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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 XIII.

On Amputations, &c.

Analysis of causes of death in the fatal cases resulting from 57 primary amputations. Nature of supervening actions causing death in amputations performed in Intermediary and Secondary periods, compared with those supervening on complicated injuries treated, and on Primary amputations. Conclusions to which this comparison leads.

At the conclusion of the last lecture, I promised to lay before you some observations on the nature of the bilio-remittent form of fever supervening on operations, and frequently attended by the formation of purulent depôts, or suppurative disease in distant organs or parts; as also upon what might be considered the chief agents in the production of this type, and its singular complications.

As, however, the remarks I have to offer, not only upon the febrile, but various other diseased actions supervening on primary amputation, have a distinct bearing upon the operations of intermediary and secondary periods, it will, probably, be expedient to place before you, first, the analysis of the causes of death in operations at each of the three periods; and then, more particularly, to consider the nature of the diseased actions prevailing in each, and the chief agents in their production.

The analysis of each series of cases has seemed to me worthy of a place in these lectures; and in considerable detail, not only because valuable hints and facts may be gleaned from them for your instruction, but that they may serve to invite comparisons, and induce others—whose opportunities give

them the means—to furnish similar returns of the results of amputations, and other severe operations, performed within any given period in the civil hospitals.

I claim your attention first, then, to the aggregate return of causes of death in primary amputations, without reference to any subdivisions as to the influence of external circumstances, &c. You will thus see the results and effects upon the system, of primary amputations in their simplest and largest proportions.

In 57 cases, 29 died.

13 with *remittent fevers* of bilious character, accompanied by vomiting and yellowness of skin.

10 of these with disease of viscera.

6 Suppurative.

1 Phlebitis and secondary hæmorrhage.

1 Phlebitis.

4 Effusion and inflammation.

2 with metastatic abscesses not involving viscera.

1 no post-mortem: the same state probably existing according to the symptoms.

2 *Hectic fever*.

1 with phlebitis: no secondary abscesses.

1 with diarrhoea and great irritability (no post-mortem).

5 *Irritative fever*.

1 Phlebitis and metastatic abscess of knee.

1 Idem, abscesses of lungs, effusion, &c.

1 Purulent depôts in lungs and shoulder-joint.

1 No recent organic disease; stump healthily united.

1 Great shock of injury; stump sluggish (no post-mortem).

1 *Cholera*. Case complicated by severe wound of thigh.

1 *Phlebitis*.

1 *Purulent disease of lungs and liver*, and mesenteric glands diseased.

Diseased actions during treatment, chiefly local, indicating the extensive necrosis of the bone above the point of amputation.

3 Actions causing death not clearly defined, portions of the notes incomplete or mislaid.

1 Tetanus.

1 Shock of operation.

29

Secondary hæmorrhage occurred and required ligature in..... 1

Slight hæmorrhage in several.

Phlebitis 6

Secondary abscesses, or disease of viscera in 16

Tetanus in 1

Shock in 1

Irregular complicating actions in 23, or 1 in 1.2.

The causes of death in their most generalised form in amputations, performed in the two periods, intermediary and secondary, may be thus stated :—

17. Intermediary.

7 Died from irritative fever, with or without complications of phlebitis, secondary abscesses, diseased stumps, &c.

4 Bilio-remittent, with complications; secondary hæmorrhage in 1.

3 Fever less distinctly defined, with disease of lungs and liver in 1.

3 Trismus.

17

Secondary hæmorrhage occurred in 1

Phlebitis in 3

Secondary abscesses, or disease of viscera, in 5

Tetanus in 3

Complicating, irregular or accidental actions supervened, therefore, in 12 cases, or in the proportion of 1 in 1.58.

9. Secondary.

1 Irritative fever.

1 with secondary hæmorrhage.

3 Shock to the system.

1 with secondary hæmorrhage.

1 Sloughing action of stump.

2 Hectic, and shock superadded.

1 Hectic and diarrhoea.

1 Erysipelas and diarrhoea.

1 Exhausted with long-continued actions, local and general.

9

Secondary hæmorrhage occurred in 2

Phlebitis in none.

Secondary abscesses, or disease of viscera, in none.

Tetanus, none.

Shock in 3

Erysipelas in 1

Complicating actions supervened in 5 cases, or 1 in 1.8.

If we compare these with the analysis already given of the actions causing death in fractures not amputated, and in primary am-

putations, the following differences and resemblances appear worthy of attention. The relative numbers of fatal cases standing thus—

38 cases of fracture treated without amputation.

29 do. of primary amputation.

17 do. of intermediary do.

9 do. of secondary.

93

1. We have to remark the disappearance in secondary amputations of the most fatal of all the supervening actions; viz., the bilio-remittent fever. This fever, which appeared in the proportion of about 1 in 7 of the cases of fractures treated, 1 in 2.2 in primary amputations, and 1 in 4.2 in intermediary, plays no part in the causes of mortality in secondary amputations.

2. The total disappearance of two other diseased actions in the secondary period. Common complications of the bilio-remittent fever, in all the other classes of cases, yet often existing separately and independent of each other and of it. I allude to secondary abscesses and phlebitis. Not a single instance of either occurs in the 9 cases: a glance at the analysis will show that these secondary abscesses are frequent in fracture treated, although phlebitis is not. In primary amputations, more than half died, either from complicating disease of viscera, secondary abscesses, or phlebitis; often from all three. Phlebitis in 6 was ascertained, or 1 in 4.1 of the whole number. In 17 intermediary amputations, we have also seen that these actions existed in 8—nearly $\frac{1}{2}$: phlebitis forming between $\frac{1}{5}$ and $\frac{1}{6}$ of the whole.

From these facts it may be concluded, that if secondary amputations are not exempt from three of the most fatal of the whole range and series of supervening actions (and that they are not quite exempt, I am aware, from cases which have fallen under my own observation, as well as that of others), yet are they by no means equally liable. Cases of fracture treated, and the secondary amputations of the series which I have recorded in these lectures, seem to have formed two classes free from the actions of phlebitis; and the latter, in addition to phlebitis, was exempt from secondary abscesses and complicating diseases of viscera.

From analysis of the proportions, it appears that the primary amputations are more obnoxious to secondary abscesses and visceral disease than the intermediary, while the liability of the latter to phlebitis is about equal. Fractures treated are less liable than either to the purulent depôts, diseases of viscera, &c.; and no case of phlebitis was traced in the whole series of 38.

Hectic supervenes, and is occasionally mortal in three of the classes indicated: it is in greatest proportion in cases not amputated,

but treated to the end; more than 1 in 4 died from its effects.

In secondary amputations, rather less than 1 in 4.

In primary amputations, 1 in 14.5.

It does not appear ever to be a prevailing action in amputations performed at an intermediary period.

Irritative fever is common to all, and is nearly the only diseased action of which this can be said; but the relative proportions vary. Thus, in injuries treated, it may be estimated as about 1 in 15.

In primary amputations 1 in 5.8.

In secondary 1 in 9.

Intermediary 1 in 2.4.

Secondary hæmorrhage occurs in three classes: in fractures treated in the proportion of 1 in 19. Most of these cases, however, become subjects of amputation, and thus do not appear under the head of fractures treated to the end. It occurred in the

Primary amputations 1 in 29.

Intermediary amputations 1 in 17.

In secondary 1 in 4.5.

Secondary amputations are those decidedly in which it most frequently occurs.

Tetanus is a rare complication of secondary amputation: in this series no case occurred.

In fractures treated its relative proportion was 1 in 12.6.

But it would be more correct to add to these the three cases where tetanus was the *cause* of amputation, and then the proportion would be doubled; remaining . . 1 in 6.5.

In primary amputations it occurred only 1 in 29.

In intermediary 1 in 5.6.

Shock, or that impression on the system from which the patient evidently never rallies (whether he die on the spot, or his death be protracted for three or four days), is a fatal attendant on all the classes.

In injuries not amputated, the proportion is 1 in 12.6.

In primary amputations 1 in 29.

In intermediary none, except in cases of secondary hæmorrhage or tetanus.

In secondary amputations 1 in 3.

The proportion of those who die by the immediate and palpable effect of the shock, that is, within a few hours, is not large, except in the worst kinds of cannon-shot injuries. But the number who die of its less obvious or sudden, but not less certain, effects, is in a much larger proportion than the above numbers would indicate; those only referring to the patients who die at once, or within twenty-four hours after operation, and such cases from musket-shot, as I have said, are rare.

Before proceeding to some more general conclusions, I would draw your attention for a few moments to the term of duration, and

consequently the intensity of the diseased actions, in reference to the site and nature of the injury.

In reference to Site and Nature of Injury.

The diseased actions causing death in *injuries of the joints*, after intermediary amputations (1 shoulder and 3 knee cases), run their course in an average term of *fourteen days* after amputation.

In fractures *not* involving joints, the average term for the ultimate development of these actions is *thirteen days*, $7\frac{1}{2}$ in fractures of the arm, 21 in injuries of forearm and hand, 9 in fractures of tibia and fibula (4 out of 6 were thigh amputations).

Secondary Amputations—Joint Injuries.

Average term of fatal result after operation in the knee, 8 days. In *fractures not involving joints*, average term for femur, 4 days; tibia and fibula, 9; radius and ulna, 9 days also. Average upon the whole, 7 days.

We thus see that the average term for intermediary amputations may be taken at $12\frac{1}{2}$, while for secondary amputations it is but 7. Either the patients are less capable of bearing the diseased actions setting in after operation at the periods selected for secondary amputations, or the supervening diseases are more destructive in themselves. What does the return show?

Intermediary.

Supervening Actions causing Death.

Joints.

Average term,
Days.

11. 1 *Shoulder.*

Irritative fever; wound of chest; pleuritic disease.

15. 3 *Knee.*

1 Secondary hæmorrhage; phlebitis; and bilio-remittent fever.

1 Bilio-remittent, and disease of lungs.

1 Irritative fever, suspected phlebitis.

Fractures simply.

$7\frac{1}{2}$. 2 *Arm.*

1 Irritative fever; abscesses in course of vessels; diseased stump; and adhesions of thorax.

1 Irritative fever.

24. 5 *Radius and Ulna—Hand.*

1 Irritative fever; abscess in shoulder-joint; phlebitis; viscera healthy.

1 Bilio-remittent.

1 Sloughing stump; fever and exhaustion.

1 Disease of lungs and liver; febrile, type not clear.

1 Tetanus.

9. 6 *tibia and Fibula.*

- 1 Irritative fever; purging; diseased stump.
- 2 Lock-jaw.
- 1 Fever, type not fixed.
- 1 Bilio-remittent.
- 1 Irritative fever; sloughing action of stump.

—

17

Average term, 12½ days.

*Secondary.**Joints.*5 *Knee.*

- Average term, 8 days.
- 1 Secondary hæmorrhage and irritation.
 - 1 Erysipelas and diarrhœa.
 - 1 Exhausted; irritability of system.
 - 1 Shock of operation and hectic.
 - 1 Hectic and diarrhœa.

*Fractures simply.*2 *Femur.*

- Average term, 4 days.
- 1 Shock of secondary hæmorrhage, and amputation.
 - 1 Shock of operation superadded to hectic.

1 *Tibia and Fibula, 19 days.*

Impression on system, and sloughing action of stump.

1 *Radius and Ulna, 9 days.*

Exhausted with long-continued bad actions, local and general, chiefly prior to amputation.

—

9

Average term of result, 7 days.

I think a very cursory glance will suffice to show that the most destructive and intense actions pervade the intermediary amputations, while the subjects of the secondary are destroyed, from the inability to rally the incapability of endurance, especially of the shock of amputation, rather than by the intensity or virulence of any supervening disease. Not one of the intermediary died by apparent exhaustion, but by bilio-remittent and irritative fevers, with phlebitis, secondary abscesses, and lock-jaw, sloughing and inflammatory action of stump often conjoined.

Irritability is among the most prominent of the symptoms in fatal cases of secondary amputation; and none, save one, gave any indication of inflammatory affections, and that was erysipelas, as often springing from impoverished blood and debility, as from plethora.

In a few words, the cases submitted to intermediary amputation, when they terminate unfavourably, do so by vigorous attacks of febrile and inflammatory actions, as stoutly

resisted in the commencement; the secondary, by the continuance of the enfeebling actions which led to the operation, as a last resource; and the superadded shock of the operation on a frame which has lost its power of resistance, and, consequently, sinks, in a period varying from a few hours to 6 or 7 days; whereas the lusty struggle between disease and the powers of the system resisting its destructive and debilitating influences in intermediary amputations lasts longer; the disease is more intense, but so is the frame stronger, and it requires an average term of from 12 to 13 days to decide the fatal event.

If we class, as has hitherto been the custom, all amputations subsequent to the supervention of inflammatory action under one head, and call them *secondary amputations*, we may take the average term of duration of the supervening actions in another view, in reference to the part injured simply.

Thus the average term for fatal development of diseased actions supervening on subsequent amputations is as follows:—

Lower extremity, average term, 8 days.

Femur, 4 days.

Tibia, fibula, knee, 10 days.

Upper extremity, 15½ days.

Shoulder and humerus, 9 days.

Radius, ulna, hand, 19 days.

The period lengthens as the injury becomes less severe, and this is progressive in the order adopted.

Does this arise from difference in character of disease or intensity?

In 9 fatal cases after operation of upper extremity.

- 1 Complicated with wound of chest; irritative fever.
- 3 Irritative fever; 2 complicated with phlebitis; secondary abscesses, &c.
- 1 Bilio-remittent.
- 1 Febrile, type less fixed; disease of lungs and liver.
- 2 Bad actions, local and general; exhausting patient after long sloughing of stump.
- 1 Tetanus.

In 17 fatal cases after operation of lower extremity.

- 4 Shock of operation, and exhaustion the most prominent cause.
- 2 Ditto, with that of secondary hæmorrhage in addition, and irritative fever.
- 7 Ditto, with sloughing action of stump.
- 3 Bilio-remittent.
 - 1 with secondary hæmorrhage and phlebitis.
 - 1 with disease of lungs.
- 3 Irritative fever.
 - 1 Suspected phlebitis.
 - 2 with purging and diseased stump.
 - 1 with sloughing action of stump.

1 Erysipelas and diarrhoea.

2 Lock-jaw.

1 Fever.

Excepting the prominent part played by the shock and by secondary hæmorrhage, in the lower extremity the actions are nearly the same: in this lies the difference to be traced between the supervening actions in subsequent amputations performed in the upper and in the lower extremity.

By this summary of differences and resemblances in the fatal supervening actions on four classes; viz.—

1. Fractures and injuries to joints, the patients dying under the treatment.

2. In intermediary amputations.

3. In secondary amputations, properly so called.

4. Primary amputations.

We arrive at the following conclusions as to the chief causes of danger, and those which, from their frequency or more fatal results, may, in some sense, be termed the *chief or peculiar dangers of each of these separate divisions or series of cases*:—

1. In 93 fatal cases, taking the four classes combined, there seem to be much fewer fatal supervening actions which are *common to all* than might be anticipated. The type of fever, however, which I have termed irritative, often destroying life without obvious trace of organic lesion, varying in its period of full development and very insidious; though most frequent and fatal in intermediary amputations, may, nevertheless, be traced in *all* the classes.

Death by shock, or the impression, direct, as it were, of the operation or injury or both, destroying life in a few hours, generally within 48 at farthest, is also common to all, occurring least frequently in intermediary amputations; most commonly in secondary.

This action is the parent of the irritative fever, on which I shall shortly have some observations to offer—when in full force, it kills by the shock without development, or time for the development of organic disease, or, indeed, any obvious diseased action—when less intense, it kills by the development of the action I define "*irritative fever*." In primary amputations, as in severe injuries of joints, its development has something of an inflammatory character, sometimes more especially local; at others general, without, in any obvious degree, affecting the local actions of the wound, which, if a stump will occasionally go through a sound cicatrising and healing process up to a very short period before death, shall be occasioned by the insidious development of the irritation on the nervous system.

In secondary amputations, on the contrary, when the shock of operation supervenes upon an exhausted and debilitated system, there is evidently less proneness to any inflammatory action; either these cases, therefore, escape this destructive action altogether, the

nervous system seeming to be less alive to intense impressions, or its action is as silent as it is rapidly destructive, and the patient sinks exhausted, as it were, and rather by the absorption of all the powers of life than by their vitiation or diseased actions. The action is *one* in all the three classes; but so different are the aspects it assumes, that it has not hitherto been recognised or properly classed; and nothing but the most careful study at the bedside, and analysis of all the symptoms in connection with the result of the case, and the post-mortem suffice to establish the identity. Examination, when death takes place, in most instances will enable the surgeon to trace the subtle links, by which he establishes, under very different aspects and conditions, the identity of the action causing death.

2ndly. No other disease is *common* to the four; but it is worthy of remark, that a diseased action, entirely dependent on the impression on the nervous system, prevails in three classes, and very rarely in the fourth, or the class of secondary amputations, which, of all the classes, is also the least liable to the "irritative and absorbent action" I have just described; I allude to tetanus, which occurs in these 93 cases, in the proportion of 1 in 13.2; in injuries without amputation, 1 in 12.6; in primary amputations, 1 in 29; in intermediary amputation, nearly in the proportion of 1 in 5.6; in secondary amputations, no instance occurred in the 9 fatal cases.

3rdly. Having pointed out the only actions common to all the four classes, I will endeavour to specify those which are, if not peculiar to one, at least the most predominant causes of death in each, further pointing out which of the classes seem more or less exempt from their supervention.

4thly. *In complicated injuries to the extremities for which operation is not performed.*—The leading causes of death and most prevailing actions are,

a. *Hectic fever*, and its most usual complications, diarrhoea, with unhealthy local, suppurative, and disorganising actions.

b. *Bilio-remittent fever*, with its most usual complications; diseases of viscera, secondary abscesses, but *not phlebitis*.

c. *Irritative and continued fever*, together with febrile actions attending unfavourable local actions difficult to typify.

d. *Shock and trismus*.

e. *Disorganised limbs, mortification, secondary hæmorrhages*, and occasionally other complicating wounds in addition to the injury of the extremity. The actions No. 4 and 5 may be classed, as, to a certain extent, accidental complications.

These injuries, then, in the progress of treatment, are liable to the action of all the causes supervening on three classes of amputations save one (phlebitis),⁵ and, moreover liable to actions from which the amputation (secondary) in this series are exempt; viz.,

bilio-remittent fever and secondary abscesses, to which, I believe, secondary amputation is always less exposed.

5thly. Intermediary amputations performed after the supervention of inflammatory symptoms and before their final subsiding, a period taken as an average to extend from the 24th hour to the 20th day, have, for their chief dangers and leading causes of death,

a. Irritative fever, with or without complications of phlebitis, secondary abscesses, diseased stumps, &c.

b. Bilio-remittent, with similar complications and secondary hæmorrhage.

c. Fever, less defined in character, vacillating sometimes between the two above-mentioned types, occasionally attended with disease of lungs or liver; at other times with no organic disease.

d. Tetanus.

Of the complications enumerated, the *secondary abscesses or diseases of viscera* occur most frequently in the series under consideration; next, *phlebitis* and *tetanus* in equal proportions; lastly, secondary hæmorrhage in a single instance.

The immediate shock of the operation as a cause of death does not appear, although its offspring, the irritative fever, does in the largest proportion. It may be concluded, therefore, that short of the immediate death, within 2 or 3 hours, to which the other three classes are liable, the intermediary amputations are subject to all the fatal actions that attack any other of the classes, *and, therefore, exposed to some from which one or other of the classes are in great measure exempt*, and in large proportion is exposed to the most destructive of those actions. The only instances of tetanus, however, did not supervene upon the amputation, since the operation was performed after its advent, and in the vain endeavour to arrest the fatal action. But to the bilio-remittent and irritative fevers, to secondary abscesses, phlebitis, and disease of viscera, there can be no doubt the intermediary amputations are peculiarly obnoxious, and that these form the chief causes of danger and mortality.

6thly. *Secondary amputations*, performed at a period generally of selection after the 20th day, when the first inflammatory actions have fully subsided, the suppurative stage been established, and the patient generally free from fever, or only suffering from hectic, as a consequence of the wasting discharge and irritation of an incurable disease.

The most prevailing actions in the small series before us are, first, the shock of the operation destroying the patient within an average term of 9 days—one-half severally on the 1st, 2nd, 3rd, and 5th; the others on the 8th, 9th, 11th, 19th (2 on the 9th), are the periods of death in the whole series.

With this prevailing shock various actions are also co-existent—secondary hæmorrhage, gangrenous action of stump, diarrhoea, or

other debilitating and bad, but chiefly local, actions.

No instance occurred of bilio-remittent, of phlebitis, of secondary abscesses, or of tetanus. I have no hesitation in coming to the conclusion on all the cases I have witnessed, that shock with the prevailing hectic and diarrhoea is the great, and almost only important supervening action to be dreaded in secondary amputations. That the other actions enumerated as not occurring in this small series, may not or do not occasionally occur after secondary amputations, I do not assert, neither do I wish it to be inferred, but that this class of cases is infinitely less exposed to them than any of the other classes we have defined. If the patient escapes the immediate effects of the shock, there is every reason to anticipate his total escape from the many other fatal diseased actions supervening on fractures or injuries treated, on intermediary or on primary amputations.

7. *Primary amputations*.—We have considered now the nature of the actions, and their fatality, as also those which chiefly predominate in cases,

1. Where the shock of the injury alone has been inflicted.

2. Where, after a few days interval, a second shock has been added.

3. Where the second shock of operation has been separated from the first by so wide an interval, that they can have comparatively little direct relation to each other; giving us, therefore, the effects of a shock upon a diseased frame of body, in contradistinction to the first, where a shock is experienced in a healthy frame.

We are now to consider the prevailing actions where two rapidly-succeeding shocks are inflicted—the first on the healthy frame, the second on one still shaken by the previous and recent blow. We find,

1st. That bilio-remittent fever largely predominates, with complications of secondary abscesses, or diseases of viscera—no phlebitis ascertained as attendant upon it.

2ndly. Irritative fever, with similar complications and phlebitis. *These are the two leading causes of death.*

3rdly. Hectic (1 with phlebitis), phlebitis singly, secondary abscess, cholera, tetanus, shock of operation all in smaller proportions, form more than half of the two first classes.

In 5 of this series the causes of death are not clearly defined.

In 13, or nearly one-half, disease of the viscera, chiefly suppurative, occurred. In 2 secondary abscesses, not involving viscera: making, from these causes, one-half of the whole.

In 6 phlebitis—between one-fourth and one-fifth of the whole.

Bilio-remittent fever, generally complicated by other fatal lesions of an organic nature; Irritative fever, the obvious effects of shock, occasionally, also, attended with organic

lesions; Secondary abscesses, phlebitis, shock, tetanus—either as complications of fever, or existing as the most prominent diseased actions—are the leading dangers and causes of death in primary amputation.

The conclusion from these facts is sufficiently clear: *primary amputation is liable to all the causes of danger and of death which are observed to supervene in all the other classes.* This without an exception. The most dangerous causes in character here, as in the intermediary amputations, predominate in largest proportion, and in proportionately nearly equal numbers in primary and intermediary.

Between the supervening actions of primary and intermediary amputations, there is, in truth, but little essential difference of character. In the series before us of primary amputation, we have death directly following operation: cholera destroying 2, and tetanus supervening in 1; phlebitis and metastatic abscess each occurring in 1, not as complications of a peculiar type of fever, but as specific diseases, unconnected with febrile origin. These are points of difference between the two classes, which would seem to indicate a greater proneness to these actions, or to any others prevailing at the time, in primary amputations; and such I believe to be the fact. The actual inflammatory and febrile action commenced before intermediary amputations, seems counterbalanced in unfavourable effects by the quickness of succession in the two separate shocks of injury and amputation, suffered in cases operated primarily. And that they are *two* separate and distinct, and not two solved into one, as the warmest advocates of the advantages of primary amputation have occasionally sustained against all reason and evidence, no one can doubt, who has had the opportunity of observing for himself. Conclusions founded on such an error, one which, I repeat, must seem palpable and evident on investigation, is a cause of the long unsettled and, I will venture to assert, the still unsettled opinion as to the relative advantages and disadvantages of primary and secondary amputation.

These are some of the more important conclusions to which I have been led by careful study, not only of the cases while under treatment, but of the results, classified and maturely considered.

Some observations yet remain on the nature of the leading actions I have thus traced as supervening upon the four classes of cases defined and proving causes of mortality, as also upon the agents influencing their development, their progress, and termination. A few cases may also be required to illustrate by definite facts the whole subject, and conclude the relation of data and views connected with the treatment and mortality of severe injuries, and of amputations performed for their relief at different periods from the date of the accident.

These views, and the facts on which they rest, I have felt anxious, not hastily or without mature consideration, but at the end of four years after the materials were collected in the field and at the bedside, to bring forward in a clear and practical manner for the assistance and instruction of those commencing their professional career.

I have been anxious, from a firm conviction that, even should I fail in carrying the conviction of others with me as to the truth and importance of those facts and views, I might, nevertheless, contribute some little to our knowledge of the complicated questions bearing upon our practice in amputations; and that the effort would also tend to produce a more philosophical, accurate, and therefore satisfactory system of investigation, whenever the questions to which these lectures are devoted shall be the subject of inquiry.

I found, at the commencement, that I must appeal to statistics for proofs, and by the same means test both my own opinions and those of others. It became immediately evident, also, that for the due understanding of the facts in immediate connection with amputation, it was essential that there should be a comprehensive knowledge of the facts connected with the progress and mortality of diseased actions supervening on similar injuries where amputation was not performed. These facts, therefore, I furnished rather as indispensable to the proper appreciation of the questions of amputation, than as a mere collateral series which might be consulted or not, according to the taste of the inquirer.

Having now concluded the consideration not only of these, but of the statistical results generally, the few remaining lectures will be devoted to the investigation of the nature of the diseased actions supervening on amputation, the chief agents in their development, and the means by which they may be modified, or their worst results averted. Lastly, I shall have a few practical observations to offer on the influence of different *modes* of operation and dressing, with a view to determine how far these may modify the results of amputations.

ON THE STRUCTURE OF THE SMALL-POX PUSTULE;

WITH COMMENTS ON THE VARIOUS MODES OF
PREVENTING PITS AND DEFORMITY.

By WILLIAM HENRY JUDD, M.R.C.S.,
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Royal Medico-Botanical Society, and Mem-
ber of the Royal Society of Antwerp.*

To the Editor of THE LANCET.

SIR:—Having perused in your valuable Journal of the 3rd ult. some extracts from an inaugural thesis by Dr. Olliffe, of Cork,