Traumatic Tetanus.
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Of all the diseases which the medical man is called upon to treat, there is none, I believe, which is more frightful to behold, more agonizing to the patient, less amenable to treatment, or more fatal in its character than tetanus. It is a disease which has, from the earliest times, attracted a considerable portion of the attention of medical writers. Hippocrates seems to have paid it particular attention, and has left us in his account of tetanus, an additional proof of the fidelity of his descriptions of disease. Little was added to his observations by the ancient writers who succeeded him, and that which was added did but too frequently encumber his faithful details, with trivial remarks, or fanciful hypotheses. Numerous are the excellent essays which have been written upon this subject in modern times, and the medical men of the present day are labouring hard to find out its true pathology, so that upon it they may base a more certain and successful treatment. Tetanus was placed by the celebrated Dr. Cullen among the "Remover of the Sperm," and it has apt to
the present time maintained that position.

Tetanus is one of the best marked forms of tonic
neuromuscular action, affecting the muscles of voluntary
motion, with exacerbations, and without any period
of complete relaxation until the subsidence of the
disease. Throughout the whole course of the disease,
the consciousness of the patient is entirely unaffected.

There seems good reason for believing that the
muscles of "Organic life" are occasionally, if not always,
more or less affected by disease, for according to
Prof. Miller, & the late Mr. Leaton, the arteries in cases
where amputation was performed upon tetanic patients
were observed to be more retracted, as well as more
contracted than usual, was scarcely to require the
use of the ligature"—Dr. Carpenter in alluding to this idea
says, "not only in the general muscular system of
Animal life" involved in these abnormal actions,
but various parts of the apparatus of Organic life
have their normal functions seriously perturbed
by the same condition of the Spinal Cord, being
connected with it, through the sympathetic
system of Nerves, whose motor filaments are
chiefly, if not entirely, derived from that source." It
is well known that the diaphragm
is nearly always affected by illness, and
The pain produced by its contraction, has been looked upon by many as the pathognomonic symptoms of tetanus. The period at which the symptoms usually make their appearance after the occurrence of an injury, varies in almost every case; in a few cases they have appeared after the lapse of a few hours, but the most common period is during the second week. Sir Gilbert Blane gives a range of four weeks; some have known them to occur even later than this, but such cases are of extremely rare occurrence. There is a remarkable case recorded by the late Prof. Robinson of Edinburgh, "a negro servant scratched his thumb with a broken plate, it died from tetanus a quarter of an hour after the slightest injury". The period of accession seems to me to depend principally upon the amount of predisposition or tendency to the disease existing in the system at the time of the injury, 2nd, upon the kind of wound, its seat, & extent. Prof. Miller says that "when these weeks have elapsed, the patient may usually be considered safe."

Sometimes the accession is very abrupt, as in Prof. Robinson's case, & in a case recorded by Mr. Curling which ended fatally in eight hours.
generally, however, the disease is much more gradual in its approach, the patient is first troubled with great restlessness, he complains of headache, he feels very much depressed; his voice has often a peculiar husky sound, as if the patient was suffering from an ordinary cold. He next complains of pain at the root of the tongue, back of the throat, which is greatly increased if an attempt is made to swallow; he complains of a stiff neck.

A peculiar expression of the countenance has been noticed by some, Mr. Pest gives a very full description of it; he says, "even before pain is complained of, there is something very peculiar in the expression of the face, it is not easy perhaps to describe exactly in what this change consists, it has seemed to me to depend upon an apparent increase in redness, the angles of the mouth being in some degree drawn downwards, the lips compressed, the eyelids slightly corrugated.

This expression has been noticed if present not ten hours before any other symptom of tetanus was present; it is very different from the one present at a later period of the disease. Some have noticed an unusual & persevering extension of the limbs during sleep.
The next thing the patient generally complains of, is a tightness about the jaws, which increasing gradually closes them; sometimes the closure takes place suddenly with a snapping noise; even once the mouth is thoroughly closed, it is impossible for the patient to open his mouth even if he use all his effort; for the bone is totally gone, in fact he has been told, it has been very truly called broken jaw.

The attempt to swallow anything especially liquids is often attended with convulsive efforts & with considerable pain; & from this circumstance some patients have to per a head of fluids, as strongly to resemble the hydrophobic patient; an interesting case of this kind has been recorded by Mr. Stafford, Surgeon to the Magdalen Infirmary.

"A boy, aged 11 years, was admitted into the above Infirmary, with a deep cut over the phalanx of the great toe of the left foot. The part was swollen & looking lead, it was leech'd & poulticed; all appeared to be going on well, when on the 10th day he complained of a stiff neck, which he ascribed to a cold; on the following morning
his mouth became quite closed, the tongue was completely, with a bending back of the curved tongue, he could speak though his mouth was shut, but he could not swallow, for when an attempt was made even with a teaspoon to feed him with milk, it was convulsively thrown back as in hydrophobia; he had a deadly study endeavouring with his hands to prevent the nurse, from attempting to pour them down his throat, if persisted in, immediately caused convulsion. The medicine which had ordered were rejected in a similar manner. He put off his coat, his breathing became affected in twenty-four, from the time he was first attacked he expired. The above is an excellent instance of how strongly tetanus does occasionally resemble hydrophobia. As the disease advances there is pain felt extending from the uniform castility to the back, which owing to spasm of the diaphragm, this pain is of the most excreting character, it is by far the most distressing symptom of tetanus. It has been noticed by some writers that the muscles controlling the various orifices are those chiefly affected by tetany. Perhaps
The will, in some degree at least, account for the obstinate constipation, which is present in almost every case. The face is generally of a peculiar and unnatural colour, being as Thelot M. Abney has said "like death", and they have a very foul and offensive smell. There is often pain, and occasionally some difficulty in passing the urine, owing to a tumor of the muscular fibers in the neck of the bladder, or the commencement of the fistula. For the first two or three days the skin of the patient is generally hot and dry, the tongue furrowed, the appetite bad. About the fifth or sixth day, the skin of the patient becomes moist with perspiration; very frequently the perspiration is very profuse, in each case this constant loss of fluid is soon felt by the system of the patient, the sufferer patiently, often hungrily, from thirst, but is often unable to satisfy it, and thus his miseries increase. The expression of the face is most expressive of the patient's agony; the angles of the mouth become drawn up, the eyes often expanded, the eyes fixed, the forehead wrinkled, the face suffused with a deep red flush. The expression then formed by the persecuted action of the
muscles of the face, has been called the river sandomi. The distortion is so great that patients are not recognized by their most intimate friends. Dr. W. Tan relates the case of a young man who was only twenty-six, yet was so altered in his appearance as to lead all who saw him to believe that he was at least sixty. I had an excellent opportunity of noticing this change in the appearance, a short time before, in a boy who was suffering from maintain, his face not more than sixteen or seventeen, yet looked all the appearance of a very old man. Instances are upon record, where the patient retained the impression of the disease upon his features for two or three years. Occasionally the muscular arrangements are preceded by distinct febrile symptoms, not attributable to the state of the wound; it was at one time supposed that when these symptoms were present, the disease would be seen to be acute, but this is doubted by many. Now, for several cases have often been recorded, where the febrile symptoms were well marked, and yet the cases were not acute. Yet many cases have been decided by all
writings into certain forms, characterized by peculiar symptoms, but which are merely manifestations of the disease in greater severity, or to a more limited extent in some muscles than in others. The forms usually recognized are trismus, opisthotonos, emprosthotonos, pleurosthotonos, and tetanus proprius.

Trismus is that form in which the muscles of the face are chiefly affected by spasm, it is the form which usually precedes the more extensive ones.

Opisthotonos is the form in which the muscles of the back are chiefly affected, the spine being bent backwards like a bow, but the back is not permanently fixed in that position, for there are frequent paroxysms of spasm, which temporarily increase the curve. During the partial remissions which occur in opisthotonos, it has been observed that the muscles on the anterior part of the body are also affected by spasm, but they are incapable of resisting their antagonists.

The suddenness—says W. Symonds—coitus while the occurrence takes place, has been so great, sometimes, as to project the unhappy patient from his bed. In one instance, it was occasioned by a dislocation of the second cervical vertebra.
"Outline of Military Surgery" by Sir George Ballingall.
With the exception of trismus, opisthotonos occurs much more frequently than any other form of the disease. Emperor opisthotonos is called when the murder on the four part of the body are more chiefly affected; the body is bent forward. This form does not very frequently occur. Mr. Hennell, notwithstanding his many opportunities of witnessing the disease, never saw this form of it. Mr. Scrope says that the best description of it that he has met with are those of Bacon, among the moderns of Plutarch among the ancients. "Bacon Lanyard seems to have met with this form of the disease. Whilst in Egypt, much more frequently than opisthotonos, the experience of this gentleman taught him that the latter form of the disease was the most fatal."

Opisthotonos is the name given to the disease when the body is drawn to one side. This form very seldom occurs. Tetanus progressivus is the form of the disease in which the body is stretched out without being manifestly bent in any direction. These distinctions however depending upon the partial or unequal division of the tissues upon the muscles moving...
supporting the body, are really in a practical point of view of little value, since the condition of the mark varies at different periods in the same case.

During the whole course of the disease, the muscles are in a state of continued contraction, and there is a period of complete relaxation till the patient either recovers, or dies. The muscles which are affected by spasm, are subject to exacerbations, which sometimes occur every ten minutes, or greater part of an hour, last for a minute or two, and fall back into the minor degree of contraction in which they were previous to the exacerbation. The slightest touch or sound is generally sufficient to bring on one of these attacks. Indeed the patient, particularly a short time since, in a patient of my father at the Stockport General Infirmary, a patient a boy, was suffering from tetanus, the result of a wound from the point of his left sword, the wound in a small ward alone, on one day, when I went to visit him, I found that he was asleep; I noticed that the muscles of the face were partially relaxed, but having by accident made a slight noise whilst closing the door, he was instantly seized with the most violent
convulsions, the face became expression of the greatest agony, & the perspiration exuded from the surface in large drops. According to the duration, & severity of the disease, tetanus has been divided into the acute & chronic, & the late Mr. Guthrie thought it advisable to add to these a mediate variety to include those cases which do not continue long enough to be called chronic. Those who have ever had cramp, may form some slight idea, of what the agony of the tetanic patient must be, who is suffering from cramp of nearly all the muscles in his body. Dr. Gilbert Blane, recorded a not remarkable case upon the authority of a naval surgeon, which ended fatally in four days; yet the patient felt no pain, the sensations excited by the violent muscular contraction, were a sort of tingling of a pleasurable nature. This I believe the only case upon record where such sensations were experienced. It is a curious fact that in the midst of all the dreadful suffering, while usually attending a case of tetany, the mind of the patient is perfectly clear, & is often
Ouios' "Hesperus Vale Incarn"
even cheerful; Dr. Allenby used to say that he had known patients express themselves as feeling better to the last.

The prognosis in acute tetanic tetanus is very unfavourable, and modern experience has but too frequently confirmed the fatal prognostic of Hippocrates: "επε το γραπτο κατα τη κεραυνωμενον, θανατησων," tetanus following upon a wound in metal. There is however some hope when the disease comes on gradually, if it is slow in its progress, and when the intervals are long between the apparent attacks. There is good ground for hope if the patient recovers the first week after the onset. As a general rule it may be said that the prognosis is favourable, if the disease does not attack the muscles of the phlegm, if it has lasted for some time without increasing much in severity, if it is entirely mitigated by the remedies employed, if the phlegm is not much accelerated, if the patient sleeps well in the bed, and if the spasms increase in severity, especially if they affect the muscles of the face. The prognosis will be unfavourable, whereas unfavourable when the breakage of other muscles of inspiration are much affected.
Much however depends, not only on the exciting cause, but also upon
the influence of concurring causes, as exposure to wet and cold,
to malaria, or to the presence of intestinal worms, either, or
all of these tending remarkably to increase the mortality of the
hemorrhagic form. The part of the subject which I now come to
is of the greatest importance to us all, and one with
which we should be thoroughly acquainted, viz.
the diagnosis of tetanus. Tetanus bears symptoms
so striking to peculiarity, that there is little chance of
its being mistaken by a careful observer for any other
form of disease. Sometimes the difficulty of swallowing,
or the disorder of fluids is so great, that tetanus might
perhaps be, have mistaken for hydrophobia. I
have already spoken of a case of this kind.
Hysteria does occasionally resemble tetanus, it has been
mistaken for it. Dr. Tymonds says that "The
representation is sometimes so faithful, that
he has not the slightest doubt, that many
repeated examples of the successful treatment,
have been much confounded with hysterical spasms."
There is a form of poisoning which may
easily be mistaken for tetanus, the symptoms
produced by a poisonous dose of strychnine
are the symptoms of this great resemblance
between the symptoms of the above diseases.
those artificially produced by strychnine, has been taken advantage of by criminals. The trial of Paine must
still be fresh in the minds of all, it will be remembered
that this man poisoned his victim by strychnine
that it was attempted to be proved in his defence
that her victim, Cook, died from tetanus arising
from natural causes, but fortunately for
mankind this did not succeed, it the wrong's
murderer, met with the fate, which he but too well deserved.

This makes it evident to us at once, how important
it is, that we should be able to give a correct
diagnosis in cases of this kind.

The way in
which the symptoms of the real and artificial
disease differ, is as follows, in true tetanus
the approach of the disease is gradual. When
once begun the spasms are continuous, if you prolong the
period of the patient are capable of enduring, then
true disease generally ends slowly.

In artificial tetanus
the onset is sudden, the spasms are not continuous.

When the dose is strychnine is large the patient
dies suddenly from asphyxia; When the
dosage has not been taken in sufficient
quantity to cause death at once, the
poisonous influence will subside for a time
but soon returns again. The symptoms of
of the real or artificial disease, though much alike in many respects, differ materially in the course they take, or the way in which they end. If these differences are carefully watched, it taken in connection with the history of the case, a variety of other concomitant circumstances, the diagnosis will be rendered comparatively easy.

CAUSES. I shall divide the cause of traumatic tetanus, into the predisposing and exciting causes. That there does exist in some persons a strong predisposition to suffer from tetanus, few I think will deny; for if this tendency to the disease did not exist, how could we account for the occurrence of such a fearful disease as tetanus, in persons who have only suffered from a mere abrasion of the cuticle, as in a case recorded by the late Sir George Bellingham, or from a slight scratch as in Rsf. Robinson's case, when most people laceration of the most painful character fail to produce the disease. It will be interesting to notice the class of persons mostly affected, the situations in which it generally occurs. The class of people mostly affected by tetanus, is that class in which every form of blood disease is most common, viz. the lowest class of every country, people who are exposed to all kinds of Malaria, to Miasma, who have hard work with insufficient or imperfect food.
who are crowded together in small, badly ventilated rooms, who do not pay sufficient attention to the cleanliness of their shoes, etc. The situations in which this disease most frequently occurs are those in which there are rapid changes of temperature, places where hot baking days are followed by cold damp nights; thus we find that soldiers who have been exposed to the heat of the sun, during a long march, are frequently seized with tetanus, from resting during the night in cold damp places. The effects of regiments are sometimes affected for the same reason, but not often, perhaps. The inferior quality of their food, etc., may have some protecting influence. It is well known that in many forms of blood diseases delirium very frequently occurs, evidently showing that the "Materies Motae," whatever it may be, is exerting a remarkable influence upon the brain; this is well shown in many fevers, in hydrocephalus, when we know that a poison has been introduced into the blood; in the latter disease we know that the poison, by its peculiar influence, creates an unnatural irritability of the brain. We also know that there are many drugs which exert the whole of their influence upon the brain such as, alcohol, opium, etc. How I cannot help thinking, but the blood may in cases of tetanus become charged with some peculiar "Materies Motae" which tends.
the whole of its influence upon the cord, producing an unnatural excitability of either, the whole cord, or of certain its segments, but which differs from the above process by not affecting the brain. We find that there are certain drugs which, by some as yet unknown effect, I cannot mention a better example than strychnia. Some people seem to think that the common causes of tetanus are those which affect the extirpation of the cord, or in those which call it into disorder action, by altering the relation which the blood bears to it, or the exciting fluid of the nervous system. I can hardly believe that such action of the cord, or of itself, sufficient to bring on tetanus, for if it were sufficient, I think we should meet with the disease much more frequently than we do; and it is probable that the causes which affect the nutrition of the cord, may by rendering the cord less able to resist the action of a blood poison, tend to produce tetanus. There is another way in which it is believed tetanus may be produced, that is by severe and continued irritation of the peripheral extremity of a nerve, this is said to cause some change to take place in the nervous center, from which the injured nerve is deprived, producing at first slight twitchings, but very soon, violent and very frequent spasms of the muscles of the limb, if the change which has originated in this one center extends through the whole cord, general spasm is the result.
From what I have said it appears that the excitability of the cord in cases of tetanus may either depend upon certain causes, that is upon causes which act directly upon the spinal cord, or upon excitatory causes which is to say, on irritation of some other part of the body, which irritation is conveyed to the spinal cord by theafferent nerves. I believe that the arrangement of the cord in cases of traumatic tetanus is exactly similar in its action to the arrangement which exists in the idiopathic form, that the two forms of the disease only differ in their exciting cause. Tetanus of wound is most common in countries in which the idiopathic form most frequently occurs. I have said that tetanus very frequently arises from trivial cause, but this has been chiefly in countries, in classes in which the idiopathic form of frequent occurrence. These facts seem to imply that there exists something common in the causation of the two forms. People are said to be more liable to tetanus, but this may perhaps depend upon their mode of living and upon their peculiar exposure to causes both predisposing to exciting, than to any constitutional peculiarity. This may perhaps also account for the greater frequency of the disease in males than in females. Exciting Cause. Wounds of every kind to extent from the sting of a wasp to the amputation of a limb, may give rise to tetanus. Lacerated & punctured wounds of the hand & feet are the most common causes of traumatic tetanus. Compound dislocation of the thumb has frequently caused it; burns also to gunshot wounds are the common causes of tetanus.
their disease. A simple clean incision is very seldom followed by tetanus. At the trial of Palmes, none of the medical men, who were examined, had ever witnessed a case of tetanus arising from the irritation of a cellular core. Dr. Hughes of Marlborough has recorded a very interesting case of this kind in the "Medical Times & Gazette" for June 7 1856. A man upon board of an American ship, was admitted into the Strand Hospital at Warsaw, on examination it was found that the planum faciei was enormously swollen, ulcerated in two or three places. The swelling was caused by a construction of the planum by the pressure, which was a state of paraphysiosis. The construction had existed for several days, the constructing ring was of a hard, almost horny texture; its division caused slight relief. On the second, or third day after admission symptoms of tetanus made their appearance, terminated fatally in three days. The patient was a strong, healthy man, whose bloated aspect, combined with a sufficient accuracy, demonstrated life which he — in common with the lower classes of seamen, at the port of Warsaw — the receptacle had been leading precocious to his admission to hospital. There is another case of tetanus which was not noticed at Palmes trial, and that is the occurrence of tetanus after large and repeated doses of antimony. Mr. Elisha has recorded two very interesting cases of this kind in the "Lancet" for July 5 1856. Sudden change of temperature, do occasionally act as exciting causes of tetanus, Mr. Elisha records the case of a "gentleman, who suffered from a very violent attack of tetanus, caused by the sudden change from the warm atmosphere of a balsam to the cold
right air." Dr. Heenan lays great stress upon the power that "air in motion" has of producing tetanus. He says, that all the cases which came under his observation had been exposed to a stream of air, either hot or cold. He has been noticed that in wounds causing tetanus there is often an absence of inflammation, or severe suppuration, but such is far from being always the case, for Sir James Barson says that "tetanus occurs in every description of every stage of wounds, from the slightest to the most formidable, from the healthy to the brownish; from the lacerated and incised; from the most simple to the most complicated." Tetanus may come on at all stages of a wound. Sometimes it will come on soon after the wound has been made, but most frequently it comes on just as the wound is about to heal. Sometimes, the wound has quite healed before any symptoms of tetanus have appeared. There are many cases on record, where the wound is far from presenting any unusual appearance, would often prove its cause unnoticed by the tetanic seizure. Dr. Heenan mentions a case in which the cicatrization of the wound was completed the same day that life terminated. Baron Lavay says that in the cases of tetanus which he has seen, the wound was always either dry or covered with a thin mossy exudation. The partial decision of a nerve was at one time supposed to be the sole cause of tetanus, but this idea is, thank heaven, given up now. The degree of a wound, influence as a determining cause of tetanus, varies in different circumstances; it being considerably more severe, under the influence of exciting at all when the injury is slight. Indeed Dr. Macphail says it is sufficiently common to find that the
History of cases of tetanus, with slight external injury, points as directly to cold as an exciting cause, as that of many, in which injury does not exist.

**Morbid Anatomy.** The appearances found after death from tetanus are very similar to those found in the cranium, when death has followed upon symptoms of excessive action of the cerebral functions, viz. there is, more or less capillary turgescence of the cedema, meninges, with or without effusion of serum. Sometimes increased vascularity of the nerves leading from the wounded part has been noticed. The blood has very seldom been found to be coagulated, but the muscles are extremely rigid. There is a case recorded by Mr. Carlow, where the heart of the patient, when examined eleven hours after death, was found so much reduced in size, as not to occupy a fourth part of the pericardium; the auricles, as well as the ventricles, were perfectly contracted. "The above patient, whilst alive, complained of the most intense pain in the region of the heart." I regret very much that I have not yet had an opportunity of being present at the post mortem examination of a tetanic patient. The two following cases, for the particulars of which I am indebted to Dr. Meiller, will I think be read with interest.

**Case I.** Jane Cummins, aged 37 years, female. This person had received a slight wound on the right foot at the P.M. examination, the brain, cedema, and medulla oblongata, appeared healthy, the quantity of fluid in the ventricles, normal. There was a slight turgescence
of the pia mater of the spinal cord, about the end of the uppermost part of the middle
thorax, but it was not at all considerable. No change could be detected
in the nervous matter. The blood was found to be very fluid. The
right side of the heart was placed, the left ventricle was partly
firmly contracted. Blood was found to be extravasated into the
abdominal peritoneum; this was found to have proceeded
from a rupture of the recti muscles, each were replaced
at the junction of the upper middle third. Blood was also found
to be extravasated above the psoas ilium, on each side.

Case W. Lewis Stewart, aged 41 years, Prince Edward.
The patient had received a fractured wound of the right foot. Upon
examination the brain & its membranes were found to be healthy, there
was perhaps a little congestion of the chorda, flumel, as well as
the pia matter of the brain. The membranes of the upper seven inches
of the cord were a little congested, but there was no trace of inflammation.
The nervous matter itself appeared natural. The thoracic & abdominal region
were not examined. The peritoneum on the right side of the foot, was
covered with a scale, 5 when the scale was removed by a probe, a deep
of pus escaped. The wound was rather more than half an inch deep.
The above are excellent examples of the appearance generally found
When the symptoms of tetanus are of short duration, 5 when the
examination is made soon after death, there is very frequently
little, or no change to be made out in the cord & its membranes,
but at the most there is a slight congestion in membranes,
when the disease has lasted for some days, this congestion is more marked.
There is often a large quantity of serum formed. The lesions sometimes much
enlarged. In a few cases marks of an inflammatory character have been found.

The part of the subject, which I now come to, is perhaps the most important, viz. the
treatment of tetanus. As yet, there does not appear to have been any
fixed mode of treating this disease, one plan has been pursued by one individual
and another by another. There are few diseases in which so many opposite remedies
have been tried with so little success. I shall divide the treatment into the local,
and the constitutional.

Local treatment. The first thing to be done is obviously the removal
—where possible—of the exciting cause; the wound should be carefully examined
to see if there are any foreign bodies present. If tetanus commences after the
amputation of a limb, the stump should be carefully examined to see if any nerve
has been tied up with the artery, and if such turns out to be the case, of course the
ligature must be instantly removed. Several cases are said to have arisen from the
above cause. In cases where tetanus has arisen from a punctured wound,
the most successful treatment which has been adopted seems to be the early
division of the nerve leading to the joint. An interesting case showing the
good effects of this treatment has been recorded by Dr. Murrin in the Lancet, May 1858.

"The patient was a young seaman, who having trodden on a rusty nail
which pierced the sole of his left foot, had kept watch the same night upon
duty, the weather being very cold. The disease began eleven hours after the
injury; the symptoms were very severe. It was a case for prompt incision.

Without loss of time the posterior tibial nerve was divided. The
limb was previously cold, as the patient said, dead, he had little
power of moving it: he could not articulate distinctly on account of
The closed state of his jaws. The scene was cut through by one stroke of the scalpel.

Dr. Murray, in 1838, in his mouth with an exclamation; on looking at his countenance I was astonished at the striking improvement in it. I asked him how he felt; he said he was already better, but that his leg had come to life again." Baron Lancy mentions a case in which division of the nerve had a similar result. Amputation of the wounded limb has been tried, but has not been attended with any success; for the patient's constitution is generally so broken down from the effects of the disease, as not to be able to withstand the additional shock of loss of blood. And Dr. Courfey said, "when the tetanic state of the spinal cord is once fully established, nothing is gained by the removal of the injured part." Beguille, when speaking of amputation in cases of tetanus, says, "the result of my own experience is favourable to the minor operations, unfavourable to the larger. Unless some agent state of the part itself (shock, phlegm, inflammation, hemorrhage) renders its removal necessary, I should not feel warranted in performing any of the greater operations in the hope of relieving tetanus." When amputation is necessary, it should be performed at an early part of the disease as possible; the offending part should be removed before the morbid condition peculiar to the disorder has had time to root itself in the nervous system; not an hour should be lost, for each one as it passes will render the operation less likely to he attended with good results. Decisions should be made when necessary for relieving tension, a letting out fluid application to the wound should be of the most soothing and stimulating character.
Constitutional treatment. When once the symptoms of 
lethargy have become fully developed, all our hope of treating the disease 
successfully will vanish. I think I might say entirely, depend upon the 
constitutional treatment. Our principal object must be to support the 
powers of life, or in other words arrest the tendency to death, and 
the more successfully we can manage this, the more likely it is that 
Nature will be able to overcome, and get rid of the disease. In what way 
is death likely to occur? I think in one of these ways, 1st death 
may take place suddenly, during one of the paroxysms of fever, from 
asphyxia. Asphyxia may, I think, be brought on in two ways, first 
from the almost closure of the chest, and second from failing of the blood 
of the thorax, the digestive organs being affected with fever at the same time. 
2nd Death may take place, from depression of the heart's action, or syncope. 
3rd Death may take place, from pure exhaustion of all the powers of life, or asthenia. 
By such remedies as chloroform, Hudson hemp, cold, opium, &c., we 
should attempt to lessen the tendency to death by fever, but 
they should be administered with the greatest possible care, lest 
they depress the heart's action too much. The next two causes of death 
should be combated with nutritious food, wine, and tonics. 
The patient should – where it is possible – be removed from all 
predisposing or exciting causes; it should be placed by himself 
in a well ventilated room, where he should be protected from 
all draughts of air. The room should be kept at as near an equal 
temperature as possible. The great benefit to be derived from 
pure air is, it is well illustrated by the following facts; and
The better ventilation of the Dublin "Lying-in Hospital" the number of deaths from tetanus, has diminished from Seventeen per cent to four per cent. And in the army & navy the disease has not occurred so frequently since the better ventilation, barracks & ships & the other improvements which tend to preserve the health of the soldier & sailor. The strength of the patient should be supported by good broth, wine & spirits only. The action of the bowels should be carefully regulated, it should be moved once a day. No one placed more faith in purgatives than Dr. Blaney, who believed that if the alimentary canal could be gradually evacuated of its contents the disease would disappear; he used to prescribe one grain of calomel & six grains of pilafa to be taken every three hours. The purgative should be carefully mixed in honey or treacle & placed at the back of the tongue, it became gradually swallowed; the bowels at length acted, & the treatment was continued as long as any symptom of tetanus remained. The purgatives which have been most used are, calomel, castor oil, & chloroform, owing to their activity & smell that Prof. Syne & other distinguished surgeons speak very highly of the cerebrothamic injections. Free ammoni injections of this kind besides having the good effect of unloading the bowels, may also, I think, be of some benefit on account of their antispasmodic virtue; for worms are said to be very frequently found in the intestines of tetanus patients, & from this irritation they cause they are most probably a strong predisposing
cause of the same, so that if we can Reid the patient off them he will of course stand a better chance of recovery. I think that diaphoretic given in such quantity as to keep the skin moist would be attended with benefit. In many cases we find the patient hot in perspiration from about the commencement to the end of the disease; in such cases the perspiration should not be checked in any account, for this probably is the way in which detention would not aid the disease. In all diseases of this kind (many other) we should look out for those hints from nature. Of course throughout the treating stage, the strength of the patient should be well supported. It is only in cases where the treating stage does not come on naturally that I would recommend the use of diaphoretics. A short time since I read of case in the "Lancet" where the patient's skin was "hot and dry" throughout nearly the whole course of the disease; it was only when the patient skin became moist that he recovered. The next class of medicines which I come to are the tonics, such as quinine the preparation given by Dr. Elliotson speaks very highly of the carbonate of iron, it is remedy which he seems to have used with a good deal of success, he gave it in large and frequently repeated doses. Dr. Todd speaks very highly of quinine; he recommends it "to be given freely by mouth or rectum." Dr. Moncrieff also highly recommends quinine, especially when combined with the extract of hemp, the former in doses of from three to six grains, the latter from one to two grains; given at intervals of from three to six hours; with animal broth, or other nourishment in small quantities, frequently repeated and from the to twenty ounces of wine in twenty-four hours."
By their system of treatment, the above gentleman has treated several very
severe cases of tetanus with the most complete success. Polythene, speaking of
Tetany of the Cannabin's hemic, it seems to have been more successful in his
treatment of tetanus with this drug, than with any other in his work on
the Principles of Surgery. He states there are very interesting cases,
which he has treated successfully with this drug, of whom
speaking of Cannabin he says "he has seen it fail to cure,
but never to relieve." Chloroform is a remedy which seems be
in great favour with medical men; it has been used with very great
benefit as a palliative, it all lessens pain and lessens the stress.But the relief of pain is not the only practical advantage gained by the
moderate use of chloroform; the effect upon the muscular
contractions is important as materially facilitating the ingestion
of food." Macleod attributed the recovery in one case in which
tetanus was complete, to the use of 8/8 of chloroform inhaled
before each time of taking food; "this was sufficient to unlock
the jaws to the necessary extent, without causing impaired respiration." An interesting case has been recorded by Mr. Cook in the
"Lancet" 1856, showing the good effects of chloroform, with
quinine and iron & a full stimulating & nourishing diet.

Case 7. The patient a female aged 30, suffering from
paralysis of the right finger, the result of a whistler occurring only four
days previously. The countenance was anxious & very pale, & had
been having badly. Treatment. He was well nourished, took quinine
and quinin at night, & after a week the inflammation subsided leaving a
line of demarcation an inch on the distal side of the knee. The joint was now removed and maintained until the fifth day after the operation, when some contraction of the same appeared, which became marked on the 6th. A few nourishing
but mere administrative precautions by means of a bottle of milk through
aspiration formed by a previously extracted tooth. The formaline was
removed by trephining answers & the quinine was continued. On the fourth
day after the attack of tetanus, the symptoms having progressed. Dr. Cook ordered
the external application of chloroform on warm flannel, with addition
of sulphate of zinc to the quinine & full hour of wine before it, etc.
After this treatment the pains were observed to subside during sleep,
& the perspiration which had been profuse diminished. The
Joints were kept open by mustard oil. On the seventeenth day after
tetanus, the quinine of issue of the suggestion of Dr. Brown
were changed for Mg of chloroform taken into the stomach
every four hours, & in addition to the external use of
chloroform, belladonna was rubbed into the neck &
shoulders. On the eight day there was slight voluntary movement
of the face, as well as perfect relaxation during sleep. The patient
went on improving & on the twelfth was quite free from tetanus.
Mr. Spratt. The above case at some length, for what it
is a good example of the great benefit of chloroform, when
combined with a nutritious & stimulating diet. However interesting
care a short time since at the Stockport General Infirmary under Dr. Drury
suffering person - a young writer from one
was admitted into the above infirmary, suffering from - a very severe burn on
front of the left most, considerable lapping took place, & in a week from the time his admission, symptoms of tetanus began to appear, which progressed very rapidly. There was complete trismus & opisthotonos. & the abdomen felt very hard. His bowels were very constipated, his tongue was, & was covered by brownish oil. His strength was sapped by thirst, want of food, & cholera. Cholera was returned sometimes, when the symptoms were very severe, & with the most marked benefit, under its influence he appeared calmer, the abdominal muscles were less tense, the trismus, & opisthotonos also more less evident, & the breathing was more regular. When the disease was at its worst, that is to say, when the symptoms were most violent, the patient became lathic in the most perfect fashion. He became very apathetic to the sound of nothing & curative dressings were applied. At the end of a week, the symptoms of tetanus began slowly to disappear. When nearly three weeks from the time he was first attacked, he was perfectly free from tetanus, it was beginning to show the good effects of the improved diet. From the above two cases, & from another which I shall speak of directly, I am led to believe that cholera was the curative administered by far the most valuable palliative we possess. I say palliative for it is only as much that I believe cholera was of use, it allows time for the action of the tonic remedies, viz. quinine, &c., food diet to be given; for it is I believe, only by increasing the general tone of the system, that we can hope for recovery in cases of tetanus. The particulars of the following case, which occurred in the Perth Infirmary were kindly given to me by Dr. Rattray, a girl aged 16 years went to the above Infirmary suffering from a severe cut on the little finger of the left hand. She did not seek surgical aid for two or three days, at the end of this time she
became an out-patient, the fever was then subsided, the patient became cheerful, symptoms of tetanus subsided, and she was taken into the Infirmary. The symptoms were not very violent. The treatment consisted first in
the exhibition of Cannabis indica, but this was not found to produce any
notwithstanding the disease was alleviated the symptoms
were soon abandoned in favour of chloroform. A very large quantity of
the chloroform was administered, and under its influence the symptoms
all became less severe, the patient became able to swallow, and the
practically began to improve. Her face was not distorted.

But they did not see her again after this, but heard that she died in
about a fortnight after this, from some other cause. The above case is
only one out of many that I might bring forward in favour of
chloroform. The next day while I was going to speak of opium,
which has been more extensively employed in cases of tetanus than
any other, I mean opium; since the discovery of chloroform
however, it has not been so frequently employed, yet there are
still many who place all their confidence in this drug. Other
again do not approve of its use, for it has been found to be
inactive in so many cases, indeed Mr. Symonds says that "Mr. Hume's
once found 5000 of solid opium undissolved in the stomach"

From the above it seems that opium is more, or less, inactive in its
action in this disease, still the disease evidently depends upon
the opium never having been dissipated when it has reached
the stomach, therefore I think that the solution of opium are
as agreeable to the patient as when it has been taken


up into the blood much more readily, & when once there I have no doubt it would produce its full effect. Generally speaking, this is very good to those of the remedy, in fact doses which would in all probability be attended with fatal results, if taken by a healthy person, are when taken by the tetricus patient only producing slight nauseae. There are exceptions to this rule however, for Dr. Christian, told me about a short time since, that he had met with a case in which the opium produced its full effect, when given in ordinary doses.

Cold is another remedy which has been found of great use in cases of tetanus; it should be applied along the course of the spine. If, as I have been told by Dr. Milne, Dr. Milne speaks very highly of this remedy, it has been found it to have great power in checking the violence of the symptoms. I can distinctly say, its good effects are very well marked, if the patient called out for its application whenever it was required. The effects of remedies of this class, should be carefully watched, but they depress the vital powers too much for this, all things should be most carefully avoided, if the general powers of resistance of the system have been lowered, the influence whatever it may be which causes the tetanus, will be free to act more uncontrolled.

Belladonna has been recommended by some, but it has been used in some cases attended with benefit. It is generally applied along the course of the spine, occasionally however it has been given internally. Strypnica has been given with the hope that it might occasion a morbid action, which would suppress the morbid action of the disease, yet behavours l
more mangeable than it." Mr. Burton tells me that he has seen it used externally, in India as a remedy for the disease. It is generally used he says, in the following way: the quantity of Nuxotin is boiled, and is mixed with a little powdered white sugar, t is sprinkled upon a blistred surface. I confess I am greatly puzzled to fancy in what way this drug could be of use in tetanus, t I should be very unwilling to try it in cases which came under my care. The powerful poison a substance exactly opposed in its effects to Nuxotin, has been tried upon the lower animals, but with no very encouraging results; perhaps sufficient experiments have not yet been made. Prussic acid, tobacco, digitale, nutsh, & many other remedies, far too numerous to mention have been tried, t with varying results. I have mentioned all that I think likely to be of any use. I have said nothing of bloodletting in cases of tetanus, for I believe that medical men very seldom, if ever, have recourse to that now in cases of tetanus. Bleeding in cases of tetanus, I believe to be much worse than useless, t I believe that each drop of blood we were to take from a tetanic patient would only hurry him to much the sooner to his grave. In conclusion I hope that those into whose hands this paper may fall, will kindly overlook the many faults which I am fully aware it contains. I regret very much that I have not been able to do more justice to a subject of such great importance as tetanus, still
one thing concerns me, and that is, the knowledge that I have done my best. Being only a student I have not yet had any very great experience, and have been obliged to make many, perhaps too many, references to the works of those of much greater experience than myself, but I feel it unnecessary for me to say more, for I know that every allowance will be made by those who are to be the editors of this paper.

John Medd M.R.C.S.Eng.

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