OBSERVATIONS

ON THE

MUSCULAR CONTRACTIONS

WHICH OCCASIONALLY HAPPEN AFTER

DEATH FROM CHOLERA.

BY

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PART II.

When I published my observations on the muscular contractions which occasionally happen after death from cholera,* I by no means flattered myself with the completeness of my contribution: on the contrary, I felt that, so far as their mere *history* was concerned, much remained to be supplied. It is in the hope of further illustrating a subject of so deep an interest, and so much in need of fuller investigation, that I beg the attention of the profession to some more facts respecting it

Since the appearance of my short remarks, which have gained more notice than I ventured to anticipate, some well-marked and valuable examples of these movements have been communicated to me; but, previous to placing them before the reader, I would refer to several instances long ago observed.

In the reports on cholera drawn up under the superintendance of Mr. Scot, and printed at Madras in 1824, I have found, amongst the cases of the disease described there, the following example: —A man, æt. 42, of middle size and sanguine temperament, who does not seem to have suffered unusually from cramps, died after an illness of about thirty hours; and for an hour after the breathing had ceased, the muscles of the mouth, and those of the feet and legs, were in tremulous motion.

A man, æt. 42, of spare habit, died, after rather more than thirty hours from the commencement of cholera, at Haddington in 1831. The cramps were severe. After death, alarm was excited by a twitching of the left arm, which was drawn across the breast. There was convulsive action of the lips, neck, and pectoral muscles.

In the same journal† whence I have extracted the foregoing will be found a statement of *an alleged premature burial.* A man, it is affirmed, was put into his coffin whilst his body was affected with spasms, and buried within a few hours of his apparent dissolution. Although I quite believe that movements of the kind referred to give no promise what ever of returning life, I can fancy nothing more careless of the prejudices or more revolting to the feelings of persons than early burials in cases where they happen. Let the body be watched until the motions seem fairly to have ceased, and the interment be so long deferred that rumour itself may have no tale to spread.

There can be no doubt, I think, that, owing to the occasional occurrence of these contractions at so late a period after death, the position of a corpse might be altered in the coffin; and it is not hard to suppose some such questions as the following put in the course of a medico-legal inquiry, perhaps occasioned by vague and unfounded rumour as to the body having been buried ere completely dead:—

Could this alteration of posture have been produced by movements happening subsequently to the body being laid in the coffin?

Do you regard such movements as evidences of life?

How long may they commence after dissolution?

Could they have been strong enough to have so altered the position of the limbs?

Have you yourself ever seen such centractions?

Are they peculiar to cholera?

Could the position have been so changed by the effects of "rigor mortis?"

It is stated in the Cholera Gazette for 1832, p. 36, that a medical gentleman of great authority mentioned to Dr. Crichton that he saw convulsions in India, after death by cholera, in the corpses of soldiers, which were so violent that their comrades, "in order to calm the timid, bound the limbs to the bed-frame."*

* Medical Gazette, Nov. 9, 1842

† Cholera Gazette, 1832.

* We have not to attend to death only, but all its circumstances. As Lord Bacon says, in his inimitable Essays, "'*Pompa mortis magis terret quam mors ipsa.*' Groans, and convulsions, and a discoloured face, and friends weeping, and blacks and obsequies, and the like, show death

An athletic young man died at Belfast in 1832*: the disease did its work in seven hours. Muscular movements were observed in different parts of the body some time after death. Some hours before expiring, he was of "a deep indigo blue." I should not have mentioned this instance but for the circumstance that in some cases of these contractions which have been observed by myself and friends, the body has been unusually livid. The colour of the surface previous to death should receive attention in reference to the motions which happen after it. But I do not know at present that there is any ground for thinking that their occurring after uncommonly intense lividity is more than an accidental event.

Mr. Lawrence mentioned to me that a gentleman, who died in 1832 of rapid cholera, was turned after death completely on the side by a strange and forcible combination of muscular contractions. This case is remarkable from the effect produced.

I wrote to Dr. Sibson respecting a case which was observed many years ago. He says, in reply, "Nearly eighteen years have elapsed since the occurrence of the case of cholera you allude to; and though, from their character, the facts are strongly before me, yet the precise time after death at which the muscular contractions occurred is forgotten." After describing the subject on whom the remarks were made, who was a Newhaven fisherman, singularly strong, muscular, more than six feet high, he remarks—"It might be about an hour after his death that I observed the contractions of the fibres of the pectoral muscles. The whole muscle did not contract at once, but adjoining fibre after fibre quivered. If I touched any fibre at rest, that fibre contracted." Dr. Sibson adds, that the mode in which the contractions progressed from one part of the muscle to another, reminded him of the flitting of the aurora borealis.

In watching contractions of this sort, it is well sometimes to keep the eye perpetually fixed upon a single muscle, —one of the long muscles of an extremity, for example. Now a few hardly discernible quiverings run along a narrow line; anon they strengthen, spread, and the whole muscle acts, bellies, becomes rigid. and perhaps its contractions are associated with those of other muscles. Presently it is still, and after a pause acts again, going through the same steps as before, but at length becoming more and more languid, its final efforts are seen to die away; or, as it would be more correct to say, its *visible* efforts, for it is probable that the skin veils the faintest of them from our view.

It is not unlikely that many cases happen in which the muscular fibres oscillate, although they act not with sufficient force to strike the eye.

Observers have remarked that some of the motions seen during the muscular contractions are very slow: I am able to say that they are so, and they sometimes remind one of the progression of tardigrade creatures, or the peculiarly gradual way in which a muscle is seen to act in some cases of paralysis, through dint of long-sustained and energetic efforts of the will.

Let us now pass on to some instances which were furnished by the recent epidemic. Dr. Green, of Bristol, informs me that "muscular contractions, after death, took place to a remarkable extent in a man who died from cholera at Grosvenor Place in this city. The forearms were powerfully flexed, and, the hands approximating, gave the attitude of praying to the body. No other parts were affected."

The *semblance* of voluntary motions is one of the most striking occasional features in the history of these post-mortem movements. It is a matter of accident. A few put on the air of such motions,—a few, amidst countless contractions which are not even distantly alike to any of design. In this case, had *one* arm acted only, there would have been nothing very strange in the appearance; but *both* arms happening to act together, and to be influenced in precisely the same manner and degree,—an attitude, reminding us of what we see in living, thinking persons, becomes imitated, if such a phrase be allowable in reference to a phenomenon of absolutely purely physical causation.

Mr. N. B. Ward, of Clapham Rise, has been good enough to send me a remarkable example. It will be seen that the eyes were observed in motion,

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terrible." When life is over, it should not amaze us if now and then the affection of survivors blind their judgment utterly, and even cause the senses to err.

* See Cholera Gazette, p. 251.

just as in a case which I detailed in my former paper, and for which I was indebted to Dr. Gull.

Mr. Ward observes—" I regret that I cannot give you very full particulars respecting the case of cholera alluded to by Dr. Gull.* I did not see the patient (a young man of twenty-five) at the commencement of the attack, but was called up early one morning in the beginning of August, and found him moribund. He died in about half an hour, without cramps. In ten minutes (while I was talking to his bereaved mother) I was quickly summoned by the nurse, who told me that my patient was not dead, as she had seen him move. On my return to his bed-side, I found him, as I had left him, without pulsation or respiration. In two or three minutes, however, I was almost as astonished as the nurse had been, at seeing the eyes of my dead patient open and move slowly in a downward direction. This was followed, a minute or two subsequently, by the movement of the right arm (previously lying by his side) across the chest. There was likewise a slight movement of his right leg. The motion of the eyes occurred but once; those of the limbs were repeated to a greater or less degree four or five times, and fully half an hour elapsed before hey entirely ceased. These motions were not by such fits and jerks, as are usually the result of spasmodic action."

Mr. Haden observes, in a letter which I have received from him:—" In one case only, on making an incision through the integuments previously to opening the body of a cholera patient two hours after death, did I observe a progressive wave-like movement of the fibres composing the pectoralis major of the left, then of those of that of the right side; and, after these had ceased, of the right platysma myoides, extending from below upwards. The *warmth* of the body, also, at this time, was *sensibly greater* than it had been *during life*, and than that of a cholera patient in the next room."

Looking to the most remarkable cases of these motions, where they exhibit great varieties and degrees of muscular action, often existing together, I cannot remember any observation, which I have made upon disea e or in course of experiment, which related to so singular a *series* of contractions; but *some* of the instances certainly reminded me, as to *form* of action, of what has been seen before, both in pathological and physiological investigation.

The way in which *portions* of the long muscles occasionally contract,—a way noticed by John Hunter and Professor Müller as inimitable by any effort of the will whatever,—is sometimes beheld in certain of these instances very much as it is seen in disease.

It is here unnecessary to go into this question at any length; but let the following passage, which occurs in the narration of a case of nervous disease, be read attentively:—" She began to perceive an actual vibration or starting up of *certain portions* of the flexor muscles of the fore-arm, and of the deltoid, on the left side; not so, however, as to move the arm or hand."* By omitting certain words, and altering the sentence slightly, an account might be given which would pass readily enough for *some* of those forms of post-mortem contraction which it has been my endeavour to describe. A fact was noticed here which, of course, could never be seen in any movements subsequent to life. The muscular vibrations were made to cease by the will acting on the parts they occupied,—acting with a stronger force than they, and putting on the stretch the quivering fibres.

I would now beg particular attention to a very interesting and valuable case, in which not only were muscular contractions of a spontaneous kind observed after death, but movements of a like appearance could be excited readily by mechanical stimulus of the irritable fibres. It was observed with great care by Mr. Helps, at St. Bartholomew's Hospital; and the notes of it were given by him to Mr. Paget, who has much obliged me by permitting their insertion amongst the illustrations of this essay.

" Patrick Ryan, æt. 29, admitted into the hospital August 23rd, 1849, half-past 12, A.M.

He was unable to give any account of himself, or even tell his name; and

* It was at the obliging suggestion of this gentleman that I made inquiry of Mr. Ward.

* On a Case of Nervous Affection, cured by Pressure of the Carotids; with some Physiological Remarks. By C. H. Parry, M.D., F.R.S. See Philosophical Transactions, 1811.

his wife left him immediately he was admitted into the hospital. After having a bath and a mustard poultice, which produced no reaction and afforded him no relief, he sank, living only one hour after admission. From subsequent inquiry it appears that he was attacked with cholera five hours before admission, having previously been perfectly well. He resided in Gray's Inn Lane, and was a particularly well developed muscular man. After he had ceased to breathe, the fingers continually twitched and trembled, and the muscles of the arm acted forcibly on even slight irritation. When the arm was straightened, and *the biceps struck with the side of the hand*, the fore-arm would be bent suddenly, the hand springing forcibly upwards, and a weal was left where the blow was struck, which subsided again in a few seconds. *Always on irritation*, and frequently without, the extensors and flexors would contract, extending the hand fully or doubling the fist; the fibres of the muscles were continually in rhythmical motion, so that when the fingers were pressed on the belly of the biceps a sensation as of the pulsation of an artery was plainly felt. The contraction of the biceps was so strong occasionally that its tendon would stand out from the bend of the elbow, almost permitting the finger to be passed behind it. The longer the muscles were allowed to remain without irritation the more powerfully did they contract when excited. The pectoralis major, biceps, and triceps muscles, acted most decidedly. In three-quarters of an hour after death the body was removed. Until that time there was no decrease of heat on the suface."

This striking example is so plainly detailed that it carries with it, for the most part, its own comment, and I will avoid diffuseness in the remarks that I shall venture to make. The points of interest in this short narrative are many; seldom, indeed, are so many to be found in so small a compass. The muscularity of the subject; the absence of the premonitory stage, as it is called, and which is wanting far more frequently than some authors and observers are ready to allow; the rapidity of the death; the extremely irritable state of the muscular fibres, as evidenced, to go no farther, by the continual quivering felt by the hand when laid upon the skin; the excitement of contraction by means of blows; the weal which followed them, and its quick vanishing; the form, strength, extent, and variety of the motions; the apparently increased renovation of irritability on the muscles being left untouched for a given period; and the allusion made to the state of the temperature, are all matters worthy more or less contemplation. The *sex* of the party seems to call for a passing notice. Females are, as would be anticipated on all sides, subject to these contractions as well as males. The very last case which occurred in the Westminster Hospital (the movements were very transient, and affected the lower extremities) was that of a woman in early pregnancy, who, for a short time before her attack, had slept in the same bed with a child that was dying of cholera; but, so far as my own inquiry goes,—which, I confess most readily, is far from complete,—males are the most subject to them, and especially if the more lasting and violent kinds be considered; or, to speak strictly, more instances have, up to this time, been observed in men.

The absence of the premonitory stage and the rapidity of the death are important in reference to what was seen after the cessation of the breathing; for, though swiftness of dissolution cannot be held, I think, to explain by itself post-mortem contractions, yet it may be regarded, if not altogether as *necessary* to, at least as a main auxiliary in, remotely causing their occurrence. But the *kind* of death, as well as its *suddenness*, must be well thought about. Asphyxiated persons come to an end more suddenly than the victims of cholera; the apoplectic die frequently far more swiftly; some perish from the heart's action failing, almost as quickly as the eye can wink; and yet no movements resembling these (I speak not merely of a few slight and transient quiverings, but of the more manifest and enduring actions) have, so far as my knowledge goes, been observed hitherto in such cases.

The persistent quivering of the muscular fibres, which was felt by Mr Helps on placing his hand upon the corpse, is perhaps most to be likened, in form of motion, to what occurs in the muscles of animals which have been destroyed by quick and profuse hæmor

rhage. I have often seen motions of this sort, but have never yet observed them with the attention they deserve.*

In animals which have been drowned, or destroyed by poison, or killed quickly by some means or other, quiverings of the muscles have been frequently seen. I have beheld them after destroying an animal *rapidly* by chloroform; and this circumstance must be viewed in connection with the indubitable fact that chloroform very much impairs the irritability of the muscular fibres.

Sir Benjamin Brodie observed "constant and powerful contraction of the muscles of the trunk and extremities, whilst experimenting with artificial respiration on decapitated animals;" he remarked also the most violent actions when experimenting similarly on an animal which he had poisoned with injection of tobacco. Inasmuch as artificial respiration was maintained in these cases, these motions occurred under different circumstances to those which happened where there is no breathing; but there were other motions, though not so forcible, which Sir Benjamin remarked in his latter case, "*half an hour*" *after artificial respiration was discontinued*," and which became by degrees less strong and frequent.† These, though there be points of difference even so far as mere form is concerned, when they are viewed in relation to those which follow cholera, are manifestly well worthy of observation, in reference to the whole question of post-mortem contraction; and in this light they were referred to by Dr. Sibson on the first part of this essay being read before the Westminster Medical Society; and Sir Benjamin Brodie has since had the goodness to refer me to them on my inquiring whether he had ever seen phenomena which touched in any way on the post-mortem contractions after death by cholera.

I have, whilst watching insects from which I had removed the head, noticed motions of the legs which lasted for a protracted time; but I have not seen the same contractions in the like insects on volition and consciousness being suspended by chloroform, and for the reason, as I suppose, that the motor force and muscular irritability are so extremely affected by this potent agent.

No doubt, all muscular actions which take place after the cessation of the respiration and circulation are of moment in regard to our difficult inquiry; but at present, after considering those with which I am conversant, the question is to me still most perplexing—*Why do such powerful and enduring contractions happen after death by cholera, and yet not happen in some other kinds of dissolution which are far more rapid; some of them being, indeed, quite sudden?*

It was this query which led me to use reserve when I spoke of the cause of them in the first part of this paper, and to avoid propounding an hypothesis which would be unable to bear scrutiny.

That the muscles maintain their irritability is clear from the facts; but the riddle is,—what causes its manifestation? If muscles acted from *mere* irritability, we should find surely muscles acting at times wherein we now see them in perfect rest. There is some stimulus or other, though we know it not, which irritates the muscles after death from cholera. Is it possible that changes in the blood go on, and stimulate their fibres, or the minute branches of the motor nerves which ramify therein? Further inquiry may one day solve what is complex now, by finding out circumstances necessary to an explanation; but "the problem is too difficult, while the data are so few and the unknown things so many."*

Still, admitting to the full the obscurity of the subject, it must be granted that many facts have been observed of no little interest, and that the minds of inquirers are, through reflection on them, likely to be made ready for profitable investigation. The facts are not altogether valueless because they cannot be satisfactorily explained. The mere knowledge of these marked and unusual manifestations of muscular irritability—these partial signs of remaining vitality in a body which, *practically*

* These movements certainly merit especial investigation in reference to our subject. This struck me long since; but I have to thank Dr. Babington and Mr. Paget for calling my attention to them.

† See the Croonian Lecture on some Physiological Researches respecting the Influence of the Brain on the Action of the Heart, and on the Generation of Animal Heat; and Experiments and Observations on the Different Modes in which Death is Produced by certain Vegetable Poisons; in the Philosophical Transactions for 1811.

* From a letter of Mr. Paget, Dec. 26, 1849.

speaking, is *truly dead*, is surely not to be despised as worthless. Had Nysten beheld them, they would doubtless have attracted the marked attention of this distinguished man.

And, though their cause be undiscovered, their course wayward, their form various, and their very event uncertain, there are *points* about them which are fairly comparable to those which we have learnt from other muscular phenomena; and there is no doubt but that a little inquiry would detect some further resemblance.

The observation of Mr. Helps, in the case he has described, that rest had the effect of renovating the irritability, becomes of interest when placed beside the fact, that a like circumstance is (as every one knows) commonly perceived by experimenters when galvanizing the muscles of the frog. They are exhausted by contraction, and draw energy from repose.

His remarks, moreover, on the mechanical irritation of the muscles, cannot be abruptly dismissed; and especially as they admit of being compared with those which Dr. Dowler made some time past, chiefly on bodies dead from yellow fever.

But apparently unexcited contractions must not be blended and compared with those obtained by Dr. Dowler's experiments, of which I propose to give a brief notice. They were performed by striking the muscle with the hand, a stick, &c., and illustrate a mode of proceeding which Dr. Dowler styles the method of "percussion," and which, in his opinion, is the only perfect method of artificially exciting muscular contraction.

The observations, some of which are of great interest, were made principally on subjects who died of yellow fever, which is said to present more frequent and enduring cases of contractility than other fevers.

The following observation was made, neither on any kind of fever, nor cholera. In the body of a German, who died after fracture of the leg, whereto gangrene succeeded, flexion was produced by a single blow.

In one case of yellow fever, contractions of the muscles were excited *fourteen* hours after death. Flexion, extension, and other movements of the limbs, were again and again excited by blows; so were knots in the muscles also.

Violent and repeated percussion entirely destroyed contractility.

The extinguishing of the irritability of one muscle did not (as might have been expected) affect that of another.

Irritability was renovated by rest, just as Mr. Helps found it to be, lately, after death by cholera.

Contractions were caused in limbs separated from the trunk by experiments, which, let me say, considering the phenomena otherwise elicited, do not appear to have been necessary to show that the contractions were independent of the nervous centres.

In many cases there was an *extraordinary elevation* of temperature, as ascertained by the thermometer*, but such great degree of heat, according to Dr. Dowler, has no necessary connection with facility of provoking the muscles to action.

Sometimes post-mortem rigidity supervened during the paroxysm of contraction; a result which reminded me of an observation of M. Sommer, who has said that tetanic cramp in the muscles of the jaw passed immediately into rigor mortis.

These and other observations resulted not from a few, but a great number of experiments. It is to be regretted that the kind of diseases after which some of them were made is not explicitly stated.

At page 33 of his researches, we find Dr. Dowler founding upon *two* cases the following question—*Does muscular contraction after death ever show itself unconnected with any appreciable cause or excitant?* And looking at the way in which the previous cases are introduced, being *apparently* related expressly for the purpose of illustrating the effects of percussion, and also considering the whole context, I rather think, although the author sometimes says "contractions took place," without specifying that they happened from irritation, that in all the cases mentioned by him, *except the two* just referred to, the movements were produced by mechanical force. They are classed with those which were so. But let the reader judge for himself. One of the two instances was contributed by cholera. A young lady died of this disease at Virginia, and

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* It is my intention to draw notice, in another communication, to the state of the temperature after death in cholera, and to refer in detail to the case that occurred at Bristol, which has been kindly communicated to me by Dr. Green.

about *three hours* after death there "was a brisk twitching of the fingers, somewhat like *subsultus tendinum*, being chiefly in the flexor muscles, which latter had suffered before death both from cramps and strong flexions."*

The experiments of Dr. Dowler should be viewed in their true light. *A muscle contracting of itself (apparently) is not surely like another which acts because we irritate it.* The results which he obtained are to be considered in relation to the proofs which Nysten obtained by means of galvanism, of the irritability of the muscles after death, and its varying degrees.†

The forces employed by the experimenters were different, but they both palpably excited the muscle to contraction. Dr. Dowler has shown that percussion can produce movements where they would not have occurred without this or some other stimulus. Mr. Helps proved that it will readily produce them where other movements are spontaneously taking place. I think it can scarcely be doubted that it would also, if trial had been made, have occasioned contraction in some of the dead from cholera, who, as it was, presented no signs of motion.

The muscles may be more irritable, and mechanical violence more powerful to stimulate, where post-mortem movements happen, than where they do not; but the question of irritability, and that of its unprovoked manifestation, must be kept apart. The researches of Nysten well proved its presence; but in cholera it is evidenced without a stimulus being applied of any kind.

The convulsions which we may excite by irritating the spinal marrow of a decapitated animal are not to be confounded with others which take place in the absence of all interference, and of which we know not the cause.

I wish not to give post-mortem contractions a new air of mystery: they are already sufficiently obscure, and need not unintelligible language.

They amaze us because they are strange, or because, perhaps, we have not yet sufficiently compared them with other forms of post-mortem contraction.

We must collect and compare phenomena; the endeavour to trace analogies is scarcely ever fruitless. Deaths by disease and poison are different things, but they have much in common; in common they are protracted or sudden, most seriously affect the blood and nervous system, and leave muscular contractility in states most opposite.

It is the state of the blood at the time of dissolution which, no doubt, accounts for many alterations in the condition of the muscles during and after dying; and this observation may be rested on the fact, that by varying in experiment forms of death, we may also change the measure of irritability which will remain afterwards.

Two things are principally to be considered in reference to post-mortem irritability,—*suddenness* of death, and the *condition of the circulation* at the time of dying.

The drowned person perishes more quickly than another destroyed by cholera; yet the corpse of the latter, though untouched, unstimulated, shall exhibit strong and remarkable contractions, whilst that of the former will manifest none at all.

In animals nearly drowned, and which recover eventually, Sir Benjamin Brodie remarks, that there "take place spasmodic contractions of the voluntary muscles, and these are the forerunners of complete resuscitation."* But before this happens, the blood has become more or less oxygenated by the respiratory efforts which precede these movements. They must, therefore, be distinguished from those which happen where there is no breathing. In death by convulsion I have never seen any spasmodic actions afterwards.

I have said that subsequent to asphyxia in animals, there are muscular quiverings seen, but in the instance in

* See Experimental Researches on the Post-mortem Contractility of the Muscles, with observations on the reflex theory. By Bennet Dowler, M.D. New York. 1846. See also a notice of this contribution in the British and Foreign Medical Review for 1847, and one of Mr. Paget's Reports on Physiology in the same work.

† See Recherches de Physiologie et de Chimie Pathologiques, pour faire suite à celles de Bichat sur la vie et la mort. Par P. H. Nysten. A Paris, 1811. The title of this work should be read together with the following passage, which occurs in the preface—"En annonçant les recherches que je publie aujourd'hui comme une suite à celles de ce physiologiste sur la vie et la mort, je n'ai pas la folle prétention de faire placer mon nom à côté du sien; je prévois trop les resultats fâcheux de la comparison de ses ouvrages avec les miens pour concevoir jamais la pensée de la provoquer." Such was the modesty of this observant philosopher! So tasteful was the tribute which he paid to genius!

* See Lectures illustrative of various subjects in Pathology and Surgery, p. 97.

which I have noted them, the fibres had been exposed to the air, which perhaps acted as a stimulus to some extent.

We must not be satisfied with proofs of post-mortem irritability remaining; we require observations on its *degrees;* and if we use galvanism in an *excessive* measure, in order to test it, we shall be able to arrive at no satisfactory results. In the dead as in the living, we must first resort to the lowest force which will produce contraction; proceeding on the principle which Dr. Marshall Hall has followed in his inquiry into the irritability of paralytic limbs. What is the condition of the muscular irritability in cases of unusually early decomposition, in such a case, for instance, as that recorded by Dr. Taylor, in a late number of the MEDICAL GAZETTE?

In animals that die suddenly from loss of blood, the muscular fibres are very irritable,—so they are in cholera; they contract of themselves,—so they do in cholera. There is, then, a certain degree of similarity between the cases. Probably so high an amount of irritability remains in cholera, partly from the circumstance that blood charged heavily with carbonic acid does not freely circulate through the muscular fibres in that disease. Still, *why* it should be evidenced in so explicit and singular a manner, the like whereof has not yet been noticed after any other *disease* in this country, remains in my mind a hard problem.

It would seem necessary to distinguish between those cases of post-mortem contraction in which the *muscular fibre is and is not exposed.*

Referring to what is already ascertained of the quiverings of the muscular fibre after death in the lower animals, I can hardly doubt that they would be seen *occasionally* in man himself, were post-examinations not deferred, and, as a general rule, very properly, until the time they are.

Perhaps slight movements would be discovered on uncovering the muscles which would otherwise be invisible; or perhaps the air would be found influential in exciting them.

I am not aware that any muscular oscillations or twitches were seen in the bodies of those who, after being hung for murder, used formerly to be given up for dissection. I opened the body of a man at Chelmsford, who was hung since the period I refer to, about an hour and a half after his death and did not observe any movement whatever of the muscular fibres.

Mr. Paget observes to me in a letter, speaking of a post-mortem inquiry, "the muscles twitched when cut or pricked three or four hours after death. I should think such an event very rarely happens," He adds—"in the body of one hanged the muscles did not show any irritability an hour after death."

It is quite clear, from the statement of this able and experienced pathologist, that observations showing post-mortem contractility as *self-manifested*, if I may use the expression, are much to be desired; and I have no doubt the reader will peruse with interest the following statement, which Mr. Haden has communicated to me:—"In 1839, at Grenoble, I once saw the same undulatory thrill* in the body of a French trooper, whose thumb I had amputated for a gun-shot injury, and who died of tetanus. On that occasion, the pectoral, abdominal, latissimus dorsi, platysma myoides, and all the flat superficial muscles, were affected."

There is nothing which shows better than chloroform the influence of certain conditions of the blood on the muscular fibre. I have seen the muscles twitch in a guinea-pig which I destroyed by means of it; and in this instance I also found the muscles were responsive to the influence of galvanism. But the animal was killed *very quickly*. and in testing the irritability I used too high a force. Dr. Tyler Smith, from some experiments upon the frog, which he has lately described, concluded that the irritability was extraordinarily impaired. Dr. Marshall Hall has come to a like inference. The other day I killed two frogs, one by chloroform, the other by decapitation: the galvanic force, which acted most readily upon the latter, did not influence the former in the least. In the course of last summer I found the irritability of the muscular fibre of the dragon-fly much impaired by this agent.

Nysten has pointed out not only the various effects of unlike gases upon the muscular fibre, but the difference between the results derived thereto from *slow* and *gradual* asphyxia.

In some kinds of asphyxia the death is so *rapid* that the irritability of the

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Alluding to remarks on cholera.

muscular fibre is not nearly destroyed, although it be always, most likely, impaired somewhat; were the process *slower*, the muscular tissue would, there is every reason to believe, be more affected, and its function more impaired. But the whole inquiry needs a closer and wider investigation.

Had not the cholera taken its departure, for which, in common with every one, I feel most thankful, I would, had health been spared me, have made, by means of galvanism, some few simple observations on the muscles after death. May the opportunity return not! "Let me be sick myself," says Sir Thomas Browne, "if sometimes the malady of my patient be not a disease unto me;"* and surely it was enough to discomfort any one to see person after person brought into a hospital only to die,—to see death baffling physic every where. Much, too much, that was published in 1849 was, in plain truth, but a melancholy echo of the "Cholera Gazette" of 1832, and the "Madras Reports" of an earlier period. There was the same narrative of fearful symptoms, the same catalogue of supposed "remedies," the same record of a tremendous mortality. To one thing only can we revert with pleasure,—I mean the conduct of so many in the profession during the raging of the epidemic, and that of those especially who devoted themselves exclusively to the suffers from it. Not theirs it was to fly infected places, and exchange a monotonous scene of desolation for one of bright variety and joy; but theirs, amidst a poisonous atmosphere, and sometimes with their own strength failing, to abide with constancy by the stricken and the dying: and, when powerless as physicians, still to act as men.

Westminster Hospital,
Jan. 18th, 1850.