

ART. XVI. *Die Gefässdurchschlingung. Eine neue methode, Blutungen aus grösseren Gefässen zu Stillen.* Von Dr. B. STILLINO, prakt arzt zu Cassel. 8vo. pp. 152, Marburg, 1835.

*Die natürlichen Prozesse bei der Heilung durchschlungener Blutgefässe mit besonderer Rücksicht auf den Thrombus. Aus einer grossen reihe Von Versuchen an Thieren abgeleitet.* Von Dr. B. STILLINO. &c. 8vo. pp. 304, Eisenach, 1834.

*Geschichte einer amputation des Oberschenkels, wobei die durchschlingung der art. fem., art. prof. fem. und der vena fem. in anwendung gezogen wurde.* Von Dr. B. STILLINO, &c. 8vo. pp. 32, Hanover, 1837.

THE three works, the titles of which are given above, have reference to a new process invented by their author, Dr Stilling of Cassel, for the arresting of hemorrhage from the large vessels, whether arteries or veins, when these have been divided by an accidental wound or in operations, as well as for the obliteration of large blood vessels in cases of aneurism, &c. The process consists in carrying the divided extremity of the vessel upwards and passing it through a loop cut in its side, a short distance above the division.

This operation, when skilfully performed, is described as a perfectly secure means for arresting hemorrhage and as affording a more certain security against secondary hemorrhage than either the ligature or torsion. It is, however, in the language of Professor Hertwig, more difficult of execution, requires a more firm and skilful hand, and greater accuracy of vision than the ligature or torsion, and, also, occupies more time. It is, likewise, liable to have its success impeded or entirely destroyed by a greater number of trifling circumstances than is the case in either of the other methods for arresting hemorrhage;—it requires too for its accomplishment a larger portion of the vessel to be laid bare—it is represented nevertheless as inflicting less injury upon the vessel and less irritation upon the surrounding parts, and consequently as presenting a less impediment to the speedy union of the wound in the soft parts than the ligature or torsion.

It may be readily executed, we are assured, on all blood vessels, which have more than a line in diameter, and it is to be preferred, in injuries of the larger arteries, where an immediate union of the external wound is desirable, as in wounds of the abdomen and of the protruded bowels, in punctured wounds that can be freely enlarged, and in all cases indeed in which the divided vessel lies superficially; it being absolutely necessary in the operation under consideration that the entire end of the wounded vessel be completely within sight. On the other hand, the operation, we are told, cannot well be performed and is not to be recommended, as a general rule, in vessels of a less diameter than one line; in the larger veins; in deep seated vessels; especially when the external wound is small in extent; in such vessels as are liable to retract, when wounded, within bony channels; in vessels the parietes of which are hardened or ossified, and finally, in any case in which the life of the patient will be endangered unless one or more bleeding vessels be promptly secured.

In the first named of the works before us the operation is minutely described—of this description we present the following summary.

The instruments required, where the operation is to be performed on a divided artery, are, a common anatomical forceps, with tolerably broad points, a compression forceps, a spear pointed knife, a small forceps with slender points, slightly curved, and a thin blunt probe.

When the vessel to be operated on is undivided, in addition to the above instruments, and those necessary to lay bare the vessel, there will be also required a second compression forceps, and two ordinary forceps, to hold the deep seated ends of the vessel after its division. The forceps with which the end of the artery is carried through the loop in its side, must correspond with the diameter of the vessel, hence it is necessary that the operator be provided with several of different sizes.

When the vessel has been divided by an external wound &c., the end of it is to be drawn out somewhat as in the application of a ligature, and a compression

forceps applied upon it, at the distance of rather more than twice its diameter, from its open end. If the end of the artery is covered with a considerable amount of thick cellular membrane this is to be separated with a forceps or knife. The operator with a forceps now seizes the vessel transversely near its divided extremity, and renders it flat and tense. He then transfixes the vessel with the spear pointed knife, at about half a line to a line according to the size of the artery, from the edge formed by the flattening of its coats, and in this manner makes an incision through both its sides, in the direction of its long axis, equal in length to the diameter of the vessel and beginning about the same distance above its divided end. Through the loop thus formed in the side of the vessel, the points of a slender forceps are to be introduced from below, and passed out a short distance beyond the loop on the upper surface of the vessel. The second forceps may now be removed and the blunt end of the probe being introduced about one or two lines within the cavity of the vessel at its divided extremity, by its assistance a fold of the latter is to be carried upwards, so as to enable the points of the forceps passing through the loop to seize the greater part of the circumference of the divided extremity, which, by the careful withdrawal of the forceps, is to be carried by them from above downwards entirely through the lateral loop and somewhat stretched so as to place the latter as high up on the inverted end of the vessel as possible. The compression forceps are now to be removed and the vessel allowed to retract while the everted end is to be carried to the bottom of the wound. When the operation is to be performed on an undivided vessel—this is to be laid bare and insulated as for the application of a ligature, to about four times its diameter if a small one, and to about three times if a large one. One of the compression forceps is now to be applied at each end of the insulated portion, which is to be divided in the centre by a sharp knife and both ends of the vessel beginning with that nearest the heart are to be interlooped as in the case of a divided vessel.

The description of the operation, of which the above are the general outlines, is followed by observations on the various circumstances occurring, either during the operation or subsequently, by which it may be impeded, or its beneficial results diminished or destroyed. It is not our intention here, to give an account of them; to those who would desire to make themselves familiar with the operation, a superficial notice of them would be of little or no value, and our limits will not permit us to enter into minute details.

We may remark, however, that among the things to be guarded against in the performance of the operation, the following are described as the most prominent.

Hemorrhage, from the slipping off of the compression forceps from the end of the vessel—this is to be avoided by care on the part of the operator;—when it occurs, the divided end of the vessel must be sought for in the usual manner, and the forceps again applied.

The longitudinal incisions, by which the loop on the side of the artery is formed, may be made too long, or too far from the side of the vessel towards the centre of its upper surface, or they may be made too near to the edge or too short. In the first two cases the operation will be rendered unsuccessful—the blood escaping through the incisions;—in the third case, the loop will be liable to be torn in carrying the end of the vessel through it, or become too much stretched to retain the latter. In the last case, the end of the vessel cannot be carried through the loop without difficulty or injury to the former. Where the incision is too short, the difficulty may be obviated by enlarging it; but in the other cases, the lower end of the vessel must be cut off, and the operation repeated higher up.

The loop may be made too near to the divided extremity of the vessel, so that the end of the artery is allowed to slip out of the loop.—The incision in this case must be made on the opposite side of the artery, somewhat higher up.

In the contrary case, when the loop is made too high up, the vessel is too much dragged forward, or laid bare to too great an extent, and cannot retract sufficiently, but coming in contact with the soft parts at the bottom of the wound, it is heated in the matter produced by suppuration, which is especially to

be avoided. The best procedure in such case, is to remove a portion of the end of the vessel by a sharp knife or scissors.

The perfect closure of the divided end of the vessel, after the loop operation, takes place, it is stated, in about the same time as after the other operations for arresting traumatic hemorrhage.

In the second of the works before us, Dr. Stilling has presented a very full and interesting history of the natural process by which the divided end of the blood vessel is permanently closed, subsequent to the loop operation, deduced from an extensive series of experiments on animals. From these experiments, it appears, that the divided end of the vessel soon retracts to a greater or less degree in different cases, and at the same time lessens in diameter, and there forms within the vessel, between the part at which the loop is formed and the first lateral branch, a coagulum by which the entire obliteration of the vessel is effected. The circumstances connected with this coagulum, denominated by the author, the thrombus, and the gradual changes which it undergoes, constitute the principal theme of the present work. The following are the general conclusions deduced from the observations and experiments of Dr. S., on this subject.

In arteries, the formation of the thrombus commences soon after the closing of the vessel, and is completed within the first eighteen hours.

The greater the repose of the blood at the closed end of the vessel, from diminished action of the heart and of the voluntary muscles, the more rapidly the thrombus forms, and vice-versa. Hence its formation commences later in the end of the vessel towards the heart, than in the opposite one.

The greater the tendency of the blood to coagulate, the quicker the thrombus is formed, and vice-versa. It is formed more early also, in the smaller than in the larger vessels.

The thrombus, is formed by the coagulation with a greater or less separation of its parts, of the blood contained in the closed end of the vessel below the first considerable lateral branch. The colouring matter of this blood, the cruor, forms always the basis and body of the thrombus, and in small vessels the extremity also. The fibrinous portion collects especially towards the extremity of the coagulum, which in the larger vessels is formed by it exclusively. When the amount of fibrinous matter is small, and the disposition of the blood to coagulate is consequently diminished, it does not become separated in the thrombus from the cruor: when the fibrine of the blood is more considerable, and it is disposed to coagulate rapidly, the thrombus is formed of layers of the red globules, and of the fibrine.

The serum of the blood forming the thrombus is partly diffused throughout the substance of the latter, partly imbibed by the parietes of the vessel, and partly escapes through the lateral branches given off at the closed extremity.

The form of the thrombus in vessels either closed by ligature or by a loop, is that of a spindle, or of two unequally sized pyramids connected at their bases by a cylindrical portion, their points presenting in opposite directions. The external surface is in general smooth. The apex of the smaller pyramid or cone is directed towards the closed extremity of the vessel. The body of the thrombus is formed of a cylindrical portion, tapering in the direction of the heart, which, according as it is longer or shorter, causes the cylindrical or pyramidal form of the coagulum to predominate. In the generality of cases the longest pyramid forms the apex of the thrombus—this, however, is often, only the short truncated termination of the body of the coagulum: the greater the amount of fibrine the blood contains, the more accumulated is the point, and *vice versa*.

The apex is always directed towards the still pervious portion of the vessel, —consequently towards the heart in the upper portion of the divided vessel, and from it in the lower portion.

The length of the thrombus is always in proportion to the distance of the orifice of the first considerable lateral branch from the closed extremity of the vessel—the more remote this occurs the longer is the thrombus, and *vice versa*.

Small lateral branches which go off near to the closed end of the vessel and quickly ramify, are filled with a prolongation of the coagulum. In large arteries

a still pervious lateral branch is also often partly filled, by a prolongation from the apex of the thrombus.

The diameter of the base, and of the body of the thrombus corresponds, in most cases, with that of the calibre of the vessel, and, hence they fill completely the latter, but at the apex the diameter of the thrombus is always less.

In the larger vessels the colour of the thrombus, at its base and body, is dark red or black, towards the apex, it becomes gradually lighter, the apex itself being whitish or yellowish. In smaller vessels the entire coagulum is of a dark red colour. Internally, the colour of the thrombus differs from that of the surface, only in those instances in which the fibrine predominates, more or less, in the concentric layers of which the coagulum is composed.

The thrombus at first adheres but loosely at its basis to the parietes of the vessel, and scarcely at all at any other part, its apex is always entirely free: in cases, however, in which the inner coat of the vessel has been torn or otherwise injured, a more extensive adhesion may early take place.

The thrombus is the least firm at its basis and body, more so towards its apex, and at the latter the most.

The coagulum in its first period affords no security of itself against the escape of the blood from the extremity of the vessel.

According to the size of the artery in which the thrombus is situated, blood vessels commence, between the first and sixth days, to be formed in the latter—in small vessels the earliest and in large vessels the latest. They appear first on the body and in the centre, and subsequently at the basis; when the formation of these vessels in thrombus takes place, a plastic substance is formed within it as well as on its outer surface.

No change takes place in the form of the thrombus until towards the termination of this period, when it becomes diminished in every direction, and the outer surface of the base and body to be covered with flocculi, while generally the surface of the apex remains still smooth.

The colour of the thrombus becomes of a brighter red than in the first period, first on its middle portion and at its apex—it gradually changes from a dark flesh red to a pale rose colour.

The adhesion of the thrombus to the inner surface of the vessel at its basis, and commonly over a great portion of its body is now firm, so that it can be separated only by force: usually the apex is still free.

The firmness or density of the thrombus becomes gradually alike throughout, and may be compared to that of a firm flesh granulation.

The foregoing changes take place more rapidly and earlier in small vessels, than in the larger, and also quicker in the divided end of the vessel farthest from the heart, than in that nearest to it.

The thrombus, in the generality of cases, now forms a complete security against any hemorrhage from the end of the vessel which it closes.

In the third period, the thrombus consists of a uniform homogeneous animal matter, its form is similar to that of the portion of the vessel in which it is formed—being cylindrical in most cases, but often however spindle-shaped or conical. Its colour is at first yellowish, subsequently grayish, white, or entirely white. Its consistency is that of a fibrous cellular mass. It now adheres throughout to the inner surface of the artery; excepting, that, at first, a portion of the apex corresponding with the calibre of the vessel, remains still free, but this free portion is gradually diminished, and the cavity of the vessel is completely and firmly closed, presenting the shape of an imperforate funnel.

The length and thickness of the thrombus still gradually diminish, until at length, the entire portion of the vessel which it occupied, to the first lateral branch, is entirely absorbed—and the occurrence of any subsequent hemorrhage is effectually guarded against.

In veins, a thrombus is never formed at the divided extremity next the heart, and in the end farthest from the heart it forms later than in the arteries.

The whole of the changes which the thrombus undergoes, proceed more quickly in veins, than in arteries—and in the smaller veins quicker than in the larger.

In veins, the thrombus contains more red globules and less fibrine than in arteries—the apex never being purely fibrinous as in the latter.

In veins, during its first period, the thrombus possesses less firmness or density than in arteries;—in other respects the circumstances of, and the changes which take place in it, are alike in both sets of vessels.

The third publication of Dr. Stilling, the title of which is prefixed to the present notice, contains an account of a successful amputation of the thigh, in which the closure of the femoral artery, the deep seated artery of the thigh and the femoral vein was affected, by looping the ends of the artery in the manner already described.

The patient was a female ten years of age, who after an injury, caused by a fall on the upper part of the left thigh, followed by inflammation and suppuration, became affected with caries of the femoral bone. The limb was amputated about a finger's breadth below the great trochanter. The stump healed entirely by the first intention.

In a note appended to this work the author examines the opinion uttered by Dr. Ungar, as the result of his experiments, upon the value, of the loop operation as a means of arresting hemorrhage, namely, that it is entirely useless—and has endeavoured to show, that this opinion has been formed entirely from the unskilful manner in which the operation was performed by that gentleman, in his experiments upon animals.

The incisions through the sides of the artery forming the loop, were, he asserts, too long, in consequence of their being measured by the diameter of the vessel when distended with blood, no attention being paid likewise to the greater or less thickness of the parietes of the vessel in measuring their diameter. The forceps used in looping the divided end of the vessel, were in the opinion of Dr. S. not adapted to its successful performance.

We have now presented to our readers, from the works of Dr. Stilling, placed in our possession by the politeness of Dr. Stahl, of Vincennes, a tolerably full account of his novel operation for arresting hemorrhage from divided vessels.—No one can doubt its practicability, however much they may its superiority, in the generality of cases, over the ligature and the other methods of securing divided vessels now in use—of its real value we profess ourselves to be incompetent to form an opinion—this can be determined only from the result of experience; though we are inclined to fear that the amount of skill required for its successful performance—the time it will consume even in the most favourable cases, and the many readily occurring circumstances which are capable of increasing its difficulty, of diminishing the certainty of its success, or of causing it altogether to fail, will stand very much in the way of its general adoption.

D. F. C.

ART. XVII.—*Recherches Médico-physiologiques sur L'Electricité Animale: Suivies d'observations et de considerations pratiques sur le procédé médical de la neutralisation électrique directe, notamment appliquée au traitement de l'Ophthalmie, de l'Erysipèle de la Face, de la Céphalalgie, de la Migraine, des Dérangemens de la menstruation, des Affections rhumatismales, de quelques Affections névropathiques, &c.* Par J. F. Coudret, M. D. P. &c., Paris, 1837. pp. 496. pl. III.

In this work Dr. Coudret sets out with the following physiological maxims: 1. that the nerves are true organic conductors; 2. that electricity must be considered as their active or moving principle; 3. that they present, like the galvanic apparatus, two different and distinct kinds of currents; 4. that one of these currents, destined to the functions of sensation and intelligence, passes from the internal and external senses to the brain; the other, destined to the functions of nutrition and locomotion, passes, on the contrary, from the brain or the spinal marrow, to the different parts of the muscular system and of the vast apparatus of capillary vessels.