ON THE
ACTION OF GALVANISM UPON THE
CONTRACTILE STRUCTURE
OF THE
GRAVID UTERUS,
AND ITS REMEDIAL POWERS IN OBSTETRIC PRACTICE.

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THE object of the following communication is to submit to the Society some investigations which were undertaken for the purpose of determining the exact influence of galvanism upon the contractile structure of the gravid uterus, the best mode of applying it, and the results which have followed its employment in certain cases attended with difficulty and danger. I need scarcely observe, in doing so, that notwithstanding the length of time which has elapsed since this agent was first proposed as an excitor of uterine action, and the many trials which have been made of it, much difference of opinion still exists in the profession as to its value and remedial powers in obstetric practice, and hence it has happened that whilst its utility has been strongly

advocated by some, it has been denied altogether by others. In this divided state of professional opinion, it has occurred to me that some further investigations might be usefully undertaken for the purpose of determining the accuracy of these opinions respectively, and, if possible, reconciling the discrepancy which exists between them. I have accordingly been led to institute such inquiry, and the present paper contains a brief record of some experiments which were planned and undertaken for the purpose of determining the effective power and *modus operandi* of galvanism upon the gravid uterus, and the principles which should regulate its employment in obstetric practice.

On looking over the several cases which have been published during the last ten years in support of the value of galvanism as an excitor of uterine action during labour, no doubt would at first arise upon the subject ; so strongly is this insisted upon by the reporters, and so apparently successful were the results of its employment. But on closer scrutiny it will be found that in many of them the facts stated do not justify the conclusions which have been drawn from them ; that in many a proper distinction has not been made between the specific action of galvanism upon the uterus and that of other agencies collaterally in operation ; and it is certain that in some the “*post hoc*” has been mistaken for the “*propter hoc*.” When, for instance, in a case in which the membranes had been punctured for the induction of premature labour, and labour supervened upon the seventh day afterwards, we may reasonably doubt the conclusion of the writer that this was altogether due to the action of galvanism, although it had been used for half an hour daily after the operation ; and when, in a case of uterine inertia occurring during labour, uterine action was restored by merely passing a few shocks through the uterus, we may assume that this effect was as much due to an influence exercised generally upon the nervous system, as to one specifically exerted upon the uterus itself ; and this view is supported by the fact that, just as is the case with other powerful impressions made upon the nervous

system, the action of the uterus has been suspended as well as excited during labour by the application of galvanism.

But, on the other hand, many cases have been reported in which galvanism applied to the uterus during labour has been found to be either powerless or useless. Dr. Simpson has more especially recorded such, and he gives the following summary of the results of its employment in eight cases in which it was so applied under the superintendence of Dr. Martin Barry. In one the pains were more frequent in their recurrence, but shorter in their duration, during the application of galvanism. In five its employment neither increased the average frequency of the pains nor their average duration. In one the pains ceased whilst the galvanism was applied, and returned upon its removal; and in the eighth uterine action ceased while the galvanism was applied, and did not return upon its withdrawal, nor for twenty-four hours subsequently. It is impossible not to be struck with the discrepancy existing between the results of galvanism in these cases and in those reported by other observers, and the inevitable conclusion must be, either that the effects of galvanism were greatly misapprehended in the one case, or its proper mode of application disregarded in the other.

Two questions of a preliminary nature require to be decided before this agent can ever be satisfactorily employed in obstetric practice. First, the exact nature of the influence exercised by it upon the contractile structure of the gravid uterus; and, second, the best mode of applying it, so as to obtain the full benefit of such influence. Now, I need scarcely observe that these questions cannot be satisfactorily solved by experiments performed exclusively upon the human female, for in her a variety of circumstances are liable to vitiate their results. In her, for instance, uterine action is liable to be simultaneously affected—to be increased, retarded, or diminished by other agencies collaterally in operation—by emotion of mind, mechanical irritation of the cervix uteri, and the exposure or application of cold to the surface of the abdomen. Other causes

of a less appreciable character are known to affect powerfully the action of the uterus during labour, and may thus occasion so many sources of fallacy in our estimate of the effective powers of any agent, such as galvanism, upon the action of the uterus during labour.

To obviate these sources of error, and obtain more exact information as to the power and *modus operandi* of galvanism upon the gravid uterus of the human female than could be otherwise gained, I some time ago planned and instituted some experiments for the purpose of determining the power of galvanism upon the gravid uterus of some of the lower animals, and as in these the organ was exposed, and the effects of galvanism upon it was ascertained both by visual and tactile examination, they were of course exempt from those sources of fallacy which vitiate similar experiments upon the human female. In this way I was enabled to obtain decisive information, both as to the *modus operandi* of galvanism upon the pregnant uterus, and the best mode of employing it; and believing that they suggest the true principle by which the employment of galvanism should be regulated in obstetric practice, I subjoin a brief record of the principal facts which were observed.

EXPERIMENT I.—Does galvanism exercise any, and what, influence upon the contractile function of the gravid uterus? To obtain an answer to this question the following experiment was performed at University College, with the assistance of Dr. Boon Hayes, then teacher of practical physiology, in the presence of Mr. Statham, assistant-surgeon to University College Hospital, and other medical men, with the following results.

1. On exposing the gravid uterus of a pregnant bitch which had nearly completed the full period of gestation, and applying the poles of a common electro-magnetic machine to the exposed organ (the current being of moderate intensity), no uterine contraction was immediately perceptible, but in less than ten minutes a slight vermicular or peristaltic action was observed to take place in the included

portion of the uterus. This occurred slowly, was of a tonic and sustained character, and it gradually subsided on removing the poles of the machine.

2. On the subsidence of this contraction, and when the uterus had returned to its normal condition, Dr. Boon Hayes ascertained by touch the state of firmness and tension of the uterine parietes, and, having done so, the poles were again applied, his hand being continued in apposition with the organ. Without looking at the uterus he reported, after a few minutes had elapsed, that it felt firmer and tenser than it had been prior to the application of the galvanism, and the correctness of this observation was rendered evident to sight as well as to touch, for the part included between the poles was observed to become more concave and contracted, both as compared with other parts of the organ, and with what it had been prior to the application of the galvanism.

3. Having thus ascertained, both by sight and touch, that the uterus contracted under the stimulus of galvanism, when applied directly to its parietes, I proposed to ascertain in the next place how far the organ contracted when the galvanism was applied to it indirectly, through the medium of the nervous system. For this purpose one pole of the machine was applied to the upper part of the spine, and the other to the uterus, and it was found that uterine action was more powerfully and generally excited by this means than when both poles were applied directly to the uterus. This fact was repeatedly verified by alternately placing both poles to the uterus, and one pole to this organ and the other to the upper part of the spine.

The first question I had proposed to investigate was thus answered in the affirmative. The structure of the gravid uterus not only responds to the stimulus of galvanism, but it does so in a peculiar and remarkable manner, the action thus excited consisting in a slow, vermicular-like contraction of the organ, which is limited to the portion included in the current when the galvanism is applied locally, and affecting

it more generally and powerfully when it is applied through the medium of the nervous system. I need scarcely observe that this contraction of the uterus under the stimulus of galvanism differs widely from that of the voluntary and other involuntary muscles when acted upon by the same agent. It is more slow in its development, more sustained in its duration, and more gradual in its subsidence, approximating in this respect to the contractions of the uterus during labour. In no instance were those violent and sudden contractions observed to take place which are so remarkable in the case of the voluntary and other involuntary muscles when stimulated by galvanism. On every application of the current the contraction of the uterus was gradual and sustained, some minutes often elapsing before it was discerned; and hence it follows that the mere application of galvanic shocks to the uterus during labour (as recommended by some writers) can be of little or no avail in promoting uterine contraction. It is evident that it is to the sustained action of galvanism upon the uterus, and the consequent production of a sustained tonic contraction of the organ, that we must mainly look for beneficial results in the practical employment of this agent.

To confirm or correct the observations made in this experiment, and more particularly with the view of obtaining an answer to the second question I had proposed, viz., what is the best means of applying the effective power of galvanism to the uterus, I performed a second experiment in the spring of the present year, and on this occasion had the advantage of the assistance of Dr. Harley, of University College, a gentleman who has been extensively engaged in physiological researches both in this country and on the continent.

EXPERIMENT II.—What is the best means of applying galvanism so as to obtain its most effective influence upon the uterus? To this question the following notes of

observations made at the time of the experiment afford the most accurate answer we were enabled to obtain.

1. Mere individual galvanic shocks of moderate intensity, passed through the uterus from the fundus to the cervix, did not produce any immediate uterine contractions.

2. After a continuous current had been passed longitudinally through the uterus, that is to say, from the fundus to the cervix uteri, or rather the vagina directly over it, a gentle vermicular-like contraction of the organ was observed to take place in the course of about sixty seconds; and, during the five subsequent minutes that the current was continued, this vermicular-like contraction was observed to propagate itself slowly over the whole of the uterine parietes.

3. A current directed transversely through the uterus for two and a half minutes caused slight contraction in that portion of the organ which was included in the current, but not in any other.

4. On directing the current longitudinally through the uterus, through the medium of the spinal cord—that is to say, by applying the positive pole of the machine to the nape of the neck of the animal, and the negative to the vagina, immediately over the os uteri—very powerful uterine contractions were produced in the course of two minutes. They commenced, as it were, in bands of the uterine fibres, and were of a much more general and powerful character than when the poles of the machine were applied locally to the uterus. The current was continued for five minutes with increasing effect, and, on discontinuing it, the contraction of the uterus continued for about five minutes longer, its intensity being apparently as great as during the application of the galvanism.

5. On repeating this experiment when the animal was somewhat exhausted, it was observed that uterine contraction was greater when the current was occasionally intermitted.

6. As the animal became still more exhausted the action of galvanism upon the uterus became much less apparent,

and as the vital powers declined it became powerless in exciting uterine contraction.

Before proceeding to consider the practical bearing of these facts, it may be convenient to recapitulate briefly the chief conclusions which are to be drawn from these experiments, viewed in relation to each other.

First. In both the power of galvanism to excite the contractile structure of the gravid uterus was unequivocally made manifest.

Secondly. In both it was rendered evident that the influence thus exercised by galvanism upon the organ is of a peculiar and specific character, differing greatly from the effects of the same agent upon the voluntary and other involuntary muscles.

Thirdly. In both it was shown that the influence of galvanism upon the gravid uterus is much more powerful and general when the current is applied to it through the medium of the nervous system—or rather its spinal portion—than when it is applied locally to the organ itself.

Fourthly. That galvanic currents directed longitudinally through the uterus, *i. e.*, from fundus to cervix, promote powerful and general uterine contraction; whereas currents passed transversely through the organ excite partial contractions only in the direction of the current, and hence must exercise an unfavorable influence upon the parturient process.

Fifthly. It follows, therefore, from the last two observations, that the most efficacious mode of employing galvanism, so as to obtain its most effective influence upon the gravid uterus, is to direct the current in a longitudinal direction through the organ from the upper portion of the spinal cord, that is to say, by applying the positive pole of the machine to the upper part of the spine, and the negative to the cervix uteri.

Sixthly. That, so applied, the force of the current may be increased or intensified by occasionally breaking or

interrupting its continuity, that is to say, by momentarily removing, from time to time, one of the poles of the machine from contact with the body.

Seventhly. That mere individual galvanic shocks, passed through the uterus, exercise little or no influence in exciting uterine contraction, and that, to obtain the specific influence of galvanism upon the uterus, it is necessary that the current should be sustained until the desired object is attained.

Eighthly. That in proportion as the constitutional powers fail is the influence of galvanism less powerfully exercised upon the uterus, until at length, with increasing exhaustion, it ceases to exert any influence whatever.

The foregoing observations appear to me to point out with greater precision than has hitherto been done, the nature of the influence which is exercised by galvanism upon the gravid uterus, the best mode of applying it, and the kind of benefit we are likely to derive from it when so employed. Had this inquiry, however, terminated here, I should not have troubled the Society with any communication upon the subject. The facts now stated had indeed been long known to me, but they appeared to be suggestive rather than conclusive as to the best mode of employing galvanism, and the advantages to be derived from it in obstetric practice, and it was not until I had had an opportunity of testing at the bedside the value of the practical inferences I had ventured to draw from them, that I deemed them of any positive value. Now, however, that I have had that opportunity, and have found that the results of clinical experience support their general correctness, I have ventured to submit them to professional notice, and I will proceed in the next place to lay before the Society the clinical evidence I have obtained of the utility of galvanism so employed in obstetric practice.

The advocates of galvanism as an obstetric agent claim for it a wide range of utility, and recommend its employment in all cases in which it is deemed desirable to excite or promote uterine contraction. I need scarcely observe, however,

upon the inexpediency of resorting to the use of so formidable and in some respects so inconvenient an agent in cases in which simpler and less powerful means may suffice for the attainment of the object in view. It appears to me, indeed, whatever may be the value or remedial powers of galvanism in midwifery, that its use will be materially restricted by this consideration ; and that it will always be regarded as an agent to be used in exceptional cases only where the better recognised and more established rules of practice either fail altogether or offer little prospect of doing good. Regarded, however, in this point of view, there are yet many in which it may be usefully resorted to and some in which, if I may judge from my own experience, it affords the best security to life. Of such I would instance more particularly certain cases of placental presentation in which profuse hæmorrhages continue to recur, notwithstanding the employment of the plug and other means, before the os uteri is sufficiently dilated to admit of manual assistance ; and cases of hæmorrhage in the early months of pregnancy which resist the usual means employed for their suppression, and which, from the constricted state of the os and cervix uteri do not admit either of mechanical or manual interference. In both these cases I have employed galvanism, in the manner suggested by the foregoing experiments, with the best results—in the latter case when all other means had proved abortive, and the patient's life was in the greatest peril—in the former so favorably as almost to justify the belief that it establishes a new principle of treating some of the worst cases of placenta prævia ; and believing that they afford the most conclusive proofs I could adduce of the efficacy of galvanism so applied in obstetric practice, and furnish at the same time the best text I could select for the further observations I have to offer upon the subject, I will briefly submit to the Society the chief points in the history of each which bear more especially upon the question under consideration.

Case of profuse hæmorrhage occurring in the early months of pregnancy successfully treated by galvanism after other means had failed.

A young married lady, of a highly nervous temperament, consulted me on the 11th December, 1856, on account of uterine hæmorrhage which had commenced on the preceding day, and which she attributed to a long and fatiguing drive. She was apparently in the third month of pregnancy, and gave the following history in connection with the attack. She was married on the 9th September, 1856—three months before the date of my visit—and on the 15th of the same month she menstruated as usual. During October menstruation did not take place, and other circumstances pointed to the probable supervention of pregnancy. About the middle of November—six weeks from the date of the last menstruation—she had a slight hæmorrhagic discharge, which disappeared in the course of the same day, and was apparently brought on by over fatigue and travelling.

On the 15th of the same month—a period which corresponded with that of the second menstruation dated from the time of its cessation—hæmorrhage again occurred, which lasted two days, and on the 10th December—nearly a month afterwards—it again occurred and continued profusely until the following day, when I was sent for.

Nothing like an abortion had as yet taken place, although many large coagula had passed, and on examination I found the body of the uterus somewhat enlarged, the cervix rigid and undeveloped, and the os uteri small and almost closed. She was requested to remain in the horizontal position, to keep her apartment cool, and to drink freely of iced lemonade. Saline aperients, strongly acidulated with dilute vitriolic acid, were at first prescribed, and afterwards, gallic acid, matico, and other astringents, alternated with aperients, and opiates when in pain. By these means, aided by the occasional application of cold, the hæmorrhage was moderated though not entirely restrained until the 24th of December,

when she experienced a good deal of backache and forcing-pain in the uterus, and in the course of the night a substance was expelled which she described as very fetid and unlike anything that had previously passed. This was followed by much relief, and the following day she expressed herself as feeling quite a different person, the hæmorrhage and pain having almost entirely ceased. I had no opportunity of examining what had passed, but concluded, from the patient's account of it, and her subsequent feelings, that it was either the entire ovum or a portion of it. From this time up to the 10th of January, there was little or no hæmorrhage or pain, but the patient continued very weak and anæmic, and had been obliged to be almost always recumbent. At this time hæmorrhage again occurred, and continued for four days; but as it was not excessive and corresponded with her supposed menstrual period, it was attributed to that cause. On the 28th of the same month, however, it again occurred, and lasted two days, and as this did not admit of a similar explanation, I was again asked to see her. I found her excessively weak and depressed, she had frequent backache, and now and then forcing-pains in the uterine region. These symptoms, together with the return of hæmorrhage at so unusual a period, led to the surmise that the entire ovum had not passed, and that some cause of irritation connected with it still existed in the uterus, and she was accordingly treated upon this view of the case. On the 10th of February hæmorrhage again returned, and lasted four or five days, but it was not excessive, and it apparently coincided with the usual menstrual period. On the 27th of the same month it again occurred very suddenly and profusely, and its effects when I saw her were strongly marked upon the constitution. On again examining the uterus, I found the body still larger than it should be, but the cervix was undeveloped and the os uteri small and undilated. Feeling quite certain that the uterus still retained some portion of the ovum, the retention of which was the effective cause of uterine irritation and consequent hæmorrhage, or, in other words, believing that the

repeated attacks of hæmorrhage depended upon so many abortive attempts on the part of the uterus to get rid of such cause of irritation, I resorted to a variety of means to excite uterine action. Turpentine enemata were administered, and drachm-doses of the ætherial tincture of ergot, with gallic acid and decoction of bark, were given every four hours. These remedies, combined with occasional aperients, were continued until the 5th of March, when, as matters still remained the same, and no organized structure had as yet been expelled from the uterus, she was visited by Mr. Stone, who had formerly attended her. He concurred generally in the view which had been taken of the case, the cause of the floodings, and the practice which had been adopted, and merely suggested, as she was excessively exhausted, that some of Battley's concentrated preparation of bark should be added to the medicine she was taking. No material change occurred until the 8th of March, when another very profuse and alarming hæmorrhage took place which left her almost lifeless, and on visiting her I found her in a state of alarming syncope. Her breathing was hurried; she complained of distressing faintness, throbbing of the temples, knockings in the head, &c.; and her pulse was so feeble as to be scarcely felt. In this emergency she was again visited by Mr. Stone, who observed that in the whole of his experience he had only once seen an instance of such excessive hæmorrhage in the early months of pregnancy, and that if it were not the fact that such cases rarely prove fatal he should have little or no hope of her recovery. It should be observed that before his arrival I had firmly plugged the vagina by means of an oiled silk handkerchief, having previously found that the os and cervix uteri were still undilated, and not such as to admit of more than the point of the finger—a fact afterwards confirmed on examination by Mr. Stone—and feeling certain that any further hæmorrhage would almost inevitably prove fatal. This treatment was continued throughout the whole of that and the following day, but without any apparent result, and on the 10th, the condition of the patient was extremely critical.

She was still suffering severely from the effects of loss of blood, notwithstanding the free administration of brandy, cordials, beef-tea, jelly, &c.; the os and cervix uteri were still too constricted to admit of manual interference; the plug was now becoming a source of excessive pain and discomfort, and the past history of the case had shown that astringents could not be relied upon, on the one hand, to prevent hæmorrhage, or ergot and turpentine enemata to produce sufficient uterine action to expel its presumable cause, on the other. It was under these circumstances that I determined to have recourse to galvanism, having, as I conceived, fairly tried all the more established plans of treatment without success. I accordingly proceeded to apply it, in the course of the afternoon of this day, in the manner which I had found to be most effective in my experiments upon the lower animals, that is to say, by applying the positive pole to the nape of the neck, and the negative, by means of a vaginal conductor, to the cervix uteri. In this way a continuous current, occasionally interrupted, was applied and continued in action for half an hour, and during its continuance the patient felt occasional pains in the uterine region, and stated that it appeared to revive her and give her strength. I had examined the state of the os and cervix uteri before applying the galvanism, and at the end of half an hour I again did so, and was much struck with the change that had taken place in the interval. The cervix was more expanded, and the os uteri was more open and relaxed, so that the examining finger could pass more easily and further into its interior. So striking was this change, that I continued the current half an hour longer, anticipating some speedy result from its action; but in this I was disappointed, and as the patient was now somewhat fatigued, it was discontinued for the remainder of the day. The next morning, encouraged by these favorable effects, I again had recourse to it, and applied it as before, but on this occasion it was used for two hours instead of one, that is to say, for one hour in the morning, and another in the afternoon. As before, the os and cervix uteri became

softened and expanded during its employment, and occasional uterine pains were felt; no hæmorrhage, however, occurring, and the patient, on the whole, feeling stronger and better for its use. I had intended applying it for a still longer period the next day, but, on visiting her for the purpose, found that it had become unnecessary, and that, in fact, the object of the treatment had already been attained. It appeared that, after I had left her the preceding day, she had a good deal of uterine uneasiness, that this recurred at intervals during the night, and that, in the early part of the morning, an organized structure was expelled from the uterus, portions of which I have preserved, and beg to submit to the Society. On examination, this proved to be the decidua or uterine constituent of the ovum; and with its expulsion, I felt that all further anxiety about the case, as well as fear of hæmorrhage, was at an end. And so it proved, for from this time neither hæmorrhage nor any other unfavorable symptom occurred, and the patient's recovery was as favorable as could be wished. No other treatment was adopted than that necessary for the restoration of her strength, and she soon afterwards left London for the sea-side.

As a sequel to this history, I may add that this patient has again become pregnant, has reached her seventh month, and is, apparently, likely to do well.

I trust I shall not be deemed hasty or illogical in venturing to connect the final termination of this case and the safety and security of the patient with the ultimate employment of galvanism; for, although the course of events may not have been such as to render this conclusion inevitable, yet it was such as to render it highly probable. Let it be remembered that an interval of nearly four months had elapsed between the first threatening of abortion in November, and the final expulsion of the deciduous remains of the ovum in March; that during this period many attempts had been made by the uterus to effect their separation and

dislodgment, with no other result than that of giving rise to profuse and alarming hæmorrhages; that these were but little restrained by the various styptic and astringent remedies which were resorted to on the one hand, and that the action of the uterus was not more successfully excited by the administration of large and frequent doses of ergot and turpentine enemata on the other; that the plug had been assiduously applied for three successive days and nights without exciting any effective uterine action; and that its continued employment had at last become a source of intense suffering and distress to the patient. Now, bearing in mind these several circumstances, and the positive evidence which was obtained by tactile examination of the effect of galvanism in relaxing and opening out the os and cervix uteri; and that almost immediately after its second application uterine action set in, which in less than twelve hours effected the separation and expulsion of the decidua and secured the safety and well-doing of the patient. It appears to me that if it is not proved that galvanism was the effective cause of this result, yet that the facts, taken together and viewed in relation to each other, constitute a mass of demonstration in favour of this conclusion, than which nothing in the nature of medical evidence can be more decisive. And if such a conclusion is allowable, does it not follow as a necessary corollary that the case furnishes a precedent for the treatment of others of a similar nature? That is to say, that when dangerous hæmorrhages occur in the early months of pregnancy, as a probable effect of the retention of portions of the ovum, and in which mechanical aid is impracticable, and other recognised means of treatment unavailable, that galvanism may be usefully and successfully resorted to. Such, I confess, is the impression left upon my mind after a careful consideration of the principal facts of this case; and looking to the inefficacy of the means adopted prior to the employment of this agent, I can only regret that it was not resorted to earlier in its treatment.

I proceed, in the next place, to submit to the Society the particulars of a case of placental presentation, in which

galvanism was successfully resorted to for the purpose of arresting hæmorrhage and accelerating the dilatation of the os and cervix uteri, so as to admit of the introduction of the hand and the delivery of the patient by turning.

CASE II.—*Placental Presentation treated by Galvanism.*

A lady, whom I had been engaged to attend in her approaching confinement, sent for me on the 30th October, 1857, on account of a slight attack of uterine hæmorrhage, which had occurred in the early part of the morning. She was apparently in the seventh month of her fifth pregnancy, and as the hæmorrhage had occurred when she was perfectly quiet and recumbent, and had not been occasioned by any obvious cause, it suggested the probability that it might be of the unavoidable character. As, however, it had been slight, and had entirely ceased before I saw her, I simply advised her to remain quiet, to take a saline aperient and some nitrate of potass dissolved in cold water, in the manner recommended by the late Dr. Gooch, should there be any return. The next day I found that no further hæmorrhage had occurred, and I did not hear more of the case until the 23d of November, when another slight hæmorrhage occurred in the early part of the morning; but, as in the former instance, it had entirely ceased at the time of my visit, and it did not again recur throughout the day. On the 26th, I was again sent for, and now found that between this and my previous visit she had sustained a considerable loss of blood. It had returned very profusely early in the morning of the 24th, and, after continuing slightly throughout that and the following day, had again become very profuse on the morning of the 26th, so much so, indeed, that it was estimated that she had lost three pints of blood during these days. On examination, I found the cervix high up, and the os uteri small and undilated, forming a nipple-like projection into the vagina. I passed my finger within it, but could not determine with accuracy the nature of the presentation on

account of its height, and on endeavouring to pass my hand into the vagina for the purpose of making a more accurate examination, the patient experienced so much pain that I was obliged to desist. On examining the cervix externally, however, I could distinctly feel a soft cushiony body lying within it, and I could even detect, as I thought, the convex outline of the placenta. Undoubtedly some such body was interposed between the child and the cervix; and this fact, together with the history of the case, left no doubt on my mind that it was the placenta.

Having been long anxious to try the efficacy of galvanism in these cases, from a conviction, as I have elsewhere expressed it, "that it would simultaneously tend to the arrest of hæmorrhage and the dilatation of the os uteri," by exciting and maintaining a tonic contractile action of the organ, I communicated my views upon the subject to my friend, Mr. Forbes, and begged that he would visit the case with me, with the view of being favoured with his opinion both as to its nature and the course of treatment I proposed to adopt. He found much difficulty in determining accurately the character of the presentation, on account of the height of the cervix uteri; but, after a lengthened examination, stated that he thought he could feel the placenta, and on passing his finger over the exterior of the cervix, he further recognised the existence of the spongy convex body I have described. With his concurrence, I applied the galvanic current, in the manner I have already described. It was now 4 p.m., and it was intended that the current should be continuously kept applied until 8 p.m., when we agreed to meet again, and note the further progress of the case; but, by some accident, the current was interrupted shortly after we left, and it was not until 5 p.m. that its action was fairly commenced. At 8 p.m. we again visited the case, and found that no hæmorrhage had occurred during the three hours that it had been applied; and, on examination, both Mr. Forbes and myself recognised the fact that the os uteri was more open and the cervix more relaxed than when we had previously seen the patient. As, however, it was now

late, it was determined to discontinue the galvanism for that day, but to reapply it the next, and then to keep it continuously in action until the state of the os uteri admitted of delivery. At twelve at night, however, I received an urgent summons from the patient on account of a fresh attack of hæmorrhage which had just occurred, and as she was now evidently suffering severely from the effects of loss of blood, and the state of the os uteri did not admit of her delivery, I determined to reapply the current and keep it continuously in action until it would do so. This was accordingly done, and it was continued for nearly six hours. During this time little or no hæmorrhage took place, and little or no pain was experienced by the patient, and, at the end of it, I found that there would be no difficulty in turning the child. I accordingly proceeded to do so, and easily succeeded in passing my hand into the vagina and thence through the os uteri; and now the nature of the case was rendered evident, for the placenta was found stretching equally over the whole of the uterine orifice. So centrally, indeed, was it attached, that it was difficult at first to know in what direction to seek for the membranes. Having, however, reached them, I was enabled to grasp and bring down a foot with the greatest ease, and the delivery was effected without any difficulty or hæmorrhage. The placenta was afterwards removed with equal facility and without hæmorrhage; and, although the patient showed evident signs of the loss of blood she had previously sustained, yet she felt cheerful and comfortable; and her recovery was so favorable that, on being visited by Mr. Forbes, on the 6th day afterwards, he remarked that she appeared to be as well as if she had merely gone through a natural labour.

I have remarked in the course of this narrative that little or no hæmorrhage occurred during the employment of the galvanism, and that the patient experienced little or no pain or discomfort from it. It is right, however, to observe that these points were carefully investigated throughout the whole management of the case. An arrangement was specially made for noting the amount of blood that

was lost during the use of the galvanism, and I can safely assert that it did not exceed, or even amount to, a small teacupful; and, with regard to the amount of pain experienced by the patient, I may remark that, although frequently questioned upon this point, she almost invariably denied having any, although, on external examination, the uterus felt tense, rigid, and hard, whenever the hand was applied for the purpose of ascertaining its condition. We may therefore, I submit, without overstepping the limits of legitimate induction, draw three conclusions from the facts of this case in reference to the practice pursued in it.

1st. That a continuous current of electricity directed longitudinally through the uterus from the upper part of the spinal cord may be certainly relied on to effect the dilatation and development of the os and cervix uteri in cases of placenta prævia.

2d. That such dilatation and development may be effected under its influence without any serious hæmorrhage taking place during the necessary separation of the placenta which is contingent upon this process.

3d. That it may also be effected without any appreciable amount of pain being felt by the patient, and certainly without the recurrence of those acute rhythmical pains which are so constantly experienced in ordinary labour.

I have ventured to observe, in the introductory remarks to this paper, that the facts of this case, fairly considered, point to a new principle in the treatment of certain cases of placenta prævia, and I would now wish to submit to the Society the grounds upon which such opinion is based.

I need scarcely observe that the treatment of cases of placental presentation is, under ordinary circumstances, one of great difficulty; so much so, indeed, that it has been calculated that the average mortality to the mother is as one to three, and this difficulty and fatality would appear mainly to depend upon the insufficiency of the means hitherto employed to restrain hæmorrhage whilst the os uteri is undergoing the necessary dilatation, either for the descent of

the head or the introduction of the hand. To attain this object two modes of treatment have been hitherto resorted to—puncturing the membranes, and the employment of the plug; but neither can be always relied upon for the fulfilment of this object. The former, indeed, can scarcely be trusted to for the suppression of hæmorrhage in these cases, and the latter is painful, tedious, and uncertain. Now if it can be shown that by passing a current of electricity through the uterus for a few hours in the manner recommended, both these objects can be accomplished, that is to say, the dilatation of the os uteri, and the simultaneous control of hæmorrhage—then it appears to me that we possess in galvanism an agency which is far more effectual in the treatment of these cases than any which has hitherto been proposed. As compared with the action of the plug it has this advantage, that the end proposed can be attained more expeditiously, more safely, and less painfully. Thus the pressure of the plug requires sometimes to be maintained for many days before its object is gained, and it sometimes fails altogether to excite adequate uterine action, as in the first case I have reported; it can exercise no influence upon the tonicity of the uterus whereby internal hæmorrhage can be prevented, whilst its employment is attended with much suffering and inconvenience to the patient. On the other hand the facts of the case I have related go far to show that the galvanic current may be relied upon to effect full dilatation of the os uteri in a few hours; it moreover excites a sustained tonic contraction of the uterine parietes, which is favorable to the prevention and suppression of hæmorrhage, and, as I have shown, it may be used in such a manner as to give little or no pain or discomfort. Such were its results in the particular case I have laid before the Society, and such are the results I think we may venture to anticipate from its employment in others.

I am unwilling to trouble the Society with the details of any additional cases treated by galvanism, not only because in doing so I should extend the limits of this paper to an inconvenient length, and also because I have met with none

which testify so decisively to its value in obstetric practice. Moreover, it appears to me that individual cases like individual facts are only really useful when they tend to establish some new inference, or some new principle, either in theory or practice. I will therefore only observe that I have employed galvanism successfully in various other obstetric emergencies: for exciting uterine action in cases of uterine inertia, for the expulsion of coagula after labour, and for the suppression of passive hæmorrhages after the expulsion of the placenta. The utility of it in these cases has, however, been insisted upon by others, and the particulars of several that I have so treated have already been made public.

How comes it, then, it may be asked in conclusion, if such are the facts, that different observers have arrived at such different conclusions as to the value and remedial powers of galvanism in obstetric practice, and how in particular are we to reconcile with them the negative results which were obtained and reported by Dr. Simpson? The answer, I apprehend, is to be sought for in the fact that the observations of Dr. Simpson are open to at least two sources of fallacy. First, in not having employed galvanism in the most effective manner; and, secondly, in having made the frequency and severity of the labour-pains the sole test of uterine action. Thus he informs us that in all his cases Dr. Radford's directions for the employment of galvanism were strictly adhered to, viz., "When the remedy is applied, the brass bar of the vaginal conductor is to be passed up to the os uteri, and moved about at intervals on to various parts of this organ. At the same time the other conductor must be applied to the abdominal parietes, over the fundus uteri. Shocks may also be passed transversely through the uterus, by simultaneously applying the conductor on each side of the belly." Now in my experiments it was distinctly noted: first, that the local application of galvanism is not the most effective means of employing it; secondly, that mere individual shocks passed through the uterus exercise no influence in promoting or exciting uterine action; and,

thirdly, that currents directed transversely through the uterus, by inducing partial contractions of the organ in the line of the current, actually tend to arrest the parturient process. And again with regard to the intensity and frequency of the labour-pains as the test of uterine action, I have only to observe that the last case I have reported tends directly to negative this conclusion; for although in this a firm tonic contraction of the uterus was distinctly felt on applying the hand to the abdomen; and the dilatation of the os uteri went on so speedily as to admit in a few hours of delivery, yet the patient, on being frequently questioned, scarcely ever admitted that she felt any distinct pain, and certainly not such as she had been accustomed to regard as labour-pains. It would appear, then, that on these several grounds we may venture to dissent from the conclusions which have been arrived at by Dr. Simpson, respecting the effective power and value of galvanism in obstetric practice, and in disposing of his objections to its utility we dispose of the greatest objections which have been raised to its employment in this department of medical practice.

I have only further to add that the apparatus I have used for the administration of galvanism has been the electro-galvanic machines, invented and sold by Messrs. Horne, Thornwaite, and Wood, of Newgate Street. They have been especially constructed with reference to the production of a large amount of electricity, and its transmission in one uniform direction, and as such they are preferable to the double-current machines, in which the quantity generated is not only smaller but is continually returning upon itself. In the first case I have reported the machine marked No. 2 was used, and in the second that marked No. 3.

POSTSCRIPT, February, 1858.—Within the last few days I have had another opportunity of testing the remedial powers of a sustained current of electricity, in the treatment of a case of uterine hæmorrhage, which occurred in the last month of pregnancy, before the accession of labour, and was presumably dependent upon the attachment of the placenta

to the cervix uteri. The application was perfectly successful, and, as the facts of the case in every respect support the views enunciated in the preceding paper, I beg to append the following notes of it.

CASE.—A. B—, an extremely diminutive young woman, who had nearly completed the full term of her first pregnancy, but as yet had had no symptoms of labour, was suddenly attacked with profuse uterine hæmorrhage late in the evening of the 18th of February. It occurred when she was perfectly quiescent, and without any apparent cause. The blood gushed from her in a full stream; was of a bright arterial colour, and escaped so profusely, that before I saw her at 10 p.m., less than two hours after it had commenced, she was computed to have lost nearly two pints. At this time she was pallid and faint, and the hæmorrhage was still going on. On examination, the vagina was found to be very contracted, the os uteri high up, and so undilated, that I could with difficulty insert the point of the index finger within it. I could, however, distinctly feel the head presenting, without any portion of the placenta intervening, but on pressing my finger around the cervix externally, a convex, thick, spongy body could be felt, anteriorly interposed between it and the foetal head. This was subsequently recognised by Mr. Norway, who observed, that he had no doubt whatever as to its being the placenta. Looking to the dangerous and uncertain character of these cases, to the loss of blood which the patient had already sustained, its suddenness and profuseness, and the effect it had produced upon her, I lost no time in applying the electric current, in the manner I have already described. It was applied at 10 p.m., and was kept almost continuously in action for three hours, during the whole of which period scarcely any hæmorrhage occurred, and the labour was found, on occasional examination, to be rapidly progressing. Active parturient pains now set in in a regular and rhythmical manner, and as the os uteri was now considerably dilated, and the head was rapidly descending, without

any hæmorrhage having occurred, the electric current was withdrawn, but so arranged that it could be again applied in the event of its returning. Such, however, was not the case, and the further progress of the labour was so favorable, that at 5 a.m. the next morning, seven hours only from its first application, the patient was safely delivered of a living child; the placenta was thrown off almost immediately afterwards, and the uterus contracted firmly, without any further hæmorrhage.

With reference to the facts of this case, I will only observe that they harmonise in every respect with those of the one I have previously related, and that together they go far to show:—

1st. That a sustained current of electricity of moderate intensity, passed through the gravid uterus, in the manner described, exercises a remarkable influence in increasing the tonicity or contractility of the uterine fibre.

2d. That in such increased tonicity or contractility of the uterine fibre, so excited and sustained, we have a powerful and reliable means of moderating and controlling uterine hæmorrhage, whether of the accidental or unavoidable variety, and of simultaneously accelerating the dilatation of the os uteri and the general progress of the labour.

3d. That such sustained current of electricity may be continued for a lengthened period, when the object to be attained requires it, without any appreciable pain or inconvenience to the mother, or any danger or detriment to the child.