and the new anormal vessels and textures had evidently been the source whence the muco-purulent matter, the flakes, and clots had been discharged, and to which the external opening of the sinus had given vent. The new and thickened textures, and the coats of the new vessels were examined with a high magnifying power, (750,) and they were generally found softer and more brittle than the normal fibrous texture, and multitudes of incoherent cells were found upon them, and distributed among the remaining fibres of the structure.

The lungs externally were of a deep purplish slate colour, their volume was less than natural, and they adhered firmly to the walls of the chest. On pressing them between the fingers and thumb, numerous hard bodies were felt in their interior, and on making sections, tubercles and cavities containing pus were found disseminated through them. The tubercles were in some places hard, in others soft, and in others they appeared to have degenerated into a completely fluid pus. The cavities in many places had several sinuous communications with each other, the sinuses or channels running through a hardened and consolidated texture totally different from anything resembling the healthy parenchyma of the lung, and here and there air-tubes opened into the interior of the cavities. The textures forming the walls of the cavities bore no resemblance to the normal textures, and when the muco-purulent matter was removed from their free surface, they were seen with a lens to be traversed by numerous long varicose and tortuous red vessels, totally different in distribution and arrangement from any of the vessels of the normal textures. Similar strange vessels were also seen running along the borders of the texture, contiguous to, and bounding the outline of, the tubercles. The coats of many of the smaller vessels, and the textures upon which they were distributed, were examined with the microscope, and found composed for the most part of incoherent colourless cells, mingled with granular matter and molecules.

Fig. III.—A capillary vessel in the fibrous or areolar texture, (normal.)

Fig. IV.—A larger vessel in the areolar texture, (normal.)

Fig. V.—Vessels excreting pus and mucus, from a scrofulous sinus in the areolar texture of anterior mediastinum. Case 1.

The textures were not tough, coherent, and elastic, but soft, and very brittle; and it was only here and there that the waved and tortuous filaments, copiously found in all the minute vessels traversing the areolar texture of the healthy lung, could be discovered.

(To be continued.)

ON VARICOSE VEINS AND THE ULCERS DEPENDENT ON THAT STATE

By JOHN M. BANNER, Esq.

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There are few diseases more painful or distressing in every point of view than ulcers dependent on a varicose state of the veins, and there are few diseases which have occupied the attention of the profession more than this. Much has been written, and many are the modes of treatment recommended. During the period that I was a pupil and house-surgeon at St. George's

Hospital, which extended over the year 1818 and to the end of 1823, more than an ordinary degree of interest existed on the part of the surgeons of that Institution in the treatment of this disease. During that time the ligature was applied to the vena saphena, a portion of the vein was cut away, and a division of the vein was also effected by cutting. Such indeed was the interest excited that we severally partook of it. The same interest has continued with me up to the present day; and from the writings and lectures of Sir B. Brodie, we may conclude that it has continued with him also. The energy and persevering industry of Sir B. Brodie has ever been so great that we cannot feel surprised that he has continued, with unabated ardour, his endeavours to master this troublesome disease, as he has done in innumerable other instances. My interest in this ailment has led me to watch the various means recommended for its cure or alleviation. I have in many instances tested their value. It is the results that I wish to bring before the profession, and though in several of the modes of treatment, from their very marked unsuccessful issue, I have been held back from trying them so fully as I could have wished, where the plan has succeeded in my hands, I have given it a full and fair trial; where it has not done so, or where it has failed in the hands of others, I have contented myself with giving extracts from the writings of those who advocate it. I am unprepared to offer anything new on the pathology of the disease; nevertheless, I have thought it well, before entering on the treatment, to draw attention to certain selections which I have made from distinguished writers, on the pathology and other matters connected with it; this I do without apology, as I consider they will prove of advantage in the contemplation of the subject.

The late Sir Astley Cooper, in speaking of this condition of the veins, remarks that it may arise from a variety of causes; the more immediate one is either a thickening of the valves, so that they are incapable of approximating, or a rupture of the valves. In either case the effects will be the same; the blood pressing in one uninterrupted column, the veins become distended and serpentine, and the valves widely separated from each other; their arteries by their powerful attempts to return the blood to the heart soon excite inflammation. This opinion appears to have been adopted by several other surgeons.

Signor Rina, the Surgeon-in-Chief of the Hospital at Venice, in his "Treatise on the Proximate Cause of Varicose Tumours in the Lower Extremities," states that the real proximate cause is a reflux-motion of the blood in the veins,—for instance, the blood from the femoral vein retreats into the saphena, and is driven backwards from the groin towards the foot, by a power peculiar to these veins. He comes to this conclusion from the following facts:—

1st. When a surgeon removes a portion from a

varicose vein in a living person, the blood is seen to spout from the upper end, as it does from an artery.

2nd. In those persons in whom varices have been caused by wearing tight garters under the knee, the veins are remarked to be more distended above the band than below it.

3rd. When the operation for varix is performed, either by the ligature or excision, those varices which are situated below the ligature or excision, are seen to contract and finally disappear, whilst those situated above remain stationary or increase, which would not be the case if the blood in these vessels flowed, as it usually does, from below upwards, as the weight of the column of blood from above acts in such a manner as to paralyze the valves of the veins, and thus keep up the communication between the individual varices.

4th. The pathological anatomy of varicose veins exhibits, in the lower extremities, hypertrophy of the walls, and a structure like that of the arteries. He thinks that inflammation following on a passive dilatation of the weak venous parietes between every two valves, with the weight of the column of blood from above, may be the cause of this hypertrophy; from this, chronic inflammation and thickening follows, and a change of structure.

Andral specifies several varieties of the disease:—

1st. Simple dilatation of the veins, without any other alteration, and either extending all along the vessels, or confined to particular points of them.

2nd. Dilatation of the veins, attended with a thinner state of their coats, and it may be either an uniform, or an irregular dilatation.

3rd. Uniform dilatation, with thickening of the coats of the veins.

4th. Dilatation, with thickening of the coats and interspaces between the varicose enlargements. In the two latter cases, as the vessel increases in diameter, it also becomes elongated and tortuous. This is the ordinary form of varices.

5th. Septa or partitions are formed in the vein, whereby its cavity is divided into small cells, in which the blood accumulates and coagulates.

6th. In the last form of varix, described by Andral, "from careful dissections, there are, in addition to the disposition exhibited in the fifth variety, various irregular perforations in the sides of the vein, and the vessel thus communicates with the surrounding cellular membrane, which is generally more or less diseased, as is exemplified in hæmorrhoids."

Mr. Syme, of Edinburgh, enumerates tall stature and largeness of the veins, as predisposing to this disease; constipation, pregnancy, and sedentary occupation, favour its actual commencement. Sir Everard Home observed, that in the army the grenadier companies are especially subject to varicose veins. Sir B. Brodie remarks that cooks are very liable to this diseased state of the veins, and enumerates

certain exertions as liable to produce it, and remarks that he has known a few instances where the varicose state of the veins appeared immediately after hard walking. Professor Cooper enumerates tall stature, large size, a long perpendicular course of the veins, as predisposing causes to the disease.

It appears to me that there must exist a predisposition to this disease in the person affected,—some peculiarity in the structure of the veins,—my experience does not bear out the observations of several writers, that persons of tall stature and large frame are the most liable to this disease. I have remarked that those of short stature and spare habit are also much affected with it. When Sir Everard Home stated that the grenadier companies are very liable to varices, he should have added also, that soldiers are subject to hard walking, which is given as a cause of this disease by Sir B. Brodie, and that they, in the days of Sir E. Home, wore the garter and knee-breeches, which, according to Signor Rima and Sir B. Brodie excite the varices. In the many cases which have come under my care, I have found that those who have undergone severe exercise of the lower limbs, whether they be tall or whether they be short, have been the subjects of this disease, and have had occasion to remark that many of the footmen in London are subject to it, those more particularly who were required to show a good leg and had to stand many hours together poised on the toes behind carriages. These men garter tightly, and where the predisposition existed, the practice no doubt acted as an exciting cause. Those subject to an exposure to great heat (as for instance cooks and foundry men,) I have observed are very liable to it. What is it then that causes this predisposition? According to Sir B. Brodie, the disease has been produced immediately after hard walking, proving at once that the coats of the veins were weak and easily dilated, or that the valves were defective; and the fact that many of the persons afflicted, have one vena saphena only diseased, proves that tallness of stature, largeness, and heat, do not entirely produce the disease. And again, many hundreds under exactly the same influences, escape the disease, which to my mind would at once prove a predisposition to it in certain individuals, which from an excitant develops itself. Women having children are subject to an enlargement of the saphena and its branches; in the several cases which I have met with, the varices disappeared at the seventh month of parturition, proving that the diseased state before alluded to did not exist. I recollect one case in particular in which a lady was seized suddenly at the fourth month of pregnancy with great pain and stiffness in the legs. On examining them I found the superficial veins generally distended, and the limbs presented a bluish appearance; the feet were cold. In this case the veins were not tortuous nor knotty; they felt generally distended. This state continued until

the seventh month, when the limbs resumed their natural appearance, and continued perfectly well until the lady was again four months advanced with child, the varices then re-appeared, and disappeared as usual at the seventh month. This effect has been produced on four successive occasions, and in every instance the result has been the same. I have met with three similar instances. I fancy that when Andral enumerates a simple dilatation of the veins as a variety of this disease, he must allude to such an instance as those I have referred to, and which can scarcely be considered a true state of varix.

That there is some peculiar predisposition to this disease is manifest from the fact that it very frequently happens that the saphena vein in one limb is alone affected, which would scarcely be the case if it depended only on the causes enumerated. A patient came under my care in whom there was a large cluster of varicose veins on the inside of one knee, forming a tumour as large as an egg, which she stated came suddenly during parturition, and has continued slightly increasing for eight years. This is the only part affected.

The veins most liable to become varicose are the spermatic, hæmorrhoidal, and saphena. These veins, from the peculiarity of their situations, are liable to be acted on by pressure, therefore we may conclude that pressure has much to do in rendering them distended, knotty, and tortuous. I am not prepared to state what the exact condition of the vein may be prior to the varicose state; there can be no doubt that a diseased action exists, most probably in the valves. We seldom have our attention drawn to the stage of the complaint alluded to; when applied to we usually find the vein tortuous and enlarged, accompanied with an ulcer in the leg, and where we have an opportunity of examining the parts after death, we find the vein enlarged, elongated, and thickened, more generally thickened at interspaces. In some instances the coats are unnaturally thin, in others the valves are widely separated; in some they appear too small for the calibre of the vessel, and occasionally we find them ruptured. The superficial veins are, in almost every case, considerably enlarged.

In contemplating the various modes of treatment which have been adopted by those writers who have distinguished themselves for their laborious researches and high attainments, we may conclude that the essential object they have each had in view has been the most efficacious means of partially or entirely destroying the vena saphena. The ulcer dependent on a varicose state of the vein has appeared to them only permanently curable, through the partial or entire destruction of the vein. This appears to have been the object of Sir Everard Home, Sir B. Brodie, MM. Fricke, Velpeau, Davat, Sanson, Bonnet, and others. Sir B. Brodie has devoted much time and attention to this disease,

and has adopted several modes of treatment; he, with Sir Everard Home, applied the ligature, and with some success for a time, when phlebitis occurring, and death resulting, it was discontinued. Mr. Abernethy, considering that the ligature was the exciting cause of the phlebitis, suggested the mere division of the vein; and Sir B. Brodie and others appear to have availed themselves of the recommendation. In many instances irritable ulcers supervened, and in most the benefit was very transient. Sir Astley Cooper, in speaking of the ligature and division of the vein, remarks,—“It was formerly the practice, when the veins were in a varicose state, to tie and divide them; this plan is pursued by many surgeons, but it is one that I have deprecated in my lectures for many years; it is bad treatment, very injudicious, and fraught with great danger. I have seen this operation prove fatal twice, and if I were to state all the cases in which I have known it terminate fatally, I should recount at least a dozen. Another overwhelming objection is, that when it does not prove fatal, its ultimate effects are perfectly nugatory.” Whereas Signor Rima, in giving the results of thirty-four operations, by the excision of an inch long of the vein above the first varicose swelling, states that there were—

10	radically cured.
13	much relieved.
6	slightly relieved.
2	not relieved.
2	deaths.
1	under treatment.

I witnessed this operation performed in St. George's Hospital, where every precaution was taken, and the operation done in a masterly style; nevertheless phlebitis came on, which proved fatal on the third day. The subject was about twenty-five years of age and in the height of good health at the time of its performance. This was the only case in which I have seen the excision of a portion of the vein, and therefore do not feel myself in a position to speak decidedly on its value, yet from the relation of several cases, and the table quoted from Signor Rima, we may conclude that it is far from being free from danger.

It was about the year 1818, that Sir B. Brodie adopted a new mode of dividing the vein with the intent of preventing the irritable ulcers consequent on the old method. The operation consisted in passing a thin-bladed knife for some distance under the skin, over the vein, then turning the cutting surface downwards, draw it across the vein, and divide it. In a very large majority of these cases much good appeared to result, and the operation for some time was held in repute; but I believe in almost every instance after a short lapse of time the disease returned, and Sir B. Brodie has given it as his opinion that the operation is not attended with a benefit great enough to justify its performance, and now recommends, as did Sir

Astley Cooper, bleeding from the saphena when necessary, and applying a well-regulated pressure and other palliative means.

M. Breschet tried the plan of pinching the vein with forceps, constructed for the purpose; this plan frequently answered the end of obliterating the vein, but often produced sloughing and ulceration, which in time was cured. The process was tedious. M. Sanson also constructed forceps, with blades so broad as to keep the sides of the vein in contact for nearly an inch. He remarks that it is not necessary to compress the vein with a force to induce adhesive inflammation; it is sufficient to compress the vessel so as to arrest the flow of blood through it, when a clot forms, which ultimately becomes absorbed, and leads to a permanent obliteration.

Sir Astley Cooper, in speaking of the treatment of varicose ulcers, says, “The first thing to be attended to is the recumbent posture, in fact this position is indispensable;” he then recommends mercurial washes and bandages. He also recommends the opening of the veins;—“indeed they are so distended that they may be more properly termed lakes than rivulets.” He advises the veins to be punctured twice a week, and speaks of the little danger attendant on the operation. He farther remarks, “if the puncture, however, at any time should not unite, but *fret into ulcers*, you must apply *Liquor Calcis*.”

Lallemand, Davat, and Velpeau, applied needles in the manner recommended by Mr. Phillips, of London, for the obliteration of arteries, and with success so far, rendering the vein impervious for some distance of its course; it is a painful operation, and not always successful.

M. Fricke adopted the plan of fixing the vein under the skin, passing through it a needle armed with a strong thread. This was done at intervals of a few inches, in every vein that it was thought necessary to obliterate. The thread was moved daily in the vessel to excite inflammation, and was removed on the third or fourth day. With M. Fricke this operation was successful, whereas with Velpeau it was very unsuccessful, for out of twelve patients inflammation of the vein took place in all; in three of the cases the inflammation was so excessive that the patients barely escaped with their lives, and the twelfth patient died of phlebitis.

M. Velpeau's method of applying the ligature appears to have been so successful in his hands, that I quote his plan more fully. A strong sharp pin with a large head, and a waxed thread, are the only instruments used. The patient is to be placed in such a posture as will render the veins tumid and prominent. The trunk of the vein is now raised up with the fingers, the pin is passed below the ends of the nails, and underneath the vein. It is necessary to protect the finger with a thimble, for the tissues

under the varicose vein are often very hard and resistant. This process must be repeated with regard to every dilated vein; eight, ten, twelve, or fifteen pins may be required from the foot up to the knee, but, generally speaking, three or four are sufficient. When the veins are free and moveable under the skin, it is easy to pass the pins under them; but when they are applied closely to the bones, this is sometimes impossible; it is then necessary to pass a strong pin perpendicularly downwards, and then direct it obliquely under the trunk of the vein. The pins being all placed, are fixed with threads, by twisting the thread in a circular manner round the pins, taking care to draw it tight. The pins and ligatures are not removed before the sixth or twelfth day, when the tissues embraced between them have been destroyed; but even if the *eschar* be not detached at this period, it is well to remove them, as there can be no doubt but that the vein is obliterated. "The introduction of the pin gives very little pain, but the constriction exercised by the ligature is *excessively painful*. Hence you should commence with the highest pin, in order to cut off the nervous communication as much as possible." The tissues embraced by the ligatures mortify and are separated, leaving a sore, which soon heals up. M. Velpeau further states,—“Of more than one hundred patients on whom I have operated by this method, not one has presented any dangerous symptoms; some slight *external phlebitis*, and the formation of some *small abscesses*, were the only consequences of any moment that ensued. Still I always dreaded that such constant success in this matter would be interrupted by an unfavourable result, and my apprehensions have been unfortunately realized. The only *fatal case* occurred recently.”

The plan so much extolled by Velpeau I have seen tried on three occasions; the subjects were young and healthy; the operations were performed by my late colleague, Mr. Wainwright, in a most excellent manner. In the first there were slight symptoms of phlebitis, but which required active treatment to allay. In the second case the symptoms of phlebitis were more acute, and it was with difficulty that the patient was saved. In the third case, a troublesome ulcer formed, the varix re-formed, and the operation was not renewed. I would state that one pin only was applied in each of these cases, and that we never ventured on this operation again.

In the year 1834 a gentleman requested me to operate on his leg. He had been quartered in Dublin with his regiment, and had consulted an eminent surgeon there for varicose veins, and a small painful ulcer. The surgeon suggested the propriety of having the vein destroyed by an application of *potassa fusa*. As I had never seen the treatment adopted, nor did I at the time know that it had been tried, I put the patient off as I best could. On considering the subject, I thought so

favourably of the principle, that I determined to give the plan a trial the first opportunity. It was not long before one presented itself, as in the month of August, 1834, a cook applied to me for an old ulcer dependent on varicose veins, whose case I will relate, as it will suffice to show the manner in which the caustic has been applied by me, and will show also the usual course in the treatment of these cases.

Mary Jackson, aged 53, a cook, of full habit of body, has been afflicted with varicose veins for seventeen or eighteen years, and during the last eight years has suffered from a painful ulcer above the inner ankle. This ulcer has been healed two or three times during that period; it frequently confines her to bed, and renders her very inactive and unfit for her work. The ulcer is about the size of a crown-piece; the skin surrounding it is inflamed and hard. After keeping Jackson in bed for two days, and prescribing low diet, I emptied the *vena saphena* by raising the feet, and passing my hand along the inside of the leg. A piece of adhesive plaster on leather, with an aperture in it of the size of a shilling, was applied over the vein on the inside, and just below the knee. The *potassa fusa* was freely rubbed on that part of the integument seen within the aperture in the plaster, until it assumed a dark-brown appearance. A warm poultice was then placed over the whole. I was pleased to find that the patient did not appear to suffer much. On the third day after the application the distension of the vein subsided, and the character of the ulcer improved. On the tenth day the slough came away, and by that time the ulcer began to heal. On the patient assuming the erect position, a cluster of veins was still observable, a few inches above the ulcer. The caustic was applied a little above the cluster, with the same result as before. The distension disappeared, and on the twelfth day the slough separated. This case speedily got well, and two years afterwards, on my examining the leg, the ulcer continued quite well, and the veins appeared more arborescent—that is, the minute branches were more observable than natural.

In the case alluded to there was no untoward symptom, and from the result I was induced to persevere in the plan, and have now treated upwards of forty cases in this manner. I have generally succeeded in healing the ulcer in an unusually short time. My only application to the ulcer itself has been a little wet lint; and I have observed the ulcer produced by the separation of the slough, and the original ulcer, heal about the same time. In two cases, at the time of the separation of the sloughs, hæmorrhage came on to a considerable extent. In both instances the patients refused to confine themselves to bed; with these exceptions I never experienced any unfavourable symptom. In one case the caustic was applied in several different places before the patient quite recovered. In this instance the woman had suffered from varicose veins and a painful ulcer for

twenty-three years; the ulcer had been healed several times during that time, but did not remain healed for a month together. This was decidedly the worst case I ever treated on this plan. It is now nine years since the caustic was applied, and during the whole of that period she has continued well with one exception, and then, after a very hard day's washing, and exposure to cold, she had an attack of erysipelas in the leg, which terminated in abscess and ulcers, which were troublesome to heal. After a few weeks' perfect rest she got well, and has continued so. The varix had followed a severe burn, which occurred when she was fifteen years old.

The minimum age of the patients attended by me was 22; the maximum 78. Of the forty-three cases the shortest time of cure was nineteen days; the longest time 147.

10 were cured in a period averaging from 20 to 30 days.

15	"	"	30 to 40	"
8	"	"	40 to 50	"
2	"	"	50 to 60	"
5	"	"	60 to 70	"
1	"	"	70 to 80	"
1	"	"	80 to 90	"
1	.	.	took 147	"

In most of the cases one eschar has been sufficient. Occasionally the caustic had to be re-applied in consequence of the slough not penetrating deep enough, so as to destroy the vein, which can be always ascertained by the patient's rising from bed. In several cases the caustic had to be applied in more than one place, seldom more than in two places, in one instance in nine places. I have met with one case only that baffled this means, and that occurred in an old man, who had gloried in a bad leg with varicose veins for many years; he had travelled the round of several hospitals, and I suspect used means to irritate the ulcers, for invariably when it was about to cicatrize, I found a greenish slough present itself, which rapidly threw back our attempts. This man left the hospital uncured.

Of the cases enumerated there existed a larger proportion of men than women; they were of various ages, from 22 to 78; the stature was generally middle-sized, and their occupations varied. Of these cases only five returned to me with a recurrence of the ulcer, and enlargement of the vein, and then not until after a lapse of two years, and in one instance not until after the expiration of three years, although they were invariably requested to return, in case the leg became again affected. In several instances I have had the means of knowing that the cure has remained good. In hospital practice there is considerable difficulty in retaining a knowledge of patients after they leave the institution; nevertheless, it is only reasonable to suppose, that out of thirty-four cases treated there during thirteen years, all of whom appeared pleased with their recovery, a greater number than five would

have returned, if the disease had recurred. A few weeks ago a man (one of the five before alluded to,) applied to me to use the caustic again; he had been under my care two years ago. He stated that the leg had become painful, and that a small ulcer had formed above the inner ankle. On examining the leg I found several knots of veins, and the ulcer was looking irritable. An eschar was made above the highest knot, when the distension subsided, the pain disappeared, and the ulcer healed quickly.

But supposing that this mode of treatment only acts beneficially for two or three years, is it not superior to any other? It is free from danger; there is no difficulty in healing the ulcers; even those of many years' existence yield to it. Sir Everard Home found it necessary to discontinue tying the veins, and Sir B. Brodie and others deprecate the removal of a portion of the vein. The application of the needles, according to Phillips's plan, and needle and ligature according to Velpeau's, has not answered, without occasionally producing inflammation of the veins, and is acknowledged by its inventor as "very painful," and not unattended with danger. Sir B. Brodie acknowledges the inefficiency of his mode of dividing the vein, and with Sir A. Cooper, contented himself with using palliative measures,—such as the elastic stocking and bandages. The great advantage of the caustic, as a means of destroying the vena saphena, over every other method, is the safety with which it may be used, the facility of its application, and comparative ease to the patient. When necessary it can be re-applied, and this too, in several parts of the vein's course. Cases in which there existed great pain from inflammation of the ulcer and indurated integument, after the application of the caustic became easy and healthy.

Mr. Mayo published a case in 1834, in which he cured a varicose state of the veins in the leg by the application of caustic issues. Sir B. Brodie also mentions having applied the caustic potass in a case without any bad symptoms; he does not state why he discontinued its use. And M. Bonnet, surgeon to the Hotel Dieu, Lyons, has been in the habit of using the kali with great success. The rules he gives for its application are as follows:—

1. Many portions of caustic must be applied on the course of the dilated vein, at intervals of two or three inches.

2. The application should not be made, except in those parts of the veins which correspond to the muscles. The only places where it should be applied are on the superior half of the leg, and inferior half of the thigh.

3. The caustic must be applied at least twice at the same points, in order to reach the vein. This supposes that it is necessary, in order to obliterate the veins, to reach and open them with the caustic. In no case

after the first application, which only destroys the skin, and a little cellular tissue, has the flow of blood been found to cease in the veins; and they are never found converted into a hard cord, impermeable to the blood. It is only after being opened that these changes occur. M. Bonnet has not even once seen a tendency in the inflammation to propagate itself along the course of the veins, although three or four applications of the potass had been made on different parts of their course, and in the greater number had opened their cavity; the inflammation was, therefore, in all these cases, limited by the bands of adhesion, and perfectly circumscribed. These results prove that destroying the veins with caustic potass does not expose the patient to the danger of phlebitis, "and," says M. Bonnet, "finding every-day proofs of the innocence of this remedy, I now take no other precaution than that of confining my patients to bed."

It is a question for the consideration of surgeons whether it were better to make a sufficiently deep eschar on the first application of the caustic, so as to destroy the vein, or to apply it a second time, as recommended by M. Bonnet. I have found it necessary in a few instances to apply the caustic a second time, but in a very large majority of them the eschar was sufficiently deep by the first application to destroy the vein, indicated by its becoming converted into a hard cord-like substance. Whenever I found the vein continuing pervious, which is denoted by its continued distension, I re-applied the caustic. I have only found it requisite in ten cases to use the caustic, as recommended by M. Bonnet, at several parts of the vein; in five of these it was necessary to use it in two places; in two it was applied in four places; in two in three places; and in one in nine places. I do not advise its application at intervals of two or three inches at several parts of the vein, as adopted by M. Bonnet. Where the first application is sufficient to take in the vein, it is usually found sufficient for the cure. It may be requisite to apply it in more than one place, but this forms the exception to the rule. When the slough comes away, a healthy ulcer is left, which usually heals by the simplest means, and generally at the same time with the original ulcer.

ON THE PHYSIOLOGICAL ACTION OF INHALED ÆTHER.

By J. BLACK, M.D., Physician to the Manchester Union Hospital.

The remarkable, and, we may now say, the popular, administration of æther, by inhalation, for producing insensibility to pain, during surgical operations, and some idiopathic affections of the body, has been put to a very general trial throughout the kingdom. The result, according to the numerous reports, has been, in the great majority of cases, declared satisfactory, and in many cases so successful, that the process has been pronounced

in several quarters, as the discovery of discoveries of the nineteenth century, and as one of the greatest blessings to suffering humanity. It is true that some cases have been reported unsuccessful, and a few others have been candidly represented as either fatal in the result, or followed by injurious effects.

Amidst all these generally favourable and exceptionable reports, although mostly given with practical detail, I have, as yet, seen no scientific solution of the *modus operandi* of this novel application of æther on the animal and sentient organism, and scarcely any attempt at a rationale of the process. Some have stated that the physiological action is narcotic; others sedative; while the majority of those who have touched the question, have compared the effects of inhaled æther with those of intoxication from alcoholic liquors, or the Indian hemp.

After so much practical experience of the visible effects of this remarkable process, it may not be considered premature now to examine some of the essential conditions of the question, to see whether we can approach to any fair physiological solution of it.

In the first place we have the chemical substance, rectified sulphuric æther, long known and used in medical practice as a quick diffusible stimulant and antispasmodic. It is a compound of carbon, oxygen, and hydrogen, and has a specific gravity of 0.750 at 40°, and 0.715 at 60°, according to Dumas and Brande. What is its more peculiar property is the density of its vapour, being at the mean pressure and temperature, as 2.58 to air, as=1. The elastic force of its vapour is another property of most important consideration, being at 54°, Fahrenheit=10.3 inches of mercury, at 64°=15, and at 96°=30 inches, gradually increasing in tension, till at 212° it has a force of 240, according to Dalton; it, moreover, boils under a pressure of 30 inches, at 98°, Fahrenheit.

Let us next examine the conditions of the subjective part of the theorem—the animal lungs and body, to see if there is any physiological path for us safely to follow. The human body has a temperature, varying from 98° to 100°, and we may consider the lungs, immediately after expiration, to be about either of these temperatures. The temperature of the æther inhaled has been at various degrees, from what is called temperate, up to 75°. On this difference of temperature depend greatly the physical and other effects of the æther vapour on the tissue of the lungs, and its ultimate force on the sentient brain. According to Dr. Snow, air, saturated with the vapour, at 54°, contains about one third of its bulk of vapour, and at 75° it contains more than one half. The simple result then of inhaling this vapour, at whatever degree of saturation, will be to increase its elastic force or extrinsic pressure, from 15 to 30 inches of mercury, if it is inhaled at a temperature of 64°. If taken at 75°, at the full point of saturation, the practical increase of elastic force will not be very much less. There can be no condensation of this vapour in the lungs, for even if imbibed in a liquid state, the heat of the body, at 98°, would soon throw it into vapour, that temperature being its boiling point, which is a very curious coincidence.

From these conditions, extrinsic pressure must be, with greater or less force, made on the air-cells of the lungs; it may be hazardous to calculate the amount