

fact already noticed, the results of the application are, the discharge of a certain quantity of water and the contraction of the vessels. This contraction, combined with increased repletion, gives rise to augmented pressure and discharge of fluid into the tubuli uriniferi.

#### *On Albumen in the Urine.*

When it is remembered that a fluid holding albumen in solution, as the serum of the blood will pass freely through bladder, it seems a remarkable circumstance that albumen is not constantly present in the urine in health.

I believe that we find an explanation of this circumstance in the nature of the membrane forming the tubules of the kidney. Ordinary animal membrane, as that of the bladder, walls of the capillaries, &c., is a fibrous tissue, whereas the membrane of the tubuli uriniferi is homogeneous, and, as far as has been ascertained, structureless.

While, therefore, albumen passes readily through the one form of membrane, it is very probable that the other variety, when in a state of integrity, presents a difficulty to its passage altogether insuperable under the usual conditions accompanying health.

If this view be correct, then there is much reason to suppose that in all cases where albumen is present in the urine, there is lesion of the membrane of the tubules.

The correctness of this supposition very frequently admits of demonstration by the microscope: thus, in fatty degeneration, where the kidney is increased in dimensions, the following is the condition of parts usually noticed:—The tubes vary greatly in size, are not unfrequently more or less spirally twisted, and, in extreme cases, even torn; their cavities are occupied either with fatty deposit, in the form of minute spherules, some of which are included in the secreting cells, but the majority are usually free, or else contain fibrinous coats; it is to be observed, further, that the larger tubes generally contain the fatty deposit in the greatest abundance.

Now, accompanying the dilatation of the tubes, and which is really the cause of the increase in the size of the entire organ, the membrane forming them must undergo some structural change, it becomes thinner, and in this state allows of the passage of the albumen through it.

The occupation of the cavities of the tubes with the deposit and fibrous coats, offers a considerable impediment to the passage of the urine and albumen, as is strikingly shown by the occasional twisting of the tubules.

It is, further, quite possible, that, under extreme pressure, such as does not occur except in disease, and which possibly exists in the congestion of the kidney occurring after scarlatina, the form of membrane constituting the walls of the renal tubules does allow of the passage of albumen through it, even without lesion.

Why the form of albuminuria following upon scarlatina should be curable, and while most other forms of that complaint, or rather, symptom of one or more complaints, should in general not be under the control of treatment, it is not difficult to explain: the first is dependent upon local causes; the impeded action of the skin produces a state of temporary fulness of the vessels of the system, under which there is increased pressure and elimination from the kidney, accompanied and modified by the local congestion, and even inflammation, of the organ present. The second form too frequently arises from general and constitutional causes, under which the local affection is first originated, and subsequently progresses.

From the term albuminuria, and from the frequency with which albumen is spoken of, in connexion with the urine, it might, by some, be supposed, that it is the only element of the blood present in such cases: this is not, however, the case, for the same condition of membrane which allows of the passage of albumen through it, permits also of the escape of the fibrin; but while the first remains in solution, the latter solidifies in the renal tubules, from which they are from time to time dislodged, and are to be detected, by means of the microscope, in the sediment of the urine.

All the elements of the blood, except the red corpuscles, are therefore contained in the urine in ordinary cases of albuminuria.

The above brief remarks seem to illustrate the truth of the following observations, made by Liebig, in the interesting work, the title of which has already been cited:—

“Since the chemical nature and the mechanical character of membranes and skins exert the greatest influence on the distribution of the fluids in the animal body, the relations of each membrane presenting any peculiarity of structure, or of the different glands and systems of vessels, deserve to be investigated by careful experiment; and it might very likely be found that in the secretion of the milk, the bile, the urine, the sweat, &c., the mem-

branes and cell walls play a far more important part than we are inclined to ascribe to them.”

*General Remarks.*—From the preceding observations it would appear, then, that the kidney is to be regarded to a great extent as a mechanical apparatus, as a filter, in fact, the action of which depends upon the fluid contained in it, and the pressure under which this is forced through.

It would be a very great error, however, to regard the elimination of the urine as entirely a physical phenomenon, wholly independent of vital influences; the nerves distributed to the bloodvessels have doubtless the power of affecting their calibre, hastening or retarding the flow of blood within them, and thus of giving rise to diminished or augmented pressure.

How far the urine itself is to be regarded as a true secretion has not yet been determined, seeing that the presence of very many of its constituents has been detected in the blood, and it is possible that they are all eliminated from that fluid.

#### *Action of Oleaginous Purgatives.*

It may not be considered altogether out of place if, in this communication, which treats of the passage of fluids through animal membranes, I make a few brief observations on the subject of the *modus operandi* of oleaginous purgatives.

Two fluids of different densities pass through the membrane by which they are separated in opposite directions, and thus mingle together, the lighter fluid permeating the membrane most quickly mixes in the greatest proportion with the heavier. This is the law of Dutochet already referred to.

Of this law we have a familiar illustration in the softening effect produced by the application of oil to a salad of lettuce; the divided leaves, at first crisp and juicy, soon become soft and flaccid, the water included in the cells of the vegetable tissue escapes, while a portion of the oil is absorbed in less proportion to supply its place.

Now the action which comes into operation when oil is poured into the intestines is of a precisely similar nature; the fluid of the bloodvessels of the villi and follicles being less dense than the oil, escapes into the cavity of the intestines, while a part of the oil is taken up; the increased quantity of fluid in the intestines excites peristaltic action, and the passage of the fecal matter is facilitated.

Other examples of the increased permeability of membranes to fluids under augmented pressure might be cited, and the great elimination of the watery part of mucus in catarrh is probably another manifestation of the same law.

Notting-hill, August, 1850.

## PRACTICAL ILLUSTRATIONS OF THE REMEDIAL EFFICACY OF A VERY LOW OR ANÆSTHETIC TEMPERATURE.—I. IN CANCER.

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HAVING already given an account of the antiphlogistic and anodyne properties of a very low or benumbing temperature in the treatment of erysipelas, headache, and other cutaneous and neuralgic affections, as well as of its utility as an anæsthetic, in many surgical operations, in lieu of the inhalation of ether or chloroform,\* I proceed, on the present occasion, to lay before the profession some details respecting other important applications of the same valuable therapeutical agent. I shall show, in the first place, by a report of a case of cancer treated by an anæsthetic temperature or congelation, that it furnishes us with a perfect means of relieving the pain of that dreadful disease, without producing the stupefaction and disturbance of the system that attends the use of narcotics; and that, instead of precipitating the unfortunate patient's fate, like these, congelation, by arresting the accompanying inflammation, and perhaps destroying the vitality of the “cancer cell,” is not only calculated to prolong life for a great period, but may, not improbably, in the early stage of the disease, exert a curative action.

If it be objected that the case to be reported is insufficient evidence of this property of congelation, I would reply, that the unequivocal, immediate, and long-enduring relief from suffering which it shows to have been effected by each of numerous applications, during a period of eight months, together with the restoration of the patient's general health, in consequence of the arrest of the local disease, leave no doubt on this point, and render a single case hardly less satisfactory than a multitude

\* See THE LANCET, September 9, 1848, and a Treatise on the diseases above specified, published last year.

would be. Nay, one such application of the remedy as has been recently made in the Middlesex Hospital, by which long-continued and severe pain was immediately and completely relieved, for a period of fourteen days, (which period had elapsed without any recurrence of pain, when I last saw the patient,) would almost be sufficient evidence; corroborated, as such a fact is, by the equally striking effects of the same remedy in other painful diseases.

As the subject will probably be entirely new to many readers of this paper, it may be proper to give a brief account of the agent whose effects in cancer it is its purpose to describe. The very low or anæsthetic temperature that is used remedially as a local application to inflamed or painful parts, is produced by what are termed frigorific mixtures, or combinations of pounded ice and various salts, which, in dissolving, reduce the temperature below the degree of zero of Fahrenheit's thermometer, or more than thirty degrees lower than any temperature hitherto employed in medicine. The application of such a mixture to the skin, or mucous membrane, causes little sensation of any kind, as the part soon becomes benumbed, and the slight tingling or smarting produced (which is seldom so great as to be complained of by the patient) is more allied to the sensation of heat than of cold. If the frigorific differs from cold water or ice in the sensations it produces, it differs from them still more in its physiological and remedial effects. There is, in fact, no greater resemblance between the effects of different low degrees than there is between different high degrees of temperature;—as, for example, between the soothing heat of fomentations, and the scalding heat that is occasionally resorted to as a powerful stimulant, or the still higher degree which, when communicated by an iron, is often used as an escharotic.

In investigating the pretensions of a new remedy, we require evidence, not only of its power of palliation or cure, but of its general safety. Large and repeated doses of opium or morphia, or copious bleedings, unquestionably alleviate the pain from cancer, but it is well known, from their effects in this, as well as in other diseases, that they as certainly prove injurious to the patient's constitution, or shorten his life. Now, there is no deficiency of evidence respecting the safety of the remedy which I have to propose as their substitute. Congelation has already been employed, thousands of times, in other inflammatory and painful diseases, without the slightest injury on any one occasion. The prejudice against this remedy, on account of its having hitherto been only known in its uncontrolled agency, or as a cause of disease, was not extraordinary, as a similar prejudice has existed against many other powerful agents, which, before they were employed medicinally, had only been known as noxious to the animal economy. Dr. Paris\* adverts, in severe terms, to this prejudice in his account of the opposition from it to the medicinal use of prussic acid, saying that it would be just as reasonable to object to the use of the knife in surgery, because when uncontrolled or unguided by the head and hand of the operator, it is capable of doing deadly injury. To condemn medical congelation because the vitality of exposed parts of the body has been lost by long exposure to severe cold, would be as absurd as to condemn medical electricity because persons have been killed by lightning. Nor is another theoretical objection better founded, that reaction must be the consequence of minor degrees of congelation. Instead of reaction following remedial congelation, there is the very opposite condition, inasmuch that parts cut in operations after anæsthesia and congelation have been produced by a low temperature, have invariably healed more quickly than under ordinary circumstances. The vessels of the part appear to be rendered incapable, for a long period, of assuming such a degree of morbid excitement as would materially interfere with the healing process.

I cannot, perhaps, more forcibly illustrate the safety with which congelation may be used in medicine than by stating, that very lately, two young ladies, resident in London, were, after having been for some time under my care, themselves employing it—one, every other day, for suppressing the nascent pustules of an acnoid eruption on the face; the other, to remove a nævus from the same locality. Were there any danger of the skin receiving the slightest blemish from regulated congelation, I should not thus have left its application to so conspicuous a part in their own hands.

But after the removal of the prejudices and misunderstandings just adverted to, another question is sure to occur to the practitioner: granting the utility and safety of this new antiphlogistic and anodyne remedy, what advantage does it possess over the numerous expedients for the removal of inflammation and pain which we already possess, that will compensate for the trouble of applying it, and of learning to apply it properly?

In the first place, it will cure diseases and relieve pains that cannot be cured or relieved by any other known means; and where the same effect may be produced by other means, it is not produced so rapidly. Both as an antiphlogistic and as an anodyne, congelation is much more powerful as respects many diseases than any agent, or combination of agents, possessing similar qualities hitherto employed in their treatment, and which on that account have often proved ineffectual. A very low temperature will arrest every inflammation which is near enough to the surface to be accessible to its influence, and totally and permanently remove irritation from the nerves which it can reach.

In the second place, congelation is a safer remedy than most of those which are usually employed for the same purpose. Bleeding often impairs or prostrates the reparative powers; both antimony and mercury occasionally act as poisons; opium stupifies and excites; and events have shown that, as anæsthetics in surgical operations, ether and chloroform are not altogether without danger. Not once, in upwards of two thousand applications which have now been made of it, has congelation caused the least injury.

Other advantages of congelation might be mentioned, but these of its greater certainty, promptitude, and safety, must suffice. Cases are every day happening, where life is endangered or lost by inflammation that cannot be subdued by bleeding or the ordinary measures, without incurring greater hazard from the debility which they occasion, or other injurious effects; and cases of suffering, to which, from some constitutional peculiarity, the ordinary anodynes are inapplicable. That a great desideratum existed here, was strongly evinced by the recent deplorable case of a much-lamented statesman, who died from injuries causing inflammation and intense pain. The medical art has never appeared to greater disadvantage than on that melancholy occasion. The inefficient measures resorted to, only showed the indications which the medical attendants were anxious to fulfil, but which, it would seem, they were unwilling to attempt fulfilling by the means in common use. What appeared to be wanting were, an antiphlogistic remedy that would not debilitate, and an anodyne that would not excite.\*

"The most dreadful disease to which the human frame is liable is carcinoma; and, perhaps, of all organs affected by it, uterine cancer is the most painful. This is indeed a horrible disease; the patient's sufferings are aggravated by the knowledge that her complaint is incurable; and she languishes under the double torment of excruciating agony and despair. In the treatment of no disease is the medical man's duty so distressing as that of cancer—to witness the increasing sufferings of his patient day after day—to hear at each succeeding visit the same unvarying statement of pain and misery, while he knows too well how poor and inadequate are the resources of his art—while he is sensible that his utmost power will not avail him beyond blunting by stupefying remedies the acuteness of bodily anguish, even if he attains that fortunate and desirable advantage—is a task that calls forth the tenderest sympathy which his nature is capable of experiencing."

This graphic description (from Dr. Ramsbotham's lectures on Midwifery) of the sufferings from cancer of the womb will, as being very applicable to the case about to be reported, supply the place of a minute detail of symptoms. Only the more essential points will be noticed.

M. R.— was admitted a patient at the Brighton Dispensary on the 25th July, 1849. She is of short stature, thin, of sallow complexion, and about forty-two years of age. She had been lately in St. Thomas's Hospital on account of the same disease for which she now sought assistance; and had complained about eighteen months previously to her entering the hospital.

Her principal symptoms were frequent and severe paroxysms of pain, chiefly in the back and hips; a profuse and most offensive discharge, and occasional hæmorrhage, from the vagina; and derangement of the digestive organs. On examination, the neck of the womb was found hard and ulcerated.

For six months the usual palliative treatment was pursued—viz., the exhibition of the preparations of opium and the applica-

\* Another expedient which I lately introduced into the practice of medicine, under the name of the "current apparatus," was had recourse to in the case alluded to—an expedient intended to regulate the temperature of morbid parts with precision, while it affords, at the same time, a means of equalizing the pressure upon them. From the strange name of "hydraulic bed," which was given to it in the reports of the case, I presume that the latter purpose was that principally had in view, although the other, if properly carried out, was calculated to be of eminent auxiliary service. I notice the subject principally on account of the circumstance, that one of the persons whom I requested, three years ago, to exhibit the apparatus in his shop, is now constantly advertising it, in terms calculated to impress the idea that this merely incidental quality of equal pressure or softness is its principal value, and without explaining how even this advantage can be attained.

\* See his Pharmacologia, eighth edition, article "Hydrocyanic Acid."

tion of leeches. She complained that the opium made her constantly drowsy and unfit for her occupation as a needlewoman; and the pain was, notwithstanding its use, occasionally so severe as to oblige her to rise from bed and roll on the floor of her room.

In January, I determined upon a trial of congelation, having previously made another careful examination of the uterus. The disease had by this time considerably extended: the neck of the womb was now completely destroyed, and there were several warty excrescences in the upper part of the vagina. Congelation was effected by means of a frigorific mixture of two parts of finely-pounded ice and one part of chloride of sodium, introduced through a wide speculum of gutta percha, having the lower part of its upper opening of a cup-like form; and in order that the temperature might be maintained at the requisite low degree, or below zero of Fahrenheit, the dissolved ice was continuously drawn off by a syphon of peculiar construction. This peculiarity principally consists in a large two-necked bottle being connected with, or constituting part of, the long arm of the syphon; and the purpose of it is, that a stream of water may continue to flow along this part of the syphon, and keep up the suction at its upper extremity, notwithstanding any interruption in the supply. A tube of vulcanized india-rubber forms the remaining part of the syphon, with a small glass tube where it enters the speculum, in order that the rising column of liquid may be seen and regulated by a stop-cock.

The success of this application exceeded my expectation. So soon as I had learned to apply the frigorific properly, I was able to give immediate and entire relief, and this has generally continued complete for about a week. The discharge was soon diminished, and became much less offensive, and the tendency to hæmorrhage ceased. From twenty to thirty applications of the frigorific have now been made, and scarcely any other remedy has been used. No advance of the disease appears, on examination, to have taken place, and in other respects there is decided improvement. The patient is not so thin; her appetite is tolerably good; she is stronger, and able to occupy herself in the usual household affairs.

She is directed to call whenever the pain returns. The speculum is generally introduced by herself while in the supine position, and she covers her extremities with a sheet before I enter the apartment. The nates are raised, in order that the speculum may be sufficiently upright to contain enough of the frigorific, which has usually been kept applied for a period varying from a quarter to half an hour. There is a slight sensation of smarting produced for a minute or two, and the pain from the disease has generally ceased within the first five minutes. If the womb be now inspected by removing the frigorific from the speculum, the greater part of its visible surface will be found perfectly white and hard. The application is terminated by allowing about a quart of cold water to run rapidly through the speculum and syphon for the purpose of gradually restoring the natural temperature, and washing away any remaining salt.

(To be continued.)

## ON A CASE OF FATAL POISONING BY STRYCHNIA;

WITH REMARKS ON EXPERIMENTAL INQUIRIES INTO ITS EFFECTS ON ANIMALS.

By GEORGE BENNETT, Esq., M.R.C.S., Sydney.

ABOUT ten A.M. of the 20th of April, 1838, my immediate attendance was requested on Amelia H—, a female servant in the employ of W. A'Beckett, Esq. On my arrival I found her suffering from violent spasms, resulting, as I understood, from poisoning by strychnine. The account I received was, that on the day previous she had consulted a surgeon for amaurosis, for which he prescribed three grains of strychnine in a solution of ten drachms of cinnamon-water, directing twenty drops to be taken three times daily in a wineglass of water; a written label of directions was attached to the bottle, and she was also verbally informed of the dangerous nature of the medicine. On the bottle containing the medicine being produced, I found the unfortunate young woman had taken about four and a half or five drachms, which had been poured out by a little girl thirteen years of age, who on being told to pour out twenty drops, and probably being ignorant of the meaning of a drop, poured out the above quantity. After taking the medicine, she went about her work, cleaned out a room, and went into the kitchen to breakfast, had swallowed a cup of tea, and was commencing a second, when she complained of feeling very ill, having a peculiar kind of twitchings over her limbs, which began rather more than an hour after the administration of the

poison; and in a very short time after this general tremors and violent spasmodic fits came on, which excited the alarm of the family, and I was immediately sent for.

On my arrival and examination of the patient, I found a general tremor over the body, the limbs rigid, and the face exhibiting an almost maniacal expression, which was soon followed by a violent fit of tetanus. Between the fits she did not utter any expression of alarm, but would occasionally request a little cold water. The muscles of the jaws remained so rigid between the spasms as to prevent their being opened sufficiently to admit the tube of the stomach-pump being introduced, but were sufficiently relaxed to admit of strong emetics being administered; it, however, repeatedly happened, that the attempt of the patient to take liquids was followed by so violent a spasmodic fit as to prevent her swallowing it, and to give that apparent dread of water, so well marked in cases of hydrophobia. Even after her request for water, on attempting to give it to her, she would find herself so incapable of swallowing it, as to request that its administration might be deferred until the fit was over, the effort to place the cup to the mouth being generally sufficient in itself to induce a relapse of the spasms.

During the tetanic fits the whole body was stiffened and straightened; the neck violently drawn back; the chest fixed; the eyes protruding from their sockets in a horrible manner; the legs pushed out and widely separated; the muscles of the face convulsed; pulse imperceptible, and no breathing could be perceived; the face was livid, more particularly the lips, and froth issued from the mouth. It is also worthy of remark, that during the paroxysm the pupil was much dilated, becoming contracted after the violence of the fits had subsided. As the fit passed away, the pulse gradually rose; she perspired freely, and complained of thirst, but not of sickness, although powerful emetics had been administered. The severe fits were comparatively few, but between them slight fits came on in rapid succession; indeed the attempt to take any liquid would be generally sufficient to induce one, and even merely pressing gently the muscles of the jaw, or an attempt to open the mouth by pressing on the lips and teeth, was sufficient to excite an attack. The emetics at one time began to operate, but the violent fits coming on about the same time seemed to paralyze any further action of the stomach. It was found impossible to produce any relaxation of the body during a fit; the head was firmly bent back, the hands were clenched, the arms bent, the legs and body extended, and if moved she remained in that fixed position. About half-past eleven A.M. a fit more violent and of longer duration came on, which terminated her existence. As soon as death had taken place, the limbs relaxed, the face and lips gradually lost their livid hue, and became as well as the body extremely pallid; indeed similar to that which we observe in persons who have died from internal hæmorrhage. The quantity of strychnine taken in this case must have been nearly a grain and a half. During the progress of this case I also administered large doses of vinegar-and-water, which remedy I was induced to employ for the reasons I subjoin, having, when experimenting on animals with the St. Ignatius' bean of Manilla,\* succeeded in a partial degree in counteracting the effects of the poison with that remedy; in this case it appeared in some degree to lessen the violence of the spasms, but the effects of the poison had advanced too far to render the remedy of any avail. As the experiments above alluded to (and published in the *Medical and Surgical Journal* of Feb. 1832) will serve to elucidate the above case, I have re-copied them from that journal:—

“During a visit to Manilla, I tried experiments of the poisonous effects of the seeds of the *ignatia amara* (named *cabalonga* by the natives) in two instances; one on a dog about ten months old, and with the following results:—At fifty-five minutes past ten A.M. I gave half a drachm of the seed, cut into small pieces and enveloped in a piece of meat, to a dog: it was swallowed without any of the pieces being lost. The dog was lively and playful, but at times would appear restless and uneasy, as if some internal annoyance was occasioned by the poison. At twenty minutes past eleven he suddenly fell, with violent convulsion of the limbs, which were extended with great rigidity, and they afterwards remained in that rigid position; this was followed by excessive panting and trembling of the muscles; the saliva became viscid, and the tongue, as well as the saliva with which it was covered, had a dark appearance. The poison acted on the nervous system; the dog exhibited no indication of pain; no yell escaped him; the eyes assumed a dull appearance; the mouth had a movement as if the animal had been snapping at flies; and there was a constant spasmodic twitching

\* A paper on this subject was read before the Medico-Botanical Society of London, January 10, 1832, and subsequently published in the *Medical and Surgical Journal* for February, 1832.