lymph on the outer surface of the sclerotic beneath the insertion of the oblique muscles, which rendered excision somewhat tedious. Six hours later the contents of the globe formed a smeary chocolate-coloured mass, none of the tubes being recognisable.

In the globe which had been removed for some congenital defect, and pain, etc., by which it compromised the good eye, an irregular shaped dead white mass (the lens) had been visible through the cornea and the dilated pupil, suspended in the transparent ciliary pigment. On opening the globe a fibrous cord was found attached (on the surface of the retina) to the portion round the yellow spot and entrance of the optic nerve, and thence stretching through the vitreous humour, was inserted into the hyaloid fossa, to the anterior surface of which the dead white shrivelled lens was firmly adherent; so that, on dragging it with a needle, the retina was detached to the extent of the insertion of the fibrous cord. The latter enclosed numerous blood-vessels, most of which branched backwards before reaching the hyaloid, and formed the central point of insertion for the transparent strings, which originated from the inner surface of the hyaloid membrane, and by their number appeared to cause the consistence of the vitreous humour.

Total of major operations, 71.

Original Communications.

THE NATURE AND CAUSE OF THE PAIN OF PLEURISY AND PERITONITIS.

By THOMAS INMAN, M.D. Lond., Physician to the Northern Hospital, Liverpool.

It is well, every now and then, as we go forward in the career of medical science, to ascertain whether our progress is as real as it seems.

Captain Parry, in his celebrated attempt to reach the North Pole by travelling over the ice, found himself at last in a position when he was constantly toiling onwards, and yet making no advance; for the ice on which he walked was moving towards the south at the same speed as he was going to the north. Medical practitioners resemble him in many respects, in their efforts to reach medical truth. As long as their view is limited, they seem to be making way; but as soon as they take an observation and consult the stars, they see that they have been almost standing still. We ought, therefore, from time to time, to do as he did, and take some bearings by which we can judge of our real progress. This can only be done by endeavouring to ascertain whether the ground we stand upon is really a *terra firma* or a moving bog. For a hundred years, the theories of the "weapon salve" and of "phlogiston" reigned; and men thought they were progressing in knowledge, the better they were able to apply the one and demonstrate the qualities of the other. But no real progress was made in the route followed, for the "weapon salve" was a cheat, and "phlogiston" a fallacy. At last, some self-reliant spirit boldly became a heretic; he became the pioneer of a new track, and that track led him nearer to truth than he was before. Now, what man has done man may do again; and it is as legitimate in us to exercise our reason against what to us appear to be false doctrines, as it was in our forefathers to exercise theirs.

In a previous number of the BRITISH MEDICAL JOURNAL (January 9th, 1858), I ventured to attack the commonly received dogmas respecting those pains to which the generic word "hysteria" had been applied. I now venture to attack another dogma of equally general interest; namely, that inflammations of serous membranes are more painful than inflammations occurring elsewhere. On the previous occasion, I attempted to show that the so-called "hysterical pains" had a purely muscular origin, and might be, under certain circumstances, as distinct in the male as in the female—that they were analogous to those sensations we experience in our own persons after excessive or unusual bodily exertion.

I have also attempted, in a larger work (*Spinal Irritation Explained*), to show that all the voluntary muscles of the body are subject to painful affections of greater or less severity and duration. I propose now to examine whether there are not some other morbid phenomena—the pleuritic stitch, for example—which have hitherto baffled the mental ingenuity of authors, that may be traced distinctly to a similar source.

If we investigate the phenomena of pleurisy, with especial reference to the symptom of *pain*, we are first struck with the undeniable fact that *post mortem* examinations prove the existence of a vast number of pleurisies that have never been suspected during life. We may see before our eyes adhesions of great or small extent; we may even have circumscribed abscess, or complete filling up of the cavity of the pleura with lymph and serum, and the mediastinum pushed over to the other side; or we may see false membranes, as thick as sole leather, covering both the lung and ribs; and even, in some rare instances, a bony concretion of great size enveloped in old adhesions: and yet, to our certain knowledge, the individuals in whom these appearances were found, never had such signs of pleurisy as to call their attention to it; they never had pain in the side, etc. We know, moreover, that amongst the living, there are many cases in which some amount of hurried respiration has been the sole physiological sign of pleurisy, and in which no proof of its presence would exist were it not for those physical signs generally considered as characteristic.

A more extended inquiry supplies us with the equally significant fact, that pericarditis will, like pleurisy, exist without the patient being conscious of any local pain.

We conclude, from these considerations, that the pain of pleurisy does not arise simply because there is inflammation of a serous membrane; that it is not purely due to inflammation, but depends upon something superadded to it. A rapid *coup d'œil* over the phenomena of inflammation elsewhere, proves that the process may go on from the beginning to the end, without any suffering being complained of. We are entitled to assume, therefore, that if pain does exist in cases of inflammation of the pleura, it must depend upon some cause which is not generally in operation in inflammations elsewhere, as of the pericardium, lungs, and liver. The dogma, that inflammation in serous membranes is more painful than in other parts, simply because they are serous, is one which has long occupied the schools, just as the dogma, that "Nature abhorred a vacuum," held them in days gone by; but as the latter, when tested by rigid experience, was found wanting, so the former, when tested by close observation, will also be found to be untenable.

After discarding our old guide, on suspicion of having led us falsely, it becomes necessary for us to find the track to truth ourselves from such landmarks as our observation leads us to recognise. How shall we pursue the route?

I propose to consider—

1. The circumstances under which the pain is complained of, when genuine pleurisy actually is present.
2. Whether similar pains come on under other circumstances, when no pleurisy is present.
3. The means Nature or the patient adopts to relieve the severity of the suffering, when it is present.
4. The means most successful in the hands of the medical practitioner.
5. The deductions necessarily drawn from the foregoing considerations.

1. Whether we refer to printed books, or to the broader page of hospital and other experience, we find that wherever the pain is situated, it is always increased, and sometimes only noticed when the patient takes a deep inspiration, coughs, sneezes, talks much, or moves the body in any way requiring fixation of the chest. Where the suffering is severe, even ordinary respiration is painful, and is effected chiefly by the diaphragm. While the patient is at perfect rest, the pain is commonly absent. It is increased or produced by percussion, especially in the intercostal spaces, the pain, then, being commonly acute and stabbing, and compelling the patient to wince or contract the thorax on that side: broad and steady pressure is borne, and invariably gives relief. The pain complained of is not confined to the thorax; we have it occasionally "in the right hypochondrium, and extending even as far as the flank".

Again, we have pleurisy without any pain at all; and those cases are almost always, if not invariably, unattended with much cough.

It is well known, too, that after pleurisy has gone on once to effusion, and the effusion is sufficiently extensive to reduce the lung to a minimum, without at the same time distending the chest to a maximum, pain is commonly absent, though it may still be produced by direct percussion, or by any motion implying action of the intercostal muscles. If the observation ended here, it would be of little significance; but when we find that the patient has absolutely a return of pain after the effused fluid has been so far absorbed that the lung is again in contact with the ribs (a tolerably good proof that the inflam-

mation is at an end), it is clear that some other causation besides the inflammation must be sought.

A moment's reflection serves to tell us that, when the thorax is nearly full of fluid, the intercostals do not act, except in coughing, sneezing, and turning the body; but that whenever the lung becomes once more permeable to air, as is evidenced by its rising to its natural condition, there is *as full and frequent respiration as in health*. There is then reason to believe that the pain recurs, not because there is renewed inflammation or even contact between inflamed surfaces, *but because the motions of the thorax, for a time suspended, are again performed*; and we may add, that this secondary pain will often continue, in weakly or delicate subjects, after all signs of genuine pleurisy have passed away.

2. We have pains similar to those of pleurisy from fracture or other injury to the ribs or intercostals; from herpes zoster; in that complaint to which the learned name of pleurodynia has been given; and in cases of parietal abscess. So similar are the pains in the side after any blow, fall, or other violence, has been inflicted, to those arising in genuine pleurisy, that the surgeon has always his attention on the *qui vive* to detect as early as possible the first physical sign of that complaint; but he generally seeks in vain. He is aware that the pain is aggravated by motion, coughing, sneezing, and the effort of defecation, or turning round. He knows that, when the patient is at rest, he is free from suffering; and in his own mind the idea of *motion* in that side of the thorax is inseparably connected with the causation of pain.

When we turn to a description of pleurodyne or stitch in the side, we find it so closely resembling in its character the pain of pleurisy, that we have authorities like Cruveilhier and Watson enunciating the opinion, "that pleurodyne (in many cases, at least) is nothing else than adhesive pleurisy." But, at the same time, we find that, as a general rule, there is nothing in common between pleurodynia and pleurisy, beyond the pain. Now we find pleurodyne common both in children and delicate adults after any exercise which has brought into excessive operation the intercostal and other muscles concerned in extraordinary respiration. It is common in phthisical patients who have excessive cough; it is common in bronchitis, pneumonia, catarrh, or in other cases where cough is frequent and the bodily frame enfeebled. I have, in the book before alluded to, given cases where pleurodyne has proceeded from prolonged sitting, whether on a sofa or in a railway carriage. I could multiply instances now in which it has been produced by even a smaller amount of fatigue. It is unnecessary here to repeat what I have there stated, beyond that it is evident that pleurodyne is nothing more than painful spasmodic contraction of the intercostal and other muscles concerned in respiration.

The next point in connexion with this same subject is, that very severe pleuritic pains precede and follow the occurrence of herpes zoster for a considerable period.

Now, herpes zoster bears the same relation to the intercostal muscles as does inflammation of the pleura. The latter is disease in close contiguity with their *inner* surfaces, and the former with their *outer* surface; and, if pleurisy and herpes are attended with the same style of pleurodyne, we must naturally infer that they both operate in a similar way. But herpes is not inflammation of a serous membrane. We may infer, therefore, that the pleuritic pains accompanying pleurisy are no more due to its being inflammation of a serous membrane, than those of herpes are due to the skin being analogous to a mucous membrane.

Again, the pain of herpes zoster is, like that of pleurisy, independent of the actual presence of inflammation. It exists long after the cutaneous eruption has ceased, and it is always aggravated by the very same motions that increase the stitch-like suffering complained of in pleurisy.

However, then, we choose to explain it, it is clear that there is something in common between the two affections.

The parallel may be extended to a much greater extent than we are justified in attempting here; but we may state generally, that the continuance of the pain both of pleurisy and of herpes depends upon the original vital or constitutional powers of the individual, the extent to which the intercostal and other thoracic muscles are used or implicated in the disease, and the severity of the depleting or otherwise lowering style of treatment which has been adopted. The greater the debility of the patient, and the greater the demand upon his respiratory muscles, the greater and more prolonged will be the pain both in one case and the other. When we consider that both the diseases under notice are attended with very marked debility, we can readily understand the long continuance of the local

suffering, or, as we should read it, of the painful local muscular excitability.

The views here set forth receive remarkable corroboration by the phenomena presented by those rare cases where abscesses form between the muscles of the back, abdomen, or side. I have had three patients under my care at different times, in one of whom there was excessive pain in the loin on one side, continuing incessantly for weeks, and at last ending suddenly with a copious discharge of purulent urine. In another, the pain was referred to the upper origin of the external oblique, and was so severe as materially to interfere with respiration. Pleurisy was naturally suspected, but no distinct proof of its presence could ever be found. The diagnosis was very obscure until fluctuation could be felt externally, and it was clear that an abscess had been forming in the parietes of the chest. The third case was still more puzzling, for the suffering was all referred to the lower margin of the ribs on the right side, where either the pleura, liver, and peritoneum, any or all, might have been diseased. The pain was very severe; there was great tenderness on pressure, excessive agony from coughing, sneezing, defecation, etc. No diagnosis was formed beyond the negative one—of what the complaint was not. In the end, it proved to be an abscess situated between the external and internal oblique.

There was no pretence, in any one of these instances, that there was inflammation of any serous membrane; and yet the pain in the two last individuals equalled, if it did not exceed, the sufferings met with in the worst cases of pleurisy. The muscles, however, were clearly implicated; they were possibly inflamed, and really in a state of excessive excitability, contracting into cramp or spasm at the smallest motion.

3. The very close resemblance between pleurisy, pleurodyne, and the pains resulting from some mechanical injury to the side, being once established, and the idea started that the suffering is in some way connected with the apparatus of motion, we pursue our inquiry into the methods adopted by nature to relieve the pain when present, or to prevent its occurrence when absent. We may shortly sum these up by saying that they all go upon the principle of keeping the side perfectly quiet. The patient will not use the intercostals of the affected side; he carefully avoids long sentences in conversation, long drawn sighs, deep inspirations, coughing, sneezing, laughing, and vomiting. If perforce he must move or must cough, he tries if possible to fix the chest by steady pressure of the hand. He attempts to control the natural propensity to defecate; he avoids any effort to empty the bladder, except by the vesical contraction alone. He curtails his conversation, remains rigidly on his back, or whatever other position he first assumed. In fine, he feels that quietness is for him synonymous with comfort.

The current of observation therefore still setting strongly towards the muscles as the chief seat of pain, we pursue the inquiry still farther, and consider the next point.

4. The means the medical practitioner adopts to relieve the pain when present, may be shortly summed up. They are directed to prevent motion and to reduce the excitability of the muscular system. The surgeon, when he has to treat an injury to the side, whether pleurodyne is present or not, applies his strapping, rollers, or dextrine bandage; if cough is present, he tries to check it by opium, *not because the cough will produce inflammation of a serous membrane*, but because it provokes a set of muscles rendered excessively irritable from injury, etc. He orders rest from a similar consideration; and I can remember more cases than one in which these means have partially failed from no other reason than because the strapping has not been sufficiently substantial. The patient has been better when first the plaister was applied; but has relapsed as it became creased and supple. The application of three layers of emplastrum resine has succeeded completely, where a single one has signally failed.

The physician has hitherto not learned his lesson so perfectly as the surgeon; he has had no definite principle to guide him; and has, consequently, only accidentally got hold of a valuable remedy. He has sometimes bled his patients until they have been too weak to breathe with anything but the diaphragm—too feeble to cough, to sneeze, or to move. He has administered antimony, which has relaxed their muscles (as does a pipe of tobacco in a young smoker), until they have been too enervated to act at all. He has blistered the skin till it has been too sore for the patient to stir it. He has varnished the cuticle so completely that the patient has found motion almost impossible. He has put on large heavy linseed-meal poultices, which have comforted the muscles, at the same

time that they have rendered motion at least inconvenient. He has administered opium with signal relief. He has done his best to allay cough, sneezing, and vomiting. He has, in fine, recognised the importance of preventing motion; and yet throughout all this he has continued to attribute the pain to the simple fact that there is inflammation of a serous organ!

But the very same remedies are recommended for simple pleurodyny, with the exception of venesection, antimony, and other powerful depressants. We conclude, therefore, from a consideration of his methods of treatment, that the physician does, in his own mind, make a distinction between the symptoms purely due to inflammation and those others that may be considered "episodical"; that when the inflammatory symptoms, as evinced by the physical signs, predominate, he attacks them alone; and that where much pain is superadded, he enlarges his battery, and possibly varies the nature and calibre of his guns.

5. The foregoing considerations lead us to doubt more strongly than ever whether the pain of pleurisy is due in any way to the simple fact that the pleura is a serous membrane.

My personal experience has furnished me with cases in which there has been inflammation of the arachnoid so severe, that the membrane has been found universally coated with pus as thick as clotted cream, but where no pain whatever had been complained of during life—where the pericardium has been densely covered throughout its whole extent without the patient having the smallest idea of suffering, although the muscular structure of the heart has been affected, and its rhythmical action altered—where the patient has had peritonitis to an extreme degree, with an equal freedom from pain—where the tunica vaginalis testis has been extensively inflamed without the individual experiencing anything beyond a sensation of weight or of faint heat. Other allied membranes, such as the synovial and the bursal, may be largely inflamed and secrete large quantities of pus, without any perceptible suffering to the patient.

As, then, we give up the serous idea, we adopt another, and, as regards the particular symptom under consideration, enunciate that the pain is *due entirely to the muscular apparatus in the vicinity of the inflamed part*. Ere, however, we venture to repose ourselves in this belief, we must inquire whether it is possible or likely that the muscular system can be the seat of such severe pain as is felt in pleurisy. In the book I have already referred to (page 50), I have given an account of a case in which, from simple indulgence in immoderate laughter, more intense pain was produced than I had ever seen in pleurisy; and I have given many others of a similar kind, showing that an immense amount of pain may be felt in other parts, where it can be traced solely and unmistakably to the muscular system. The experience of others will amply confirm this statement; the occasional intensity of muscular pains being thoroughly known to every observant physician.

The muscular origin of the pain in pleurisy being conceded, if only for the sake of argument, we must next proceed to inquire *how* it is that the same class of pains may occur from injury to, or inflammation of, the pleura—from herpes zoster, or from simple debility or over exhaustion.

We have shown elsewhere, that whenever the muscular system is weakened from any cause, it becomes much more excitable than in health; that it is sooner thrown into spasmodic action, the cramp being invariably attended with pain—a pain which seems to be in direct proportion to the weakness of the sufferer. Thus a weak growing lad suffers more with stitch in the side from running and breathing rapidly than a strong one. The abdominal or other cramps so common in delicate women are productive of a comparatively greater amount of pain than similar cramps occurring in the strong—a thing very rare until the muscle affected has been thoroughly wearied. But the excitability of any organ may be exalted from other causes than simple debility; and amongst those causes may be reckoned inflammation. We know, from the experience of abscesses and other complaints occasionally met with in or near muscular structures, that when the latter are affected they are not only peculiarly excitable, but that their contractions are unusually painful. A similar remark applies to direct injuries; for example, every one is familiar with the painfully spasmodic attacks to which the stump of an amputated limb is subject for many hours after the operation; with the horrible twitches in the calf of the leg which accompany gout, or follow after a sprain of the ankle. We know how an abscess in the neck may produce a more or less persistent and painful contraction of the sterno-mastoid or other muscles; how a diseased bone may produce a stiff joint from throwing

one set of muscles into a continuous cramp. We know that any abnormal condition of an organ shows itself in perverted function; and as contractility is the function of muscle, we ought to be prepared for some alteration in that function whenever the muscle has been in any way impaired. That alteration is occasionally shown in a total suspension of contractility, as in paralysis; but it is much more frequently shown in diminished contractile force, with increased inclination to contraction and propensity to cramp. Impairment of function being produced equally by inflammation, injury, or great debility, we can well understand how "stitch" in the side may be the result of any one of them. But it has been observed that pleurisy, etc., may be present *without the existence of pain*. What is this, but the expression of the fact that we may have pure inflammation of the pleura without its being extended to the intercostal or other muscles concerned in respiration, just as we may have an inflammation of the urethra without its extending to the corpus spongiosum, or of the conjunctiva without its extending to the sclerotic?

When the muscles are not so inflamed they perform their duty without suffering the pain of cramp; when they are, they can only do the smallest amount of work without being thrown into distressing spasm. This being so, we can readily understand how it is that coughing, sneezing, or any other motion shall produce or aggravate the pain, and how any plan for keeping the thorax at rest shall relieve it.

Of course, if this explanation be true, we shall find that it is equally applicable to inflammation of the peritoneum; whether it covers the diaphragm, or lines the abdominal walls. Practically it is so. I have myself met with cases where muscular pain, closely resembling pleurodyny in everything but its name and locality, has been mistaken and treated for peritonitis. In pure peritonitis I have seen the muscles in a permanently cramped condition, and every movement accompanied with intense suffering. I have seen even more severe pain from a permanently cramped condition of the abdominal walls than in the worst forms of inflammation. I have also seen very severe and fatal peritonitis, arising from perforation of the bowel, accompanied by so little pain, that the patient declared she had none to speak of.

The importance of these observations may be made more apparent if we pursue closely the history of the pain in acute peritonitis. Turning to my note-book at random, I extract a case occurring fourteen years ago, and of course reported without any reference to my present views.

CASE. George R., aged 27, had Bright's disease, and amongst other symptoms great debility, intermitting pulse, a good deal of tympanites, but no particular tenderness on pressure over the abdomen. A day or two afterwards he had constant hiccup and vomiting, and now there was tenderness over the abdomen, and especially over the region of the liver. He died next day; and on examination very extensive peritonitis was found, the lymph glueing the intestines together.

What have we here? First, peritonitis, with little pain; secondly, extension of inflammation to muscular tissue of the diaphragm, producing perverted function, frequent cramp (*i.e.*, hiccup); extension of inflammation to the stomach, producing vomiting, this producing excessive action in the abdominal walls, and that action producing pain and tenderness.

Now, it is well known that pain closely resembling that of pleurisy attends bronchitis, phthisis, pneumonia, and even ordinary catarrh; it ought to be equally well known that pain resembling peritonitis frequently follows the efforts of parturition, the efforts of excessive vomiting, of excessive straining at stool, or of any other excessive action of the abdominal walls.

This being so, ought we not habitually, both in our diagnosis and treatment, to take into consideration the possibility of the pain in certain complaints being of a muscular origin? These painful affections of the muscular system are of much more constant occurrence than is generally supposed; they most materially complicate a diagnosis; they open a new phase in pathology, as well as a new page in nosological arrangement; and the suffering from them is so severe, that they demand the best attention we can pay them.

I have already entered so fully into the treatment of muscular pains in the book I have before alluded to, that I need not reiterate it here, further than to say that no plan of practice is likely to be successful which does not enforce judicious and necessary rest, and employ such contrivances as are available for relieving excessive excitability when present. To effect the latter purpose, morphia internally and externally is of the greatest value.