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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 X.

Causes of death in primary, intermediary, and secondary amputations of the March series. Abstract of the general results. Conclusions to be drawn from the facts in connection with this series of wounded, especially bearing upon the questions connected with amputation.

We have seen by the analysis contained in the last lecture, that there was an increase of mortality, in all cases exclusive of gunshot wounds, during the months of March and April, in both hospitals; and although not apparent, a real increase also in those classes of gunshot injuries, which more especially and frequently give rise to the necessity for amputation. A proportionate increase in amputations, therefore, we might naturally expect; but finding seven-eighths die, it is worthy of close investigation to what causes may be justly attributed such an excessive mortality. The causes of death may probably assist.

Causes of Death in Primary Amputations of the March Series.

15 Amputated.

10 *Bilio-remittent fever.* 5 of the thigh; 5 arm.

9 with diseases implicating viscera. 4 of the thigh; 5 arm.

1 Abscess of thigh.

Disease of both lungs and liver existed in 4: of lungs only in 4; of liver only in 1.

6 The suppurative form of disease was found in 6: in 2 of these the stump
No. 920.

was soundly and nearly entirely healed, not sympathising in diseased action: in the remaining, 4 stumps were diseased, and in 1 (arm) phlebitis was obvious.

2 Effusion in chest: stumps diseased in both, and phlebitis in 1 (arm).

1 Pleuritic disease only, stump not sympathising.

1 Metastatic abscess of thigh in amputation of arm; stump sound.

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2 *Irritative fever.* 1 (Thigh) Gangrene of inner muscles; some disease of bone; phlebitis; but adhesion of stump.

1. Arm; phlebitis; effusion under dura mater; abscesses of lungs; effusion in cavities; liver mottled; stump diseased.

1 *Hectic.* (Leg) Phlebitis; diseased stump; morbid dryness of peritonæum.

1 *Type doubtful.* Arm; abscesses in lungs and liver; effusion in thorax; isolated abscess in shoulder-joint; bone of stump denuded of periosteum.

1 *Shock of operation.*

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15

Causes of Death in 4 Intermediary Amputations.

1 (Thigh) Remittent fever; pus in lungs; lymph over surface; morbid quantity of fluid in pericardium; no phlebitis discovered, and stump healthy.

1 (Shoulder) Irritative type of fever; complicating wound of chest; adhesions of pleura; rosy tint of auricles; stump filled with coagulum, and unhealthy.

1 (Arm) Febrile type doubtful; amputated after secondary hæmorrhage; died with disease of lungs and liver.

1 (Thigh) Tetanus.

Causes of Death in 2 Secondary Amputations.

In both, the shock upon the system seemed a principal cause.

In 1 (Thigh) With slight hectic fever during life; no organic disease after

death was discovered; the femoral vein had been secured, but no phlebitis traced. Amputation performed on the twenty-fifth day; vomiting supervened after operation, and he died on the third day.

1 (Thigh) Labouring under hectic; evidently died of shock on the fifth day.

Resumé of Causes of Mortality in Primary Amputations.

These cases presented four kinds of febrile action; the bilio-remittent forming five-sevenths of the whole.

There were secondary abscesses in all, except the hectic form.

Phlebitis complicated both remittent and irritative types, and was attended by abscesses, by effusion only; occasionally was without either the one or the other, and not always marked by a diseased or open stump, although frequently.

Suppurative disease in remote parts occurred in 9. One of these was a case of purulent depôt in a distant extremity, and there only; the other eight implicated the viscera.

In addition to these 9 cases of suppurative disease, in 8 of which the viscera became the seat, 4 more presented signs of disease, although not suppurative, involving the thoracic or abdominal cavities. Thus, 2 presented effusion in the thorax; 1 pleuritic disease solely; 1 morbid dryness of peritonæum. The remaining 2 cases proved fatal: 1 by phlebitis, and apparently local disease only, with hectic fever; 1 in a few hours from the shock of the operation.

Resumé of Secondary Amputations.—6.

Considering in one class all the fatal cases of amputation performed subsequent to the first twenty-four hours, and in this sense terming them secondary, we find no peculiar type of fever predominating, but the following results.

Abscesses in distant organs implicating viscera in 3: but 1 of these strictly does not bear this classification, since the pleuritic and pneumonic mischief was the result of a wound inflicting a direct injury, and questionable symptoms of inflammation of the right auricle were present.

Phlebitis was ascertained in none.

Nervous system seemed the chief, if not the sole, agent, in producing death in 3, or one-half the number.

It may be said, therefore, that one-half died by complications affecting the viscera—a mechanical cause acting in one; and the other half, by the deleterious impression on the nervous system—no organic disease present.

If we compare the causes of death in the amputations with those occurring in some of the severer injuries, we find that in 78 fractures of this series not amputated in the first instance, 12 died; and among these the bilio-

remittent fever equally predominates: nearly one-half of the deaths are referred to it, and its more usual complications. 5 thus died—

2 with suppurative disease ascertained.

1 with enlarged liver.

2 with symptoms of visceral disease, but cavities not examined.

4 were tetanic.

1 Died exhausted with excessive suppuration.

1 Irritative fever.

1 Cause unknown.

12 severe flesh-wounds, out of 214, caused death.

6 with tetanus.

1 Excessive suppuration.

1 Gangrene.

1 Inflammation of membranes of brain (wound of scalp).

3 Causes unknown.

Abstract of General Results in 21 Fatal Cases of Amputation in one Series of Wounded, and the Conclusions to be drawn from the Facts presented.

In the primary amputations, the bilio-remittent, the irritative, and the hectic types of febrile action were defined; the first largely predominating, in the proportion of two-thirds of the whole number.

The same types appear in the subsequent amputations, but none predominating.

1. *Conclusion.* Either the peculiar causes of the bilio-remittent form were disappearing, or the patients after secondary amputation were less susceptible to their influence; but, as the operations were all performed in the first 26, and the majority in less than 20, days from the 16th of March, within which period, too, the greater number of primary amputations were carried off by this peculiar form of fever, the more legitimate inference would seem to be, that the patients amputated at a later period, and who had not consequently suffered the second shock of the operation rapidly after the first, although dying in large proportion from other causes, were, nevertheless, less susceptible of this peculiar form of diseased action.

The fractures not submitted to amputation, on the contrary, present a large proportion of bilio-remittent fevers among the fatal cases; which would indicate that the single shock alone, and under the same dynamic influences, in many cases, proved sufficient.

In the primary amputations, suppurative disease occurred in 9—three-fifths of the fatal cases; and in 8 of these the disease was in the lungs or liver. In the subsequent amputations, the same phenomenon occurred in 2, or one-third of the number. In the primary, effusion or pleurisy occurred in 3, or one-fifth. Strictly speaking, this result took place in none of the subsequent amputations.

In primary amputations, these suppurative diseases were complicated by phlebitis; as far as could be ascertained, in 2 only. In

Phlebitis ascertained in none.

the subsequent amputations, no marked case occurred; in 1 case only was there something suspicious—in the tint of one of the auricles, and where a wound of the chest existed.

Phlebitis was traced in primary amputations only in one case of effusion; in one case of local disease, where there was no organic lesion; in a third, with the local disease, a morbid dryness of peritonæum was observed.

No instance of phlebitis was traced in any of the fatal cases arising from fracture or flesh-wounds. The large proportion of tetanus, especially in the first fortnight, giving 8 deaths in 13, while, in the whole month of April, there were only 2 cases in 14, seems worthy of remark. The more so, that no case of its supervention occurred in the amputations, although 2 were performed on tetanic subjects, in a vain endeavour to arrest the fatal action.

Excepting tetanus and bilio-remittent fever, no predominating action appears as the cause of death, either in the class of fractures or severe flesh-wounds. Remittent fever even plays no part in severe flesh-wounds; neither does it in any other class. This disease, so fatal in its attacks, fell exclusively upon two classes—*complicated fractures* and *amputations*; in no other fatal case, in the whole series of 500 wounded, does it appear.

2. *Conclusion.* The peculiar suppurative disease of distant parts, or organs, which by some has been described as peculiar to secondary amputations, we see occurs in much larger proportion in the primary of this series. By others it has been described not less unhesitatingly as the mere result of phlebitis, and depending upon it as a primary affection for development; it occurs, to all appearances, totally independent of the existence of phlebitis, both in primary and secondary amputations, precisely as I have already shown it to occur in fractures not amputated. In 40 fatal cases of this kind of injury occurring in one period of a twelvemonth, although suppurative disease was found to exist in 4, congestion and effusion of thorax in 2, not one case of phlebitis was ascertained.

It is also not less evident that the train of febrile symptoms described as the distinctive fever of phlebitis, is neither more nor less than the bilio-remittent, which, from whatever cause it may proceed, seems peculiarly favourable to the development of this disease, especially in the lungs and liver; but that this fever is *not* distinctive of phlebitis, we have a double proof—1st, the type of fever exists and destroys, without leaving any trace of phlebitis; sometimes with secondary abscesses developed, at others without such effects. 2ndly, phlebitis exists, with a different type of fever, and without producing these suppurative diseases, although death ensue.

The cause of remittent, or bilio-remittent fever, and of those purulent depôts and sup-

purative affections of distant organs or parts, is not to be sought in phlebitis; neither is there any essential or necessary connection between these affections, sometimes found in conjunction, each may frequently be found existing separately.

In describing, therefore, the symptoms of a bilio-remittent fever as the signs, the type and effects of phlebitis, I suspect a great error has been committed. In these 21 fatal cases of amputation, and 40 cases of death from fracture where amputation was not performed, there are frequent instances of each of these affections—viz., phlebitis, remittent fever, and secondary abscesses of organs—existing separately, and in various degrees of combination.

Under these circumstances, either of the doctrines I have alluded to are in contradiction to facts, too numerous to allow of a doubt as to their incorrectness.

Phlebitis. Metastatic abscesses and secondary suppurative disease are peculiarly favoured in their development by this type of fever, but they do not stand in the relation of cause and effect.

Finally, the result to which these facts lead me is, that primary amputations are more subject to the three diseases under consideration—separate, distinct, and essentially different from each other, as I have endeavoured to demonstrate—than secondary amputations, properly so styled, that is after the twentieth day, more or less.

That fractures, treated without amputation, are more subject also, during the first thirty days of treatment, than secondary amputations after this period. This applies more especially to the series under review, but its application is also general, and the conclusion is amply borne out by all the facts before me.

The bilio-remittent fever, with its frequent complications of diseased viscera and phlebitis; together with the small irritative fever, one of the products of severe shocks to the nervous system, either consuming life rapidly or more slowly, still generally without organic lesion, occasionally developing a disorganising and highly-irritating action in the stump, and thence again re-acting on the system, are the chief sources of danger and causes of death in primary amputations.

Each period of amputation is beset with its own peculiar and distinct sources of danger, together with some that are common to all periods, as they are also to fractures treated without amputation; it is desirable to distinguish the peculiar from the common. Intermediary amputations singularly justify by their causes of death, and even contrary to general opinion, often by their results, the name I have given them. Exposed to the chief dangers of primary amputation, above enumerated, although in a less degree, they are by no means exempt from those which seem more especially ap-

pertaining to secondary amputations. They have to contend with the dangers attached to both, but to the dangers of *neither in the same degree of intensity*. Into the causes of death, in both intermediary and secondary amputations, we shall have to inquire more fully hereafter; it will then be seen how far the results prove the truth of this conclusion. To fully appreciate any peculiarities in the present series, it is only necessary in general terms to allude to the more usual results and their causes.

Thus, in reference to secondary amputations, when unsuccessful, they are generally rendered so by hectic and its complications—diarrhoea, dysentery, effusion and development of pthysical disease, occasionally to the extent of suppurative action; they are not exempt from the formation of purulent depôts or secondary abscesses, but are certainly less liable, so far as my observation extends, than primary amputations.

Secondly,—By shock; it often proving too great for the debilitated system, and the patient never effectually rallies.

Thirdly,—Any other causes of fatal result may fairly be classed under the head of accidental or irregular actions, and form exceptional cases.

Pleuritic disease solely—manifested most commonly in adhesions simply, at other times proceeding to effusion—is by no means an unfrequent complication in primary, more rarely in secondary, amputations. Such a result I have not ascertained to be attendant on other fatal cases from injuries of the extremities.

In this series of March, the primary amputations present 3 such cases in 15. The subsequent amputations none, if we except the mischief resulting from a wound of chest. Both the secondary amputations fell a sacrifice to one of the chief sources of danger I have described as peculiar to operations at that period—viz., shock upon a debilitated system.

We may now proceed to the final consideration of the causes of death in primary amputations generally, which was postponed for the purpose of more strictly analysing the causes of mortality in this unusually fatal series. We can now form an opinion of what is peculiar to this series, and what common to the whole class of primary amputations. If it be found, on the one hand, that the same diseased actions are in play in other series, only less frequently, or with less virulence, then there will be no reason for continuing to isolate and separate the two, the temporary purpose in view being now accomplished. The causes of mortality, the character and progress of the supervening actions on the whole of the primary amputations, will form our proper study.

Already informed by this analysis of the fatal and destructive action of the diseases specified in this and the preceding lecture,

when any causes, *dynamic* or *physical*, give them increased virulence or force.

Thus, step by step, would I carry you with me in this inquiry; the inferences drawn have not been the results of any foregone conclusions, neither do they present any preconceived opinion in my own mind. In the same way that I now lay the various facts before you have I studied them, in search of the true, rather than the extraordinary or the novel.

I have devoted some time and labour to this series; for it serves as an exposition of the relative amounts of mortality in amputations, and all the grave and complicated injuries of a field of battle, when certain dynamic and depressing influences attend the closing scene of action, and the subsequent periods. Influences, hitherto but little dwelt upon, of most subtle character, but not the less fatal or important, because so frequently passed unheededly, as difficult of tangible demonstration.

This analysis, indeed, has had peculiar interest to me, anxious as I felt at the time of treatment, thoroughly to investigate the true causes of a mortality in the amputations far exceeding any I had previously witnessed. A similar form of disease attacking so many patients, naturally led to an impression that they perished by the effects of some endemic or epidemic disease akin to the yellow fever; yet the rare occurrence of this disease in either hospital, exclusive of amputations, scarcely 2 per cent., and these cases almost entirely confined (in the distinct and obvious characters of the fever at least) to the same complicated injuries which led to amputation, sufficiently proves that whatever the cause of the action it was not epidemic in the hospital, where the mortality upon the whole number, although increased, was not greater than might reasonably have been anticipated from the temporarily crowded state of the hospitals, and the circumstances attending the military operations of the week.

The cases, as I have observed, form a very complete series, and show the results *when the injuries and the treatment take place under unfavourable circumstances, even of temporary duration, but more especially when these are of a nature to affect the morale of the wounded*. Any unfavourable circumstances of a physical nature were entirely removed within fourteen days, and by the 29th of March the hospital had been thinned below its full complement, only 581 patients remaining within its walls.

As this series has occupied so much of our attention, it may not be uninteresting to glance at the general result of the whole of the 500 wounded throughout their treatment, by which the total loss upon that number in three months will be seen.

Admitted, 500; discharged cured, to duty, 243; transferred to Santander, 94; invalided, 81; died 82. Those transferred were cases

for the most part of severe flesh-wounds, presenting little or no danger of fatal result, but requiring protracted treatment, and probably one-half would be more or less disabled for active service.

The mortality is very great, nearly one-sixth; and 74 of these deaths occurred in the first month, of which nearly one-third were from amputations. It is to be observed, however, that in the classification of these 500 cases, only 135 were defined as of slight character.

SURGICAL OBSERVATIONS.

By G. H. SMITH, Esq., Surgeon, Penang.

CASE OF STRANGULATED INGUINAL HERNIA.—OPERATION.—CURE.

BAWA SAAB, ætat. 49, a native from the Madras coast, applied for assistance on April 4, 1839, stating that four months ago the gut came down, and that he then complained of severe twisting pain in the umbilicus, which immediately subsided on the bowel being returned; and that this was easily effected by his own efforts. Had a cold, and was walking when the gut descended; can assign no other cause. From that time it had repeatedly protruded, a truss not being worn, but yet could be returned without difficulty. Eight days previous to this date it came down, and could not be returned; since then there has been no evacuation from the bowels.

The patient had been attended from 8 A.M. this morning by Mr. Palmer, a practitioner in this place, who, at 11 A.M., called me in, when we found him complaining very much of a burning pain in the umbilical region; the abdomen tympanitic, and tender; the countenance expressive of great anxiety; the tongue dry; pulse quick, and small; there was vomiting and hiccup. The hernial tumour was smooth, tense, and crepitating, and acutely painful to the touch. On the same side there was a hydrocele of four years' duration. Mr. P. had previous to my being called repeatedly tried the taxis, assisted by venesection, warm baths, and tobacco enemata. It was again tried for a short time without benefit, and a tobacco-enema was exhibited, which produced great exhaustion; and the taxis then repeated, but still found ineffectual. While the depression from the tobacco lasted, a large lumbricus was vomited. The operation was now determined on; and the patient having given his consent, I made the preliminary incisions in the usual way; the stricture was divided, and some adhesions, which were found surrounding its neck, were separated, partly by cutting and partly by tearing; and the gut was returned, having a bluish appearance. The edges of

the wound were brought together by two stitches of the interrupted suture, and cold applied. Some castor-oil was given, and a common salt-and-water injection administered; both acted, and the stools contained mucus.

5. Had rested pretty well, but the hiccup continued. Some antispasmodics were prescribed; the hiccup and other bad symptoms, in a day or two, gradually subsided; and in ten days from the date of the operation, the wound was quite united. I saw the patient on the first of the present month (July, 1840), now fifteen months since the operation; he enjoys good health, still goes about without a truss, but wears a very broad and tightly-bound T-bandage, which keeps up the hydrocele; and this then fills the inguinal aperture so completely, that the gut is prevented from descending.

CASE OF TETANUS FOLLOWING A KRIS WOUND.

Euroff, ætat. 24, a native of the Madras coast, on the 23rd November, 1839, at four, A.M., had inflicted on his left arm a severe kris wound by a thief, who had been detected in, and was attempting to escape from, his house. The natives found all their efforts ineffectual to stop the bleeding. When called, at six, A.M., I found the patient weak, exsanguine, and collapsed, from the loss of much blood, which was still escaping through thin bandaging and a quantity of leaves, &c., that had been placed on the wound to check the hæmorrhage. On removing their bandages, &c., and the clots from the wound, blood sprung, in a large stream, right from the arm. Graduated compresses and a bandage were applied, and the hæmorrhage effectually stopped. The wound on the surface was about an inch and a half in extent; it divided the insertion of the deltoid, penetrated deep to the bone, running across its anterior surface, dividing muscular fibres, nerves, and a very large artery—perhaps the brachial itself. The patient was directed to be kept quiet, and to have the antimonial saline solution, with low diet. The pulse was 100.

24. Had slept during part of last night; was not so exhausted; pulse 96; the tongue moist, and the bowels had been moved. The arm was considerably swollen, and there was pain, but no escape of blood. He continued to do pretty well until the 29th, and to take the saline solution to keep the bowels open, which were inclined to be constipated. On the 27th there was more swelling, and some oozing of pus from the bandage; that, with some of the graduated compresses, were removed, and warm fomentations applied. On the 28th the suppuration was increased, but not so healthy in appearance; more of the compresses were removed, and the fomentations continued. On the 29th, between one and two, A.M., he commenced complaining of