Practical observations on distortions of the spine, chest, and limbs : together with remarks on paralytic and other diseases connected with impaired or defective motion / by William Tilleard Ward.

Dr. Francis H. Brown.

PRACTICAL OBSERVATIONS

ON

DISTORTIONS OF THE SPINE,

CHEST, AND LIMBS;

TOGETHER WITH

REMARKS ON PARALYTIC

AND OTHER DISEASES

CONNECTED WITH IMPAIRED OR DEFECTIVE MOTION.

BY

WILLIAM TILLEARD WARD, F. L. S.

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GUTTA CAVAT LAPIDEM NON VI SED SÆPE CADENDO.

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SIR ASTLEY COOPER, BART., F.R.S., G.C.H., D.C.L.,

&c. &c.

SERJEANT SURGEON TO THE QUEEN,

THIS WORK

IS DEDICATED AS A TESTIMONY OF RESPECT

FOR HIS TALENTS AS A SURGEON,

AND FROM A SENSE OF OBLIGATION

FOR

PROFESSIONAL KINDNESS,

BY

THE AUTHOR.

PREFACE

TO

THE SECOND EDITION.

SINCE the publication of the First Edition of this Treatise, various works have appeared on the subject of Spinal Distortion, by the late Drs. Harrison, Jarrold, Messrs. Shaw and Bampfield, and by Messrs. Dods, Beale, Hare, Delpech, &c. From some of these the Author differs: a more extended observation has tended to strengthen the opinions advanced, and to prove the propriety of the practice founded upon them. Some addition has

been made to the cases, already perhaps too numerous, of distortion of the spine, and chronic affections of the lungs accompanied by spitting of blood and irregularity of circulation dependant on it, in order to illustrate more fully the opinions adduced, as well as the practice recommended.

18, Rivers Street, Bath.

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 observed 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

* Since the publication of this treatise, two instances have occurred at different periods, which bear out these remarks; both cases of disease of the hip-joint in children, one eleven, the other four years of age, which had been under the care of surgeons of deserved reputation, whose remedies had been *effectual* in removing the *disease*. Both had been treated in the usual manner by leeches and recent blistering, and in both little prospect was held out to the parents of a successful termination: under these circumstances they were brought to me. In order to ascertain whether the symptoms present were the effect of remedies, or of the disease, and as making pressure on the part would be a necessary step towards a diagnosis, I desired all remedies to be discontinued, and to see them again in the course of a month after the parts were healed. In both, all inflammatory appearances had subsided; there was no tenderness on pressure, and the patients were *well* with the exception of contraction, which readily yielded afterwards to the means employed.

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 showing 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 exclusively 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 the

author of this work, 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 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

* Pugh on Muscular Motion, 1794.

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

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 to that life of inaction, particularly with reference to the exercise of the upper

parts of the body, consequent upon wealth and refinement *.

The history and treatment of paralysis and of chorea, as far as belongs to the province of surgery, have 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

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

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.

31, Percy Street, Bedford Square.

CONTENTS.

Page

CHAPTER II.

OF THE CURVED SPINE.

CHAPTER III.

OF DEFORMITY OF THE CHEST.

Page

CHAPTER IV.

ON SPINAL CURVATURE AND MALFORMATION OF CHEST, ACCOMPANIED BY HÆMOPTYSIS AND THREATENING CONSUMPTION.

CHAPTER V.

CONTRACTIONS OF THE LIMBS.

CHAPTER VI.

ON PARALYSIS.

* See Aston Key, Guy's Hospital Report.

Page

CHAPTER VII.

CHOREA ST. VITI.

CHAPTER VIII.

MISCELLANEOUS OBSERVATIONS.

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 inquiry 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 inquiry 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 inquiry, 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 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

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

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 dependance 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 dependance 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 air-cells 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 which 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 development of power in the muscles is proportionate to the degree of exercise imposed on them, is shown 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†."

This phenomenon is neither altogether without analogies in the animal body, nor is its solution difficult according to our present physiological

* 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.

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

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

shown 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 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 sei-

zure 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 contractilité de tissu est une peu alterée du coté affecté, mais jamais elle n'est totalement détruite, de manière à ce que dans l'amputation d'un membre paralysé, il n'y ait point de retraction musculaire. J'ai fait cette expérience sur un chien. Les nerfs ayant été coupés dix jours auparavant, et le membre ayant resté immobile depuis cette époque, la section des muscles produisit un écartement manifeste entre leurs bords, et même en coupant ensuite comparativement le membre resta sain : je ne trouvais aucune différence."

A comparison between the living and dead body still further 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

* Bichat, Anatomie générale, tom. ii.

† Dr. Fordyce, Philosophical Transactions, vol. lxxviii, p. 29.

from its origin to its insertion." A remarkable proof of this spontaneous contractility of the muscle is shown 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 remained in the state they were left by the accident, till the callous 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

* Philosophical Transactions, vol. lxxxv, p. 210.

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 versâ*, 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 increasing 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, appears 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 mentioned in treating of those diseases under their respective heads.

CHAPTER 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 inquiry 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 scarcely 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 here noticed, and unconnected with caries, 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 on 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 on 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 déviations 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 presenté 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. Cases

* De Rachitide, p. 147.

† Bichat, Traité d'Anatomie Déscriptive, tom. ii, p. 210.

of this affection occur, in a greater or less degree, to hard students and persons of sedentary lives and studious habits of the male sex, which must be familiar to the recollection of my readers, and have occasionally fallen under my own notice.

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. Amongst the number may also be included all those females who are not under the necessity of using much exercise, whether it be of a laborious nature, or otherwise, such as dress-makers and those who earn a livelihood by sedentary occupations. 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 defective. 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, that dispose the young, in all classes of animals, to active exercise, which exertion is the means of producing a greater inclination for food, of improving the powers of assimilation, and of favouring the progressive growth of the body; and in proportion as their wants become less, and they no longer require such assistance, the inclination diminishes with declining age.

In making these observations, however, I wish to exonerate the conductors of those establishments from the censure implied by the foregoing remarks, by observing, that many are fully aware of the causes of the evils here detailed, and deplore the mischiefs that arise from the neglect of exercise suitable to young persons. But they are the creatures of a system which they cannot control. Girls are placed under their tuition for a limited period, during which time it is expected that they shall be *crammed, literally crammed*, with knowledge and accomplishments of various kinds, all of which, with the exception of dancing, are of a sedentary nature, and tend to engender habits of inaction. They have much to execute in a given

space of time; and it is not to be wondered at, where professional character is at stake, if, in the anxiety to effect the wished-for attainments, the physical condition of the pupil be either entirely overlooked, or become an object of secondary importance; and the more so, as cases of the kind are generally unattended by pain; and the disorder is often of so insidious a character in its approach, as not readily to excite the attention of those, who are in the habit of domestic association. It is therefore to parents that we must look for the application of the remedy. Let not the young person be urged to mental exertions incompatible with her health and strength; and let it be taken into consideration, that the faculties of the mind, equally with those of the body, have their limits; that if the muscles of the body be on any occasion tasked beyond their powers, weakness will ensue, from which the individual will not recover during several days; so with regard to the brain, if more labour be required from that organ than it is capable of supporting with ease, in an equal ratio will mental debility be induced. Numerous instances may be adduced, of both the bodily and mental functions having broken down by being overworked, which must be familiar to my readers. How much more will be attained with facility in a given space of time by a young person moderately tasked, than one jaded by the labours of the preceding day. The more perfect the physical health,

the greater will be the aptitude for, and capability of intellectual acquisition. It would therefore appear desirable, even in an economical point of view, that a sufficient portion of exercise should be taken for the preservation of the bodily health, upon which the support of the mental faculty so materially depends.

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 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,

* Lichtenstein remarks, that amongst the Koossas, where 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.

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 diseases arising from privation of food be not much less frequent than those occasioned by the contrary extreme, 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 *.

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

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

Parents who either in their own persons have laboured under curvature of spine, or whose progenitors have been afflicted with that disorder, have expressed themselves as distressed at having been the means of conveying a disease to their offspring: it appears a mistaken view of the subject, and that the principal error has been committed in the erroneous manner of bringing up their children. Of this I had a marked instance in the eldest child of a large family, respecting

whom I was consulted, the friends on both sides having had spinal curvature in their respective families. By altering their mode of management with regard to both diet and exercise, every one of the junior members has grown up straight.

One of the causes of distortion which occurs also not unfrequently, should not be omitted; *viz.* any accident or injury, happening to the feet, or lower limbs, which either incapacitates the individual from using one limb to the same extent, or with the same power as the other, inducing disposition to stand more upon one leg than the other, for the purpose of favouring the weakened, or hurt limb. Infantile paralysis is one of the most frequent occurrence, to which I have been enabled to trace many instances of spinal curvature.

Short-sightedness also, may be enumerated as one amongst the causes that give rise to excurvation of the spine; this includes the lower cervical and upper dorsal vertebræ; the frequent necessity for advancing the head forwards and downwards, as in reading, working, or drawing, will readily account for this form of complaint in those children that do not wear glasses; and the propriety of their use, either after the distortion is removed, or to prevent the recurrence of the disorder, will readily suggest itself to parents.

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 symptons 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, in a majority of cases, 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 gene-

rally 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

* The smaller muscles of the spine, may be considered as subservient to the purpose of preserving the relative positions 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 shown 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

vertebræ with each other, at the same time that the sacro-lumbales, spinales, and longissimi dorsi, &c. move them as a whole, when fixed by the smaller muscles.

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

* 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.

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 equilibrium. 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.

It is to be recollected, that every time the right arm is powerfully, or even moderately employed, for instance, in carrying a weight, the right leg is usually made the point of support: the limb being thus, by its extra exertion, rendered stronger than the

other, is used more frequently; the muscles of that limb which can be exerted with the greatest facility, being most commonly put into action, as giving least trouble to the individual.

In two hundred and eighty-two cases of spinal curvature that have fallen under my observation, and of which I have taken notes, the following has been the proportion in which they occurred:

Of curvature to the right side without disease	230
Of curvature to the left side without disease	10
Of posterior curvature unaccompanied by disease	9
Of posterior curvature with disease	30
Of that which I denominate incurvation, *i. e.* projection of the lumbar vertebræ within the pelvis	3

It is probable that the registry of hospitals would afford a different result, by giving a greater proportion of cases arising from disease.

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

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

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 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 connection also with the muscular structure, may be assigned as the cause of their general 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,

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

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

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 occurrence 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 equalizing 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 redditis, 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

* Van Swieten, Comment. in Boerh. Aphor.

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

* Il y a des courbures latérales vicieuses commes des antérieures, où ces courbures présentent un phénomène remarquable; c'est que des qu'il en existe une dans un sens à une région, les autres régions en présentent bientôt d'autres en sens alternative-

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 many cases of long standing, that have fallen 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

ment inverses. Supposez, par exemple, qu'un depôt une bride, &c. forcent à incliner la portion cervicale de l'épine à droite, bientôt pour soutenir le centre de gravité la région dorsale se courbe à gauche, et par suite la région lombaire à droite en sorte que tout le tronc se ressent bientôt de la vicieuse attitude d'une partie isolée de l'épine.—Bichat, tom. i, p. 124. See also Glisson, p. 139.

* A lady, 40 years of age, had a trifling curvature of the spine at the age of 16, which remained almost stationary for above twenty years, when after a difficult and protracted labour, which was followed by great debility, deformity to a considerable extent took place.

to yield in a greater degree than it had previously done during as many years.

It is not, however, always to be concluded, that where there is great pain and uneasiness present in lateral curvature, that there must necessarily be disease. I have witnessed sundry instances where the patient could scarcely bear the spine, or neighbouring parts, to be touched, which have yielded readily to shampooing and muscular exercise. In cases of this kind the pain is usually of a dull kind, and with little intermission. If pressure is made by placing a finger firmly on the convex part of the curve, by the side of the spinous processes, it will occasion considerable uneasiness, whereas by pressing in a similar manner, on the same line on the opposite side of the spinous processes, on the concave portion of the curve, no such effect will be produced. It will be commonly found, that the same symptom will obtain, in a greater or less degree, in the other curves of the same patient, but not invariably. It appears to have its origin in the efforts constantly making in the small muscles connected with the spine, to sustain the erect position. The pain will sometimes, though seldom, be found seated in the larger muscles of the back.

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 within 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, or any other injury likely to give rise to inflammation, will be 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.

One of the symptoms, which accompanies caries,

* 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.

is the necessity the patient is under of resting the hands upon the knees, to relieve the muscles fatigued with trying to support the parts in their proper relative positions. It is an interesting subject of inquiry, whether in *all cases* of sudden projection of the spinous processes, *however slight*, there is absorption of the anterior surface of the bone. As far as I am aware, no inspection has been made of a case in the earliest stage, when a very slight projection only of the spinous process is first visible; and this question can only be decided by a *post mortem* examination being made of a patient having such a malady, and dying from the effect of some other disease.

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 has taken place in the bodies of the vertebræ from the former, or where there is a scrofulous 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 diagnosis, as well as treatment, are now better understood than formerly, caustic issues being rarely used in cases of simple lateral curvature, whereas many years ago their application was not of infrequent occurrence.

The curvature of the spine anteriorly, as a sequel of chronic rheumatism, or any other long protracted debilitating disease, is not an unfre-

quent complaint; it appears to be induced by the patient inclining forward when sitting or lying, 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 uneasiness or pain, it is either not attempted, or so imperfectly, that the incurvation becomes gradually permanent, unless proper means are resorted to for its removal.

There is an affection of the spine consequent upon paralysis, that has not been noticed, that I am aware of, by any author: it consists in a falling down of the dorsal and lumbar vertebræ within the pelvis; it is not of very frequent occurrence; I have seen only three cases. It may be denominated incurvation of the spine. The lumbar vertebræ project anteriorly towards the pubis, causing a great hollowness of the back, and giving rise to a peculiar waddling gait in the person affected with the disorder.

In this particular form of distortion, in addition to the ordinary means, I have recommended that the patient should make use of chairs as little as possible, and rather sit on a couch, or on the ground, with the legs folded in the manner of the Turks, or as tailors are seated when at their usual employment.

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. In the case of young persons, where the attainment of future benefits, or the avoidance of distant evils, cannot be expected either to enter into their contemplation, or be attended to if it should, it is of importance, in slight cases, to endeavour to blend amusement with our curative means as much as possible; they will thus not only be made more available, but also more agreeable than those exercises that may be viewed as a task. It is sufficiently obvious also, that all those causes which assist in laying the foundation of the disorder, should be avoided: amongst others may be enumerated, that of giving strength to one side of the body at the expense of the other, which is done by obliging children to use the right hand exclusively on all occasions, lest they should become left-handed; it is more desirable to increase the power of the arm defective in strength by its more frequent use: in this way the leg of the same side is made a point of support, and the muscles of the

whole side become strengthened by the increased use. In some slight cases, where I have thought the deviation has been caused by a weakness in one of the ankles, I have recommended the game of hop-scotch, well known and played by boys, and this has been followed by an evident improvement. In those cases where the curvature is of that extent, or importance, as to induce the patients to call for surgical assistance, 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 evident 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. 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

* 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.

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 observed, that they are chiefly those of anterior curvatures of the spinal column, connected with diseased bone, 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

* Baynton on Diseases of the Spine.

† For its injurious effects, see Cases.

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 upper, which is slight, 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. When the projection is towards the left shoulder, the inflexions are reversed.

The inclined plane has been much used 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. This is extremely disagreeable to the patient, and sometimes 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 reflect, 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 posture, 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 bones of the spine have, by these means, reco-

vered their proper station, the muscles which are attached to them, 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 pulley, 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 patient's strength. After each effort, it is ad-

visable 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, when not connected with caries, as to that which takes place laterally.

A combination of these means of muscular excitement will be attended with more advantage than when pursued separately. I have witnessed many 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 general ill health and dyspepsia are 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 of muscular strength, which are usually found to keep pace with each other.

Opinions have been very commonly given by medical men, where the curvature is slight, that "the patient will grow out of it." I do not deny the possibility of its occurrence, but such cases have not come under my cognizance, unless there has been a complete change in the habits of the child; on the contrary, many have fallen under my notice, where curvatures to a considerable extent have arisen after such an opinion has been expressed. It appears, in slight cases, to be more judicious to point out to the friends, that the malady has a constant tendency to *increase*, unless means are taken to counteract it, and that the patient should always keep in view the necessity of taking precautions with regard to diet; using general exercise daily; and local exercise for the purpose of strengthening the muscles connected with the spine: amongst the latter may be enumerated, all those juvenile amusements, which, if they are allowed to indulge in with little restraint, contribute to give them health and vigour. The probability of its increase will depend much upon whether the patient's habits of life are sedentary, or otherwise; if the individual preserve good health, and be actively engaged, the disorder may remain stationary for years, even if no means are used for recovery; if, on the contrary, the person be-

come an invalid, or follow occupations or employments of a sedentary nature, it will be more or less rapid in its progress.

The arguments that have been urged against the employment of muscular exercise as a curative means in this complaint, apply rather to their abuse than to their judicious administration; it is therefore useless to attempt their refutation. The most important results obtained by the means recommended, are (independently of the change in the spine), the manifest alteration for the better which takes place in the bust, and the great improvement in the general health; and this also under the most unpromising circumstances. The instances have been very rare, in which the general health has not been materially benefited; and so uniformly has this occurred, that I have been enabled with tolerable confidence to predicate the change, during the course of a month or six weeks, and have usually been borne out by the result. Other collateral advantages also occasionally ensue; a greater determination to the skin takes place, by which the lungs are relieved, if in a state of congestion; a more healthy state of skin is induced; and thus in this manner two persons were freed from obstinate cutaneous disorders, which had existed for years, the eruptions disappearing after the patient had been some time under treatment for the cure of spinal distortion.

If the means above recommended be sedulously

persevered in, with the precautions given (a recapitulation of these may not be unuseful) — strict attention to diet; passive exercise, beginning with friction, or shampooing, afterwards percussion, and active exertion, very gradually increased according to the improving strength of the patient; and occasional recumbent posture; — a favourable result may, in a majority of cases, of however long standing, and whatever the age of the patient, be confidently anticipated, if there be no disease of the spine. The length of time requisite to effect this, will, of course, much depend upon the longer or shorter existence of the derangement, and its extent. If the disorder be very extensive, and of long continuance, and the patient advanced in life, few persons will devote so much time as may be necessary for the purpose of the full attainment of that object. When I first commenced the treatment of this class of ailments upon the principles here advocated, I entertained an opinion, that it was useless for persons to make any attempts for its removal, unless they were disposed to persevere till the evil was quite remedied, thinking that their labour would be entirely lost, and supposing that the parts would soon revert to their former state. The result of several cases that I have witnessed, in which the parties had gained much, without going on to the full removal of the distortion, has shown, that although there may be a subsidence of the spine to a certain ex-

tent, it is but trifling, and that the nearer the spine approaches the perpendicular, the less that subsidence will be; that the stronger the patient becomes, the less the spine will decline from the straight line, and *vice versâ*. These remarks have been verified by an extended experience of seventeen years since the publication of the first edition of this treatise. The mother of a family had many years a distortion of the spine, to a very considerable extent. Although thinking from the lapse of time the disorder was incurable, she was induced to apply to me, owing to pains in the side, difficulty of breathing, headach, &c., which she attributed, and not unjustly, to the spinal distortion. She was in an early state of pregnancy, and therefore very moderate exercise only was allowable; she, however, did as directed, the result was, she gained one inch in height, with a corresponding amelioration of the symptoms.

I beg here not to be understood, as wishing to assert, that I have in every instance effected a complete restoration of the spine to its proper shape in cases of lateral spinal curvature, unaccompanied by disease of the bone; a regard for truth compels me to admit, that in several cases of long standing, treated by me upon the plan before mentioned, and where, in addition to the above means, extension has been resorted to, I have failed; the curvature originally, perhaps, between an inch and a half and two inches, has

been reduced to within a quarter of an inch, beyond which, an advance could not be made; although I have every reason to believe that my patients have strictly followed my injunctions in every respect, both with regard to exercise, and the strict observance of the recumbent posture. In these cases there was no suspicion of diseased bone; if there had been, I could not have used the same means (extension) without producing mischief. The average rate at which improvement takes place, presuming the curvature to be of the extent of an inch and a half or two inches, is, half an inch the first month, and one-eighth of an inch every succeeding two months. I have witnessed some cases, where the diminution of the curvature has proceeded more quickly; these are, however, rare, occurring either in natives of India, or very young subjects, or where the progress of the distortion has been unusually rapid.

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, al-

* Lectures on Diseases of the Bones, p. 178.

though 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 have been enabled to corroborate, by the inspection of a case of extreme 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.

That this disorder has a tendency to shorten life there is little doubt, for, although instances are occasionally met with, where persons, labouring under distortion of the spine, have lived to a good old age, they are comparatively rare: probably, in these, the chest has been less involved than in other cases. It reacts in producing serious ills, that are often during life little suspected of being occasioned by such a malady.

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 considerable 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, sufficient 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 increase 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 further 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 show, 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 contraction 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-eighths; 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 increasing 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 patient's 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., ætat. 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 coccygis ten inches: she was directed to be kept in a 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., ætat. 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 employed over the whole of the spine, exercise of the

muscles 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 lie 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., ætat. 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 with 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 fulness in the other parts.

CASE VII.

The friends of Miss T., a young lady, ætat. 11, of a light complexion, had observed for some time past a projection of her right shoulder; her health was delicate, and she was 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.

CASE VIII.

A young lady, between 25 and 30, had been labouring some years under distortion of the spine, accompanied by great debility, for the relief of which she had recourse, under the direction of her professional adviser, to the recumbent position, and, when occasionally in the erect posture, to a support, formed of a stay passing from the hip to the shoulder. Her health was very delicate, and she was incapable of bearing fatigue. There was a deviation of an inch and a half from the perpendicular line. In addition to the usual means, she took steel and aperients. By following the plan resorted to on similar occasions, at the expiration of a month the chest acquired an additional inch and a half in circumference. After the lapse of twelve months, the spinal curvature was reduced to half an inch, and she had gained three quarters of an inch in height. If it is taken into consideration that the measurement was taken when the patient was in a state of extension (if it may be so termed) from debility, and having been so long recumbent, the improvement will be still more manifest. She became comparatively strong and active, and her general health good.

CASE IX.

A. G., ætat. 9, a delicate girl with a florid complexion, and all the external appearance of robust

health, had a spinal curvature an inch in extent. By the use of the ordinary means before recommended, combined with a recumbent posture, in the course of fourteen weeks the spine became entirely straight; she acquired an increase of two inches and a half in the circumference of the chest, of an inch and a half in height, and a good state of general health. The rapid recovery of this young lady may be ascribed to the great attention paid by her friends to her diet, a strict observance in lying down, as well as to her youth.

CASE X.

A young lady, ætat. 15, had spinal curvature several years, which increased gradually till about twelve months before I saw her, at which period she was directed to wear irons to support her: during their use she became rapidly worse; her health also began to fail. She was then placed under my care. On examination, the spine was an inch and a half out of the perpendicular; the chest twenty-five inches and a half in circumference; on taking a full inspiration, twenty-six inches and three quarters. She was treated in the same manner as other cases of the kind, except that when she had gained *great strength*, she was placed on her back in a box, fitted inside with projecting pads, so as by slightly pressing on the protruding portion of the ribs, she was obliged to

remain in a straightened position, enabling the parts to recover their strength in the improved posture. At the expiration of a month, the spine was an inch from the perpendicular; the chest, in its ordinary state, twenty-six inches and a half; on taking a full inspiration, twenty-seven inches and three quarters in circumference. Her health materially improved. She continued to gain afterwards, at the rate of one-eighth of an inch every two months, till the spine was only one-eighth of an inch from the perpendicular line, when her friends were satisfied with the progress she had made. The great augmentation of strength prevented a recurrence of the distortion.

CASE XI.

The following case strongly illustrates the disadvantage of relying on the recumbent position solely, without exertion, for the cure of spinal distortion.

A young lady, ætat. 27, had been labouring some years under a curvature of the spine to the right side, without disease of the bones. When I saw her, there was a curvature to the extent of an inch and a half from the perpendicular.

The recumbent posture had been persevered in during four years; she was reduced to such a state of debility, that when lying on her back she was obliged to remain in that position, being inca-

pable of turning on her side. Her most anxious desire was, to reacquire the power of walking, her expression being, that "if she could once walk again, the improvement of her figure would be of very little consequence." Her digestive functions were disturbed, for which, small doses of rhubarb and light tonics were prescribed. The first exercise she was able to bear, as she lay on her back, was the taking a duodecimo volume in her hand and carrying it over her head, this she accomplished thrice, and was incapable of further exertion: she was directed to repeat it once more during the day, and to increase the labour by an additional trial of once or twice each day. In the course of a week she had rapidly increased the exercise by the use of a larger book, and gained so much strength, that it was thought advisable to support her sitting erect: after a short time she was able to stand; then bear exercise in a carriage; she was then directed to use a dumb bell of three pounds weight, morning and evening, by carrying it in both hands over the head, and walking with it at the same time. By these means she gradually recovered her health, and acquired sufficient strength to enable her to walk two or three miles a day. The spine was straightened to the extent of half an inch. She had employed so much time, and suffered so greatly, in the attempt to improve her figure, that she declined any further efforts for that purpose, resting satisfied with having acquired the power of locomotion.

CASE XII.

A young gentleman, ætat. 15, had had, during *ten years*, an excurvation of the spine to a considerable extent, including the lower cervical and nearly the whole of the dorsal vertebræ, without disease. I introduce the case, as illustrative of the extent of debility sometimes induced by remaining too long in the recumbent posture. He had some time before been in that position on the back so long, that he had lost the power of turning to either side. From this he had recovered when I saw him, and was able to walk about. He was under my care nearly two years, and acquired so much bodily strength, that he could support himself five minutes consecutively by the arms; one minute, or one minute and a half, being as much as persons of ordinary strength are able to accomplish. He had recovered very much from the deformity; but, as his stay in town was inconvenient, he went into the country, with injunctions to persevere in the directions given him; since which time I have not heard of him.

CHAPTER 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 connection between the two diseases, and the dependance 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 from 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 by the name of chicken breast, from the resemblance which it is supposed to bear to it. 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 rise from such a cause, *viz.* difficult respiration, pain in the chest*, headaches, frequent palpitations, and indeed all the symptoms attendant on an interrupted, quickened, or disordered circulation.

Presuming that the oxygenation of a determinate quantity of blood, by its passage through the lungs, be subservient to the well-being of the body, it would appear, that if from tubercular disease, or inflammation, a portion of the lungs be consolidated, the air-cells broken down, or any other cause arise that tends to diminish the extent of surface exposed to the action of atmospheric air, there will be a necessity for the blood being thrown through the pulmonary system with greater rapidity, to answer the demand made for its oxygena-

* 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, consequent upon that, a deficiency in the capacity of the latter.

tion. To this may be ascribed the hurried circulation, as denoted by quickness of pulse; and hence, any means which will enable the lungs to take in a larger supply of air, and consequently to oxygenate a greater quantity of blood, must conduce towards diminishing its acceleration. I have been enabled to prove in numerous instances, that its velocity diminishes in equal ratio with the additional size of the chest; the consequence is, an increased power of dilatation of the lungs, and capacity of inhaling a greater quantity of atmospheric air at every breathing; therefore the present has a manifest superiority over other methods of treatment, inasmuch as the benefits are permanent, a larger portion of blood being exposed to aeration at each natural inspiration.

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 whom 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 show 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 connections 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

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

which they are attached, is less, and the chest consequently becomes narrowed, and its capacity diminished. During inspiration, the chest, in its external appearance, assumes a circular form; in expiration it approaches 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 connections 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 various 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 cause of alteration in the form of the chest has been noticed by Sir C. Bell and M. Delepech, as occurring in consequence of disease in the contents of the cavity, such as abscess, &c., having caused a loss of its substance; this of course is irremediable, but affords an additional reason that every means should be employed, that can improve the functions of the remaining portion.

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 chiefly 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.

It has been remarked to me by medical men, who have been rather sceptical as to the results being attained by the measures pursued, that the patients being about the age of puberty, might account for the rapid expansion of the chest, that has been noticed in several cases recorded, presuming that it might arise from natural growth. A reference to the cases detailed, of all ages from five to thirty years, will be sufficient to show, that the alteration in the size of the chest, and increased

height, are not a consequence either of the coming on of puberty, or of increased natural growth, but a result of the means adopted.

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 summerset backwards. While in this situation, the patient 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 desire 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 are not confined to the removal of the local disorder, but, as I have already stated, in treating of the distortion of the spine, it 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.

* See cases of spinal curvature and deformity of the chest.

CASE I.

Miss E. L., ætat. 13, September 1819, of a light complexion, had a considerable fulness 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 ——, ætat. 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 further 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., ætat. 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 was 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., ætat. 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., ætat. 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., ætat. 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 projecting 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., ætat. 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 was 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., ætat. 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 had 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., ætat. 12½, observed a projection of the left clavicle at its connection 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., ætat. 6, January 1822, had 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, showing 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 an 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 are 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, ætat. 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.

CASE XII.

The friends of a young lady, ætat. 15, residing in the country, had remarked for the last year or two a great indentation on the left side of the chest. As the depression of the breast occasioned much disfigurement, and had increased rapidly, she was brought to me. On examination, it was found to arise from a gradual projection of the upper dorsal vertebræ, unattended by pain or disease, and her health was good. She made use of the means before mentioned, shampooing and per-

cussion over the chest; moving a weight by the head; suspension by the arms: in each instance apportioning the labour to her improving strength. In the course of two months the deformity was entirely removed. She was recommended to carry an urn on the head, which could be heightened at pleasure by a screw; to balance it, in order to preserve the strength of the muscles of the back, and to prevent the recurrence of the complaint. This had the desired effect, as I heard several years afterwards that the disorder had not reappeared.

CASE XIII.

A lady, ætat. about 30, had a peculiar formation of the chest, a great sinking in at the scrob. cord., and a projection of the sternum, at its connection with the first and second ribs; she had been in an ill state of health some years. The countenance was suffused; there was a blue appearance of the lips; difficult respiration; the voice not above a whisper, so low, that with the utmost efforts on her part she could not make herself audible at the end of the room. The inspiration and expiration only occupied six seconds, an insufficient quantity of air being admitted at each inspiration. Pulse in the ordinary state, when at rest, one hundred and twenty, on exertion one hundred and thirty. The measurement at the scrob. cord. was

twenty-five inches and a half, not increased on inspiration. This patient had great debility: in the erect attitude, the inner ancles were close upon the ground; and she had been confined a length of time to the recumbent position, in consequence of suffering much uneasiness in the lumbar region when standing, in which posture she could support herself only a short time, owing to the distressing pain it occasioned. A moderately spare diet was ordered; animal food once in the day. Aperients repeated every fifth morning. More than ordinary caution was requisite in adapting the means to the management of this case, as at first, the least attempt at extension of the muscles connected with the chest produced violent coughing and a great sense of suffocation, so that nearly three weeks elapsed before she could have their full extension; and after each exertion, however trifling, she was obliged to return to the recumbent posture: exercise and rest were thus alternated, beginning gently with ten minutes or a quarter of an hour in the day, and progressively increasing her efforts daily, as she became stronger, till she was enabled to bear it during one or two hours without occasioning much fatigue. In the course of six weeks she gained two inches in the circumference of the chest, on taking a full inspiration; the circulation became less rapid, the pulse being not more than seventy-two after using strong exercise. The countenance assumed a much

more healthy appearance; the voice improved in volume; she entirely lost the pains in the lower part of the back, and at the end of four months became able, without inconvenience, to take walking exercise, to which she had been so long unaccustomed.

CASE XIV.

One of the most deplorable cases of deformity of chest I ever witnessed, was that of a young lady, ætat. 12, who had suffered from infantile paralysis in both limbs at so early a period of life, that it was, by her mother, dated at birth: it was accompanied by very considerable spinal distortion, for which, as a remedy, she had worn irons for several years. There was great depression of the sternum; the ensiform cartilage, as well as the ribs, being turned in, towards the anterior part of the spine; the lower ribs, more especially the three lowest of the left side, were buried within the pelvis. The countenance was wasted, and had a sickly appearance. The pulse was between one hundred and thirty, and one hundred and forty, and was so weak, that it might be compared to the fluttering of the heart of a young bird, rather than the pulsation of a girl of her age; after every exertion, however trivial, it became so rapid, that it could not be counted. The bowels were in a constant state of relaxation. The irons were immediately discon-

tinued. She took alteratives for some time, then different preparations of steel. The chest was shampooed daily; she used muscular exercise in proportion to her capability of bearing it, and observed the recumbent position when not actively engaged. By perseverance in this method of treatment, although with many occasional relapses, she acquired a good state of health, which she has enjoyed some years.

CHAPTER IV.

ON SPINAL CURVATURE AND MALFORMATION OF CHEST, ACCOMPANIED BY HÆMOPTYSIS, OR THREATENING CONSUMPTION.

In the preface to the first edition of this Treatise, it was suggested as not improbable, that many cases of consumption had their origin in a diminution of the circumference of the chest, whether occasioned by distortion of the spine, or any other cause. The following mode of treatment of a few cases of this kind, which would in all probability have ended in the destruction of the patient, if not subjected to it, or measures somewhat similar, is offered to the consideration of the profession, not as a specific for the cure of hæmoptysis, nor of its frequent concomitant, consumption; nor is it desirable to estimate the remedy at a higher value than that to which it may be fairly entitled by its merits; but believing conscientiously, that it may be made available in many chronic cases, it is ventured as a contribution towards effecting a diminution of the mortality, occasioned by a disease, which too commonly baffles all the resources of our art, and to which many thousands of the population of this

country annually fall a sacrifice. The means are chiefly those proposed in the preceding chapter; in their employment, however, a much greater degree of care and caution is requisite. Passive exercise, such as shampooing only, should be resorted to during the first week, and that very *gently* at first; *increased gradually* in force. It is desirable that the patient should be shampooed in a very warm room, and that no larger surface of the chest be exposed than can be avoided: when it is found that a slight improvement has taken place (one of the first indications of which will be a more healthy appearance of the skin, particularly about the chest and surrounding parts, denoting a better performance of its functions), muscular exercise may be commenced, and as gradually increased in proportion to the strength acquired.

CASE I.

P. K., a young lady, ætat. 18, had been subject, during the last two years, to spitting of blood, not in large quantities, but frequently. Her appearance was almost bloodless, in consequence of a repetition of these attacks. As there was lateral curvature of the spine to a considerable extent, which had existed several years, it was thought it might have a share in occasioning the disease; this seemed the more probable, as all the ordinary remedies had been unavailingly used: she had

cough, emaciation, pulse 120. She took small doses of hydrarg. cu. creta, and aperients occasionally. The chest was shampooed for about three quarters of an hour every day, previously rubbed over with a spirituous embrocation; the muscles connected with the thorax being at the same time placed in a state of extension, both by taking in a full inspiration, holding the breath, and placing the back against a cylindrical piece of wood, in the manner described. Muscular exercise was employed in the most cautious manner possible, for the debility was so great, that the most trifling exertion occasioned fainting. After the lapse of a few days, the patient's symptoms became gradually mitigated, the pulse was lessened in frequency, the cough diminished, the skin put on a more healthy appearance; at the end of four weeks she became tolerably well. She acquired, at the expiration of three months, an increase of two inches and a half in the circumference of the chest at the pit of the stomach, and three and a half at the false ribs; two inches and a half on inspiration: the whole of the unpleasant symptoms had vanished.

One of the most prominent features of the present case must not be omitted—the strikingly marked improvement in the respiration. Before she commenced the course of shampooing and muscular exercise, the least exertion occasioned such difficulty of breathing, that, in attempting to go up a short flight of stairs, she was under the

necessity of resting twice, or thrice, to take breath; she was afterwards enabled to run up an ascent as quickly as another person, and without more difficulty than would be felt by the most healthy individual.

CASE II.

E. P., a young lady, between 25 and 30, had suffered under repeated attacks of hæmoptysis for several years. As the usual remedies had been employed unsuccessfully for a considerable length of time, and as several cases of mine had come under the cognisance of the late Dr. Luke, in which passive and active muscular exercise, in conjunction with the recumbent posture, had been tried with advantage, he recommended her to place herself under my care.

This case was unconnected with distortion of the spine, the chest only being affected. There was an extreme degree of debility, which might be supposed to result from the long continuance of such a disorder, and that dusky and dirty appearance of the skin, which is the frequent accompaniment of long protracted disease. The pulse one hundred and ten, and very weak; the voice could scarcely be heard above a whisper. The measurement of the chest at the scrob. cord. was twenty-four inches; on inspiration, at the false ribs, twenty-three inches.

At the expiration of a month, the chest had gained

in the ordinary state one inch and a half, on inspiration one inch and a half; and on inspiration, at the false ribs, one inch and a half. By perseverance, at the expiration of two months, the voice was materially improved; the pulse returned to its natural standard; the skin resumed its healthy appearance and colour, and she acquired a considerable increase of bodily strength.

CASE III.

A young lady, ætat. 18, was brought to me with an extensive lateral curvature of the spine; more with a view to the restoration of her bodily health, than an expectation that much could be done for the spinal curvature, which had existed many years. The spine was two inches and a half out of the perpendicular, with a corresponding displacement of the bones of the chest; the left blade bone was so much elevated from its natural position, that the whole hand could be buried under the left scapula, between it and the ribs. She had *spitting of blood*; cough; expectoration; great difficulty of respiration, even in ordinary conversation; the pulse was so rapid and weak, that it could scarcely be felt; and, altogether, the case was one of the most unpromising aspect. There was also that extreme wasting of the countenance, which is connected with extensive and long continued dis-

tortion of the spine. Small doses of the hydrarg. cu. creta were administered, with aperients occasionally. She commenced with rather a spare diet; took three meals in the day, a portion of animal food forming one meal. She was treated in the same manner as in the former case, *viz.* beginning with slight passive exertion, increasing it, then commencing active exercise, as her improved strength and the lessened frequency of the pulse and diminution of the violence of the other symptoms allowed, persevering till all her unpleasant symptoms had left her; the only check that arose in the course of the treatment of her case, which occupied more than three years, was a few months after the commencement, when perhaps owing to some little irregularity of diet, there was a very slight spitting of blood; the exhibition of a few doses of hydrarg. cu. creta and aperients removed it, and she recovered a tolerably good state of health, so as to be enabled to bear fatigue in walking or other exercise. The curvature, although not entirely removed, was lessened from two inches and a half to five-eighths of an inch.

CASE IV.

Mr. ——, ætat. 23, residing in the country, had been labouring under a delicate state of health from childhood, and had had one or two attacks of in-

flammation of the chest every year; was of a consumptive family, and had lost two brothers by that disease. When I saw him, he was much emaciated, had foul tongue; constant cough; great expectoration; and night-sweats; the pulse, one hundred and ten. The attempt at forcibly filling the chest by inspiration occupied only two seconds. The measurement of the chest at the scrob. cord. twenty-eight inches; on inspiration twenty-nine and a half inches. There was no spinal distortion; he had made use of all the usual remedies, amongst others, digitalis, &c.

I prescribed hydrarg. cu. creta, gr. v. omni nocte, and a draught containing ʒss. magnesiæ sulph. either once, twice, or thrice in the day, according to the effect produced upon the bowels. His diet, the first three or four days, was thick gruel; afterwards pudding; then animal food once in the day, with bread and butter, tea, or coffee for breakfast; and in the evening shampooing was employed over the whole of the chest, taking in each inspiration as full as possible, gradually increasing the force of the shampooing till he could bear percussion, or more strictly *pommeling*, on the chest for half an hour daily. After the passive exercise by shampooing had been continued some time, as his strength improved he commenced gentle exercise, gradually increasing it as he gained in power; he also used suspension by the arms, and climbed a rope by the hands alone. At the expiration of six weeks he had

acquired two inches increase of the circumference of the chest in its ordinary state, and three inches on inspiration. He pursued the same plan of treatment some time longer; was able, after taking a full inspiration, to retain his breath a minute and a half; lost all his unpleasant symptoms; returned into the country, and has preserved a good state of health for some years.

SPINAL DISTORTION

CONNECTED WITH DISORDERED CIRCULATION, ASSUMING ALL THE APPEARANCE OF DISEASE OF THE HEART.

CASE I.

A young lady, ætat. 16, was placed under my care for general ill health, which was supposed to have its origin in spinal distortion, the spine being one inch and a quarter out of the perpendicular. Her countenance was of a leaden hue; respiration ordinarily quick, much increased on any slight excitement; the pulse one hundred and twenty, and irregular; occasional fainting on using any trifling extra exertion. It was thought advisable that the most lenient measures only should be employed for the removal of her ailment, on the presumption, that although the disordered circu-

lation might be dependant on the spinal curvature alone, yet that the symptoms might be connected with organic disease of the heart, and without caution, mischief be induced; yet the circumstances justified a trial, as she had been gradually becoming worse. Small doses of the hydrarg. cu. creta, and aperients, were occasionally exhibited; shampooing over the chest was commenced lightly, and was increased in force, as it was found that it could be borne without inconvenience; afterwards, gentle muscular exercise was undertaken, and pursued with the same degree of care. The only untoward symptom that arose was the patient having one fainting fit. By perseverance in these means, at the expiration of twelve months, the countenance had resumed a healthy appearance, the spinal curvature was reduced to a quarter of an inch, and the patient was in a good state of health.

CASE II.

A young gentleman, ætat. 16, had a severe rheumatic inflammation in the head and neck, which terminated in stiffness of the latter. On examination, there was found a gradual projection of the cervical vertebræ anteriorly, towards the trachæa and œsophagus; the muscles of the neck were entirely rigid, the head being motionless. There was great palpitation of the heart, and ir-

regularity of the circulation; pulse one hundred and thirty-two. The irregularity in the circulation made it necessary to observe great caution in the means employed, on the presumption that the rheumatic inflammation might have terminated in organic disease of the heart. A very moderate diet was enjoined, and purgatives were administered every fifth day. Shampooing only was had recourse to at first, and as, after a short time, a manifest remission of the symptoms ensued, exercise of the muscles connected with the neck and shoulders was ventured upon, in conjunction with it. The violent action of the heart and arteries then began gradually to diminish, and in the course of a month, the pulse was only ninety. The rigidity of the muscles of the neck continued to decrease by degrees, till they became quite flexible, and he acquired the power of rotating the head with facility. During the time this case was under treatment, I repeatedly noticed the effect of exercise upon the state of the pulse during the first few weeks, whilst the irregular action of the heart lasted. Prior to any exertion, the heart would be bounding with great force and irregularity; after the lapse of some little time, when, perhaps, the system had been by gentle perspiration relieved of its load, the intermissions of the pulse were less frequent; and before he had finished his exercises for the day, the pulse had become entirely regular. These observations were made

not only many days consecutively, but repeated at different times and with the same result. At that period, diagnosis by the stethescope was little, if at all used, as a mode of detecting internal disease.

CASE III.

A young lady, ætat. 21, had spinal distortion, inconsiderable in extent, and scarcely visible for several years; but after a severe illness, she became suddenly very much worse: there was a great irregularity of pulse occurring five or six times a day, giving rise to extreme depression, faintness, and sickness; there was great debility, and that dusky appearance of the countenance, the usual accompaniment of disordered circulation. Unfortunately I made no memorandum of the number of pulsations in the minute. She was put upon a moderate mixed diet of animal and vegetable food, without stimulants. She took aperients once a week, and light tonics. The usual means were obliged to be used at the commencement with great caution; shampooing in the first place, afterwards gentle muscular exercise. After the lapse of a month, the irregularity of the circulation and faintness occurred only once in the twenty-four hours; the chest increased one inch and a half in circumference, and the countenance

assumed a more healthy appearance: in six weeks, the circulation returned to its natural state, and her general health became good.

One patient, who was under my care a year and a half, for an extensive distortion of the spine, with rapidity of pulse, a bluish appearance of the face, and of the lips more especially, denoting congestion in the lungs, persevered nearly twelve months before the countenance assumed a natural and healthy hue.

CHAPTER V.

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 scrofulous 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 contraction, 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 coagulable 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 para-

* Crowther on White Swellings, p. 39.

lytic 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; the pain, deep seated, and referred to the part which is the seat of disease, is immediately under the patella; 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 accompanied with wandering pains in various other joints. In the latter case, also, the swelling is not so permanent, but 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 varieté nommé rheumatismale la tumeur reste plus dure, et n'arrive jamais á un grosseur aussi considérable que chez les scrophuleux †."

It has been remarked, by an author who has devoted much time and attention to the inquiry, and has had considerable experience: "From my own examination of the parts on the living subject, and in morbid preparations, I am induced to think, that the bones do not suffer any morbid change of

* Brodie on Diseases of the Joints.

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

structure from the influence of gout*;" it may therefore be presumed, that it is of rare occurrence. Although seldom found, I witnessed one instance where there was an exfoliation of the third phalanx of the little finger, as a sequel of long continued gout. "The effects of gout on the joints are very remarkable; the cartilages are absorbed; the exposed surfaces are partially, or entirely encrusted with a white earthy matter, which I conclude to be lithate of soda, and sometimes they have the appearance of having been formed into grooves, as if they had been worn by their friction on each other. In some cases, repeated and long continued attacks of gout occasion complete anchylosis†."

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 its loss. This has been observed by Mr. Mitten ‡, as having been noticed by Mr. Brooks and M. 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 oc-

* Scudamore on Gout, p. 38.

† Brodie on Diseases of Joints, p. 342.

‡ Tentamen Medicum de Morbis Artuum Vitiis curandis.

casionally been able both to feel and to hear the hard surfaces of the bones grating against 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 semitransparent 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 *.

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

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 show 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 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 show, 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 attended 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., ætat. 37, 1816, had had for several years 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 covering, 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., ætat. 13, September 1819, of a pale and dark complexion, had had, during six or seven years, 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. Manipulation, 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 plain 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., ætat. 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.

CASE V.

A gentleman, ætat. 60, had for many years been, as it is termed, "a martyr to gout," which terminated, after a succession of attacks, in a stiffness of the joint at the ancle. I prescribed gentle aperients occasionally, the sodæ carbon. with light tonics daily, shampooing over the whole of the leg and foot, leaving untouched the joint affected. After a lapse of some little time exercise was used, by inducing him to attempt to press down a weak spring gently; by a repetition of efforts he succeeded; as he acquired additional motion and strength, he stood on the inclined plane before described; by perseverance, varying the exercise according to circumstances as they arose, he recovered a complete freedom of motion in the joint, and the power of exertion, of which he had been so long deprived.

CASES OF CHRONIC MUSCULAR AFFECTIONS.

CASE I.

J. M., ætat. 50, had 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 muscules. Manipulation 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 per-

severance 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., ætat. 37, 1820, had, 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, except when business compelled him to e ertion. 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., ætat. 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 were also 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 pail full of water up three pairs of stairs without assistance.

Although the following case does not properly rank under any of the foregoing heads; yet, perhaps, its insertion here may not be amiss, as showing how much may be effected by well-directed muscular efforts.

CASE V.

A medical student had, for some years, laboured under a weakness of both ancles, the inner part of each ancle hanging so much over the foot, and deviating so greatly from the perpendicular, as to occasion him such discomfort, that he could only walk a short distance without suffering great pain. He had tried cold bathing, bandages, &c., without avail. I ordered him, as a placebo, to use a strong solution of salt in water every morning to the leg, and directed him to attempt to make use of the following exercise twice a day: to raise the body on both legs by alternately elevating the heels, resting a short time on the phalanges of the feet, and depressing them; continuing this till fatigue was produced, and to increase the exertion by rising once, or twice, or oftener every day. When he had accomplished this, at the rate of one hundred times per diem, I directed him to stand and use the same exercise on each foot singly, twice a day, beginning with as many trials as he could bear with comfort to himself, and increasing the exertion in the same gradual manner. By persevering in

these means, in a few months he recovered completely, and could walk distances without experiencing any of those distressing pains which had formerly annoyed him. The appearance of the feet also was improved in a manner commensurate with the increase of their power.

CASE VI.

A lady met with an accident by falling from her horse upon her shoulder. There was no fracture, but it was supposed by one or two surgeons that a subluxation had taken place. The parts remained in a painful state for *two years* after the accident, without yielding to the means taken for her relief. When I saw her, there were no indications of inflammation in the joint; but there was pain almost continually, which she described as not acute, but of a dull kind; which, nevertheless, kept her in a situation of great distress. I ordered aperients occasionally, and light tonics, to put her into better health. The parts being previously rubbed with a spirituous embrocation, were shampooed daily, and the patient began with moderate exercise of the muscles of the arm and back. In the course of a week she became relieved from pain; and in two months, her health and strength were entirely reestablished.

CASE VII.

R. B. fell from a great height on the arm; swelling of the part to some extent ensued, which remained for a long period before it subsided: the arm was kept in a sling as the easiest position. After the tumefaction had subsided some months, there was still remaining very great pain in the arm, which could not be raised from the side. The pain did not yield to any of the remedies that had been applied. I prescribed those means that were likely to improve her general health; directed gentle friction with oil on, and moderate exercise of the arm. She was unwilling to commence the exercise, as the slightest attempt at moving the arm from the side had hitherto been attended with great distress: in two days, however, the pain began to decrease, by perseverance was daily diminished, and she acquired an useful limb.

CHAPTER VI.

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 have been 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.

It is not my intention to give a history of these different forms of disease, but only such a concise notice as 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 com-

monly 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, and double or indistinct vision. The symptoms which more immediately characterize 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

* Pinel, Nosographie Philosophique.

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 of different parts, as cavities ‡ in the substance of the brain §, obliteration of the corpora striata ‖, ossification of the arteries, softness of the cerebrum and cerebellum ¶, schirrus of nearly the whole of the cerebellum.

* Morgagni, de Morbis Capitis, Epist. Anat. lxii, 9.
† Id., xi, 6. ‡ Serres. § Willis.
‖ Morgagni, lxii, 9. ¶ Id., 15.

The appearances on dissection will depend in some measure on the duration of the disease, in recent cases showing 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.

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.

* Hunter on the Blood, p. 213.

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; 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

* Medical and Physical Journal, No. 13.

health by the great discharge from the skin, keeping up the balance of the system.

The greater liability of its occurence to those who are somewhat advanced in life, appears to originate in some measure from a longer continuance of the remote canses, 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 shown, will equally tend, either indirectly 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.

It is not to be denied, that paralytic affections of the nerves have often a local source*; but if this cannot readily be detected, the view taken, and mode of treatment here advocated, are the safest, of which a patient of mine deceased affords an in-

* For many valuable researches on the uses and functions of the nerves, it is almost unnecessary to remark, that the profession are indebted to Sir C. Bell, Messrs. Swan, Mayo, Bellingeri, Majendie, &c.

stance. He had some years ago a paralytic seizure of one side of the face, for which he was bled, purged, and placed on a moderately low diet, with directions to be always on his guard for the future; he soon recovered, and was told that the disorder had been a mere local affection owing to cold, that the means employed had been unnecessarily severe, and that the strict attention to diet and regimen, that had been advised, was injudicious and uncalled for; this opinion was the most palatable and made him careless. He some years after had an attack of apoplexy, and expired suddenly, before any assistance could be rendered to him.

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

* Dr. Cook on Palsy.

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, but it is advisable that it should be powerful, and continued until a full and free perspiration is 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 pleasurable sensations, which follow the abstraction of blood, lead 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.

* An instance of the benefit arising from copious perspiration, in a case of partial paralysis, is related by Dr. Abercrombie, p. 406, on Diseases of the Brain and Spinal Cord.

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, 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; in these cases also depletion should not be carried to the same extent as in those where the causes of disease have been either of a more active kind, or of longer continuance.

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 its respective uses, and each in its turn has disappointed the expectations of those who have relied on its exclu-

sive administration. As the exhibition of stimulant remedies appears to have prevailed very generally in this complaint, and to have been highly esteemed, 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 or congestion 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 fulness 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; 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. Several cases have been related where the exhibition of strichnine, a remedy lately more extensively employed, has been attended with fatal results.

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 control, 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; although the pressure or other cause affecting the brain be removed, and its healthy functions restored, yet the connection

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.

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 connection 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 *."

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, 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.

* P. 12.

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.

Perhaps it is not advisable to attempt the removal of the paralysis by volition in an early stage, certainly not till that vascular fulness, or extreme

congestion, which is commonly the forerunner of this malady, has been subdued, and till some time has been given to allow of the restoration of the defective portions of the brain to their respective functions; and any success I may have had, is probably somewhat attributable to having been consulted after other means had been tried unavailingly, by which a considerable lapse of time had occurred.

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 commonly allow.

It is worthy of notice, that sometimes after an attack of paralysis and the employment of muscular exercise for its cure, when the nerves are beginning to reacquire their accustomed power, that uneasiness and pain will be felt along their course, similar perhaps to that which occurs after recovery from any long continued pressure on the nerves from a mechanical cause, such as placing one leg over the other and keeping the limb too long in that position. This is the more important to observe, as it sometimes operates as a discouragement to the necessary perseverance, unless explained to the patient.

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 or other parts, occasioning pressure on the spinal marrow.

It would appear from the relations of different dissections of persons who have died of paraplegia, that although in many cases the spinal cord and its connections were involved, yet in no case that I have met on record, has paraplegia occurred in

consequence of affections of the brain, in which the cerebellum has not been more or less the seat of disease.

It is not unlikely, that in some of those cases where there has been pressure on the spinal cord, and in which the patients have afterwards recovered the use of the limbs, such as in the angular distortion of the spine, there may have been inflammation of the theca; the parts being distended by their mechanical pressure upon the cord, paralyse the nerves, and produce a disturbance of their functions, although the structure be not altered; analogous to what we observe in other parts of the body, where inflammation proceeds to a considerable extent, and yet the parts resume their functions, with this difference, that in the one the disease occurs in parts readily distensible, in the other it is enclosed within an unyielding substance.

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.

* Transactions of the College of Physicians.

We find this communication between the parts in cases of spina bifida; 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 connection also with disease of the brain, is shown in the left lobe of the cerebellum being schirrous †; tumours extending into the medulla oblongata ‡; the left lobe of the cerebellum indurated §.

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 cartilages, or neighbouring parts, the application of leeches, and a repetition of blisters may, in my opinion, be resorted to 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

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

† Morgagni, ep. lxii. ‡ Edin. Journal, xi, 470.

§ Abercrombie, p. 175.

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 in which 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, in a lady 60 years of age, 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.

In the paraplegia of young children it will sometimes be found, that one limb partakes less of disease than the other; in this case it is advisable to direct the chief of our efforts to that which gives the prospect of the most speedy recovery, as it will afford some aid towards the removal of impediment to motion in the other.

In what is termed the painter's dropped hand, I have made use of an instrument, an improvement upon the one recommended by the late Dr. Pemberton, which kept the arm and fore arm extended and confined on a splint; this effects the object of allowing the contraction of, and consequently giving strength to the extensor muscles of the fore arm more readily than by any other

* Further Remarks on the Useless State of the Lower Limbs, &c.

means. The alteration is that of dividing the splint, making a joint at the junction of the palm with the wrist, and by means of a spring, keeping the fingers extended, and the hand bent backwards towards the anterior part of the fore arm; a catch regulating the extent to which it is to be allowed to go back. Several cases have readily yielded to this mode of treatment, after other means had been tried in vain.

CASE I.

Master K., ætat. 11, of a light complexion, eight years since was suddenly deprived of speech, 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., ætat. 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 muscles, 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; 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, by accommodating its increase according 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, followed by an extreme degree of emaciation. Her mind was not otherwise affected than as showing 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 less gradual reduction was attended with the most distressing feelings to the patient, so as to give rise to all the symptoms of approaching dissolution. The patient was allowed a liberal diet; 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 scarely 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., ætat. 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 Poupart's 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, he was directed to stand on the sound leg, supported by a crutch, 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 fol-

lowing 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 was then 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 sup-

port 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, 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-eighths. The glutæi muscles of the side

affected were very much increased in size; the tendo achilles was also considerably enlarged.

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

CASE V.

H. K., ætat. 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 might 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., ætat. 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, during that time he suffered severely from cholic, and occasional uneasiness

about the head; he had 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 control 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 headach, fourteen ounces of blood were taken from the arm, 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 control 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, 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 showing that the muscles are much more under the direction of the mind.

CASE VII.

A gentleman, ætat. 60, was attacked with hemiplegia of the right side. Under the treatment that had been employed by his medical attendants, he had in a great measure regained the power of the leg of the affected side, and was able to walk about; the arm still remaining in such a state of weakness, that he was incapable of using it. He was filling a public situation of consequence: as his signature was frequently necessary, and of importance, I was desired to see him, and requested to devise some means by which he might be enabled to write.

The same affection of the brain had here occasioned the loss of both limbs; the one had been exercised, the other had not; the mode of treatment became obvious. He was shampooed an hour every day; a pulley was fixed up at a height, much above the head; to the one end of a line passing over it, was connected a weight barely heavy enough to carry up the hand, which was attached to the other end of the line by means of a handkerchief. He was desired to pull it downwards as often as he could during the day. When he had acquired sufficient power in the hand to grasp, he was directed to use a dumb bell as much as his strength would allow. By perseverance, in the course of a few weeks, he recovered the use of his hand.

CASE VIII.

The following case is interesting, as showing the length of time the muscles may be in a state of inaction, and yet recover their powers, as well as the utter uselessness of irons in cases of paralysis.

A lady had worn irons, during forty years, for a paralysis of the left leg; she consulted me in consequence of the pressure which the instruments made on the foot. The foot was turned inwards, and rested much on the outer ancle, giving great pain. The instruments were fixed round the pelvis, and the limb was moved by the jerking of the muscles attached to the pelvis; there was no other

power of motion, except a slight movement of the toe. The treatment was commenced by shampooing. She was placed in a high chair, and a small weight fixed to a cord, passing over a pulley, was attached to the fore part of the ancle by a strap. She had at first not the slightest power of moving it; but by a repetition of attempts, at last succeeded. As she by degrees acquired strength, the weight was gradually increased; when, by the daily application of these means, the extensor muscles had acquired sufficient power to preserve the straightness of the limb, and to allow her to bear some weight upon it, without its giving way, attempts were made to restore the shape and powers of the foot; the necessary dependance of the thigh upon the pelvis, the leg upon the thigh, and the foot upon the leg, for useful station or motion, being borne in mind. Having acquired thus much power, she was required to use a spring, which gave way to the pressure of the foot, by bearing upon the extremities of the metatarsal bones.

The increased size of bone, consequent upon the exercise of the muscles attached to it, was in this case strikingly manifested; the os calcis having at the expiration of the time (two years and a half), under treatment, become nearly double its former size.

By daily perseverance in the means above detailed, she acquired a useful limb, and the power of walking without the aid of instruments.

CASE IX.

A young gentleman, 14 years of age, was attacked, when six years old, with paralysis of the whole of the *left* side. On any unusual exercise of the *right* arm, there was an instant spasm and contraction of the fingers of the left hand, and of the fore arm. When the disease had existed two years, I was desired to examine him: I recommended the use of muscular exertion; the friends were dissuaded from its adoption; and I did not see him till after a lapse of six years more, being eight years from the invasion of the disease. He was in every respect the same, except that the attacks of spasm were more frequent and distressing, occurring twenty times, or oftener, in the day. Any exertion of the right arm or hand, however slight, such as writing, would give rise to it. He complained occasionally of giddiness and some uneasiness in the head; the left arm was totally useless; the fingers had so little power of resistance, that they, as well as the thumb, could be retroverted, and were so flexible as to allow of the fingers being bent at the junction of the metacarpal bones with the phalanges, and laid back upon the metacarpal bones. He had not the power of raising the body upon the left foot; or, when the heel was placed on the ground, of raising the foot. There was a trifling power of pronation and supination, not the least of grasping;

therefore any substance, however light, placed between the fingers, was allowed to fall upon the ground.

The following treatment was adopted: he was put upon a moderate diet, and took a purgative once a week; he was shampooed over the whole arm and hand; the hand was *tied* to a cord passing over a pulley, to the extremity of which a weight of half a pound was attached, which he moved, not by the muscular power of the arm, but by throwing the body backwards: the first attempt to do this only six times, occasioned great fatigue and cramps of the muscles; by a repetition of trials, increasing the number by degrees, and also the weight in proportion as the power attained became greater, he was enabled to move the weight by grasping with the hands, without the recurrence of spasm. The spasms decreased in frequency with the augmented strength of the limb; and, at the expiration of twelve months, he was able to draw up twenty pounds, by the muscular force of the arm alone, seven or eight hundred times a day, and hold a dumb bell of seven pounds weight in the hand, with the arm extended at full length, a considerable time, without any spasm being produced. The leg also improved in the same ratio, and when he left town, he could hop several times round a room on the paralytic limb.

CASE X.

J R., ætat. 35, February 1832, a servant, had twelve months before a distressing spasmodic pain on the left side of the spine, at the junction of the dorsal and lumbar vertebræ, accompanied by a numbness and sudden contraction of the limb when walking, so as almost to throw him down. He had tried the ordinary remedies, blisters, plaisters, issues at two periods, under the care of different surgeons; he was placed in stays six weeks, and for four months was obliged to preserve a recumbent position. He was directed to be careful in his diet; to take a purgative once a week; five grains hydrarg. cu. creta every night, till a slight increase of saliva took place in the mouth, and then continue it another fortnight, twice a week; to rub the parts with a spirituous embrocation; bathe thrice in the warm, and then in the cold bath, every morning; to use a dumb bell of seven pounds weight thus—having placed the right foot as far in advance *as possible*, to extend the left as far backwards, and taking the dumb bell in the left hand, carry it in a circle over the head, and deposit it on the ground in front of the extended right foot; beginning twice or thrice in the day, and increasing the exercise daily. He followed this plan very attentively, and told me, on his return to town in September, that he had

walked fourteen miles a day without spasm, or other inconvenience.

CASE OF PARAPLEGIA.

An interesting child, ætat. $4\frac{1}{2}$, was attacked with paraplegia when sixteen months old. He had, when I saw him, neither sensation, nor power, over the lower limbs; he made progressive motion on the ground by the use of the arms alone, the lower limbs being dragged after him, and totally useless. He was directed to observe a moderate diet; aperients were administered occasionally; shampooing was had recourse to; and the child being placed in a sitting position on a chair, a half-ounce weight, connected with a line passing over a pulley, was attached to the fore part of the instep of one leg, and then the other in succession, he was directed to try to throw the leg forward; after a repetition of attempts, in the course of a week, he succeeded in effecting a slight degree of motion; a trifling addition was occasionally made to the weight as he gained strength. When he had by these means acquired considerable power in the muscles of the anterior part of the thigh, he exercised those attached to the posterior part of the pelvis, by being placed in a chair lying on his belly, and a weight, connected with a line passing over a pulley, being fixed to the heel, he was directed to throw the leg backwards gradually, and

daily increasing the quantum of labour till the muscles had gained power equivalent to their antagonists. He was then required to try to balance himself on his knees; in this, after a number of fruitless attempts, he succeeded, and gradually acquired the power of progressive motion, being able to walk on his knees twice across a room between fifteen and sixteen feet long. At this time he was withdrawn from under my care, and I lost sight of him.

The above is interesting, as showing what may be accomplished in the most apparently hopeless cases. Here was both motion and sensation reacquired from a state in which there was neither; and the circumstances justify me in the conclusion, that a continued perseverance in exercising the defective muscles would have been crowned with complete success.

PARALYSIS AGITANS.

This species of disease has been described by the late Mr. Parkinson, of Hoxton. It seems to have its seat in the nerves distributed to the muscles that support the neck. With proper precautions, muscular exertion may be usefully employed. In the case of adult persons, occasional purgatives should be combined with strict attention to a moderate diet, in order to obviate any tendency to

plethora, or congestion in the head, which, if present, would not only prevent the means being attended with the desired success, but aggravate the disorder we are endeavouring to remove.

I had recourse to shampooing and muscular exercise, in the case of a woman between 50 and 60 years of age, who was sent to me from the country; she had suffered from violent headachs some years, and was attacked with paralysis agitans three years before I saw her; she was incapable of keeping the head steady without assistance from the hands. I made use of various exercises; amongst others, that of pulling with the head a weight attached to a line passing over a pulley, gradually increasing the exertion, and was gaining ground upon the disorder, but having recommended in addition, the balancing a small weight upon the head, my patient could not comprehend the utility of adding to a part, already incapable of supporting itself, an additional burden; I therefore had not sufficient influence with her, to induce her to persevere a length of time sufficient for obtaining an entirely favourable result.

In a young lady, between 13 and 14 years of age, the head dropped on either side, most commonly on the chest, I pursued somewhat similar means to those used in the former case. As she was out of health, aperients and alteratives were also had recourse to. She balanced a weight upon the head; and it was worthy

of remark, that as volition was directed to the muscles connected with the head and neck, she not only acquired sufficient strength to enable her to support the head, but that after some time, any weight, however slight, was sufficient for that purpose; so that she obtained the power of controlling the movements of the head, that were before involuntary.

In another young lady, ætat. 9, there was the same unsteadiness of the head, but it was accompanied by a convulsive movement of the arm and hand. There appeared to be some hepatic derangement; she took small doses of hydrarg. cu. creta, and occasional aperients. In this case shampooing, and other means before detailed, were resorted to with still more beneficial results, as she entirely recovered the power of keeping the head steady.

CHAPTER VII.

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 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.

* Mead.

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 there 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 headachs, 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 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 headach experienced on the side opposite to the part affected, hesitation of speech,

* Andree on Chorea. † Hamilton on Purgative Med.

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. 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,

* London Medical Repository, January, 1821.

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 connection 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 shown by the following cases, two of which were of long standing, and the usual remedies had been found unavailing.

CASE I.

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

* On Purgative Medicines.

CASE II.

Master R., when between ten and eleven years of age, was in the night attacked by 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 controlling 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, though I had anticipated its good effects, I 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 connection 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 were 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 control.

CASE III.

Master H., ætat. 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 furred; the bowels habitually costive; the pulse 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 control 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 reestablishing 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.

CHAPTER VIII.

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 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

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

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 patient's capability to support it; that those parts which are the seat of disease should be especially called into action; and that when the patient's 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.

A young lady, between 8 and 9 years of age, had been troubled a considerable time with spasmodic twitchings of the muscles of the face and head; various remedies had been used, purgatives, mercury, arsenic, without success. Believing that the stimulus of volition might be beneficially employed, she was directed to carry a light piece of wood standing upright on the head, thus rendering it more difficult to balance; and by perseverance in its use, after some time, the disorder was entirely removed.

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.

There is scarcely any distinction to be drawn between mollities ossium and rickets, the former being merely an aggravated form of the latter; they both arise from the same general causes, the only difference appearing to be in the period of life, at which they respectively occur; both attributable rather to a defective assimilation of food, than to any deficiency of the materials from which osseous matter is formed. The administration, therefore, of the various combinations of lime, which were some years since recommended, was founded on erroneous principles, the ordinary animal and vegetable food furnishing all the earthy substances necessary for the deposition of bone. This is particularly illustrated in the case of Anne E. Queriau, the wife of M. Supiot *.

These means were tried in the case of a young lady, who had such a softening of the bones, that she had been obliged to remain for several years in a recumbent posture: the debility was extreme, and the bones yielded so greatly to the superincumbent weight, that she lost the power of walking. There was distortion of the spine, although not to a great extent; the bones of the leg and thigh were much curved. She was put upon a regulated diet, animal food forming one meal; shampooing was had recourse to; and she commenced muscu-

* Histoire et Mémoires de l'Académie des Sciences, 1753.

lar exercise by drawing the thigh upwards, when lying extended on her back, and returning it forcibly to its former position; occasionally pushing a weight from her with the foot; elevating and depressing a small weight with her hands; gradually and daily increasing the task, as her strength augmented. Having by these, and various other means of a similar kind, gained a considerable degree of power, and when it was thought sufficient time had been allowed for the bones to become more consolidated, she was permitted to try to stand; after repeated attempts she was successful, and acquired the power of walking; the bones having attained firmness gave way no further to the weight of the trunk. She is now capable of taking walking exercise, and has not only had no return of her disorder, but has preserved a good state of health.

The effect of well-directed exercise, persevered in for a considerable length of time, was also exemplified in the case of a young lady, ætat. 11, who had the bones of the thigh and leg curved forwards, in consequence of rickets, at a very early period of life. I had seen the general health suffer much from the use of instruments, and determined therefore to try the effect of exercise only. She was directed to raise herself, and support the weight of the body on the phalanges of the foot, as often and as long at a time as she could every day till fatigue

was induced; repeated twice in the day. This was continued between three and four years; at the expiration of that time, the curvature of the bones had disappeared. In this case occasional aperients, and cold bathing during the summer season, were also resorted to.

The congenital club-foot, in which there is no destruction of parts, but which is simply owing to their having been confined too long in an improper position, and their having lost their size by disuse, is doubtless remediable by muscular exercise, with the aid of mechanical means to allow of placing and preserving the parts in their proper relative position, at any period of life: of course, that fulness of development of the muscles, connecting the foot with the leg, cannot be attained so completely as if efforts had been made for that purpose when the subject was young; but enough may be gained in the usefulness of the limb, and the avoidance of deformity.

It is, perhaps, unnecessary to remark, with regard to its proposed application in the case of ligamentous union, 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, were 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 had 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 to 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 fulness, 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 con-

clusion, 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 connection between the mind and the nerves distributed to the muscles having been broken, the muscles connected with the organs of speech are not so much under the control 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, yet 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 Médicales. 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.

Some, who have not hitherto directed their attention to muscular exercise as a remedial agent, may perhaps think it has been recommended too indiscriminately in disorders apparently so dissimilar in their nature. It has however this advantage, that provided what may be termed the dose be properly regulated and apportioned to the strength and capability of the patient, no injurious consequences will ensue from its use.

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 might have been susceptible of affording material benefit.

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