneal tissue, whilst in the stellate cells of the cornea no particles of the pigment could be clearly made out.—*Virchow's Archiv*, xlii. 1868.

ON THE THERAPEUTICAL ACTION OF DIGITALIS.*

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IN connexion with the preceding and subsequent observations, it is desirable to notice an interesting theory that has been advanced to explain the action of digitalis; viz., that it acts primarily on the sympathetic (vaso-motor) system of nerves; that it stimulates the said system, and so causes increase in the contractile power of the capillary vessels. The theory has been well put lately by Legroux (*Du Digitale*, Paris, 1867), and supported by reasoning somewhat as follows.

1. M. Galan has *proved* (Thesis, 1862) that digitalis, administered to frogs, will cause contraction of the capillaries of the web.

2. M. Legroux has *seen* the subcutaneous injection of digitaline (one centigramme) cause long continued contraction of the central artery of a rabbit's ear.

3. In certain conditions wherein the sympathetic is paralysed (partially), digitalis will act as known stimuli to it will. I will consider this point more in detail.

What are the effects of paralysis of a sympathetic branch? If it be complete, as after division of the nerve, there will be dilatation of the capillaries of the part supplied by it, increase of heat, congestion, perhaps effusion, etc. If it be partial—that is, if the nerve be doing duty in a feeble manner, as in patients suffering from fever, from debility after hæmorrhage, or from chronic illness—there will occur similar accidents, though in a less degree; the normal balance of circulation will be interfered with; the heat of the body will be increased; the secretions will be altered; there will be partial congestion, as in the extremities; the vessels will be relaxed; arterial tension will be diminished; and the heart's action will be feeble, rapid, and irregular.

Now these effects may be controlled, and even obviated for a time, by a stimulus applied to the same system. Galvanising the distal end of the divided nerve will re-establish normal circulation; and a powerful emotion *may* re-establish apparent health for an hour or two in a feeble invalid. Now, taking the condition of the capillaries to indicate the state of the sympathetic—their relaxation to indicate a partially paralysed, and their contraction a tonic state of it—it is to be proved that digitalis has power to induce the latter.

In the first place, says M. Legroux, it will, when given to persons in feeble health, *increase* arterial tension, as proved by sphygmographic trace (*op. cit.* p. 46): therefore it must increase the contractile power of the capillaries, the principal indicators and rulers of the said tension.

In the second place, it will lower the temperature of the person taking it, sometimes even *before* the heart action be slowed (Wunderlich and others, quoted at p. 70): therefore its primary effect is not on the heart, but on the capillaries; and it is to contract them.

In the third place, it will diminish the frequency of the heart-beats, and yet it will, in equal proportion, increase arterial tension (Marey); we conclude, then, that the heart is not weakened, but is slowed secondarily to the contraction of the capillaries. This slowing does not occur till twelve, twenty-four, thirty-six hours after administration of a moderate dose; moreover, it is often preceded by a quickening. This latter fact is to be explained as a consequence of increased effort required to overcome the resistance of the narrowed capillaries to which the heart was not accustomed (*sic*).

In the fourth place, it will relieve local congestion; and of this clinical experience will give us proofs. It has been of service in pneumonia (Lissauer, Thesis, Berlin, 1856); in uterine and pulmonary hæmorrhage; and markedly in hæmorrhoids. This last disorder is a good instance in point, because cure may be produced without notable effect on the heart; and, as this is not generally known, I will insert here a few cases kindly forwarded to me by Mr. Duncalfe, who drew attention to this subject in 1859.

CASE IX. April 1859.—T. W., aged 45, had drank freely, but not lately. He had had piles occasionally for many years, more persistently for the last two. With each motion now he passed a little blood and much mucus. On examination, no external pile was found. The sphincter, when pressed upon firmly, gave the sensation of a hard swelling underneath. On straining, there was protruded a dark bluish pile, which was painful to the touch. The sphincter was firmly contracted, and admitted the finger with some difficulty and with much pain. Two or three painful protrusions were felt within the rectum; and much

* Concluded from page 529 of last volume.

heavy throbbing pain was felt after withdrawing the finger. He was ordered tincture of digitalis, in ten-drop doses, every three hours during the day. After two days' trial, he said "he had not had so much ease for months." The sphincter was less irritable. There was some mucus, but no blood. He was ordered to take one teaspoonful of castor-oil in milk every morning, and to continue the digitalis. Five days after the first administration, "passes no blood, no mucus, and is free from pain." Since the report, he has been under treatment on three separate occasions for piles—the result, no doubt, of irregular living. Relief and cure have, on each occasion, followed the use of digitalis.

CASE X. June 1859.—N. S., aged 40, stout, plethoric, had had piles for several months. He had taken different remedies, without more than temporary relief. He passed very large quantities of blood after each evacuation, and suffered much from tenesmus and pain up the sacrum. Externally, three piles, one of the size of a horsebean, and two about as large as peas, were observed. The sphincter was firmly contracted. The piles were returned within the rectum, but gave rise to much pain, and desire to defecate. Fifteen-drop doses of tincture of digitalis were ordered to be taken every three hours. On the second day after taking the medicine, he had no more bleeding, no pain; said he was well. He continued the medicine in smaller doses for two or three days, and, at the end of a fortnight, had had no return. Three months afterwards, he had signs of relapse after hard lifting. He immediately applied for his medicine, which was given to him; and he was not troubled afterwards.

CASE XI. 1867.—E. C., aged 48, a strong man, accustomed to walk much, had had piles for years. He had them tied once. The sphincter was loose, easily yielding to the protrusion of large congested piles. He lost blood with each motion. He could scarcely take exercise, owing to the faintness produced by dragging pains. His health had been failing lately. The skin was loose and perspiring; the complexion haggard; tongue pale and tremulous. He was ordered fifteen minims of tincture of perchloride of iron, with ten minims of tincture of digitalis, every four hours. When the medicine had been continued for a week, he was better, and could walk longer without the piles coming down. After continuing the medicine for three weeks, he could walk without inconvenience for five or six miles. His health, however, was much below his standard. He went to the seaside, and returned home well. He had had no inconvenience from piles since he left home.

CASE XII. 1863.—A. F., mother of seven children, had been subject to piles during gestation and after delivery of her last three children. Previous treatment never relieved her. One week after her last delivery, she was found to have a large protrusion of piles and mucous membrane external to the sphincter, tender, and producing much uneasiness. Digitalis was given in fifteen-drop doses, combined with five grains of extract of henbane. The bowels were relieved by enemata. In two days, the piles could be returned within the sphincter, and protruded only after defecation. The treatment was continued for a week, and then the tumours were less vascular and smaller, scarcely tender, and could be readily returned without pain. There was, however, much redundant mucous membrane; and the piles were touched with the strong nitric acid, with the usual precautions. In three weeks' time she was well. She has since borne another child, and the piles were not so bad as to require treatment. I ought to add to these cases, that I have myself found some good effect from its use in hæmorrhoid, but not much in cases with marked constitutional disorder, hepatic or otherwise.

To return: As other illustrations of the value of digitalis in local congestions, we may fairly cite cured or relieved cases of epilepsy (Corrigan, quoted by Osborn, *Dublin Quarterly Journal of Medical Science*, 1856); of delirium tremens (Jones, *Med. Times and Gazette*, Sept. 1860); of mania and general paresis (Robertson, *BRITISH MEDICAL JOURNAL*, October 1863).

The most rational pathology of the idiopathic form of the first named disease is the congestion of the capillaries in the neighbourhood of the medulla oblongata. In the second named, though the pathology be dubious, all will agree that the condition of vessels in the brain, as elsewhere, is one of exhaustion—of relaxation. In the third named, modern research points specially to morbid conditions of the capillaries, the "miliary aneurisms" of Bouchard, or the "varices" described by Sankey (*Journal of Mental Science*, Jan. 1864). It follows, then, that, in all the above mentioned diseases, we may trace the beneficial effect of digitalis to its *regulating and equalising the capillary circulation*. A similar action well explains its value in ascites; and, when the venous circulation becomes less embarrassed, effused serum is re-absorbed, and so into the blood is taken an excess of fluid, of which the system relieves itself by a profuse diuresis.*

Finally, its remedial value in cardiac disease may be traced sometimes to its diuretic action, explained as above; and sometimes to its steadying and strengthening the peripheral circulation, without any marked excretory action.

Considering all the previous observations as illustrating the theory to which I have alluded, it is evidently interesting, as another instance of the application of the idea now assuming, and very justly, such prominence in therapeutical inquiry; viz., the action of medicines on the sympathetic system.† But I think we must consider the said theory as only partially true. The experiments quoted from M. Galan do not prove much, because the contraction of the capillaries was subsequent to, or at most simultaneous with, the slowing of the heart. The experiment of M. Legroux was a single one. Moreover, the quickening of the pulse which often precedes the slowing is not explained satisfactorily by this theory; neither is the fact of the drug injuring some cases of aortic disease; nor can I substantiate its principal arguments by experiments made according to the following principles. The theory necessarily implies that arterial tension is increased by digitalis; and Legroux publishes, with the sanction of M. Siredey, a sphygmographic trace to *prove* increased tension; but I believe I am warranted in saying that the said trace may be got from any radial artery by a certain pressure of the spring. Again, if the said trace represent the arterial condition after digitalis has been taken for some days, there ought early to follow a similar condition, less only in degree. So many circumstances contribute to alter a pulse-trace, that I could draw no conclusion from one taken many days after a medicine was commenced, where the patient moved, and ate, and slept, under varying conditions; but I considered that I could fairly test the assertion that digitalis increases arterial tension by comparing the pulse-trace taken before and after a dose of the drug, whilst the patient remained still, with the sphygmograph unmoved and the pressure equal.

This experiment I carried out, with the kind cooperation of Dr. Foster and the assistance of Dr. Sawyer. We administered two drachms of the fresh infusion, to persons in average health, on an empty stomach, and we took tracings every five or ten minutes afterwards for the space of an hour or an hour and a half. There were quick and interesting changes in the pulse-trace; but all that I need specially record is, that in four out of five cases the pulse rose, and the arterial tension was *diminished*, as shown by the higher upstroke, which at times had a break in it, more sudden descent, with obliteration of secondary curves and greater diastolism. In the exceptional case, the patient was very "nervous"; his pulse was 120 before his dose, and 92 one hour after; and his tracings *did* show signs of increased tension.

It will be remembered that Winogradoff's experiments tended to prove that digitalis did not alter the blood-pressure in the arteries, whereas Traube's showed a variable result (*Sydenham Society's Year-Book* for 1862).‡

From all this I conclude that, although the idea that digitalis acts through the sympathetic system by contracting the capillaries has several arguments in its favour, and well explains certain of its therapeutical actions, yet it is not the whole truth. A varying amount of direct action upon the heart must be allowed (Conf. Experiments of Fagge and Stevenson, *Guy's Hospital Reports*, 1866). This direct action seems under certain conditions to strengthen the heart's energy, under certain others to weaken it, although the dose of the drug be alike under both. If we compare the cases of disease narrated in my first paper with the cases of health just alluded to, it really seems as if the medicine toned a feeble heart, and yet lessened tone of healthy one.§ An explanation of this apparent contradiction may be founded upon Traube's experiments (*Schmidt's Jahrb.*, cxiv, p. 182), to the effect that digitalis acts on both the regulating and the motor nerves of the heart; and that, if the motor be more stimulated than the regulating, the heart's action will be strengthened, and *vice versa*; or upon Lister's experiments, quoted by Dr. H. Jones; or upon Dr. Reith's "double action of medicines"—with most satisfaction, I think, upon the latter. But to discuss this would lead me into wide regions. Suffice it that I have pointed out, from clinical experience, what cases may be benefited by the drug; any others illustrating its action will always be received by me with thanks and acknowledgments.

and in some cases, perhaps that of belladonna, described by Dr. J. Harley as a stimulant to the sympathetic system, much as digitalis is in the text.

† See especially Dr. H. Jones's writings, and suggestive essays by Dr. Reith, in the *Edinburgh Medical Journal*, February and April, 1868.

‡ I have to thank Dr. H. Jones for his kind correspondence on this subject.

§ Since this was written, I have found the same apparent paradox stated by Dr. H. Jones (*BRITISH MEDICAL JOURNAL*, December 1859). This fact, if it be one, will, of course, explain the discrepancy between our tracings (taken in health) and those of M. Siredey (taken in disease), granting the latter to prove increased tension.

* A similar action may explain the diuretic powers of many so-called "sedatives";