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With the writer's kindest regards.

VARICOSE VEINS AND THEIR TREATMENT BY TRENDELENBURG'S OPERATION.

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Varices, or ectases of the veins, were for a long period considered as simple dilatations of the vessel without any change in its tissues, but to-day we know that this understanding is erroneous. Varices are met with in various regions of the body, but only infrequently are they found in the head, mouth, vagina, or bladder. Sometimes the upper limbs may be the seat of the affection. The hæmorrhoidal veins and those of the spermatic cord are often the seat of venous ectasis, but by far the most common site for this pathological condition is the lower limb, and more especially in the domain of the saphenous vein.

According to their shape we have simple, cylindrical, cirsoid, and serpentine ectasis; in the latter case there is also an elongation of the vessel. We often meet with cases presenting true nodes of varicose veins which form a tumor. Now, as varicose veins are, so to speak, a special affection of the saphenous vein, and as Trendelenburg's operation is performed for the relief of these cases, a few words regarding the situation of this vessel may not be perhaps out of place here, and which we will quote from Quain's "Anatomy," ninth edition.

"The external or short saphenous vein, smaller than the internal, proceeds from the outer end of the arch on the dorsum of the foot. It passes behind the outer ankle and ascends

in the leg along the outer border of the tendo Achillis, in company with the external saphenous nerve, and then over the internal, between the heads of the gastrocnemius, to the lower part of the popliteal space, where it perforates the deep fascia to end in the popliteal vein. Opposite the ankle and along the leg it communicates with the deep veins; and it receives superficial branches from the outer part of the foot and heel, and the back of the leg, as well as one which descends on the posterior surface of the thigh. A communicating branch passes from this vessel near its termination upward and forward to the internal saphenous vein, and sometimes the trunk itself follows this course, having no connection, or only a very small one, with the popliteal vein."

The deep veins may also be the seat of ectasis, as has been demonstrated by Verneuil, but these are far from having the clinical importance of the saphenous vein. The deep vessels are surrounded on all sides by hard and firm tissues which uphold and protect their walls, and, what is more, the muscular contractions greatly aid the circulation in the deeply situated veins.

In 1877, Bardeleben demonstrated that the veins of the lower extremities were very richly supplied with unstriped muscle and valves, for, of all the veins in the economy, these are most assuredly the ones that have the greatest amount of pressure to support, and, consequently, when the muscles and valves become insufficient, they will be more easily distended than others. The valves are of the greatest importance, because they divide the blood column into several segments, so that in the normal state this column does not bring all its weight to bear on the veins of the lower limb.

When the valves become insufficient, from no matter what cause, the entire weight of the blood column must be supported by the walls of the veins. Other factors may produce an increase in the pressure, such as an elastic circular garter, which is so frequently a cause, or a hernia truss having too much pressure over the crural canal. A stricture of the orifice in the fascia lata has also been mentioned as a cause of

varix of the saphenous vein. Pregnancy is particularly favorable for the development of ectasis, either by increasing the abdominal pressure or by direct pressure on the iliac vein and vena cava. A varix so produced does not always disappear after labor, even when the circulation is again in a normal condition, and, according to Lesguillon, 5 per cent. of women who have borne children are subjects to this affection, a statement that the writer believes to be correct. Cysts of the ovary and uterine fibroids have the same effect as a pregnant uterus.

Occupations obliging the subject to remain on his feet for hours at a time, such as postmen, shop-girls, waiters, soldiers, porters, etc., predispose to venous ectasis of the lower limbs, and it may be for this reason that men appear to be more often affected by this trouble than are women. Certain affections of the legs may produce varices, for example, a large callus or a cicatrix of the skin which directly compresses the subcutaneous veins. And, lastly, pulmonary emphysema or an organic disease of the heart may be set down as factors on account of the obstacles to the general circulation produced by them.

Venous ectases produced by these various causes develop slowly and progressively in most cases, but infrequently we meet with subjects whose veins became varicosed after a violent exertion or a contusion. But it must be said that an increase in the blood-pressure is not generally sufficient in itself to produce a varix, and it coincides with a pathological change in the walls of the veins. Billroth, Orth, Bardeleben, Ziegler, and Lesser have demonstrated this fact. The researches made by Cruveilhier and Cornil have demonstrated that the walls of the veins in a state of ectasis are thickened at certain parts and thinned at others. The middle tunic presents the most marked changes, and occasionally it is so very thin that some parts of the vessel will be entirely lacking in it, while at other points a true hypertrophy of the middle tunic will be present.

The condition of the vessel walls naturally varies with

the degree the morbid changes present, because it often happens that the middle tunic is in the first place hypertrophied and later on undergoes atrophy. Epstein demonstrated that dilatation of the veins produced a change in the walls of the vessels, and he clearly showed that hypertrophy of the middle tunic, followed by atrophy, is the process that takes place. This tunic, as well as the external, is more vascularized and presents a round-celled infiltration. The writer has always found the intima the seat of a formative endophlebitis, which decreases the size of the lumen of the vessel, and has also noted a dilatation of the vasa vasorum, with hypertrophy of their walls.

Dilatation of the veins always produces a slow circulation in the distant venous branches. This is what also occurs in the case of dilated arteries, and in both instances there is a neoformation in the tissues of the intima, with this difference that the neoformative process commences with a slight amount of change in the dilated arteries, while in the veins this change occurs later on.

According to their stage of development we can divide varicose veins into three degrees.

First Degree.—The veins are only *dilated*, without any pathological change in their walls. These dilatations may disappear after the cause has been removed, as, for example, after labor or the removal of an abdominal tumor.

Second Degree.—Here we have dilatation and deformity of the veins with hypertrophy of the middle tunic. If such a vein be cut across it will remain gaping and give rise to severe hæmorrhage.

Third Degree.—In this stage we have marked morbid changes in the vessel walls. Hypertrophy is everywhere, and often the middle tunic is so thin that it readily bursts, and at the points of rupture partial sacculated dilatations arise. On account of this dilatation the valves are prevented from coming in contact with each other, and insufficiency results.

It must be remembered that the valves are simply a reduplication of the intima, and consequently undergo the same

pathological changes as the walls of the vessel. After their function is lost they undergo fibrous contraction and may even disappear.

At a very advanced stage the vessel walls will have lost their elasticity; they are soft and imbibed with blood.

The blood in the first and second degrees of ectasis remains normal, only circulation is slower in the dilated vessels. In the third degree circulation is still slower, and coagulation takes place at certain points, and the clot thus formed obliterates more or less completely the lumen of the vein. This coagulation is not the result of the slow circulation, but is due to the morbid changes in the walls of the vessel.

The parts surrounding the diseased veins are altered. The cellular tissue is infiltrated with an inflammatory exudation, and sometimes its vascularization is increased. The skin is thickened and adherent, while the subcutaneous veins are dilated; or, on the other hand, it may be thin, shiny, and ulcerated. The pigmentation is the result of capillary extravasation and transudation of the red corpuscles.

The diagnosis of varicose veins is generally a simple matter. The process often commences by a dilatation of the cutaneous veins, which are first seen as bluish spots or pigmented points. When the patient stands the veins become turgescent, but if the leg be raised while the subject is in the recumbent position the ectasis becomes rapidly emptied, but will fill again as soon as the limb is in a declining position.

Varicose veins are more often larger in summer than in winter; they dilate when the patient takes a warm bath and contract by contact with a cold application. Slightly developed ectasis gives rise to hardly any symptoms, the skin is normal or nearly so and moves easily over the underlying tissues, the only thing complained of by the patient being a sensation of weight or a vague pain in the leg after walking.

In a more advanced degree the varix affects the shape of sacciform dilatations, which may be as large as a walnut or even larger. These varices are soft, fluctuating, and the skin covering them is thin. These large varices are more

frequently found on the trunk of the saphenous vein near the crural ring or below the internal condyle of the femur. A chronic œdema is often present in their neighborhood, which renders their dissection difficult.

A large varix seated near the crural ring has been mistaken for a hernia on account of the reduction of the tumor obtained by digital pressure, but this error is avoided if the leg be raised or if the femoral vein be compressed above the tumor.

A very large varix may pulsate, and give rise to bruit isochronous to the heart-beat, but this bruit and the pulsations do not belong to the varix, but are propagated from the underlying arteries.

The diagnosis of deep-seated venous ectasis is far more difficult. Here we find the patient complaining of a tired feeling in the limb after a short walk. Cramps and neuralgic pains are frequent and are more especially felt in the calves of the legs. Perhaps we can explain these painful phenomena by the pressure produced by the dilated vessels on the neighboring nerves.

A gentleman of forty consulted the writer not long since for a very disagreeable tingling sensation in both legs, particularly in the calves. His family and personal history excluded gout, rheumatism, malaria, venereal disease, or nervous trouble. The patient was engaged in a large grain business which kept him constantly on his feet.

When he retired his legs would immediately feel better, and in the morning, unless he had taken an unusual amount of exercise on the previous day, they would give him no trouble until he had been about for a couple of hours.

When the patient was first seen this state of affairs had existed for over seven years. He had seen many physicians, most of whom had pronounced his case to be muscular rheumatism, while one or two told him that he was commencing a tabes dorsalis. A diagnosis of deep venous ectasis was made, and he was ordered elastic stockings to extend above the knee, and when last seen by the writer was quite comfortable, although not en-

tirely cured. It may be said that there was absolutely nothing to be noted as to the appearance of either legs; the skin was normal excepting a very slight dilatation of the subcutaneous veins at certain points, and their development symmetrical.

The progress and prognosis of venous ectasis are very different according to the case, and really greatly depend on the occupation and social condition of the patient. Consequently the worst cases are more frequently met with among the working class.

As has already been said, their development is slow, but after a time changes occur in the varix and surrounding tissues. As a slow circulation is most favorable for the formation of a thrombus, these often arise in varicose dilatations, especially in the pockets formed by the valves. Their changes are numerous.

In the more favorable cases the thrombus becomes organized, transforming little by little into hard connective tissue, and by thus completely obstructing the lumen of the vessel brings about a spontaneous cure of the affection. But the thrombus formation is not without danger, because if it should disintegrate it will give rise to emboli. A thrombus may become infected and give rise to abscess or pyæmia.

Another complication of great danger is venous hæmorrhage. It may take place from a slight wound from scratching or by spontaneous rupture from exertion. The skin being so thin, it gives way at the same time that the vessel wall ruptures. As these ruptures are without pain, the patient may not be aware of the large amount of blood that is escaping from the wound, and fatal cases have been reported.[1]

It may also happen that the skin does not rupture at the time the vein opened, so that the blood becomes pent up in the subcutaneous cellular tissue, in which case the patient is seized with pain and a considerable tumefaction of the parts.[2]

The last and at the same time most frequent and impor-

tant complication of varices is varicose ulcer. The lower limb offers a particularly good position for the development of ulcers on account of difficulty of circulation. If to this circumstance we add a circulation which is hindered by the ectasis, an incomplete nutrition of the parts, we can readily understand why a slight, superficial erosion, contusion, or eczema are sufficient to provoke the formation of a varicose ulcer. For that matter these ulcers also arise spontaneously.

They extend in surface little by little as well as in depth, and an irregular wound with cleanly cut borders, with a bottom covered with sluggish granulations or none at all, secreting a fetid and bloody liquid, results. This wound may become infected and suppurate, and in some cases give rise to a general infection or to erysipelas. Hæmorrhages also occur. The ulceration may take on such dimensions that in some cases amputation has had to be performed.

It is only when these ulcers are of considerable size that the patient will come for treatment, for varicose veins do not generally give rise to much trouble, and many are the therapeutical measures that have been extolled for their cure. Without going further into the consideration of the treatments of varicose veins and ulcers, as none of them are really of any value, for the very simple reason that they only treat the ulcer without suppressing its cause, we will simply describe Trendelenburg's operation, which, as we shall endeavor to demonstrate, is the ideal method of treating these most unfortunate patients.

Trendelenburg's operation is certainly the greatest progress that has ever been made in the treatment of ectasis of the saphenous vein, and although every case operated on has not resulted in a complete and radical cure, we at least almost always have a very marked improvement, with rapid cicatrization of the ulcers.

While studying the conditions of blood-pressure in the veins, Trendelenburg based his theory on the fact that the greater number of varicose veins of the lower limb are in relation with a general dilatation of the saphenous vein, and that

on account of this dilatation insufficiency of the valves results. As the inferior vena cava and iliac veins are devoid of valves, it naturally results that the blood column which extends from the saphenous vein to the right heart is not divided into segments, and consequently presses with all its weight on the walls of the saphenous and its ramifications. This hypothesis might explain the œdema, vague pains, and ulceration so frequent in varicose veins.

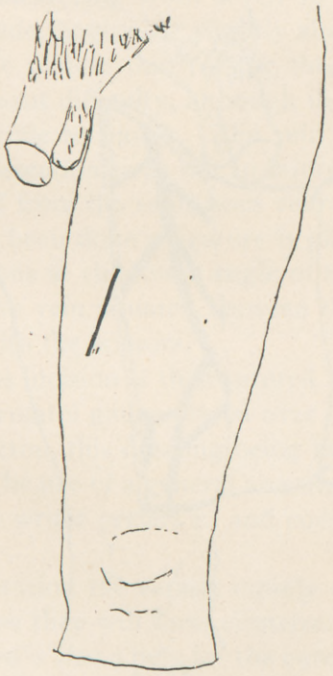

FIG. 1.

In order to give weight to his hypothesis, Trendelenburg performed the following experiment: He emptied the varicose veins of the leg by elevation of the limb and then lowered the leg again, but exercising strong pressure over the trunk of the saphenous vein. He then remarked that the veins were refilled slowly by the return blood coming from the arteries, while at the instant compression of the vein was

stopped a blood wave came from above downward, instantly filling all the venous trunks, thus proving that there is a great central pressure acting on the walls of the veins, and from this reasoning Trendelenburg advised ligature of the saphenous vein at two points followed by section of the vessel between the ligatures.

The operation of ligaturing the external saphenous vein is very simple and requires no special instruments. The re-

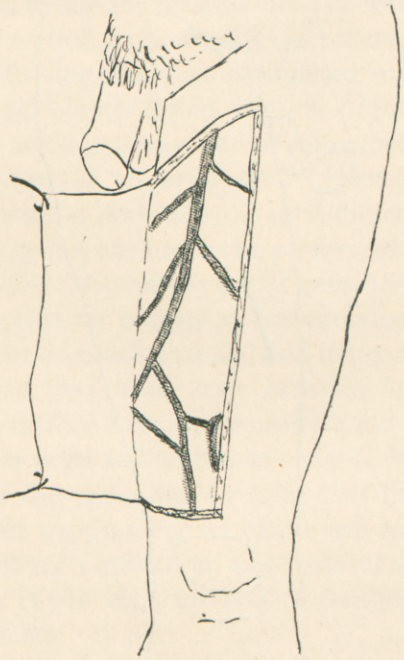

FIG. 2.

gion of the incision should be shaven and properly disinfected, and a rigorous asepsis must be maintained throughout, for infection of the vein, resulting in a suppurative phlebitis, with all its consequences, might otherwise occur, and it is for the same reason that union of the incision by first intention should be secured. We do not recommend the use of Esmarch's band, although some surgeons advise its use.

To find the line of incision, the internal aspect of the

thigh should be carefully explored, and a bluish line will be seen, which indicates the course of the internal saphenous vein. The vessel will be very easily found if it presents an ectasis in this region.

Subjects in which the course of the vein is not readily seen may necessitate a slight constriction at the upper part of the thigh, so that the superficial veins will distend as the blood continues to be pushed through by the arteries.

An incision measuring from seven to ten centimetres should then be made, beginning slightly above the union of the lower with the middle third of the thigh. The vein is usually found without difficulty, although in stout persons it may take a little time to find it. The vein is then carefully freed by a blunt dissection so as not to injure the vessel. All branches going off from the saphenous vein are now ligated, and when this has been done a ligature is placed on the vein at the upper and one at the lower angle of the skin incision. That portion of the vein situated between the two ligatures is then exsected with the scissors.

The cutaneous incision is then sutured and a large piece of xeroform or dermatol gauze placed over it, then over this a thick layer of cotton, this dressing being kept in place by a roller bandage. The use of a general anæsthetic is not necessary, although the writer prefers it, and cocaine may be employed.

After the operation the ectasis rapidly decreases, and if there be ulcerations they will soon cicatrize. It is quite evident that rest in bed is also a help for the cure, but it is certain that they heal more rapidly after this operation than by any other treatment combined with rest in bed. It is well to have an elastic stocking worn, for a few months at least, after the operation.

Tenacious varicose ulcers, which, as we all know too well, resist all treatment, certainly heal in a most astonishing manner after ligature of the vein.

The results reported by Trendelenburg, Tobold, Chatelain, Faisst, Perthes, Cordebart, Schäffer, and others are cer-

tainly good in the majority of cases, and a permanent cure has resulted.

The writer has done this operation seven times, and here reports briefly his cases.

CASE I.—Mrs. J. H., aged thirty-seven years. Four children; the last being three years of age. Since birth of last child has suffered from a well-developed ectasis of left leg. No ulcers. Much pain and sensation of tension in leg. Heart and lungs normal. Urinalysis negative.

Operation March 12, 1896. Vein easily found. Union *per primam.* Result: Complete disappearance of ectasis within ten weeks after operation. Examined in October, 1897, and no relapse found.

CASE II.—Miss S. D., aged twenty-nine years; shop-girl. For past six years has been considerable of a sufferer from ectasis of veins of left leg. Great discomfort towards afternoon, after patient has been standing during the morning. Otherwise in very fair health.

Examination showed enlarged veins on inner aspect of leg, especially marked over internal condyle of tibia.

Operation on April 17, 1896. Result: Permanent cure when seen in October, 1897.

CASE III.—L. J., aged fifty-seven years, housewife; seven children. Well-nourished, healthy woman. Has suffered from ectasis of internal saphenous vein for over seven years. About seven months before consulting writer, an ulcer appeared about four centimetres above the internal malleolus, and had attained the size of a quarter of a dollar.

Operation September 20, 1896. Vein quickly found. Union *per primam.* Ulcer cicatrized at the end of five weeks and ectasis greatly diminished.

Seen in September, 1897. No return of ulcer; a few varicose veins still to be seen over calf of leg, although in no manner to be compared with the original condition. Patient states that her leg gives her no inconvenience.

CASE IV.—L. F., aged sixty-four years; washwoman. Large varicose veins of left leg with a large circular ulcer on internal aspect of leg, about seven centimetres above malleolus.

Operation November 12, 1896. Some difficulty in exposing

vein on account of abundant subcutaneous cellular tissue. When found, the vein was small and rather sclerous. Discharged in six weeks; ulcer healed; ectasis greatly diminished.

Seen in September, 1897. Leg in excellent condition. No return of ectasis or ulcer.

CASE V.—G. H., aged forty-six years; housewife. Has suffered from varix of both legs for several years. Trophic disturbances began to occur in right heel, causing much pain, especially towards evening, and obliged the patient to seek medical advice.

Examination showed a varicose condition of the veins of labia majora, but uterus and adnexa appeared to be normal. General condition good. Negative urinalysis.

Operation on January 8, 1897. Both saphenous veins were ligated in one *séance*. Recovery uneventful. Trophic disturbances over right heel ceased almost immediately after operation. Discharged in six weeks.

Seen in October, 1897. A slight ectasis on right leg; left leg normal.

CASES VI and VII have been operated on within the past four months, and consequently it would be premature to consider the result, which up to the present is good, as permanent. The last case, an old lady of sixty, presented an anomalous condition of saphenous vein of right leg. After incising at the point of election no vein could be found, it being replaced by a number of small branches. A second incision over the internal aspect of the condyle of the femur, however, exposed the internal saphenous, which was ligated at this point.

This anomalous condition of the internal saphenous vein is mentioned by Sappey, Cruveilhier, and other anatomists.

REFERENCES.

[1] Eczema is of common occurrence in the region of a varix. It will appear sometimes without any material cause, while at others a traumatism will be the factor in its production. According to Broca, an eczema is nearly always present before the appearance of an ulcer, and is a frequent cause of the latter complication.

Syphilitic eruptions may also arise and complicate a varix. These are more particularly secondary or tertiary ecthyma and gumma, which remain sufficiently characteristic in appearance to make a diagnosis in the vast majority of cases. Verneuil particularly insisted on what he termed "hybridité syphilitico-variqueuse" of ulcers, and pointed out the part

played by antisyphilitic treatment in bringing to light the true nature of the affection.

[2] It may be well to here append a few words regarding *varicose phlebitis.* A varix of the first degree is not so liable to become inflamed as those of the second and third degrees, but serpiginous ectasis and varicose tumors are more readily subject to inflammatory processes. Pregnancy, constitutional conditions, and the infectious diseases are the predisposing causes.

Local causes, such as a local infection entering through an ulcerated or ruptured vein, are important factors, while overwork and privation only secondary ones. The infectious agent penetrates the tissues and is then carried through the vessels in the circulation.

Deep varicose veins may rupture from a sudden contraction of the muscles, a shock or a violent traumatism producing a fracture, and a phlebitis has been thus set up, which has in some cases ended in deep suppuration and pulmonary embolus.

Two forms of phlebitis are met with,—viz., diffused phlebitis and phlebitis of varicose nodules. The first variety is usually insidious in its beginning; there is a rapid fatigue in walking and œdema of the leg at the end of the day. Finally, there are all the usual symptoms, such as pain and changes of the skin along the track of the vein. The phlebitis may remain localized to a small portion of the vein or may invade the entire venous system of the limb, in which case embolus is to be feared.

A. Broca has given as special description of inflammation of the ampullæ, which may be attacked separately, although having undergone little previous pathological change. The diagnosis is a simple matter when there are only a few inflammatory nodes, but it becomes difficult when they have become fused into one phlegmonous mass, which may be mistaken for a syphilitic gumma or an erythema nodosum.

LITERATURE.

Trendelenburg: Ueber die Untersuchen der Vena Saphena Magna bei Unterschenkelvaricen, Klinische Chirurgie, 1890.

Bardeleben: Lehrbuch der Chirurgie und Operationslehre.

Duplay et Reclus: Traité de Chirurgie.

Tillaux: Traité de Pathologie externe.

Follin: Traité de Pathologie externe.

Bruns: Beiträge zur klinischen Chirurgie, Band xiv.

Tobold: Ueber Varicen der unteren extremität, etc., Dissertation, Bonn, 1889.

Chatelain: Traitement des Varices, etc., Geneva, 1896.

Schäffer: Ueber der Erfolge der Unterbindung der Vena Saphena Magna bei Unterschenkelvaricen nach Trendelenburg, Kiel. 1896.

W. H. Bennett: Treatment of Varicose Veins of the Lower Limbs, Clinical Journal, January 19, 1898.