PRACTICAL

OBSERVATIONS,

&c &c.

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ON

Distortions of the Spine, Chest, and Limbs;

TOGETHER WITH

REMARKS ON PARALYTIC

AND

OTHER DISEASES CONNECTED WITH IMPAIRED OR DEFECTIVE MOTION.

BY

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Gutta cavat lapidem non vi sed sæpe cadendo.

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CONTENTS.

PREFACE.

Among nations not improved by the arts of civilization, the exemption from disease which they enjoy, compared with those who have advanced higher in the scale of refinement, appears, independently of other causes, to be in no small degree attributable to the bodily labour imposed on them by their natural habits of life; and its importance in the preservation of health has been a matter of observation from the earliest periods. Notwithstanding this assent to its general utility, the application of this power for the recovery of natural, or the removal of the disordered function of particular parts of the body, seems to have

been little attended to. To supply, in some degree, this deficiency, by combining theoretical views with practical results, is the object of the present attempt.

Ten years have now elapsed since the author's attention was directed to the disorders which form the subject of the following work, by two cases of paralytic affection in which he was led to adopt the particular method of treatment recommended, in consequence of the ordinary methods of cure proving ineffectual. The principles upon which the treatment was conducted, appeared to him to be new, or at all events not to have been acted upon by medical practitioners. A conviction of its utility subsequently, founded on the beneficial result of cases of a similar description, has induced him to lay them before the public, more particularly as he has ob-

served many injuries from accidents as well as from other causes, in which, from inattention to some practical points not generally adverted to, he has had occasion to witness the want of success, even in the hands of judicious and able practitioners. It is to be lamented, that the treatment of some of the diseases which are here noticed, has too often been confined to empirics, who, without being aware of the real nature of the disorders they have attempted to treat, have endeavoured to remedy what is very often the effect of muscular debility by mechanical contrivances, which, instead of alleviating, tend to perpetuate the complaints which they were designed to remove. The treatment of the diseases of the joints may be selected as shewing the mischief likely to result from the misapplication of such means. It is sometimes difficult for the surgeon, aided

by correct anatomical and pathological knowledge, to decide whether the morbid alteration has taken place to such an extent as to occasion the absorption of the cartilages and the formation of anchylosis, and in distortions of the spine of long continuance, whether they have been preceded by caries or not. If, under such circumstances, without discriminating between the different states of disease, an attempt should be made to cure the disorder by frictions or mechanical force, in some individuals of irritable habits, or in certain states of the constitution, even the life of the patient might be put to great hazard.

It will be seen in the view taken of that state of disease which has been termed *Anchylose fausse*, by Petit, as well as in those of contractions from chronic rheumatism, gout, &c. that in cases of long

standing, although the original disorder may have subsided, another is frequently superadded to it, arising from the loss of muscular substance and of strength, consequent upon the state of inaction in which the limb has been kept. An attention to the causes which have given rise to this state of debility may prevent the useless if not injurious application of remedial measures, such as frictions, &c. to the joints, which if employed exclusivly over the muscles, might be attended with advantage.

It is proper to state, that the treatment here recommended for the cure of incurvation of the spine, was first suggested to him by the perusal of a treatise on muscular motion*, the principles upon which it should be founded have also been lately laid down by Mr. Wilson †. The particular mode advised by him, however, on the

* Pugh on Muscular Motion, 1794.

† Lectures on Diseases of the Bones, p. 181.

authority of Mr. Grant of Bath, of carrying a weight on the head, appears to be better adapted to the slighter cases of curvature, whether anterior or lateral, than to those of either great extent or long duration, and may be resorted to as an auxiliary measure when the spine has nearly recovered its original shape, and to establish a permanent cure.

He is inclined to think that many cases, of incipient consumption may be connected with that deformity of the chest of children commonly called chicken breast; he is aware that even where the alteration in shape is not very considerable, it is frequently productive of great distress at an after period of life; and he is induced to believe that the treatment here proposed may be found also useful towards the removal of predisposition to this complaint, as he has found by observation, that the

increased velocity of the circulation diminishes in an exact ratio with the improved circumference of the thorax; and to those families whose members have suffered by that malady, it would be of importance to ascertain whether increased exercise of the trunk and upper limbs, conjoined with a proper attention to diet and other juvantia et lædentia of that complaint, would not be useful as a means of preventing the accession of the disease, or of checking its progress, as he is convinced, however opposed by general opinion, that its frequency in this island, especially amongst females, is not so much attributable to the variations of atmospherical temperature, or even to diet, as that life of inaction, particularly with reference to the exercise of the upper parts of the body, consequent upon wealth and refinement*.

* Sydenham notices the advantages of horse exercise in this disorder. See also Fuller's Medicina Gymnastica.

The history and treatment of paralysis and of chorea, as far as belongs to the province of surgery, has been rendered as concise as was consistent with a proper elucidation of the views which he has formed of those disorders. To medical writers he must refer for fuller information with respect to points of general treatment. It is not unlikely that in the cases related, he may have been indebted to the protracted state of the complaint for the relief which the means employed have enabled him to afford, as it is probable, that time may effect a restoration of the nervous functions, although the muscles, by the deprivation of nervous excitement and consequent inactivity, may have lost their bulk and strength. Thus, the original disease being removed, another cause arises which equally prevents a free restoration of the muscular powers, in this respect bearing some

analogy to the wasting of muscular substance after long continued disease of the joints.

If, by this endeavour to establish the treatment of these different diseases upon more correct principles of pathology, he should be the means of directing the attention of the profession to these subjects, and, though at the risk of opposing the prevalent doctrines as to the causes of consumption, be instrumental in effecting a change in the present injudicious mode of bringing up females, with respect to exercise, and thus lessening the number afflicted with that disease, his time will not have been misapplied.

OBSERVATIONS,

&c. &c.

CHAPTER I.

OF THE INFLUENCE OF MUSCULAR EXERCISE ON THE BODY.

Among the more perfect classes of animals, those parts by which their locomotion is performed, and the principal functions of life are carried on, constitute by far the largest portion of the animal machine, and are termed the muscles. In what the property of contraction and relaxation in the muscular parts consists, or in other words, what is the cause of muscular motion, has been long a subject of unsuccessful enquiry among physiologists, and like that of the connection of the brain with the operations of the mind, and an infinite number of other phenomena in the universe of which we are content with the simply observing, without enquiry into their cause, must, I fear, be left as a

matter beyond the reach of the human understanding. Without entering therefore into any general physiological views respecting the nature or functions of muscles, I shall confine myself to those only which are connected with the diminution or increase of power and bulk of the muscular parts, as points which have a practical application to the subject of my present enquiry, and appear to me to have been hitherto much overlooked as the causes of various important diseases associated with lameness and deformity of the human body.

All the functions of the animal body, as well as the power of locomotion, being dependant on the muscular part of the frame, this peculiar structure is necessarily coeval with the first formation of the embryo, and its action in the motion of the heart marks the first dawn of life in the newly created being. This moving principle which distinguishes the muscular parts from all others, is observable also in the action of those of the voluntary kind, as those of the limbs, even while the fœtus remains in utero, the perception of it being what is termed in common language, the quickening of the infant. The functions of the muscles therefore, like those of many other

organic parts of the frame, do not lie dormant even in the infantile state, but are exercised as it were with a view of better fulfilling those purposes of life for which they are afterwards designed.

When the muscles, especially those of the voluntary kind, are examined in the fœtal state, their bulk is small in comparison with many other structures of the body, as that more particularly of the adipose membrane, the fibres or packets of which they are composed, are at this period pallid and soft, but as the animal advances in growth, they become gradually of a deeper and more florid colour, as well as firmer in their texture. This change in the colour, and firmness of the muscular fibre, as well as the bulk and intensity of power in the muscles, appears to depend on their acquiring greater vascularity, and the latter on the degree in which the muscular functions are performed, or in other words, on the frequency and extent with which they are called into action, whether spontaneously or at the will of the mind.

It is observed * that when pugilists, during a course of training as it is called, have acquired their full strength, the hands, when placed between

* Sir J. Sinclair on Health and Longevity, vol. ii, p 112.

the eye and a candle, have a more florid and transparent appearance than under ordinary circumstances. A similar remark may also be made on the game cock, in which the bright red colour that the comb acquires in consequence of an increased circulation of blood in the part, is regarded as an indication of the muscular powers of the animal being in their fullest vigour. In these instances, the intensity of muscular power is produced by a free circulation of blood through the part, and by the changes which the blood undergoes in the respiratory organs. On the other hand, a negative proof of the importance of a large supply of blood towards the support of muscular strength is afforded, after an operation for popliteal aneurism, where the debility which ensues is evidently a consequence of the defective supply of blood in the limb. A change in the bulk and colour of the muscles is likewise observable in a remarkable degree in persons who have died of dropsy, or any other disease in which the powers of the body have been greatly weakened.

All the vital, as well as animal functions of the living body, have a dependence on each other; those of respiration, circulation, and digestion, as

well as of muscular action, are so intimately connected, that whatever injures the one, in some degree affects the other, and any imperfection in the performance of one of these processes, is followed by a corresponding defect in the rest. This reciprocal dependance of the several organs of the body upon each other, is particularly remarkable in animals that remain in a torpid state during winter, in which the power of digestion, the slowness of respiration and circulation, and the inactivity of the body, keep pace with each other. Of the dependence of the muscles on the state of the respiration and circulation, many proofs may be adduced both from the comparative vigour they are found to possess in different classes of animals, and from the changes produced on them in health and disease. In birds that are long on the wing, as those of prey, the aircells of the lungs communicate with the cellular texture in the bones, and the flesh is of a deep florid colour; the greater capacity of the chest, and consequently the circulation of a larger mass of blood through the lungs, constitutes a distinguishing mark of the greater strength and firmness of the muscles of the male over that of the female in most animals. In persons employed in laborious exercises, and in wild animals,

the muscles possess greater vigour, and are of a deeper colour than in those who lead a sedentary life, or in animals that are domesticated. This increased vascularity and strength are found to result from the agency of several causes.

The degree, or increase of power and bulk of the muscular parts, is not only dependant on their relation with the state of the organs of respiration and circulation, but the extent and frequency of exercise to which the muscle itself is subjected. The effects of exercise, in this respect, on the body are so obvious as scarcely to need a recital; it will be sufficient therefore to point them out, only in a few instances. In those individuals whose condition in life exempts them from labour, the muscles of the arm, for example, are rarely called into action, or exerted with much force or frequency, in other words, the nervous influence is directed seldom and with little intensity to those muscles, and in consequence of a deficient supply of blood in them, they are diminutive in size. In the man employed in hard labour, as the waterman, on the contrary, who is constantly exercising the act of volition over the muscles, and urging them to frequent and energetic exertion, the circulation is more active, a larger quantity of blood is sent

through them, and an accretion of muscular fibre, of weight, and strength, is the consequence. That muscular power corresponds to muscular size, is well known to those who frequent pugilistic or other athletic contests, where, although the spirit of the combatants may be equal, a superiority of weight is (*cæteris paribus*) always decisive of the preference. That the increased developement of power in the muscles is proportionate to the degree of exercise imposed on them, is shewn by facts which are within the most common observation ; thus the muscles of the arms of watermen particularly, compared with those of the legs, are considerably larger. In the persons of dancers, the muscles which move the lower limbs greatly exceed those of the upper extremities. In those who have undergone amputation of one of the limbs it is commonly found that the other, from the additional exercise imposed on it, becomes comparatively larger and more powerful.

The same thing takes place in the involuntary and voluntary muscles, in consequence of disease, as we frequently find in cases of enlargement of the muscular structure of the heart from the ossification of its valves, and in the thickening of the muscular coats of the bladder from obstructions

in the urethra. * It is the well directed use of muscular exertion that makes the distinction between the gait of the ploughman, and the carriage of the soldier, and to which the natives of the South Sea Islands owe their agile limbs, and the manly and erect deportment of the body.

That the firmness and strength of the muscles should increase with their use, is contrary to all that we observe in machines of human invention. The acute and indefatigable mind of Haller, seems only to have formed some conjectures on this point, and has afforded us but an imperfect explanation of this peculiar property of muscles. "Suffecerit forte admisisse (says he) ad maximum musculi robur requiri certam in glutine firmitatem eam acquiri pressione, quæ est in musculi actione, dum lacerti ad se invicem accedunt. Hinc senes non exercendi qui abunde glutine sint nimis rigido. Hinc vita nimis actuosa senectutum præcocem facit." †

* I have seen several instances where the muscular coat of the bladder, which in its natural state is so thin as to be scarcely perceptible, increased to the thickness of an inch or more, from long continued strictures of the urethra and enlargements of the prostate gland.

† Elementa Physiologiæ, tom. iv. p. 571.

This phenomenon is neither altogether without analogies in the animal body, nor is its solution difficult according to our present physiological views, for we observe that the senses become more acute by use, and the defect of one is from the same cause often supplied by an increased power of perception in others. The manner in which this effect is produced on the muscles seems to be this ; in consequence of the relation before pointed out between the several functions of the body, the action into which the muscle is thrown by the will of the mind, necessarily occasions an accelerated respiration, and a more rapid circulation of blood. This increased quantity and flow of blood to the muscle, is followed by an evolution of heat in the part, and probably a separation, or rather secretion of coagulable lymph, which becoming organized, an accretion of new fibre to the muscle ensues, and in this manner the muscle by its action becomes the means of its own increase.

The length of time that muscles can continue to act without intermission, will depend on the frequency and degree of exercise to which they have been habituated. Thus if an equal weight be placed in the hands of two individuals with the arms extended, the one accustomed to labour, the

other unused to exertion, the former will be able to support it for a much longer space of time than the latter. In some instances, it should seem that the protracted duration of muscular exertion, is the result of peculiar organization, independently of the causes already enumerated*. This is shewn in the slow moving animals, as the Maucauco, (Lemur Tardigradus) Great American Sloth, (Bradypus Tridactylus) and the Lesser Sloth, (Bradypus Didactylus). It appears that in these animals the axillary and iliac arteries are found to divide into a considerable number of cylinders, which are exclusively distributed on the muscles of the limbs. The effect of this peculiar distribution of the vessels, would seem to be that of retarding the velocity of the circulation; this is confirmed by a comparison of these animals with each other, and of the upper and lower extremities of the same animal. In the Great American Sloth the cylinders are more numerous, and the communications of the vessels with each other more frequent than the Maucauco or Lesser Sloth, and the animal is represented as more slow in its motions than either of the others. In each of

* Philosophical Transactions, vol. 90, p. 100, Mr. Carlisle.

these animals respectively, the cylinders are in greater number, and anastomose more freely in the upper extremities upon which the chief support of the body appears to devolve, than in the lower limbs. The same distribution of vessels also takes place, "in the muscles which act upon the toes and feet of many birds, and seems to be an adaptation for the long continued exertion of these muscles whilst they sleep, and also when they retract one foot under the feathers to preserve it from the effects of cold."

In all these instances, the long continued action of the muscles seems to be the effect of a more regular and full supply of blood in them.

The intensity of muscular power, or the energy with which muscles are excited to contraction, will depend on the degree of incitement of the nerves, by which they are connected with the brain: this is evident from experiments made on animals where life is apparently extinct, in which the muscles can be thrown into the strongest action by the application of galvanic or electric stimuli. How greatly this power is excited by strong efforts of volition, is also evinced by examples of the extraordinary strength exerted by lunatics, and persons actuated by fear, or any strong passions of the mind.

If a muscle from injury or other cause remains inactive for any length of time, although in other respects in a healthy state, it wastes and loses its tone and florid colour: this is frequently the case in injuries of the upper limbs, in which the deltoid muscle, from want of use, becomes incapable of raising the limb, or sometimes even of moving it from the side.

Another law which belongs to the muscular fibres of a living animal, is, that they appear to have a perpetual tendency to contract themselves, independently of the application of any stimulus; this is evinced in the retraction of muscular parts when divided across, and also in a paralytic seizure of one side of the face, in which the resisting force on one side being withdrawn, the muscles of the opposite side draw the mouth in a contrary direction.

I consider an experiment made by Bichat, as strongly illustrative of this point, in which it is proved that the division of the nerves distributed to the muscles of a part, diminishes its contractile power, but does not entirely destroy it*. "Il paroit que dans beaucoup de Paralysies la contrac-

* Bichat Anatomie generale, tom. ii.

tilité de Tissu est une peu alterée du coté affecté, mais jamais elle n'est totalement detruite, de maniere à ce que dans l'amputation d'un membre paralysé, il n'y ait point de retraction musculaire. J'ai fait cette experience sur un chien. Les nerfs ayant été coupés dix jours auparavant, et le membre ayant reste immobile depuis cette epoque, la section des muscles produisit un ecartement manifeste entre leurs bords, et meme en coupant ensuite comparativement le membre resta sain: je ne trouvais aucune difference."

A comparison between the living and dead body still farther tends to elucidate this matter*. "Take a long muscle, as the sartorius, dissect it in the dead subject, it will be longer than from its origin to its insertion, but, lay bare the same muscle in the living body and it will be always shorter than from its origin to its insertion." A remarkable proof of this spontaneous contractility of the muscle is shewn in the case of a negro, related by Mr. Home†. "A negro, about thirty years of age, having had his arm broken above the elbow joint, the two portions of the os humeri were unfortunately not reduced into their places, but

* Dr. Fordyce, Philosophical Transactions, vol. 78, p. 29.

† Philosophical Transactions, vol. 85, p. 210.

remained in the state they were left by the accident, till the callus or bony union had taken place; so that when the man recovered, the injured bone, from the position of the fractured parts, was reduced almost one half of its length. By this circumstance the biceps flexor cubiti muscle, which bends the fore arm, remained so much longer than the distance between its origin and insertion, that in the most contracted state it could scarcely bring itself into a straight line. This muscle, however, adapted itself to the change of circumstances, by becoming as much shorter as the bone was diminished in length, and by acquiring a new contraction in this shortened state, it was enabled to bend the fore arm: some years after this accident the person died. The biceps muscles of both arms were carefully dissected out, and being measured, the one was found to be eleven inches long, the other only five, so that the muscle of the fractured arm had lost six inches, which is more than the half of its original length." From this tendency of the muscle to shorten itself, it must be obvious that the limbs could not be preserved in a straight position, unless there were some counteracting power to preserve their balance; this is effected, for the most part, by

muscles which are opposed to them, which are termed their antagonists.

From what has been stated, I think we may draw the following inferences:

That the comparative power of muscular parts depends,

1. On the state of the functions of respiration and circulation, and that increased strength is a consequence of increased vascularity and circulation of blood in the part, and vice versa, a want of tone and power, of a deficient supply of it.

2. On the degree of exercise or frequency with which they are called into action.

3. On the mental energy or power of volition exerted on them.

4. That the most effectual means of encreasing muscular strength is by the frequent exercise of the power itself, and, consequently, the preservation of the healthy actions of those functions by which it is influenced.

5. That the muscular parts have a constant tendency to contract, by which they adapt themselves to the state of the limb or parts to which they are attached.

The proper application of these principles appear to me, of essential importance in the treat-

ment of those disordered states of the limbs which are accompanied with muscular weakness, more especially as it is often associated with diseases which not only affect the comfort, but the life of the individual.

The indications which arise from these, and the mode of fulfilling them, will be spoken of in treating of those diseases under their respective heads.

CHAP. II.

OF THE CURVED SPINE.

DISTORTION of the spine is of very frequent occurrence, and important in every point of view, whether considered with relation to the actions of the body, or to its influence on the health of the individual. The disease which forms the subject of my present enquiry does not affect the bony substance of the vertebræ, from which I shall hereafter distinguish it, but is confined to the parts connecting them, and is in its consequences no less injurious to the general health and happiness of the individual.

It may be defined, an alteration in the natural form of the spinal column, without caries of its bony structure.

Curvatures of the spine may be of two kinds, lateral or anterior; the former of these more frequently attacks young persons in their growth; the latter is met with at a more advanced period of life, as one of the sequelæ of general chronic

rheumatism or of any long protracted disorder occasioning muscular weakness.

The appearances met with on dissection are the following:—the intervertebral substance is generally thinner than natural, but much more so on the concave than the convex side of the curve, and in some cases has not exceeded more than a third part of its natural thickness. Glisson notices the alteration produced by this disorder in the Ligaments. "Hinc sæpe fit ut ligamenta vertebrarum spinæ a parte lateris frequentius prominentis laxentur atque elongentur, a parte vero opposita contrahentur; ita ut tractu temporis secundum rectam et naturalem lineam spina erigi non possit."* The transversales muscles inserted into the spinous processes, are elongated and much finer and smaller on the convex than the concave side of the curve, where they are shorter and fuller. Bichat gives an accurate description of this state of the parts in the following words:—"Dans les deviations diverses de l'épine, les muscles suivent la disposition osseuse: ils s' allongent du côté de la convexité se raccourcissent et se renflent du côté de la concavité. Les faisceaux divers du transversaire épineux m'ont pre-

* De rachitide, p. 147.

senté surtout cette disposition."* In both instances the muscles are more pallid than usual, the ligaments also are not so strong as in a healthy subject, where they are found to correspond in size and power with the muscular structure.

This disorder appears, not only from my own observation, but that of others, to be of increasing frequency, more particularly amongst females in the opulent classes of society, a circumstance which perhaps may be attributed to the present mode of education, in which greater attention is paid than formerly to the cultivation of the mind and female accomplishments, and less time consequently allowed for the bodily exercise necessary to the preservation of health. In no instance, perhaps, is the zealous regard of parents for their children more misapplied than in an overweening desire for high attainments and polite accomplishments, at the expense of what is of infinitely paramount importance; by which the future enjoyments of life are either much circumscribed or destroyed, and the individual rendered the subject of disease and misery. The system acted upon in many of our boarding-schools, in the education of females, I consider, in this respect, materially de-

* Bichat Traité d'Anatomie descriptive. tom. p. ii. 210.

fective. The plan pursued in most of these seminaries is to allow of little more than the exercise of walking, it being deemed indecorous or indelicate to run or use any more active mode of exercising the body. This restraint is evidently a contradiction to the laws of nature, which disposes the young, in all classes of animals, to active exercise, and is designed as the means of producing a greater inclination for food, and, consequently, of improving the powers of assimilation, and favouring the progressive growth of the body; and in proportion as its wants become less, and no longer require such assistance, the inclination diminishes with declining age.

This complaint has its foundation frequently laid in the improper method of nursing during early infancy, from the ignorance, if not culpable negligence of mothers, in refusing that nutriment to their offspring which nature herself has provided, and for which it is scarcely possible to find any substitute capable of affording, to the infantile stomach, a food so readily digestible and convertible into nourishment. It may be confidently asserted, that the infant is under no circumstances so healthy or free from disease, as when it is supported entirely on the breast of the mother;* and I

* Lichtenstein remarks, that amongst the Koossas, where

have observed that children nourished entirely at the breast are more capable of resisting the baneful effects of overfeeding afterwards, than those which have been sustained by other food. The health of the parent may, in some instances, be deemed a sufficient reason for the non-performance of this duty, the frequent neglect of it, however, on slight and insufficient grounds, cannot be too strongly reprobated.

A similar error to which the disease may be often traced, is the abuse in the mode of diet often adopted by nurses and others, not only during the period of weaning, but for some years afterwards, of loading the stomach with an unnecessary quantity of food, the defective nutrition of the body is to be attributed no less to excess of quantity than to a deficiency of nutriment; and I would appeal to the experience of those who have had extensive opportunities of observation in the disorders of children, whether the instances of disease arising from privation of food be not much less frequent than those occasioned by the contrary ex-

the mother suckles her child two years—" Diseases among infants are rare. It is very rare indeed to hear a child cry; all my companions agreed with me in this point; we never knew an infant scream, or an older child weep."—*Voyage in Southern Africa.*

treme, by which the assimilatory organs are rendered incapable of converting the superabundance into chyle proper for the nutrition of the body. It is a fact exemplified in the mode in which men are trained and exercised for pugilistic contests, as well as in the feeding of game cocks, that though the animal powers are increased for a time by the free use of highly nutritious aliment, the practice cannot be persevered in, and if continued too long it will occasion a loss of strength and vigour.*

To the combined operation of these two causes, viz. defective nutrition from the organs of digestion in the child being loaded with more food than they are capable of assimilating, and the want of exercise necessary to favour their proper action, I therefore attribute, in a great degree, the prevalence of the complaint.

If the incurvation of the spine take place after six or seven years of age, it appears to me that a want of proper exercise may be deemed the chief cause, for although the same errors in the management of their offspring, with respect to diet, are committed by the labouring as the higher classes of society, we see amongst the children of the former an unrestrained freedom of action and

* Bryan Robinson, on the food and discharges of human bodies.

bodily exertion, favouring the production of muscular strength and vigour. That sex has no peculiar influence in the production of the disorder is evident, from its being equally uncommon in the females as amongst the males in the lower ranks of life.

It has been supposed by many, that certain habits, such as standing on one leg, sitting awry in particular occupations, &c. have a share in producing the distortion. But from what I have stated hereafter it will be seen, that the former is an effort to preserve the equilibrium of the body, and should therefore be looked upon as one of the symptoms indicating that an alteration has already taken place in the relative position of the trunk, with respect to the pelvis and of the vertebræ with regard to each other. Sitting in a crooked position, such as in writing, &c. may be admitted as contributing a share, in some degree, to the formation of the disorder; but as females are not alone confined to the desk, and rather less so indeed than children of the other sex, it is more reasonable to ascribe its origin to causes of a general rather than those of a local nature.

The opinions generally entertained upon the subject of distorted spine appear to have been,

that it has always had its origin in caries of the vertebræ, or in a morbid state of the bone tending to it. Prior, however, to the occurrence of any alteration in the position of the spinal column, except in those cases where it arises from local injury, we find that there is a considerable decrease of muscular power, and a sense of great general lassitude and weariness: the least bodily exertion induces great fatigue, and the patient, even if permitted, is not inclined to indulge in the sports common to childhood; there is generally derangement of the digestive organs, and an uneasiness which is referred to different parts of the spine. As no particular spot can be pointed out as the seat of disease, these symptoms perhaps are overlooked, till from the general causes of debility, some part of the muscular structure becomes unable to support the spine in the erect position, and it yields; this perhaps may in some instances give rise to unnatural pressure on the parts, and consequently inflammation of the ligaments, absorption of the intervertebral cartilages and caries of the bone; but, that very considerable distortion of the spine, both laterally and anteriorly, may exist for years without such effects being produced, I have had sufficient demonstration, both from the

instances of restoration which I have witnessed, and from inspection of the parts in the dead subject.

It has been observed that the curvature takes place more frequently towards the right side than the left: the manner in which it appears to be occasioned is this; during the perfectly erect position when standing, and while the muscles are in their full tone, the body is so supported, that the centre of gravity falls exactly in the middle of the line which divides the space between the centres of the two feet. In this situation of the body little muscular effort is required to sustain it. The weight of the head is borne by the spinal column, and transferred to the pelvis and lower limbs in the most favourable direction, any deviation to one side, gives to the muscles affixed to the transverse and spinous processes of the concave side of the curve increased contraction, whilst a corresponding state of relaxation or extension takes place in those of the opposite side; the muscles on the concave side acquire comparatively increased power, whilst those on the convex become proportionately debilitated, and the balance by which the spine is preserved in its erect form is necessarily destroyed.

If one side of the body be heavier than the other, so much additional weight will necessarily be required on the opposite, as may be sufficient to serve as a counterpoise, in order to preserve its equilibrium. This is easily shewn in the case of a person holding a weight in the hand with the arm stretched out; he is under the necessity of bending to the opposite side in a greater or less degree according as the weight is increased. To illustrate the matter more clearly, let it be supposed that an individual, standing with both feet close to each other, took a weight in the right hand with the arm extended, and that he continued the position in which he necessarily threw himself to preserve his equilibrium, for a considerable length of time, it would be found that the left shoulder inclined greatly to the left side; that portion of the spine on a line with the left shoulder would be slightly drawn towards it; that a second curve would ensue with its convexity towards the right side, and again, a curve would take place in the lumbar region with the convexity towards the left ilium: the intertransversales muscles of the concave side of each curve respectively, would become contracted; those of the convex side of the curve, on the contrary, being in their extended state

inactive, would become smaller in size* and consequently weaker, so that if the weight were suddenly abstracted, they would no longer have the power of replacing or preserving the bones of the spine in their natural position, so as to bear the superincumbent weight; and as every increased deviation from the perpendicular line would render the muscular parts still less capable of acting, the alteration of form, unless some means were used to counteract it, would become perpetuated.

The inequality of bulk in the arms I conceive to have some influence, however inconsiderable it may appear at first sight, in producing this effect: the right arm, which is constantly used in preference to the left, becoming larger, and consequently heavier, tends to draw the spine to the right side, and the body is insensibly obliged to incline to the left, in order to preserve its equili-

* The diminution of muscular parts from disuse is seen still more conspicuously in those of large size, as the extensors of the thigh, for example, in cases of anchylosis of the joint, long continued rheumatism, gout, &c., where, with a view to relieve pain, the limb has been kept in a bent position for a considerable length of time, I have seen on dissection, the rectus not much thicker than a wafer, and the vasti corresponding in size, whilst the flexors have preserved nearly their original bulk.

brium. It must be admitted that this inequality of weight in the arm is of itself inadequate to the production of the derangement of the spine in a healthy subject; but if we advert to the circumstances above enumerated, with respect to the manner in which the disease is produced, and the state of muscular debility of the patient, and also take into consideration the constant operation of this cause throughout the day, or during the time the body is in a standing attitude, it must be allowed some share, however small, in producing that state of disordered spine which falls most frequently under our observation.

The firmness of cartilages will be proportionate to muscular strength. The Rev. Mr. Wasse*, from a number of experiments made by himself and others, asserts, that there is nearly an inch difference between the height of the body on first rising in the morning, and in the evening; and goes on to remark—"all the difference I find between labourers and sedentary people is, that the former are longer in losing their morning height, and sink rather less than the latter." This is corroborated in the next paper of the transactions

* Philosophical Transactions, vol. 33, p. 87.

by Mr. Beckett*, who, after stating that his experiments confirm the preceding, says, "only this I have further observed, that in those persons who have been young, the alteration has been more considerable than in those that have been aged. The trials equally succeeding in a sitting or standing posture, will naturally lead us to believe that it must necessarily be from the trunk of the body, or some of its parts, that this remarkable alteration is brought about." These experiments are of importance, as bearing upon the present investigation of the causes of distorted spine, and as they were not instituted with a view to serve any particular theory are entitled to attention.

The greater strength of the intervertebral substance in persons advanced in life, in connexion also with the muscular structure, may be assigned as the cause of their exemption from this disorder; Mr. Pott† having remarked that he had "never seen it at an age beyond forty." In youth the cartilages are less firm than in the adult age, and from a cursory review of the above experiments it would appear, that to the want of firmness of the intervertebral substance may be ascribed the oc-

* Ibid. Remarks on the foregoing paper, p. 89.

† Farther remarks on the useless state of the lower limbs, p. 9.

currence of incurvation; if we, however, take into consideration the uses of the muscles, it will be seen, that when in the erect position, if they act in a natural manner, the cartilages will not be pressed upon in an undue direction, either laterally or anteriorly, so as to produce distortion, but that the only effect of the superincumbent weight will be for the time to decrease the height of the individual, by bringing the bodies of the vertebræ more closely together. On the recurrence to the horizontal position, the spine will resume its proper length. Less consequence has been attached to the influence of the cartilages and ligaments in the production of this disorder, than the importance of their functions to the motions of the spine may seem to demand. This has arisen, however, from observation both in health and disease, that their relaxation or firmness, increase or decrease of size, power or weakness, will be commensurate with the tone and vigour of the muscular structure; that the diminished strength of the ligaments and cartilages, is a sequel of muscular debility; and that, therefore, by giving power to the muscles, an accession of strength to the ligaments, and intervertebral substance, will result as a matter of course.

That to muscular debility we may ascribe the

first occurrence of the disease, is confirmed by the method of cure, which, however it may differ as to the particular mode of conducting it, is founded on the principle of giving increased action to those muscles of the spine which have been weakened and extended, and thereby equalising their contractile power with that of their antagonists.

I cannot but advert, on this occasion, to the ill-judged practice of mothers, who, with a desire of giving their daughters a fine shape, or of preventing or removing deformity, endeavour to effect it by the fashionable use of stays and other equally bad means of support. The materials of which these are usually formed are either whalebone or steel, and therefore yield little to the natural action of the parts to which they are designed to give support. The motion of the intermediate parts of the spine must by this means be greatly circumscribed; the action of the muscles attached to the trunk impeded; the necessary determination and circulation of blood through their substance lessened, and, of necessity, their size and power diminished; thus defeating the object in view, and increasing or perpetuating the deformity they are intended to remedy. The

same may be also said of pressure made on the chest by any other similar means which may impede the free action of the muscles of respiration.

I have thought it useful to extract the following passage from a writer of great authority, not only as it points out, in a striking manner, the ill effects which arise from the use of these machines, but also confirms the opinions advanced with respect to the proper and most effectual means of correcting them*:—"Musculi longo tempore quiescentis ad paralysin disponuntur videmus hoc evidenter in mulieribus, quæ pessimo more loricis, ex balænarum ossibus factis, corpus stringunt, die sæpe noctuque in illis totus truncus corporis sustinetur hac lorica, quæ constrictio abdomine ossibus illi utriusque innititur, simulque axillas sustinct: hinc musculi dorsi validissimi, qui truncum corporis erectum firmant, otiantur; et cum iidem musculi decumbente in lecto homine vix agant, hinc, licet deponatur noctu lorica, tamen manent illi musculi fere otiori. Unde miseræ mulieres, quæ a prima juventute his loricis usæ fuerunt, illas postea deponere nequeunt, quin antrorsum collabantur totus truncus corporis, musculi dorsi inertibus red-

* Van Swieten Comment in Boerh Aphor.

ditis, qui in valido et exercitatio corpore spinam dorsi erectam et firmam tenere possunt, licet grave pondus humeris imponatur, uti in bajulis videmus. Vidi non sine commiseratione miseras tales fœminas, quæ nequidem somni tempore deponere audebant lorices expertæ jam sæpius quod vix se vertere in lecto possunt, multo minus corpus in lecto erigere vel erectum sustinere. Ob hanc causam videtur post rheumaticam lumbaginem quandoque sequi levior paralysis artuum inferiorum frictionibus tamen sensim superabilis, dum sæpe per plures septimanas ne minimum quidem motum partium inferiorum tentare audent. Dolentissimum hunc morbum expertus *Celeberrimus Boerhavius* per plures septimanas, caruit usu artuum inferiorum, dolore jam cessante; frictionibus autem valdis adhibitis superatum fuit hoc malum quam integerrime, et quidem brevi satis tempore quod in paralysi, ab impedito influxu spirituum per nervos producta, raro vel nunquam tam cito fit. Unde videtur hoc malum a flaccida inertia musculorum tam diu quiescentium factum fuisse."

Distortion of the spine, arising from muscular debility, may be distinguished from disease of its bony structure, not only from the mode of its

termination, but by an attention to the general history of the complaint; for although it must be allowed that the principal causes which give rise to the two disorders are the same, yet some difference is observable in the mode of their termination.

In the lateral distortion, the incurvation is commonly gradual and not sudden, and if it occur in the cervical vertebræ there is a second or third curve* from the action of the muscles of the spine necessary to preserve the centre of gravity; it is not attended with acute pain, but merely a sense of uneasiness, which may, perhaps, be referred to the fatigue of the muscles connected with the spine. In several cases of long standing that have fallen

* Il y a des courbures laterales vicieuses commes des anterieures ou ces courbures presentent un phénomène remarquable; c'est que des qu'il en existe une dans un sens a une region, les autres régions en presentent bientôt d'autres en sens alternativement inverses. Supposez par exemple, qu'un depôt une bride &c. forcent a inclinér la portion cervicale de l'epine à droite, bientot pour soutenir le centre de gravité la region dorsale se courbe à gauche et par suite la region lombaire à droite en sorte que tout le tronc se ressent bientôt de la vicieuse attitude d'une partie isolée de l'epine.

Bichat, tom. i. p. 124.

See also Glisson, p. 139.

under my own observation, the patient has never been sensible of any pain or uneasiness in the spinal column or its vicinity, and, except from the alteration in shape, would have been totally unconscious of the approach of the disorder. The length of time which it is in forming is also various, sometimes its progress is slow and insidious, occupying a period of one, two, or three, and in some instances six or seven years or more. Its approaches are for a long time scarcely perceptible, but on the occurrence of any particular disturbance to the constitution, such as febrile indisposition, the spine in the course of one, two, or three months, is found to yield in a greater degree than it had previously done during as many years.

In the anterior curvature of the spine the curve will also be found very gradual, as it comprehends several of the lower cervical, and the whole of the dorsal and lumbar vertebræ; in some instances it is formed by the dorsal and lumbar only; in these cases likewise the pain is of an obtuse kind, which may probably be referred to the same cause.

In caries of the bodies of the vertebræ there is a sudden projection of the part; the relative position of the spinous processes is altered, and

they are occasionally separated to a greater distance than could be imagined, without a loss of substance anteriorly ; in other instances they only approximate more nearly to each other. * The incurvation from with in outwards is occasioned by the absorption of the bodies of one or more of the vertebræ. The circumstance of the disease having been preceded by a blow, is, with others, a fair ground for suspicion of caries. The pain, previously to any incurvation taking place from disease of the bone, is more acute than in that arising from weakness, as might be expected from the manner in which inflammation proceeds in parts of a ligamentous, cartilaginous, or bony texture, and it is more confined to the diseased part, and attended with greater febrile indisposition.

It is a matter of great importance to distinguish between the two diseases of caries and rickets, as it is evident that where any alteration of structure

* Mr. Copeland relates a case in which the intervertebral substance was removed, and the dorsal vertebræ anchylosed, without there having been any elevation of the bent spinous processes, or distortion of the form of the spine; this case however must be deemed of rare occurrence.

Copeland's Observations on the Spine, p.15.

has taken place in the bodies of the vertebræ from the former, or where there is a scrophulous disease in the parts, any attempts to cure the distortion by muscular exercise would, by preventing the natural cure by anchylosis, be highly injurious.

The curvature of the spine anteriorly, as a sequel of chronic rheumatism, or any other long protracted debilitating disease, is not an unfrequent complaint; it appears to be induced by the patient inclining forward when sitting or laying, with a view to procure relief from pain: after this position has been maintained for some time, debility is produced in the muscles of the back from long inaction, and as every effort to draw the spine backwards is attended with pain, it is either not attempted, or so imperfectly, that the incurvation becomes gradually permanent, unless proper means are resorted to for its removal.

By referring to the explanation which has been already given, of the mode in which the disease originates, the method of treatment which I propose will be readily understood. On the first invasion of this disorder the diet ought to be carefully attended to, it should consist of plain animal food once in the day, of which the patient should

be allowed to eat heartily. Bread and butter, or bread and milk, or tea, furnishing the two other meals of breakfast and supper: if the food be plain and simple, there will be no inducement to overload the stomach. The principle upon which our endeavours should be directed for the cure of this malady, must be that of restoring the balance of power between the muscles which are contracted, and those which are in a state of extension; it is obvious, that any increase of strength and size in those which have been weakened by extension, and consequent disuse, will enable them to act in opposing the contractile force of their antagonists, and, consequently, in restoring the spine to its natural shape; this object may be attained by various means, which, for the sake of distinction, I would divide into passive and active. Under the head of passive, I would place all those external means which have the effect of increasing muscular power, such as friction, shampooing, percussion, confinement to a particular position, galvanism, electricity, &c. Under the head of active, the excitement of the muscles by volition, or that of muscular exercise.

Friction has been used as a remedy, by different nations, in various chronic disorders from the

earliest ages; most commonly some unctuous or other application has been rubbed on the distempered part, to which any benefit that may have accrued has been ascribed; the most advantageous method of employing it, however, is by the bare hand, using some flour to absorb perspiration and prevent abrasion of the skin*. Manipulation or shampooing, is performed by squeezing or pressing the muscles in the hand, and between the fingers; percussion by striking with the fleshy part of the clenched hand. The manner in which they respectively appear to act as auxiliaries in the removal of this disease, is by stimulating the nerves of the part, increasing the circulation of blood, and, consequently, favouring the increase of muscular size and strength. These various methods of exciting the warmth of the part, and promoting a greater flow of blood to it, differ from each other as to the effect, only in degree. The choice of these, the length of time requisite for their application, and the frequency of their repetition, are points which must be regulated by the sensibility of the parts and the state of the disease.

* For this particular mode of using friction, and also its more general introduction into this country, the profession are indebted to Mr. Grosvenor of Oxford.

As a general rule, it is advisable to commence with that mode of excitement which produces the least uneasiness, and gradually to increase it as the susceptibility to its influence diminishes. Upon this ground, perhaps, shampooing and percussion possess some advantage over friction; whichever of these means is employed, it should be continued for not less than an hour, and repeated twice or thrice during the day: it ought to be kept in mind, however, that they should never be carried to such a point as to excite any considerable pain. The plan of confining the body to an horizontal position, was recommended as an exclusive mode of relief by Mr. Baynton*, who argued, that many of the cures of spinal distortion which Mr. Pott attributed to the application of caustic issues, derived their efficacy from the influence of the recumbent posture which was enjoined during their treatment, and as a proof of the correctness of that opinion, he adduces instances of long standing, in which he effected a cure by this means alone.

On referring, however, to the histories of these cases which are detailed in his treatise, it will be

* Baynton on Diseases of the Spine.

observed, that they are chiefly those of anterior curvatures of the spinal column, and that, although in cases of slight lateral incurvation, he conceives this practice may be useful, yet he admits, to use his own language, that " it does not often happen that curvatures with two inflexions are removed by any means," and it is therefore not unfair to conclude, that in such cases he was not fully satisfied of the entire efficacy of this mode of treatment. The curvature with two inflexions differs only from the simple incurvation of spine, inasmuch as it may be regarded as a more aggravated form of the disease, in consequence of its longer continuance. The curve, in these instances, generally consists of three inflexions; the first, which is slight, usually begins in the cervical vertebræ, with the convexity towards the point of the left shoulder; a larger one is met with in the dorsal, towards the right side; and again, a curve of less extent than the latter in the lumbar vertebræ, with the concavity towards the right ilium.

The use of the inclined plane for the purpose of confining the body to a particular position, in the recumbent state, for a considerable length of time, without allowing any alteration of posture, is extremely disagreeable to the patient, and some-

times productive of distressing feelings, without being compensated by any particular advantage that may not be gained by allowing rest on a mattress or sofa, without restraint on the motion of the body.

It has been remarked to me by patients themselves as well as by those around them, that they arose from the former not only without feeling refreshed, but sometimes greatly fatigued; and if we consider that the alternations of position in the body throughout the day, and even during sleep, are so many changes to relieve the contractions of the muscles, and that in this confined attitude a great number of them must be kept in action during the time it is persevered in, and that they cannot support long continued exertion without great weariness supervening, we shall be at no loss to discover why such an effect should be produced.

In the anterior incurvation of the spine, I should esteem the recumbent position on the back most advisable, although I do not think it indispensable or absolutely necessary. I would merely recommend, that it should be pursued to such an extent as not to be productive of inconvenience to the patient.

In the lateral incurvation the confinement to a general horizontal posture is all that is requisite, without restricting the patient to any particular position.

The recumbent position, by taking off the superincumbent weight, and thus favouring the disposition of the parts to regain their former healthy condition, is unquestionably a measure of essential importance in the treatment of this disease, and in slight cases, may alone be sufficient for the removal of it; but it ought not to be relied upon exclusively. It should be recollected, that when the spine has, by this means, recovered its proper station, the muscles which are attached to it, and are so considerable in number and bulk as to be in a material degree the support of the trunk in its erect posture, are left in an atonic state and altogether incapable of executing their functions. It is obvious, that the only means of restoring this power, of effecting a permanent cure, or preventing a recurrence of the disorder, is that of giving additional tone and strength to the muscular parts, which, from long disuse, have become incapable of fulfilling their office.

This intention will be best attained, by putting in force the measures already hinted at under the

head of active treatment, which consists in compelling the muscles to exert themselves with energy to restore the spine to its natural situation. One of the methods that I employ for this purpose and the detail of which will place the subject in the clearest point of view, is the following—a weight appended to a cord is passed over a pully, and the other extremity, having a strap attached to it, is fastened round the patient's head; the pelvis being fixed, the patient is directed to raise the weight by drawing the head and trunk backwards, and to repeat this effort until fatigue is produced. The frequency of repetition of this exercise of the muscles, and the weight of the body to be raised, must, of course, depend on the patients strength. After each effort, it is advisable to take rest, by lying down on a couch or sofa, in order that the muscles may not be placed on the stretch and thus prevented from recovering themselves. This mode of exercising the muscles is equally applicable to the anterior curvature of the spine, as to those which take place laterally.

A combination of these means of muscular excitement will be attended with more advantage than when pursued separately. I have witnessed

several cases where friction alone has been unsuccessfully employed for a considerable length of time, and others where the inclined plane also has been depended upon solely, without the other measures being prosecuted at the same time, in which a combined plan of percussion and strong muscular exertion, assisted by a recumbent posture, has afterwards been attended with complete success.

By the union of these means the cure can be effected in a much shorter time. It would appear that another advantage is also gained of great importance with regard to the general health. I have observed, that when the recumbent position alone has been relied upon, that great dyspepsia is very often present, sometimes to a distressing degree—this does not occur if recourse be had to occasional action and rest; on the contrary, this regular exercise of the body tends to strengthen the powers of digestion, and to promote the restoration of bodily health as well as muscular strength, which are usually found to keep pace with each other.

Various mechanical contrivances, calculated to rest upon the pelvis as a base, have been resorted to for curing spinal distortions. The advocates

for their adoption appear to have viewed the spine as a mere assemblage of bones which were displaced, and therefore required only external aid to replace and retain them in their position, without any reference to the natural moving powers connected with them. If the view which has been taken of the cure of the disorder be correct, that it is effected by increasing the growth and strength of the muscles connected with the spine, it will be seen at once, that under any circumstances such mechanical means are inadmissible, and that their use has arisen from an erroneous view both of the general causes of the disease, and of the principles upon which their treatment should be founded. Admitting that by any mechanical contrivance the spine could be rendered straight by the use of external force alone applied to it, the muscular parts would still be left in the same atonic and wasted state as before. If the inutility of these means were the only objection against the use of instruments in these cases, it would be of little importance; but, unfortunately, they are too frequently injurious, by causing such a degree of pressure on the bones of the pelvis, in an improper direction, in a weakly subject, as would cause them to give way even in a healthy person. The observations of

Mr. Wilson * on the subject, with reference to this point, are important, as being the result of examinations after death, and are therefore entitled to considerable attention. He says, " I have examined very many cases of incurvated spines happening in women, in that class of life which would not permit of the purchase of expensive instruments, in which I have found the pelvis so perfectly well formed, as to allow of the birth of several living children, although the incurvation of the spines had been very considerable and long confirmed.

I have examined others, happening to women, where I had the means of ascertaining that instruments had been used; in all of these, and in others where, from similarity of appearance, I could not doubt but that instruments had been used, I found the bones of the pelvis irreparably injured, by having yielded to the additional burden thrown on them where they were never intended, and were not calculated even in a healthy state to bear much weight."

The truth of this observation I am enabled to corroborate by the inspection of a case of extreme

* Lectures on diseases of the Bones. p. 178.

distortion which lately occurred to me, where the curvature was so great that there was only one quarter of an inch of space between the inner surface of the middle of the ribs and the projecting part of the spine, notwithstanding there was no defective formation of the pelvis.

CASES

OF

DISTORTION OF THE SPINE.

CASE I.

A MILITARY man whilst serving with his regiment in India, after long exposure to inclement weather and sleeping in wet clothes, was seized with pains in the back, hips, shoulders, and knees, with general disorder of the whole frame; recourse was had to the usual remedies in cases of rheumatism; fomentations, blisters, opiates, salivation, liniments, the application of cooled water, and the use of the warm sea bath, without deriving any benefit, except from the latter, which afforded him a very trifling mitigation of pain: during the continuance of the disease, different parts of the body became contracted. On his return to England, at the end of twelve months, the medical treatment was equally

inefficacious, till another year had elapsed, when he was advised to go to Bath, where to use his own expression, "after a fortnight's bathing, he found a balsam for those pains which had deprived him of rest for two years, but at the same time proved to him the melancholy fact, that he was permanently contracted in almost every part of his body." At the expiration of between five and six years, from this time; a period of more than seven from the commencement of his illness, he placed himself under my care: the following minutes were made at the time—October, 1817, General contraction and rigidity of almost the whole of the body; the head fixed on the dentata so as not to allow of rotation, no motion of the cervical vertebræ; the chin bent downwards on the chest to the lowest point of depression; the incapability of raising it from this position, and the consequent necessary elevation of the eye-brows to give him any range of vision, had produced strong furrows on the forehead; there was a curvature of the spine anteriorly, including the whole of the cervical, dorsal, and lumbar vertebræ, accompanied with a considerable lateral incurvation, owing, most probably, to the unnatural position to which he had been long accustomed, as he found consider-

able relief from resting the left elbow on the chair, and reclining his head upon the arm of that side; the chest very much narrowed and sunk in; the left arm contracted at the elbow joint; the thighs nearly at right angles with the pelvis, without any motion either backwards, forwards, or in a lateral direction, so that they could neither recede from, nor approximate each other; the legs contracted on the thighs, and considerable enlargements of the knee joints. The diminution in height was so great, that, when standing supported by crutches, he measured only four feet seven inches, whereas his ordinary stature, previously to the incurvation, was between five feet seven and eight inches; the head also, when placed in the same position, projected nine inches beyond the feet. As the history of this disease decidedly marked it as a case of rheumatism, and as there was no other reason to suspect caries of the bones of the vertebræ, or anchylosis, than the immobility of the joints, it was deemed advisable to try the effect of muscular action. During the first fortnight he was directed to attempt general exercise of those parts which were motionless; the first efforts were futile and discouraging, but by repetition a trifling motion was gained, suffi-

cient to incite him to further perseverance. The most distressing part of the case apparently, was the confinement of the head on the chest; my attention was therefore more particularly directed to assist its elevation, especially as the means requisite to effect it were equally applicable to the altered state of the spine; with this view I directed frictions to be used to the neck, and he was desired to make attempts to raise the head frequently. Having made some trifling progress in this; to increase the power of those muscles which act in preserving the spine erect, a strap was fixed round the head, connected with a cord running over a pulley, to the extremity of which a weight of one pound was affixed: as he was unable to stand, unless supported by crutches, he was placed in a chair with the weight before him, which he was directed to draw backwards, and to continue this effort as long as the strength would permit, repeating this exercise twice or thrice during the day. He was also desired gradually to increase the effort, for example, if on the first attempt he was able to draw up the weight a dozen times, thrice in the course of that day, the ensuing day he was to encrease the number to thirteen at least, and repeat the labour as often as before. In the

course of a month there was a very evident improvement, particularly in a greater mobility of the cervical, dorsal, and lumbar vertebræ on each other, some motion of the head from side to side, and a greater freedom of the arms, hips, and legs. The weight was gradually increased till it amounted to four, seven, ten, twelve, and fourteen pounds, and so great was the increase in the powers of the muscles of the neck and back, that it was raised in the manner before described between two and three thousand times a day. After each task of exercise, he lay down on the back or side on a mattress, until he recovered from his fatigue: at the expiration of nine months he had acquired three inches in height; the head being raised as far as possible, and then supported by an instrument constructed for that purpose, three inches more were gained in addition, although the muscular power alone was unequal to preserve it in that situation till some time had elapsed; the legs could be separated twenty one inches farther apart, and in the step forwards twenty five inches. The contractions of the left arm and of the legs were entirely removed; the anterior and lateral curvature of the dorsal and lumbar vertebræ disappeared; in the cervical, however, a slight bend

still remained. A striking feature in this case also, was the visible improvement which took place in the form of the chest, and corresponding to the amendment in the spine; at the commencement of the treatment it was contracted and concave from the sternal extremity of the clavicle to the ensiform cartilage, and the points of the shoulders approximated very closely; the breast had now acquired its usual appearance and rotundity; the stomach also, which at first would not bear more than half a pint of liquid, and a proportionate quantity of food without great annoyance, could now admit double or treble the quantity with less inconvenience. Circumstances occurred which prevented the same strict adherence to the pursuance of that plan, which had been attended with so much success. He, however, by regular exercise, confirmed the power he had acquired, and was capable of walking two miles without much fatigue; his health also was tolerably good. Enough, however, has been given in this concise account of the case, to shew that if the same measures had been persevered in for a longer period, the results would have been still more beneficial.

CASE II.

A gentleman, aged 26, applied to me in October, 1818, for an incurvation of the spine and contractions of the hips and legs. The account which he gave was, that about six years before, he had been attacked with uneasiness in the hip joint, and severe pain along the thigh, in the course of the sartorius muscle, which deprived him of rest at night. In this state he continued during three months, and he could walk with the help of a stick till the year 1814, when he experienced an increase of pain over the whole of the body, for which various remedies were administered with little success. After labouring under the disease two years, he went to Bath, and continued bathing for four months, with evident relief from pain; but he derived no benefit with regard to the contractions of the hips and legs, or distortion of the spine. The bowels were regular, and the appetite and spirits good during the whole of this period.

On examination, I found that there was an anterior incurvation of the spine, including the whole of the dorsal and lumbar vertebræ, which did not admit of any motion on each other, and he felt

no pain on pressing different parts of the column. The hips were bent towards the pelvis and motionless, and the legs contracted; the left leg was two inches shorter than the right, and he was incapable of standing without the assistance of crutches. His present height five feet two inches three-eights; when in health he measured five feet eleven inches three-fourths. His general health was delicate in the extreme, and affected by the slightest changes of weather; the least exertion either from speaking too loud, or from any cause which quickened the circulation, rendered him breathless, and the voice was very feeble. The pulse (one hundred and thirty) was weak, and from any trifling excitement so much accelerated as to be scarcely counted, and he was greatly emaciated.

Gentle aperients were administered twice a week, and the sulphate of iron twice a day, in doses of two grains.

From the symptoms attendant on the complaint in the left hip, there was reason to fear that mischief might have proceeded to a considerable extent in the joint, and it was therefore necessary to proceed with much caution, lest in attempting the cure by muscular exercise, a latent disease might

be roused into action which might have been attended with hazardous consequences to the patient, particularly in his very delicate state of health.

The method by shampooing was therefore employed along the course of the spine and the lower part of the back, avoiding the immediate neighbourhood of the joint. He was directed to attempt to stand and lean on two chairs without the aid of crutches. As his strength improved, endeavours were made to separate the legs, as in the act of striding and walking, cautiously and gradually encreasing the distance. He was likewise enjoined to observe the recumbent position on the back as much as he could bear without inconvenience. This was more strongly enforced than in the former case for the reasons already given. A strap also, with a weight attached to it, was fixed on the neck, and drawn backwards until fatigue was induced, the weight being gradually increased according to the improvement in the patients strength.

The beneficial effect upon the general health, in a short space of time, was sufficiently manifest; the pulse was much diminished in frequency; the strength increased; the breathing became more free, and the voice more powerful. Exposure to

cold air and variations of temperature, were no longer productive of indisposition, and, indeed, it may be asserted, that he suffered less from the effects of winter than others. The improvement in other respects, though not so rapid, was visible; some slight motion of the vertebræ upon each other became perceptible. In the course of the first month, one inch and a half was gained in height; the left foot could be advanced from the other to the distance of six inches; the right could not be placed before the left in consequence of the difference in length, and six inches was acquired in the lateral stride.

This plan was followed up during twelve months with great regularity; the amendment was progressive; the spine became perfectly straight, and there was an acquisition of four inches and a quarter in height, of one foot seven inches and a half in the progression of the left leg before the right, of one foot three inches in that of the right before the left, of two feet one inch in the side step. The health of the patient was good; he could walk two miles, with little inconvenience, with the help of a stick alone, without the assistance of crutches. In this instance the utility of the plan recommended, however, is not, I conceive, to be

estimated merely by the improvement in the state of the spine and limbs; its beneficial influence on that of the general health was marked in a still more striking degree, and I feel myself justified in believing, that if these or similar measures had not been resorted to, the disease must eventually have proved fatal.

CASE III.

C. S. etat. 6, of fair complexion, was brought to me in June, 1820, with an anterior incurvation of the spine, including the whole of the dorsal vertebræ, of which the third and fourth projected more particularly; she was very much emaciated; had a constant cough; great difficulty of breathing; was excessively fretful and irritable, and had lost the power of walking for the last four years. The measurement of the chest at the scrob cord was seventeen inches and a quarter, the length from the occiput to the os occygis ten inches: she was directed to be kept in an horizontal position, friction and shampooing were first used over the chest, afterwards percussion for one or two hours during the day, and gentle aperients were administered twice a week. As there was some reason to apprehend

a caries of the bone, from the sudden projection of the upper dorsal vertebræ, as she lived at a distance from me, and the circumstances of the parents did not allow her to be placed immediately under my inspection, I thought it better not to incur the chance of doing mischief, by having recourse to the active mode of treatment before recommended, therefore shampooing, percussion, and the horizontal position alone were had recourse to. At the expiration of six months the measurement of the chest was nineteen inches and a half; being an increase of two inches and a quarter, the spine fourteen inches and a quarter, being an increase in length of four inches and a half. The child has now gained flesh, lost her cough, difficulty of breathing, and irritability of temper, and runs about with alacrity.

CASE IV.

In July, 1820, I was desired to see an infant seven months old, who had an incurvation of the spine, apparently brought on by his leaning and being carried in the nurse's arm on one side only; there was some acidity present, I therefore prescribed testaceous powders twice a day, and mild

aperients were administered twice a week; gentle friction and shampooing were employed over the whole spine during an hour once or twice a day, and the position in which the infant had been carried was reversed. At the expiration of six weeks the child recovered perfectly.

CASE V.

The attention of the friends of Miss A. etat. 16, had been directed for some time to an unseemly protuberance of the right hip, which became gradually worse; on examination it was discovered that there was an incurvation of the spine, which continued to increase for nearly two years. When the case was submitted to my inspection, I found that there was a projection of the right scapula, an anterior curvature, including the three lower cervical, and two superior dorsal vertebræ inclusive; a more considerable distortion laterally towards the right side, extending from the fourth dorsal to the first lumbar vertebræ, and a slight curve in the inferior lumbar. As her general health was delicate, I prescribed the carbonate of iron twice a day, and aperients twice a week. Shampooing, and afterwards percussion was em-

ployed over the whole of the spine, muscular exercise of the spine in the manner before described, by moving a weight by the head, and other similar means, by which the muscles of the spine could be called into action, were resorted to, and she was directed in the intervals of rest to lay on a mattress or sofa in any position that was most agreeable to herself, changing it when it became irksome. By an adherence to this plan which was followed up with steady perseverance during six months, the anterior curvature was first lessened, and then progressively the other parts of the spine which were altered in shape; the spine became perfectly straight; the protuberance of the hip, and also the projection of the scapula vanished, and no appearance of personal deformity remained.

CASE VI.

Miss B. etat 15, was brought to me September, 1821, with a distortion of the spine, which was supposed by her friends to have commenced about three years before, though in all probability its origin was of still earlier date. It was observed that the distortion had increased very materially

during the last three months, which induced her parents to place her under my care. Her health was delicate; any trivial exertion produced breathlessness; she was unable to bear slight exercise without great fatigue.

The alteration of shape had not been preceded by the slightest pain either in the back or any portion of the spine, and but for the remarks of her friends she would have been entirely unconscious of its approach; the following appearances presented themselves on examination; a considerable projection of the right scapula; the right shoulder much higher than the left; a protuberance of the right hip; a lateral incurvation of the spine, commencing at the first dorsal vertebra; the spinous process of the third being nearly covered by the superior edge of the left scapula, from thence bent towards the right side, passing under the inferior part of the right scapula and covered by it; and a third incurvation towards the left side formed by the inferior lumbar vertebræ.

On drawing a line from the last cervical vertebra to the middle of the sacrum, the spine at its greater curvature deviated two inches and a half from the perpendicular; there was a considerable projection of the ribs on the right side near their

junction with the spine, forming a ridge with a corresponding hollow in the left side. The measurement of the chest at the scrob cord on taking a full inspiration was twenty-three inches.

During the first three weeks she took the tinct ferri ammoniati twice a day, with aperients twice a week; shampooing and percussion were successively employed over the chest and spine, the patient standing against a machine, which will be described in the next chapter, and the position varied according to circumstances; a weight also was used and drawn backwards by the head, as in former instances, and afterwards, when the curvature of the upper portion of the dorsal vertebræ was removed, it was appended to the shoulders, and increased according as the patient's strength improved. At the end of the first month the chest had increased in admeasurement on inspiration two inches and a half: after a lapse of another month the measurement was twenty-six inches, being an additional gain of half an inch; the deviation of the spine, at the expiration of nine months, was not more than half an inch from the perpendicular; the upper curvature had disappeared, and the other was much decreased; there was also a considerable improvement in

the appearance of the chest. The anterior and posterior projections were much diminished, and there was a proportionate fullness in the other parts.

CASE VII.

The friends of Miss T. a young lady etat. 11, of a light complexion, have observed for some time past a projection of her right shoulder; her health is delicate, and she is incapable of much exertion from the fatigue induced by it. On examination, Dec. 1822, there was a great inequality in the two shoulders; the right scapula projecting more than the left, and the shoulder of that side was one inch higher than the other. There was an anterior curve of the upper dorsal vertebræ, with a lateral curve towards the right side; the chest measured twenty-two inches at the scrob. cord., the height was four feet six inches. I prescribed for this little girl the tinct. ferri ammoniati twice a day, and aperients twice a week, during the first fortnight, when they were discontinued. Shampooing was used over the thorax and spine an hour each day, the patient standing against the instrument noticed in diseases of

the chest. She also commenced drawing a weight of five pounds by the head, in the manner before described, gradually increasing till it amounted to fifteen pounds, and continuing the exertion as long as she was able to bear it. In addition to this, she was desired to observe a recumbent position during the remainder of the day. At the expiration of the first month, the chest acquired an additional circumference of two inches; she became an inch taller; there was less projection of the right shoulder, and it was only two-eighths of an inch higher than the other when standing erect. The general health improved in an equal degree with the form of the spine. After the lapse of another two months, the measurement of the chest was twenty-five inches; the height four feet seven inches and three quarters; the shoulders were of equal heights, and there was no appearance of personal defect; the child became perfectly healthy and strong.

CHAP. III.

OF DEFORMITY OF THE CHEST.

As far as I can judge from my own observation, little has been attempted in the treatment of deformities of the chest, except in as far as regards an attention to the state of the general health; although they appear to me equally to admit of alleviation or cure by a judicious use of some of the means recommended in the last chapter.

The bones forming the thorax derive their support from the spinal column; any incurvation, therefore, of this part will necessarily be accompanied by a corresponding displacement of the ribs and sternum, and the removal of the spinal distortion will usually be followed by an improvement in the form of the chest. This intimate connexion between the two diseases, and the dependence of the several parts on each other, may, at first sight, appear to render any separate notice of them unnecessary; but instances do

not unfrequently occur, where considerable deformity in the thorax has existed, without any derangement in the spine; it appears to me, not only on this account, but of its importance in a general point of view, to merit a distinct consideration.

The treatment of deformity of the chest simply, was, indeed, suggested to me by observing the amendment which took place in such cases, whilst my attention was directed to the removal of the incurvation of the spine.

The general appearance of the chest in the disorder of which I am treating has been usually designated, from the resemblance which it is supposed to bear to it, by the name of chicken breast. It is marked by an apparent projection of the sternum, which seems rather to arise from a loss of the arched form and a flattening of the ribs on each side, than from any unnatural protuberance of the bone itself. Sometimes there is a falling in of the breast bone, producing a preternatural hollow instead of projection of this part of the chest, in which case the edges of the false ribs are frequently turned in upon the lungs, and the ensiform cartilage can scarcely be felt, and not unfrequently one side of the breast is flattened, while

there is a corresponding swelling of the opposite side.

In weakly and delicate children also, independently of any distortion, there is a greater length of chest from the first to the lowest false rib than in the natural state; the clavicles project forwards, as well as the points of the shoulders, and there is not that depth or capacity of chest from the sternum to the spine which may be observed in perfectly healthy individuals; this is particularly apparent when the patient is viewed sideways.

The diminution in the size and capacity of the thorax is productive of various complaints, which at first may not be suspected to arise from such cause, viz. difficult respiration; pain in the chest;* frequent palpitations, and indeed all the symptoms attendant on an interrupted, quickened, or disordered circulation. For if it be necessary for the proper supply of the body, that a certain portion of blood should circulate through the lungs

* It seems not improbable that in consumptive cases among females, the most marked symptoms of which are accelerated pulse and distressing cough, a large proportion of them may be ascribed, in conjunction with the other exciting causes, to a want of active exertion of the upper parts of the body and thorax, and, consequently, a deficiency in the capacity of the latter.

in a given space of time, it necessarily follows that, if from a diminution of size in the capacity of the chest a less volume of blood only can be exposed to oxygenation, the velocity of the circulation must be proportionately accelerated in order that it may undergo the changes necessary for the purposes of life.

It may be observed in the cases of children or young people labouring under this disorder, that when they attempt to run or quicken their pace, they are obliged to stop and take breath much sooner than those in which the configuration of the chest is perfect.

The general constitutional causes which give rise to malformation of the chest are the same as those which occasion incurvation of the spine. To shew their influence in the production of this disorder, it will be necessary to take a brief view of the process of respiration as far as the mechanical part of its functions are concerned.

In a healthy subject, where the thorax is well formed, during the erect position of the body, when the air has been expelled from the lungs, the ribs pass obliquely downwards from their vertebral attachments to their connexions with the sternum. In an ordinary inspiration, the levatores costarum

intercostales, &c. by their action, tend to elevate the ribs and sternum, and bring the sternal ends of the ribs nearer to a right angle with their vertebral extremities, and at the same time, by carrying the ribs and sternum outwards, increase the distance from the spine, and enlarge the circumference of the chest, while the diaphragm by its action pressing the contents of the abdomen downwards increases its capacity in its longitudinal axis or greater diameter. Majendie * supposes that the formation of the sternum, in a young subject, being divided into two parts by symphisis, the upper part of the lower portion has some motion outwards and thus assists its further enlargement.

After each inspiration is completed, the diaphragm becomes relaxed, and the abdominal muscles act in pushing the contents of the abdomen upwards, the sterno costales, and serrati postici inferiores pull down the ribs and sternum, in which they are assisted by the tendency of the latter to fall by their own gravity, the angle which the ribs and sternum form with the vertebræ, to which they are attached, is less, and the chest consequently becomes narrowed, and its capacity diminished. During inspiration, the chest, in

* Majendie Précis élémentaire de Physiologie, t. ii. p. 271.

its external appearance assumes a circular form; in expiration it aproaches more to that of an ellipsis.

The only difference with respect to the muscular agency in respiration is, that inspiration is effected solely by muscular power, whilst in expiration the influence of gravitation is superadded to it. In childhood, the constant inclination to active exertion induces a corresponding activity of the muscles employed in respiration, by which their strength is increased and the chest expanded to its utmost extent, thereby allowing ample space for the dilatation of the lungs, and the absorption of that portion of the air which is essential to the purposes of vitality.*

In children, on the contrary, who from defective alimentation have not the same muscular strength, the inclination to exercise is necessarily less, and as the effect of inaction is to do away with the necessity of taking in more than an ordinary inspiration, the muscles connected with that process will become debilitated, the abdominal and other

* It is, perhaps, not improbable, that to this salutary exercise of the muscles of the chest, which is necessarily employed in the inhalation of oxygen and other factitious airs, may some of the good effects which have been ascribed to their use be traced.

muscles concerned in expiration, aided by the continual influence of the gravity of the ribs and sternum, will acquire an undue power, so as effectually to counteract those of inspiration, and the chest will become permanently diminished in circumference.

The ribs themselves, also, will sometimes be found to be comparatively diminutive in bulk, in consequence of deficient muscular exertion; of this I have witnessed many proofs in deformed persons, where from the position in which the ribs were placed, by lapping over and laying close upon each other, it was scarcely possible there could have been any motion of them, or that only in a trifling degree during life, and when compared with other bones in the same subject, or with those of other persons of the same size, they were found considerably less both in bulk and weight.

It is not improbable that the ribs, in these cases, being less freely supplied with blood, the earthy and gelatinous depositions are proportionally decreased, and their substance consequently diminished.

To this deficiency of strength may the loss of the arched form of the bones be ascribed, an effect, perhaps, produced by the ribs firmly attached

at their connexions with the vertebræ, having to support the sternum at the extremity of a long lever, and to sustain the weight of it almost entirely, in consequence of the diminution of power in the muscles.

Whether the views here advanced, with regard to the causes of the disease, are correct or not, may perhaps, admit of some contrariety of opinion; but the fact is unquestionable, that children who have been nurtured entirely at the breast, have generally a much larger circumference of chest than those who have been brought up in any other manner. Of the truth of it any one may be easily satisfied who will take the trouble to make a comparison, in this respect, in children of the same family, or of different families, making, at the same time, a proper allowance for the natural differences which will arise in the comparative form of the parents.

There are some other causes of a local nature which ought to be particularly noticed, such as undue pressure made on the chest from the child being constantly held in one position by its nurse, without exercise, or in consequence of its being tightly laced or clothed.

The observations which I have made apply

chiefly to that deformity of the thorax which is met with during the period of infancy, yet a state of disease similar to this is not unfrequently produced at a more advanced period of life, by the injudicious use of stays or other mechanical contrivances, which, by pressing upon the ribs and impeding the natural actions of the thoracic viscera, occasion the respiration to be carried on solely by the action of the diaphragm, and sometimes lay the foundation of alarming disease.

Although in the treatment of the disorder I rely chiefly on the local means which are employed for restoring the chest to its natural figure, and have observed that even in delicate children, in proportion as the thorax has regained its proper form, the general health has amended in the same degree, yet this is by no means designed to preclude a proper attention to the diet and the general state of the constitution.

The method which I have employed with regard to the local means in those cases, where the spine has been exempt from disease, has been that of placing the intercostal muscles and those connected with the anterior part of the chest on the stretch, by placing the patient in a standing position, with the back against a cylindrical piece of

wood and the arms extended backwards. By this means an extension of the pectoral muscles is produced, and they are thus brought into full action upon the ribs as well as the muscles of the abdomen which are opponents to them. The position, as well as the condition of the muscles, may be imagined by that of a person in the act of attempting to throw a somerset backwards. While the patient is in this situation he is desired to take deep inspirations. I direct manipulation, and afterwards percussion, to be employed for one or two hours during the day, gradually increasing them in force according to the influence produced on the patient.

In addition to these means, I usually direct the patient to suspend the body by the arms, and similar modes of exercise, with a view to promote the full action of the pectorales, serrati magni, and postici muscles, &c. on the ribs, to produce the greatest possible extent of elevation of the ribs and sternum, and consequent expansion of the chest.

The benefit to be derived from this plan will, of necessity, depend much on the age of the patient; if the sternum and cartilages have not yet become completely ossified, although the disease

may have existed for a considerable length of time, a greater degree of benefit may be expected by a steady perseverance in the means recommended, than if the individual be at an age when the bones have acquired their solid state; and even in the latter case, much may be done by the increase of muscular power, for the relief of the patient. The good effects of this plan of treatment is not confined to the removal of the local disorder, but, as I have already stated, in treating of the distortion of the spine, is attended with still more important advantages with regard to the state of the general health. It is uniformly found, that, in proportion as the parts are restored to their natural form, the pulse is diminished in frequency; the respiration becomes fuller and easier, and the actions of the digestive organs, as well as of the bowels, become more regular and natural. A brief recital of the following cases will place the advantages of this mode of treatment in a more conspicuous point of view.

CASE I.

Miss E. L. etat. 13, September, 1819, of a light complexion, had a considerable fullness of the

third and fourth ribs on the right side, which attracted the notice of her friends; upon examination it was discovered that there was an incurvation of the bones near their middle. The child's health was delicate, she had a slight cough and quickness of pulse. The chest was longer than natural from the clavicle to the lowest false rib, as is usually observed in weak and debilitated subjects. The circumference of the thorax at the pit of the stomach, measured twenty inches and a half. Gentle aperients were administered twice a week; manipulation, and afterwards percussion, were employed for an hour each day, placing the patient in the attitude already described. This plan of treatment was persevered in for two months, when the parts were again examined. At this period the cough had subsided as well as the quickness of pulse; the general health was very much amended, and the projection of the ribs considerably less, the measurement being found to be twenty-three inches and a half. At the expiration of another month her general health was entirely restored, and the circumference of the chest at the part before mentioned, was twenty-four inches and a quarter, and the protuberance had entirely disappeared.

CASE II.

Master ——, etat. 15, July, 1819, of a light complexion; the chest when examined had the appearance as if a circular band had been passed round it just above the scrobiculus cordis, dividing the upper from the lower part. As this malformation of the thorax had escaped the notice of his friends, they could give me no information of the length of time it had existed. The circumference at the depressed part measured twenty-three inches when he took a full respiration. The pulse varied from ninety to one hundred and twenty. There was every appearance of health, as far as regarded the appetite, spirits and sleep at night, he complained of considerable uneasiness about the chest, however, on any increased exertion but not otherwise, and the pulse was so much accelerated, that it could scarcely be counted. In addition to the means before detailed, he was directed to raise himself by the arms as in the act of climbing, and to run certain distances without resting, so as to give greater action to the muscles of the thorax, and thus expand the chest.

At the expiration of a month the circumference of the chest at the contracted part, was twenty-

seven inches, making an increase in measurement of four inches.

In September he was again measured, and had gained half an inch more, making twenty-seven inches and a half; from this time no farther increase was observable, the chest being nearly restored to its natural proportions, and it was thought unnecessary to continue the mechanical means any longer for the purpose of exciting the muscles. The salutary influence of this plan on the functions of respiration was very manifest; at the commencement he was breathless and almost sinking from difficulty of breathing, after an attempt to run twenty yards; at the expiration of a month he could run at his utmost speed, till muscular fatigue of the limbs obliged him to desist.

CASE III.

M. M. etat. 24, June, 1818, of a fair complexion and blue eyes, pitted with the small pox, had from her early infancy an anterior incurvation of the spine, attended with difficult respiration, which has been at all times very much increased by any trifling exertion; the head could only be thrown so far backwards as to form a straight

line with the spine, and could not be turned round to its full extent. The measurement of the chest was twenty-five inches and a quarter at the scrob. cord. Her situation as a servant in a family not allowing me fully to make use of the mechanical modes of exercise in the manner I have described, I did not anticipate any material amendment in the state of her complaints; but thinking it right to attempt some mode of relief, however imperfect, I directed her to employ, as far as it lay in her power, means similar to those recommended in the former cases, with the exception of percussion; to take in a deep inspiration, so as to fill the cavity of the chest completely, and to throw the head as far back as possible with the arms extended, at such intervals in the day as her occupation permitted her, or till it produced fatigue. After persevering in this plan for two months, she expressed great satisfaction at the pleasurable change in her feelings, and she was now able to carry a pail of water to the top of the house without stopping, which she had never been able to do before. The lateral motion of the head was also more free; the incurvation was no longer perceptible, and she was enabled to carry the head as far backwards as in ordinary circumstances. The

measurement of the chest was now twenty-seven inches. She persevered in her plan of exercise a month longer, when she quitted the country. I have been induced to insert the history of this case, merely in order to show the advantages of muscular exercise under circumstances in which the plan of treatment could only be conducted very imperfectly.

CASE IV.

E. T. etat. 9 months, June, 1819, a child brought up by hand, had cough and difficult respiration; on inspection there was a considerable projection of the sternum, and flattening of the ribs on each side, giving to the thorax a triangular appearance; gentle aperients were directed occasionally, and manipulation used to the whole surface of the chest. By perseverance in this plan during two months, the cough and respiration were very much improved, and the chest was increased one inch and three-quarters in its circumference.

CASE V.

Miss L. etat. 7, March, 1821, had an enlargement of the right side of the thorax, occasioned

by a projection of the ribs, which included the fifth to the eighth; it was unattended with pain, and had been a considerable length of time in arriving at this state; in other respects the chest was well formed; her health was what would be called delicate. The usual plan of treatment was adopted in this case, and in the course of a month attended with a considerable diminution in the size of the swelling; it was adhered to during another month, with evident improvement in the state of her general health, and so great a subsidence of the tumour that the parents thought it unnecessary to continue her any longer under my care.

CASE VI.

Master A. etat. 12, April 20, 1821, of a light complexion, with a narrow chest, and protuberance of the fifth and sixth ribs at the junction of the sternum, was placed under my care on account of a cough, attended with slight expectoration, general debility, nervousness and breathlessness, from any trifling exertion or quickening of pace. The circumference of the chest, when measured at the scrobiculus cordis, was twenty two inches and three quarters, and at the project-

ing part, twenty-three inches and three quarters; the chest was not increased more than a quarter of an inch in circumference during a full inspiration. The plan before recommended was carefully pursued during six weeks in conjunction with the use of aperient medicines; at the expiration of which time the thorax measured at the scrob. cord. twenty-five inches; at the projection twenty-five inches; and, during a full inspiration, the circumference was increased two inches; the cough and expectoration had subsided as well as the quickness of pulse; indeed the amendment in his general health was progressive, and commensurate with the increasing size of the chest. The boy could now breathe with ease after exercise, was apparently in good health and spirits, and entered with alacrity into the usual amusements of his age.

CASE VII.

Miss M. etat. 7, July, 1821, of a light complexion, was recommended to me by a medical friend in consequence of her complaints not yielding to the usual remedies. Her general health was very delicate, and she was much debilitated. From what was stated I had a suspicion that the

chest was ill formed, and on inspection it was found narrower than usual; the sternum very much depressed, forming a cavity three eighths of an inch in depth, with a considerable projection of the extremities of the ribs on each side. The ensiform cartilage appeared to be turned back, and could not be felt; the upper false ribs were turned inwards, and could not be thrown out by the most powerful inspiration. The circumference of the chest, when measured between the fifth and sixth ribs, and at the junction of the true and false ribs, was nineteen inches.

The method of treatment before recommended was pursued for six weeks, at the end of which period the measurement round the scrob. cord. was found to be twenty-one inches and seven eighths; at the depression in the sternum one eighth of an inch. The projections of the ribs became less apparent; the ensiform cartilage resumed its situation; the ribs assumed a more natural appearance, and she was restored to a complete state of health and strength.

CASE VIII.

Master F. etat. 5-6, August, 1821, a boy stouter than the generality of children of his age, but of delicate health, had for some time laboured under considerable difficulty of breathing, and suffered repeated attacks of inflammation of the lungs, which were brought on by the slightest exposure to cold, and had several times reduced him so much as to render his recovery very doubtful. On examining the chest there appeared a flattening of the ribs and projection of the sternum. The measurement of the thorax by a line circumscribing the plane of the scrob. cord. was nineteen inches. In addition to the means usually resorted to, he was directed to take small doses of the hydrarg. cu. creta every night, and aperients twice a week. At the expiration of the first month the chest had gained one inch and a half in its circumference, the measurement being twenty inches and a half; after the lapse of six weeks more, an increase of one inch and a half, making three inches in the whole. At the expiration of this time, he caught a severe cold in consequence of being drenched in a heavy shower of rain, and the beneficial results which ensued from the increase of

capacity of the chest became sufficiently manifest to the observation of his friends, who remarked that a less degree of exposure to cold or wet had commonly subjected him to an attack of inflammation of the lungs. The child has since enjoyed a much better state of health than for two or three years past.

CASE IX.

The friends of Miss T. etat. $12\frac{1}{2}$, observed a projection of the left clavicle at its connexion with the rib; on measuring the thorax at the scrobiculus cordis, in December, 1821, the circumference was twenty-two inches and a half, which was increased one inch and a half on inspiration; the spine was perfectly straight, and she enjoyed good health. She was shampooed over the chest for an hour each day in the usual manner, and drew a weight of seven pounds by the head, backwards, as recommended in the treatment of distortion of the spine. At the expiration of five weeks the deformity was no longer observable; the chest was improved one inch and a half, and half an inch on inspiration. When in a state of expiration the admeasurement being twenty-

four inches, and on inspiration twenty-six inches in circumference.

CASE X.

Miss M. T. etat. 6, January, 1822, has suffered under considerable difficulty of breathing, the consequence of occasional attacks of inflammation of the lungs; on stooping or using exertion, the face became suffused with a purplish colour, shewing an imperfect oxygenation of the blood in that viscus. On the measurement of the thorax at the scrob cord, it was found to be twenty inches, the circumference of which was augmented one inch on inspiration.

This was not a small chest for a child of her age, nevertheless it was thought advisable to have recourse to the same means as recommended in the former cases. After a lapse of six weeks the admeasurement of the chest at the scrob. cord. was found to be twenty-one inches on expiration, and twenty-two inches on inspiration, being in the former state an increase of one inch, and in the latter two inches in circumference. The advantages of the method of treatment is not in this instance to be estimated merely by the actual augmentation of the size of the thorax, which was less

than in some others that have been related. Before this plan was commenced, the child was precluded from using much exertion, in consequence of the uneasiness about the chest, and the difficulty of breathing which it produced. By these means, however, the powers of respiration were so much improved that she could use active exercise without difficulty, and run as far without resting to take breath as most children of her age.

CASE XI.

A young lady, etat. 13, was placed under my care in March, 1822, her general health was delicate, a consequence of the small size of the thorax. Its circumference, between the second and third ribs, was twenty-three inches; at the scrob. cord. it was twenty-one inches and a half, and twenty-two inches and a half on inspiration. The means usually adopted were had recourse to in this case. At the expiration of six weeks, the admeasurement round the thorax, between the second and third ribs, was twenty-four inches and a half; at the scrob. cord., on expiration, twenty-four inches, and twenty-six inches on inspiration. In the general health there was equal improvement, with the augmentation in the size of the chest.

CHAP. IV.

CONTRACTIONS OF THE LIMBS.

THE term contraction has been usually applied to that state of the limb in which some portion of it is permanently bent, and its free motion either entirely or in a great degree impeded.

The appellation, however admissible in this general sense, serves to convey an incorrect notion of the nature of the disease, inasmuch as it is to be understood generally to imply that it consists in the preternatural contraction of particular muscles, whereas, in a great majority of instances, independently of other causes, the incapability of motion rather has its origin in muscular weakness, and is to be regarded as a consequence of decreased energy in the power of the muscles, more particularly of those which produce the extension of the limb.

The cases in which these contractions of the limb take place may be divided into two classes; those in which there is a complete immobility of

the joint, from an ossific union having taken place between the articulating extremities of the bones, or what is termed anchylosis, and those in which the motion of the joint is only partially lost. The first of these, or anchylosis, are those generally in which there has been considerable and highly active inflammation, in consequence of wounds or other violent injuries inflicted on the parts, or from caries of the heads of the bones connected with a scrophulous disposition of the habit; instances of the latter are more frequently met with in the joint of the hip, and those of the tarsus and carpus, than any other of the articulations. That anchylosis is not a very frequent termination of long protracted cases of disease in the joints, is noticed by Mr. Crowther,* who observes, " I have never seen, before nor since my first publication, more than four cases of the knee and one of the elbow anchylosed by ossific union."

The cases of distortion, in which the motion of the limb is not entirely abolished, arise generally from inflammation of the joint, connected with some internal disorder of the frame, as rheumatism, gout, &c. occasioning deposition of coa-

* Crowther on White Swellings, p. 39.

gulable lymph, or the formation of concretions; at other times, collections of fluid within the cavity of the joint, or an abrasion of the cartilaginous extremities of the bones. To these causes of impeded motion may be added spasmodic, or paralytic affections bruises of the muscles, or any occurrence which induces a confinement of the limb to a particular position for a considerable length of time.

In all cases arising from the causes which I have enumerated, if a careful examination be made, it will be found that the muscles of the limb are wasted and flaccid, and from long continued want of action, have almost entirely lost the power of moving it. The limb, unless means are taken for its prevention, is usually bent on the side, on which the largest and most powerful muscles are situated; thus the leg, from this cause, is bent backwards on the thigh, and the fore arm, by its flexor muscles, is drawn forwards towards the upper arm.

As one of the most frequent examples of contraction of the joint is met with in the knee, I shall select this, to elucidate in some degree, the distinction between anchylosis and that derangement of the parts which is remediable by art.

It is an object of primary importance, in all cases that have been preceded by severe inflammation, to ascertain the nature of the disease, and whether it has proceeded to such a destruction of the soft parts as to have occasioned anchylosis to take place between the articulating extremities of the bones, constituting the joint, or whether the mischievous effects of the disorder have not proceeded to such an extent, as it is obvious that any attempt to relieve the former, by the means which may be applicable to the cure of the latter, would not only be useless but highly injurious.

In those cases of diseased joint, where the limb is immoveable in consequence of the shortening of the flexor muscles, it is sometimes very difficult to ascertain, by the mere examination of the parts, whether anchylosis has taken place or not. In these instances, the history of the disease must be the guide to the practitioner in forming his opinion as to the propriety of attempting their cure. Whenever inflammation has been so severe and long continued as to produce erosion of the cartilages and an union of the articulating extremities of the bones, it will be found, on enquiry, that the pain previously, as well as during the absorption of the cartilages and articular surfaces, has

been of the most insupportable kind: that the patient has been unable to procure sleep, except by the use of the strongest opiates; and the pain, deep seated, and referred to the part which is the seat of disease, is immediately under the patella; and that the disorder has continued, without any diminution of swelling or remission of pain, accompanied with a grating sensation on the slightest motion of the limb; and lastly, that the pain has for some time preceded any appearance of external swelling, the growth of which has been gradual and uninterrupted. In the morbid change of structure of the synovial membrane mentioned by Mr. Brodie,* "the gradual progress of the enlargement and stiffness of the joint without pain, and the soft elastic swelling without fluctuation, in the majority of cases, enable us to distinguish it readily from all the other morbid affections to which the joints are liable."

This general history of the symptoms, which precede the absorption of cartilage, will be sufficient to distinguish the state of the parts preceding anchylosis from that which takes place in rheumatic affections, in which the pain is more diffused over the joint, and frequently accom-

* Brodie on Diseases of the Joints.

panied with wandering pains in various other joints. In the latter case, also, the swelling is not so permanent, and comes on, and arrives at its greatest bulk more suddenly. I have seen it very considerably enlarged in the course of a night. Richerand observes, "dans la varietè nommé rheumatismale la tumeur reste plus dure, et n' arrive jamais a un grosseur aussi considérable que chez les scrophuleux." *

From the examination of morbid parts made by different surgeons it appears, that even after a considerable degree of ulceration has taken place in the cartilaginous parts of the joints, although the cartilage itself is not renewed, yet that a new secretion of a hard smooth substance is formed, at the extremity of the bone, which serves to supply their loss. This has been observed by Mr. Mitten, † as having been noticed by Mr. Brooks and Mon. Tessier of Paris. Mr. Brodie says, "I have not hitherto examined any cases in which it appeared that there had been an attempt at the regeneration of the absorbed cartilages; and I have occasionally been able both to feel and to hear the hard surfaces of the bones grating against

* Nosographie Chirurgicale, tom. iii. p. 236.

† Tentamen Medicum de Morbis Artuum vitiis curandis.

each other in the motion of the joint, in such a manner, that it was evident that they had no cartilaginous coverings. In some instances a compact layer of bone is formed on the carious surface, nearly similar to what is seen in the healthy bone after the cartilage has been destroyed by maceration. I have many times, in dissection, observed a portion of the cartilage of a joint wanting, and in its place a thin layer of hard semi-transparent substance, of grey colour, and presenting an irregular granulated surface. In a subject in the dissecting room, I found no remains of cartilage on the bones of one hip, but in its place a crust of bony matter was formed, of a compact texture, of a white colour, smooth, and having an appearance not very unlike that of marble." Dissection demonstrates that ulceration of the cartilages occurs also in gouty subjects, independent of the formation of concretions. In confirmation of the opinion that restoration of the free motion of the limb is not incompatible with the apparent destruction of a portion of cartilage, I have witnessed examples of gouty concretions in the joints, where the grating sensation given on moving the limb proved that abrasion of the cartilages had taken place, and which subsequently

ceased after a long continuance of muscular exercise cautiously pursued.

In cases of contractions arising from spasm, paralysis of the antagonist muscles, gouty concretions, or any long standing complaint inducing confinement to a particular position, the distinction between these and the anchylosis will be sufficiently obvious. If the view hitherto taken of the subject be correct, it follows that the length of time that muscular contraction may have existed, is to be esteemed of importance only as retarding or protracting the cure, and not as ultimately preventing a successful result.

That crepitus or crackling which takes place on the motion of joints which have been long affected with rheumatic swelling, and which might be attributed to ulceration of the cartilages, appears sometimes to arise from a deficient secretion of synovia, I have traced this cause very satisfactorily in a patient, where the shoulder, elbow, hip, knee, and ancle joints equally partook of the same symptom. The knee joint was exercised alone, the crepitus, swelling, and pain diminished, first in that joint, and successively in the others as they were used. It is not unreasonable to suppose that a deficient secretion would be the result of inaction,

and, on the contrary, that increased motion of a part would augment the fluids poured into the joint, analogous to what we observe in other parts of the body.*

In corroboration of this opinion, I have witnessed the same sensation on the motion of joints which have remained a long time inactive, in consequence of the neighbouring muscles having been bruised, and where no suspicion of ulceration of cartilage could arise. In rheumatic swellings I have known this symptom subside in a week, after regular exercise of the limb. The removal of it in so short a time is incompatible with the supposition that any ulcerative process had been going on in the cartilages; it is also not unreasonable to suppose that, in the latter case, active muscular exercise would have proved injurious rather than beneficial. It is noticed here to shew that such symptom alone should not preclude the use of gentle motion of the joint, unless accompanied or preceded by those continued pains in the

* "La dissection des articulations, devenues roides à la suite de ces fractures, (de la partie moyenne des os longs) fait voir quélles contiennent bien moins de synovie que dans l'etat naturel, mais qu'il en existe encore. M. le Baron Boyer Traité des Maladies Chirurgicales, tom. iv. p. 558."

part which are usually symptomatic of ulceration of cartilage.

In the majority of instances, as I have before stated, the immobility and consequent loss of power in the extensor muscles of the limb, from inaction, is principally owing to the wasting of the muscles, so that in cases of diseased knee of long standing the rectus femoris is sometimes not much thicker than a wafer, it therefore must be an object of the first importance to endeavour to restore the muscular parts of the limb to their proper office. This object is most fully gained, according to my observation, by the use of such mechanical means as are best adapted to promote the gradual and gentle exercise of the muscles, and thereby to restore them to their former tone and power, precisely on the same principles as those which I have recommended in cases of distortion of the spine.

The contraction of a single muscle, or of a particular set of muscles, which concur in the same action, can be longer sustained than that of a great number of muscles put in action at the same time. It needs no proof to shew that the muscles of the arm for instance, can be exerted for a longer space of time, as in various branches of mechanical labour, than when the greater part of the

muscles of the whole body are put in exercise, as in dancing or any other similar mode of exertion. The sensorial power, from which it is reasonable to suppose the muscles derive their energy, is distributed in the latter case to a greater number, and consequently is exhausted in a shorter time than when it is directed to those of a particular part; they likewise act with less intensity, even for the short period in which they are employed. A very simple experiment will serve to put this in a clearer point of view; let a weight be supported in each hand, with the arms extended, until fatigue is produced in them, and afterwards severally, or by one arm at a time, and it will be found that, in the latter case, it can be sustained by either for a longer time than when the weight was supported by both simultaneously. It is evident that, in this case, the muscles of either arm sustain only the same weight as when they are put in action together, but the whole of the sensorial power being directed to the muscles of one side only, they are thereby enabled to continue their state of contraction for a longer space of time. This fact is of material consequence in our endeavours to give greater strength to the particular muscles, which are weakened in cases of distortion of the limbs, for by exciting these to action only, while those less

connected with the cause of weakness are suffered to remain in a certain degree at rest, they can be kept in action, and exerted with more energy for a longer space of time, and therefore more quickly restored to their natural strength and tone.

Although the adaptation of the mechanical means may in different cases admit of some modifications, yet as the principle to be aimed at in all of them is the same, viz. that of increasing the power of those muscles which have been kept too long in a state of extension, I have thought it sufficient, for all practical purposes, to select the method of treatment suited to the contraction of the knee joint, not only because of its greater frequency, but because the same or very similar means will be found applicable to almost all other cases of contracted joints. Considerable caution, however, ought to be observed in all cases of this description, in which there has been long continued inflammation, from whatever source it may have had its origin. Attention should also be paid to the patient's general health, particularly with reference to the action of the bowels, which ought to be kept in what is termed a soluble state to prevent the repetition of inflammatory action, that the progress in the cure of the local disease

may not be impeded by constitutional indisposition. If inflammatory action should supervene on using exercise, which will be indicated by permanent pain in the part, it should be immediately discontinued; rest should be enjoined, and the antiphlogistic plan of treatment resorted to.

On commencing muscular exercise, some slight degree of uneasiness is commonly felt under the patella, at the insertion of the rectus into that bone, and along the course of the muscles; the former will continue a few days, the latter will give more or less inconvenience during the progress of cure, according to the force which the muscles are daily accustomed to exert.

In those cases where there has been considerable inflammation of the parts, depositions of coagulable lymph, fluid, or gouty concretions in the joint, I think it better to trust their absorption to the influence of gentle exercise of the limb, rather than by the employment of friction, manipulation, or percussion on the joint itself, to incur the risk of the injurious consequences likely to result from the application of local stimulus to parts which, from previous disease, are more liable to the recurrence of inflammatory action. As this use of friction also to the joint itself is commonly at-

tended with some degree of soreness and stiffness of the part on its first application, a circumstance which might mislead the practitioner, and induce him to ascribe it to the effect of disease. I think it better in the first instance to direct friction, manipulation, or percussion to be applied over the extensor muscles of the thigh only. If the angle at which the tibia is fixed on the femur be acute, the patient being placed sitting on a high chair, a line passing over a pulley is affixed to the heel with a small weight attached to it, and he is desired to pull it steadily forwards, and continue to repeat the efforts till fatigue is induced. The first attempts should be continued only for a short time, and in proportion to the increased strength of the extensor muscles, the weight; as well as the length of time occupied in the exercise of the limb, should be gradually augmented. When by a steady perseverance in these means considerable motion has been gained, and sufficient strength acquired to allow the patient to bear his whole weight on the affected limb, a further plan may be adopted of extending the flexor muscles by placing the foot on an inclined plane (which may be made by attaching two pieces of flat board, about one foot and a half in length, and a foot in breadth, to

each other, so that when placed on the floor a triangle will be formed, the base of which is the ground, the point of attachment the apex,) the heel resting on the ground, and the toe towards the upper part. In this position the patient should stand on the affected leg only, holding by the back of a chair, so that by advancing the body forwards, or receding, the flexor muscles of the leg may be proportionally extended. This exercise should be persevered in as long as it can be borne without excessive fatigue, and repeated at intervals during the day.

The following cases will show the efficacy of the plan of treatment recommended:—

CASE I.

T. A. etat. 37, 1816, has had for several years past repeated attacks of rheumatic inflammation in the right knee, which terminated in stiffness; it could be bent backwards, but could not be straightened; the general health being good, local means only were resorted to. As the leg was not greatly bent on the thigh, he was enabled at once to commence the use of the inclined plane. The rectus femoris was, as usual, merely a co-

vering, like a thin skin over the bone, the flexors preserving nearly their usual size. There was considerable puffiness of the knee, and the uneasiness which he occasionally suffered during the progress towards recovery, frequently rendered it necessary to desist for a time from his usual exercise. By perseverance, however, in seven months he recovered entirely the use of the limb.

CASE II.

M. L. etat. 13, September, 1819, of a pale and dark complexion, has had, during six or seven years past, repeated attacks of inflammation of the left knee joint, which appeared to be rheumatic. Four years since the leg became contracted upon the thigh; on inspection, the extensor muscles of the thigh were wasted; there was great swelling and puffiness of the joint; uneasiness, not amounting to pain, upon pressure, more, perhaps, from distension of fluid in the joint than any other cause. The leg formed a right angle with the thigh, and admitted of no motion. As general debility prevailed to a great degree, I commenced by giving three grains of the carbonate of iron twice a day, and aperients twice a week. Mani-

pulation, and afterwards percussion, were directed to be used to the muscles of the thigh for an hour each day, and gentle exercise in a chair in the manner before recommended. At the expiration of a month a very slight motion was gained; some uneasiness was felt under the patella, particularly at its connexion with the tibia, which led to great caution in the employment of the exercise, which was at intervals discontinued until the pain subsided, and then resumed as before.

By persevering in this cautious manner during two or three months, considerable increase of size and strength of the limb was gained; the swelling of the knee was much diminished, and the motion of the joint became more free.

When he had acquired such an extent of motion and power in the limb as to be able to bear upon it, he was placed with the foot resting upon the inclined plane before described, and remained as long a time as he could support it.

After a lapse of five months more, still observing great caution as to the extent of exercise, which was rendered necessary by the occasional recurrence of pain, the limb became straight, and he regained its complete use.

CASE III.

A gentleman applied to me with an apparent anchylosis of the two first joints of the left toe, the consequence of repeated attacks of gout. As it prevented the proper action of the foot in walking, it was productive of considerable inconvenience, and he was anxious to attempt some remedy for it. He had been careful in regard to diet and exercise, and therefore had not suffered lately from gout. He was directed, by standing on the left foot, to raise the body gently, to bear as much weight on the toe, and for as long a time as he was enabled to support without much pain, and repeat this frequently with caution; when any uneasiness was induced, a poultice was applied, and a few days rest given; by perseverance in this plan during three months, he entirely recovered the use of the respective joints.

CASE IV.

J. E. etat. 28, January, 1822, has suffered during the last six weeks under inflammation of the cartilages of the left knee joint. The pain at

night was so acute that he was unable to procure rest but by the use of powerful opiates. A repetition of leeches to the part, alterative doses of pil hydrarg, purgatives, and a succession of blisters were prescribed during two months, with the effect of totally removing the pain and swelling, the disease notwithstanding terminated in an immobility of the joint. The leg became bent upon the thigh in consequence of his having preserved it in that position as one which gave him the least pain. With a view to restore the parts to their proper motion, by enabling the extensors to counteract the power of the flexors, he was placed on the inclined plane before mentioned every day, standing on the diseased leg alone as long as he could support it. By perseverance in this plan during three weeks, (with the exception of four days that he was desired to desist in consequence of his feeling some pain in the part,) the leg became perfectly straight, and he suffered no inconvenience in its use.

CASES

OF

CHRONIC MUSCULAR AFFECTIONS.

CASE I.

J. M. etat 50, has been incapable during the last twelve months of moving the wrist or fingers, which were bent on the palm of the hand; this he attributed to exposure to a current of cold air. The complaint, at its commencement, was attended with great pain, which was relieved in two months by the administration of purgatives, fomentations, and blisters. There appeared to be some derangement of the digestive functions, I therefore prescribed alterative doses of mercury, with purgatives twice a week; manipulation and percussion were directed to be used for an hour each day over the extensor muscles, and as much muscular exercise of the arm as he could support; in addition to this also, a splint was placed on the inside

of the arm, to the extremity of which a spring was attached with a view to press back the hand; the force was increased by a gradation of others of greater strength as he became able to bear them, and they were taken off when pain was occasioned by their use. By perseverance in these means, at the expiration of seven weeks he acquired the use of the wrist and fingers.

CASE II.

A lady was thrown from a chaise and fell with great violence on the shoulder, which produced much swelling and inflammation from the summit downwards; the usual means, bleeding from the arm, antiphlogistic topical remedies, &c. were had recourse to. On the subsidence of the tumefaction, which existed for a considerable time, the patient experienced an inability to raise the arm from the side, and every attempt to do so was attended with distressing pain, and she could scarcely endure the slightest motion of it. After the lapse of twelve months I saw her; on examination, the only marks of disease were slight tenderness on pressure, and great diminution in size of the supra and infra spinati, and deltoid muscles. Manipu-

lation and afterwards percussion were used during an hour each day, and the patient was directed to exercise the arm by drawing a weight over a pulley, varying the position of it according to circumstances. The first effect was that of augmenting the pain and uneasiness; this was apparently occasioned by the increased exercise of muscles which had been wasted from disuse, in consequence of pain accompanying their action; it was succeeded, however, by a greater diminution of pain than had been before experienced. By perseverance in this plan for six weeks, gradually increasing the weight according to the capability of the muscles to bear the augmentation, the limb was restored to its wonted powers.

CASE III.

K. L. etat. 37, 1820, has, during the last two or three years, complained of considerable uneasiness and weakness in the whole course of the spine, but particularly in the lumbar region; so greatly did he suffer when in an erect posture that he was unable to preserve it for any length of time, and was under the necessity of reclining on a sofa during the greater part of the day, ex-

cept when business compelled him to exertion. In addition to these complaints he suffered much from pain in the right shoulder, which prevented the free motion of the arm; the bowels were confined and did not act unless he had recourse to purgatives. I directed small doses of a mercurial alterative with occasional aperients, and that percussion should be employed for an hour once or twice a day along the spine and upon the shoulder, together with such exercise as to call the whole of the muscles of the spine into strong action. He was also directed to exercise the arm three or four times during the day, with a weight in the hand, till full perspiration was excited, observing always the precaution to lay down on a sofa after the exercise had induced fatigue. By perseverance in this method of treatment for the space of three months, the pain and uneasiness in the back and shoulder gradually decreased; the debilitated muscles of the spine regained their full strength, and the arm was restored to its usual vigour. Mercurial remedies had been before exhibited in this disorder without any advantage; it is therefore not unreasonable to presume that to the agency of muscular action was the patient chiefly indebted for the beneficial result.

CASE IV.

H. L. etat. 40, was thrown down on the pavement, and severely bruised on the hip, when in the seventh month of her pregnancy. The parts became very much swollen and painful; she was incapable of walking, nor could she bear any pressure on the limb without its being attended with extreme pain. The remedies usually applied to subdue inflammation were resorted to on this occasion. She was confined to her bed from the time of the accident till after her lying in. When she recovered from her accouchement, she was equally as unable as before to bear any weight on the foot. After the lapse of twelve months she applied to me; on examination, scarcely a vestige of the glutæi muscles remained; the muscles of the thigh also were much diminished in size, and there was some uneasiness on pressure, not amounting to pain. The limb could be moved in all directions by another person, though the attempt occasioned considerable uneasiness to the patient. The symptoms attendant on this case, distinctly negatived the supposition of any other disease than the mere absorption of muscular substance from inaction. Manipulation was directed to be

applied over the hip and thigh; she was desired to make gentle attempts to exercise the limb several times during the day, by swinging it backwards and forwards till the muscles became fatigued. Having by this means acquired some little power and freedom of motion, it was deemed advisable, with a view to promote the action of the glutæi muscles in particular, to affix a strap to the heel, to which a weight of six pounds was connected by a line running over a pulley, and oblige her (standing on the other leg) to draw the weight backwards. When she had acquired sufficient strength to allow her to bear on the affected limb solely, she was required to stand on that leg only, to bend the body forwards, keeping the leg straight, and raise and depress it alternately till fatigue was induced. By perseverance in this plan, for the space of five or six months, she was enabled to leave off her crutches, to walk without a stick, and carry a pailful of water up three pair of stairs without assistance.

CHAP. V.

ON PARALYSIS.

Palsy may be defined to be a disease in which there is a partial or total loss of sensation or power, or both; of the muscles depending on the will, or those which are partly voluntary and partly involuntary.

Palsies have been differently distinguished according to the parts which may be affected; thus, when the disease takes place on one side of the body only, it is termed hemiplegia; when half the body transversely is affected, paraplegia.

As it is not my intention to give a history of these different forms of disease, but only that which will best illustrate the advantages of a mode of treatment which has hitherto been either overlooked or too much neglected by the profession, I shall single out hemiplegia and paraplegia as the best suited to effect that purpose.

The precursory symptoms of hemiplegia are

the same as those which are usually observed on the coming on of apoplexy, of which it is commonly a sequel, viz. drowsiness, giddiness, pain in the head, which is described as more circumscribed than in simple cases of apoplexy; confusion of ideas, loss of memory, great irritability of temper, hesitation of speech, double or indistinct vision. The symptoms which more immediately characterise it are, a partial or complete loss of power of the muscles of one side of the body, not only of those which are voluntary, but also those of a mixed character, as the intercostals. The disease, however, is not always confined to one side. I have a case under my observation where the right arm and left leg are paralyzed. The sense of feeling in the part is diminished, or so much lost that it may be pricked, or even burnt, without the person being conscious of any feeling.

The paralytic limb is sometimes perfectly motionless, but not unfrequently is found to have a shaking motion, sometimes the muscles of one limb of the affected side will be in a state of relaxation, whilst those of the other are permanently contracted; to these symptoms a decrease of the natural heat, and diminution of the bulk of the limb are to be added.

It has been stated * that the sensibility may continue unimpaired, or even be increased in a greater degree than natural; it may be questioned whether this circumstance should not be esteemed as a proof that the parts are recovering their healthy functions, and therefore imply rather an approach to convalescence than a symptom of disease.

I have seen several cases of hemiplegia where the strabismus has been slight, and where, from the inability to direct the muscles of voluntary motion in walking, the patient has exhibited to an ordinary spectator the appearance of intoxication.

The immediate causes mentioned by writers on this subject are to be referred to whatever occasions pressure on the brain or spinal marrow, or an alteration in their structure, and may be briefly enumerated under the following heads †, effusion of blood, of limpid, serous, gelatinous or bloody fluids, between the cranium and the meninges, between the pia mater and the brain, and in the ventricles, tumours, lesions, ulceration of the cerebrum, the presence of hydatids ‡, a deficiency

* Pinel Nosographie Philosophique.

† Morgagni de Morbis Capitis 'Epist Anat, 62. 9.

‡ Id. xi. 6.

of different parts, as cavities * in the substance of the brain †, obliteration of the corpora striata ‡, softness of the cerebellum §, schirrus of nearly the whole of the cerebellum.

The appearances, on dissection, will depend in some measure on the duration of the disease, in recent cases shewing extravasation of blood, in others ulceration of the brain||.

The remote or indirect causes of paralysis are, the suppression of regular discharges, such as the menstrual, hemorrhoidal fluxes, perspiration, &c. or the disuse of customary evacuations, bleeding, cupping, and the healing of ulcers which have existed for a considerable length of time, without either setting up another discharge or increasing the bodily exercise, or diminishing the quantity or quality of the aliment.

The causes which may be considered as more immediately exciting, or by their direct action producing paralysis, are intoxication, narcotics, anger, terror, grief, anxiety, or any other strong emotion or passion of the mind; to these may be added mechanical injury to the brain or spinal marrow, and the sudden application of cold.

* Serres. † Willis. ‡ Morgagni. lxii. 9. § Id. 15.
|| Hunter on the Blood, p. 213.

The general causes may be traced to the usual habits of civilized life, which are such as to occasion, either directly or indirectly, general or local plethora; amongst the direct may be enumerated the too free use of animal food, and that perhaps highly seasoned, without a sufficient admixture of vegetables with it; the excessive use of vinous and fermented liquors.

The indirect causes of plethora are, sedentary habits of life, although the diet be moderate; its consequences in persons of studious habits, on the state of the digestive organs, must be sufficiently manifest. It will be equally evident that the operation of these causes, either collectively or separately, must have a tendency to produce a plethoric habit of body, especially if we reflect that, to the healthy actions of the animal frame, a certain equilibrium seems necessary to be preserved between the assimilatory and excretory functions, and that a redundancy on the one side, or a deficiency on the other, must tend to destroy that harmony of the whole, on which the preservation of health so essentially depends.

That temperate persons, and those of thin and spare habits, should be liable to the invasion of this disease, is explicable on the supposition that

although the quantity of aliment taken into the system be not great, yet that, if the excretions from the effect of exercise be not proportionate, the balance will not be maintained, and disease must be the necessary consequence.

The converse also is illustrated in a case of inordinate appetite, related by Dr. Cochrane*, of a man who swallowed sixteen pounds of solid animal food, with six bottles of porter, in the course of twenty-four hours, and was preserved in good health by the great discharge from the skin keeping up the balance of the system.

The greater liability of its occurrence to those who are somewhat advanced in life, appears to originate in some measure from a longer continuance of the remote causes, and from the habits of persons of mature age being such as to foster a greater tendency to plethora. The early part of life is usually spent in active exertion, with a view to future ease and enjoyment, and the majority derive their chief gratifications either in a respite from those exertions, or from indulgence in the pleasures of the table, both of which causes, as it has been shewn, will equally tend, either indirectly

* Medical and Physical Journal, No. 13.

or positively, to the production of apoplexy or paralytic affections.

With the exception of mechanical injury, I conceive the exciting causes inadequate to the production of the disease, unless a plethoric habit of body be presupposed.

The rare occurrence of paralytic affections among the soldiery * may be greatly attributed both to the regularity of bodily exercise, and to their comparative moderation in diet, independently of the period of life at which they quit the service.

The treatment may be considered under two heads, preventive and curative.

The preventive measures will necessarily consist in guarding against the remote causes; patients who from headach, vertigo, or any of the symptoms enumerated under the head of the remote and exciting, or whose parents having been afflicted with the disease, have reason to fear its occurrence, would do well to observe a spare diet, and to take regular exercise, which should at first be moderate, and afterwards may be gradually and safely increased. To what extent this ought to be carried cannot be easily determined,

* Dr. Cook on Palsy.

but it is advisable that it should be powerful, and continued until a full and free perspiration be induced.

A caution here also may not be useless to those persons who, from feeling some forewarning of symptoms threatening this disease, are in the habit of losing blood, or being cupped at regular periods as a measure of prevention; the pleasureable sensations which follow the abstraction of blood leads them too often to overlook the causes which render such practice necessary. But it should not be forgotten that this temporary expedient renders them, by degrees, more liable to the attacks of the disorder, inasmuch as it is itself a cause of increasing the plethoric state of the habit.

It would be more judicious, either by abstinence, by the use of a less nutritious diet, or by additional exercise, or both, to endeavour to remove the causes of disease, than to have recourse to a means which, though it may appear for a time to palliate the mischief, must eventually, by its repetition, tend to aggravate it.

On the first attack, blood-letting, as a curative means, holds the first rank; in all instances it ought to be taken away freely; regulating the

quantity, however, according to the state of the symptoms, the period and habits of life of the patient, and the greater or less disturbance of the functions of the brain, without reference to the loss of power of the limbs.

In cases where the patient is young, or not greatly advanced in years, and of a full habit, and there is great derangement of the powers of the mind, it is advisable to bleed largely, both generally and topically; of the immediate advantages of which mode of practice, numerous instances might be cited from the writings of almost all those who have treated on the subject; neither, in my opinion, ought the circumstance of advanced life to be regarded as an objection, provided the symptoms are such as to indicate great vascular action.

If the view hitherto taken of the exciting and other causes be correct, the employment of emetics will appear to be of very questionable utility; they are objectionable on the ground of exciting a great influx and determination of blood to the head, which is not compensated by any stimulant properties they may be supposed to have on the stomach, in which view only they appear admissible, especially as the latter may be attained by much less hazardous methods.

To purgative remedies the same objections do not apply; their exhibition has been recommended, and their efficacy established on the concurring testimony of the greater number of writers; they may be used with advantage in every stage of the disorder.

In that state of paralytic disease where, from the previous habits of the patient, and from other symptoms, there is reason to suspect derangement of the liver in particular, or general visceral disorder, some of the forms of mercury may be usefully conjoined with purgatives; and in these cases also depletion should not be carried to the same extent as in those where the causes of disease have been of a more active kind.

Various stimulants, both internal and external, have been resorted to, and recommended by different authors. The Bath and Buxton waters internally and externally. Rhus toxicodendron, nux vomica, arnica montana, raphanus rusticanus, cantharides, semen sinapeos, opium, valerian, camphor, castor, ether, the mineral acids, ammonia, lavender, blisters, the actual cautery, burning with moxa, galvanism, electricity, warm and cold bathing, and friction.

Each of these remedies has been extolled by

those who have treated upon their respective uses, and each in its turn has disappointed the expectations of those who have relied on its exclusive administration. As the exhibition of stimulant remedies appears to have prevailed very generally in this complaint, it may be useful to enter more fully into the question, and discuss impartially their respective advantages and disadvantages.

The principle upon which they appear to have been administered has been that of stimulating the nervous power, under a supposition of its being defective. If we advert to the appearances on dissection, and review the causes that have given rise to it, we find that the deficiency in the distribution of nervous energy has arisen either from pressure or effusion on the brain, or from some alteration in its structure, occasioned, in most instances, by a more rapid or slow operation of causes which have a tendency to produce increased vascular action in that viscus; if they have been of an active kind, it is probable that rupture of the vessels has taken place, for it is to be presumed that a great state of fullness of the vessels of the brain is likely to be attended by a corresponding weakness of their coats from constant distension;

if they are of a slower kind, effusion or ulceration will be the consequence, according as it affects a secreting surface, as the ventricles, or the substance of the brain itself.

If the theory of the disease be correct, it necessarily follows that internal stimulants given with a view of acting on the nervous system, must, if not absolutely injurious, be at least of questionable utility; and indeed many of those who have at first advocated their use have admitted that, in many cases, they ought to be suspended or given up, from an apprehension of fatal consequences; indeed they must in all cases be regarded as totally inadmissible until the plethoric state of the system which originally gave rise to the complaint be removed, and under such circumstances only should they be had recourse to.

The manner in which stimulants are supposed to operate in this disorder, is by increasing that energy of the brain which is necessary to the production of muscular action. The stimulus, however, which appears to me the most safe, the most completely under our controul, and the best calculated to effect this object, is that of frequent exercise excited by or dependant on volition.

From the phenomena which the disease presents, it would appear, that an interruption takes place between the sensorial and muscular power, between the governing principle and the subordinate agent, by which the movements of the body are performed; and although the pressure or other cause affecting the brain be removed, and its healthy functions restored, yet the connexion having been once destroyed between the sensorium and the muscles, the habit of association has been thereby lost, and the latter are no longer subservient to the dictates of the will.

The necessity of the frequent exercise of volition, to accustom the muscles to obey the impulse of the mind, and its influence in producing that effect may be illustrated by a reference to those arts in which the association between volition and action, is enjoyed in the highest practical degree of attainment, as in those of fencing, dancing, especially on the tight and slack rope, the feats of jugglers, &c. &c.

A tyro has the same power of volition over the number of muscles which are to be exerted, as the most expert professors of the respective arts; but his first efforts are, however, unconnected and irregular, and it is only by repeated attempts that

he is enabled to acquire the power of immediate association between volition and muscular action.

A want of attention to these, and other circumstances which will be hereafter detailed, will explain the general failure of the usual means that have been resorted to for the cure of paralytic affections after the primary disease of the brain, whatever may have been its nature, has been removed; the intimate connexion and dependance which exists between the sensorial and muscular power has not been adverted to, and that most powerful of all muscular stimulants, volition, has been altogether overlooked, or regarded only as a casual and secondary means of cure.

We constantly see individuals who have attained the full and free use of the leg of the affected side, whilst the arm, perhaps, hangs as useless as when first attacked by the disease. Dr. Cooke, in his valuable History of Palsy, observes, that "in hemiplegia it almost always happens that the power of the leg returns long before that of the arm; I have even seen more than one case in which the arm of the affected side has remained paralytic for several years after the restoration of the leg *."

* p. 12.

The character of the malady, in the majority of these cases, as far as relates to the state of the brain, must be the same, and the reason of the difference in the recovery of the two limbs will not appear difficult of explanation. The invalid is under the necessity of using the leg frequently, the efforts of volition on the muscles are stronger and more constantly exercised, and necessarily produce a greater determination of blood to the limb, and consequently an increase in its bulk and strength. The action of the arm not being so indispensably requisite for the common purposes of life, the inducement to the exercise of it is less, especially as its uses can be readily supplied by that of its fellow.

To external stimulants the same observations are not equally applicable, although the utility, or perhaps even safety of their exhibition will depend, as in that of internal stimuli, on the primary disease of the brain being removed. The administration, therefore, of such powerful stimulants as electricity and galvanism must be inadmissible while there remains a general excitement or local increased action in the brain.

With the restrictions before laid down as to the removal of the predisposing and exciting

causes, and of the vascular excitement of the brain prior to their use, a trial of such as may appear best adapted to the case may be allowed of. A want of attention to this, in the treatment of paralytic affections, may, perhaps, account for many cases of failure in the application of stimulant remedies. In my opinion, the advantages to be derived from the actual cautery, and burning with moxa, are not compensated by the pain they occasion, and may be attained by means that are much more effectual. Friction with the hand, manipulation, or percussion, appear to have a local effect on the nerves distributed upon the muscles, by increasing their energy as well as inducing a greater sanguiferous circulation, and a consequent enlargement and correspondent increase of strength in them. These stimuli I consider inferior in their effect to that excitement produced by the act of volition; they are, nevertheless, to be regarded as powerful auxiliaries.

To obtain the full benefit of these means, viz. friction, manipulation, or percussion, they should be employed simply without the addition of stimulant substances, particularly that of friction, otherwise soreness of the skin will be produced, which will render it necessary to discontinue the

remedy, as the increased irritation excited on the skin will not afford an advantage equivalent to the regular application of this stimulus to the muscular nerves.

As the manner in which these excitants act, is upon the same principle, they may be used indiscriminately, though perhaps manipulation and percussion are preferable to friction, particularly the latter, as the skin is not so easily abraded thereby; it also can be carried to such an extent, with regard to force, as to act on the deeper seated muscles, and it is performed with greater ease to the operator.

If friction be used, some dry powder, such as flour or some oleaginous substance should be rubbed on the skin, but if percussion be preferred, these adjuncts will be unnecessary. It is advisable to continue them for one or two hours at intervals during the day.

It here becomes necessary also to advert to a part of the general method of cure, without attention to which all our efforts will prove abortive, viz. regimen. The diet of the patient should consist of the plainest and most simple kind; animal food, as a general rule, should not be eaten oftener than every other day, and that sparingly; if it be

eaten every day it should form only part of a meal; pudding, or fish without high seasoned sauces, making up the remainder. As a general rule, also, the patient should finish his meal before the appetite is fully satiated; this should be most rigidly enforced, for otherwise when the paralytic limbs have recovered their powers, a renewal of the malady may take place in the brain, and either carry off the patient or render it necessary to commence the treatment de novo. It should be most carefully impressed on the minds of patients who have suffered attacks of paralysis, more particularly at a late period of life, that no exemption from a relapse can be insured to them, unless a strict attention be paid to the avoidance of the predisposing and exciting causes; but it may fairly be stated, that by abstinence and strict adherence to the precautions before laid down, a more favourable issue may be anticipated than writers on this subject are willing to allow.

Paraplegia.—Many of the causes that give rise to hemiplegia are also incident to paraplegia, but independently of these, the latter is frequently produced by disease of the spinal column, or enlargements of the ligaments occasioning pressure on the spinal marrow.

The theory of the disease, as propounded by Dr. Baillie *, that there is often effusion between the membranes of the brain, and that serum so formed may fall into the theca vertebralis, and press upon the lower part of the spinal marrow, appears highly probable, and enables us to explain some of those cases where no disease of the spine or any of the ligaments has been discoverable on examination.

We find this communication between the parts in cases of spina bifida, and in children affected by it, the limbs are most usually paralytic. It is also illustrated in the case related by Mr. Astley Cooper †, in which he tried the cure of spina bifida by means of pressure, the mother observing that during the time pressure was made on the tumour the child was occasionally convulsed.

The constitutional remedies are the same as those which have been recommended for the cure of hemiplegia.

If there should be tenderness on pressing any part of the spinal column, giving reason to suspect inflammation, or thickening of the ligaments or

* Transactions of the College of Physicians.

† Medico Chirurgical Transactions, vol. ii. p. 323.

cartilages, the application of leeches, and a repetition of blisters may be resorted to, in my opinion, with greater advantage than issues or setons. Purgatives should be had recourse to at the same time.

After the adoption of these means, the return of sensation, however trivial, should be hailed as the signal for the commencement of the local treatment by muscular exercise, assisted by friction, manipulation, or percussion, the extent of which should be regulated according to the progressively increasing strength and powers of the patient. In some instances I think these measures may be resorted to, even before there is a return of sensation. In a patient on whom this plan was adopted, although at the commencement there was not the slightest sense of feeling in the lower limbs, so much so that he was scalded, and vesications produced without his being sensible of it, and the bladder and rectum appeared also to participate; yet by the use of these means, especially that of directing the influence of the will to attempt motion, at the same time exhibiting constitutional remedies, the powers of sensation and motion kept pace with each other, and were so far restored that the patient was enabled to walk.

In another instance, on the contrary, where there was a return of sensation, and where, in consequence of gentle muscular exercise of the limbs, there appeared a gradual increase of strength, both sensation and muscular power were suddenly lost and never afterwards regained.

I have usually advised that the patient should observe a recumbent position, and in that posture make use of muscular exertion till a considerable degree of strength was acquired.

It has been remarked by patients who have suffered much from the spasmodic twitchings and pains in the night, described by Pott *, that on using considerable muscular exertion, or frequently attempting it, and repeating it at intervals during the day-time, the pains and cramps either did not occur or were lessened. To effect this object it appeared to be necessary to induce complete fatigue.

CASE I.

Master K., etat. 11, of a light complexion, eight years since was suddenly deprived of speech,

* Farther remarks on the useless state of the lower limbs, &c.

and the use of both legs and the right arm, by a paralytic seizure. At this time, June, 1819, his articulation is very feeble and indistinct; he is not understood by strangers, not always by his friends, and only when close to him; his walk is unsteady, resembling that of a person intoxicated; a slight impediment, such as that of a stone lying in his path, is sufficient to throw him down; he is unable to carry a cup of tea to his lips, cut his food, or feed himself with his right hand. The appetite and general health are good; tongue remarkably clean, and the bowels regular. He has some pustular eruptions over the skin, for which small doses of the hydrarg. cu creta were prescribed every night, and the magnes sulphas twice a week. The measurement of the right arm, across the middle of the biceps muscle, is six inches. He was directed to pay strict attention to diet, and to avoid eating meat more frequently than twice or thrice a week. With a view to increase the power of the muscles of respiration, and those connected with the voice, he was desired to stand at a considerable distance and repeat the letters of the alphabet, or any short sentences that he had been taught, increasing the distance at which he spoke, as he acquired

strength of articulation. He was directed to hold a weight in the right hand, and to add to it from time to time as his strength became augmented; he was enjoined also to stand on each leg singly till it became fatigued, to lower and raise the body alternately, supporting it entirely on one leg, and he was induced to attempt to hop and jump frequently by receiving slight rewards when he excelled. This plan was pursued steadily during the space of twelve months; at the expiration of that time he could articulate distinctly, so as to be heard at the distance of forty or fifty yards; the arm increased one inch and a half in circumference; he was able to support a weight of nine pounds in the right hand, with the arm extended; he could jump forty or fifty times without resting; run with tolerable swiftness, and walk five or six miles or more in the course of the day.

CASE II.

A. S., etat. 65, June, 1819, was attacked, twelve months ago, with a paralysis of the whole of the left side, from which he had recovered, with the exception of the left arm, which was totally

useless. The measurement around the arm, at the middle of the biceps muscle, was seven inches and a quarter. He was directed to pay strict attention to diet and the state of the bowels, to prevent a renewal of the affection of the brain, and as he appeared in other respects in good health, local means only were resorted to; shampooing was used over the whole arm every day. As there was no voluntary motion of the arm, but merely that which was communicated by the movement of the trunk, he was directed to exert the act of volition frequently, by attempting to move it. The first efforts were attended with scarcely any effect; but by successive exertions of the will he gained a trifling degree of power. In July he was desired to try to hold a very small weight, and by accommodating its increase to his improving strength, at the expiration of twelve months the arm was increased two inches and a half in circumference; it became useful, and although not so powerful as the other, yet strong enough to enable him to resume his occupation.

CASE III.

E. A. was suddenly deprived of the use of the upper and lower extremities, in consequence of

the baneful habit of taking large quantities of laudanum. This attack was preceded by pains throughout the whole of the muscular system, particularly in the muscles of the limbs, and followed by an extreme degree of emaciation. Her mind was not otherwise affected than as shewing that apathy to external impressions which usually accompanies the influence of this narcotic. The quantity of laudanum taken throughout the day was directed to be gradually diminished by filling up the vessel containing it with a portion of water equal to that which was taken out. Any attempt at a more gradual reduction was attended with the most distressing feelings to the patient, so as to give rise to all the symptom of approaching dissolution. The patient was allowed a liberal diet, and small doses of the sulphas. ferri. twice a day, and purgatives twice a week were administered with the effect of improving the general health. Frictions were directed to be used to the extremities twice in the twenty-four hours with evident benefit. The patient, though incapable, was directed to attempt to stand, and by the repetition of these efforts succeeded, and acquired strength. The lower extremities had attained nearly their full power, when the arms or hands could scarcely be

moved from the side. She was advised, therefore, in addition to the frictions, to hold a small weight in the hand, and exercise with it till fatigue was induced; a weight also was suspended from the ceiling by a line over a pulley, with a handle attached to one extremity; the hands were tied to it, as the muscular power was not sufficient to enable her to grasp the handle, and this was drawn up several hundred times during the day, increasing its amount in proportion as the strength improved. By perseverance in this method, for the space of eighteen months, a restoration to health, and the power of the hands and arms was effected.

CASE IV.

Master J. W., etat. 12, at three years of age, after an attack of fever, was seized apparently with a paralytic affection of the right leg; various means were tried for his relief without success; amongst other remedies, irons had been worn for a period of nearly two years. On examination, March, 1821, the leg was hanging useless; there was a slight contraction of the knee joint, and an inability of raising the thigh

backwards or forwards. The muscles of the hip, thigh, and leg, were very much wasted; the foot was two inches shorter than the other, and formed an arch, so that when placed on the ground, the only points of support were the extremity of the great toe and the heel; there was no vestige of the tendo achilles; a considerable lateral incurvation of the spine had also taken place from the necessity of supporting the body on the other leg.

The upper part of the thigh, below pouparts ligament, measured, in circumference, eight inches and a half; about the middle, eight inches; the calf of the leg, six inches and three-quarters; the distance from the trochanter major to the malleolus externus was twenty-two inches and a half; length of the foot, six inches and a quarter. The measurement of the sound limb was, at the upper part of the thigh, twelve inches and a half; middle, twelve inches; foot, eight inches and a quarter; calf, nine inches and a quarter.

As the child's general health was by no means good, and the appearance of the tongue, &c. indicated deranged secretions, alterative doses of the hydrarg. cu creta. were given every night, with gentle aperients twice a week; manipulation

and percussion were used over the whole of the thigh and leg during an hour each day, and he was directed to stand on the sound leg, supported by a crutch, and to try to swing the affected limb to its utmost extent, and to endeavour each time to throw it out further than the preceding, repeat it as frequently, and during as great a length of time as he could bear.

At the expiration of the first month the following increase had taken place in the size of the limb:—the upper part of the thigh, three inches and a quarter; middle, three inches and a quarter; calf of the leg, one quarter of an inch; length of the foot, three quarters of an inch; the tendo achilles could with difficulty be distinguished.

This plan being persevered in till considerable strength was gained in the muscles which move the thigh on the pelvis, he then was directed, with a view of increasing the labour, to kneel and balance the body on the affected limb, and in this situation gradually to attempt progressive motion, till he had acquired (what may be called) a facility of running on his knees: having gained thus much, it became an object to increase the powers of the extensor muscles of the leg; for this purpose, being placed in a chair, and a strap

fastened to the heel, with a cord passing over a pulley, and a weight of two pounds attached to it, he was desired to move the leg forwards, and repeat his attempts till complete fatigue was brought on. The weight was gradually increased to four, and at last to six pounds.

After this had been continued for two months, he acquired sufficient strength to enable him to bear on the affected limb, assisting himself by fixing the hands on the back of a chair, which was not deemed advisable to attempt before, lest the limb should give way, by allowing it to support the weight of the body before the muscles and ligaments had acquired the power to preserve it in the proper situation; subsequently he became strong enough to balance the body on the diseased leg alone, which was continued till he was tired, and repeated very frequently during the day. He was now able, standing on the sound limb alone, to draw a weight of thirty-seven pounds backwards, and six pounds forwards, when the strap before described was attached to the heel or fore part of the foot.

The chief obstacles remaining were the shortness of the foot, and the incapability of placing it flat on the ground from the contraction of the plantar

aponeurosis. The method pursued to obviate this difficulty, was that of standing on the diseased leg alone, placing the extremities of the toes on the ground, and elevating the heel by placing a board underneath it, and gradually increasing its thickness as the tendon became extended; the height to which it was raised was regulated by the effect it produced in its extension, taking care, although some uneasiness was necessarily produced, to avoid giving much pain.

The measurement of the limb was as follows:— of the upper part of the thigh, thirteen inches and a half; of the middle of the thigh, nine inches and a quarter; of the calf of the leg, seven inches and a quarter; of the sole of the foot, seven inches and five-eights. The glutæi muscles of the side affected, are very much increased in size; the tendo achilles is also considerably enlarged.

The patient, although not entirely recovered, and still requiring a continuance of the means before detailed, is able to walk two miles with the assistance of a stick.

CASE V.

H. K. etat. 13 months, was suddenly seized with a paralytic affection of the left arm and leg. In consequence of the indisposition of the mother, this child had been fed with a larger quantity of spoon victuals than the stomach could readily digest, to which cause the occurrence of the disease may be attributed.

By strict attention to diet, in not allowing any other nourishment than the mother could supply the exhibition of gentle aperients twice a week, and manipulation over the arm and leg one or two hours during the day, in the course of ten weeks the infant completely recovered the use of her limbs.

CASE VI.

T. B. etat. 40, was, three years since, deprived of speech and the use of his right leg by paralysis, which was slow in its approach. His trade was that of making the patent yellow, at which he worked five years, and during that time suffered severely from cholic, and occasional uneasiness about the head; he has always been temperate in his habits of living.

He cannot at this time, August, 1821, speak to be understood, is very irritable, walks badly, and when he rises from his chair, or endeavours to turn round, when standing or walking, is under the necessity of dancing about a few seconds till he can controul the muscles of the lower extremities. If there is a determination of blood to the head, induced by stooping, or any emotion of the mind, such as anger, the left side of the face becomes remarkably florid, whilst the other remains pallid.

To relieve the head-ach, fourteen ounces of blood were taken from the arm, and a blister applied to the back of the neck, five grains of the pilul. hydrargyri were prescribed three times a week, and such a portion of magnes. sulphat. as was sufficient to procure two evacuations every day. He was enjoined to abstain from malt liquor or spirits, and not to eat meat more frequently than once or twice a week. To improve his powers of articulation he was desired to speak loudly and slowly to a person near him, increasing the distance at which he spoke as his voice became more powerful; he was desired also to stand on the affected limb only, and alternately to lower and raise the body upon it so as to give

to the muscles increased exertion. By persevering in the above-mentioned plan, at the expiration of eight months his articulation became much more distinct, the muscles of the limbs were under the controul of the will, and he could walk eight or nine miles without much fatigue.

It is at the same time but right to remark, that if he is agitated and attempts to talk fast, that the articulation becomes indistinct; also if he is hurried, and rises from his chair or turns round suddenly, he is obliged to dance about till he recovers his balance; but if desired to sit down and get up again slowly, or to turn round more leisurely, he effects either the one or the other without difficulty with a tolerably firm step, evidently shewing that the muscles are much more under the direction of the mind.

CHAP. VI.

CHOREA ST. VITI.

THE irregular and convulsive actions of the muscles of one side of the body, their being no longer under the guidance of the will, evidently demonstrate an interruption to the transmission of nervous influence; the confusion of mind, the irritability accompanying this disorder, the conversion also of the one disease into the other, induce me to consider it as a modification of hemiplegia occurring in a young subject*. Thus we know that pressure on the brain will produce hemiplegia, and when occasioned by effused fluid, irregular action of the voluntary muscles; we see the same thing, in a less degree, occurring to individuals at a more advanced age during paralysis; on the examination of a child who, some time before death, had jerking and convulsive

* Mead.

motions of the right arm and leg, not continued but occasional, I found a considerable quantity of water effused in the left ventricle of the brain.

In a young woman who laboured under a constant involuntary motion of the arm, which was synchronous with the pulse, beating regularly one hundred and twenty strokes, the symptoms at the commencement of the attack clearly indicated that their had been pressure on the brain.

In the case of a woman aged 40, a patient of the public dispensary, a convulsive jerking of the right arm occurred every second pulsation; she had a fit about two months prior to the attack, and suffered much from head-achs, which were confined to the left side of the head. This complaint was removed in a few days, by one bleeding and the use of purgatives. It appears probable that a greater degree of the same cause, in both these instances, might have produced paralysis.

It is remarked by Sydenham, that the disease occurs more frequently among girls than boys; in the cases given by Mr. Andree*, the proportion is four to one, in those recited by Dr. Hamilton †, five to four; the comparatively less exercise

* Andree on Chorea. † Hamilton on Purgative Med.

taken by the former, may, in some measure, account for their greater liability to its attacks.

In addition to the symptoms above enumerated, there is usually head-ach experienced on the side opposite to the part affected, hesitation of speech, and dulness of intellect. Though the faculties of the mind are frequently impaired, the memory more especially, yet it is not a constant accompaniment of this disorder, as in several cases of chorea that have fallen under my care, the individuals have displayed considerable acuteness of mind; in one of the most severe and troublesome which I have met with, and which yielded with the utmost difficulty to the means employed, the intellectual faculties were particularly acute.

Dissections of those who have laboured under this complaint have been rarely made; in a case related by Dr. Copland*, a quantity of turbid serum was found within the spinal canal, and the serous membrane covering its sides were more vascular than usual.

Sydenham recommends bleeding to the third or fourth time, and purging every other day. Tonics and stimulants of different kinds have also been resorted to with various degrees of success.

* London Medical Repository, January, 1821.

To these remedies the same observations are applicable, as in the treatment of hemiplegia. With respect to the general treatment, bleeding appears to be unnecessary, and therefore unadvisable, except in cases where great vascular excitement is present. Upon the whole I am rather disposed to place a reliance on the plan of purging, the efficacy of which, in recent cases,* Dr. Hamilton has fully established. In consequence of the beneficial results which had ensued from the employment of the exercise of volition, in restoring the connexion between the sensorial and muscular power in paralytic affections, I was induced to try its influence in the cure of chorea; with what degree of success will be shewn by the following cases, two of which were of long standing, and the usual remedies had been found unavailing.

CASE I.

E. P. etat. 11, a quick and lively girl, in the spring of 1814 was attacked with chorea, which had been preceded by considerable head-ach, affecting the right arm and leg. In 1815, a twelvemonth from the commencement of the

* On Purgative Medicines.

disease, the solutio. arsenici was exhibited twice a day in the dose of eight drops; purgatives, consisting of rhubarb and calomel, were given twice a week, aided by the muscular exercise of the arm and leg. This plan was persevered in for six weeks, and was attended with the complete removal of the disease.

The intellects of this child remained however much impaired; her memory was neither so retentive, nor had she the same quickness of comprehension as before the attack.

CASE II.

Master R. when between ten and eleven years of age, was, in the night attacked, by a paralysis of the whole of the right side, supposed to be occasioned by fright; at the expiration of twelve months I saw him, when he had a continual cough, indistinct articulation, and perpetual convulsive motion of the right leg and arm; after the lapse of another year, from the invasion of the disease, he was placed under my care: it may be necessary here to premise, that during this period purgatives were had recourse to, as well as various tonics, arsenic, nitrate of silver to such an extent as to

discolour the skin; zinc, electricity, sea-bathing, and every means which an intelligent and affectionate relative could procure, or medical skill suggest, had been tried with very little advantage.

At this time, October, 1818, he had acquired more power in the arm and leg, but the irregular action of the muscles was so great, that in the act of drinking he frequently threw the glass or cup from him with a jerk, and when sitting at table had no power of controuling the motion of the leg, so as to prevent him from striking those who sat next to him.

Though in the preceding case, the administration of arsenic, conjoined with purgatives and muscular exercise, was attended with a beneficial result, yet as, in consequence of their being used together, it was uncertain to which of these remedies the favourable termination was to be attributed, I determined to give the two former a fair trial. After continuing the use of them for two months without any decided advantage, I resolved on making trial of muscular exertion alone, and though I had anticipated its good effects, was surprised at its speedy influence over the disorder; he was in the morning directed to attempt to hold a weight of four pounds and a half,

with the arm extended, as long as he was able, and to repeat it several times during the day; he was directed also to stand on the right leg only, till it would bear him no longer, and repeat it continually. On the same evening the convulsive motions were lessened, and after persevering in this plan till the expiration of a month they entirely ceased.

So great was the increased muscular power, that he was now enabled, by repeated trials, to support the whole of the weight of the body by the diseased arm alone.

I was induced to suppose that muscular action might be usefully employed in this case, not only from the similarity of the previous symptoms to those of paralysis, but also from observing that the frequency of convulsive motions in the leg was diminished, and its strength improved in a greater degree than in the arm, which I attributed to the more frequent exercise of the limb.

On a review of this case, it appears that an interruption had taken place in the connexion subsisting between the brain and muscular system; the former was restored to its healthy functions, but in consequence of the interruption to the sensorial excitement conveyed to the

muscles by means of the nerves, they had lost the power of obeying the impulse of the will, and, in consequence of diminished exercise, were less freely supplied with blood, and had become debilitated; the unity and connected action between these parts was to be acquired anew: it therefore appeared that the most rational mode of procedure was to enforce the frequent exercise of the power of volition over them, so as to bring them under its natural controul.

CASE III.

Master H. etat. 15, was placed under my care in July, 1819. He had laboured under convulsive and irregular actions of the muscles of the trunk, upper extremities, neck, head, face, and eye-lids, during the last nine years. Within the last twelve months the disorder was suspended for a fortnight, during the appearance of the nettle rash, when it again recurred, accompanied with a constant snuffling, snorting, and a barking noise, sometimes loud enough to be heard at the distance of more than a quarter of a mile, and so frequent as to occur twenty or thirty times during his dinner. The following

memoranda were taken of the case; the tongue is furred, the bowels are habitually costive, the pulse varies from 90 to 120. He is quick of apprehension, easily irritated, but remarkably cheerful and good-tempered. It has been observed by his friends that, on the whole, the convulsive motions were less frequent when he was confined to a low diet and his bowels kept in a soluble state. Any attempt to resist these irregular actions, even for a short time, fatigued him excessively, produced great uneasiness about the chest, and apparently aggravated the disorder.

Exercise, or any emotion or passion of the mind that accelerated the circulation, increased the contortions in different parts of the body. On examination, the thorax was found contracted, the extent of which, and the means adopted for its removal, have been stated under the head of distortion of the chest (Case II.).

Various means had been resorted to for the removal of this disease, purgatives, electricity for the space of six months, daily for the first, and twice a day during the next three months; he took anodynes, underwent a course of mercury, and had an issue applied to the nape of the neck.

A sea voyage had also been recommended and tried, without deriving any other advantage from it than that of the improvement of the general health.

I determined, as in the last case, to try the influence of the sol. mineral arsenici. of which he took ten drops thrice a day for two months, and purgatives of calomel and pulv. rhæi. twice a week, without any diminution of the convulsive motions of the body; the former was therefore discontinued, and purgatives only were persevered in.

The principal indication appeared to be, in this as in the former case, to restore the influence of the will over the muscles, by the frequent and powerful exercise of volition over them; for this purpose he was desired to hold a weight in each hand successively, with the arm extended as long as he could support it, to carry as great a weight on the top of the head as he could bear, balancing it without the assistance of the hands, and proportioning its increase to his improving strength, and he was daily required to stand for an hour, and to endeavour to restrain the convulsive twitchings of the eye-lids. He was encouraged also to use different kinds of muscular exercise,

such as digging, climbing trees, and to run as far as he could at a time, without stopping to recover his breath. In October the barking noises entirely ceased, and the convulsive twitchings in different parts of the body were much improved.

In January every complaint was, to all appearance, entirely removed; the bowels were regular, the pulse varying from 70 to 75, and he remained rather more than three weeks free from disorder of any kind, but in consequence of his paying a visit to his friends, and intermitting the exercises and the strict attention which had hitherto been paid to his diet, he suffered a slight relapse with respect to the involuntary contractions of the eye-lids. He continued in this state during a year, sometimes free from any complaint for a week or fortnight, and occasionally a return of the nictation. To remove this affection the ung. antim. tartariz. was rubbed on each side of the face, and occasionally a very small blister applied on the upper or under eye-lid, with the view, by giving some uneasiness on the motion of the parts, to induce him to restrain their inordinate action.

These applications answered the intention whilst the least soreness remained, but as soon

as the irritation ceased the convulsive affection returned.

That he possessed the same controul over the muscles moving the eye-lids as the others, cannot be doubted, for independently of intervals of a week or a fortnight, when he was totally free from any complaint, in the company of strangers he could restrain himself for five or six hours without incurring a suspicion of his labouring under any disorder. On the contrary, when alone and supposing himself unnoticed, he has been observed to give an unrestrained freedom to these contortions of the countenance, which he admitted gave him pleasure.

On a review of this case, it appears that the original malady of the brain had been removed by the long continuance of the purgative course, assisted by the strict adherence to a moderate diet, and that the different modes of exercise were instrumental, by means of the frequent and powerful exertion of the faculty of volition, in re-establishing the influence of the sensorial over the muscular power. The want of success in conquering the irregular motions of the eye-lids may be imputed somewhat to the difficulty of eradicating a disorder which had been long habitual,

partly to the action of the eye-lids being in some measure involuntary, but principally that its entire removal depended very much upon his own voluntary exertions, as the same external agents calculated to oblige the muscles to exercise the act of volition, were not equally applicable to the muscles of the eye-lids as to those of the limbs and neck.

CHAP. VII.

MISCELLANEOUS OBSERVATIONS.

THERE are various other disordered states of the body which do not admit of being classed under any of the above-mentioned heads, for the relief of which muscular exercise may be employed with material advantage. In intractable cases of chronic rheumatism, which are generally if not always connected with impaired digestion, or functional or organic derangement of the liver, it may be advantageously used in conjunction with some of the preparations of mercury *. The cure of the disease, in general, may perhaps be ascribed exclusively to the administration of that medicine: several cases have, however, fallen under my observation, where mercury has been previously

* The use of mercury, in chronic rheumatism, has been warmly eulogized by Mr. Cheshire, in a Treatise on the subject, in 1734.

given, to a considerable extent, by itself, and failed of the desired relief in consequence of the loss of muscular substance of the limbs, as already noticed, where its subsequent use, in conjunction with muscular exercise, has afterwards effected a complete removal of the disorder. To derive the full benefit from its employment, in these cases, it will be necessary to pay attention to the diet, and to the cautions, as to the regulation of exercise, before given, that the exertion should be progressive according to the patients capability to support it; that those parts which are the seat of disease should be especially called into action; and that when the patients strength will permit, it should be pursued till full and free perspiration is produced.

It appears that there is an advantage in exciting perspiration, by this means rather than by internal remedies, as it is not followed by that debility which ensues from the administration of diaphoretics or sudorifics. Nor is the patient so liable to relapse; of this I have witnessed a remarkable instance where the disease was of several years standing, in which any occasional accession of cold air produced a recurrence of general rheumatic pains. After using strong

muscular exercise, however, in the manner before recommended, the patient was enabled to bear exposure to easterly or north-easterly winds without inconvenience.

The state of spasm in which the sterno cleido mastoid muscle is sometimes found, denominated wry neck, usually has its source in disorder of the stomach and bowels, and, in general, yields readily to purgatives, anodynes, and fomentations. But if the disease should have become permanent, it admits of a cure by the means above-mentioned.

The observation in the third chapter, that the proportionate deposition of gelatinous and earthy substances in the bones, and their consequent solidity and strength, depend on the relative quantity of blood circulating through them, and, of consequence, on the degree of muscular action induced in the limb, will lead to the inference, that the employment of friction, shampooing, or percussion, would be found beneficial in rickets, mollities ossium, and those cases of fracture in which ligamentous instead of ossific union has taken place.

It is, perhaps, unnecessary to remark, with regard to its proposed application in the latter

case, that if percussion, which would be the preferable mode of rousing the action of the vessels of the part, be made use of, a most perfect quiescence of the limb should be preserved; that it should be employed twice or thrice a day for an hour each time, and that any trial for a less period than three months may be deemed insufficient for the removal of the complaint. A striking evidence of the increase of bulk which bones acquire, in consequence of greater muscular exertion, was lately furnished in the case of a paralytic subject, in whom the heels had remained three or four years drawn up by the contraction of the muscles of the calf, so that the sole of the foot nearly formed a straight line with the back part of the leg. By making use of the inclined plane before described, and such other means as were calculated to bring the extensors of the legs into action, at the same time greatly augmenting the exercise used by the patient, in the course of four months the posterior parts of the os calcis on each side, into which the tendo achilles is inserted, was, to appearance, nearly doubled in size.

The influence of exercise in diminishing the frequency of the pulse is not undeserving of

notice in this place. In the case of a young gentleman, whom I directed to use considerable muscular exertion, the first effect was to produce a considerable increased quickness of the pulse; at the expiration of a quarter or half an hour, however, when the immediate acceleration from exercise had abated, the number of beats has been reduced twenty and thirty in a minute. The same effect I have also frequently witnessed in adult age. In a gentleman of forty years of age, whose pulse had regularly, during two years, beat ninety strokes in a minute, it fell to eighty, and subsequently seventy-five, on using daily strong muscular exercise.

In gouty concretions of the joints, excitement of the muscles, whether by voluntary exercise or other modes, as those of friction, shampooing, or percussion, or a combination of all of them, may be employed with success, observing the caution before given to bring into action the muscles which move the affected joints, and to limit the friction, &c. to those parts only, rather than apply it to the seat of disease. By following this method, in one instance, I have succeeded in removing the complaint in several joints where it had existed eleven years. In this state of disorder

it may be also remarked, that it is indispensably necessary to avoid those causes which have laid the foundation of the complaint, and by the observance of an abstemious regimen and general exercise, to endeavour to prevent a recurrence.

The accession both of strength and fullness which the voice acquires in those young patients in whom an increase of size takes place in the chest, in consequence of a greater exertion of the muscles connected with it, as well as the improvement in the powers of articulation in paralytic patients, produced by increased muscular efforts, lead, I think, to the probable conclusion, that such means may be found useful in persons afflicted with the imperfection of speech called stammering. Slighter cases of this affection may arise from diffidence, which, by distracting the mind of the individual, prevents the proper direction of the influence of volition to the nerves of muscular motion; some of the more severe cases would appear to depend upon paralysis of some of the muscles employed in verbal articulation. In the greater number of instances, when the disorder has been of long standing, the paralytic affection has been subdued by a renovation of the proper function of the nerves; but, as

it has been observed before in the remarks on chorea, the chain of connexion between the mind and the nerves distributed to the muscles having been broken, the muscles connected with speech are not so much under the controul of the will as before, and therefore, to produce a correct articulation, a greater effort of volition is required than in ordinary circumstances. Thus instances are not unfrequently met with, where persons who stutter and stammer greatly, can sing without difficulty or interruption, the latter requiring a much greater effort of the muscles of respiration, as well as those which modulate the voice, than ordinary speech. This fact is strictly analagous to what was observed in the case of master R—, who, although he was unable to execute the usual movements of the arm without convulsive jerkings, could support a weight, with the arm extended, with perfect steadiness till fatigue obliged him to desist. The mode of cure, which consists in calling the muscles into strong action, is exemplified (independently of those which have been narrated) in the well known instance of *Demosthenes*, and in two cases related in the Dictionnaire des Sciences Medicales. In attempting its removal the same cautions as before given should be observed, that

the nervous affection, whatever may have been its cause be first removed, and its recurrence prevented. But this caution may, perhaps, be necessary only in recent cases, as after some time a renovation of nervous power takes place, and the renewal of the association between volition and muscular action alone is required.

In conclusion, I cannot but esteem muscular action as a powerful agent in the cure of disease, although its utility must necessarily depend on its proper application to individual cases; and it would be no less unwise to discard many powerful remedies from the Materia Medica, which have been misused, or are occasionally liable to abuse, as to neglect this as a remedy, because it may have been sometimes incautiously employed in disorders in themselves incurable, or abused in others, in which, under proper restrictions, it may have been susceptible of affording material benefit.

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