

CLINICAL LECTURES ON SURGERY,

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BY

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ON AMPUTATIONS.

(Concluded from page 591.)

Hemorrhage after Amputation.

I do not propose to treat here of those arterial hemorrhages which come on during the course of an operation, an accident which can only happen when the main artery of the limb is not compressed with sufficient care. I would rather draw your attention to a species of hemorrhage which has not been neglected by authors, I mean those arising from the veins. It sometimes happens, that at the moment the soft parts are divided, though the course of the blood has been suspended by pressure, a considerable quantity of this fluid rushes in a body from the wound; and the unexperienced surgeon becomes frightened at this accident, puts a stop to the operation, or increases the flow of blood by disturbing the assistants who are occupied by compressing the main vessel. In such a case the operator should be guided by the colour of the fluid discharged; a dark colour indicates that it comes from the surface of the wound, and is of little consequence, as it will soon cease to flow. But when we operate upon parts abundantly supplied with veins, where the circulation cannot be arrested, the discharge of dark blood continues, and embarrasses the surgeon by covering the whole surface of the wound, as we frequently have occasion to observe in laryngotomy or tracheotomy,—sometimes large venous trunks are divided, the blood escapes in great quantities, and the patient becomes pale, and seems often on the point of expiring; we have examples of this in amputations near the large joints, in extirpation of certain fungous tumours, of cancer, &c. The cause of these hemorrhages is to be sought for, not in the state of the parts operated on, but in that of the patients themselves. In fact, if we pay attention to the state of a patient, we may observe that while endeavouring to struggle against the pain which he suffers,

respiration is completely suspended; hence the blood, not finding a passage through the lungs, stagnates in the vena cava and its branches, and is determined in quantity toward the vessels which are opened by the knife; in such cases the ligature is of little use; the most beneficial and rational mean is to make the patient breathe, in order to re-establish the venous circulation; scarcely have the lungs dilated forcibly once or twice before the hemorrhage ceases; but we must caution the patient against any renewal of his efforts, as the loss of blood is sure to return with the exciting cause.

Of the Means necessary to arrest Hemorrhage after Amputations.—The Cautery, &c.—The Ligature.—M. Amussat's Method by Torsion.

Cautery, &c.—The first care of the surgeon, after an amputation, is to effect the obliteration of the divided vessels, which would otherwise, in most cases, give rise to a fatal hemorrhage; for this purpose, Hippocrates proposed nothing but a calming regimen, and the elevation of the stump. Celsus advised the application of a sponge steeped in vinegar, a means which may be useful when only small vessels are concerned, but totally unavailing when large arteries are divided. Paul, of Ægina, applied the actual cautery to the stump, and this method was followed for many years after him. The Arabians, in order to avoid the loss of blood, were not afraid to amputate the limb with red-hot knives; others endeavoured to remove the part by first inducing gangrene with a ligature.

Ligatures.—These, and various other methods, were in vogue, when Ambrose Paré invented the ligature, which, with the modifications which it has received in latter times, must be considered as the most sure and simple method of arresting hemorrhage. The manner of applying the ligature is so well known to you all, that I need not describe it here at any length. The extremity of the vessel is seized with a forceps, and drawn out from the surrounding substance by an assistant, who closes on it the knot of the ligature. Bromfield, an English surgeon, was the first to revive this method, which is very nearly the same as the first process employed by A. Paré. The English surgeons also frequently use a kind of hook, called a tenaculum, with which they lay hold of and draw out the vessel; this instrument is very convenient, especially in the country, where the assistants are not always too well instructed, and I frequently employ it myself. Threads, of different ma-

terials and size, are usually employed in the composition of the ligature. It has been latterly imagined, that ligatures made of animal substances, being more analogous to the surrounding tissues, would be absorbed, and give a greater chance of union by the first intention, but experience has not confirmed the truth of this idea. I have always found that animal substances are as surely expelled from the wound as vegetable, which have this advantage in addition, that they are applied with much more precision, and are more readily procured. Much importance has been always attached to the form of the ligature: most practitioners advise that all the threads composing it should be placed on the same plane, in the form of a riband, in order that the coats of the vessel should not be cut through too quickly; others, on the contrary, prefer a round ligature, which they say insures the division of the internal and middle tunics; but it seems proved that the efficacy of the ligature is independent of its flat form, for be it ever so flat, when drawn tight, it assumes a rounded form. It sometimes happens, that a small vessel retracts within its cellular sheath, or is so placed, that it cannot be drawn out by the tenaculum. In these cases we are obliged to tie the vessel by a different process, called the mediate ligature. The surgeon passes a curved needle, armed with a thread, a little above the extremity of the vessel, through the flesh in its neighbourhood; the needle is repassed a second time, so as to embrace some portion of the surrounding tissues, which, being drawn out, are enclosed within a double knot by an assistant.

In the application of the ligature, the surgeon should take the greatest care not to embrace with the artery any large nerves or veins. From the former result intolerable pain and many severe accidents; while the ligature of the veins is often followed by phlebitis and death. Finally, he should be cautious not to pass the tenaculum merely through one half the circumference of the vessel, as secondary hemorrhage may be the consequence. When blood flows from some small branch which we find it impossible to discover, we must have recourse to the actual cautery. An important point connected with the ligature of arteries is the consideration of the parts which it should embrace, and the degree of constriction necessary. When the ligature has been drawn too tightly, the cellular coat is divided, the clot which should form a permanent bar to the circulation is expelled, and hemorrhage comes on; if, on the other hand, the ligature is not sufficiently tight, the cavity

of the artery will not be obliterated, and the circulation is re-established in the vessel.

The danger of secondary hemorrhage is much greater after the mediate ligature than when the artery alone has been tied; the reason of this is evident, for the enclosed parts soon diminish in volume, and the ligature of necessity ceases to exercise any pressure on the artery. It is impossible to enumerate the number of vessels which may require to be tied in each amputation; for it is recognised in principle and in practice that we should proceed to tie every artery that bleeds, even though the blood may not escape in jets, if we wish to avoid the danger of a secondary hemorrhage.

Torsion.—It remains for me to speak a few words about a method lately invented by M. Amussat, called "*torsion*." Surgeons had for a long time observed that contused wounds were not liable to bleed; that when a limb is torn off by a cannon ball, by machinery, &c., even the large arteries do not furnish blood; hence M. Amussat was induced to make various experiments on animals, in the course of which he was led to the idea of twisting the vessel with a forceps adapted to that purpose. When seized and drawn out from the surface of the wound, the vessel is turned for six, ten, fifteen, or twenty revolutions, according to its size, until it is on the point of giving way, or until it is completely ruptured; after which the wound is dressed in the usual manner. The operation is sufficiently simple, and if always successful, might take place of the ligature; let us therefore for a moment endeavour to appreciate its true value. When M. Amussat proposed *torsion* in 1829, he had made numerous experiments upon various animals, and the method had constantly been crowned with success, even when applied to arteries such as the brachial and femoral. Afterwards he employed this means in a certain number of amputations performed before several surgeons. Amongst four examples of amputation of the thigh, there were children of from seven to twelve years of age; one amputation of the arm was performed on a man of fifty years, whose arm was fractured by a ball in July. In all these cases it was successful; no secondary hemorrhage came on; but union by the first intention was obtained in only one case. As soon as this method became known, it was quickly employed in foreign countries; in Prussia by Lieber; at Hamburg by Fricke; at Dresden, M. Schrader applied *torsion* to the branches of the temporal artery, the thoracic, and the brachial;

in no case was the operation followed by hemorrhage, and the same surgeon has assembled in a paper written upon this subject twelve or fourteen facts from his own practice, which are all more or less favourable to torsion. M. Delpech, indeed, was unsuccessful in two amputations when he tried torsion of the arteries; but we should remark, that one patient died the 48th day after the operation, the other about 18 days, and that neither had suffered secondary hemorrhage. However, we should compare with these cases of success many examples in which surgeons of undoubted ability have failed. Sometimes inflammation and suppuration along the sheath of the vessel have followed the employment of this means; sometimes it has been found insufficient to arrest the bleeding, and occasionally it has been totally impossible to apply it, and the ligature became necessary after many fruitless efforts. With regard to union by the first intention, which it would seem at first sight to favour extremely, experience has shown that torsion does not enjoy any marked advantage above the ligature. From these and various other considerations I am inclined to conclude that the new method of M. Amussat may be applied with security to arteries of a small calibre, but that we cannot prudently trust to it when the vessel is of any magnitude.

Dressing after Amputation.

Reasons for delaying it for a short time.—It has been the usual custom to proceed at once to the dressing of the wound as soon as the hemorrhage has been arrested by the application of ligatures, but I conceive we may depart from this established custom with much advantage; and, in fact, for several years I have been in the habit of letting one or two hours pass over before I think of applying a regular apparatus of dressing to the stump, being content to place on the wound a simple compress, sustained by a light bandage.

My reasons for this line of practice are the following:—It frequently happens, that in spite of the attention and care of the surgeon to tie every vessel that bleeds, a few hours after the operation a secondary hemorrhage comes on, which is often dangerous to the patient, and which always compels us to remove the dressing to examine the surface of the stump. Now, when a regular apparatus is put on immediately after the amputation, we cannot be aware of this hemorrhage before all the bandages are soaked in blood, and consequently not before it has produced on the patient a certain debilitating effect. The cause of this accident is easily ex-

plained. Sometimes it arises from some small branches which were not tied, because they did not bleed at the time of amputation. Here the vessel retracts within the surface of the stump, and does not furnish any blood until after a certain period, when the fluids are drawn towards the wound by the irritation which supervenes. In other cases the suspension of hemorrhage depends either on the moral state of the patient during the operation, or on a certain spasmodic condition produced by terror, &c., or the vessel may not have been properly tied. In all these examples, one, two, three, or four hours elapse before the afflux of blood to the part, and the dilatation of the arteries gives rise to hemorrhage; for these reasons I am not in the habit of dressing my patients immediately after amputation, and the result is, that secondary bleeding has been extremely rare with me.

I need not remind you that during the interval between the operation and the dressing it is incumbent to leave some assistant by the side of the patient, furnished with every means of arresting hemorrhage should it suddenly come on.

Mode of Dressing.—Let us now consider the subject of dressings. In former times it was the custom to stuff the wound with pledgets of lint, which were supported by a tight bandage, in order to arrest with more certainty the bleeding, and to excite an abundant suppuration, which was thought particularly necessary in amputations practised for chronic affections. Violent pain, excessive inflammation, exfoliation of the bone, or conical stumps, were the frequent consequence of this ill-judged practice. But for a few years back, some surgeons have fallen into an error exactly opposite, in carrying to excess a method the object of which is to avoid the slightest suppuration and to obtain the immediate reunion of the divided parts. Several practitioners of celebrity have been seduced by this illusory hope, but, at present, experience has led us to adopt a just medium, and to apply our dressing according to the nature of the case.

The manner which I generally prefer is as follows, and has for its principal object to preserve all that is useful in union by the first intention, while a free exit is left for the fluids to escape from the wound. The ends of the ligatures are collected in one bundle, and placed at the interior angle of the wound; the muscles and integuments are then brought into contact, and retained by straps of adhesive plaster, with convenient bandages. In this way the fluids are conducted by the ligatures

to the angle of the stump which is not quite closed, and we never have occasion to observe effusion, infiltration, or abscess, formed within the cavity: the greater part of the wound heals by the first intention; and suppuration sets in only at that portion which borders on the ligatures, and does not in general continue after they have come away.

As a general rule and guide for the application of the divided surfaces of a stump we may say, that when the circular incision has been employed, the line of the closed wound should correspond with the small diameter of the limb; if the oblique incision, this line should represent the great diameter of the oval; and if we operate by flaps, the bleeding surfaces, of course, should be placed in contact; thus, after the circular amputation of the arm and thigh, the line of union should run across the limb from one side to the other, and the ligatures should be placed at the posterior angle of the wound; but when the leg or fore-arm has been removed, the lips of the wound should be united from before backwards.

Union of the Stump.—I shall take this opportunity, before I conclude the subject of amputations, to make a few observations on the relative value of mediate and immediate union of the stump. The older surgeons were unable to give any opinion upon the subject, because, from their method of operating, they seldom preserved sufficient soft parts to cover the stump. The application of the muscles and integuments to one another, in order to obtain a complete covering for the stump, and a speedy cicatrix, were first proposed by B. Bell, in 1772, and converted into a principle of practice by Alanson, in 1779: since which period it has been universally, and almost exclusively, employed by the English surgeons. In France, union by the first intention was received with much greater reserve, but having been employed successfully in many cases by Dessault, and afterwards by our military surgeons, the doctrine gained numerous partisans, and innumerable examples of a happy termination were collected in a short time. I confess that I was for several years an advocate of the doctrine; but observation and experience have convinced me that the supposed advantages of this method are not real, and that we lose a much greater number of patients by employing, exclusively, union by the first intention, than if we follow that which I have latterly been accustomed to use. I have compared a considerable number of facts, and have found that of thirty patients treated by our method,

six die; while nine, out of twenty-nine, have perished when immediate union has been attempted; this disproportion is very great.*

However, immediate union may be tried with advantage after amputations practised for particular injuries or wounds; for example, on the field of battle; for there we have a patient in vigorous health, who has not been debilitated by any preceding disease, or by an old suppuration to which the constitution has been accustomed. But in the civil hospitals, on the contrary, the patient is usually affected with some organic disease; is reduced by a suppuration of long standing, or by continued pain. Here when we amputate the diseased limb, we suppress suddenly an irritating cause, which has modified the whole organization of the individual. The economy is seldom able to accommodate itself to this sudden change, and some visceral inflammation usually comes on. Besides, are we to imagine that when the lips of a wound are kept in close contact, either by sutures or bandage, no secretion takes place in its interior? This would be an error. It is well known that the edges unite much quicker than the deeper parts, and hence, from a continued weeping of the smaller vessels within the wound, we have the formation of enormous abscesses; the irritation of the effusion, which acts as a foreign body, produces ulceration, or a large quantity of blood may be poured out into the cavity of the stump, by some vessel dilating; hours after the operation.

To sum up all that I have to say on this subject in a brief space, I would lay down as a rule, that immediate union may be tried after all those amputations which surgeons call primary, but that it is never to be applied to amputations practised for a chronic disease.

Secondary Hemorrhage after Amputation

Amputation may be followed by a number of accidents which retard the cure, and often endanger the life of the patient: such are, hemorrhage, inflammation of the stump, the formation of abscess, projection of the bone, its exfoliation or necrosis, phlebitis, internal inflammation, hospital gangrene, &c.

As it is impossible to treat at length of

* We do not know whence M. Dupuytren has drawn this calculation, but it certainly is not taken from his hospital practice; we remember perfectly his saying, not long ago, that he considered himself very fortunate when he saved one-third of his cases of amputation.—*Translator.*

all these complications, I shall conclude this lecture by some observations on secondary hemorrhage.

Secondary hemorrhage is one of the most unfortunate accidents which can succeed an operation; for it comes on when we are least prepared for it, and when the patient, full of security, thinks only of an approaching cure. It shows itself at different periods, which it is impossible to foresee; sometimes a few minutes or hours after the operation, sometimes several days or even months. J. Petit has observed it twenty days after an amputation of the thigh, and a few years ago, secondary bleeding came on two months after the removal of the leg of a patient at La Charité. After death the surgeon found a fistulous canal, at the bottom of which the popliteal artery had been opened by ulceration.

Besides the causes which I have already enumerated as producing secondary bleeding, there are many others, viz., violent moral affections, exciting drinks, any irritation of the wound, by pressure, or otherwise. In these cases the bleeding usually comes on during the first four or five hours, but sometimes at a later period, and during the stage of reaction. It may also arise from the insufficiency of means used to arrest the hemorrhage in the first instance; thus, when the actual cautery is employed, bleeding often comes on at the separation of the eschar. Inflammation and suppuration of the vessels of the stump also predispose in a peculiar degree to this accident.

These secondary bleedings are often suppressed with great difficulty, on account of the changes which take place in the surrounding soft parts; the tunics of the vessel adhere to the neighbouring tissue, and render it often impossible to apply a ligature immediately to the bleeding orifice; on the other hand, the mediate ligature or pressure presents many inconveniences. Under these circumstances it appears better to expose and tie the main vessel at some distance above the stump. I have adopted this line of practice in many cases with success, particularly in one where hemorrhage came on after amputation of the leg. Several ligatures had been successively applied to the vessels and failed to stop the bleeding; the actual cautery was tried more than once with like ill success. After each attempt the hemorrhage was renewed with greater intensity; at last I was obliged to tie the femoral artery in the lower third of the thigh, which was attended with the most happy results. This example has since been followed upon several occasions by other surgeons with equal benefit.

MONSTROSITY.

UNION OF CHILDREN, ONE WELL FORMED, THE OTHER HEADLESS.—POINTS OF PHYSIOLOGICAL INTEREST.

THE following case of monstrosity was addressed to the Academy of Sciences, Paris,* by Dr. Scoutetten, of Metz. It presents many curious particulars, especially in a physiological point of view, and will form, probably, the subject of future remark, as the mother of the children has been invited to bring them to Paris, and submit them to the inspection of the learned as well as the curious of that capital.

On the 26th of June, 1832, Catharine Ruff, aged 32, living at Salembach, brought forth, without any accident, two female children, connected together by the anterior part of the trunk. One of these children is well formed, the other is perfectly acephalous. Both children continued to live after birth, and were constantly nursed by their mother up to the present moment, July 11th, 1833, when they were submitted to my examination. They enjoy excellent health, and are now about one year old. The well-formed child is very nearly two feet in height, is lively, gay, and sucks extremely well; indeed she eats nearly double the quantity that another infant of the same age would. As yet she has no teeth, but they are about to appear. The skin is well coloured, but the flesh is soft, and sensibly less firm than that of the acephalous child. The umbilicus is well formed, and adhered to a single chord. The genital organs also and anus are perfectly well formed.

The acephalous child is eleven inches in length; it adheres by the base of the chest and upper part of the abdomen to the corresponding parts of its sister. This infant has no umbilicus, for the trunk begins to separate at the point where the umbilicus should exist. The inferior extremities are very well developed, especially the thighs, and the flesh is remarkably firm. The legs and feet are small; the articulations are stiff and nearly demi-anchylosed. The superior members are much less developed than the inferior; that of the right side is very small, and the hand is furnished with only four fingers, the left arm is much better formed, has all its fingers, and the articulations are much more flexible than in the other. The vertebral column presents a strong deviation to the