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## LECTURES

ON

## AMPUTATION,

AND ON THE

*Nature, Progress, and Terminations of the Injuries for which it is required.*

(Delivered at Sydenham Coll. Med. School.)

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### LECTURE XVIII.

*Observations on the relative value of union by first intention and by consecutive process—(continued). First Series of six cases of amputation performed without pre-existing disease or injury of the limb, illustrative of the pure and unmixed effects of the operation by Flap and by Circular Incision. Second Series, showing the influence of immediate union of the Stump upon the progress and issue of the case. Deductions and conclusions. Observations on the first dressing and putting up of stumps, and on the after-treatment, general and local.*

I CLOSED the last lecture with some observations, the marked tendency of which, you would perceive, was to call in question the accuracy of the prevailing estimate of the value of union by first intention after amputation. The doctrine, that immediate union of a stump is the highest reward of a surgeon's science and skill, and the best means of insuring a successful issue to the operation, has been handed down from father to son, without inquiry, for so long a period, and been received in England with such implicit faith in its accuracy, that it has scarcely ever been assailed; and to question it now, must seem sad heresy to many of the "grave and learned" of the English profession, albeit they are not unaccustomed in the present day, in common with the rest of the world, to hear all things questioned, all doctrines weighed, and principles rigorously analysed and tested by new facts and processes. As we find examples in morals are more impressive and effective than precepts, so in science facts form the best means of carrying conviction to the mind; and it is by facts that I

shall endeavour to demonstrate, and convince you of, the truth of a conclusion directly opposed to the prevailing opinion. This mode of reasoning, supporting each position by facts, is the more imperative on the present occasion, since a proneness to assert the imperfection and error of long-established doctrines and opinions, is one of the most frequent characteristics of the ignorant and the superficial. When assertions tend to impugn the accuracy of any conclusion generally accepted as true, we have a right to exact that such assertions should be based upon facts, and that these also should be brought forward. Although unhesitating assertions denying that "whatever is is best" so frequently spring from empty conceit, it is not the less true that to inquire, examine, and test received opinions, and the bases on which they stand, in order to be satisfied of their truth and freedom from fallacy, is the sure labour of all minds desirous of advancing in any science, and therefore anxious for the truth as the best means of guiding them onward. Thus, again, as I have often had occasion to remark to you, extremes continually meet; where vanity and conceit lead the superficial, at random to assert, and deny, without knowledge or facts;—continued observation and mature reflection not unfrequently lead to the detection of error, and the development of principles adverse to the accuracy of some which may have been long received as true. Both may make startling assertions; but the one dogmatizes, and the other shows the grounds for his opinion. The facts I have to submit have neither been hastily observed and collected, nor brought to bear upon the question of primary and secondary union, in the conclusive form they now assume, without long and patient inquiry into a variety of collateral facts and circumstances requiring mature reflection.

It is now some ten years since I performed my first capital operation; and although for many subsequent years the treatment of injuries in great number and of the most complicated kind, and diseases of every type and degree, incessantly demanded my close attention, I believe I may safely say, that no operation of magnitude was performed from that time, either by myself or under my direc-

tions (numerous as they necessarily were), without the cases being constantly under my observation during their progress, and anxiously watched to the end. Under these circumstances to record all the principal facts, and to weigh them in my mind, comparing the progress and result of one case with another, became not only natural but a necessity; and instead of requiring effort for its continuance, it would assuredly have demanded a considerable effort to refrain. I mention this as a fact, which I trust may prove to you that labour the most continued in the practice of your profession, and in the pursuit of scientific objects, so far from requiring a constant and most irksome effort, is capable of affording in itself the excitement and interest necessary to make its continuance a pleasure. Under such circumstances you will find the truth of an axiom which in the commencement of life we are often inclined to dispute—“*Labor ipse voluptas*”—the apparent toil and application becomes a real pleasure of the highest order, and not willingly exchanged for many of the occupations which bear the name of amusement, but are in truth, and so would seem if called by any other name, wearying in their detail and vapid in the enjoyment.

The first series of facts to which I shall call your attention, are those resulting from six cases of amputation, to assist in determining, 1st, the pure and unmixed effects of the operation on the system; and, 2ndly, the influence of the flap and circular mode of amputation, on the effects of amputation, and on the period of healing of the stumps.

Four cases selected were of men who, months previously, had lost one or both feet from gangrene, attendant on the fever at Vitoria. The feet had been detached at the time by nature's efforts, and the bones had merely the most trifling excoriation over their imperfectly-rounded extremities. The men were healthy, of the respective ages of 19½, 20, and 22 (one of these undergoing, at different periods, amputation of both legs). The fifth case is an amputation of the thigh, which took place in the Westminster Hospital, for congenital contraction of knee-joint, which many of you had an opportunity of watching; and Mr. Williamson, my young friend and pupil here, who kept careful record of the observations of each day, has furnished me with his notes, which I shall use as a running text. The sixth is the case of a man whom I sent to the same hospital for operation, and which you also saw amputated, for an old wound of the knee, long cicatrised, and free from active disease. You will remark that in these six cases the men were all in moderate health, not in the plethoric state of a countryman, or a soldier suddenly levelled by a blow or wound, but accustomed to the air and diet of the hospital, suffering from no recent shock or wasting disease, anxious for the operation, looking forward to it with

hope as a means of improving their comfort, and consequently without alarm or moral shock. Whatever action supervened upon these, may most unequivocally be referred to the operation as the pure and unmixed cause. It is also evident that the relative progress of the flap operation and amputation by circular incision, could not be tested under a greater parity of circumstances and conditions, than the first four cases present.

One of these men had both legs removed; the second limb after the stump of the first had healed: two men had one leg each removed—making four amputations. One was a thin, scrofulous-looking lad (Cases I. and II.); the second (Case IV.) also, apparently, of scrofulous diathesis, but stout—a labourer, of sanguineo-lymphatic temperament; the third (Case III.) was pale, middle-sized, not very muscular, and of lymphatic temperament. The amputations were all performed under precisely the same circumstances: two on the same day; the third within four days; the fourth, at an interval of three months. I operated on two myself. Two healed in the same time, viz., the 42nd day; one on the 52nd day; one on the 57th day. None, therefore, healed by the first intention, although the utmost pains was taken in two to produce such result; and in neither of the cases at the Westminster Hospital was this result obtained.

Of the two performed on the same day, both were removed by the circular incision, at the same point, below the knee: one by myself, and the other by one of the medical staff attached to the hospital. The one healed on the 42nd day, the other on the 57th; a variation of 15 days.

The third patient was operated on, the first time, Sept. 4, 1836, when I removed one leg by the flap below the knee; the second limb was amputated, at the same point, by the circular incision, Dec. 25, of the same year.

The flap operation was healed on the 52nd day, the circular on the 42nd; the average period for the whole being 48 days. In the flap operation, where there was union in the first six days in the greater part of the line of incision, a depôt of matter formed in the face of the stump on the 20th day, requiring an incision to evacuate it.

The principal facts worthy of notice are the following.

**CASE I.—Flap Operation (immediate union attempted).**—The patient had been a farm-labourer; he was pale and thin, a scrofulous-looking young man, aged 19½. He stated that he had never been subject to illness in England, but had suffered severely nine months before of a peculiar typhoid fever at *Bribiezca*, in Castile, from which resulted the mortification of both feet, and their separation at the ankle-joints. Subsequent to that period he had enjoyed good health, and been located in different military hospitals. *A little fever and soreness of stump supervened on the first*

day after operation, and continued until the 4th day, when a trifling but healthy suppurative process was established, and the local inflammation and tenderness subsided. A little sloughing of the cellular tissue was observed on the 6th day at the edges, although union had taken place in the greater part of the line of incision. 8th day, all fever had subsided. On the 20th day, a depôt of matter was ascertained to have formed between the flap and the face of the stump, but unaccompanied with any general disturbance or fever. The matter was evacuated by a deep incision. No tendency to secondary hæmorrhage or exfoliation was observed.

CASE II.—The same patient. The opposite limb removed at a similar point below the knee, by circular incision. He had enjoyed good health from the period of his former amputation. Immediate union was attempted.

*Disturbance, General and Local.*—Some hæmorrhage, but to no great extent, a few hours after amputation, and during second day also. Pulse quickened, but soft; stump cool, and free from pain; slept pretty well.

Fourth day. Stump dressed; some adhesions had formed in the middle, between the flaps, and since the previous day a little sanious discharge; no suppuration; very little febrile action. 6th day. Adhesions gave way; stump completely opened; a considerable quantity of sanious discharge, but no great swelling; tongue clean; pulse soft; bowels open; no constitutional disturbance. 8th day. Some sloughs detaching; the stump cleaning; a great deal of foetid discharge. 9th day. Surface of stump quite clean; granulations vigorous and healthy; general health good; no further symptoms; stump soundly healed on 42nd day.

In this case it may be seen the inflammatory action was almost entirely local.

CASE III.—Amputated, September 8th, by circular incision below the knee. A layer of lint interposed.

*Disturbance, General and Local.*—Although he slept well on the first night, by the next day *diarrhœa, febrile action, and some swelling of stump had supervened*, and during the first few hours a hæmorrhagic tendency shown by some oozing.

Dressed fourth day; lint adhering, and not removed. On the eighth day after operation considerable swelling, and the sides of the wound were separated, and hard. On the ninth, *suppuration began* with healthy pus; *the swelling and pain and febrile disturbance* (which latter had not been very severe) *abated*.

From this date no disturbance, local or general; the suppuration was very trifling, and healthy in character: on the 57th day the stump was quite healed.

Some twelve days later a slight superficial ulceration appeared on the stump, which gradually disappeared; no exfoliation.

CASE IV.—On the same day as the above, amputated by circular incision. A stout, scrofulous-looking youth, ætat. 20, sanguineo-lymphatic temperament; had been a labourer, and in England always enjoyed good health; had the fever at Vittoria, and subsequent mortification of the toes and portion of the foot of one leg; a slip of lint inserted between the edges of the stump.

*Disturbance, General and Local.*—Passed a tranquil night; pulse slightly accelerated, but no fever. On 5th day, slip of lint removed. 6th day. Skin hot. 7th day. Stump tender; surrounding parts swelled and painful; leeches and cataplasm. 8th day. Some slight discharge, and restless night. 9th day. Slept well, and did not complain of pain, but discharge still trifling, and much tension, swelling, and inflammation about the neighbourhood of the stump; leeches repeated (24). 10th day. Sensation of weakness; *discharge increasing, and stump less swelled*; from which period he advanced to a favourable cure, without halt or disturbance; suppuration never great; soundly healed on the 42nd day.

#### Analysis.

What do we observe different in the circular and flap operation on the same man?

In the circular operation there was some trifling hæmorrhage, both first and second day; in the flap none, but *more of soreness of stump and of general fever*.

In the circular, on the fourth day, some adhesions had formed in the middle of the incision, which on the sixth day gave way, and the stump completely opened, giving a sanious discharge, but no febrile disturbance. Some sloughs detached, with much foetid discharge, and on the ninth day the stump presented clean granulations.

In the flap, a trifling and healthy suppurative discharge was set up by the first dressing, when all local inflammation and tenderness subsided, and a little cellular sloughing on the 6th day, though union had taken place in the greater part of line of incision. 8th day. All disturbance, local or general, had ceased. On the 20th day, matter collected in face of stump, and was pressed from between the flaps and the stump, the former giving a baggy and unhealthy feeling to the touch; evacuated by incision.

In this amputation the whole of the inflammatory actions were local, not general.

Both healed, the circular on the 42nd day, flap 52nd day, and both were excellent stumps.

The ultimate result is the same, the progress only somewhat different. The circular healed eleven days earlier, but exhibited a hæmorrhagic tendency for two days. All action, local, and of inflammatory character, ceased in the flap on the 8th day, in the circular on the 9th day. The local inflammatory action in the flap was the greatest; but the

discharge and action generally was of more unhealthy character for some days in the circular. The febrile disturbance was very slight in the circular, and not obvious at all in the flap.

The deposit or collection of matter in the face of the stump by flap operation, may be safely attributed to the peculiar form of operation, which leaves no ready exit to any suppurative product, if the lower angles at once unite. Thus, unless the flap and surface at once soundly unite, such a collection is a necessary result. If the parts are unsound, therefore, in amputations below the knee, I consider the circular operation preferable, as allowing a readier exit to any matter. But for this collection it seems probable that the flap operation would have healed first instead of last.

Let us turn to the two remaining cases of circular operation, as closely parallel to this as possible, and see if they present similar differences to the flap operation, Nos. 3 and 4. A slight difference existed between these and the former two in dressing, a slip of lint being introduced between the edges of the incisions. The term of local and general disturbance in one may be stated at the tenth day, the other a day later, the eleventh.

In No. 3, hæmorrhagic tendency, diarrhoea, and considerable disturbance, general and local, quickly supervened. In No. 4, no hæmorrhage; pulse a little accelerated, but no fever or local tenderness until the 6th day; and on the 7th day leeches and cataplasm were necessary. 9th day. Swelling and tenderness still, requiring leeches to be repeated; system sympathising, although no high febrile action. From 11th day no disturbance; suppuration moderate. In No. 2, suppuration was rather more tardy. 8th day. Flaps were hard, swelled, and separated. 9th day. Suppuration was established; all the symptoms, local and general, abated, and very shortly disappeared entirely. No. 3 healed on 57th day, No. 4 on 42nd.

Thus we see the hæmorrhagic tendency recurred in one of these. It is also evident that the diseased actions, local and general, were more severe in both than in either of the former, and of somewhat longer duration. Some difference of constitution might have produced this variation, but the interposition of lint between the edges I think a more palpable and obvious cause. In such cases as these, where the parts are sound, this experiment convinced me the practice was injudicious, and calculated to be as mischievous as I think in a modified form decidedly beneficial, where the parts are really in a suppurative condition.

Upon the whole, these four cases must be regarded as full of interest; for here we have the unmixed and unalloyed effects of the mere operation of amputation to study.

Some degree of local inflammation, a tendency to throw off a thin slough in the cellu-

lar tissue, and to partial or general suppuration in the stump, is evident in all.

Some acceleration of pulse and febrile action seems also a natural consequence. In No. 4 only a quickened pulse was perceptible until the sixth day, when fever set in simultaneously, with swelling and inflammation of stump.

Neither the local inflammation nor the febrile action seem naturally inclined long to persist if suppuration supervene, and generally altogether disappear within a day or two *after the commencement of suppurative action*, unless this be of unhealthy character, when some little farther delay may be occasioned. The latest period for this healthy state, general and local, is the eleventh day.

Six weeks is about the average period for entire recovery.

It is worthy of remark, that with the febrile exacerbation supervening the first day after amputation in No. 3, there was a marked tendency to diarrhoea, showing how by certain sympathies, due probably to the influence of the nervous system, the mucous membrane of the intestines may be involved in the disturbed action, resulting from the shock of an operation, and the removal of a portion of the body.

These are all the characters present in four of the most favourable subjects for amputation: men previously for months accustomed to the confinement, air, and diet of the hospital; long prepared in mind, and anxious to undergo the operation, having already lost their feet; without, therefore, a *moral* shock (independent of that occasioned by pain, and entirely physical). Some degree of local and general disturbance existed distinctly in all: in two the local action was considerable; in all, the febrile excitement moderate: partial union only took place in the two where immediate was attempted, and one opened out again; while in the other the collection of matter bagging in the stump showed the union had not been complete between the surfaces. Each ultimately healed by aid of the suppurative process. Both local and general actions were of short duration, ten days.

The abatement of all febrile action on the commencement of healthy suppuration may reasonably excite some doubt, as to whether when the shock is greater, as in amputation of the thigh, and under other circumstances, we do wisely in taking every step in our power to prevent any suppuration: the next case, the fifth, in this series, the chief points of which I will recapitulate, from Mr. Williamson's notes, is, if possible, still more conclusive as to the valuable effects of a suppurative process.

John Proctor, ætat. 17, of sanguineo-lymphatic temperament and good health, was admitted into the Westminster Hospital, November 1, 1840, under Mr. Lynn's care, with a congenital contraction of the knee-joint.

He came in for the purpose of having the leg removed, and was most anxious for the operation. Prior to this step a bistoury was introduced beneath the ham-strings, to try the effect of their subcutaneous division. The contraction not being in any way relieved, the leg, a day or two subsequently, was amputated on the 7th, by the circular incision above the knee. Two arteries were secured. The sensorium was visibly affected by the pain; the patient's excitement during the operation was extreme; he talked and shouted incessantly to the surgeon and to those about him. The edges of the stump were brought together to favour union by first intention.

First day after. Febrile action had set in, skin hot; tongue slightly coated; pulse quick, but soft. A purgative was administered, and a saline and diaphoretic mixture, with small doses of liq. opii. sed. ordered. Towards evening the fever increased. 2nd day. Bowels freely purged; skin improved; slept during part of the preceding night, but considerable fever remained; pulse 140; skin hot and dry; some swelling of stump, but no pain; bandages cut. An effervescent saline ordered. 3rd day. Some improvement; the edges of the wound which at first seemed agglutinated together opened on removing the plaster; *surface underneath dry and unhealthy in aspect.* 4th day. Pulse more frequent; tendency to delirium; skin hot and dry; great thirst; no action of bowels. Towards evening he had a violent shivering fit; pulse 140. A teaspoonful of brandy administered, and shortly after he fell into a profuse perspiration, which was succeeded by a cold chill; countenance anxious and pale; skin clammy, and tongue foul; *stump quite dry; great delirium.* Enema ordered. 5th day. Delirium continues; picking the bed-clothes (poultice to stump, and fomentations to the thigh); increasing delirium and muttering towards evening. 6th day. Delirium in the morning with dry and hard tongue, but towards noon he improved, when he was ordered a quarter of a grain of morphine, from which he seemed to enjoy some refreshing sleep, and in the morning he awoke cool; a little brandy from time to time had been given; *suppuration of a tolerably healthy character*, and a red blush of stump abating since the previous day, when the suppurative process seemed established. Beef-tea and brandy; calomel and haust. sennæ. 8th day. Slept, but with intervals of delirium; *suppuration arrested; violent pain complained of in the bowels*, relieved by warm fomentations; pulse 140, *very feeble*; *surface of skin hot and dry; tongue hard and dry*, with circumscribed white coat in the centre; involuntary discharge of feces during night, of slimy and offensive character; urine scanty, and high coloured. 9th day. Subsultus tendinum; red blush at extremity of stump, but all action seems to have ceased in it; unhealthy aspect of superficial veins and skin up to the

groin; respiration short and hurried; roused with difficulty to any consciousness of surrounding objects. Leeches were subsequently ordered to the temples, but he continued sinking, and, with the appearance of much suffering, died in the evening.

On examination after death the femoral vein was traced upwards, and the artery to the heart. The outside of the thigh was in a state of decomposition; the vein presented a suspicious appearance, but not distinctly inflammatory in character; and an imperfect chain of abscesses extended along the sheath of the vessels towards the groin; bone denuded of periosteum; slight vascularity of dura mater; brain firm and healthy; viscera presenting no prominent marks of disease.

This man died, there can be little doubt, from the deleterious impression made by the shock of the operation upon the nervous system, and first upon the centre of the sensorial system rapidly involving the other centres, as shown by the deficient and depraved secretions, absence at first of healthy action in stump, and finally the relaxation of the sphincters. For a moment some suppurative action appeared, with instant relief to all the symptoms; again it ceased, and the patient passing through various stages rapidly sank. An imperfect effort at suppurative dépôts existed along the tract of the vessels. The attempt was very judiciously made to promote suppuration after the third day; had it been permanently successful, the patient would, in all probability, have been saved.

In reference to the sixth case of this series, I need not detain you by any longer statement than suffices to tell you that union by first intention was attempted, and did not succeed; suppuration was speedily established, and the supervening febrile action and general or local disturbance was trifling in extent and short in duration. Secondary symptoms of syphilis with a plentiful eruption showed shortly after amputation, and the case was marked by a very long-protracted process of exfoliation. The syphilitic taint did not seem to induce any increased febrile action; whether it exercised any on the healing process or on the exfoliation, I will not stop at present to inquire, but the fact may be worthy of attention and remembrance.

In further elucidation of this question of union by first intention, and the influence of suppurative processes upon the progress and issue of cases of amputation, let us for a moment turn to a series where immediate union, temporary or permanent, *did take place*, and thus seemed to reward the surgeon's efforts.

The first and second of this series to which I shall call your attention, are cases that have been already related to you, one of Lieut. B.,\* and Crowther.†

\* See Case IV., vol. ii., p. 499.

† See Case II., vol. ii., p. 498.

In the first case you will remember a large collection of matter formed on the outside of the thigh above the agglutinated stump, although cicatrisation had not taken place, yet from the close contact of the surfaces only a very imperfect discharge took place from two or three points: but for the more ample formation of matter above, it seems probable that I should have lost my patient with the irritative fever which was partially developed in the commencement.

The second is the case of a young man, ætat. 20, and precisely parallel as regards the nature of the injury, external circumstances, &c.; but the amputation was performed by flap, and death, instead of recovery, was the result: union by first intention taking place through the greater extent of the incision. I have to recall to your recollection that the febrile action which set in from the first day only abated with the appearance of the discharge, and the establishment of the suppurative stage in a part of the stump not united; that so long as this continued, with even a more copious discharge than seemed desirable, the patient did well; that on the twelfth day the discharge diminished greatly, and as the appearance of suppuration had relieved the febrile action, so the suppression developed the fever anew, and in a fatal degree, destroying the patient the sixteenth day after operation, and the fifth after the arrested suppuration. The stump after death was found healthily united in nearly its whole extent, although the bone was denuded; no recent organic disease was found to account for death.

The third of the series was furnished by a young man, ætat. 18 (Holden), amputated by double flap three hours after the receipt of the wound, a musket-ball lodging in the knee-joint. He had been a sawyer, enjoying generally good health, although he had been attacked with the fever of Vittoria the preceding year.

The stump, on being dressed the third day, seemed united by first intention throughout. 5th day. Febrile disturbance increased, and he passed a bad night; tongue white; stump painful. 6th day. Pain in stump continued, and up to the sixteenth day sleepless nights, much disturbed by pain of stump; after which both stump and general health continued favourable, although the former was tender, and the pulse always more rapid and full than natural. 24th day. A sinus was discovered extending from centre to inner angle; all else healed. An exacerbation of fever on the fiftieth day, and stump seemed likely to open again, with great hardness and pain; these symptoms not subsiding till the sixty-first day, when a sinus and discharge was established; and on the first of the fifth month a large portion of bone, consisting of the extremity of the femur, came away.

The fourth case is that of a young man, Hatchett, ætat. 18, on whom I performed amputation of the forearm by circular in-

cision on the sixteenth day, for a gunshot wound of wrist. 3rd day. Edges united by first intention, but not apparently to the parts beneath. 14th day. Stump swelled, inflamed, and tender; pressure brings thick but well-conditioned matter away; there is evident collection of matter above, but far from the surface. 15th day. Discharge profuse, and not well-conditioned; arm less painful; stump continues much enlarged. 20th day. Slough separating. 26th day. Diarrhoea. 28th day. Better; stump cleaning; considerable loss of substance, and skin and the bones protruding, although abundantly covered in the first instance. The stump for a considerable period remained puffy and tender, collections of matter forming as high as the elbow, and almost entirely surrounding it. These unhealthy actions in various degrees continued to the fourth month, when a shell of the extremity of the radius, about one inch in length, exfoliated, and he was discharged cured the sixth month.

The fifth and last of this series has been already related to you, as a fatal case illustrative of the second form of "*irritative fever*;" it is the case of Simpkins,\* ætat. 35; amputation of thigh by flap operation for a gunshot injury of knee-joint within three hours of the receipt of injury.

On the third day the stump was found united; some swelling of the parts, but no fever. On the fourth day the dressings were stained with discharge, and on the seventh day a thick and healthy matter appeared on the edges. The adhesions, however, continued firm, and the edges were well approximated. On the eleventh day the stump became painful, and on the thirteenth day fever was developed. For some days these symptoms abated with careful treatment; but on the twenty-sixth day fever of more aggravated form showed itself, ushered in with well-marked rigors morning and evening, succeeded by perspiration; thin and curdish discharge from a sinus at one angle of the stump having preceded. The symptoms, nevertheless, were not of very urgent character, until within twenty-four hours of his death, which took place by rapid changes on the thirty-second day.†

Viscera found healthy; disease seemed confined to stump, involving soft parts, bone, and femoral vein; internal part of stump was in a state approaching to gangrene; the front and inner muscles emphysematous; *adhesion of stump in the line of incision perfect*, with the exception of two fistulous openings communicating with the bone denuded of periosteum, in patches for four or five inches; femoral vein inflamed.

It seems needless to multiply cases; these are sufficiently illustrative of the facts to

\* See Case VIII., vol. ii., p. 501.

† This date was misprinted the *eighty-second* day.

which I wish to draw your attention, although union by first intention has seemed for so long a period the most desirable result; it is an error to imagine that this will secure the patient's safety, or that no accidents, general or local, productive of fatal result, are to be dreaded if such union take place, but that these are reserved for the cases in which suppuration occurs.

As immediate union will not prevent the development of local and general disturbance capable of producing death, so neither will the non-union of the flaps and the production of suppuration prevent the development of equally fatal and often very similar diseases. My object is not, therefore, to advocate the abandonment of treatment (except in the cases already specified) calculated to obtain immediate union, but to correct a very generally-pervading error respecting the *value and safety* of this treatment, even in cases fitly adapted for such methods, and thus to diminish the prejudice against any modification of such plan when reason and experience alike point out its propriety.

It is to be observed that there are a series of accidents peculiar to immediate union, certainly not of invariable, but assuredly of very frequent, occurrence; viz., the formation of suppurating purulent deposits, and disease generally, in the limb above, either in the face of the stump beneath the united flaps or edges, or round the bone, and occasionally higher up, beneath the cellular tissue, or effused among the muscles. Nos. 1, 2, 4, and 5, of this last series, are all examples of these effects, long delaying the cure, and by their consequences, general and local, always placing the patient's life in jeopardy.

We have next to remark that in a great number of cases which seem to unite at the first dressing, they partially or entirely open out again, as if by an effort of nature, in an opposite sense to the surgeon's, and a healthy suppuration is established, or diseased surfaces are cleaned in a few days; and with these changes all constitutional disturbance and febrile action (often considerable before) disappear, and the patient proceeds to his cure without a check or doubt,—not so rapidly as if the union by first intention had been permanent and complete, without attending unfavourable actions, but I am bound to believe as *much more safely as the process is more gradual*.

With these two results before us—First, that the union by first intention often, if not generally, takes place at the edges only, or, at least, not extending throughout the whole of the divided surfaces; in which case nature either extensively destroys the adhesions which have taken place, and establishes, with the free vent for matter, a process for ultimate union essentially suppurative and granulating; or, the union being maintained, matter forms behind the closed curtain of the

stump, often productive of great mischief, and until a vent, artificial or natural, allows its escape, the patient does not recover, and the occurrence is fraught with danger.

Secondly. That even when the union extends throughout the stump, is firm and maintained, disease of the extremity of the bone frequently results leading to the formation of a sinus, hardness, and unhealthiness of the whole stump; and, lastly, that this union is not even a sure safeguard against the most fatal of local sequences—phlebitis, as is seen in No. 5 of the present series.

These views and facts, I think, all tend to confirm the line of practice I have recommended in regard to the after-treatment of stumps, and prove how exaggerated has been the opinion entertained, in this country especially, *of the value and efficacy of union by the first intention*; it is infinitely more rare than has been usually assumed, and it is by no means free from evil when it does result.

Some degree of local inflammation, intumescence, and tension, together with febrile action, is the usual and the natural result of the stimulus and injury of the operation. The most effectual means nature ever adopts to remove these deleterious effects, if they proceed beyond a certain extent, is by a process of suppuration. This can take place nowhere so beneficially or so easily as in the cut and bruised surfaces of the stump; the instant suppuration fairly commences, the tension, heat, and inflammation of the limb subsides, and quickly disappears, and with it ceases the general excitement and febrile action in the frame. When, by the surgeon's "cunning" art, the edges of the stump are suddenly glued together by the adhesive process, what is the result? Is the patient suddenly well? On the contrary, the fever is often more violent, obstinate, and fatal, unless, by a somewhat perilous effort, of nature she succeeds in bursting the adhesions of the stump, and establishing a plentiful suppuration; or, failing in this, purulent depôts are established in the face of the stump beneath, in the limb above, extensive disease of bone and periosteum, abscesses along the course of the vessels, and finally phlebitis. These are frequently the results, as they are the rewards, of a blind adherence to the established doctrine on the invariable expediency and advantage of immediate union, maintained so long against the most striking and conclusive series of facts that could well be devised to force observation and conviction on men's minds.

Thus, then, I would impress upon you that the gradual healing of the large wound formed by the amputating knife, in some part of its extent at least, is safer than the general adhesion of all the surfaces in twenty-four hours, and without any suppurative process. And, independent of the different modes of dressing and putting up the stump in the first moment, I would strongly recommend you, while you endeavour to keep all



local action within moderate bounds, as cold applications and perfect quiescence of limb and body, to be careful neither, on the one hand, to repress its development so far as to check all suppurative process, nor, on the other, to allow this action to involve the whole limb to such an extent as materially to exasperate the general febrile state.

When the patient's pulse gets up, on the second day or earlier, the limb becoming in some degree swollen, both the state and the changes, in the stump and the system, must be carefully watched. If a moderate action from the bowels and skin, and the application of cold to the stump, do not prevent, on the third day, a greater exacerbation of fever, and the supervention of tension, heat, and pain of stump, the patient's best chance of safety lies in the speedy development of an effective suppurative action. This is to be induced by removing all stricture or compression from the limb, whether by bandages, strapping, or ligatures, lowering the action of the heart by bleeding proportionate to the vigour of the patient, and its *effect* should be carefully watched while the blood is flowing. The bleeding should be effected, if possible, with the patient sitting up, and from a free orifice; the total prostration of strength and relaxation of all the fibres of the body is the object, and not the actual diminution of the quantity of blood circulating. If you produce faintness with the loss of four or six ounces of blood, suddenly abstracted in a full stream, with the patient upright, you will effect not only all the good that would ensue from the loss of sixteen ounces, and accompanied with none of the evil consequences which might follow the abstraction of so large a quantity; but if the larger quantity is not followed by faintness, less good will be effected. Gentle nausea, induced by minute doses of tartar emetic, materially assists the other means, by favouring that general relaxation of the vessels which it is your object to obtain. Other local means, in addition to those I have already indicated, will assist, such as warm fomentations to the stump and limb above, alternating with light warm poultices.

If the shock of the operation has not seriously impaired or vitiated the powers of the nervous centres, deranging the functions of all the more important organs, and depraving the secretions, or shall not have induced a disorganising action in the stump itself, these means I have frequently seen successful in drawing the patient from a state of great jeopardy. The suppurative stage established, and the inflammatory symptoms, general and local, subsiding, this treatment will be no longer persisted in; the limb may be dressed and bandaged again, the edges of the wound approximated, and the surfaces generally and gradually brought into apposition, taking care not to heap lint, bandages, and dressings upon the limb with a profusion

only to be equalled by the swaddling-clothes of a baby, or the hundred and fifty wrappers of an Egyptian mummy. Keep the limb cool, an equable pressure round it; the surface of the stump free from irritation, especially the officious irritation of a sponge over its surface, contenting yourself with clearing the outer surface, and with the aid of a little pressure and tepid water removing the *superfluous* discharge that may have collected within the lips of the wound. Add to these local means the measures necessary to ensure a gentle but continued secretion from the skin and bowels, and you will by this simple, but really scientific treatment, if the judicious adaptation of the means to the end be the test, save many of your patients from the supervention of the fatal complicating actions, the causes, progress, and results of which I have brought prominently before you in these lectures, and prevent the development of many of those more obscure local actions terminating in callous sinuses, diseased bone, and tedious exfoliations, which seriously undermine the patient's health, keeping him long weeks on his back, and many additional months under treatment.

Occasionally you will find, instead of the more ordinary tendency to violent inflammatory process in the stump which I have described, a sluggish and altogether inadequate action; no redness, heat, or swelling, the parts remain nearly unchanged; and on removing the dressings on the third or fourth day, the edges will be found ununited, the surfaces pale, flabby, or even dry. Here suppuration is not impeded by the adhesive process, but is rendered impossible by a deficiency of vigour in the parts, and very frequently in the system itself. Stimulants in such a case, local and general, may be required; dressings of the warm aromatic balsams, or of wine warmed and sweetened, applied to the sluggish surfaces, some degree of general support or compression round the limb, and warm aromatic fomentations. These must be seconded by general means modified in relation to the state of the system; the judicious combination of warm purgatives and James's powder with minute doses of mercury, and a light but nourishing food, will not unfrequently be found of great service, and calculated to give that general tone and stimulus to the secretory apparatus throughout the body necessary to the development of a healthy action in the stump.

I had hoped to conclude all the details in this lecture, leaving only one remaining, which I purposed devoting to a *resumé* or summary of the leading facts laid before you in these lectures from the commencement, the more important of the conclusions they authorise, and finally the principles of practice and doctrines they inculcate, pointing out the more prevailing ones to which they are opposed. Before I can thus pass in general review facts, conclusions, and principles of practice, so as to



leave a clear and distinct impression on your minds of the final *results* of the investigations—the observation and the labour of many years—I find it necessary to give up one more lecture to embrace some remaining details connected with the subject into which I have entered this evening, viz., the influence of different modes of amputation, of dressing and after-treatment, upon the progress and results of cases, and thus conclude the parallel commenced between the amputations by flap and by circular incision.

ILLUSTRATIONS OF THE  
PATHOLOGY AND TREATMENT  
OF AMAUROSIS.

By EDWARD HOCKEN, M.D., M.R.C.S.L., &c.

(Continued from page 536.)

PART VIII.

*Amaurosis from Hyperæmia of the Visual Nervous System generally.*

In this variety of amaurosis the loss of function is dependent on preternatural fullness of the blood-vessels of the visual nervous textures generally: it occurs under different forms, and present diversities both in the local and general symptoms; it may be regarded, in fact, as a generic term (hyperæmial amaurosis), comprehending very different affections, all of them presenting in common either the indications of active or passive hyperæmia of the optic nervous apparatus, with diminution or suppression of the visual powers. This variety of amaurosis, then, is itself divisible into the following forms, viz., active, passive, mechanical, and sympathetic; and these include subdivisions, expressed in the following table:—

\* The division here adopted is founded on practical grounds, and not on a mere desire to be minutely correct; for it will be obvious that a wide difference should be made in the treatment of active, passive, and mechanical congestions, and modifications are requisite in the sub-varieties themselves: hence the advantage of considering the cause, and recognising the difference between an active local hyperæmia, dependent on a constitutional cause, viz., active, general plethora, and that originating solely in a local, without any necessary connection with a general, viz., hypertrophy of the left ventricle, and again separating the local effects of pressure from the retarded circulation induced by disease in the heart, or great vessels; whilst local hyperæmiæ, dependent on some manifest disturbance in distant and associated organs, would call for treatment having an especial reference to their derangements, besides the

HYPERÆMIAL AMAUROSIS.

1. *Active.*

1st. Absolute or active general plethora.

2nd. Local determination of blood.

a. From accidental causes.

b. From hypertrophy of the left ventricle.

2. *Passive.*

1st. Relative or passive plethora, &c.

2nd. Venous congestion (accidental).

3rd. The effect of previous inflammations, injuries, &c.

3. *Mechanical.*

1st. Venous retardation from the pressure of tumours, &c.

2nd. From disease of the heart and great vessels.

4. *Sympathetic.*

1st. Sympathy with connected organs.

*Active Hyperæmial Amaurosis from General Plethora.*—The term active plethora supposes a condition of the vascular system in which the quantity and quality of the blood are morbidly increased in relative proportion to the containing vessels, and the system generally. During the early continuance of this constitutional condition there is an exuberance of health, denoted by the full, frequent pulse; the free, vigorous capillary circulation; the increased nutrition, and great activity manifested, both in the secreting and excreting organs.

Now, although these excited actions may go on for a considerable time, tending to counteract the injurious influences of repletion on the system, especially if the habits and occupations of the individual favour the sanative efforts of nature; yet sooner or later important organs flag in their functions, or the constitution generally yields beneath a power far superior to its weakened condition; and hence local inflammations, active

measures adopted for the local congestion itself.

It was from the consideration of the differences requisite in the treatment, and not from the mere differences of the causes themselves, which suggested the foregoing division to my mind; for it will be obvious that a confused account of many different affections, having something in common under one name, must tend to great confusion and perplexities in treatment: and thus affections, the pathology of which is not clearly understood, must require a very confused account of the mode of treatment, a great many exceptions and qualifications to some general rule, in order to adapt them to each particular variety; and although practical men may themselves recognise differences, and use appropriate modifications, yet they are theoretically unacquainted with their own motives, and quite incapable of explaining them to others.