

— Tetanus —

Its varieties — Symptoms, pathology and treatment

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Of all the Spasmodic Diseases which the Medical man is called upon to treat, the most terrible and pathologically spreading the least known Tetanus (from *τῆνος* to stretch) occupies the first rank.

^{1st} Tetanus is defined by authors to be a more or less violent and extensive contraction of the muscles of voluntary motion attended with tension and extreme rigidity of the parts affected.

In the following pages I shall first enumerate the varieties ~~and~~ symptoms and causes of the disease, then the pathology and treatment. ^{see} Four varieties of Tetanus have been described.

1st Tismus, when its effects are confined to the muscles of the throat or jaw:

2nd Tetanus, when a great number of muscles are involved, but the trunk retains its ordinary straightness:

3rd Emprosthotonos, when the body is bent forward:

4th Opisthotonos, when the muscles of the back are principally affected. To these four

varieties some authors add a fifth which is denominated Pleurasthotonos, and characterized by the body being bent on one side; (Tetanus, lateralis, or Scurvus). The different terms applied to tetanic affections

As it imply in many particular diseases, but only the seat and various degrees of the same complaint, this may be invariably a part of each of the other (strictly) Another important division of tetanus is into Acute and Chronic, the first is very dangerous and usually proves fatal; while the latter on account of its slower approach affords more opportunity of being successfully treated.

Tetanus is also divided into Traumatic, or that arising from wounds (sometimes called *Emploetic*) which cases generally fall to the lot of the Surgeon; and into idiopathic or that proceeding from other causes. Having enumerated the divisions, I shall now go on to the consideration of the symptoms presented by each.

Tetanus as its name implies is characterised by violent and acutely painful spasmodic contractions of the muscles of voluntary motion (I am now considering Traumatic Tetanus the form in which the disease most frequently occurs), the muscles first affected being those of the neck, jaw and throat.

In some cases the disease comes on soon after the receipt of the injury; the most rapid case on record is, one that came under the observation

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of Prof Robinson of Edin^{burgh}, who was once a stult, when a high sword lacerated his stern by the fracture of a China dish,

He was seized with convulsions almost instantly, and died with Tetanic symptoms in a quarter of an hour. Such a case ^{proves} as this, however is out of the usual course of the disease, and probably (says Dr Watson) was mainly caused by fright.

In other cases the disease makes its appearance more slowly; when it begins slowly and gradually the stiffness is first perceived at the back of the neck, this symptom increases and causes the slightest movement of the head to be attended with intense pain. The muscles of the jaw also become stiff to such a degree that the teeth are firmly set, accompanying the stiffness of the neck there is also a peculiar sensation of uneasiness at the root of the tongue, and a difficulty of deglutition. There is also an acute pain at the lower part of the sternum piercing thro' the back, this symptom is doubtless caused by cramp of the diaphragm. The spasm extends to the muscles of the trunk. The abdominal muscles are also powerfully contracted and feel hard and tense as a board. By the violence of these contractions the Recti muscles have been known to be

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lacerated; in fact the Spasm affects all the muscles - those of the hand, the large muscles of the leg and arm - those of the back and even the muscles of the tongue. When the disease reaches its worst stage, the flexor muscles of the head and trunk contract so powerfully, that they counteract the force of the extensors and hold these parts in a strong and immovable position. In this state the term tetanus more properly belongs. The muscles of the fingers often remain unaffected, while all the others are subject to frequent recurrence of Spasm, the paroxysms taking place every two or fifteen minutes, and generally lasting for two or three minutes at a time. And it has been observed, that the shorter the interval between the paroxysms the greater is the patient's danger. Dr Watson remarks that the Spasms are sometimes relaxed during sleep. Mr May has recorded a case of Tetanus occurring in a boy.

He says that one day on visiting him he found him asleep and all his muscles relaxed. He awoke the boy and immediately all the muscles became rigid - left by himself to sleep and the muscles again became relaxed, and again on being a second time waked returned.

to the state of spasms before. In many cases of tetanus the muscles of the back become so violently affected as to overcome those of the body, the consequence being that the body is bent in the shape of an arch resting on the head and feet alone; to this form of Tetanus the term Opiorthotonos has been applied. At the same time the Masticatory, Temporal and Internal Pterygoid muscles which were before affected with spasm now contract with increased force, so as to maintain the lower jaw in inseparable contact with the upper. This last state which has been considered as a particular affection under the name of Trismus or lock jaw, Boyer considers to be a pathognomonic symptom of Tetanus which in some or in all most cases is limited to such an affection of the jaw.

In some few cases the head is bent forwards the head resting on the knees and the patient resembling a ball: this forms the complaint in Chorea Laryngothotonos.

It is however comparatively rare; Baron Larrey however found it more frequent in Egypt than Opiorthotonos, tho the latter was more generally fatal. It may be mentioned the numerous opinion entertained by Larrey concerning the contraction

of the muscles of the Neck; we suppose that the violent extension of the vertebrae of the neck and the forceful manner in which the head is thrown back, caused strong compression of the Spinal marrow and permanent contraction of the Larynx and Pharynx: it is evident however this result could not occur since the compression would at once destroy the patient, or cause paralysis of the muscles supplied with nerves from the compressed part and immediately arrest their violent contractions.

Thin variety and of seldom occurrence is that form of Tetanus denominated Pleurothotonos when the body is bent to one side.

All these varieties occur tho they are essentially more modifications of the same disease.

The countenance is pale and contracted; the Mastoid and Sternocleidomastoid together with others concerned in deglutition and the Orbicular and Pectoral muscles are most violently contracted so that the shoulders are strongly raised forward, and the arms are stretched out or drawn across the body, but the wrists and fingers seem not to be affected. In a few minutes a perspiration breaks out but not entirely, but the forehead

Such a degree of rigidity remains as to prevent their being bent even when this is attempted by another person, the patient breathes quick for some time as if he had been violently exercised, the pulse is small, fluttering and irregular, the face is sometimes pale in the intervals but often flushed: and the whole countenance is expressive of the most acute distress.

The patient for the most part desires to lie still as much as possible and avoid all attempts at drinking, speaking or any kind of motion: all of which are apt to occasion a return of the paroxysm in all its horrors. In extreme cases there are hardly any of the voluntary muscles that remain in the natural state. The face and eyes are distended: the tongue is darted out between the teeth and often dreadfully lacerated from their closing at the same moment.

Even the small muscles of the larynx seem to participate of the general spasm which is generally fatal to the system.

The countenance becomes contracted, a general sweat breaks out, eyes watering and languid and a pale or blood froth

Neuro from between the legs. Tetanus in these violent forms is perhaps the most painful disease which can affect the human frame, so exquisite a degree of pain would scarcely be compatible with life were it not occasionally assuaged by short and imperfect remissions which occur. Continual and severe spasms or general convulsions usually finish the tragedy and relieve the unhappy victim from all his misery; or if too exhausted to admit of this mode of termination Delirium often ensues, protects the patient by a happy insensibility to further suffering and shortens the avenue to death, which is then preceded by a general relaxation the spasms

Such are the symptoms which peculiarly belong to Tetanus and it is perhaps the most remarkable circumstance attending this, that hardly any function is primarily affected except that of muscular action.

The Senses and Appetite are perfectly entire, the intellectual functions are undisturbed, and the natural functions proceed in their usual course. Fever is neither an essential nor a common attendant on the disease,

In the first stage when the spasm is confined to a few muscles the pulse is not affected; it becomes accelerated only when the spasmodic actions are accelerated and this is merely in consequence, as it would appear, of the mechanical effect produced on the blood vessels by the contractions of the muscles, which hurried on the circulation and throw the blood upon the heart in larger quantities than usual, unduly the pulse contracted, frequent and irregular, the respiration is hurried from the same cause, and the temperature of the body is increased in the same proportion.

That these symptoms are not the effect of fever, appears from the condition of the blood, which is noticed to be of a looser texture than natural, and now exhibits the buffy coat; this fact is particularly noticed by Dr. Gellphare and Chalmers. On some occasions indeed when the disorder is very violent the arterial actions are increased and a febrile state prevails;

This appears to take place more frequently when the disease has originated from cold, than when excited by wounds. The skin is at first natural but as the

Disease advances is covered by a cold sweat.

The tongue is always moist; something always takes place early in the disease, but not noticed in the prognosis. The urine is sometimes voided with great pain and difficulty, the bowels are found in every instance to be obstinately costive, partly perhaps owing to the quantity of Opium frequently administered and partly to spasm of the muscular fibres of the intestinal Canal.

It is mentioned by Cullen that a milinary eruption has in some cases appeared on the skin: but he expresses a doubt whether this was a symptom of the disease or the effect of a certain treatment.

I now conclude what I have to say concerning the symptoms of tetanus, and shall now speak of the consideration of its various causes.

"All the remote and predisposing causes of Tetanus act by inducing a preternatural activity and irritability in the muscular parts of the body." (Dr Rush)

I shall briefly enumerate, without discriminating them, or pointing out when they act singly, or when they act in conjunction with each other.

Wounds on various parts of the body are without exception the most frequent causes of this disease. It was formerly supposed it was only the effect of a wound, which partially divided a tendon, or nerve, but we now know it is often the consequence of lesions which affect the body in a superficial manner. The following is a list of such wounds and lesions as have been known to induce the disease.

1st Wounds in the sole of the foot, and palms of the hands, and under the nails, by means of nails and splinters of wood &c

2nd Amputations and fractures of limbs.

3rd Gun shot wounds

4th Venerection

5th The extracting a tooth and irritation of new teeth

6th The extraction of schenels

7th Irritation of the bladder

8th Abscess of the tongue

9th The injury which is done to the feet by frost

10th The injury which is sometimes done to the ^{toes} feet by stamping on it (as it is called) in Wal Ring

11th Renting a nail or corn too closely

12th Wearing a shoe so tight as to abrade the skin by one of the toes

- 13th A wound, not more than the eighth part of an inch,
upon the forehead
14th Walking too soon upon a broken limb
15th Biting of a wasp upon the Glans penis
16th Cutting the umbilical cord in new born infants
17th The stroke of a whip upon the arm which only
broke the skin.

Between the time the body is thus injured or wounded,
and the time in which the disease makes its appearance,
there is an interval which extends from one day to six weeks.
Dr. Rush mentions the case of a man who died from
strapping his toe, the day after the receipt of the injury.
The same author mentions two cases of tetanus, from
running nails into the feet, which did not appear till
six weeks after. In most cases of this disease from wounds, there
is a total absence of pain and inflammation, or but very
moderate degrees of them, and in many the wounds have
entirely healed, before any of the symptoms of the disease
make their appearance. Wounds and lesions are most
apt to produce tetanus, after the long application of
dust to the body; hence its greater frequency from these
causes, in warm than in cold climates, and in warm
than in cold weather, in northern countries.

Secondly, as a cause of Tetanus, is, Cold applied
suddenly to the body, after it has been exposed to intense

heat. Of this Dr. Guilleston mentions many instances, in his Treatise upon spasmodic affections in India. It was most commonly induced by sleeping, after a warm day. Such is the dampness and unwholesome nature of the ground, in some parts of that country, that "fools" (says the doctor) put into coops at night, in the tickly season of the year and on the same soil that men slept, were always found dead next morning, if the coops were not placed at a certain height above the surface of the earth". It was brought on in a servant girl in Philadelphia, on the evening of a day, on which the mercury in Fahrenheit's thermometer stood at 90°x. Dr. Chalmers relates a case of its having been induced by a person's sleeping without a night cap, after shaving his head. Dr. Bartram states, that he has known a draught of cold water produce it in a man who was in a putrefactively heated state.

The cold air more certainly brings on, this disease, if it be applied to the body in the form of a current.

The stiff neck which is sometimes felt after exposure to a stream of cold air from an open window is perhaps a tendency to lock jaw, or a subtle and partial tetanus.

Therby Burns and certain other matters in the Elementary Canon. Morgagni relates a case of

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Rush's
medical
enquiries

It arises Arising from this cause.

Fourthly, Certain poisonous vegetables. There are several cases on record of its being produced by the Saturea Thymonema or fennel tree and

Fifthly, it is sometimes a symptom of the bilious vomiting and intermittent fevers and is said to occur more frequently in those states of fever, on the Island of Malta, than in any other part of the world.

Sixthly, it is likewise a symptom of that malignant state of fever which is brought on by the bite of a rabid animal, also of hysteria and gout.

Seventhly, the grating noise produced by cutting with a knife upon a pewter plate excited it in a servant, while he was waiting upon his master's table.

Eighthly, certain emotions of the mind.

From thought it on in the case of a man mentioned by Dr Rush. He had been previously by great labour, in warm weather. The same author has heard of its being produced in a man by great agitation of mind, occasioned by seeing a girl tread on a nail.

Fear excited it in a soldier who fell down to be shot. Upon being pardoned he was unable to rise, from a sudden attack of tetanus.

Parturition sometimes gives rise to this disease.

It must be kept in mind that all these remote and exciting causes act with more or less certainty and force, in proportion to the greater or less degree of fatigue which have preceded them, and to the condition which the nervous system seems prone to assume the morbid impression which gives to the disease.

It has been customary with authors to call all those cases of tetanus, which are not brought on by wounds symptomatic. This however is a misnomer, they are no more so than those which are said to be idiopathic. They are equally dependent upon irritating impressions made upon one part of the body, and reflected thro' the medium of the nervous system to another, there producing morbid excitement or disease.

The result is the same, whether the exciting cause act upon the intestine by a worm, upon the ear by an ungrateful noise, or upon the mind by strong emotion: it is alike

communicated to the muscles, which being previously in a state of debility and morbid irritability are easily thrown into a state of spasmodic action: and it is observed that those muscles which are most generally

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Some authors have, indeed, mentioned appearances
in dissection, as occurring in these parts:
but they were doubtless the effects of the disease
or of the remedies employed for its relief —

in a state of relaxation (as those of the brainstem) are the first to be affected by the spasmodic action. The reports in the best Index are more subject to this disease than white people. This may perhaps be owing to greater irritability of their nervous systems.

Having enumerated the causes of the disease I now go on to the consideration of the Pathology.

It is to be regretted that notwithstanding the careful investigations by many scientific men the pathology of tetanus is not yet thoroughly understood.

The dissection of patients dying of this disease tends to throw little or no light upon this fatal disorder:

most of the deductions that can be drawn being of a negative character. By observing the phenomena of the disease I think we can show, that the thoracic and abdominal viscera are not primarily affected, and that the disease, can not take its rise in the nervous substance. Supplying these organs, for when it is, then organs must immediately take on diseased action.

Hence we may conclude that the ganglionic system is not the seat of the disease. The same argument is applicable to the cerebral system, comprehending the intellectual powers and the fine senses,

which generally remain unimpaired till the last
 Sometimes slight effusions are found within the
 cranium: but in general no morbid appearances
 whatever can be found within the ~~head~~ ~~cranium~~
 Cranium. There is always more or less of an inflam-
 -matory appearance in the Oesophagus and the
 villous coat of the stomach about the Cardia
 There are circumstances (says Dr Reid) which
 even show, that these Systems (Gastric and Cerebral)
 have rather a tendency to oppose the disease,
 than to participate in its effects:

Thus we observe that the tongue which is the principal
 organ of taste, retains its power of motion, until
 the Cerebral system becomes affected.

Now we know that the Gustatory nerve is a
 branch of the fifth pair, which properly belongs
 to the Cerebral system, while the ninth pair are
 acknowledged to be those which supply the
 muscular parts of that organ and are found to
 arise from the inferior part of the Corpora
 Pyramidalia, and to pass out of the Skull at the
 Anterior Condylar foramina.

We also observe that the principal organs of touch
 are in the hands. The nerves of touch should
 then in this situation, oppose the effects of the disease

; And this we find really to be the case, the upper extremities remaining for a long time exempt from the disease, and the fingers often continuing to till the end. This opposition of the Cerebral, to the action of the Spinal system, in Tetanus, is very plainly shown at the commencement of the affection, when in a mild state. For then the spasms are most frequent, on the patients inclining to sleep. Having thus explained how these two systems do not appear to be the seat of the disease, we must conclude, that in all probability, it exists entirely in the spinal canal.

Every circumstance of the disease conspires to substantiate this idea. Thus we observe that the only parts of the body which are engaged in the disease, from the commencement, are the muscles; but upon dissection there is not the slightest injury to be discovered in their structure.

Some authors however, observe that the muscles are more soft and placcid than in health, this may however result from a morbid action consequent upon the disease. We know that the Nerves which are distributed to these parts, and from which all proper stimulus, to muscular action, in the living body, is derived,

take their origin from the nervous system of the spine. It is therefore natural to conclude, that as, the parts which are acted on by the disease, show no indications of morbid change, on post mortem examination, that these morbid changes should be look'd for in the part which affords the stimulus to muscular action;

hence we must look for the origin of the disease in the nervous system of the spine; and when we examine the bodies of those in which this disease has proved fatal, we have strong arguments in favour of this assumption. I am aware that many writers on this subject do not consider the spinal system as the seat of the disease, nor do they seem to understand its nature or treatment, and tho' they lay their boast of knowledge on the subject, are quite undecided as to where, they would place the seat of the malady.

Thus, in the 4th volume of the Medico-Chirurgical Transactions, when Sir James M. J. describes the disease, which the British Army were liable to during the Peninsular war, with respect to Tetanus he observes, "I have at some pains collected information respecting a disease which was too frequently fatal among the Army; for among several hundred cases detailed, there

"Are few when this disease had made any progress,
in which the remedies, however varied, seemed to
have any influence on it."

Yet notwithstanding the numerous opportunities he had,
of investigating the morbid changes resulting from the disease, he seems (as would appear from his
next observation) to have come to no definite conclusions,
as to the treatment or nature of the affection.

"The remedies which have been chiefly resorted to,
for the cure of this formidable disease, are —
Opium, Mercury, Wine, the warm and cold bath,
the secretion of evacua, and Digitalis in
large doses, enlargement of the original wound and
Amputation of the limb." These have been tried
alone, and in various combinations: and I am
obliged to confess, that the whole failed, in
almost every case of acute tetanus, which
occurred." The three first have been administered
in unlimited doses, without effect;
the cold bath is worse than useless, and I
am obliged to confess, that little or no dependence
is to be placed on any of the remedies;
and to regret, that the method of cure is
yet to be discovered."

The Author then observes, that in four cases, where he

engaged into the state of the bowels, the evacuations were not like feces, and he proposes, as a question, in investigating the cause. "What is the state of the bowels between the infliction of the injury and the appearance of this dreadful malady?" And in another place he expresses his opinion that— "The seat of the disease, should be looked for in the stomach"

This idea probably suggested itself to him, from finding the mucous membrane of the stomach, presenting a red and inflamed appearance similar to that which Mr. Lury mentions, as occurring, in the pharynx and oesophagus of persons dying of this disease, the appearance in both cases however must have been the effect and not the cause of the disease.

In some cases published a few years ago by Dr. Dixon, with respect to the pathology of the same disease, he says, "I am unable to say anything satisfactory: nor have the dissections been sufficiently numerous to allow us to judge, how far it has any essential connection with such morbid appearances as have been discovered."

Dr. M^r Arthur has published some cases, when he observes, "A yellow matter, found in the stomach, and intestines, was very common," but asks, is it to be considered a feature of the disease? or was it in consequence

of the quantity of Callusum exhibited?

I might adduce the observations of numerous other ancient authors, all of which would tend to support the idea that the true source of the disease has never been

discovered: or at least had not in their days

I shall now go on to the consideration of the morbid appearances, as described by more modern authors, which tend to show that the disease originates in the spinal canal. Dr. Riis gives some valuable information on this subject, in his work on Tetanus, from which I shall extract one or two cases, he says;

On the 25th of February, having occasion to visit, about three miles from town, I was requested to see a boy, aged thirteen who, the night before, had received a severe blow on the toes of the left foot. I was informed he was a hyacinth grower, who went about the country, exposed to the vicissitudes of the weather, during the inclement season: And that the evening before, he went to rest in a lime kiln, where he was found, next morning, in the state I saw him. Having no friends, or habitation, I directed that he should be sent to the Richmond Surgical Hospital, where he remained under treatment, for four or five days, when Tetanus came on, with the usual symptoms,

And in 86 hours after the first attack, he expired. I did not however, see him again till after he died. On examination of the body, after death, the viscera of the Abdomen and Thorax appeared perfectly natural, and there could not be discovered any morbid appearance in the muscular parts.

The brain appeared healthy in every respect, except some increased vascularity in its investing membranes. Upon opening however, the cavity of the spine, from the back part, then appeared to be a fatty substance, deposited in the cellular tissue, investing the dura mater, for the extent of several of the dorsal vertebrae.

x This appearance is natural to the part

On removing the nervous map (with its dura mater entire) from the spine, then appeared a considerable effusion of blood into the cellular tissue, connecting it with the upper lumbar and lower dorsal vertebrae.

On splitting up the dura mater, on its anterior surface, or that next the bodies of the vertebrae, the nervous map appeared highly vascular, and the vessels of every description remarkably tortuous.

In the part which was situated opposite the ninth and tenth dorsal vertebrae, then appeared a whitish substance very much resembling the medullary matter exposed between the crachnoid coat and

pia mater, occupying the space of about an inch and a half, and crossing about half the circumference of the nervous mass. On breaking the membrane enclosing it, I could wipe it off, and then could not be the slightest rupture discovered in the pia mater, or any of its vessels.

The only appearance in the nervous substance itself, that I could discover, was a deep tinge than natural, in its cortical and medullary parts.

The remarkably circumscribed appearance, of both the extravasations of blood, which have just been described would naturally lead one to imagine, that these were the results of local injury. We find however, from accounts published by Dr. Horsfield, that similar general affections, may be produced by some Indian poisons.

Thus, he observes that in animals killed by the Wapiti or Antelope, the large vessels of the Thorax, the Aorta and Vena Cava were in every instance found extensively distended.

The surrounding viscera, especially the lungs, were gorged with blood, of a florid colour.

The stomach was unusually distended with air. But the train was less indicative of marked effects, than the viscera of the Thorax and Abdomen.

In some instances it was perfectly natural.

Then again the post mortem appearances of those destroyed by Eschschick was very different. The viscera of the Abdomen and Thorax, were found nearly in their natural state, as were the vessels leading to and from them.

The brain and dura mater, on the contrary, exhibited marks of violent action. In some instances the inflammation of the brain and dura mater was so strong, that they at first appeared as the consequence of a blow, previously received. There can be no doubt that, many of the ancient writers on this disease, must have observed these morbid appearances in the spinal canal; but they evidently derived little advantage from their observations, as they seldom had any influence on their practice.

Dr. Ferrius of this City, mentions a similar case of a young man, who, from a violent blow, received fracture and contusion of the finger, which produced Tetanus ending fatally. He says, I examined the whole spinal cord with care, and found it quite sound, except in the Cervical portion, where the envelopes were reddened, and had evidently been the seat of inflammatory action.

Beneath these envelopes, the spinal cord in the Cervical portion was reddened and softened for

The space between one inch and a-half and two inches. In fact as I could determine, this has the point which gives origin to, or is connected with those branches of the cervical nerves which proceed and chiefly form the brachial plexus.

In this case and in the one before mentioned, (Dr Reid's) we have good examples of the excitement caused by tetanus, the subsequent inflammation, in the one case of the nerves of the foot; and in the other of the Digital nerve, being reflected to the spinal origin of these nerves, and thus inducing inflammation and irritation of the spinal marrow, followed by softening; that then were the cause of the tetanic symptoms and their self termination, we can have little doubt. The post-mortem appearances presented by the majority of cases of Tetanus write, I think beyond the conclusion, that, in general the irritation is propagated from the injured parts in a reflex action to the spinal connection of the nerves; that then it is followed by another irritation and inflammation of the spinal marrow; and that the last is the cause of the tetanic symptoms. This further seems most probable, when we consider, that some time always elapses

Between the date of the infliction of the injury, and that of the development of the tetanic spasms.

From the morbid appearance observed by various modern authors, I think we are warranted in laying down the following propositions, regarding the contracted pathology of this disease.

That the disease is of an inflammatory nature; that it is essentially a disorder of the excito-motory apparatus: that it results from irritation of a peculiar kind, affecting that part of the nervous system: that the irritating cause may be centric—within the spinal canal itself: that, again, it may be, and often is, eccentric, situated at the extremity, or somewhere in the course, of one or more of the apparent spinal nerves: and that a certain predisposition is for the most part necessary, under the body susceptible of the disease under the operation of the exciting irritation.

It would also appear that the disease has its principal seat in the nervous map of the spine or, rather perhaps, first commencing in the membranes investing that map: for we can observe here the peculiar characteristics of membranous inflammation, in the remarkably tortuous state, of the vessels of the part.

It is excellent, from dissection, that the nervous
 map of the spine, is affected with this disease
 with such local injury as has been described;
 And we can in a satisfactory manner, account
 for more peculiar circumstances, which
 occur in the course of the disease: it seems
 probable that the various form of the disease is
 liable to assume, depending, upon the situation
 in the spinal cord, where the effusion may
 chance to take place. It is much to be regretted
 that the pathology of this disease is a subject
 "adhuc sub judice", that it is a disease
 essentially commencing in the spinal system,
 receives confirmation from the well known
 doctrine propounded by Dr Marshall Hall,
 which have already furnished a key to
 many problems previously perplexing
 pathologists: And this they do by distinguishing
 the proper functions of the two distinct nervous
 centres: the brain and the spinal cord

I have now to say a few words respecting the
Prognosis of the disease which has hitherto
 been always most unfavourable.

Dr Lionel Chambers of South Carolina
 states, "That when the disease forms very
 quickly, and invades the unfortunate person
 with the whole train of its mischievous symptoms,
 in a few hours, the danger is proportioned to the
 rapidity of the attack, and that the patients
 thus seized generally die in 24, 36, or 48 hours,
 and very rarely survive the third day."

But when the disease is less acute, and the
 patient survives till the sixth or eleventh day,
 the prognosis is much more favourable.

The disease has a better prognosis when
 more favourable fatal, when arising from a
 wound than from any other cause.

It is the opinion of most medical men, that,
 when the disease has once fairly set in, recovery
 is hopeless or nearly so, but that if timely
 measures be taken it may in some cases, be
 braved off.

I next proceed to consider the Treatment of tetanus,
 a subject of infinite difficulty, because the
 disease often baffles every medical treatment
 and in certain instances gets well under
 the very same remedies which decidedly fail

in other similar cases of the disease.

Every plan has occasionally succeeded, and every plan has still more frequently miscarried.

The disease from remote ages has been considered a lamentably fatal one. Hippocrates says,

"Tetanus supervening on a wound is fatal" And

this opinion holds good, with very few exceptions even in the present day. Hennen says he never saw

a case of acute "Rheumatic Tetanus" recover.

Dr. Dickson found all remedies to fail.

Mr. Mayner uses these words: "I have never seen a case of an intercurrent recovery from acute Tetanus" And it is to be regretted that the present state of our knowledge of the disease, and of the remedies employed, does not lead to a more favorable prognosis. All we know is that if the patient survives the first ten or twelve days, in the generality of cases he ultimately recovers, under various modes of treatment, but to what remedy more than another, this fortunate result should be attributed, we are unable with any certainty to decide. From the great rapidity with which

Tetanus generally proves fatal, we should avoid wasting our time in idle experiments, but at once proceed to employ those remedies which have been

considered most efficient in the cure of the disease. I shall now briefly review the various remedies that have been tried and enquire what degree of success has attended their exhibition.

Opium is a drug from which we would naturally expect much good to be derived on account of its Anodyne and Antispasmodic action, and as the intense pain which is present fortifies the system against the action of narcotics we must exhibit it in very large doses.

Dr Watson mentions a case of a lady attacked with tetanus, who in twenty one opium days, swallowed the enormous quantity of 40,000 drops of Laudanum. This lady recovered. A case is recorded in the second volume of the Medical-Chirurgical Transactions, in which an ounce of solid opium was taken in divided doses, every day, for twenty two days. The tincture is the best form to exhibit this drug, for when given solid it is sometimes found undissolved in the stomach. We may also apply an opium plaster externally to the spine, in this form it sometimes relieves the intense pain in that region. This remedy has been most successful in

The idiopathic and milder forms of the disease, and of little use in the acute forms except as an anodyne. Dr. William Budd, indeed, denies the propriety of giving any opium in this disease. He says: It has been ascertained that the effect of that drug is to excite, and not to quiet, the motor functions of the spinal cord.

Bleeding When the disease has once fully set in, is not considered expedient. If used with moderation in the beginning of the disease, it often proves of service, by promoting the action of other remedies, and particularly of purgatives, which are of essential service in clearing out the irritation secretion which are prone to collect in the intestinal canal. Croton oil is perhaps one of the best purgatives as proper in this disease both from its easy administration and its promptitude of action. The operation of purgatives will be much assisted, by turpentine injections. Belladonna has been found of considerable service, in allaying the violent spasms, but no case of cure can be ascribed to it. x

Of all the sedative remedies which have been tried, Canabis Indica, holds, perhaps, the highest

x Lancet
May 1844

place, particularly in warm climates.

On this subject Prof Miller remarks:

In this country its success has not hitherto been so great: And yet such a fully warranted further trial: My own experience speaks loudly in its favor. I can now record three fortunate cases under its use, all traumatic. A girl, eleven years of age, received comminuted fracture of the finger, Tetanus occurred, the finger was amputated; and the treatment consisted of purgatives, cold to the spine, Indian Hemp pushed to narcotism - no mustard and occlusion. The amendment was gradual and complete.

A boy, about the same age, had simple fracture of the thigh, treatment and result then the same. Another boy, rather older, had compound fracture of the bones of the arm. The treatment again resulted in cure. And in this case I was, and am inclined to award to Canalis the greater part of the Therapeutic Agency.

In other examples of the disease I have seen it fail to cure, but here to relieve it is given in doses of three grains of extract, or ~~gr~~ ^{gr} ~~xxx~~ ^{xx} by Tinct. repeated every half hour, hour, or two hours

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The object being to produce and maintain narcotism
judging from the effects of this drug, in
these three well marked examples of ~~thall~~ morbid
tendencies, we are I think fully entitled to
give it the precedence of all other remedies,
taking care not to administer it too sparingly,
in sufficient quantities to produce its
narcotic effects as soon as possible

Digitalis and Tobacco are two medicines, which have been employed: both probably, on the same principle. Their effects being when given in large doses being very similar: Great fulbness of the Pulse, Fluttering of the, exsplan faintness, copious perspiration, extreme Alarm and sometimes vomiting, with that relaxed state of the Muscular System which belongs to Syncope. But when we come to consider the influences of these substances, upon the ~~in~~voluntary muscles, more particularly the heart and when we recollect the tendency to death by Asthenia, in this disease I think we should pursue the safe course, in not making use of these remedies, particularly in the advanced stage of the disease. Some Arney Surgeons however,

have fancied Digitalis useful: Sifflens M^r Jigot mentions a case in which it caused relaxation of the Spasms: but the man afterwards died apparently from the effects of the remedy.

The Tobacco is given, per Annum either in the form of Smoke, or an infusion of the leaves in water. In whatever form it is given the effects should be watched very carefully, and Stimuli kept at hand to counteract its depressing influence.

Chloroform has been tried, and altho we have no authentic instance of the disease having been cured thro' its agency, it has certainly afforded temporary relief from some of the most urgent symptoms.

We learn from the reports of Sifflens M^r Jigot, that, Ether, Camphor, Mustk and other Antispasmodics, as well as various Alkalies have been tried by our Military Surgeons in Spain, and found unsuccessfull. x

Mustk, however, in large doses, has been strongly recommended, by Fournier Passey. He gave ten or twenty drops at intervals. So that a Arachn, or even two Arachn have been taken in the course of the day and he declares that he found it more

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efficacious than any thing else he had tried. Another remedy said to have effected a cure in Tetanus is Mercury. Mercurial frictions, practiced so as to bring on a quick effection of the mouth, and in an early stage of the disorder, are in general preferred. Others say it acts equally as well when given by the mouth.

Whatever benefit, however, may have been experienced from this treatment in mild cases, it completely fails in the acute form of the disease. In Egypt mercurial frictions appeared to Baron Larrey to aggravate the disease symptoms.

The sub nitrate of mercury combined with Ipecacuanha is useful in chronic cases by keeping open the bowels, but it is generally useless in acute cases. Another method of treating Tetanus is that of administering the most powerful tonics and stimulents. The introduction of this plan was chiefly owing to Dr. Rush of Philadelphia, who considered Tetanus as a disease essentially connected with debility. Considerable success is reported as having attended the practice. Dr. Elliot was induced to try

The effects of Carbonate of Iron in these cases of
Traumatic Tetanus, in consequence of the
success with which it had been exhibited in
cases of, Paralysis Agitans, Chorea &c.

The method by which the remedy was administered
was this: The carbonate was made into an
electuary by mixing it with twice its weight of
Treacle. The electuary thus made was
well stirred in sup-tia, just as the patient
was about to drink it. One of the cases
occurred: The third, which was one when
the spasms were especially violent, and the
pulse 140, was too rapid in its progress
for an efficient trial of the remedy, the
patient dying the day after the commencement
of the plan.

Strychnia has been suggested as a
remedy in Tetanus. We know that
Strychnia acts upon the spinal cord, affecting
apparently those parts, and those functions
of the cord which are affected in tetanus,
and in so fatal a malady, it would be justifiable
to give the Strychnia, in hope that it might
occasion a morbid action that would
disperse the morbid action of the disease,

and get, and get be less painful and more manageable than it.

I shall now conclude my subject with a few remarks on the local or surgical treatment of Tetanus. Ampulation of the affected limb has been proposed and performed by various surgeons: but it is now well known that this treatment will not arrest the disease when it has once fairly set in, as the regard to this subject Mr. Granville made the following remarks "The state of the part is not the sole cause of tetanus. In cases of tetanus I have often amputated injured fingers: and tho' I did not thereby save the patient, yet I think the symptoms have mitigated after such amputations." "In such cases, then, I should not amputate any considerable member; nor even a small one, unless I thought that, from the injury sustained, it would prove amputee to its propriety, even tho' the case should terminate favourably."

The tourniquet has been applied to the limb, but with no good result. Of all the remedies which surgery offers, that of division of the nerve proceeding from the affected part is perhaps most

to be relied on; it also possesses the advantage of being less hazardous, and should certainly take place up maintaining the patient.

Lamley says that the division should be performed before inflammation has set in: for if this has made progress, the practice would be useless and even dangerous.

The practice of merely surrounding the wound by a deep incision, has been practised in University College Hospital, and mostly the cases have been in favour of the plan. Altho, in the present state of our knowledge, there is no remedy or plan on which we can rely for the curing this fearful Malady we may confidently rely on our friend who, the assistance of which will help the patient in the chance of a favourable result—