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 XIV.
On Amputation, &c.
Observations on "Irritative Fever," and its
connection with diseased stumps, phlebitis
and secondary abscesses, or purulent depôts
distant parts of the body; with cases
illustrative of the cause and progress of
these diseased actions.

We have traced the various diseased actions
supervening on fractures and complicated
injuries of the extremities when amputation
is not resorted to; as also, those fatal actions
which follow the operation performed in the
Primary, Intermediary, and Secondary pe-
riods. Having also endeavoured to deter-
mine the proportions and relative frequency
of each form of disease, under a variety of
modifying influences and circumstances, it
will be expedient now to inquire into the real
nature of these actions; their resemblances
and differences, and the true causes of their
development after injurie's and capital ope-
ration.

In order to present the many facts and
views into which such an inquiry naturally
branches, in a clear and systematic manner,
I shall limit myself to certain classes or
groups of diseased actions; arranging these
in reference to their causes, and the frequency
with which they are found combined.

It has been shown that there are two gene-
ral actions of most fatal character superven-
ning on primary amputation: the one, bilio-
remittent fever, chiefly occurring when the
patients are placed under unfavourable cir-
cumstances; the other, which I have defined
under the term "irritative fever," occurring,
independent of circumstances, in a great
measure, and despite of the most favourable
means of treatment, &c. To this latter, there-
fore, as clearly referrible to the injury and
operation (but little influenced by external
or collateral circumstances), I shall first
refer.

Irritative Fever.—This occurs in all classes
of amputation, and under all circumstances,
but in its fullest development only in primary
and intermediary amputations: in the former,
more generally in a pure or simple form,
without organic lesion; in the latter, more
frequently attended with complicating dis-
eases of different organs, leaving it more or
less doubtful how far the irritative febrile
action is a cause or an effect. In its most
simple form this action destroys the patient,
without any complicating organic lesion, or
unfavourable local action.

In a second and less favourable form, there
is highly inflammatory local and unhealthy
action developed in the stump, and extending
generally as high as the next joint, without,
however, any complicating affection of the
viscera, or other organic change or disease.
The morbid action in the system falling
chiefly on the stump.

In a third form of irritative fever, there is
secondary abscess or purulent depôt at some
distant part: often disease of chest, or of the
contents of the abdomen, frequently suppura-
tive in character; and, finally, phlebitis, super-
added to various forms of local disease in the
stump. Any one or all of these affections
may be developed during the progress of this
subtle and destructive febrile action.

Here are short abstracts of five cases illus-
trative of the first form, which may be de-
deined as "irritative fever, induced by the
double shock upon the nervous system of the
original injury and the operation, and capa-
cible of destroying life in a few days, without
perceptible change of structure, or any other
marked form of disease."

CASE I. — Almy, ætat. 37, an unfavour-
able case of compound fracture of tibia and
fibula, three inches below patella; ampu-
tated by circular incision on 2nd day, within
48 hours; died 23rd day, with a small irri-
tative fever; external circumstances unfavourable; viscera healthy; stump soundly healed, end of bone rounded by callus; fever supervened 13th day after the operation.

Operation borne well; 3 ligatures; little blood lost. Up to 12th day, case went on most favourably; slept well, and felt refreshed by his sleep after the first night of operation. On 4th day of operation stump dressed; seemed inclined to unite by first intention.

Fifteenth day after the injury, and 13th after the operation, sickness of stomach, and slight pain of head; skin hot and moist; pulse full and frequent. The succeeding morning the remaining ligature came away, "stump looking well, and discharge trifling and healthy;" sickness abated; complained of weakness and great perspiration. The two following days, 15th and 16th, after operation, also better; slept well, free from pain; stump healing soundly, discharge trifling; bowels regular; tongue clearing, and moist; pulse 90, soft.

17th. Vomiting and purging, which he attributed to some fancied mistake in the medicine he had previously taken, without such effect. Carbonate of ammonia and spiritus ammonia aromat. ordered in small doses.

18th. Bowels relaxed, free from pain, face flushed, skin hot and moist, pulse feeble and frequent; complains of difficulty of voiding urine. Half an ounce of thick high-coloured urine drawn. Next day, no change. Last three days, soporose, countenance and breathing anxious, slight blush over stump, incoherent.

Post-mortem.—Body not emaciated; stump had healed soundly; callus rounding end of bone; a small collection of healthy pus found on outer side of thigh, but unconnected with any other part; viscera healthy.

CASE II.—Thomas Crowther, a.tat. 20, gunshot fracture of femur in action of August 1, 1837; amputated by flap operation from four to six hours after receipt of injury; died 17th day, from irritative fever; bone a little denuded, but stump almost united; no lesion of any important organ; external circumstances favourable.

First day after amputation passed a quiet night, sleeping greater part of time; in good spirits; pulse soft, moderately full, and regular; tongue rather loaded, and white; no heat of skin. One dose of aperient medicine administered, has not operated; stump not swollen; very slight bleeding; some increased action about noon, but slept a good deal, and felt no pain of any consequence. Ecremen—stump swelled; pulse rapid, and rather full, with occasional intermissions; thirst considerable. 2nd. Slept well, upon the whole better; towards evening, exacer- bation; stump cool; no blush of redness; bled to syncope. 3rd. Much relieved by bleeding; quiet, and slept well; secretions good; stump commenced discharging freely; dressed; apparent adhesion all round incision; pulse less frequent, soft, and not full; less thirst. 4th. Satisfactory. 5th. Not slept so well as usual, but no particular com- plaint; eruption about the mouth. 9th. Stump looking well, and united by first intention through its greater portion; general health good. 11th. Stump discharging copiously; bowels rather relaxed. 12th. Dis- charge has diminished exceedingly; pulse rapid. 13th. Heat of skin; pulse rapid, and a tremulous motion in the hands and countenance. 14th. Singultus tendinum; stump looking well: again relieved by a free bleeding; blood put on a bluish tint, and looked thin. 15th. A more comfortable night; face and neck bathed with perspiration. 16th. Died at night.

Post-mortem.—No recent or organic disease of any important organ. Although bone denuded near extremity, stump healthily united. Whence the sudden diminution of discharge, and the irritative fever that killed?

CASE III.—Sergeant Cunningham, a.tat. 40, amputation under unfavourable circumstances by circular incision forty-eight hours after receipt of injury; a fractured femur through the knee-joint; shock from the injury great, supervening irritative fever; death in fourteen days.

Stated to have lost much blood in the two hours' transit from the field. He was anxious to have the operation done, but about the fourth hour, on being taken to the operating-room, he was so weak and exhausted, as to forbid any attempt before reaction. Stimulants were administered during the night, but he did not much improve, and was restless, though inclined to sleep; pulse fluttering, and limb easy.

Second morning after wound—Passed a tolerably good night, and slept at intervals during the day; in the evening he was feverish; pulse, early, was full, but immediately before the operation at mid-day it became accelerated, and less full; countenance cheerful; tongue clean. Operation borne tolerably well: a large limb. In the evening, composed and tranquil, pulse quick, but wishing for sleep. Opiate ordered.

First day after operation—Slept pretty well; tongue clean; pulse quick and full; free from pain, and countenance cheerful. 2nd. Little change. 3rd. Slight relief; tongue clean; pulse quick; drinks much; bowels open. 4th. Stump dressed; partial union. 5th; discharge; tongue clean; pulse regular; free from pain; slept tolerably well; bowels regular. 5th and 6th. No obvious difference. 7th. Bowels act; pulse full and quick; tongue white and flabby; skin cool; countenance natural; stump suppurring and look- ing healthy. 8th and 9th. Discharge dimi-
INJURIES REQUIRING AMPUTATION.

nishing. 10th. Stump rather sluggish; little or no discharge; some cough; pulse full and quick; tongue clean; sleeps badly. 11th. Stump more sluggish and unhealthy; tongue foul and clammy; pulse small and quick; skin hot and dry. 12th. He died.

Post-mortem examination not made.

Case IV.—Lieut. B., ætat. 20, gunshot fracture of femur in action, Sept. 13, 1837; amputated by circular incision five hours after receipt of wound; stump healed second month; suppurative stage established; fever has subsided, and pulse, for the first time, again 80, and soft; skin hot and dry. 12th. He died. no discharge; some cough; pulse full and quick; tongue clean; sleeps badly. 11th. Stump more sluggish and unhealthy; tongue foul and clammy; pulse small and quick; skin hot and dry. 12th. He died.

Post-mortem examination not made.

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Case V.—Toledano, ætat. 22, shattered humerus from gunshot; amputated by circular incision 3rd morning after the action; formation of purulent depôts within the stump, and accompanying attacks of irritative fever; recovered 3rd month; external circumstances unfavourable.

Swarthy, middle-sized Castilian; anxious temperament; amputation near head of bone. Within the first twenty days nothing remarkable, beyond a slight attack of fever: tongue continued more or less loaded. On the 24th, pain in the axilla; uneasiness in the epigastric region; and about 30th day some fever. An emetic produced the ejection of a considerable quantity of greenish fluid, and an incision in the axilla gave exit to about two ounces of well-formed pus. During the succeeding ten days he complained, at intervals, of pain and uneasiness in the epigastrium, and passed a worm by the mouth; after which the tongue gradually cleaned.

From 40th to 60th day a second collection of matter formed nearly in the same place, and a small piece of partially-detached bone was felt by the probe, near the surface of the stump, which he would not allow to be removed. This was never observed to exfoliate. Third month he was discharged well in health, and stump healed.
sion upon the nervous system and the powers of life, so much so as to induce me to defer operation unto the second day. On being carried into the operating-room two or three hours after having been wounded, such was his state of depression and prostration, that death must rapidly have followed amputation. On the succeeding day his powers had rallied, but from the time of operation I traced the development of what might best be described "une fièvre sourde." I augured ill of the result, notwithstanding he bore the removal of a large limb remarkably well. Although there was partial union, yet the stump had an unhealthy aspect, and he sank on the 12th day after amputation.

No. IV. is a case of cure, but well adapted for comparison with No. II.: both fine, healthy young men. Operations performed within six hours, and, for similar injuries, within thirteen days of each other. The same action commenced in this as in the case No. II. He was most carefully watched, and by the 10th day it was happily subdued; but although the stump closed from the beginning, and united, a large secondary abscess formed in the outside of the thigh. On this being evacuated, no other untoward occurrence presented.

No. V. is a second case of somewhat similar character, where, twice after this irritative fever, there were collections of matter forming secondary abscesses, although the febrile action partook somewhat of the bilo-remittent type as well as the irritative. He was a Spaniard, whose arm I removed in a Spanish hospital, and the only one out of a large series performed in the same locality that was saved. To these cases of purulent deposits in or above the stump I shall refer hereafter, in some observations on the value of union by first intention.

We pass on to the second series, showing with this irritative action the development of severe local disease, but still no other organic or visceral disease to account for death. Sometimes this is accompanied by phlebitis, and then has been esteemed as the simple effect; at others, however, no trace of venous inflammation can be discovered, and therefore it cannot be considered otherwise than as a febrile and irritative action of the system, independent of such cause: the more so, that with it we find occasionally a metastatic or secondary abscess, in some distant and otherwise unimportant part.

Let me draw your attention to the three following cases.

SECOND SERIES OF IRRITATIVE FEVER,

"Accompanied by severe local disease, sometimes by phlebitis, but presenting no organic lesion to account for death."

CASE VI.—James Smith, ætat. 21, compound fracture of femur; amputated on the field by circular incision, from four to six hours after infliction of wound; secondary hemor...
ing to diarrhoea; now improving. 45th. Towards this period symptoms anything but favourable; state of mind desponding; delirious one night; granulations pale and unhealthy; had diarrhoea; tenesmus and want of sleep; bone becoming slightly discoloured; rest of stump nearly healed up; patient exceedingly irritable; prognosis unfavourable.

75th. Stump healed much; rounded, and become in all respects, save one, more healthy and satisfactory in its appearance; exfoliation threatens to be a long process; pain from time to time near bone; health and appetite good.

95th. Projecting bone getting loose. 120th. Fungus projects from centre of bone, which is exceedingly painful. 130th. Great pain in the bone at night, preventing sleep. 135th. Is exceedingly painful. 130th. Great pain in the bone at night, preventing sleep. 135th.

CASE VII. — William Cooper, Ætat. 23, a parallel case to No. VI., but ending fatally; shattered tibia into knee-joint, amputated by circular incision six hours after receipt of wound; died 122nd day; treated under favourable external circumstances.

Stump dressed 4th day. Limb considerably swollen; great retraction of integuments; surface of stump bare for three inches, and unhealthy; no complaint of pain or uneasiness in the limb; a little febrile action, which did not last long. 19th. Doing well. 11th. Stump deteriorates; discharge of flaky matter. 18th. Constitution giving no evidence of irritation or disturbance; pulse full and regular; tongue clean; bowels acting; bone protruding considerably. A month later, surface of stump not very florid, still not unhealthy; bone and granulations presenting a very projecting cone; health and appetite long continued excellent. In thirty days more the stump had deteriorated considerably; glazed and unhealthy kind of fungus; pale and flabby at most projecting surface, and surrounding the bone, which is more exposed than at last report, and discoloured; still general health does not seem to suffer, although subject to an occasional attack of diarrhoea. He had no pain; and, although he coughed, no clear indication of disease of chest; appetite good, and tongue clean. From this, the 83rd day, to the last, there was a slow diseased action of stump; cough; occasional diarrhoea, and once vomiting. On the 123rd day, appetite good; felt quite comfortable; discharge not very great; much emaciated; face extremely pallid and sharp; globules of pus were remarked in the expectoration for the first time on the day of his death; but that very day, "appetite good; sleeps at night; perspires profusely!" was the report.

Post-mortem. — Hepatisation, adhesions and vomicæ of lungs; liver greatly enlarged; mesenteric glands ditto; necrosis involving the whole of femur.

CASE VIII. — Serg.-Major Simpkin, Ætat. 35, gunshot fracture of head of tibia through the knee-joint; amputation of thigh by flap operation performed three hours after wound received; died 32nd day; late supervention of irritative fever and phlebitis; no trace of visceral disease or lesion of important organs; treated under unfavourable external circumstances.

Third day. Stump seemed united; patient easy, not much swelling; bowels confined; pulse full, but soft; tongue clean, &c.

Fifth day. Stump discharging. 7th. Discharge becoming more thick and healthy; adhesions firm, and edges well approximated; scarcely any constitutional disturbance. On the 23rd day he is noted, "without an unfavourable symptom."

25th. A sinus extending down to the bone, the aperture being at inner side of incision, from which about four ounces of thin curdish pus were remarked in the expectoration for the first time on the day of his death; but that very day, "appetite good; sleeps at night; perspires profusely!" was the report.
soon improved; and to the last presented a
good and healthy appearance. About 16th
day he had some derangement of bowels,
was very restless, and in the succeeding two
or three days he complained of some shiver-

ings previous to the formation of an abscess
in the inside of arm. 20th. A shivering fit;
again on 21st. 22nd. Checked after com-

enced by a dose of morphine; tenderness
over right hypochondrium; thirst; tongue
moist; stump at this date healing rapidly.
23rd, 24th, 25th. He seemed generally worse;
but on the 26th his pulse was 100, soft, then
natural; tongue clean and moist. 28th. Pr.

ounced moribund. 29th. Wonderfully ral-
liecl; pulse 85, distinct and regular; some
diarrhoea; tolerably coherent; stump dis-
charging considerably; no tenderness. 30th.
Died.

Post-mortem.—Superior lobe of right lung
contained a large quantity of pus; middle
sound; inferior full of well-formed tubercles.
There were several tubercles in the inferior
lobe of left lung, and on this side a large effu-
sion of bloody serum; liver enormously en-
larged, but appeared tolerably sound, with
the exception of one abscess in the inferior
portion of left lobe; humerus denuded of
periosteum for one inch and a half of extre-

mity; abscess in shoulder-joint; three ounces
of pus not communicating with the stump.

CASE X. —Burrard, ætat. 20.—5. Frac-
tured humerus into elbow-joint; arm ampu-
tated by circular incision within six hours;
threatened tetanus; febrile action supervenia-
15th day; patient died 28th day; disease of
all the viscera; of the stump and of the axil-
ary vein; treated under unfavourable cir-
stances.

Third day. Some pain of stomach; tongue
clean; pulse 104. 5th. Stump and general state
good. 6th day. Difficulty in opening mouth
wide, referring pain to articulation of jaw;
slight twitching pains in stump, otherwise
free from pain. 7th day. Stump united two
lower thirds, but large discharge from upper
part of wound; still difficulty in opening
mouth. To 12th day going on well, general
health and stump.

Stump opened, and a slough is being de-
tached; discharge of a flabby character, and
mixed with blood; a sinus in axilla has been
opened and is healing; fever somewhat
abated.

19th. Stump swollen, painful; exacerba-
tion of febrile symptoms; skin hot; dry and
loaded tongue; so to 22nd. Delirium during
night; pulse 112, hurried; skin moist;
tongue somewhat cleaner.

23rd. Great delirium at night; eyes suf-
fused; vacant stare; pulse 112, quick and
erjerking; skin hot. 24th. Same. 25th. Same;

skin and tongue dry; pulse small, quick and
flattering; bone protruding.

27th. Appears in a much more natural state,
and free from pain. In the evening died.

Post-mortem.—Body emaciated. Head.
Effusion under dura mater; pia mater tur-
gid; substance of brain studded. Chest.
Lower lobe of left lung cavities filled with
pus; rest more or less diseased; purule-

tate matter in both cavities of chest. Liver
mottled. Stump—Bone protruding; pus sur-
rounding course of bone; veins surrounding
shoulder-joint contains pus as far as axillary

vein.

The connection in this last case between
the shock and subsequently morbid state of
the nervous system, and the extensive dis-
edased actions of all the viscera, is clear, and
strongly confirms the deduction that the latter
are the effects of that disorganising shock.

The three series of cases I think sufficiently
demonstrate,

Firstly. That there is a febrile action of a
small irritative character, depending, appar-
ently, on some deleterious impression made
upon the nervous system by severe injuries
and great operations, and rousing it into mor-
bid action.

Secondly. That sometimes this action alone
destroys, leaving no trace of organic lesion
or local disease; at other times in company
with it, is developed a diseased and disor-

ganising action of stump, from which the pa-
"ient may recover; or the local disease con-

inuing, he may die worn out by its violence,
and the continued irritation of the system.

Thirdly. That with this irritative febrile
action, phlebitis, secondary abscesses, dis-
eases of liver and lungs, may also be de-
veloped, and that their connection or depend-
ence on each other is apparently but slight and
difficult to trace, but all are referrible to the
nervous shock. The fever in some of these
instances vacillates in type between a conti-
nued inflammatory, an irritative, and a bilio-
remittent fever. These, then, are the facts of
greatest importance at present, as proving—
That not only do patients die by the direct
action of a shock—clearly by the impression
on the nervous system, and generally so im-
mediately as to allow no time for the deve-
lopment of organic disease—but that this
same impression, acting with less intensity and
less promptly, induces a small irritative fever
—presenting no very alarming appearance, but
frequently destroying the patient in the same
manner as by shock without organic disease
—the same influence is in operation, but in a
less concentrated form, affecting vital func-
tions rather than important structures.

That various complications by some attri-
buted to arrested suppurations in secondary
amputations, and to those referred only—by
others referred to phlebitis only (the type of
febrile action marking it, being described as
always bilio-remittent)—may be more justly
referred to the deleterious impression on the
nervous system made by a severe double
shock, and that the fever attending may either
be continued, hectic, irritative, or remittent; but the two latter are the most frequent, neither being absolutely distinctive of phlebitis, and phlebitis, on the other hand, being by no means necessary to the production of the secondary abscesses, bilio-remittent fever, &c., attributed to it. If these premises be correct whenever a severe shock has been received, these effects may follow; and as some patients by their temperaments and constitutions must be more liable than others, no very correct scale of relative proportions under different circumstances can be fixed. It may, however, be fairly assumed, that these cases, in which there is a double and quickly-succeeding shock inflicted upon a system full of vigour, and the elements of excited action, will be most liable, and these form the class of primary and intermediary amputations. The injuries not amputated, and cases of secondary amputation the least liable, for, although in the latter there are two shocks, they are yet widely separated, and the second falls upon a system often less sensitive. These conclusions are fully verified by the results of my own experience.

The cases hitherto related show this effect resulting from the double shock of primary amputation. The single shock of the injury, as I have shown was to be anticipated, will occasionally produce the same results, but, like the cases of secondary amputation, much more rarely than when two shocks are experienced with an interval more or less short between each. If the shock be, in its concussion or commotion, very perceptible, it destroys the patient at once instead of by the slower process of developing a small insidious, but fatal febrile action of irritative character. By this singular correspondence between the two classes, where there is but one shock, and when the shock of an operation supervenes at short intervals upon that of injury, the view I have taken of this cause of danger, and often of death, seems still further borne out.

Thus, although death by shock, or by tetanus, occurs in cases of injuries unamputated in a considerable proportion, it is difficult to affix this particular type of irritative fever upon more than 1 or 2 in 38 fatal cases. So in secondary amputations, this peculiar irritative fever is rare, while the shock of the operation more immediately destroys a large proportion. Tetanus also more rarely occurs in cases of secondary amputation; the long-continued wasting discharge, seems to reduce the susceptibility of the nervous system to any deleterious impression, unless it be overwhelming, and then the patient sinks, not by tetanus, not by irritative fever—but at once and completely, without a struggle or an effort, under the violence of the commotion.

If we turn to the intermediary amputations, we find this irritative fever, and its frequent complications, predominating over all other causes of mortality, and tetanus in considerable proportion also. There is some difficulty often in determining the really predominant character of the febrile action leading to death, sometimes unaccompanied by organic disease, but more frequently with some of the complications I have enumerated; but of this I can feel no doubt, that in the primary and intermediary amputations there is always large predominance of three forms—the irritative, bilio-remittent, and inflammatory continued form, sometimes merging into each other in such a manner, as to make it doubtful to which type the action might most be strictly referred; but one of the two first largely predominate.

These forms of fever exist also in the cases of injuries for which amputation is not performed, but they by no means predominate. On the contrary, in this class, as in that of secondary amputations, when the shock does not at once carry the patient off, hectic plays the principal part, with its usual accompaniment, diarrhoea; the remainder die by a host of irregular and accidental actions, as I have defined them in a previous paper, consisting of secondary heemorrhage, from ulcerated arteries, gangrene, tetanus, complicating wounds, &c.

To the primary and intermediary amputation, then, is this irritative and subtle action chiefly confined; and to nearly the same extent the bilio-remittent, the cases of secondary abscess, phlebitis, &c. They certainly, as far as my experience extends, do not exist in anything like similar proportions in either of the other classes, although such cases occasionally occur in all.

These facts lead to the strong conviction, that they are peculiarly the results of that shock or commotion, moral and physical, the chief force of which must fall upon the whole nervous system, and that of organic life more particularly—vitiating the secretions, causing, in many instances, a merely functional though fatal derangement; in others, with those vitiated secretions and functions developing a bilio-remittent and malignant fever of typhoid character, and such as we would the most naturally attribute to, as we would expect it to arise from, any influence falling upon the nervous system of organic life—vitiating the functions of the most important organs, depraving all the secretions and poisoning the circulation. At the same time, there is probably irregular distribution of nervous power to different organs, the blood itself, is sent in morbid quantity, and irregularly, to one or more points, leading to congestion, inflammation, and suppuration.

In illustration of these remarks, I will conclude by calling your attention to a brief outline of three cases of injury where amputation was not performed. Observe how close the analogy between the diseased actions and those I have pointed out as supervening on the shock to the nervous system by amputa-
tion, and how the tendency to tetanus tends to confirm these views, which refers the first cause of such fatal actions to the nervous system.

**Case XI.**—J. Waite, partial fracture of tibia into knee-joint; shock affecting nervous system and threatening tetanus, followed by the development of fatal febrile action, and no organic disease.

Second day after injury. Pain and tension considerable; pulse quick and sharp; straight position rendered impossible by the agony it occasions; free bleeding; leeches; opiate, 4th day. All symptoms aggravated; heat, tension, redness, and pain considerable; febrile action high; bowels costive; pulse 110, hard and full; tongue dry and brown; skin hot and dry. 5th. Two incisions made inside of joint, followed by discharge of matter. 7th and 12th days. Considerable improvement, local and general. Intervening days. Return of symptoms. 17th day. Evidence of great exhaustion; restless; little pain; discharge profuse; tongue dry and foul; rigidity about the jaw. 18th. Fluid in joint; calf baggy with matter; stiffness of jaw continued, and previous night extended for a time to the throat; great irritability.

After this the stiffness of jaw gradually diminished, while all the symptoms of fatal exhaustion gradually increased up to the 27th day, when he died.

**Sectio cadaveris.**—Leg much diseased with infiltrated matter; deep ulceration near external malleolus; knee-joint filled with pus; cartilages extensively absorbed; interarticular cartilages in a state of slough, and connections destroyed; larynx presenting no source of irritation.

**Case XII.**—Peter Carey, shattered knee-joint, not amputated; shock to nervous system determining violent and gangrenous local action, as the chief result and cause of death.

Musket-shot passed through head of tibia, and made its exit in popliteal space. Patient retained perfect command over the limb, and would not submit to amputation. 2nd day. Pulse 180, rather sharp; little swelling or pain set in; skin hot and dry. A sharp purgative and febrifuge mixture ordered. 3rd. No sleep; tongue foul; venesection to 16 oz. 4th. Tension of leg; swelling of knee; pain moderate; febrile action continued. 5th, 6th, and 7th days. Remarkably free from pain; pulse 112; tongue slightly furred and brown. 8th. Delirium; vesications and gangrenous appearance of limb; thigh tense; little discharge from the wounds; pulse 112, small and intermittent; free incisions to let out matter and relieve tension, with a good deal of relief, after which he slept. 9th. No delirium; less tension; large sloughs separating; pulse 112, more regular, and of better strength; in the evening, worse; feeling exhausted and pulse interrupting. 10th. Limb gangrenous to the knee, and extending on the inside; delirium; pulse small, thready, 112, regular. Died at night.

**Sectio cadaveris.**—All the tissues of the leg disorganised; no injury to vessels or nerves, but the former filled with coagula to the popliteal space; no further disease ascertained; the synovial membrane of uniform pink colour.

**Case XIII.**—Sergeant West, ætat. 37, partial fracture of tibia into knee; irritative fever, in its development threatening tetanus, leaving congestion of lung and disease of liver.

Great swelling and tension, with a sharp pulse at 100, came on by the second day. On the 6th, swelling relieved, and an abscess opened on outer side of leg. Improved to 12th day, when some spasmodic action of muscles of leg set in; a piece of bone removed next day. 14th. Spasms continuing; discharge thick and healthy. 16th. Stiffness about the jaw; spasms diminished in frequency, but increased in intensity; tongue clean and moist; appetite good; spasm of leg and rigidity of jaw continued more or less severe up to the 28th day, with some soreness of mouth, and an attack of diarrhoea; these symptoms gradually disappeared, and on the 39th profuse discharge existed, but general health seemed improving. 40th. Great irritability. 42nd. Spasms quite gone; slept well, and was free from pain; next day swelling of leg increased, and on the 44th day the spasms returned; restlessness; unhealthy discharge, and after rallying for a few hours he speedily sunk.

**Sectio cadaveris.**—Knee distended with pus, without much disease of articulating surface; thickening of synovial capsule only. Abscesses of unhealthy pus extending upward and outward; posterior tibial nerve adhering firmly to the surrounding parts; left pleura vascular; lower lobe same side congested. Several small cavities of pus in liver.

In No. XI, you have an example of fracture producing some symptoms of tetanus, and killing the patient by the development of a purely febrile action. In No. XII, the same action results from a similar injury, but attended with disorganising local action of limb, but still no visceral disease or lesion of important organs. Finally, in No. XIII, we see an example of the third form, or series, viz., irritative fever, determining congestion of lung and purulent depôts in the liver.

What have these cases of injury, and of amputations in common, to which may reasonably be attributed this parity of progress and results? I would answer without hesitation, a shock to the nervous system; to this, I believe, may be very distinctly traced the various lesions to which I have in this lecture directed your attention.