

The tumour consisted of two cysts, one large, and a small one with solid matter at the base; it weighed 18½ lbs., and was filled with a dark thick fluid, very like boiled glue.

She was sick, pale, and very much depressed, for some hours after the operation; and complained of pain in the back.

5 P.M. Pulse 129; respirations 60 in the minute. Ice and champagne were ordered. A suppository of a grain of muriate of morphia was administered.

9.30 P.M. She felt more comfortable, was less sick, and had less pain. Pulse 114; respirations 40; skin moist. A catheter was used.

Sept. 19th, 8 A.M. She was very comfortable; slept well during the night; was not sick. Pulse 120, small; skin moist. She was not in much pain. Her countenance looked less anxious. She took wine, ice, and grapes.

9 P.M. She had had a comfortable day, but had slight hiccup to-night. Pulse 132; respirations 36. She was ordered to have a suppository.

Sept. 20th, 8 A.M. She had been in pain in the night. The abdomen was distended and tympanitic. She vomited once, and had hiccup. Her countenance was anxious. Pulse 106; respirations 34. She was ordered to have brandy and water in small quantities frequently, and a grain of solid opium every three hours.

9 P.M. She had been very uncomfortable during the day, sick, and in pain; the abdomen was very much distended. The suppository was administered in the afternoon, and she was easier to-night. She had slept soundly, and was perspiring freely, and was not so sick. She took gin and water. Pulse 114; respirations 30. The countenance was less anxious; hiccup troublesome; urine plentiful.

Sept. 21st, 8.30 A.M. She had passed a quiet night, slept well, and perspired freely. She had been sick once. Pulse 114. She began to menstruate last night.

*Vespere.* She was in more pain in the bowels, which were tympanitic. An injection with brandy, beef-tea, and opium, was ordered, which came back, and the bowels acted. Half a grain of muriate of morphia was injected subcutaneously, which secured a good night. The hiccup was troublesome.

Sept. 22nd. She was better, and was ordered to have the injection repeated, and to take the opium every fourth hour.

Sept. 23rd. She had a comfortable night. Pulse 100; respirations natural; skin moist; belly natural. She had an egg and coffee for breakfast. The sutures were taken out. The wound healed by first intention, excepting two inches at the top, which had been torn open by the retching, the suture having been torn through one side. She had fowl for dinner, and a glass of wine.

Sept. 25th. She was doing well, and took her food, with beer for dinner. She was ordered to take the pill every six hours.

Sept. 27th. She was comfortable, and was ordered to take the pill three times a day.

Sept. 29th. She had her bowels moved three times last evening; was awakened in the night with pain in the bowels, which was relieved by an opiate. To-day she was very comfortable, and had a chop and wine. She was ordered to take the pill twice daily.

Oct. 1st. She was going on very well. The bowels acted last night.

Oct. 5th. She rose from her bed for a short time; took nourishment well.

Oct. 6th. She sat up.

Oct. 11th. She walked out.

Oct. 14th. She was well; and the next day she left the infirmary.

## Original Communications.

### THE TREATMENT OF CANCER BY INJECTIONS.

By CHARLES H. MOORE, F.R.S., Surgeon to the Middlesex Hospital.

THE ingenious method of treating certain cancerous tumours communicated to the Association at its last annual meeting by Dr. Broadbent, could not fail to awaken very great interest, because of the singular nature of the novelty and of the success attending it. It is strangely novel, inasmuch as it chemically dissolves the cancerous cell in the midst of the tissues; and it is strangely successful, for it has effected the absolute dispersion of small cancerous tumours, without destroying, as caustics do, the natural textures in which the tumours lay. Both these facts I happened to have the opportunity of demonstrating; and I took occasion to bring them before the Pathological Society of London at its first meeting in the present session.

The introduction of this method constitutes a most important epoch in the treatment of Cancer; for the acid is as nearly a specific against the disease as anything can well be—a specific, happily, which is, in a great degree, intelligible in its action, a specific without a mystery.

Like all new remedies, its value needs exact estimating. It is capable of doing certain good; its applicability is still uncertain. There are situations in which difficulties of manipulation may prove insuperable, and the remedy cannot be brought into action against the disease. There are conditions of bulk in some cases, which we do not yet know that a remedy so slow in its action can overcome. There are also misconceptions in our own minds as to the extent to which the disease is diffused; for disappointment consequent on which no remedy is answerable. Acetic acid dissolves cancerous tumours, and the absorbents may remove the inert remnants of it; but the acid does not change the disseminating power of the disease. If fragments be left beyond the limits of a tumour, they will grow again, whether the main mass have been cut away with the knife or dissolved away with the acid.

Again, there are dangers to the reputation of the acid as a local remedy which are incident to its misuse. If employed too strong, it acts as a caustic, and produces sloughing; only in a certain degree of dilution is the proper action obtained which was contemplated by Dr. Broadbent.

I have been led into these remarks by the present interest of the subject; but my intention in writing was to refer to the questions raised in the letter of Dr. John Barclay of Banff. Who originated, in whole or in part, the method of treating Cancer by injection of acetic acid? No one can deprive Dr. Broadbent of the credit of the treatment as a whole. He devised it; he employed it; he published it. But others are answerable for the parts; for detecting the action of acetic acid on cancer-cells; for employing it in the living patients; for the invention of the syringe and cannula for subcutaneous injections; and for adapting them to throw remedies into the substance of a cancerous tumour.

Dr. Barclay claims to have originated the use of acetic acid in Cancer; and he assigns to me the

credit of having first treated Cancer by injection. I do not know whether either claim can be substantiated.

That Dr. Barclay's suggestion was independent and original, I have no question; it needs only to peruse the account of his valuable comparative experiments with the citric, acetic, and carbolic acids, to perceive that he had obtained good results from the use of acetic acid in Cancer in the living subject. I was aware of his observations, having carefully read his paper at the time of its publication, and afterwards employed the carbolic acid, according to the form he recommended, on some of my patients at the Middlesex Hospital. Nothing was further from my intention than to ignore Dr. Barclay's work, of which I do not doubt that, as it certainly contributed to our knowledge of the use of acetic acid, it may also have led up to the choice of it by Dr. Broadbent. It was in connection with the method of injecting cancerous tumours, not with the superficial treatment of them when ulcerated; and it was in contrast with my own injections of other substances, that I referred to Dr. Broadbent's happy selection of the acetic acid.

This acid had, in fact, been thought of, and actually used, in the treatment of Cancer before 1866. My former colleague at the Middlesex Hospital, Mr. Mitchell Henry, when he had not yet condescended from Surgery to Politics, was in the habit of giving it to his Cancer patients as an internal remedy, on this very account of its action on the cells under the microscope. Mr. Henry retired from the profession in 1862. And I was once informed by Mr. Charles Hawkins, that Sir Benjamin Brodie used this remedy in the local treatment of an open Cancer of the breast. Dr. Barclay has had the satisfaction which always accompanies the exercise of ingenious and original thought, and that of extending our knowledge of the action of acetic acid; but it does not appear that he has the additional pleasure of having been the first to discover its usefulness in Cancer.

My own connection with this treatment is not that of an originator. At least, I did not, in my remarks on October 16th, intend to make that claim. I said that, "as the hypodermic injection-syringe was so much in use at present, it would be surprising if it were not employed in the treatment of Cancer." And I said, speaking inexactly, that I had for a year or two, or a year and a half, been trying various remedies introduced in this manner in the treatment of that disease.

Whether I really first used injections in the treatment of Cancer I do not know. In a London hospital our proceedings are so public, that that which we originate may be adopted by others as usual treatment, and may be afterwards published without reference to the inventor, and certainly without the intention of depriving him of the credit of his thought. But Dr. Barclay's letter has led me to refer to my notes, and to cull from them the following history of my doings.

In a clinical lecture on Surgery, which I delivered on June 30th, 1860, I detailed a case of Lupus exedens in a young woman, which had destroyed the tip and one ala of the nose, had split the lip, and extended far into the nostril. After failing to arrest the disease by ordinary treatment and superficial caustics, I injected, at Mr. De Morgan's suggestion, perchloride of iron into the tissues beneath the disease. At that part the Lupus was stopped; elsewhere it went on. In the same lecture, I suggested that the plan was applicable to the treatment of Cancer. My first application of the method of injection to Cancer is thus due to advice from Mr. De Morgan in what was practically a similar disease. And I am disposed to

attribute to this hint from him the direction of my thoughts to that treatment of Cancer by zinc after incisions, which I adopted first in a vast Rodent Cancer of the face, and which has been since frequently practised for those gigantic ulcers with surprisingly successful results. My first patient so treated lived in comfort for three years, until the age of 75; and I presented her before the British Medical Association at its meeting in the College of Physicians in London. The same hint, and its result in the cases of Lupus and Rodent Cancer, led me on to apply solid zinc and zinc paste to the wound after removing a cancerous breast; but, in Mr. De Morgan's mind, his thought produced the more practically and widely useful plan of treating all wounds, cancerous or not, with the zinc in solution.

I next find in my notes sundry thoughts on the Treatment of Cancer, from which I extract the following.

"*Treatment of Cancer.* It seems to me clear that our methods of treatment for cure fail for want of quantity and continuousness of application. Some medicines cannot be administered in more than a small dose; and we already know that within the limits of their tolerance by the system they are useless for the cure of Cancer. Of this kind is arsenic, which influences solid new growths, but kills without curing.

"But if we would alter cell-growth in the body, we must have a long continued stream of the medicinal agent flowing through the Cancer. It might be introduced through the skin, as by a long residence in a bath of it, or by wearing it inside a caoutchouc dress. It might be made to saturate the liver by profuse and repeated enemata. It might be inhaled. Only, whatever the substance chosen, there should be enough of it, and it should be long continued.

"Whether the Cancer be at first local or constitutional, it is usually already diffused through the system when Surgeons operate. From its earliest existence, a cancerous tumour contaminates the system and invades adjoining tissues. These are its first victims, and glands next, which have no power to eliminate its surplus or refuse. Are we then upon the right track in merely extirpating the tumour? We know nothing of a constitutional remedy; have we the completest local one? Subcutaneous injection might do with local deposit what other organs could not—neutralise, dissipate, render it innocuous.

"We want not merely to extirpate the tumour, but to remove adjoining blastema. Could acetate or perchloride of iron, or chloride of zinc, or chlorine, or what not, much diluted, be driven into the tissues all round a growth, beneath it, into it? The tumour might be injected with undiluted, the tissues with diluted solutions. And, after a cutting operation and cicatrisation, could the same be done with the whole region?

"Slow daily injection, as diffuse as emphysema, to wear out the propensity to the disease or to destroy the material of it.

"What is wanted to destroy the tendency to recur in tissues and in glands, is a cutaneous and subcutaneous application of the chloride of zinc. The skin should be soaked in it; the subjacent tissues flooded with it, until the Cancer growing elements wear out. The whole region leading to the axillary gland should be acted on, and the tendency of Cancer of the breast to grow towards the clavicle should be observed.

"Should this seem effective, some less painful way of arriving at the same result might be discovered.

"If it saved from recurrence, it might also be of service to destroy a young growth, when extirpation

was objected to. The progress to glands by the natural circulation would be the means of acting on them, if not diseased; but if diseased they also should be punctured.

"In the beginning of such treatment of the primary tumour, would any advantage come from underbinding the absorbent vessels below the edge of the pectoral with a wire ligature; so only as to interrupt the current, but not to obliterate and cut through them, as in varicocele? The changes in the primary tissues would perhaps be more complete, if the injected liquid or gas did not so readily run off by those vessels."

Though these suggestions were committed to paper from time to time as they occurred to me in 1859-64, I did not put my thoughts into execution until 1865, when I had some syringes and sharp-pointed cannulae prepared for the purpose. I first injected into an advanced case of epithelial Cancer of the face a solution of twenty grains of the chloride of zinc to the ounce of water. The effect was severe pain, which was over in an hour and a half, and œdema around the diseased parts which were infiltrated with the liquid. I have not kept the date of this operation.

The next case was one of Cancer of the breast, sent me by Dr. Rowe of Margate. The disease was in an advanced stage, and unfit for ordinary operations. My report of the injection is as follows.

Nov. 10th, 1865. The parts being all quiet, though the dull vascularity of the skin towards the sternum continued, I made the first injection to-day. Having a long silver cannula, steel pointed, screwed on a vulcanite syringe, and in order, I filled it with a solution of chloride of zinc in distilled water, of the strength of one grain to one ounce. Then, introducing the cannula about an inch from the middle of the sternum below the red part, I slowly thrust it up in the subcutaneous tissue for two inches. I held it steady for a minute or two, that the bleeding in the track of the puncture might cease, and then slowly injected three drachms of the solution. No hæmorrhage occurred; the fluid formed a long bulging prominence, which soon spread out and lost its tension; and, on withdrawing the cannula, no fluid escaped. I dressed it with collodion. The puncture hurt a good deal; and she complained of the stinging of the solution the instant I began to inject it. This latter pain was at once relieved when the cold collodion was laid on, but it returned, and then gradually lessened.

Subsequently, within a brief time, the pain recurred and became severe. It kept her awake till 3 A.M.

Nov. 11th. There was swelling over the injected spot and along the chest for two or three inches towards the axilla; redness of the skin from the same spot over the fold below it to the furrow next adjoining; much tenderness over the spot and soreness to the mesial line, the inner end of the right clavicle, and rather beyond the redness outwards. No inconvenience in the armpit or tumour. She had suffered so much that she determined to leave to-day. Lest the injected spot should suppurate, I ordered a lead lotion, and requested her to show it on Monday.

Nov. 13th. She returned to the hospital to-day before going to the country. The redness and swelling had much diminished, and they were now chiefly concentrated over the small remaining swelling from unabsorbed injection. This part was still, but much less, tender; and the integument over it seemed a little more supple than before the injection was made. There was now no more appearance of suppuration.

This excessive and long continued pain, which had led to the patient's abandoning the plan of

treatment, may have been simply due to the chloride of zinc as such. Or it may have been more than usually severe on account of the contact of such a liquid with the deep surface of over-vascular and over-sensitive integument. Or it may have been the result of throwing in a quantity so large as to keep too much in contact with the tissues, and for too long a time.

In the first case, it is remarkable that the pain should have continued so long with one grain to the ounce, whilst with twenty grains to the ounce the pain was over in an hour and a half. In this latter, however, I threw in two drachms of the liquid, of which not more than one drachm remained. The result, both in that and in this case, was inflammation, without suppuration, and in each patient it far exceeded what I desired to produce; namely, a modification of the nutrition of the local textures. Nevertheless, I have confidence in the zinc, if it be reduced to a bearable strength. I had a solution of pure chlorine prepared, hoping to try it in Mrs. P.

In the second case, the pain may be evaded by making the injection under uninfamed skin, and parts having no tenderness. It is worthy of special notice, that though so irritating, the solution was not of a kind to produce suppuration; a fact closely corresponding with Mr. De Morgan's observation of the result of applying zinc on raw surfaces. It prevented the formation of pus, even by a tissue already prone to it.

The third suggestion refers also to what may be avoided in future. Whatever liquid I may throw in, which is capable of producing irritation, must be in quantities not exceeding a drachm, and half a drachm might be better. By one puncture in the skin half a drachm might be thrown in in different directions, the north, east, south, and west, of the neck pass. When thus brought into contact with more tissue, there is more probability, both of its early diffusion and of its speedy chemical union with the albumen of the tissues.

Feb. 10th, 1866. Mrs. P. was sent back by Dr. Rowe. She had lately lost some sloughs from deep parts of the breast, which she extracted through the chinks. At the bottom of these were now deep clean cancerous ulcers. She suffered much during their detachment. The whole mass was smaller than it had been, and looked quiet. There was no increase of the axillary disease, and she suffered little at present. The injected spot was not now larger than an almond, was red on the surface, was tender, and fluctuated.

After this, I made trial of a still stronger solution of the chloride of zinc. The case was one in which Cancer was recurrent in the cheek after an operation. I extract from my notes the account of so much as relates to the injections.

Dec. 21st, 1865. The wound was granulating healthily in all but two parts; at the lower lip and along an inch of its lowest edge. At both these parts, the granulations are prominent, the skin firm, and the appearance cancerous. I injected chloride of zinc, forty grains to the ounce, into and beyond the cancerous parts; introducing the sharp fine cannula on the granulating surface and injecting in various directions a few drops of the liquid. Very sharp pain (he compared it to an adder's sting) immediately came on, and continued more than two hours. The next day there was whitening of the cancerous granulations without slough, and some œdema and trifling swelling of the lips and cheek, and of the neck near the lower injected edge. The day following it had nearly subsided.

Dec. 25th. The injected parts had dried, shrunk, and apparently sloughed.

Jan. 4th, 1866. I removed a thick large slough, the remains of tissue killed by the injection.

Jan. 8th. I endeavoured to inject into the healthy tissues of the lower lip, through the doubtfully diseased granulations of that part, a little of the filtered sediment of liq. calcis. Through one aperture, I pushed in two directions half a drachm or less; but the third puncture was useless, as the cannula became clogged, and the clear liquid oozed through at the joint under the pressure I used against the piston. None of the material passed into the tissues.

Jan. 15th. Little result; only trifling swelling. Cancer remains in the anterior part and rather increasing. I injected a saturated solution of sulphate of iron, which stung, but in a different way from, and less severely than, the chloride, and continued more than an hour. The result was an ink-black slough of the injected part.

Since writing the principal part of this communication, I have become aware, by a letter in another journal, that Sir James Y. Simpson must be regarded as the author of the method of injecting medicinal substances into tumours, as he actually practised it with success about ten years ago. This announcement renders further discussion of the priority in originating that method unnecessary. My observations on the subject may nevertheless appear to you worthy of consideration for their own sake.

## Progress of Medical Science.

### ANATOMY, PHYSIOLOGY, & PATHOLOGY.

**PATHOLOGY OF CEREBRAL SOFTENING.** Two Parisian hospital internes, MM. Prevost and Cotard, have diligently availed themselves of the opportunities afforded them during their residence at the Salpêtrière, of studying the pathology of cerebral softening. In addition to noticing the appearances presented in the brains of persons dying with softening of the brain, they have, by the advice of M. Vulpian, produced artificially in animals some of the symptoms attending this morbid condition. Their researches, and the conclusions derived therefrom, were last year communicated to the Société de Biologie, and have appeared in various numbers of the *Gazette Médicale de Paris* for the present year. Their object, they state, has been to determine the true relation of obstruction of the blood-vessels to cerebral softening. No one, they say, denies in the present day, the part which obliteration of the vessels plays in the production of softening of the brain; but are all cases of softening to be attributed to this cause? Having related and commented on a number of experiments and *post mortem* examinations, and given a general summary of the results, MM. Prevost and Cotard remark, that they have not studied every point in the history of cerebral softening. This was not their intention; their purpose has been to offer some new considerations, and to elucidate some still obscure points. They have taken no notice of the various kinds of inflammatory softening. The following are the principal conclusions at which they have arrived.

Experiments on animals (consisting in the injection into the vessels of lycopodium or snuff) has enabled them, by means of these artificial emboli, to produce softening identical with that which is observed in man, and to follow its progress through various stages. In this way they have been able to study the hyperæmia which is first produced, the ne-

crobiotic\* degeneration which follows, and, finally, the production of connective tissue and the formation of yellow patches which belong to the third period of softening. Analogous experiments have already been made by MM. Virchow, Cohn, Panum, etc.; but the procedures employed by them have produced death too rapidly to allow them to study softening in its different phases. From their experiments, MM. Prevost and Cotard have ascertained that ordinarily a distinct congestion is produced at the points where the obstructed artery is distributed. The cause of this hyperæmia it is difficult to determine at present; but, whatever may be its mechanical cause, the hyperæmia of red softening must be considered as of an entirely different nature. As early as the third day, there are present well defined granular bodies, and a large number of fatty granulations not yet agglomerated; these are collected around the capillaries, forming, as it were, a sheath to these vessels. In some instances, the walls of the capillaries have presented consecutive granular and fatty degeneration; and, in one case, dissecting aneurisms were formed. In a dog which survived the experiment fifteen days, a true yellow patch was found in the cerebral convolutions.

The study of cases at the Salpêtrière, in which cerebral softening has been found after death, has led the authors to consider the process very analogous to that which they have artificially induced in animals. The necrobiotic process has appeared to them almost always to depend on arrest of the cerebral circulation, varying in origin; and they have observed a certain relation between the various forms of disturbance and the characters of the softening. The disturbance of the circulation sometimes arose from obstruction of an artery by a thrombus or embolus; sometimes from atheromatous degeneration of the cerebral arteries; sometimes, perhaps, from more or less general capillary embolism. In two cases, no cause could be ascertained; but perhaps the arterial obstruction escaped notice. None of their observations have led them to infer with certainty that softening has been due to atheromatous degeneration of the capillaries; this degeneration may be consecutive.

Phenomena of irritation are sometimes added to the process which essentially constitutes softening. In some instances, inflammation and suppuration took place around the infarctus formed in dogs; and the authors endeavour to trace a relation between these phenomena and the production of false membranes on the dura mater at the level of old foci of softening.

In speaking of the symptoms, they point out that the attacks of vertigo and the apoplectiform paroxysms followed by rapid death without lesion of the nervous centres, which most authors have ascribed to congestion, are due to impeded cerebral circulation. They endeavour to establish a direct relation between the intensity of the attack and the extent of the interference with the supply of blood; and they show that both thrombosis and embolia may give rise to sudden death. Regarding paralysis, spasm, and other symptoms of softening, they have but little to add to what has already been said by other authors. The paralysis, they find, most frequently sets in suddenly, and rarely follows a progressive course; hence no diagnostic value can be attached to this symptom. Examination of the temperature of the rectum in some instances, and the information on this point which the authors have derived from M. Charcot, leads them to conclude

\* Necrobiotic (Fr. *nécrobiotique*), from *νεκρος*, dead, and *βίος*, life, a term denoting the death of tissues during the life of the individual.