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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 VII.

Further conclusions from the statistical tables of the preceding lectures, in reference to causes of death in cases treated.—Inquiry into the diseased actions supervening on complicated injuries of the extremities during treatment, and rendering amputation necessary.

I CONCLUDED the last lecture stating, that there were further conclusions to be drawn from the tables under consideration, in reference to the diseased actions resulting from injuries of the extremities, and causing death, without the intervention of amputation. To these I would now draw your attention.

I think it has been demonstrated, that there are two sets of physical causes which have a striking and palpable influence, upon the nature, gravity, and frequency of occurrence of diseased actions, supervening on severe injuries of the extremities, and which either cause death during treatment, or render amputation necessary. First, The favourable nature, or otherwise, of the circumstances under which they are treated. Secondly, The nature and degree of the injury.

The relative frequency of amputation, and of death during treatment, as modified by the nature of the injury, was shown in the fourth and fifth lectures, as also the nature and character of those actions. The relative frequency of amputation in injuries involving the joints during the progress of their treatment, might be stated in the following relative numbers:—In joint injuries the proportion of amputations required to the whole number treated was 1 to 3.862, or 16 in 61 cases, including cases secondarily affecting the articulations. In complete fractures, not involving joints, and exclusive of partial fractures, 1 in 4.043, or 23 in 93. In refer-

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ence to the proportionate mortality in these two classes of cases while under treatment, the tables show that in joint cases the deaths were 1 to 2.250; that is to say, of the 61 cases, 16 having been amputated, there remained only 45, in which the result of treatment could be seen to the end, without the intervening shock of an amputation; and of these 45, nearly one-half, or 20, died.

In the class of fractures, complete, but not involving joints, 70 cases thus treated to the end gave a mortality of 1 in 4.375; 23 of the original number of 93 having been amputated.

RESUMÉ.

Joint Cases. *Fractures only.*

Amputations 1 to 3.862 . . . 1 to 4.043

Deaths in remaining cases treated, 1 to 2.250 . . . 1 to 4.375

These, then, are the ultimate results of the influence of the nature of the injury on the proportionate frequency of amputations during treatment, and of deaths in the remaining cases treated to the end without operation.

The amputations slightly preponderate in joint cases; the deaths largely, in proportion to those resulting from injuries where the joints escape. But it requires to be borne in mind, that there was a greater disproportion in the primary amputations required by each of these classes—that the results I have just given are the results of cases *put under treatment*, and not including those amputated within twenty-four hours. If we refer to Tables I. and II., it will be seen that in joint cases the proportion of primary amputations to the total number of cases, was 1 in 3.904; in severe fractures, joints escaping 1 in 5.227.

To this part of the subject, however, I shall return, in speaking of the primary amputations. Another mode has been adopted, however, of determining the influence of degree of injury: in the Tables VI., VII. and VIII., you have seen 101 cases of complicated fractures (not involving the articulations), classed according as the degree made them favourable. Doubtful or unfavourable cases for treatment having reference to the prognosis of a successful issue. Here a still more obvious difference is made evident.

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RESUMÉ.

Proportion of Amputations during Treatment.	Deaths in Cases treated only.	United Results not including Deaths after Amputation.
Favourable cases 6.111	..... 27.500	..... 5.000
Doubtful 1.846	..... 1.100	..... 1.714
Unfavourable 2.444	..... 1.000	..... 1.000

Glancing at the combined results as regards the number of amputations during treatment, and the number of deaths in those remaining and treated to the end, we find the influence of degree of injury shown in gradations. The two unfavourable results of a case, loss of limb or loss of life without amputation, are as 1 in 5 in favourable cases; more than half in doubtful; whereas none escapes from either the one or the other result in cases originally unfavourable for treatment.

But it is worthy of remark, that this scale varies when we consider the two results separately. In favourable cases, one-sixth

demand amputation during treatment; in doubtful cases, somewhat more than half; in unfavourable cases, between one-third and a half; the remainder perishing; the cases of most favourable progress alone permitting amputation.

Other modes still suggest themselves of determining the degree in which these physical causes respectively, and in combination modify the morbid actions which determine the result of a case. Their relative importance is shown tolerably clearly in both the classes of injuries selected in the resumé I now place before you.

Statement of Cases of Amputations and Cases treated, included in Nos. I. and II., showing the relative Proportions of the Two Unfavourable Results—Amputation and Death without—under different External Circumstances.

1. Under Favourable External Circumstances.

	Proportion of Amputations.	Of Deaths without.	Combined disastrous Results.
In injuries of articulations in 34—10	3.400....	in 34—6 5.666....	in 34—16 2.125
Injuries not implicating joints.....	71—19 3.736....	71—3 23.666....	71—22 3.227
The two classes combined	105—29 3.451	105—9 11.888	105—38 2.763

2. Under Partially Unfavourable Circumstances.

Injuries of articulations	12— 2 6.0	7 1.416	9 1.266
Injuries not implicating	26— 2 13.0	9 2.888	11 2.365
The two classes combined	38— 4 9.500	16 2.157	20 1.900

3. Under Unfavourable Circumstances.

Injuries of articulations	15— 4 3.750	7 2.142	11 1.363
Injuries not implicating	34— 2 17.000	6 5.666	8 4.250
The two classes combined	49— 6 8.166	13 3.769	19 2.578
Total.....	192—39 4.923	38 5.052	77 2.493

Many interesting results are here brought out well deserving attentive consideration; but before proceeding to ultimate conclusions, I must refer to No. XV. We have seen, separately, the effects of external circumstances, and the effects of different kinds and

degrees of injury; but this table shows at a glance the results of degree of injury and external circumstances combined, and was wanting to the perfect development of this part of the inquiry. By this we gain the following data:—

	Amputations.	Deaths in Cases not Amputated.
Favourable cases of compound fractures, treated under favourable circumstances	1 in 4.000	..... 0.
Ditto under unfavourable circumstances.....	1 in 1.700	..... 16.000
Doubtful cases treated under favourable circumstances	1 in 1.444	..... 0.
Ditto under unfavourable circumstances	1 in 2.000	..... 3.00
Unfavourable cases under favourable circumstances..	1 in 2.833	..... 1.00
Ditto under unfavourable circumstances.....	1 in 6.250	..... 1.00

The amputations are most numerous in doubtful cases treated under favourable circumstances ; next, in favourable cases under unfavourable ; thirdly, in doubtful cases under unfavourable circumstances. The amputations in favourable cases, and under favourable circumstances, are more numerous than might have been anticipated—6 in 24— or 1-4th, and is not easily accounted for, except that none of this class underwent primary amputation, and none died under treatment ; it may also be assumed that, in drawing a line between classes of cases, some of the first must approach very near to the second ; and the 6 amputations among the favourable cases may be so considered, as merging on the next or doubtful series.

From the facts and tables variously embodying them, to which I have drawn attention in this and the preceding lectures, I think the following are legitimate conclusions :—

1. That when circumstances are favourable for treatment, and the cases, from their nature, offer a fair chance of recovery, although a fourth may require amputation by the development of morbid actions, few or none will die under the treatment adopted, with a view to save the limb. Even in doubtful cases, although a large proportion, say one-half, may require amputation, yet few or none will die under the previous treatment if carefully watched, and amputation be not deferred too long. But in the treatment of unfavourable cases under the best circumstances, not a third will allow of amputation after the first period has passed, and all not amputated will perish. A portion of those operated upon who recover will be the only ones saved.

2. When the circumstances under which the treatment must be conducted are unfavourable, the number of amputations in doubtful and unfavourable cases for which there is opportunity, with a fair chance of success, is much diminished ; and the number of deaths is increased in proportion. In favourable cases the number of amputations is, on the contrary, largely increased, and the deaths also, though in a less degree. The opportunities for amputation are most rare in unfavourable cases under unfavourable circumstances. On the deaths which take place in all not amputated in this class, external circumstances have no control, at least in so far as the *result* is concerned, although they possibly, in some degree, modify and control the character and duration of the supervening diseased actions.

3. From these general facts the last conclusion may be drawn, viz., that in favourable and even in doubtful cases, judicious treatment, if it will not always save the limb, at least need not cost the patient his life (unless in exceptional cases), if good judgment be exercised in stopping the curative treatment, and resorting to amputation at the proper

period. Thus, in doubtful cases, much may be adventured, in the first instance, to save a useful limb. In unfavourable cases, on the contrary, amputation or death, sooner or later, are the only results that can be anticipated ; and the only object and legitimate end of any treatment is to save the patient's life, until a proper or favourable period may be selected for operation.

When, as we proceed, the dangers attendant on treatment and the danger of amputations, at different periods, are brought out and contrasted, the best line of practice can be determined with considerable certainty ; and the important bearing and application of the materials of these introductory or preliminary lectures, as they may be termed, will then be fully seen.

Before even these materials are completed, however, much yet remains to be done. Hitherto I have only inquired into the nature of such supervening actions as destroy life by their development. I proceed now to investigate and determine what are the supervening actions which render *amputation* necessary during the progress of treatment.

The Tables, Nos. III. and IV. (p. 433), will form the groundwork of the inquiry. The numbers stand thus :—

Fractures involving Joints.

Intermediary amputations.....	8
Secondary ditto	13
	—
	21

Fractures not involving Joints.

Intermediary amputations.....	19
Secondary ditto	12
	—
	31
	—
	21

Total of amputations in both classes, 52

What were the supervening actions rendering these amputations necessary ?

The results shall be laid before you, first, as regards the whole number of 52 ; secondly, as regards the two classes of cases of fractures simply, and complicated with injuries to the joints separately ; thirdly, in reference to the gravity of the injury ; and fourthly, with reference to the site.

In conclusion, I shall endeavour to demonstrate the influence of external circumstances on the character and frequency of those supervening actions, and how these various statistical results practically bear upon the periods for operation.

Supervening Actions rendering Amputation necessary during Treatment.

CLASS I.

23 Amputations were performed to arrest and, in some instances, to anticipate the full development of actions, general and local, having no prominent or specific

character, but threatening life if not arrested, and to render amputation impossible. In many unfavourable cases an opportunity was seized, during the intermediate period, before the full development of the inflammatory stage, in order to anticipate such actions.

CLASS II.

- 4 For actions chiefly or entirely local, having in like manner no very specific or peculiar character, but obviously rendering any attempt to cure the limb hopeless, and indicating, therefore, the necessity of amputation prior to the system's becoming too seriously implicated to permit the alternative.

CLASS III.

- 20 For supervening actions, local and general, having peculiar or specific characters.
3. Trismus.
 7. Secondary hæmorrhage.
 5. Sloughing or gangrene.
 2. Periosteal disease.
 1. Bad and sluggish action, leaving no hope of union.
 1. Contraction of limb.
 1. Pain and inconvenience in locomotion.

The following abstracts of cases will not only serve to illustrate these classes of supervening actions as causes of amputation, but to define their nature more clearly:—

CLASS I.

CASE 1.—Injury of leg ultimately implicating knee-joint, and producing a state of general irritation and debility threatening life, and if longer permitted to continue, to render amputation impossible or hopeless.

George Smith, æt. 32, a musket-ball entered the right leg to the outside, and at the lower margin of the patella, coursed downwards and outwards a length of six inches, and made its exit over the external edge of gastrocnemius, about four inches below the popliteal space.

Considerable constitutional disturbance, together with local evidence of mischief to the knee soon supervened, involving the thigh in extensive suppurative disease, marked by profuse discharge. Protrusion of cartilage later, proved the destruction of the joint. During thirty-five days great irritability, feebleness, together with disordered functions and want of sleep, marked the case. At this period pulse was 120, of moderate strength, but varying, and patient complaining of extreme languor and want of rest; bowels tolerably regularly acted upon; tongue moist, clean anteriorly, but covered with a dark fur behind; discharge profuse and unhealthy; numerous counter incisions

had been practised; leg quite œdematous; obscure fluctuation in joint, and surrounding parts much diseased.

On the 35th day the limb was removed about the centre of the thigh: the ball was found to have traversed the popliteal space without opening the joint; there was a dry cavity in the internal part of the calf under the integuments. Another large cavity in the popliteal space, extending some way up, and containing a little matter; the cartilages of the joint had entirely disappeared; the ligaments were in a pulpy state, and the articular surfaces much corroded and ulcerated. Various openings communicated with the articulation.

For three months subsequent to amputation a doubtful struggle was maintained; stump took on diseased action; sloughing with hæmorrhagic tendency; bad discharge and collection of matter above, attended with fever; diarrhoea; disease of bone protrusion through skin, and finally exfoliation. He ultimately recovered, and was discharged with a good stump.

CASE 2.—CLASS I.

Corp. Williams, æt. 23, a musket-shot passed obliquely through the external condyle of the humerus directly implicating the structure of the articulation, but without detaching any fragment of the bone. Ball removed on the 68th day from below the tendon of the triceps above the olecranon; amputated one hundred and thirty-six days after the injury; cured forty-one days; patient's health had been seriously injured by protracting the operation so long; he was emaciated; his appetite gone; diarrhoea had set in; constant and rather profuse discharge of foetid pus from openings leading into the joint; arm remarkably wasted; bony anchylosis had taken place; soft parts surrounding the joint were converted into semi-gelatinous and cartilaginous structure; olecranon carious.

CLASS II.

CASE 3.—Illustrating the second class, or actions chiefly or entirely local, having in like manner no very specific or peculiar characters, but evidently rendering any attempt to save the limb hopeless, and indicating, therefore, the necessity for amputation prior to the system's becoming seriously implicated.

Wm. Williamson, æt. 55, amputation was performed twenty days after the injury was received, which consisted of an extensive gunshot comminuted fracture of first phalanx of index finger; metacarpal bone of middle and comminution of nearly all the bones of the carpus. He refused to submit to amputation in the first instance: although the hand swelled excessively, no constitutional derangement was apparent. On the 9th day a considerable quantity of ill-conditioned matter was discharged from the dorsal surface

of the hand. On the 18th, it was observed to be in a very bad state; although the patient still remained free from much suffering. The constitutional disturbance was wonderfully slight, taken in connection with the incurable nature of the wound; the whole hand and wrist swelled; sloughing and suppurative action to a great extent; bowels regular; tongue clean. He was an old man, possessing a wonderful vigour of constitution. On the 20th day he consented, but the forearm had then become so extensively diseased, that it was necessary to sacrifice the elbow and amputate above. He bore the operation bravely; some slight disease of cellular membrane existed, even where the first incision commenced; carpal bones were found crumbled, and the articulation destroyed; partial disorganisation having also extended half-way up the forearm.

A good deal of diseased action supervened on the stump; he was cured on the 172nd day after amputation; tedious exfoliation having kept the stump open. The constitution seemed altogether unaffected during the whole period.

CLASS III.

CASE 4.—Periosteal disease; illustrative of third class or supervening actions, local or general, having peculiar or specific characters.

S. Bagley, æt. 21, wounded Jan., 1833, near Oporto. Case of gunshot fracture of ulna involving elbow by the spread of periosteal disease.

First day after receipt of injury. Pulse full; tongue loaded; bowels well opened. V.S. ad $\frac{3}{4}$ xii. Second, Slept badly; much tension of forearm with redness of integuments; tongue cleaner; pulse hard. Third, Better in all respects. Fourth, Health good; wounds discharging, and the suppurative process commencing. Fifth, Sloughs detaching kindly. Sixth, Wound more painful. Seventh, Slept very badly; complaining of great pain in arm and hand; bowels confined. Eighth to tenth, Some amelioration. Eleventh, Two large excrescences protruding at the entrance and exit of the ball; the whole arm red and swelled, and exquisitely tender to the touch; the integument pitting, on pressure, and giving an obscure sense of fluctuation; forearm laid freely open between the wounds; pulse sharp and jerking; the incision bled considerably. Twelfth, Arm less painful and swollen; discharging freely; pulse better, and he slept during the night; tongue foul; bowels confined. From thirteenth to sixteenth, Improving locally and generally; surface cleaning, and becoming covered with healthy granulations. Seventeenth, Smart hæmorrhage from posterior wound checked by pressure. Twentieth, Going on well, though feeling much weakened. $\frac{3}{4}$ Thirtieth, Two previous days deteriorating; pain of joint; arm, as high as insertion of deltoid, swelled; granulations

high, glazed, white, and flabby; a small sinus found on top of elbow, and leading to rough bone. Thirty-ninth, Forearm laid open nearly the length of the ulna through the puffy swelling; a smart hæmorrhage followed. Next day patient felt relieved, as on a previous occasion, by the incision, which gapes widely; bone beneath denuded, rough and carious; pulse febrile and jerking; occasional hectic spot on cheek; tongue clean, and he is in good spirits; warm and soothing applications chiefly employed; bandaging and regulated pressure for a short period substituted. Up to fiftieth day the patient continued with no material change, the arm discharging considerably, and his strength becoming more exhausted without a hope of improvement in the state of the arm. Amputation was performed; very little febrile action supervened; the stump united in a great measure by first intention; ulna was found corroded in its whole course; elbow-joint also deeply involved by extension of periosteal disease.

I have given the details of the last case at some length, because the peculiar diseased action is of rare occurrence, and the progress of the symptoms is not otherwise void of interest.

With these examples, the classification I have adopted will be better understood. In the next lecture, by a comparison of the character and proportionate frequency of those actions which render amputation necessary, with those already analysed as causes of death during treatment, I trust to lead you to another series of conclusions having immediate practical application.

CLINICAL REMARKS

BY

DR. SEYMOUR;

DELIVERED IN ST. GEORGE'S HOSPITAL.

PLEURITIS.

WHENEVER you meet with a case of pleuritis, having a modified character, and assuming a sub-acute type, you must not be induced to bleed your patient to so full an extent of depletion, as if the disease assumed the simple and uncombined form of acute severity. In such a case as I have described, the affection is most commonly of a chronic character; and lymph may be poured out, glueing together the opposing surfaces of similar structure; and in such cases there is no remedy whose power is more efficient than mercury, given so as to affect the mouth: the moment this therapeutic action shows itself, the patient is cured. This is the sure and general principle to be followed out in such cases; but it must be modified in some special instances. There is no point of practice which will re-