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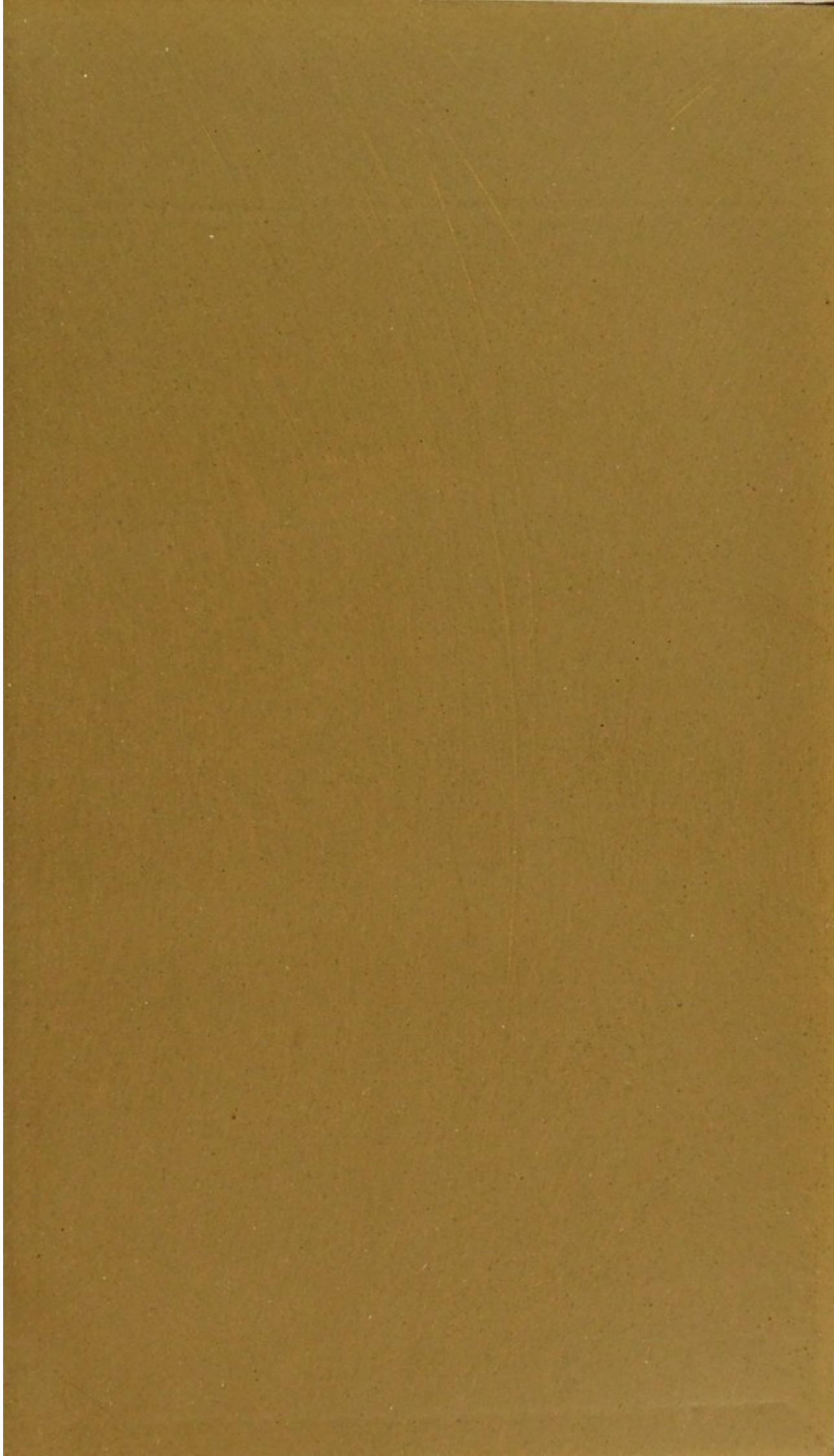
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ON

SPINAL WEAKNESS

AND

SPINAL CURVATURES:

THEIR EARLY RECOGNITION AND TREATMENT.

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ARCHIBALD BILLING, M.D. A.M. F.R.S.

MEMBER OF THE SENATE OF THE UNIVERSITY OF LONDON, FORMERLY SENIOR
PHYSICIAN OF THE LONDON HOSPITAL,
ETC. ETC. ETC.

THIS SMALL TREATISE IS GRATEFULLY INSCRIBED,

IN APPRECIATION OF HIS EMINENT SERVICES TO MEDICAL SCIENCE,

BY

HIS PUPIL, COLLEAGUE, AND FRIEND,

THE AUTHOR.

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INTRODUCTION.

IT is my design in the following pages, whilst placing before the profession the *résumé* of my experience in the treatment of spinal weakness and spinal curvatures, to endeavour to confine myself as far as practicable to those points of pathology and treatment on which, during the last twenty or thirty years, reasonable differences in opinion have been entertained. I do not purpose to preface this small treatise with the too common elaborate disquisition on the anatomy and physiology of the component parts of the spinal column. I may give credit to my readers for familiarity with the apparently complex but really simple conformation of the bones, the connecting muscles and ligaments, as well as the contained spinal cord, still so mysterious in its construction, and the nerve-trunks passing between the individual bones. From a similar belief that my readers are sufficiently familiar with the various forms of spinal deformity, I shall not even consider it necessary in the present day to add to my pages a series of illustrative drawings of these affections. I shall confine myself, in the matter of pictorial illustrations, to inserting in an appendix a few woodcuts to exhibit the spine and chest deformity caused by pleuritic contraction, and the differences between it and so-called "ordinary lateral curvature." In former publications I have availed myself more largely of drawings, because at the date of these publications I had to describe many deformities and their varieties which had never before been illustrated, or even published to the profession. A similar remark applies to these woodcuts of pleuritic chest and spinal deformity. I am not aware that this class of cases has been elsewhere thus illustrated and brought to the knowledge of the profession.

Many opportunities have been afforded me of perceiving that, in spite of the greater study nowadays of special subjects of disease, once placed more out of the track of general medical and

surgical practice, very considerable misconception of the true nature and treatment of spinal curvatures exists. There is, however, in the present day, a disposition of the profession in general to inquire seriously into the intimate nature of the deranged condition of the anatomical framework and the moving powers of the spine, and to correct them, which is far different from a former state of things, when it appeared sufficient for the student and young practitioner to distinguish between lateral and angular curvature, and to relegate the patient to the contrivances of the instrument-maker, or the *pis aller* of the reclining board and prone couch. Yet I believe the minority only of medical men really possess clear ideas of the pathology and diagnosis of spine-affections; and the majority are insufficiently acquainted with their early stages, during which alone effectual *curative* treatment can be employed.

The second half of the last century and the first half of the present one have been increasingly prolific of books professing to treat of the nature and *cure* of spinal curvature. Many of these books, when looked at by the light of the pathology of their respective periods, doubtless responded fairly to the knowledge then possessed; but in no department of medical practice has the good been more checkered with evil than in books relating to spinal curvature. Too many of these books are but a reproduction of those which have preceded, including always the announcement of the discovery of some new spinal couch or support for the cure of lateral curvature in particular; though their pages are sought in vain for evidence of the cures effected by each new instrument. In no branch of medicine, whether in books or in actual practice, has charlatanism on the part of legal practitioners of medicine, and of illegitimate ones, been more rampant. To allude to a single point: even in the present day, a practice is followed in the treatment of scoliosis, commonly called lateral curvature, consisting of encasing the flexible, expanding frame of all females during childhood, girlhood, and even womanhood, who exhibit the slightest trace of this deformity,—or, indeed, who exhibit no trace of it, but whose anxious friends are apprehensive of its occurrence,—in heavy,* unyielding spinal supports, worn by night as well as by day for several years.

* The author has released several patients who had worn, uninterruptedly, during one, two, or three years, spinal machines or supports, consisting of a clumsy, rude scaffolding of ornamented iron bars, weighing five to nine pounds, variously mystified by straps, screws, and cog-wheels.

Such an apparatus is secured by a lock and key more powerful than if made of steel or brass, viz. the assurance of the practitioner that, without the persistent use of it, frightful deformity will inevitably result; acting upon the fond solicitude of the parent, lest any departure from the prescription should entail so calamitous a consequence.

I may be excused for pausing to inquire how a state of things such as I have here described has become possible at the present moment. There can be no doubt that, as a general rule, the persons who sedulously devote their attention to the treatment of a particular affection, say spinal curvature, even if they are less well acquainted with the general treatment of disease, benefit their patients in a greater degree than those physicians and surgeons who, notwithstanding high scientific attainments, give to the case of deformity but a fleeting attention, and assert that the patient will outgrow the evil. The orthopædists, at the beginning of the present century, although little versed in pathology, succeeded, by means of their extension beds, their head-suspenders, their cumbrous spinal machines, their pressings and counter-pressings with gymnastics, in effecting more cures than the Hufelands, the Dupuytren's, and the Astley Coopers of their day; but the good actually accomplished led to so pretentious and preposterous an application of those orthopædic means, especially of spinal supports, that a reaction against them took place, so that thirty years ago the ablest members of the profession altogether repudiated the use of them. When, in 1838, I established the first orthopædic hospital for the cure of club-foot and analogous distortions, a multitude of spinal deformities, especially those of advanced grades, presented themselves for relief. I soon found, contrary to the notions I had imbibed from writers on general medicine and surgery, that the orthopædic practitioners, who were then almost an extra-professional body, were right as to the benefit frequently derivable from the employment of spinal supports. The consequent introduction by myself of these supports, for the palliation and relief of the numerous *severe* deformities which presented themselves at that public hospital, was the signal for their more general adoption, and has led to the glaring abuse of them, in the cases of private patients, by some practitioners at the present day.

In the following pages I shall show that many deformities of the spinal column may be restored without the use of spinal sup-

ports, and shall point out what are the cases in which they are useful for the palliation of existing deformity, and the prevention of further mischief. It will be seen that many cases of lateral curvature, which are treated by means of three or five years' use of apparatus, are *curable* by physiological means, as opposed to iron scaffolding, in three or four months.

There are certain main essential facts in the anatomy and uses of the vertebral column and its contained parts which it is necessary to remember in connection with distortions of the column. Thus, whilst it may be affected with all the sources of weakness, and probably with all the diseases, to which the articulations in general are liable, the spinal column—composed of twenty-four segments, and taking part in twenty-five principal articulations, including the occipito-vertebral, besides the lesser articulations of each pair of the articular processes with each other, and with the costo-vertebral ones—offers a peculiarity which distinguishes it from other parts of the body, viz. that no one of the composing segments of the column can be seriously displaced or diseased without in some degree implicating every other segment. And further, in consequence of the greater importance to life of the superior parts of the spinal cord, it may be laid down as an axiom, that the higher in the vertebral column disease is situated, the more serious its effects are liable to become, as regards that nervous centre. Thus, disease of the second cervical vertebra is not seldom complicated with gradual or sudden annihilation of the functions of the spinal cord, *i. e.* death by destruction of the vagus and phrenic nerves; whilst disease (Pott's) of the lowest lumbar, as a rule, under proper treatment, traverses all the stages without implication of the nerve-trunks.

The relational anatomy of the intermediate parts of the column should no more be overlooked than that of the extreme parts. Thus, the contiguity of the middle portions of the column to the thoracic abdominal viscera exposes these organs not only to the mischievous influence of direct propagation of disease (suppuration, for example) to them from the vertebræ, but also to manifold derangement of their functions by disturbance of the nerve-trunks which traverse the diseased sections of the column. Nor must the intimate relations of the spinal cord with the brain, and the secondary derangement of mind and body sometimes consequent upon disease of the vertebral column and of its contents in the ultimate stage, be left out of consideration.

It will be remarked that throughout the following pages I have made no reference to, or quotation from, the writings of contemporary authors. The frequent reference to these in my treatise on *The Deformities of the Human Frame*, and in my earlier works, will show that the omission is not because I was unable, in the language of the learned translator of the works of Hippocrates and Aretæus (Dr. Adams) to do so "sine irâ aut studio," but because the following pages do not profess to be a critical dissertation on the subjects of which it treats—which would have necessitated a larger work than I proposed to write—but a compendium only of my own opinions.

I especially request the attention of the reader to the circumstance of my having in the following pages designated the deformity commonly known as "Lateral Curvature of the Spine" by the term "Rotatory," or "Rotato-Lateral Curvature of the Spine." The Germans, following the examples of Hippocrates and Galen, have usually denominated it "Scoliosis," in consequence of the twist which the spinal column undergoes in this deformity.

It is, perhaps, a hopeless task to expect the general substitution of a new for a well-known name. I propose simply now to direct attention to the advantage of a more appropriate name, one which shall more correctly describe the deformity to which it is applied. If the name "Lateral Curvature" did more than affirm a part of the nature of the deformity, I should be content to retain it; but it expresses a relatively small part of the deformity only; for however considerable the lateral curvature may be, the rotatory twist of the column is more considerable, and far more deserving of notice, as it constitutes the especial cause of the difficulty of cure. The lateral deformity is that portion of the mischief which a tolerable spinal support may in slight cases remedy, whilst it leaves the rotatory twist of the column untouched. But a stronger reason for altering the designation of lateral curvature is the fact that, in the deformity of the chest and spinal column which sometimes succeeds to pleurisy, we have presented to us a simple lateral curvature of the column, without the scoliotic or rotatory twist noticed by the ancients as a part of the "ordinary lateral curvature." Moreover, we shall do ourselves honour if we follow Hippocrates and Galen, who have so ably written on spinal curvatures, and use an English term more nearly approaching a translation of scoliosis. I am more sanguine of the probably gradual adoption of an improved name since my efforts in the same direction, thirty years ago, have been

flattered with success. I allude to my proposal to employ the term "Talipes" as a generic term for deformities of the foot, and to classify Equinus, Varus, Valgus, and Calcaneus, as species of the genus Talipes. Since that time I have successfully introduced to the knowledge of the profession several varieties of deformity, under the names Talipes Equino-Varus, Talipes Calcaneo-Valgus, and others. Dr. Dods, in 1824, proposed the designation, "the Rotated or Contracted Spine," for that "commonly called Lateral Curvature." He met with no success; probably because, at the time he wrote, the impulse which has since been given to orthopædic medicine, through the discovery of subcutaneous tenotomy by Stromeyer, had not taken place. He might have succeeded better, if he had been able to show that true lateral curvature ensues only from pleurisy. After pleurisy, the contracting cause—the adventitious membrane organised within the pleural cavity—operates upon the spine in a lateral direction only; whereas in that which is commonly, but erroneously, termed "Lateral Curvature," the acting powers (the muscles), which are naturally capable of acting upon the spine in a rotatory manner,—by which, in fact, in health, the young are enabled to twist or turn the trunk round as desired (as when picking up an object somewhat behind),—in states of weakness, gradually imprint upon the spine a constant rotation of the trunk, not wholly recovered from when the individual is at rest. The sequel will show the probability that the lateral part of the deformity, which is obvious upon a cursory examination, is the result of debility of the structures of the spinal column; whilst the peculiar twist—the scoliosis element—is imprinted by the action of the muscles. The mixed lateral and twisted or rotated character of the spinal column in "ordinary lateral curvature," may be most easily explained as the product of two forces acting upon it simultaneously; *i.e.* one force is consequent upon debility of structures,* through which the spinal column tends to *s'affaïsser*, as the French would say—to shut itself up, as it were; tending, whilst so doing, to the production of a series of curves of a sigmoid lateral character; whilst the spinal muscles, by their unequal, unsymmetrical action,—arising

* The description of the state of debility as a force is, strictly speaking, incorrect; but, considering the powerful influence of debility in the causation of disease in general, the reader will understand the sense in which the term is here employed.

from their unequal development on the two sides, through habitual unequal use,—cause the rotation (see further, pp. 17-36). It is possible that the twist or rotation of the vertebræ may be partly or wholly due to the resistance to the collapse or lateral giving way offered by the spinal muscles.

It will be observed that, as a concession to the usage of this country and of France, I have in the following pages more commonly employed the term “lateral curvature” than “rotatory curvature.” Time alone will affirm the value of either of the new designations suggested, or condemn them.

I am aware that in some of the above observations I expose myself to the charge of egotism, and an undue depreciation of the labours of the past, and insufficient tenderness for the opinions and practices of others; but I rely upon the indulgent exculpatory judgment of my professional brethren in general: and in extenuation, should any justification appear necessary, I may add, that in whatever I have written now, as well as formerly, I have aimed, in addition to any personal gratification and advantage derivable from contributing the result of my labours to the profession, to do it openly and thoroughly; to explain fully every particle of technical knowledge I may have acquired; and thus, to the utmost of my power, to assist my professional brethren in our common duty of relieving the physical sufferings of mankind.

BROOK STREET, LONDON, W.

October 1867.

THE UNIVERSITY OF CHICAGO

ON

SPINAL WEAKNESS.

AN attentive observation of spinal cases, and of internal diseases in general, shows that in many forms of internal disease an abnormal condition of the spinal cord—as shown by concurrent symptoms, the nature of which symptoms proclaims their relation to the spinal cord—presents itself as a super-added complaint. In fact, we become aware in our practice that in certain individuals, and certain constitutions, in children of both sexes—and in the adult, especially in the adult female—whatever be the nature of the serious, or even slight, internal disease for which our services are sought, we may look forward to phenomena of spinal disturbance showing themselves during its progress, more often towards the last stage, when probably incipient or decided general exhaustion, caused by the internal disease, has manifested itself. The mention of the occurrence of the ordinary forms of infantile paralysis, of chorea, and hysteric convulsions, will serve to illustrate the foregoing statement.

In our daily practice, whatever may be the nature of the attack of urgent illness, we participate in the anxiety of parents and friends, lest *cerebral* disturbance should intervene and complicate the case; and, owing to the immediate recognition of any impairment of the intellectual and sensorial functions, we are in no danger of overlooking this alarming condition. But,

as regards complications through impairment of the spinal cord, it not unfrequently happens that considerable lesion of this part may occur in the progress of internal disease, when convulsions, or other *energetic* symptoms, do not attract attention, without the medical attendant having suspected the superadded disease. Thus, in children's disease, a considerable paralysis of the lower extremities has often occurred unobserved whilst the patient has been confined to bed with gastric and abdominal febrile derangement. When the hands have been simultaneously or subsequently seized, there has been no danger of the complaint being overlooked. An adult may be recumbent for several weeks with typhus or rheumatic fever, followed by paralysis of the lower extremities—here, as in children's cases, the complication not having been discovered until convalescence from the primary disease had commenced.

In the majority of instances of disease, the whole of the cerebro-spinal system conjointly suffers; but, great as is the susceptibility to brain-disturbance during acute illness of any kind, it is probable that, in less acute and more chronic forms of disease, the spinal cord, ultimately, as often participates in disturbance. Under the term spinal cord is here included, of course, its prolongations in the cranial cavity. Perhaps the disturbances of the proper brain-functions are more often transient than are spinal derangements. It is not difficult to find a reason for the frequency and permanency of spinal affections in the fact that the spinal cord, as a supply-centre of nerve-power, has far greater and more continuous demands upon its agency than the brain has—life itself being dependent upon the integrity of the spinal system; the organs of vegetative existence being indirectly, by means of the vagus and sympathetic system, and those of purely animal life (exclusive of the special senses) directly, by means of the spinal nerves, in such intimate dependence upon the spinal cord, that probably no departure from health in any of these organs takes place without its influence being felt and reciprocated by the cord. It may be

remembered also that the spinal cord commences its functions before birth, enjoys no such entire repose as falls to the lot of the brain during sleep, and may continue its functions after the brain has ceased to act. A familiar example of the influence of slight interruption or delay of function upon the cord is illustrated by the return of comfort felt in the lower extremities when defecation has taken place; torpid bowels occasion weariness of the lower limbs.

In the naturally robust, the reciprocal action and reaction upon each other of the organs of vegetative and purely animal existence, and of the spinal cord, does not pass beyond the bounds of physiological cognisance, if it may be so expressed, or at any rate of transient pathological derangement; unless there exist in the system a proclivity to general disease of tissue,—such, for example, as syphilis, rheumatism, or other constitutional maladies, engender,—in which case the cord and membranes may undergo more or less considerable material changes. In the feeble, however, especially in those who have an hereditary or acquired weakness of the spinal cord, the susceptibility to derangement and permanent affection of this part is so great that, either without the coöperation of a distinct constitutional malady, such as syphilis, rheumatism, tubercle, cancer, &c., or with so feeble a dose only of the constitutional malady as would, in the robust, be easily resisted, a great liability to protracted or permanent spinal lesion takes place.

In practice, we have no difficulty in recognising the fact of numerous individuals having inherited a cerebro-spinal system more prominently developed in their organism, or whose brain or spinal cord—or either, sometimes, separately—presents a development above the average; and we are constantly reminded that, although this extra development has its advantages, in stimulating to and facilitating the performance of acts and functions which redound to the activity and excellence of the individual, yet that it has its shady aspect, in

the disadvantage of increased penalty of suffering for over-use, *i. e.* abuse, of the function.

Numerous circumstances in the life of individuals in every generation, which it is unnecessary here to fully particularise, lead to extreme or excessive use of the functions which derive their power of action from the spinal cord—excessive labour of muscles, voluntary and involuntary, excessive venery, excessive child-bearing, frequent abortions, excessive demands upon the organs of vegetative existence, the liver, heart, &c. Undue exercise of function is continued at the price of excessive stimulation and nutrition of the central organ, which for a time facilitates the supply of the increased power demanded by the function. After a time, the increased and repeated demand, as well upon the peripheral or the distal organ as upon the centre of supply-power, leads to exhaustion; at first with diminished facility of replenishment of strength of function by repose, finally with cessation of it. This is well shown in certain limited paralyses of external parts—as, for example, in paralysis of the gastrocnemii after excessive walking, or of the muscles of the thumb and forefinger after excessive writing. These are not, as often taught, purely peripheral affections; they are not even exclusively spinal or peripheral in their etiology: for the brain proper has a share in their production. I have watched no case in which mental causes (anxieties) had not appeared to favour or to precipitate the disorder. On the contrary, retarded, restrained, or neglected functions, as of the muscles, for example, and of the corpuscular cineritious matter,—which corresponds in the spinal cord with the muscles,—leads to incomplete development of them in the individual who has not attained to puberty—impaired nutrition, wasting, possibly atrophy, in him whose development has at one time been completed. We observe this often in the muscles of the trunk—those of the spine in particular—in some persons with large cerebral development, who are given to literary or sedentary pursuits, to the neglect of bodily exertion; the large head

contrasting with the puny, thinly covered bony framework of the trunk, and favouring the production of lateral curvature in the young, and posterior curvature in both young and old.

Closely associated, in some respects, with spinal curvature, and its frequent paralysing effects upon the spinal cord, is a state of things with which the popular mind is familiar, namely, *spinal weakness*. Sometimes we are consulted, and the question is eagerly asked, whether the subject of the consultation is affected with spinal disease or spinal debility—the idea of the questioner not being very clear, as to whether disease of the bones of the spine or disease of the spinal cord itself be meant by the terms. Amongst the profession, too, the lines of demarcation between several forms of spinal ailment in their early stages have not been very plainly set out; doubtless owing to the chronic nature of many of these complaints having debarred the morbid anatomist from a rigorously correct acquaintance with the structural changes on which the first symptoms depended. The altered physical conditions met with in the spinal cord twenty years, or more, for instance, after symptoms of spinal lesion first showed themselves, may little resemble, or bear but little relation to, the state of things which first existed. In many cases the alterations discovered are referable to the one prominent symptom which clouded the last months or years of life—such as paraplegia, or more general paralysis. Hence, in writings on the diseases of the spinal cord, the states which have destroyed life are more abundantly described and illustrated than the diseased conditions, whatever these may have been, which embittered and enfeebled the life of the individual, maybe, from the commencement of the period of puberty, throughout middle age. In purposing to treat briefly in this place, under the head of “spinal weakness,” of certain cases which frequently present themselves to the physician and surgeon, I admit the scientific insufficiency of the designation, “spinal weakness;” because weakness of the spine is an invariable symptom

of several well-known anatomical states of the spinal cord. But until a distinct anatomical or pathological state can be shown to be associated with the cases in question, I know no better term under which they can be described.

Spinal weakness touches closely upon, is comprehended in, or is confounded with, several conditions more or less well known and understood, namely, spinal irritation, spinal hysteria, and tabes dorsalis. Many cases of spinal weakness are also associated with uterine disturbance, such as disposition to menorrhagia, or with superficial ulceration of the os, the pathological importance and the topical treatment of which was for some years greatly exaggerated.

On inquiry into the history of a large number of cases of spinal weakness, we discover that the most frequent hereditary family antecedents met with are phthisis or lateral curvature in the mother, or a marked tendency in one or both parents to disorder of the nervous system. We are ignorant in what mode a phthisical element in the constitution modifies the spinal cord in simple spinal debility. It is true that in the phthisical constitution a peculiar susceptibility of the nervous system is commonly recognised; but it is possible that a phthisical element may operate on the spinal cord simply as it is apt to operate on most organs, by diminishing their resistance to the causes of disease.

If in a single generation we witness such a deterioration of parts as is described (p. 4), from in some instances excessive use, in others from neglected use, it appears at first sight not improbable, from our ascertained knowledge of the hereditary transmission of mental and corporeal qualities, and of the forms and development of organs, that in the second or later generations a marked inferiority of development of the spine, for example, takes place—either of all the component parts of this trunk-stem of the organism, namely, muscles, bones, and contained spinal cord, or, perhaps, of either separately,—giving to the individual, in fact, an

hereditary weakness of the spinal column and its contents. In the following pages, under the head of Spinal Curvature (see p. 23, *et seq.*), it will be shown that a similar weakness of texture of the containing and contained parts of the spine may be *acquired*, *i.e.* originate after birth, as the consequence of imperfect nutrition of the system in general, and imperfect development of the parts, caused by sedentary and other enfeebling habits, neglected use, &c. In many cases it will be found that the enfeebling habits which we witness are traceable to the example afforded by the life led by the parents, and to the manner in which the child is nurtured and brought up. In fact, an hereditary predisposition to spinal disease or spinal weakness may be present, whilst little or nothing is done during the rearing of the child to mitigate or avert the evil tendency. It may be truly said that the hereditary predisposition on the one hand, and the tendency to acquisition of spinal debility caused by defective physiological and hygienic training on the other, mutually act to the injury of the individual.

I have thus far endeavoured to make clear, without quoting from the detailed history of cases which have fallen within my own experience, the fact that an hereditary or an acquired predisposition to a state of "spinal debility" is very frequently met with; and I doubt not that cases appearing to originate in the manner described have been commonly observed by my professional brethren.

In these spinal cases—spinal debility—as in most other diseased conditions, something more than even a strong hereditary or acquired predisposition is usually required to produce the disease. An *exciting* or *determining cause* is needed to induce an outbreak of the particular disease. Thus a young woman, for example, who is approaching puberty, or who has just entered upon that state, is said by her friends to have "never been very strong," yet never to have had "any particular illness;" to have been "always rather delicate;" until

a serious cause of mental anxiety, and heavy demands upon the bodily strength, such as the illness and death of the mother, and the protracted, anxious watching and attendance at the sick bed, broke down the young woman's health, ending in spinal debility, characterised by impaired digestive and assimilative power, anæmia, incapacity for any exertion, especially of the muscular system, rachialgia, &c. Or this and similar exciting causes of general debility, undue nervous excitement in general—grief, despondency, or disappointment—in the predisposed and weakly subject, may induce the class of symptoms commonly called "spinal irritation;" just as, in the similarly predisposed, profound alarm or disappointment, or mental and bodily exhaustion, may excite hysteria.

It were much to be desired that morbid anatomy could shed light upon the pathology of the spinal cord when suffering, and displaying its suffering by means of the congeries of symptoms denominated spinal debility and spinal irritation. As cases of this nature are, in after years, sometimes merged into more or less complete spinal paralysis, the spinal debility or spinal irritation may then be justly regarded as the first symptoms of the paralysis, and therefore of the atrophy and softening of the cord often met with after death. But many links in the pathological chain are wanting between the first signs of spinal debility and the confirmed wasting and degeneration of the cord. During a long period of time, derangement of the cord, formerly termed functional, must needs precede the occurrence of palpable atrophy, softening, or other changes. This stage, once termed functional, obviously because it was seen to be occasionally recovered from, is doubtless analogous to the morbid stage preceding that of physical deterioration in those tissues which, by their greater accessibility, have presented greater facilities for the study of their physical condition—the eye, for example.

Whatever be the ultimate form assumed by the diseased actions and products in the tissues, we have good grounds for

the belief that, in diseased action in general, the normal relation between the blood, the capillaries, and the tissues, is altered; that the blood may be deficient, or superabundant, or defective in quality; that the flow of it through the capillaries may be accelerated, retarded, and at length arrested; and that materials foreign to the part are deposited in the tissues, instead of those which should naturally find place there,—in fact, that a state of abnormal nutrition succeeds to the normal nutrition: the form which the abnormal nutrition shall ultimately take being determined by the preëxisting disposition to disease in the individual—as in rheumatism or scrofula, for example; or by the character of any poison recently admitted into the system—animal poisons, for example. In any case, the impairment of the normal nutrition announces itself by symptoms characteristic of disturbance of the part. The process of diseased action in the spinal cord forms no exception to that in other parts of the economy, modified as it is in various parts by reason of difference in texture, but not modified to the extent of departure from the principles of impaired normal nutrition and organic change.

Atrophy of the cord, so often met with after death from paralysis, which may or may not have succeeded to “spinal weakness,” may itself not be the cause of the paralysis, but may be the result of it, and of the disuse of the functions of the cord, just as a wasted nerve and muscle is the consequence of disuse of the respective functions of each of these parts.

The diseased action of the intimate structures of the cord, on which depended the wasted muscles, nerves, and cord, consisted in the aberration of nutrition or of the reciprocal action upon each other of blood and tissue in the cord; the aberration of nutrition itself being favoured by hereditary or acquired susceptibility to disorder, by excessive and diminished calls upon the cord for its peculiar offices, by unsuitable materials supplied by the blood (poisonous agents included), and by inefficient action of other organs, especially of the circulatory system.

The condition of the capillary system of the cord in spinal weakness, as affected by the heart, is one of insufficient activity of blood-current, as regards the stomach and assimilative system as organs of supply; and as regards the lungs, liver, kidneys, skin, &c., as depuratory organs, it is one of impaired quantity and quality of blood-contents. This view is borne out by the effects of remedial treatment; for amongst the means which unmistakably benefit, are—improved quantity and quality of blood supplied, with the help of appropriate medicines and diet; and an accelerated current, effected with the aid of internal stimulants and muscular exercise.

In treating, farther back, of the effect upon the spinal cord of excessive demand upon the functions of organs dependent upon the cord as their centre of nerve-power, I have contented myself with the statement, that excess of function may exhaust the correlative parts of the cord, and determine disease. I have offered no attempt to explain the manner in which this takes place. We may assume that it occurs in a manner analogous to that in which impaired or abnormal nutrition takes place from excess of function in other organs, although we may not understand the mode in which the link connecting the exciting cause of the disease is forged upon or into the first step in the morbid change. We are obliged to be content with the fact that active exertion, when not followed by repose, does lead to exhaustion and disease.

In like manner we are compelled to have recourse to analogy and hypothesis when we endeavour to account for the fact that neglected use of parts dependent upon the spinal cord for their nerve-supply appears to induce disease of this centre. We observe in every part of the frame that whenever, from any cause, one of several organs mutually dependent is thrown out of use, the remainder suffer in their size, structure, and development. The more the human frame is examined from an æsthetic, physiological, and pathological point of view, the more numerous the instances of unequal development of

parts appear, the more commonly we find departures from the normal or average type. When we consider the multifarious duties and occupations of individuals, in the existing state of society, which tend to develop excessively one function and one organ, to the exclusion of other functions and parts, it becomes almost as natural that aberrations from the normal type should occur, as that all or even any should approach the ideal perfection of the artist. Still, the physiological pathologist is able to observe that undue development of one part takes place at the expense of other parts; and he learns to teach the value of encouraging the use of the neglected part, whilst repose is afforded to that which was previously active. The normal activity of one organ is essential for the integrity of the correlated organs. We see in the extremities, for example, how arrested blood-circulation, wasted nerves and muscles, and thinned bones, are consequent upon impaired vitality and use; and we may infer from analogy, that the correlated parts of the nervous centre share at least the fate of the nerves. It would be contrary to all our notions of want and supply, and the maintenance of healthy nutrition in the economy, to suppose, for example, after a limb has been amputated, say the arm, that the correlated parts of the spinal cord should not share in the diminished nutrition which, after a time, visits the axillary plexus. Doubtless, if the limb could be reproduced, the axillary plexus, and the portions of the spinal cord with which the plexus is affiliated, could, unless destructive atrophy had set in, be restored by appropriate means. In like manner, functional disuse, especially long-continued habitual disuse of muscles, whether of one muscle, or of a set of muscles, or of the greater portion of the muscles of the upper half of the trunk and upper extremities, such as has obtained in some modern forms of education and states of society, may be followed by impaired nutrition of the nerves *through* which the muscles communicate with the nervous centre, as well as of the parts of the centre *with* which they communicate.

Physiology assists but little in the comprehension of the manner in which disuse of the muscular system acts mischievously upon the cord; the facts observed in those forms of spinal disorder in which the function of sensation is exalted, whilst the function of voluntary muscular action is at the lowest point, tend to show that, in some manner, a sedentary, luxurious mode of life, in which the sensibility of the individual is morbidly cultivated and enhanced, tends to deaden the activity of generation of muscular nerve-power. The cultivation and stimulation of sensation augments the susceptibility of the spinal cord to sensitive impressions, whilst neglect of muscular activity impairs the faculty of developing motor nerve-force. It would almost seem as if, in some mysterious, because at present unintelligible, manner, from the fact of the spinal cord not being called upon to put forth motor nerve-force or function, it continued, in some cases, to develop the motor power, which, by a correlation of forces, became transformed into sensitive power, causing the extraordinary increased sensibility of the cord, in some individuals, to the slightest impression—an altered polarity, as it were, taking place. Something similar appears to occur in certain hysterical and epileptic subjects, in whom much excitement of sensation, and insufficient active muscular life, ends in outbreaks of convulsion. The bearing of these reflections upon the successful remedial treatment of cases of spinal weakness will presently, I trust, be apparent. Daily observation in ordinary life shows that, with habitual out-of-door active muscular life, morbid sensibility vanishes, whilst the capacity for sustained muscular exertion increases.

In whatever way we may attempt to explain the nature and mode of production of spinal weakness, the disorder of the central organ is manifested by exhaustion of its functions, by the absence in the cord of the nerve-power necessary for the due performance of the acts of vegetative existence and of purely animal life, indicated by feeble performance of the re-

spiratory, circulatory, and chylopoietic functions, and incapacity for muscular exertion. There exists a peculiarity in the mode of supply of nerve-power to the voluntary muscular system, in this respect,—that, whilst in health the cord appears to possess the faculty of generating and supplying power to the muscles as rapidly as it is consumed through the agency of volition,—the cord, in the state of spinal weakness, appears to possess no reserve power in store at the command of volition. Thus, a patient affected with spinal weakness may be able to walk a moderate distance with ease and comfort, but soon experiences fatigue, appears to have expended all the nervous energy,—as if the spinal cord had no reserve power on which to fall back. The brain proper does not appear to participate to any considerable extent in the affection. It appears, for the most part, to retain all its faculties; indeed, it is often disproportionately active and developed. Perhaps, in some cases, if the condition of the spinal cord were not inimical to active participation in the duties of life, we should find the intellectual faculties, if clear, incapable, nevertheless, of enduring exertion. A certain amount of mental depression and quiet resignation to the bodily weakness is commonly observed. To this extent, at least, we may say the brain is involved in the disturbance; illustrating the universal observation, that disorder of one part of the cerebro-spinal system seldom fails to affect the remainder. Still, the extent to which the brain remains intact, even in the severest chronic disorganisation of the cord, until the last stage of the disease has been reached, is often the subject of remark.

The derangement in the parts of the spinal column concerned in the healthful maintenance of vegetative life and of voluntary muscular energy is accompanied or followed by symptoms of disturbance of sensation, perversions of feeling, oftener hyperæsthesia and neuralgia. The most common of these symptoms is a fixed pain in the spinal column, which

may occur in any part,—immediately below the occiput, in the neck, between the scapulæ, in the dorsal or low in the lumbar region. It is worthy of the consideration of those who will study the matter, to what extent, if any, the pain localised in particular spots over the spinal cord may be attributable to the influence of particular functions; thus, for example: whether the sub-occipital pain be due to mental activity, or to sexual activity, which is often associated with mental energy; and the pain in the lower cervical and upper dorsal regions, to disturbed relations between the reciprocal wants and uses of the upper extremities, the upper half of the trunk, the thoracic viscera, and the corresponding part of the spinal cord,—precisely as the lumbar pain may be associated with the wants and uses of the abdominal viscera, and its correlated parts of the cord. The same may apply to the sacral pain, and the condition of the adjacent viscera. In low lumbar and sacral pains, the physician needs always to have present to his mind the question of muscular and fascial rheumatism, the coexistence of renal affection, hæmorrhoids, and so forth. When pain is very prominently complained of, especially if frequent “irradiation of pain take place to other parts of the body,” combined with something like hysterical hyper-sensitiveness and suddenness, the case corresponds to the descriptions of the *spinal irritation* of authors. Little value need be attached to the mode of diagnosis so often recommended for the discovery of a tender spot in the spinal column, by the use of a hot sponge applied to the spine. Whenever a painfully sensitive spot exists in the spinal cord, it is proclaimed with sufficient vividness; it is not necessary to search for it; and if it does not exist as a part of the disease, it is easily excited by a leading question, and by a mode of examination conducted “behind the back,” calculated to excite a sensitive female. In some patients the pain is sacral rather than lumbar,—being due, apparently, to fæcal accumulation in the sigmoid flexure of the colon and rectum; or to an internal hæmorrhoidal condition, the consequence of the

diminished healthy spinal influence upon the intestinal functions. Occasionally, an affection of one of the special senses occurs—hyper-sensibility of the optic nerves—especially in long-standing cases.

So great is the prostration of voluntary muscular power, of the heart's action, of the respiratory function, of the digestive powers (indicated by anorexia), or of the chylopoietic viscera, as shown by the torpid manner in which the secretions are poured into and the excreta carried along the alimentary canal,—the bowels seldom acting oftener than once a week, or at a longer interval, unless aperient medicine be taken,—that the patient sometimes becomes emaciated, and is ultimately confined to bed.

Rarely does any evidence of morbid excitation of the motor tracts of the column show itself in cases of simple spinal weakness: I have, in rare cases, found a contracted limb, where I could neither satisfy myself of the presence of hysteria or of vertebral disease involving the spinal cord, nor feel justified in the conclusion that organic deterioration of the cord, causing spasmoparalysis, was present. In fact, in simple spinal weakness, whether hereditary or acquired, there is a remarkable absence of the ordinary hysterical signs, such as globus, the characteristic faintings, and alternations of tears and laughter, convulsions, &c. The sphincter vesicæ seldom fails in its function, as in hysteria and *spinal disease*; and others of the protean phenomena of hysteria are wanting. The passing paralysis of sensation often met with in hysterical subjects is absent; and even when the voluntary muscular power has been for three or four years in abeyance, we do not find the unmistakable atrophy of muscle which accompanies physical degeneration of the spinal cord. Some of these cases verge upon "reflex paralysis;" but they want the decided paralytic symptoms, the spastic movements or jerkings, and the affections of the sphincters observed in that disease.

After this general view of the subject of spinal weakness,

laying aside all theoretical and hypothetical considerations, we may briefly treat further of the disorder under the following forms :

- Simple uncomplicated spinal weakness ;
- “ Spinal irritation ;”
- “ Hysterical” spinal weakness ;
- Tabes dorsalis ;—

all but the last being almost exclusively confined to the female sex. Each one of them may be associated with scoliosis, *i. e.* rotatory lateral or ordinary lateral curvature, or with anterior and posterior curvature.

Simple spinal weakness begins, for the most part, in young women, before or soon after puberty ; sometimes in those in whom education of the intellect has been prematurely cultivated, the muscular development of the trunk having been neglected, or parts of it, as the lower extremities, having been prematurely employed in exhaustive walking. Many instances occur in women intellectually gifted, as if the activity and nutrition of the brain proper had deprived the spinal cord of all chance of strength. Spinal weakness is often the penalty of the softest tissues and of the most *spirituel* characters. Fast-growing girls, especially such as exhibit a tendency to rotatory-lateral curvature, may fall into spinal weakness about puberty. Certain constitutions, especially those predisposed to spinal disorder, who are descended from phthisical parents, require, during the completion of growth, an apparently inordinate supply of good food. Girls are often too timid or too self-denying ; whilst the boys of the same family, through the difference of their habits and constitutions, are troubled with no such weakness or scruples.

The share which anxious intellectual occupation has in producing the disorder, is shown by the frequency with which young women brought up as governesses suffer from it. The influence of anxiety and depressing emotions of the mind,

especially when combined with bodily fatigue, late hours, and perhaps inadequately nutritious diet, is shown in the occurrence of the disorder in girls who have unfortunately been early initiated into a knowledge of the domestic and pecuniary troubles of their parents, and their reverses of fortune. Perhaps the nutrition of the spinal cord suffers, under these circumstances, equally with, or more than, that of the brain; and as regards the order of suffering of the spinal cord and the organs of vegetative existence, there is probably a simultaneous reciprocal action upon each other: the cord failing to afford the necessary stimulus to action; the vegetative system not yielding the *pabulum vitæ*,—each acting and reacting unfavourably upon the other. So with the order of suffering in the cord and the voluntary muscular system: these probably exercise a simultaneous reciprocal effect upon one another—the cord failing to supply nerve-power to the muscles, and the muscles, owing to the inactive life which their weakness entails, failing in their share of duty towards the vegetative system, in helping these to supply assimilable and oxygenated materials to the cord; the cord, it is probable, suffering also directly through the continued inertia of the muscles.

The appetite is much impaired; the stomach performs its functions languidly, but without much active stomach-disturbance (atonic dyspepsia); the alimentary canal is torpid, and defecation scanty and irregular; the pulse is of more than average frequency, and weak; respiration is languid,—the circulation, consequently, being feeble in the ends of the extremities; the skin is commonly cool and clammy, indicative of feeble organic innervation and circulation; the sleep is disturbed and unrefreshing. A disposition to menorrhagia, rather than to amenorrhœa, exists. The spinal pains and feeling of weakness in the back are constant, are little modified by the catamenial period, and are seldom relieved by it. Unlike the debility of dyspepsia and hysteria, the patient is not capable of greater exertion in the evening than in the morning, but

becomes weaker as night approaches. As time advances, the patient quits her couch for a gradually decreasing number of hours daily, until at length she confines herself, or is wholly confined, to bed, and sinks into one of the worst forms of chronic invalidism. I have visited some cases, and watched others, who have passed several years on their couch, almost entirely isolated from the external world. In some of these cases, the despair of ever returning to active life, fostered sometimes by the varying diagnoses, prescriptions, and prognoses of different physicians who have been consulted, leads to so great despondency and aversion to even the occupations which are possible to a person acknowledged to be bedridden, that she sinks into a state of extreme mental torpor, and may pass much of her time in an apparently soporose state. There is, however, no real sopor in these cases; and it is remarkable, as already observed, that although considerable general emaciation may exist, no complete atrophy of muscles takes place, even after several years' confinement to bed. In some cases, a suspicion of mental derangement is justly entertained, but examination fails to discover any delusions. The brain is as weak and as ill-nourished as the rest of the organs have now become, and suffers to that extent, and even more than some organs, owing to its superior rank in the organism. The brain might be suspected to be the cause of spinal debility, when the malady has succeeded to reverses of fortune. It is probable that when the brain is unduly excited for a lengthened period, its nutrition is for the time excited, and its demands for supply from the economy at large are increased, at the very time when the anxiety and worry leading to vigorous effort to sustain others in one case, or to despondency in another, by diminishing appetite, arrest the supply of the materials necessary to support the brain in the demands made upon it.

Cases of spinal debility terminate, after few or many years, with intercurrent diseases, the most frequent of which are phthisis and bronchitis. Unlike cases of incipient spinal

paralysis, with which in the early stage they may be confounded, they seldom pass into severer forms of disease, and disorganisation of the cord, until an advanced period of life. Thus I have witnessed cases of women who had had scoliosis and spinal weakness over forty years, sink at last suddenly, *i. e.* with only two or three days' serious illness, from effusion into spinal membranes.

In the early period of my observation of these cases of simple spinal debility, I was usually introduced to them as intractable cases of hysteria; and probably, after the lapse of a decade, they may be regarded as being as inveterate as some cases of that disease: but since I have ascertained the pathology of the disorder to be without taint of hysteria, and to consist of a feeble condition of spinal life—sometimes cerebro-spinal—due to the various mental and bodily causes already enumerated,—acting, for the most part, upon constitutions hereditarily prone to spinal disorder, or to general derangement of the nervous system,—I have felt increased confidence in prognosis, and have urged, in consultations, continued sedulous use of all the means which rational medicine would naturally apply for the relief of impaired nutrition of the cord, and stimulation of its functions. Of late years, the satisfaction has been afforded me of seeing cases of the kind, which had led respectively for as much as three, four, and even seven years a life of isolation and etiolation, restored to active participation in social life. Every physician has probably had the good fortune to rescue from spinal debility cases which, when judiciously treated in the early stage, yield easily to medicinal, dietetic, and general management. But when, from errors of diagnosis, hysteria has been whispered to the friends, or apprehension of life-long paralysis has been admitted into the pathological vista, the probability of relief of the spinal weakness is comparatively remote. Nothing is more detrimental to the harmonious management and cure of this complaint, than the erroneous belief in the presence of either of these disorders,

so widely differing—hysteria, and organic disease of the spinal cord. We can understand how many cases of spinal weakness, even hereditary cases,—in which, if the health never be robust, it may be tolerable through a long life,—become aggravated as much by insufficient appreciation of the case, as by exaggeration of it.

When the case is correctly diagnosed, the first element in success, as it is in any disease, is the physician's own belief in the probability of his method of cure being effective; and the next element of success is the entire confidence of the patient and friends in the treatment enjoined. In the treatment of the early stage of spinal weakness, I have found ordinary physiological and therapeutic treatment successful. No portion of this treatment has seemed more important, after supporting the action of the brain, heart, and vegetative system in general, by diffusible and more permanent stimuli, and by attention to nutrition, than to rouse the dormant faculty of the muscular system and spinal cord, by suitable out-door life. Relief should be given to all tangible symptoms, such as disposition to menorrhagia, constipation, &c. In many cases depending upon tendency to menorrhagia as the exciting cause in unmarried women, I have found physical exercises continued throughout the catamenial period of singular use. In such cases, opiates and placebos should be used to mitigate the pain, and suitable internal astringents employed to moderate the discharge. Of such agents, the various forms of opium are often the most efficacious. Besides the strengthening influence upon the volition of the patient, and the confidence which actual and novel exercises impart, they operate beneficially upon the uterus, by abstracting from it the superfluous blood during the periodic turgor of the part, and diverting it to the nutrition of the muscles, to the cutaneous, pulmonary, and other excretions. Doubtless, in many cases of spinal weakness and lumbar pain excited by a hyperæmic state of the uterus, the hyperæmia exists not only during the catamenial period, but

also—owing sometimes to general relaxation of the organ, often to psychical and sensuous influences—during the greater part, if not the whole, of the time intervening between the periods. Physical exercises of the muscles of the trunk are often an efficient derivative from the uterus. Recoveries are not effected by underrating to the patient herself the reality of her suffering. We have, as practitioners, been prone, when pain of several months' duration has appeared to produce no physical alteration of the part, either to believe that the patient can exert herself if she would, or to doubt the existence of the pain, or to regard it as hysterical,—prescribing some appropriate medicines, and perhaps a spinal support; the patient, meanwhile, shuffling on in society to the best of her ability, the spinal weakness varying at times in urgency, but the case gradually pursuing a downward course.

It is probable that, in many instances, if an accidental circumstance had confined the patient entirely to the bed or couch for a few weeks, provided moral and physical supporting treatment were liberally supplied, with gradual reintroduction to active life, and the help of gentle gymnastics, or gentle outdoor exercises and amusements, as soon as the bodily functions and the *morale* of the patient were fairly restored, the case would have been arrested in the early stage. In many such cases, owing to deficient appreciation of the pathological tendency at the commencement, the patients pass into the bedridden stage—confinement to bed being at length adopted from sheer necessity.

Some of these cases at the commencement, with their feeble pulse and circulation, torpid digestion and assimilation, are as little fitted for sitting up, and struggling to perform feebly some of the duties of life, as some patients who are simply convalescents from an acute disease, such as a severe attack of typhus, for example. Indeed, I have seen two or three cases of spinal weakness which declared itself during convalescence from fever.

Acting upon the experience some of these cases have af-

forded, and reflecting upon the etiology of the disorder, confinement to the couch or bed, according to the season of the year,—spinal weakness exhibiting great incapacity for developing animal heat,—has sometimes, at the outset of treatment, been advised. Hygienic treatment, the most likely to repair the nutrition and tone of the nervous centre, has been simultaneously employed. A favourable start in the treatment is effected, when the patient finds that, instead of being inopportunately urged to eat and drink and exert herself, she is solicited to get strong by the treatment recommended, and subsequently resume gradually a more active life in proportion as strength may permit. The patient's friends, as regards their comportment towards the case, have almost as much to effect, in carrying out the treatment, as the medical adviser himself.

In cases less severe—those not requiring confinement to bed—suitable gymnastics, besides general hygienic treatment, seem to exercise a peculiarly beneficial effect upon the spinal cord. That disuse of the muscular system, to the extent we constantly meet with in many cases of spinal pain and weakness, is capable of having produced the morbid state of the spinal cord, is shown by the benefit which has accrued from gentle gymnastics. Girls, incapable of walking a mile, become, under a judicious teacher, capable of lengthened exercises, and of permissible feats of strength, which it would previously have seemed utterly impossible that they should perform. As atony of the spinal cord appears to be a consequence of disuse of the muscular system, so return to muscular activity reinvigorates the nerve-centre, and drives away the subjective painful symptoms.

The prognosis in cases which unequivocally depend upon hereditary transmission is less favourable than in the acquired weakness. Yet, in the former, it is surprising how much good may be effected by recourse to the principles of practice here laid down. In applying these principles, the utmost tact, patience, perseverance, firmness, and humanity, are required on the part of the physician, no less than of the attendants. In

the treatment of no class of cases is there greater need of the lessons of experience, learned from actual cultivation of therapeutics and pathology.

The form of spinal weakness denominated "spinal irritation" has received from some writers undue attention as a separate form of disease, by others it has been regarded as altogether apocryphal. By it is meant a state of things in which, besides much want of energy in the vegetative functions, there is considerable disinclination to use, if not weakness of, the voluntary muscular system; and so great an amount of spinal hyperæsthesia exists, that the slightest touch, almost a breath of wind, along the spine, excites suffering, and even spasms. The state resembles in this respect the extraordinary sensitiveness to impression observed in tetanus. With these symptoms, irradiations of pain to every part of the trunk, face, and extremities, also occur. It would, therefore, seem as if spinal irritation were related closely to spinal weakness, the sensitive columns of the cord, in spinal irritation, being chiefly disturbed; whilst, in spinal weakness, the motor columns mostly suffer. Despite the doubts expressed by some observers as to the reality of spinal irritation as a distinct form of diseased function of the spine, I can state that I have witnessed numerous instances in which many of the phenomena grouped under the head of spinal irritation presented themselves. When these occurred in the young female, the disorder, unlike simple spinal weakness, appeared to partake of the character of hysteria. This is what we should expect from our knowledge of the prominence of hyperæsthesia, in hysteria, over debility of the muscular system. I have as often witnessed marked "spinal irritation" among married females between the ages of thirty and forty, of highly sensitive organisation, as amongst the unmarried. The predisposing and exciting causes of "spinal irritation" are similar to those of simple "spinal weakness," except that, in the causation of "spinal irritation," sexual influences ap-

pear to bear a larger part. To these causes may be added blows, falls, and undue use of alcoholic beverages. The course run by the two forms of disorder is different in one respect,—that spinal irritation often leads to spinal paralysis. The treatment of spinal irritation resembles that of simple spinal weakness, in the advantage derived from hygienic and physiological management,—especially, also, from the removal, as far as possible, of exciting causes.

It is probable that there is in spinal irritation a hyperæmic condition of the blood-vessels of the cord, rather than the feeble state of capillary circulation I have supposed to exist in simple spinal weakness. This assumed difference in the nature of the capillary circulation in the two forms of disorder is justified by the difference in the effects of the application of ice to the spine in the two cases—it being beneficial in some cases of spinal irritation, ineffective in simple spinal weakness.

The hysterical form of spinal weakness is almost as varied in character as the parent disease hysteria itself. It is, in fact, only a part of that general affection; and when the spinal cord becomes affected, there is scarcely any conceivable combination of symptoms producible from disturbance of the functions of the several parts of the spinal cord, added to the disordered manifestations which take their point of departure from the sympathetic and cerebral centres, which may not occur—hyperæsthesia, anæsthesia, spasm, paralysis, contracture of limbs. The disordered spinal function is less nearly allied to simple spinal weakness than is even spinal irritation. The influence of the mind upon the disease is greater. I prefer not to dwell further on this form of disorder, but to refer the reader to the writings of authors on hysteria; and will only add that, on first view, some cases of hysterical spinal weakness might be confounded with the non-hysterical form, when the physician is called upon to determine his diagnosis and prognosis. Usually the hysterical spinal affection is not so gradual in its occurrence, and is less constant in its progressive increase

when uninterfered with by remedial agency. It is paroxysmal, —the patient being at times free from the disorder, and liable to its sudden return under the operation of any renewed exciting cause. There is in the hysterical disorder always good ground for expectation that, simply by means of judicious moral treatment, and avoidance of exciting causes, the patient may recover, although one or more attacks, at intervals of months or years, may occur; moreover, the disorder may be expected to subside entirely at least before the age 7×7 , so justly regarded as important by the older physicians. But there are occasionally cases met with, especially in incurable asylums, of hysterical cases of spinal weakness, hyperæsthesia, and anæsthesia,—assumed indeed to be, or pretended to be, cases of spinal paralysis with contraction and spasms,—which have defied the humane and rational curative efforts of medical practitioners during a period of thirty, forty, or fifty years. Except during a few hot days in every summer, the whole of this long period has been spent in bed, or occasional short periods have been passed sitting on the couch or chair. In these, a morbid will to be the object of the sympathy and care of others has taken possession of the individuals early in the complaint; at length, they become enclosed in a mesh of structural derangement of the contracted members, through long-continued mal-position of them: until relief, if desired by the patient, would probably be impracticable. These cases are rarely met with in persons whose position in life and whose means are incentive to exertion, either for pleasure or for duty; on the contrary, they occur in persons who, at a period when, with some exertion on their own parts, they might have remained of tangible use and profit to society, have found a series of Ladies Bountiful to support them, or a charitable institution to shelter them in a life of idleness. Such persons, with some rare exceptions, are usually the least grateful and the most exacting inmates of our public charities.

The progressive spinal weakness and paralysis, named *tabes dorsalis*, is so well known and so fully described by

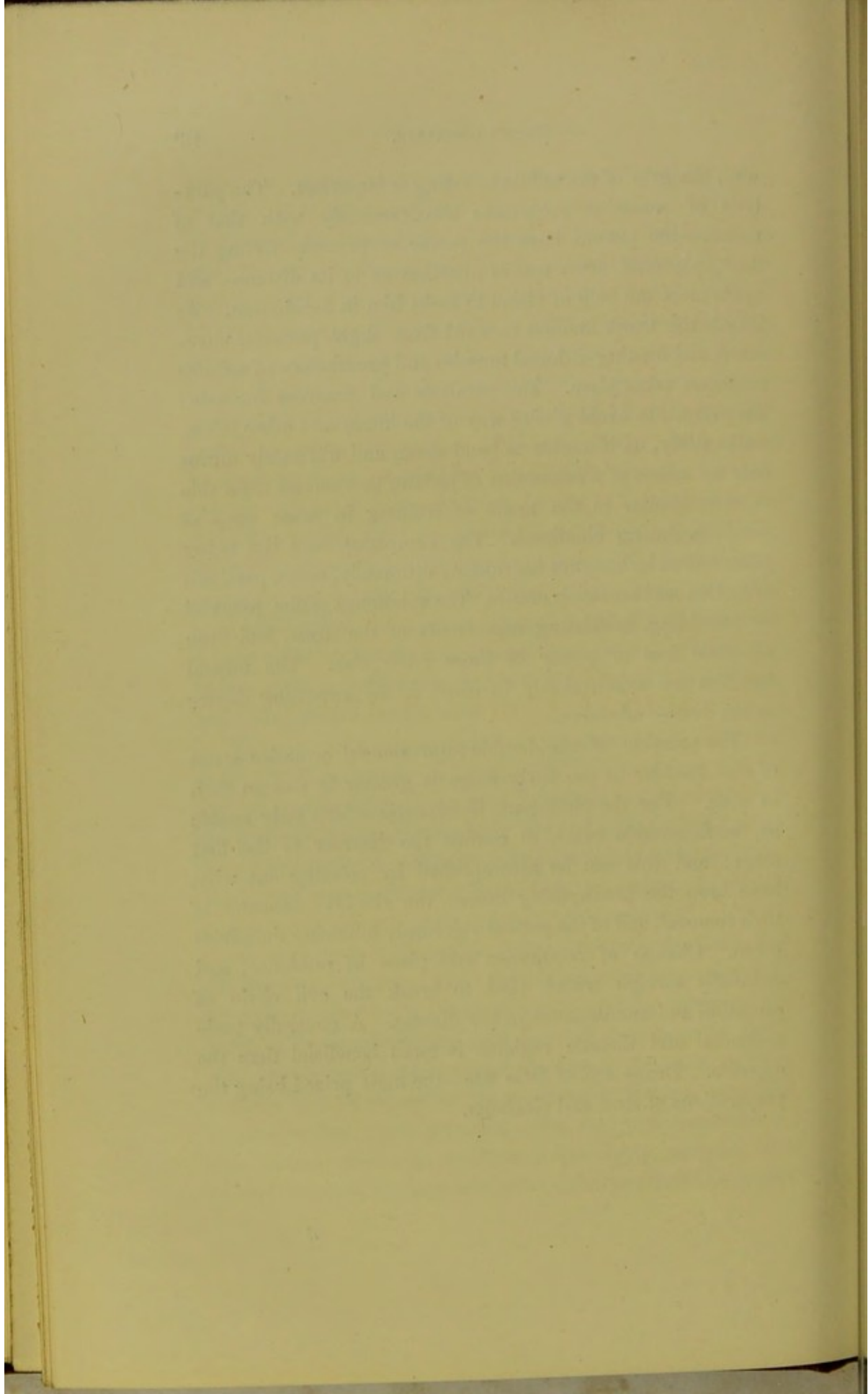
numerous writers, that it may be somewhat summarily dismissed. It is mentioned here, for the purpose of aiding the diagnosis of the other forms of spinal weakness, and because a hasty tendency exists amongst many medical practitioners to regard spinal weakness as being, like *tabes dorsalis*, caused by sexual abuses. I am unable to affirm positively that this cause may not sometimes produce "spinal weakness." I have never thought it desirable to enter into the close private questioning of patients on this point which I have heard suggested by other physicians. The harm likely sometimes to be done by such questioning is calculated greatly to overbalance any good that can result from it. The symptoms—and often rapidly fatal course—of *tabes dorsalis* unmistakably differ from those of simple spinal weakness, which sufficiently proves, in my opinion, the difference in causation; and, after close observation of numerous cases of simple spinal weakness, I have failed to observe in the bearing of those so affected any of the features which denote the evil practices alluded to in connection with *tabes dorsalis*.

Tabes dorsalis occurs chiefly in the adolescent and adult male, rarely in women and aged men. The primary or predisposing cause is venereal excess, especially onanism; although the apparent exciting cause may be cold, over-walking, over-use of the limbs in particular occupations and positions, falls, blows, and over-indulgence in alcoholic beverages. In women it sometimes depends upon excessive child-bearing.

It commences with restless feelings in the lower limbs, and the muscles soon tire,—but often, if the walk be persisted in, the patient may walk a long distance,—falling asleep of the limbs, stiffness, alternating cold and hot sensations in them, with weakness and other uneasy feelings in the loins, spermatorrhœa and feebleness of the procreative faculty, succeeded by some of the worst psychological evils, fear and despondency. The patient gradually acquires a peculiarly unsteady but painstaking gait, the knee and ankle-joints are inclined to give

way, the grip of the saddle in riding is imperfect. The paralysis of sensation progresses simultaneously with that of motion—the patient loses the power of properly feeling the floor or ground, often makes mistakes as to its distance, and needs more the help of vision to assist him in locomotion. At length the trunk inclines forward from slight posterior curvature, and wasting of dorsal muscles and prominence of spinous processes takes place. The paralysis and lameness increase; the patient, to avoid giving way of the knees and other joints, walks stiffly, as if unable to bend them, and ultimately moves only by means of a succession of jerking movements from side to side, similar to the mode of walking in some cases of paralysis during childhood. The complaint may last many years before he becomes bedridden; ultimately, entire paralysis of motion and sensation occurs. The sphincters suffer, followed by trembling, oscillating movements of the arms, and even complete loss of power of these parts also. The mental faculties are unmistakably involved in an increasing degree as the disease advances.

The prospect of considerable improvement or entire arrest of the disorder in the early stage is greater in woman than in man. For the most part, therapeutic efforts only enable us, in favourable cases, to confine the disorder to the first stage; and this can be accomplished by pointing out what have been the predisposing causes, the absolute necessity of their removal, and of the patient rigorously following the advice given. Change of occupation and place of residence, and especially foreign travel, tend to break the evil chain of causation and maintenance of the disease. A generally tonic medicinal and dietetic regimen is more beneficial than the opposite. Drugs are of little use—the most prized being the preparations of steel and cinchona.



ON

SPINAL CURVATURES.

THE UNIVERSITY OF CHICAGO

ON THE NATURE
OF
ROTATORY OR LATERAL CURVATURE
OF SPINE.

THIS affection might with as much propriety be designated bulging of the right or left shoulder, chest, or hip. Occasionally I have witnessed the shoulder (scapular) projection when it was doubtful whether any spinal deviation yet existed. Although it is certain that the spinal distortion does not, as a rule, precede that of the shoulder or of the hip, but proceeds *pari passu* with them, yet, as the fabric of the spine supports the other parts and is the most important of them, it is consistent to designate the complex deformity by the name of its principal element.

Under the head of Lateral Curvature are comprehended several forms of lateral yielding of the spinal column; but there is one kind of lateral curvature of frequent occurrence, which originates for the most part in young girls, in adolescents, and those entering upon puberty, which is, indeed, so common as to constitute the typical rotatory or lateral curvature of the spine.

This affection may commence in early childhood, or at any period before the growth of the frame is complete. It more commonly arises about the age of ten, but is sometimes not observed until the twelfth or thirteenth year. It is at this period often

designated a growing-out of the shoulder or hip, a sinking of one shoulder, a stoop in the gait, or by whatever irregularity of figure may have first attracted the attention of the parent. These departures from the normal form and carriage are seldom discovered until they are sufficiently marked to show through the dress of the patient. Hence the date of origin is usually assigned to the moment of this observation of the distortion through the dress, although it may be quite certain that a considerable want of symmetry has existed months or years before advice is sought.

Nothing in orthopædic practice is more remarkable than the frequency with which parents who have been most solicitous for the welfare of their children bring for consultation girls affected with considerable spinal curvature, which they believe has existed only a few weeks or months, whilst experience teaches that mischief has probably existed one or more years. This anomaly is explained in part by the circumstance that the curvature at first increases slowly, but that after reaching a certain stage aggravation is very rapid. It is also probable that a circumstance to be hereafter mentioned contributes much to the early stage of lateral curvature being so often undetected. Thus, a parent may bring a daughter twelve years of age with marked distortion; she justly asserts that as a child the patient was remarkably well formed, and sometimes even robust, and that until quite recently no suspicion of any distortion was entertained. On inquiry, it is found that until the age of six or eight—*i. e.* until the end of early childhood—the parent or nurse was accustomed regularly to see the child undressed, but that during the last two or three years, from motives of delicacy and the proper desire of inculcating upon the child self-dependence in the matter of ablutions and dressing, the parent has never seen the child actually undressed, by which opportunity alone the earliest stage of lateral curvature could have been discovered. A third circumstance which favours the non-detection of

lateral curvature in the first stage is, that the child may be one of the most active and restless of her species—affected with a social St. Vitus's dance, which seldom leaves her still enough for the symmetry of the figure to be sufficiently noticed. Nor is it always perfectly easy even to the medical practitioner, who may not be very intimately acquainted with the subject, to determine whether or no the early stage of curvature is present.

The ordinary form of lateral curvature is that in which the convexity of curve in the dorsal region is directed to the right side. The circumstances which usually first attract attention are, the sinking of the left, and elevation of the right shoulder; the elevation and tilting backwards of the inferior angle of the right scapula; the undue prominence of the right half of chest posteriorly, or of the left chest anteriorly; the habitual leaning of the head towards the left side; and a prominence and elevation of the hip. Perhaps, in addition, the patient is observed to rest principally on one leg (the right). The dressmaker discovers that the line of lacing of the best-made dress does not "come to" straight, that the waist-band is not horizontal, or that one side of the garment sweeps the ground more than the other; and the parent complains of her daughter, that she does not keep her dress on the sunken shoulder. The patient is also perpetually teased to sit upright; a thing which in lateral curvature can never be naturally and thoroughly done, without the employment of other restorative means—*i. e.* the teaching of the patient in what manner this is to be accomplished. On examination of the patient undressed, it may be noticed that the sulcus between the nates, which in the normal erect attitude is perpendicular, has become more or less oblique, in correspondence with the greater or less existing obliquity of the pelvis. This obliquity of groove between the nates is an important sign in temporary or persistent lateral curvature.

When the majority, or even several, of the above features of lateral curvature are present, no difficulty in detecting a

lateral yielding of the spinal column in one or more directions will be experienced; but long previously to distinct presence of several of these features of distortion, the surgeon may, by careful investigation, find that the spine has already yielded. Practically disregarding, for the moment, lateral or posterior prominence of a single spinous process here or there,* he has only to bear in mind the perfect symmetry which the two halves of the back and chest naturally exhibit; and provided the child is old enough, or sufficiently steady in disposition, to stand still, undressed, whilst he examines the figure from behind, he will perceive whether any want of symmetry of the two sides of the back shoulders and pelvis exists. I leave entirely out of question the often asserted greater normal development of the right half of the trunk, because for practical purposes in early life any difference of normal development in healthy, well-grown children and adolescents is not usually discoverable. Having determined whether or no any topical or general want of symmetry of the two halves of the body is visible in the upright attitude, he may notice whether any lateral curve which necessarily involves many vertebræ along the range of spinous processes is perceptible, either in the cervical, dorsal, or lumbar regions. The lumbar curve is usually more marked in the early stage than is the dorsal curve, because at the outset the mechanical, basket-shaped arrangement of the ribs and sternum opposes the lateral yielding of the dorsal vertebræ. The lumbar vertebræ, on the contrary, are only supported, or rather are unsupported, by the attached fleshy, muscular bands and the juxtaposed abdominal viscera. If he can discover no irregularity, or is in doubt whether lateral yielding of the spinal column exists, he has but to put the patient through a particular extension movement, which constitutes one of the simplest of gymnastic exercises, to be enabled to discover the slightest departure of the series of

* See treatise *On Deformities of the Human Frame*, by the Author, note, p. 368.

spinous processes from the straight direction. The extension movement in question consists in the individual standing at first erect with the feet side by side, on a line with each other, keeping the knees well "clasped back," *i.e.* thoroughly extended, raising the arms perpendicularly over the head, and then slowly directing the arms, head, shoulders, and trunk gradually forwards, so as to endeavour to touch the feet with the hands without bending the knees or leaning to either side. By this simple, well-known calisthenic or gymnastic movement the surgeon will readily perceive whether any lateral deviation exists. Whatever disturbance of symmetry of the two halves of the trunk or of the perpendicular line of the spinous processes may have been apparent before he resorted to this gymnastic test, he may be certain, if it disappears on the application of this test, that it was due to weakness, temporary relaxation of muscles and ligaments, awkward standing, or "trick;" and that no persistent deformity and organic departure from the anatomical normal condition of the ligaments and bones of the spine exists.*

An aid to diagnosis and determination of the stage to which deformity of the spine has attained, is afforded by examination of the patient in the recumbent prone position. It will often be found that the prominent features of want of symmetry of trunk, already enumerated (p. 19), which accompany a yielding of the spine to one side, as well as the actual lateral inclination of the spinous processes itself, entirely disappear when the patient assumes the recumbent posture. This test is less satisfactory than that afforded by the gymnast's extension-forwards movement of the trunk; because in the recumbent position the row of spinous processes is, in moderately stout persons, not thrown boldly into relief, but tends to sink more deeply out of sight below the level of the

* The term "persistent deformity" is employed in a relative sense. By it is meant a distortion which does not disappear when the attention of the individual is directed to its removal.

scapulæ and angles of the ribs. Even at this stage a disproportionate fulness in the loins on the left side, corresponding with the situation of the transverse processes of the lumbar vertebræ, may be perceived,—due to horizontal rotation of vertebræ, in addition to their lateral yielding. This peculiar prominence increases with the increase of the deformity.

An analysis of the stage of lateral curvature above described shows that, from some cause, the spinal column, with the attached humeral and pelvic members, deviates, in two or more situations, from a straight line within the limits of a voluntary removable quantity, causing the ill direction and want of symmetry of shoulders and pelvis, and consequent production of the features of lateral curvature, which first strike the eyes of the unprofessional observer.

Before I proceed to describe a more advanced stage of lateral curvature, I will stop to inquire into the causes of the deformity, and detail the means by which this stage of the complaint can be expeditiously and permanently *cured*.

In the inquiry into the causes of lateral curvature, as into that of the causes of any disease, we find as much, if not more, help from searching into the early history of the individual, than we do from studying the circumstances which have immediately preceded the occurrence of the affection; in short, we investigate the predisposing causes no less than the exciting or immediately determining causes. When we examine into the antecedents of a considerable number of cases of lateral curvature, we find in a large proportion that some debilitating illness—hooping-cough, measles, scarlet fever, gastric or typhoid fever—has appeared to the friends the starting-point of the deformity. We may be told, as already mentioned, that the girl was originally robust, but since the illness she has been observed never to sit perfectly upright. In some cases debility has been traced back to an earlier period of life,—to want of breast-milk. In others the carriage has been said to have been perfectly erect and normal until a

change of residence from home to boarding school; and however frequently this change benefits the moral, intellectual, and social habits of the individual, we find many patients in whom the nutrition of the system becomes, from some cause, defective, debility becomes apparent, and lateral curvature of spine is rapidly induced. In many cases the distortion appears clearly attributable to the weakness incidental to extremely rapid growth. In such instances we not unfrequently find a young girl of twelve or thirteen years of age as tall, and presenting as many signs of approaching puberty, as the average female of fifteen or sixteen. Hence, young ladies in families remarkable for uncommon or precocious height offer many examples of lateral curvature. Hereditary influences tend to produce the affection; it is by no means uncommon to witness lateral curvature in either the mother, the maternal or paternal aunts, or two daughters of the same family—sometimes even in two or three generations of the same family. We will for the present exclude hereditary influences from our consideration, and confine our attention to the predisposing causes of lateral curvature appearing to originate in consequence of fevers, want of breast-milk, home and boarding-school studies, and precocity of growth.

Physicians need scarcely to be reminded of the condition of system apt to follow exanthematous and other fevers in the growing girl, when too early resumption of accustomed pursuits is permitted, to comprehend the bearing of the resulting debility as a predisposing cause of lateral curvature. The partial anæmia of weeks', months', or years' duration, corresponding with the want of "stamina" in the girl's constitution; the consequent relaxed condition of the muscular system; the incapacity to endure oft-repeated fatigue; the inability of the individual to concentrate attention except for a moment upon a muscular effort,—such as may be required, for example, to respond to the parent's admonition to stand or sit straight,—are all symptoms indicating or constituting

the debility, which may favour any more permanent disease or deformity if an *exciting* cause be applied.

The want of breast-milk during the early months of existence is a recognised source of debility, the effects of which may be shown by the supervention of any disease or deformity, especially when an *exciting* cause comes into operation. A similar weakness has often succeeded to the change from the comforts and ample nutrition of a well-regulated home, to the very early rising, the long and late hours of *competitive* study and in-door occupation, the ill-suited and ill-dressed food, the crowded and ill-ventilated sleeping-rooms, of some boarding schools of even first-class pretensions. The anæmia thus induced often borders on chlorosis, although the last-named complaint more frequently attacks those who have passed puberty. The anæmia is often accompanied by amenorrhœa, or dysmenorrhœa; loss of appetite for animal food, and even for farinacea; confinement of bowels; indisposition and incapacity for out-door exertion. Such disorders, and the lateral curvature which frequently attends, may periodically abate at mid-summer and Christmas,—significantly enough, from intellectual rest and change of the mode of life during the vacations.

The home-life of many young girls is equally calculated to *predispose* to lateral curvature. An ill-drained house, badly ventilated rooms, an atmosphere poisoned by employment of gas or by the crowding at night even in some families in good circumstances, are the causes of deterioration of female health and predisposition to lateral curvature, as they are of consumption and numerous other diseases. The feverish anxiety of the parents to commence education of the active-minded, impressionable offspring at an early period; the desire to accomplish too many branches of education within a limited time, *i. e.* by the time the child has finished her growth; the number of hours passed by girls in sedentary in-door occupations, almost unavoidable in cities; the exciting, stimulating, laborious life led by some girls, to the gratification of the

parent and the satisfaction of the governess, the child's every hour from sun-rise to sun-down being allotted to some school *duty*, the strict and cheerful performance of which by the young child is, nevertheless, effected with a large expenditure of nerve-power,—the time which should be allotted to active games of play or leisurely recreation being sometimes reduced by too fast walking across country (for lateral curvature is generated in the country as well as by town life), at a pace only suitable to the seasoned governess,—all these form some of the predisposing causes of debility conducive to lateral curvature which I have been able to note, in explanation of particular cases where this distortion has shown itself in previously robust girls who were not hereditarily prone to the disorder.

Over-rapid growth, uncompensated for by active digestive power, by ample supply of good food, by extra hours of night repose, and by suspension of, or reduction from, the average hours of school work, readily explains the production of debility sufficient to predispose to lateral curvature.

I have dwelt fully on these predisposing causes, because every day's experience tends to confirm the medical observer, that even as regards lateral curvature, as well as all diseases, prevention, besides being better than cure, is, moreover, easier—more within the power of those most interested in the result.

Before I quit the subject of predisposing causes, I may touch upon the influence of parents' constitutions upon the production of debility in the offspring, and particularly the debility conducive to spinal deformity. Many facts have come to my knowledge which tend to show the existence of a more intimate pathological connection between the spinal cord itself and lateral curvature than has been hitherto pointed out. I do not allude to the circumstance of severe lateral curvature—like angular curvature from strumous disease, caries of spine, or Pott's disease—being occasionally succeeded by

severe neuralgia, paralysis, or spastic contraction. I cannot avoid entertaining the conviction, from the facts I allude to, that as pathologists we are accustomed to study the diseases of the osseous framework of the spine as instances of one class of disease, and the diseases of the spinal cord itself as examples of another class of disease, instead of studying them, or looking upon them, as jointly dependent upon a common cause. I have observed the occurrence of a sufficient number of instances of disease of the spinal cord, in persons affected with a moderate amount only of lateral curvature, to lead me to suspect a common origin, and, regarding lateral curvature as a developmental disease, to consider whether the osseous framework of the column, and the contained parts (the cord and nerves), may not conjointly be involved in some error traceable to influences derived from the parents antecedent to birth of the child. It is sufficient in this place to allude to the numerous circumstances in the life and habits of *civilised* society which act injuriously upon the constitution of parents of both sexes, and especially upon the trunk, the spinal and assimilative systems, sufficient to induce a proclivity to disorder in the child affecting the spinal column and its contents.

I have no doubt that the paralysis of the lower extremities, and often of the upper, which occurs in women of a menorrhagic habit, towards cessation of menstruation, who have borne many children, is more readily determined in those who have from early life retained some degree of lateral curvature. The liability to paralysis in such cases is not necessarily related to the amount of deformity, because that may have been restrained by treatment and by mode of life. It appears to me, from the observation of the individual cases of this paralysis combined with lateral curvature which have passed under my observation, and especially the study of their physical and moral temperament, and of the proclivity to nervous affections manifested throughout life,—such as chorea, neuralgia, rheumatism (?), hysteria,—that lateral curvature is apt to occur in those who

are simultaneously predisposed to disturbance of spinal cord. Sometimes, probably, an *hereditary* predisposition to a general want of tone, or robustness of vertebral structures, containing and contained, exists. An *acquired* predisposition to disturbance of spinal cord is readily accounted for in lateral curvature; for we know that nothing favours a healthy condition of contained parts more than healthy activity of the containing parts, the reverse of which is the case during the greater part of the life of those affected with lateral curvature.

Imperfect performance of the nutritive functions, and consequent imperfect sanguification; deficient nerve and muscular power; debility, hereditary or acquired,—may, then, be regarded as predisposing causes of this spinal curvature. This would be the place to inquire in what consists the difference between the bones, ligaments, and muscles, which are the parts concerned in the framework of the spinal column, in the robust individual,—who, although she may be exposed to the exciting causes of lateral curvature, does not often become troubled with this affection,—and those of the weaker individual, who, as we know, is incapable of resisting the operation of the same exciting causes, and, therefore, succumbs to those influences, and becomes the subject of the distortion. This inquiry is properly an histological one, and would lead me beyond the intended limits of this monograph. No distinct structural changes of tissues have hitherto been discovered capable of throwing light on this subject. The clinical physician often perceives facts not yet elucidated by, or susceptible of, microscopical demonstration. There is no doubt that the tissues of certain individuals yield to influences which the tissues of other persons resist. The spinal column of one individual, who has been weakened through the operation of the predisposing causes I have described, gives way under the operation of certain exciting causes of spinal curvature; whilst the spinal column of another individual develops itself normally, in spite of an equally prolonged operation of the same

exciting causes. One spinal column in a growing girl is capable of maintaining itself straight, notwithstanding twelve, fourteen, or sixteen hours* daily use of it in the upright attitude; whilst another spinal column is unable to do so, and becomes gradually distorted. The muscles, ligaments, and bones of the one individual possess the natural tonicity, strength, and hardness; whilst those of another individual yield to the superincumbent weight which the parts have to support, and progressively a lateral curvature is established. And yet, as far as we know, no histological difference has been witnessed between the tissues of these individuals.

The fact that, in the young especially, a *short* illness of any kind, having for its result impaired sanguification and debility, commonly gives rise to such muscular debility and relaxation of tissues as often to cause the knees to give way during convalescence, shows that no great histological change is needed to account for lateral curvature.

The rarity of lateral curvature in the male sex is doubtless due in part to the greater strength of the tissues in the male, and to the difference in the mode of rearing boys.

The operation of similar predisposing causes is seen in another part of the body,—the ankle; a part called upon to perform the important office of sustaining the greatest weight which any part of the frame has to support—I mean especially the arch of the foot. The human tarsus and tibio-tarsal articulation present in the healthy, robust individual a remarkable combination of strength, flexibility, and elasticity, and are wonderfully constructed to bear the shock of impinging weight of the entire frame in standing, walking, running, and leaping. It is well known how large an amount of endurance of physiological strain the tissues comprising the tarsus and ankle-joint, when healthy, bear without detriment. But these

* I have occasionally discovered that a growing girl has been permitted to rise almost at daylight during the summer months, and work "at lessons" three or four hours before breaking fast.

tissues in a person exposed to similar predisposing causes of weakness to those which predispose to lateral curvature of spine, give way under an amount of use much inferior to the amount a healthy individual bears with advantage, and a troublesome lameness—flat-foot*—results. A great analogy exists between the physiological uses of the spine (and lateral curvature of it) on the one hand, and the physiological uses of the instep (and flat-foot) on the other. The spinal column is the suspensory framework to which are fastened, and which has to bear, the weight of the head, the upper extremities, and many organs of the chest and abdomen, besides giving protection and support to vascular and nerve trunks. When its tissues are unequal to their work, lateral curvature is apt to ensue. The tarsus has to bear the entire weight of the trunk and members; it gives protection to vessels and nerves, and other structures passing to parts situated more inferiorly. If the tissues become impaired,—lose their strength, tonicity, and hardness,—they give way, the arch sinks, and flat-foot is produced. The spinal column and tarsus being found by this mode of comparison to be more similarly circumstanced than any other parts of the economy, it is not surprising that these two deviations—lateral curvature of spine and flat-foot—often coexist in the same individual. The predisposing causes are similar; but as the exciting causes may not be applied to spine and ankle simultaneously, in one individual lateral curvature results, in another flat-foot; whilst in a third individual, in whom the exciting causes of both lateral curvature of spine and those of flat-foot (too long and too fast walking, overmuch standing) have been applied, the two deviations simultaneously occur in the same person. For similar reasons we often see lateral curvature and knock-knee in the same individual. Sometimes the same individual presents flat-foot (in-ankle), knock-knee, and lateral curvature.

Amongst all the *predisposing causes* of lateral curvature, no

* See treatise *On Deformities of Human Frame*, p. 230.

one cause operates so powerfully as want of physical development and exercise of the muscles of the trunk and spinal column. If we consider the effect of the sources of debility already treated of upon the trunk and spinal column in particular, and reflect upon the state of almost complete voluntary disuse in which the trunk, including the spine, is permitted to remain during several years in the female sex, in certain classes of society, whilst rapid growth of the body proceeds, especially shown by the elongation of it which takes place between the ages of ten and fifteen, we cease to be surprised at the frequency of lateral curvature.

Amongst the superior classes of society, particularly in town and school-room life, mental development is so often cultivated for several years, to the exclusion of physical development of the entire frame, that we readily understand the frequency with which a blight falls upon the muscles whose office it is to maintain the equilibrium of the body.

Many girls, after passing through the joyous, restlessly active period of early childhood,—when nature, by the pleasure which every muscular exercise imparts, excites to the employment of each muscle of the body in games and “mischief,”—are condemned, about the age of nine or ten, to a more staid existence. Romping and active games must, in many families, be left to the brothers; the sedentary pursuits of book-learning, the piano, and drawing occupy a yearly increasing portion of the child’s time, until at length no exercise is taken save in walking,—even running, which would tend to induce greater development, is sometimes taught to be vulgar, and is out of place in town life. In fact, except that the fingers are employed by the needle, the book, the pencil, or the piano, no parts of the frame are actively employed but the lower extremities. The muscles of the trunk, the vigorous use of which exercises so important and beneficial an influence upon the vital organs of the chest and abdomen, are neglected. They are arrested in their development; moreover, their want

of use and feebleness of action react unfavourably upon the manner in which the internal organs of the body perform their functions.

It is an instructive study to notice the effect of this constrained neglect of the use of the muscles of the trunk upon the development and form of the trunk,—even where no actual distortion has resulted from it. The anatomist will often be struck by the disparity in development of the lower extremities (these having been kept in activity by walking exercise), and the trunk and upper extremities,—especially the upper half of the trunk, the neck, shoulders, and chest. The lower limbs are disproportionally large compared with the puny, contracted chest, and the angular, conical, forwardly curved shoulders. Many growing girls may be said to have lost the use of the body, so seldom has it been permitted to go through any of the natural exercises: an exceedingly ungainly figure is the result. The whole of this deficient development and weakness of the trunk would be prevented if the lessons of the calisthenic master or mistress bore a larger proportion to the remaining instruction and “practice” of the pupil, or if the natural bent for active games and active domestic occupations were not too much interdicted in modern education. In schools for the humbler classes, conducted under governmental inspection, I believe the example of greater attention to physical education during and after school-hours has long been set, and might advantageously be followed to a greater extent than at present prevails by those engaged in educating the richer members of society.

It may not be out of place to remark that, in consideration of the importance to the community at large of healthy educational development of mind and body, the general or local government might, in the author's opinion, exercise at least so much inspection of private educational establishments for both sexes, without undue interference with the liberty of the

subject, or diffuse such authoritative information, as would insure adequate playgrounds, either covered or in the open air, sufficient air-space in the sleeping apartments, and sufficient accommodation for offices which it is here unnecessary to particularise. Notwithstanding the great advances made of late years in many first-class schools for both sexes, there exists in many schools, preparatory and others, a lamentable departure from the requirements of hygiene, especially in points liable to be overlooked by parents. Orthopædic practice has brought me much into contact with managers of schools, and it becomes a pleasure to state that I have never drawn attention to gymnastic and other school wants in relation to hygiene without observing that my advice was fully appreciated.

The benefit of muscular exercises of the trunk is not confined to the muscles themselves. The nutrition of all parts kept in activity by muscular exertion is improved; consequently, when deficiency of muscular exercise has existed, the nutrition and strength of the ligaments—the office of which in the spinal column is so considerable—become impaired, and the production of deformity rendered more easy. In many cases no other predisposing cause can be found than simple sedentary, inactive habits, and its resulting torpor of digestive and defecating organs. The general bodily tone and the nutrition of the muscles fail from the protracted influence of this cause. I have repeatedly observed a girl in the first stage of lateral curvature lose all trace of it by a six weeks' visit to sea-side or country, and again acquire the distortion after a few months' sedentary life in town.

The *exciting* causes of lateral curvature need occupy less space. It is more difficult to define with certainty what these causes are. The predisposing causes already enumerated may indeed suffice, by the intensity and duration of their action, to produce the deformity. Thus, I have indicated that simple

debility of muscles of the spine, laxity of ligaments from their imperfect nutrition and exercise, probably also a diminished firmness of the osseous tissue itself, enfeeble the spinal column as an active and passive supporting pillar of the frame, render it incapable of sustaining itself erect, and cause it to swerve from the perpendicular. If the spinal column yields laterally, the resulting deformity is called lateral curvature. Just as a thin lath of wood placed upright on a table, if weighted at the upper end, will swerve from the perpendicular, so a weakened spinal column may, through the weights (cranium, upper extremities, thorax and contents, &c.) attached to it, fall sideways from the straight line, from mere weakness and inability to support itself, without the supervention of any exciting cause, *i. e.* of any cause which determines the particular kind of curvature which shall result from the weak spine; for we know that it is not always lateral distortion which proceeds from the weakness we have so much dwelt upon, but that sometimes an antero-posterior curvature—"round shoulders" or "hollow loins"—arises from it. When once the spine yields to one side, it is probable that in all cases at first this yielding occurs in the daytime only, and that it disappears during repose in the recumbent position. In proof of this we meet with many cases of lateral distortion which wholly disappear on lying down. By frequent repetition of the strain and yielding it becomes habitual, so that repose in the recumbent position ceases to rectify what is now a distortion. In short, without the operation of any other causes than those enumerated as predisposing causes, a confirmed lateral curvature may be gradually produced.

In the great majority of instances, if not always, the lumbar curve precedes the dorsal one: the oblique position of the pelvis and lumbar vertebræ being excited by standing on one leg, or by one leg being shorter than the other, the debility of the spinal column coexisting, lateral curvature results (see p. 22).

Much sitting awry, the trunk then resting unequally or disproportionally upon one ischium, has the same effect upon the spinal column in susceptible children as inequality in the length of one leg.

All occupations which tend to employ one arm or one leg in standing on one side of the body, to the exclusion of the members of the opposite side, have been usually considered to be exciting causes of lateral curvature. It cannot be denied that in persons predisposed to the distortion from any of the various causes previously enumerated, the exclusive use of one arm, as in long-continued writing or drawing, or the habitual standing on one leg, may excite or determine the direction of curvature to one side, and that these one-sided occupations may become exciting causes of lateral curvature. And, as the lateral curve is usually towards the right side in the dorsal region,—which is the part of the spine usually considered to be most influenced by the excessive use of the right arm,—it is not remarkable that this direction of the principal lateral deviation should be attributed to undue use of this member. But as I have seen several cases of lateral curvature in which the dorsal curve was towards the left side, the subjects of it not having at the same time been left-handed, the theory of excessive use of the right arm being the exciting cause of ordinary lateral curvature is untenable. The *habitual position* in which young people sit whilst engaged in writing is, in individuals already predisposed to the affection, a more probable exciting cause of it. Habitual standing on one leg—the right—by elevating the right hip, and causing obliquity of the pelvis, a yielding of the lumbar vertebræ to the left side, and compensating convexity of the dorsal vertebræ to the right—appears a more likely exciting cause. Its mischievous influence in those who are predisposed to the complaint cannot be doubted; but the capability of mere habitual standing on one leg to produce lateral curvature, unless the predisposing causes have been

in operation, is disproved by the comparative rarity with which severe lateral deformity, *i. e.* persistent lateral distortion, occurs in persons who from any cause possess a shortened leg. I have said persistent lateral distortion, by which I mean such a spinal deviation as will not be removed by causing the person to stand upon a book or other substance adjusted of sufficient thickness to compensate for the shortness of the leg. The comparative infrequency of persistent severe lateral curvature in persons who have a short leg, is a proof that something more than the unequal standing is required to induce ordinary lateral curvature.* Although ordinary severe persistent lateral curvature does not follow paralysis of one side occurring in childhood, there exists just sufficient tendency to it, as well as to the peculiar rotation of the column described in connection with lateral curvature, to illustrate the action upon the spine of the muscles of the lower extremities and trunk, the antagonism of which is destroyed by the unilateral paralysis and wasting of one side. The difference in the power of muscles of the two sides of the trunk and limbs necessarily induces a constant condition of unsymmetrical muscular action. It is easily conceivable how disadvantageously the habitual unequal action, traction, and rotation of the two sides of the spinal column, aggravated by the shortening of one leg, when this is not compensated by wearing a raised boot, must operate. But as a slight hemiplegia must effect as much comparative disuse of one side as sedentary occupation is capable of doing, something more than the unilateral, artificially produced, weakness of one side from habitual disuse is required to account for ordinary lateral curvature. The solution is found in the predisposing causes of lateral curvature which I have elsewhere enumerated.

An anatomical explanation of the common tendency of the convexity of the dorsal curve to the right is furnished by the fact that the heaviest internal organ of the body—the liver—

* *Op. cit.*, p. 112.

is suspended mainly on the right side of the trunk. This is an explanation which has much to recommend it. It is well known that in early life the liver is relatively much heavier than at a later period, and it is very conceivable that when once the spinal column has been weakened by any of the predisposing causes I have enumerated, the weight of the liver may determine the direction which the principal curve shall take. An objection to this explanation, similar to that made to the influence of excessive use of the right arm, will occur to the reader after the statement above made, that the principal curve is in a few cases directed towards the left side, and we do not yet know that the liver in those cases was abnormally situated on the left side.* A certain number of lateral curvatures take their origin from pleurisy; but as these cases essentially differ from ordinary rotatory or lateral curvature, they will be treated of under a separate head.

Particular trades occasionally induce lateral yielding of the spinal column; but these cases also differ from the ordinary lateral curvature, and, being exceptional, need not detain us here.

Treatment of the early stage of Lateral Curvature.

We have seen that imperfect nerve-power, and deficient nutrition of the muscles of the trunk, induced by various causes which, if they do not at once act powerfully so as to cause well-marked disorder or disease (such as anæmia, dyspepsia, chlorosis), at all events produce a sufficient amount of languor and lassitude of the voluntary muscular system of the trunk to lead, without operation of further causes, to a lateral yielding of the spinal column; whilst in other cases, in addition to debility as a predisposing cause, some exciting cause—such as prolonged position of the growing body in an unsymmetrical attitude, writing, drawing, undue

* For other hypotheses, see treatise *On Deformities of the Human Frame*, by the Author, p. 367.

standing—may give a one-sided impulse to the spinal column. The student will at once comprehend that if the body once habitually yields to one side from any cause, the influence of gravity will tend to cause the individual to fall sideways to the ground, unless the entire spine, by an automatic action of the muscles, were again drawn towards the perpendicular. This restoration of the equilibrium of the trunk is effected by the production of complementary curves in a direction contrary to the original yielding, by the agency of which the line of gravity of the trunk is restored. The several curves which arise are not equal. Thus, supposing the spinous process which occupies the middle of the curve to the right in the dorsal curve to have yielded half to three-quarters of an inch from the perpendicular, the spinous processes at the middle of the lumbar curve will be found to have given way about half the amount. In the cervical region the distortion is still smaller. The lumbar curvature too often escapes observation at the commencement of the distortion, because it is smaller, and more concealed by the lumbar muscles. The lumbar portion of spine, owing to anatomical conformation, is, moreover, capable of less curve than the dorsal portion.

The treatment necessary for the cure of the first stage of lateral curvature is composed of three parts: the first comprehends the application of means calculated to remove any amount of general debility distinctly cognisable to the medical observer, or, at all events, to invigorate the general system in those cases in which the patient, although not absolutely anæmic, is yet deficient in robustness. Good air, suitable diet, ample repose, reduction of the hours of study, steel, cod-liver oil, quinine, regulators of *primæ viæ*, rubefacient embrocations and manipulations,—all these means are calculated to restore the nutrition of the nervous and muscular, ligamentous and osseous, systems, and to give tone to the entire frame.

Lateral curvature in “idle” sedentary subjects, in so far as the idleness is dependent upon derangement of bodily

health and debility, needs similar treatment. But lateral curvature occurs sometimes in the really idle and over-fed, and instead of the bodily state requiring tonics, the necessity of more active habits of life, calculated to invigorate the will and to prompt to exertion, must be urged as means of cure.

The second part of the treatment consists in elongating the muscles and ligaments of the spine on the contracted aspects of the column, and in augmenting the development and the strength of the muscles of the back generally through the stimulus of using them, by calling into action the muscles of the trunk, which, during the neglected employment of it, have remained feeble, and incompetent to sustain the erect position of the body. We may correctly say of the trunk of the girl of twelve or fourteen affected with lateral curvature, that through arrested or diminished development, consequent upon sedentary occupations, she has the out-growth and length of body of the girl of twelve or fourteen, with the muscles of the trunk such as she possessed four or five years earlier. The muscles, through neglected use, not having increased in strength in proportion to her growth, the girl may be said to have outgrown her muscular system.

The only direct means by which the feeble, undeveloped muscles of the trunk can be rendered capable of supporting it in the erect, symmetrical attitude, is to exercise them. If the duration of the lateral yielding has been considerable, or if the predisposing causes of the curvature have been long previously in operation, a proportionately long fostering education of the trunk muscles will be necessary. Many household occupations performed by the ancestors of the present generation probably saved those more homely individuals from the prevalent lateral curvatures of the present century. It is useless in the present day to recommend a return to more primitive domestic habits as a means of exciting activity and strength in the spinal muscles; but, doubtless, young ladies in good families might perform many simple offices

calculated to strengthen the frame without derogating from their station. Many popular treatises, "boys' and girls' own books," suggest appropriate "parlour" and out-door exercises, the practice of which would often prevent lateral curvature.

In former years, when, from analogy of the anatomy and pathology of spinal distortions with the anatomy and pathology of deviations of the limbs, I found that analogous means cured deviations of all these parts, I yet not unfrequently observed that a moderate lateral curvature treated by means directed to improvement of general strength, and by means of gymnastics, gradually advanced to a further stage, and that a scaffolding of irons around the trunk—a spinal support—was needed to arrest the progress of the deformity from bad to worse. I occasionally found that the gymnast developed the shoulders, the chest, and scapular portions of the back, to a degree uncommon in the female, and yet the curvature was not reduced. I even witnessed a disadvantage from excessive—I may say ill-directed—gymnastics (horizontal exercising beds and couches); for the upper part of the frame became top-heavy in relation to the still-curved spine, and therefore a positive obstacle to cure. I have since analysed these results, and discovered the reason of the uncertainty of the effects of gymnastics, and the mode of obviating it.

Many slight cases of incipient lateral curvature are cured by the drill-master, without much thought of any particular exercises being more useful in such cases than in the ordinary gymnastic training or drill of healthy, straight boys and girls. But when lateral curvature has not yielded to a few weeks' drill or gymnastics, something more is required. The medical attendant needs to reflect that the distorted, even contracted, spine is comparable to a distorted, contracted limb, in the cure of which we elongate the shortened parts, before we can succeed in restoring strength and usefulness to the member.

Observation of the failure of gymnastics in particular

cases led me to discover that the source of failure consisted in the gymnast often having "put the cart before the horse," in having endeavoured to give strength and usefulness to the trunk before elongating and straightening the shortened or curved parts. Orthopædic practitioners have at all times, even throughout the last century, recognised this necessity of first elongating the contracted curved parts by spinal support, by extension beds, by exercise on crutches, by extension chairs, the use of the hand-swing, hanging from horizontal bars or upon parallel bars, extension of the trunk upon a barrel maintained by the patient in a slow rolling motion,—extension when lying, by the patient grasping with both hands a fixed point in front of her whilst an assistant draws the legs in the opposite direction. The barrel exercise is not very appropriate for a delicate female, although, probably, effective.

Of all drill exercises, none is so well calculated to effect the desired elongation of curved or contracted parts of the spine, and, indeed, of the entire body, as one well known to the gymnastic and calisthenic teachers. If the reader will lay upon the table a piece of thread in the shape of the letter **S** reversed (**Ɔ**), which represents the form the spinal column inclines to assume when affected with even slight lateral curvature, he will feel persuaded that if he can by any means elongate—that is, pull out and extend—the similarly curved line of the distorted spine so as to make a straight line of it, he has taken the first effective step towards cure, in having demonstrated to himself the possibility of mechanically straightening the spinal column, at least temporarily.

The third part of the treatment consists in the patient being made to equalise the use of the muscles,—that is, to call into exercise those of the leg, arm, and body, that have previously been least used. Unsymmetrical, unilateral use of the trunk and limbs, is the exciting cause, as we have shown, of lateral curvature, whether from too constant addiction to particular

occupations and consequent attitudes, or from the shortening of a leg and consequent unequal use and unequal action of the right and left halves of the trunk.

Connected with this third indication of treatment is the education of the patient's volition, so that she may effectually contribute to her own cure. There can be no doubt that where from infancy, throughout childhood and adolescence, the trunk and limbs have been permitted to develop themselves according to the normal type of symmetry and beauty, by the individual having been permitted to devote instinctively a due proportion of time to exercises and repose, men and women grow up straight, in spite, often, of many bodily weaknesses, and take no account of how it is that they carry themselves erect involuntarily,—without heed on their parts. But when some departure from the normal use and development of the back has taken place, and the parent discovers some irregularity of figure and attitude, the patient is told to sit, stand, or walk upright. An effort of volition is necessary to effect this end; an effort which, if successful at all, is so but for a moment. When, indeed, such patients are examined undressed, and told, when under inspection, to carry themselves upright, they very commonly aggravate the existing deformity, or temporarily create a new distortion. In fact, great as is the volitional influence exercisable by man upon the members, and upon the separate joints of each member,—an amount which varies according to education and cultivation,—he acquires in an ordinary way exceedingly little volitional influence upon separate parts of the back, until special cultivation or training is employed,—as, *e. g.* to overcome an existing tendency to an ungainly figure, an improper mode of standing, or a lateral spinal curvature which is spontaneously removable, *i. e.* by the patient's own effort.

The medical practitioner, who is responsible for the cure, should not content himself with directing that his patient

be taught calisthenics, gymnastics, Swedish exercises, drilling, or the like, but should see that the particular exercises taught are such as are calculated to develop those muscles which particularly need development, and above all to develop the voluntary power of the patient over the dorsal and lumbar muscles, which may long remain prone to permit lateral yielding of the column. In the metropolis and large cities,* able male and female teachers are to be found who exhibit sound discrimination and judgment as to the amount of exertion a young girl can bear, and who, above all, take a proper interest in the permanent restoration of the figure. It is true, as I have insisted, that active employment of the muscles of the trunk in games and exercises, just as they tend to prevent lateral curvature, are sufficient even for cure of it in the early stage; but it is equally true, as I have stated, that ill-directed, careless, ignorant application of muscular exercises may confirm the curvature. The medical attendant may satisfy himself that the calisthenic teacher will effectually carry out his wishes and cure the patient if he finds that the exercises provide for pulling out the spine longitudinally, and thus obliterating the curvature, at least temporarily; and, at the same time, the patient is instructed how voluntarily to keep the spine straight when the exercises are over. I will append a few directions, the fruit of much observation of the beneficial effects of well-directed gentle gymnastics.

The mechanical elongation of a laterally curved spine in the early stage of the distortion can be witnessed most readily by the common exercise already alluded to—that in which the individual, standing with the feet in a line with each other, endeavours, without bending the knees, to touch the ground with the fingers, holding a stick or suitable bar of wood with both hands. If the surgeon will place himself behind the patient, who has her shoulders, back, and lumbar regions uncovered, whilst she endeavours to make

* Efficient portable and fixed gymnasiums are readily procurable.

the movement above described, he may, perhaps, observe that when she stoops to touch the toes, the trunk is inclined to the right or left side in a very unsymmetrical manner, and that, although the lateral curve or curves which he noticed before the effort was made have much decreased, yet the series of spinous processes does not represent a continuous straight line from occiput to sacrum. But after a few repetitions of the effort under proper instruction, the patient will bend forwards so symmetrically as to present to the eye of the observer an unbroken series of spinous processes—in fact, just as the piece of twine laid on the table in the shape of a letter **S** reversed is straightened by drawing the thread at both ends, so the spinal column is made temporarily straight by the stretching effort of the patient. The hand-swing effects a similar straightening, especially of the lower portions of the curvatures; one of the well-known dumb-bell exercises effectually does the same. In some cases, further directions as to correct performance of the movement in question are necessary, principally in consequence of the more confirmed and advanced character of the curvature—some horizontal rotation of the vertebræ having already taken place, dependent upon or accompanying an obliquity of the pelvis, as shown by undue prominence in front of the left ilium, and by the obliquity of the sulcus between the nates. Even in such cases, previously to the ligaments, muscles, and bones of the spinal column becoming structurally shortened on one side and lengthened on the other, the symmetry of the column and trunk generally may be restored by the patient, attention being steadily directed to the following points:

1. To place the feet side by side, the heels about two inches apart, the toes only slightly turned outward, standing in a line with the end of the apartment, and poising the body more upon the anterior part of the metatarsus of each foot than upon the heels.

2. To stiffen the knees well back. By this means, if no

inequality in the length of the legs exists, the two sides of the pelvis (the hips) will be of equal height, and the sulcus between the nates will be perpendicular.

3. To direct the left hip backward, so that the patient feels the pelvis to be square with the feet, and with the end of the apartment. By this means the situation of the pelvis will be normal as regards the legs, and all deformity below the lumbar vertebræ will be removed; and, in fact, the rotation and curve of the vertebræ will be already perceptibly diminished.

4. To hold the abdomen and loins back. By this last effort, provided the directions numbered 1, 2, and 3 be simultaneously and firmly acted upon, the attitude and symmetry of the trunk will be, in many cases, entirely rectified. Some lateral curvature may, however, yet exist.

5. Let the patient, holding the stick or bar (three and a half or four feet in length) parallel to the end of the apartment in front of her, gradually raise the arms perpendicularly above the head, then gradually and slowly bend the body forward so as to approach the bar to the toes or touch them, being firmly attentive to the directions Nos. 1, 2, 3, 4. If this movement be carefully performed, the whole series of spinous processes from neck to sacrum will be thrown into prominence; and if the lateral curvature has not reached the stage of ligamentous and osseous distortion, they will form an uninterrupted straight line—free from trace of lateral curvature. If the effect of this exercise, and of similar ones, be studied from an anatomical and physiological point of view, it will be apparent that the therapeutic benefit derivable from it in the first stage of spinal curvature is both mechanical and dynamical. To repeat, then: *No attitude of the trunk elongates so much the spinal column as the one described*, and this constitutes its special utility. In distortions of any part of the body or limbs, of even moderate duration, we proceed to cure by mechanically elongating habitually contracted parts, and

we excite at the same time the inherent muscular power, with the view of regaining a spontaneously natural action and form of the part. In the management of spinal lateral curvature, curable, in the early stage, without confinement or spinal supports, we endeavour to attain the same ends. We know, as regards the spine, as well as the limbs, that if we are able to elongate shortened parts on one side of the organ and can call the muscles into normal activity, the structures on the relaxed, protruded side of the organ will spontaneously recover themselves, and adapt themselves to the restored form and mobility.

It has been shown that habitual standing, or unduly resting on one limb, usually the right, is an *exciting* cause of lateral curvature. It tends, as I have already hinted, unduly to elevate and throw backward one hip, and to depress and throw forward the other hip, accompanied with a slight flexion of the knee. The lumbar vertebræ are, at the same time, inclined to the left. These circumstances are all apparent in the early stage of lateral curvature. The successful application here of the fundamental principle—*sublatâ causâ, tollitur effectus*—is at once illustrated by the immediate effect of attention to the rules enumerated at p. 43; and, in directing the cure of these cases, it is important to impress upon the gymnastic or calisthenic teacher, as well as on the parent or instructress, the importance, during all exercise, of following the mode I have indicated of rectifying the position of the pelvis and lumbar vertebræ. It is practically of little use to say to a child with weak spine, "Stand upright," unless she be taught how to effect it. In nine cases out of ten, the girl with first stage of lateral or other curvature of spine, when desired to stand upright, will be observed to hollow excessively the loins, and throw far back the shoulders and chest, instead of assuming a normal attitude and good position of the hips, chest, and shoulders. By mensuration in these cases, the observer may ascertain that the patient does not

momentarily increase her height; whereas, by the means I have indicated, the figure will not only be more or less completely rectified, but the actual height will be sensibly augmented.

In the young, the ordinary subjects of these curvatures, the spinal column is so flexible, the will being capable of direction to the subject for a few moments only, that the patient, in recovering a state of rest or standing at ease, especially when tired, exhibits as much spinal curvature and undue shoulder and hip elevation and prominence as before the attempt at the exercise above described was made. The patient, however, can soon learn spontaneously to correct the deviation. After a time it becomes an easier matter to continue straight; and ultimately, with patience and practice, the correct attitude becomes habitual, without effort, by instinct merely, as in the case of the military man.

The continuing growth of the individual favours the prompt attainment of a correct form and attitude. The cultivation of this attitude, and simultaneous invigoration of the frame, as already pointed out, lead to permanent restoration.

To resume, every lateral curvature in the early stage is curable by—

1. Attention to the general health and hours of repose;
2. Gymnastic elongation of the spinal column in the manner described; invigoration and development of weak muscles by gentle gymnastics, aided by other ordinary appropriate exercises, natation, equitation, active games, &c.;
3. Extra use of the arm, leg, and side of body, which were formerly disused during the operation of the exciting cause or causes of the curvature,—

without recourse to any kind of spinal couch, spinal support, lying down, or extension beds.

The cases which present most difficulty or tediousness in treatment are those which are complicated with antero-pos-

terior curvature, being marked by much roundness of shoulders and hollowness of loins. The cases also in which a decidedly hereditary or a congenital tendency is apparent are slow of cure.

Before leaving the subject of the successful treatment of the early stage of lateral curvature, I take the opportunity of condemning in the strongest manner the common habit of resorting to "lying down" on sofa, ground, or "reclining board" as a means of cure of existing distortion, or as a means of causing young girls to grow up straight.

This custom is so general as almost to form a part of modern female education. I am aware that first-class schools exist where a sufficient number of "reclining boards" are considerately kept to insure that each young lady shall take daily her turn upon one of them, as she would in rotation devote an hour to practice at the piano. Such a course is prescribed with the utmost good faith, and is readily acquiesced in by parents.

So general a recourse to this proceeding must have had something to recommend it. I have already mentioned the fact, that lateral curvature is often apparent only in the standing position, or is aggravated by it; and if the parent or instructress is ignorant of any certain remedy or preventive means, it naturally follows that it is a sensible proceeding to remove the influence of superincumbent weight from the weak spine, and place the growing girl in the position in which she seems most likely to grow straight,—namely, the recumbent one; but this passive growth in a straight direction whilst in the horizontal position resembles the gardener's culture of an agreeable edible in cylindrical straight glasses, and is not the development in a properly straight symmetrical direction of the spinal column by means of the spontaneous, active physiological use of the muscles of the trunk in the physically active child, or by means of the exercises taught by the gymnast. The dependence upon "lying down" as a means

of prevention and cure for moderate lateral curvature, is a relic of the period when, from the poverty of means for cure of considerable lateral curvature possessed by the physician or surgeon, he was thrown upon "lying down" as the sole resource in slighter cases.

I have often witnessed the back of a young lady rendered "flat as a board" through injudicious lying down,—the natural antero-posterior curves in the dorsal and lumbar regions having been obliterated, and the figure rendered most unsightly. Increased weakness of the dorsal muscles, a stiff awkward gait, and diminished ability to bear shocks, as in jumping and running, are the necessary results of this treatment.

The end attainable by lying down is attainable by early retirement to rest at night. Yet there are exceptional times and conditions when recumbency may be judiciously recommended, for an hour after meals or exercise once or twice a day: for example, in girls in whom the growth is unusually rapid, or who can by no other means be kept quiet; in those in whom the digestive functions are weak, and apt to be impeded by sitting at a desk or table; or in whom fatigue is obviously induced by very moderate out-of-door exertion. Between the intervals of gymnastic exercise, also, repose upon a sofa for a few minutes may be advised. But neither such late hours on the one hand, nor such violent gymnastic exercises on the other, should be permitted, as to render repose in the day-time in the recumbent posture a necessary complement to them. Lying down may be employed by many as a preventive to spinal curvature. From this point of view it is less objectionable than when employed as a curative means. It is unnecessary as a preventive if the hours of rest at night are proportioned to the age of the child. When used curatively alone, it is delusive and mischievous, by diverting attention from more certain modes of cure.*

* *Op. cit.*, p. 381.

A considerable proportion of cases of lateral curvature occur in individuals descended from phthisical parents. There is an obvious pathological connection between pulmonary tubercle and the want of stamina which favours yielding of the spinal muscles, ligaments, and bones. A certain proportion of the children of a phthisical parent may inherit, if not distinct tuberculosis, at all events a constitutional debility, which marks a proclivity in the tissues and system at large to give way under the functional calls made upon them in the duties of life. The first great persistent strain made upon the economy whilst passing from childhood into adolescence, occurs whilst the education of the individual is actively pursued. The change from the incessantly active, locomotive life of the young child to the sedentary life of the school-room, subjects even the best constitution to a strain which rarely does not leave some temporary, if not permanent, trace. The weakly break down under this strain. Nevertheless, it must not be supposed that pulmonary phthisis lurks beneath every case of lateral curvature.

A useful curative direction as to the manner of the patient's standing may often be given with advantage in this stage. We observe, as a rule, that the young girl affected with incipient lateral curvature bears the weight mainly upon one leg. The right foot, for example, is usually found to be placed beneath the perpendicular axis of the body, whilst the left foot is placed somewhat in advance. The constancy of this relation of the limbs to each other excites to an habitual elevation and prominence of the right side of the pelvis, and consequent inclination of the lumbar vertebræ to the left side. It is, therefore, desirable to induce the child to reverse this manner of standing, *i. e.* to place the left leg beneath the axis of the body, and the right foot somewhat in advance. By this means, prominence of the left hip, and inclination of the lumbar vertebræ to the right, are favoured, and the equilibrium of the spinal column

is promoted. The faulty manner of standing above described should be perseveringly checked. If a change in the manner of standing is required by the child for temporary relief, the change should be into that termed by the drill-master the first position, instead of into the attitude I have deprecated. The act of hopping upon the left leg, when no weakness of the corresponding ankle or knee exists, is well calculated to favour the return of the lumbar vertebræ to the right side. The proof of the value of standing upon the leg which corresponds to the least prominent side of the pelvis is, the immediately visible reduction in the existing lateral curvature which ensues when resort is had to this studied use of the particular leg. The extent to which one foot is apt to be preferentially used is often shown by the child's inability to stand or hop equally well on either leg.

Before concluding the subject of the treatment of the early stage of lateral curvature, I may remark, in relation to gymnastics, that I have no disposition to encourage the transformation of the lithely shaped, susceptible female form into that of the laborious dairy-maid; nor to sanction the growing up of the present generation of young ladies with easily preventible distortions, to the extent witnessed during the present century, since intellectual education has been so much cultivated. Gymnastics have been much abused; young females having been excited to athletic feats and exertions beneficial or necessary only to the male sex. It is not desirable that the teachers of gymnastics, when their services are called into requisition to assist the development of the muscular system of young women, should aim at exciting the strength to the point of enabling the girl to lift, throw, or carry the heaviest weights of which a woman may be capable. Gentle movements, frequently repeated, more beneficially develop the frame than do laborious efforts, of which the child may, nevertheless, be an eager performer. Feats of strength have been pushed to a dangerous extent,

as when undue fatigue and exhaustion have been consequent upon them. It is now well known that excessive muscular exertion in youth has something lethal in it. In fast-growing, excitable children, even when not pushed to this extreme, impairment of the nervous system, loss of appetite, debility of the digestive organs, often result. Suitable games and gymnastics in the open air, when practicable, relieve the mind of the anxious, scrupulously attentive girl—the most apt to become deformed; they quicken the blood-circulation, and distribute it more equally to the extremities, surface, and internal parts; increase the activity of movement of the contents of the alimentary canal; favour defecation, and effect other physiological purposes upon which it is unnecessary to insist. These effects of moderate gymnastics obviate some of the prominent symptoms of a weakly constitution. Many ingenious contrivances for in-door, safe gymnastics are now procurable.

ON THE MORE ADVANCED STAGES OF ROTATORY OR LATERAL CURVATURE.

WE may conveniently include under the head of early stage of lateral curvature all those cases which momentarily disappear, wholly or almost wholly, on the application of the test exercise described at p. 21, or by the patient assuming a horizontal position. In the more advanced stages* of lateral curvature, the rotation of the several parts of the spine upon the horizontal axis, and the principal abnormal lateral curves—those, for instance, of the dorsal and lumbar regions, the obliquity of the pelvis, and the depression of one shoulder—are much increased. The ribs, which in the first stage are only slightly prominent, now project considerably behind on the right side, whilst the left lower ribs advance in a smaller degree in front. In fact, the lateral halves of the trunk have undergone an antero-posterior displacement in relation to each other, the left half of the chest having advanced, whilst the right half has receded. By this time the left side of the chest also exhibits considerable wasting of the ribs and proportionate reduction of air-space for inspiratory purposes. As the deformity progresses, the length of the trunk diminishes sometimes to the extent of several inches, from which results a corresponding loss of space in the thoracic and abdominal cavities, and impediment to the functions of the contained organs.

If we apply the test exercise to cases advanced beyond the first stage, we do not find the spine rectified by it; more commonly the deformity appears to be aggravated: the bulge of the right ribs, especially of their posterior angles, and even the bulge of the lumbar vertebræ to the left, and the visible

* See *op. cit.*, p. 374.

rotatory prominence of their left transverse processes, being much augmented. It is now obvious that the structural changes of form of the bodies of the vertebræ and of their articular connections, as well as the shortening of ligaments and muscles, resulting from prolonged retention of the spinal column in a distorted position, oppose a resistance to straightening which the test exercise or recumbency are unable to overcome. In short, the deformity has passed that stage in which any voluntary effort of the patient, however well directed, is immediately effective. Gymnastic exercises are now of only secondary importance as to cure. We have to deal with the spinal column and chest, of which the component parts, the vertebræ, at their several points of contact with each other and with the ribs, have adapted themselves in a more permanent manner to the change of general direction of the column and trunk. The bodies and processes of the vertebræ have become compressed, and changed in form, in the parts corresponding to the concavity of the curves, and enlarged and changed in direction towards the convexity of the curves. The ribs have become disproportionately enlarged, and bulge out posteriorly on the right side, whilst on the left side they are atrophied sometimes to a great extent, changed in form, and pressed inwards towards the median line (see figs. at end), as well as anteriorly, in a remarkably characteristic manner; in extreme cases, even resting upon the ilium of that side. Where great posterior projection of the right ribs and spine has taken place, the right ribs also may rest upon the corresponding hip. Considerable shortening of the trunk, displacement of contained viscera, and, above all, reduction of the space within which the important organs of the chest, abdomen, and pelvis have to perform their functions, are the result. It is foreign to the object of this work to dwell upon the ultimate effects of the severe stage of this deformity upon the general health. The heart, the stomach, and the nervous system are the parts which suffer most commonly

from the distortion. Exclusive of the cases in which hereditary predisposition to consumption exists, the lungs suffer chiefly from mechanical disturbance of circulation, emphysema, and proneness to intense sudden congestion. The subjects of severe lateral curvature who have attained to the age of forty or fifty years, having bravely combated the troubles incidental to their external physique and to the resulting internal derangement, sometimes having been the mothers of large families, often find a considerable impairment of general strength before the period at which the debility of age usually shows itself. In many instances, it is a marvel to the pathologist how even life—to say nothing of tolerable health—has been maintained under circumstances apparently so unfavourable. Much has doubtless been due to the incessant watchfulness over their health rendered necessary to such persons, and I believe something is owing to the assistance our art has been able to render them.

Treatment of more advanced Lateral Curvature.

The analogy of the means successfully resorted to in deformities of the limbs with those of which experience confirms the value in advanced lateral curvature of the spine, illustrates the fact that pathological and therapeutic laws are the same in every part of the economy. Nothing can appear more unpromising than the attempt to rectify considerable lateral curvature; and when the result is compared with that which Stromeyer's discovery of subcutaneous tenotomy has enabled us to accomplish in many congenital and acquired deformities, it behoves the candid writer not to boast of the resources of art in these cases.

The measures applicable to those deformities of the extremities which are not amenable to tenotomy—viz. frictions, manipulations, mechanical elongation, mechanical supports, and gymnastic exercises—are equally applicable to the treatment of the severer cases of lateral curvature of the spine. An

important difference, one which renders the successful treatment of advanced lateral curvature of the spine more difficult than the treatment of distortions of the limbs, is, that whereas in the latter we have to deal only with long bones, or with disturbed relations between the articular surfaces, the ligaments and muscles of one, two, or at most three principal articulations,—we have in the spine to contend with a multitude of articulations, the deranged relations and connecting structures of each of which require to be restored before a true cure can be effected. In the limbs, the individual joints are so far apart that the requisite space is afforded for our manipulations and applications of apparatus destined to act upon each articulation; whilst, in the spine, the individual bones and articulations are comparatively so small, and so peculiarly and deeply situated, that the surgeon is unable to reach them in such a way as directly to apply his restorative measures to them. The mechanical means employed are in great part applied only indirectly to the spine, *i. e.* through the intermediation of the ribs, the shoulders, or the pelvis; and are therefore liable to expend their agency rather upon these secondary parts than upon the vertebræ themselves. And as deformity always implies as a consequence comparative disuse of the more distorted parts, and as this disuse of parts in the growing individual induces their wasting or atrophy, a further loss of symmetry from this cause is added to that which depends immediately on the spinal deviation.

When the ribs of one side have grown much beyond their natural dimensions, whilst those of the opposite side have dwindled much below their normal development, the individual having attained the age at which general growth of the body has ceased, the recovery of a balance of power of interstitial growth in the two sides does not take place. When, however, in slight cases, even after the general growth is complete, the spine is straightened, and the several parts of the body are permitted fair play, the tendency of nature to revert to

the primitive symmetrical type shows itself in such a manner that the parts once unduly developed shrink in their turn, whilst the formerly atrophied structures resume a greater activity and growth.

We will proceed now to consider more in detail the individual means available for the palliation and removal of more advanced lateral curvature.

Temporary absolute repose of the Dorsal Muscles.—When treating, without the aid of tenotomy, contractions and distortions of the larger articulations of the limbs,—the knee, for example,—I have often been agreeably struck with the comparative facility with which restoration was accomplished, after the part had been kept a few days entirely at rest, as in an extension instrument, or even when the patient observed entire rest upon a couch. Precisely as a large portion of the visible vigour and power of a healthy member—which is due to the constant exercise of volition in the muscles, and the carrying out of active movements by their instrumentality—is temporarily lost by a few weeks' confinement to bed, in like manner the muscles of a distorted member lose, through the forced repose, something of their irritability and power of resistance. Now, in those cases of spinal curvature in which either the spontaneous efforts of the individual, the test exercise before described, or recumbency, effects little or no improvement of position,—in which, in short, bones, ligaments, muscles, and fasciæ are disturbed in their anatomical conformation, reduced in breadth and length upon the concave side of the spinal column, and elongated upon the convex side,—the muscles having been forced, especially during the upright position, to adapt themselves to the altered bony framework, they become irritably accustomed, as one might say, to the abnormal length and direction they have been forced to assume, and oppose a great obstacle to restoration. It was formerly recommended to solve this difficulty by myotomy—an operation since, for good reasons, almost abandoned. In

severe cases we may, however, commence the treatment by restraining the patient to the recumbent posture for weeks or months, according to the urgency of the case, for the purpose of removing so much resistance of the muscles as is due to habitual action in the most distorted direction. This repose of a few weeks on a couch is often of singular benefit to individuals afflicted with considerable lateral curvature. They are usually much below the average in strength, although the activity of their intelligence and general nervous system prompts them to undue exertion. Repose, with good diet and freedom from cares, improves the digestion and assimilation, and therewith the general system, and lays a good foundation for subsequent treatment.

Manipulations.—During recumbency, manipulations may with great advantage be resorted to. Very superficial observation of the beneficial effects of attempting to press the spinal column into a straighter direction will, unless the patient be much advanced in life, encourage the patient and her friends to persevere in a proper and sedulous use of this means.

The person employed to effect these manipulations needs to be expressly taught in what manner they can be most advantageously carried out. The surgeon can impart the necessary instruction by showing where the pressure and counter-pressure upon the several curves require to be made. Dr. Harrison, a well-known practitioner thirty years ago, adopted a peculiar means of endeavouring to press the rotated spinous and transverse processes into a more favourable position. The instrument used by him resembled that which is sometimes employed to compress the subclavian artery above the clavicle. Although the attempt to effect the object he had in view appears at first sight futile, the reiterated pressure upon particular projecting parts of vertebræ is fairly indicated, and is not unattended by benefit.

Forcible elongation by Extension Beds, &c.—A preposterous resort to forcible attempts to elongate the spine by means

of apparatus contrived to draw the head and shoulders in one direction, and the pelvis and lower extremities in the other, was the characteristic of the orthopædists in the last and early part of this century. They ignored the fact that all forcible extension of the spine was liable to stretch parts which least required elongation, rather than those most contracted. Yet it cannot be denied that gentle extension of the spine, by means which support the head and shoulders at the upper end of an inclined plane or couch, whilst the pelvis is drawn down by a weight attached to it, or by strap, spring, or screw, does contribute to rectify the column. The extension bed must be regarded as a dangerous apparatus in the hands of incompetent or thoughtless people.

One benefit sometimes obtainable from the use of an extension bed is, that the patient, even by the gentle application of its power, is excited, if not coerced, into quiet retention of a position desired by the medical attendant. The designing and manufacture of racho-orthopædic extension beds have been carried to an extraordinary degree of completeness. These beds have been adapted to every possible modification of deformity, and to the fulfilment of every mechanical indication, and in many very severe cases have been found useful.

Mechanical elongation of the trunk has also been attempted by a variety of suspensory apparatus; the patient, for example, being suspended by the head in a suitable framework, without the feet being allowed to touch the ground. Many representations of this apparatus are to be found in orthopædic works. It is sufficient to remark of this proceeding, even more pointedly than of extension beds, that the connections of the upper cervical vertebræ with the cranium and with one another are less firm than those of the lapsed dorsal and lumbar vertebræ with each other, and that, consequently, a moderate amount of suspension will rather tend to separate the atlas from the occipital bone than to cure deformity; moreover, cases are recorded of injury and disease

of the ligaments of cervical vertebræ having been produced by it. As if to solicit danger, some orthopædist, not content with simple suspension by the head, the weight of the trunk and members constituting the measure of the extending power, have added weights of twenty or thirty pounds to the feet to increase its effect. Suspension by the head combined with sea-bathing has been practised, the person being let down from a ridiculously cumbrous wagon, and allowed to practise gymnastics in the water. Doubtless, this is less dangerous than suspension in air.

Extension chairs have also been employed for a similar purpose, the patient undergoing perpendicular elongation from the head, whilst the pelvis rested upon and was secured to the chair. An improvement upon the ordinary extension chair is that of Delpech, employed whilst the patient practises at the piano: above it, and in front, is a pulley, with weights attached by a chin-strap and collar to the neck and head. This chair I have found very useful. It appears to operate less by any violent extension of vertebral structure than by continually exciting the patient to use the spinal muscles in order to counteract the effect of the weight, and sit upright. The patient can leave the chair and resume it with little interference with dress or loss of time. Moreover, its use is unattended with risk. A more common proceeding is that of causing the patient to take exercise upon common crutches only. By this means the lower part of the spinal column is relieved of the weight of the upper extremities, and is to that extent beneficially affected; but little straightening influence is exercised upon the more unsightly dorsal curve, whilst the influence of the weight of the head upon that part of the column which it especially and primarily influences, viz. the upper part, is little modified. Locomotion upon crutches may, however, be advantageously practised in some very young subjects, in whom, whilst exercise in the open air is desirable, the laxity and flexibility of the column is

so extreme, that every time the upright posture is exercised, the ligaments and muscles upon the convexities of the curves are injuriously elongated, whilst the inter-vertebral substances and bodies of the vertebræ on the concave sides are compressed; and consequently the benefit derivable to the bodily health from open-air exercise is neutralised by the injury inflicted upon the spine.

A usual mode of attempting to effect mechanical elongation of the trunk, is the act of swinging by the hands from a cross-bar or hand-swing suspended from the ceiling, door-way, or out-of-door beam or tree. During the act of swinging, so long as the muscles of the trunk are actively influenced by volition, the straightening of the column is not immediately very apparent; the patient needs to swing at times passively, as far as the back is concerned; or the muscles of the back need to be fatigued, before they will permit, by this means, much straightening effect upon the spine. On examining patients whilst engaged in swinging, it will be found that the weight of the arms and shoulders, being transmitted to the hand-swing, is removed from the spine, and that if the suspension is continued long enough, the position of the column is improved. It is, however, not a reliable means in severe deformity; it is more beneficial during the earlier stages, and derives its principal utility from its gymnastic character. When not immediately productive of visible straightening of the spine, its use should be encouraged, as an exercise calculated to call the muscles of the shoulders and trunk into symmetrical action, *i.e.* to develop the muscles on both sides of the trunk and shoulders, in lieu of the unilateral action common to persons affected with lateral curvature.

Theory has suggested that where the spine is shortened by the occurrence of rigid curves, the large muscular bands filling the concavities of the curves, as well as the multitudinous smaller bundles of muscles connecting the individual bones within the concavities, would become stronger by

gymnastic exercises, and resist cure. But experience demonstrates that the use of muscles, when encouraged simultaneously with attitudes calculated to draw out the contracted spine, invariably tends to rectify distortion. In whatever part of the body we may be concerned in the rectification of deformity, it is found that when the distortion was not present at birth, nature, when actively assisted by art, tends to bring back the distorted part to the normal form.

Art can render this assistance to nature in no manner so certainly as by exciting muscular action, development, and growth of *all* the muscular structures of the part, *in both sides* of the trunk. On the contrary, as I have elsewhere shown, during the treatment of deformities arising before birth, nature constantly endeavours to frustrate our efforts to cure, unless we persevere beyond the point at which reiterated experience proves that relapse to the old deformity is impossible.

Spinal Supports.—The exercise of our art *tutò, citò, et jucundè*, is never more desired than in the case of the young adolescent female affected with considerable lateral curvature, to whom, consistently with her position in society, a loss of time appears an irremediable evil. From the preceding observations it has been seen that in this severe class of cases, whilst *tutò* is secured, the *citò* cannot be promised; and as to the *jucundè*, considerable sacrifices need to be made by the practitioner to insure it as far as possible. In the matter of spinal supports, it will be found that, whilst supporting the spinal column, relieving it of superincumbent weight, and endeavouring to press lapsed parts into a better position, we are continually called upon, in giving directions to the instrument-maker, to endeavour to combine the maximum of usefulness with the minimum of unsightly interference with the patient's habiliments. The successive International Exhibitions, the shops of the best and the worst instrument-makers, here and upon the Continent and in America, exhibit every variety of apparatus designed for

this purpose. The most pretentious articles exhibited in 1862 were amongst the most clumsy and ill-designed. In many instances, the spectator must have stood aghast at the cumbersome mass of half-concealed iron, suggested, rather than destined, let us trust, to encompass and act as a scaffolding to the delicate, nerve-gifted, sentient female.

Formerly, a spinal instrument or support was simply calculated, as far as practicable, to remove the weight of the head or shoulders from the spine and transfer it to the pelvis. Hos-sard's belt, adopted by Tavernier as his lever-belt, introduced a new principle, that of employing a metal lever extending upwards from the pelvis, secured to the patient's leg below, furnished with a strap designed to act directly against the protruded ribs and principal convexity of the column.

Since the introduction of this lever-belt, the principle of the lever has been imitated by many surgeons and instrument-makers, whose names have been given to spinal supports. An additional lever has been added, to act upon the lumbar curve as well as the more apparent dorsal one. Ratchet screws, unavoidably adding to the weight, have been commonly used to regulate the levers, and metal pads to press upon projecting parts have, in many instances, taken the place of straps. But there are two radical defects in all such spinal apparatus, one of which springs from the inherent difference between living tissues and a model on which supports are tried: the human frame cannot bear equally with a machine the amount of pressure which an elaborate spinal support is capable of exercising. The second defect is, the difficulty of finding a fixed point from which the apparatus can act. The pelvis is used as a fixed point; but however tightly the pelvic portion of the apparatus may be secured, in practice it will be found that this part shifts its relations, so that the influence of the lever is apt to be constantly neutralised. The lever, to be effective, therefore, and not a mere pretence, requires fastening to the lower extremity, opposite to the principal dorsal projection. This

portion of Hossard's lever-belt, in principle the most effective part of it, is in practice, owing to certain inconveniences attaching to its employment, commonly omitted.

In fact, spinal instruments are most justly termed supports; for that portion of them which contributes properly to support the patient, yield her comfortable assistance in the erect attitude, and enable exercise to be taken, may be depended upon for those ends; but that portion of them which is designed with curative intentions, on however correct anatomical and mechanical principles it may seem founded, will disappoint in the great majority of instances. There is an important physiological point of view, as well as a mechanical one, from which the figure of a growing female affected with spinal curvature may be regarded. It is well known that the feet of the women of certain rank in some parts of China may be pressed, during the growing period of life, into a given approved and fashionable shape; or, as formerly shown in the clinical wards and dissecting-room of a hospital, that the ribs of the European female may be compressed and driven inwards to the extent of so bisecting the liver as to make an additional lobe out of it, by wearing certain stays with once-fashionable tightness.

In like manner, the deformed chest of a growing female may, by the compression of spinal apparatus, be pressed back into a better form, if the apparatus be sufficiently unyielding to necessitate the body of the patient growing into the mould presented, as it were, for its reception. Even much older patients, from thirty to forty years of age, may not only derive support and comfort from spinal apparatus, but obtain considerable reduction of projecting parts, and improvement in personal appearance. Such results naturally suggest for our consideration whether the continued pressure, by limiting the movements of the ribs, can fail to inflict injury upon the organs contained within the chest. In this inquiry it must be observed that, in considerable

spinal curvature, the movements of the chest, especially upon the concave side, are already greatly limited; whereas the effect of a properly constructed spinal support is, whilst compressing protruded parts, to favour expansion of the sunken and contracted side. The physiologist will be satisfied to know that, under proper arrangements, one effect of a spinal instrument is often to cause the patient to stand half to three-quarters of an inch higher when wearing the apparatus than when without it. This increase of the perpendicular extent of the chest, and consequent increased air-space within, with corresponding relief from diaphragmatic pressure upon the abdominal viscera, explains, without reference to probable influence of habit or pride of personal appearance, the sense of relief experienced by patients, and their unwillingness to discontinue the use of support.

It is the fate of every useful therapeutic agent to be abused. The tendency of the day is towards excessive appreciation of the advantages of spinal apparatus. A spinal support, and much time spent in the recumbent position (see p. 47), constitute the only means often resorted to, either in the slightest forms of lateral curvature,—*in which both of these means of treatment are unnecessary*,—or in the severer forms, in which supports and lying down absolutely require the coöperation of physiological means of cure. I have shown how important an element in lateral curvature is the rotation of the vertebral column upon its horizontal axis; this rotation is most perceptible in the lumbar region, but it extends throughout the column. The student will comprehend the nature of this rotation in the following manner: Let him take a thin lath, hold it by the ends, and endeavour to twist it spirally; he will thus imitate the continuous rotation of the entire spinal column which occurs in lateral curvature: he will instantly comprehend how the weight borne by the column tends to increase this rotation, when this is once set up by unilateral action of the muscles of

the trunk and extremities, and how the simultaneous lateral yielding of the column is produced when the structures of the column are so weak as to permit the deformity.

Notwithstanding all that has been said or written in relation to lateral curvature and spinal supports, no spinal apparatus or support hitherto designed is able to overcome rotation of the spine. It springs from the very nature of lateral curvature that mechanical means can only remove that which is the consequence of the operation of mechanical forces—incidence of weight; whilst the spiral rotation of the column, excited by neglected or perverted muscular action, can only be remedied at any stage by physiological, dynamic means calculated to antagonise these improper uses of parts. I have shown that this distortion, so far as the spinal column is concerned, is, in severe or complicated cases, composed of several elements: (1) lateral yielding; (2) rotation; (3) increase of the natural antero-posterior curve in the dorsal region (round shoulders), with (4) increased hollowness of loins (lordosis). Spinal supports will, if properly adapted and worn, correct Nos. 1, 3, 4, but are directly powerless as to the rotation.

I may here repeat, that *the early stage may, in every case in which there is not a strong hereditary tendency, be arrested and cured without the use of supports of any kind*; it follows, therefore, that if the disorder be recognised and properly treated in the early stage, the innumerable forms of spinal apparatus exposed in the shops may be relegated to the back-shelves as relics of a more ignorant period. In the present day, the abundant demand for these articles illustrates the need of a more extended knowledge of the means of early discovery and remedy of this serious distortion (see pp. 18-22, 36-51). It should not be supposed that the work of the surgeon is accomplished when he has prescribed an appropriate spinal apparatus. The continued growth of the patient, the modifications in form which the spine and chest undergo through the treatment employed, the wear and tear of the machine

itself, are all circumstances that necessitate the care and vigilance of the practitioner, with a view to the adjustment of the apparatus to the varying aspects of the case. The disbelief of many members of the profession, in the last generation, in the advantages of spinal supports, often led the patient and friends into the hands of empirics and well-intentioned instrument-makers. The improvements effected during the present generation in the mechanical treatment of those spinal curvatures, as well as other distortions, in which instruments are required, has sprung from sound anatomical and physiological study of spinal deformity and other distortions by our profession, and the large experience gained by us during the last thirty years, aided by the mechanical talent of ingenious instrument-makers. The interests of our patients, not less than the credit of the profession, demand that when surgeons prescribe instruments, they should not favour the pretensions of some instrument-makers and empirics by simply sending the patient to purchase a support, and give no further heed to the success of their prescription. There will be less probability of the surgeon committing this mistake when he has studied the views as to the class of cases requiring supports, the objects attainable by them, and the principle on which they should be constructed, as laid down in these pages. A spinal support is often a mere blind, to conceal deformity. The employment of supports by the surgeon for this purpose would reduce his art to a lower level than that of the corset-maker.

The *omne ignotum pro magnifico* has come much into play in the case of spinal instruments; though, really, the mystery of spinal supports consists rather in the pretensions of their contrivers. The surgeon who reflects upon the pathology of the complaint, and the anatomy of the human figure, will perceive that the object attainable by them is, to relieve the vertebral column of weight, by transferring as large a portion

as possible of the weight of the head and shoulders from it to the pelvis, which, when the bones are sufficiently developed, is capable of sustaining it: unfortunately, a principal weight—the head—is seldom provided for.*

In fine, mechanical supports or scaffoldings have been as much condemned by some medical practitioners as their advantages have been extolled by others. Experience justifies the assertion that, in suitable cases, they neither merit the praises lavished upon them by some nor the anathemas of others. Too much has been expected from them. As a scaffolding or a buttress may support an inclined building, in like manner a well-adjusted mechanical support may prevent further yielding—may prevent increase of deformity—may arrest the evil at the stage at which the machinery is employed. But the admission of their utility is qualified by the results of experience, which show that many lateral curvatures increase in spite of instruments apparently well adapted to the intention with which they have been employed. The causes of failure consist in some inherent imperfection, in want of constancy in their use, in their liability to shift in their adjustment through the continuous growth of the patient and alterations in the progress of the curvature. The failure of supports is, above all, determined by the omission to use simultaneously other means, such as are recommended in this work.

Lateral Slinging of the Trunk.—Another means of acting upon the lateral yielding of the spine consists in slinging the recumbent patient upon the projecting side by means of a broad, firm, padded, suspensory band, supported by wooden uprights, attached to the sides of a couch. Something similar is attempted by causing the patient to lie on the side with a firm pillow beneath the projecting part of the dorsal region. In slight cases of lateral curvature, lying in this manner for an hour at a time, once or twice daily, is sometimes beneficial;

* *Op. cit.*, p. 376.

but in practice it will be found that the patient is more inclined to roll round upon the back than to preserve a lateral position. And, in truth, when we consider that the dorsal projection, as its name implies, is more in a backward direction than to one side, it is desirable, when attempting to press inwardly this projection by lying upon it, that the pressure should be as much from behind forwards as laterally or in an inward direction.

In severe cases of lateral curvature, there exists, as already mentioned, a marked tendency of the ribs comprising the dorsal projection to bulge at their angles; and any pressure made against the sides of the ribs, whether by lying upon the part with the intermedium of a pillow or a sling, or by the use of the ordinary, and the sometimes extraordinary and complicated, lever-pads employed in some spinal "supports," increases the flattening of ribs often seen in the complaint, and forces out still more the angles of the ribs. I have found, in such cases, that pressure upon the dorsal projection by means of a well-fitted spinal support, provided the shoulders are sufficiently held backwards by it, is preferable to lateral pressure in the recumbent position.

The most advantageous use of the sling, however, in lateral curvature, is obtained by applying it to reduction of the lumbar curve. The band requires to be narrow—sufficiently wide only to reach from the lowest left rib to the top of the corresponding ilium. I find that the sling thus applied to the lumbar curve, in well-marked cases in the growing girl, for three or four half-hours daily, will often entirely remove it in a few weeks. Care should be taken that the sling does not slip on to the left ribs, and thus tend to increase the dorsal curve instead of effacing the lumbar one. If the band is not too wide, there is little danger of this result. I attach the more importance to the use of the sling as a means of acting on the lumbar curve, from the facility with which, by its means, pressure can be directly made upon this curve, without

the drawbacks which exist in its application to the dorsal one ; and also from the conviction that, if any difference in point of time of origin of the dorsal or lumbar curves can be recognised, the lumbar one, through unequal sitting upon one ischium, or through unequal standing upon one leg, is the most powerful of the *exciting* causes of rotatory or lateral curvature,—a cause which, operating through resulting obliquity of the pelvis, induces lumbar curve, and the complex deformity commonly called lateral curvature.

But although, in point of time, looking at the matter abstractly, it is probable that the lumbar curve precedes or excites the dorsal one, or, in other words, that the series of unsymmetrical muscular acts and attitudes begin in the muscles and bones of the pelvis and loins, and excite complementary muscular acts and changed relation of the bones in the dorsal region,—yet we know from physiology that such actions of living parts, although, doubtless, successive, are spontaneous, automatic, and practically simultaneous.

With the help of such reflections as these, we can understand the fact that different good observers of the origin and nature of lateral curvature differ as to which of the principal curves, dorsal or lumbar, is the primary one. There is no doubt that, to the ordinary observer, the dorsal curve appears the primary one. The more rapid progress in distortion visible in the dorsal region is connected with the greater length of this portion of the spine. It follows from the number of vertebræ concerned in the dorsal region, and from their anatomical construction, that if each dorsal vertebra yields only as much as each of the lumbar ones, the resultant curve will earlier attract attention, and a higher degree of deformity will be attained in the former situation than in the latter one.

In treating of rotatory or ordinary lateral curvature, we speak of distinct cervical, dorsal, and lumbar curves. I may, however, note, that either of these curves, when present, is

seldom confined strictly to the respective cervical, dorsal, or lumbar regions. Thus, the lumbar curve often embraces one or more of the dorsal vertebræ; probably because the lowest dorsal vertebræ, being unconnected by means of their corresponding ribs with the sternum, are less allied to the thoracico-dorsal muscular movements and attitudes than to the abdominal-lumbar ones. The lumbar curve might often more properly be designated *lumbo-dorsal*. Even at the summit of the dorsal region—where, from the small circuit formed by the upper dorsal vertebræ, the upper ribs, and the intervening upper portion of the sternum, a greater compactness of structure exists—we frequently find that the dorsal curve can be traced upwards into the cervical region—the dorsal curve constituting, really, a dorso-cervical or cervico-dorsal one. When we reflect upon the natural strength of the connections of parts at the summit of the chest, we may wonder that unsymmetrical, unilateral muscular action and attitudes should so distort it. But the explanation of the occurrence is afforded by the remarks elsewhere made (p. 22) on the predisposing causes of the distortion. We can thus understand the unnecessary multiplication of varieties of lateral curvature made by authors.

But, leaving this digression from the treatment to the causation of distortion, it is an important fact, that the lumbar curve can by no means be so promptly, decisively, and beneficially acted upon as by the sling, applied to it in the manner I have described. It coincides with all observation, that just as a curve in one part of the spinal column excites a complementary curve or curves elsewhere in it, so in like manner the rectification of one curve tends to improvement in the remainder.

The more carefully we examine the mode of operation of the various means resorted to for the cure of lateral curvature, the more we find that each curative agent which is advocated has something to recommend it. We find, in

short, that each agent is calculated to remove some one element in the distortion, the removal of which may favour the disappearance of other elements. We see, at the same time, the error of those who pretend to cure by one plan,—whether it be by gymnastics, by spinal supports, by prone or other mode of recumbency, or by extension, &c. The exclusive advocacy of any single means of cure, although justly applicable to a particular stage, savours of the empiric, and is contradicted by simple and abundant experience.

Raising of Leg in the depressed side of the Pelvis.—It has long been recommended to produce artificial elevation of the depressed side of the pelvis by means of a raised boot, usually on the left side. No doubt exists that whenever lumbar curve to the left exists with corresponding depression of hip, a proportional raising of the boot on this side to the extent of half or three-quarters of an inch is of great service. It not merely raises the pelvis on the depressed side as a mechanical prop might do, but it excites a mode of action of the pelvic and hip muscles contrary to the accustomed one, which has produced the deformity, or has accompanied its production. The medical practitioner can always determine in any particular case whether a raised heel will be beneficial, by observing whether the direction of the sulcus between the nates is oblique, and observing whether a thin book beneath the foot of the depressed side of the pelvis temporarily alters the sulcus from an oblique to a perpendicular direction.

When prescribing a raised heel, I have often been asked whether no danger exists of producing a contrary disorder, or of its use being permanently needed. It would be equally appropriate to ask the same question respecting every therapeutic agent. In fact, the need of the raised heel ceases as soon as the lumbar curve is permanently rectified. Its use should be gradually discontinued in proportion as the general deformity declines. As an illustration of the value of mechanically tilting the pelvis, I may mention an experiment

readily performed in the case of children afflicted with paralysis of several years' standing of one lower extremity. I have elsewhere described the effect, in temporarily removing any lumbar or lumbo-dorsal curve, of letting such a patient place a book beneath the sole of the shortened, partially paralysed limb. In these cases, the paralysis of leg may be the remanet of an original hemiplegia. Be that as it may, old-standing, general, but partial paralysis of one leg commonly shows also diminished development of the muscles of the same side of the trunk in the loins, and perhaps also of the lower half of the chest. When this is the case, the patient, while sitting as well as when standing, exhibits an inclination of vertebral column to one side, caused by unequal length of the supporting part of the trunk, ischium, or leg, unequal muscular action, and impairment of the articular surfaces of the vertebræ, caused by that muscular action. The experiment in question consists in letting the patient sit with a cushion or small pad beneath the ischium of the weak side, when it will be found that any previously existent vertebral curve will have disappeared, or have been much lessened in amount. This equally well illustrates the mischief of growing children sitting too long awry—that is, sitting unequally upon the ischia—when the long-continued, unequal, sedentary attitude is not compensated for by sufficient exercise in active games and amusements.

It seems probable that some of the injurious effects of much sitting awry might be neutralised by sitting with a cushion under one ischium.

ON CURVATURE OF THE SPINE AFTER PLEURISY:

TRUE OR SIMPLE LATERAL CURVATURE.

It is well known that when pleuritic effusion has taken place, one or more, at least, of the following results may flow from it: (1) compression of the lung by the effused fluid; (2) reabsorption of the effused fluid, reëxpansion of the compressed lung, without subsequent considerable adhesion between the pulmonary and costal surfaces; (3) considerable amount of cellular or fibrous adhesion between the lung and the costal surfaces,—even a universal, rigid, ligamentous or cartilagiform connection between the lung, pleuræ, and ribs, becoming established; (4) the compressed lung, which is sometimes otherwise injured in texture by implication in the pleuritic disease (pleuro-pulmonic), being incapable of expansion through the combined effects of the disease, and from being tied down by the unyielding fibrous adhesions, remains shrunk, so that the affected side of the chest-wall is drawn towards the contracted lung, is deformed, and appears a permanent and increasing deformity; (5) the individual being thus deprived of the services of part or the whole of one lung, is proportionally dependent for breathing capacity upon the unaffected lung and sound side of the chest, which consequently expands to the fullest normal development, if not beyond it, in order to remedy, as far as possible, the effects of the damaged and compressed organ,—the sound side of the chest appearing preternaturally prominent (I have, in consultation over chronic latent but convalescent pleurisy, more than once had my attention drawn by the medical attendant to the enlarged side as the diseased one: such an error could not have occurred if the practitioner had been sufficiently versed in

auscultation and percussion); (6) the collapse and shrinking of one side of the chest involves the vertebral column in the deformity; in short, the chest deformity could not occur without a simultaneous *lateral* curvature of the spine.

The lateral curve consequent upon pleuritic contracture being necessarily concave towards the contracted side of the chest, tends to force the healthy portion of the chest to the opposite side. Viewed in front or behind, there is on the contracted side great approximation of the shoulder to the ilium (see plates at end of book), causing a uniform lateral curve of the spine from the summit of the dorsal region to the bottom of the lumbar one. I know of no other distortion of spine in which a similar simple, continuous, lateral yielding of these regions takes place. It is, in fact, the only true lateral curvature. It has none of the sigmoid character of the ordinary so-called lateral curvature, and no rotation of the vertebræ, which is a more or less marked feature of that common deformity, and which has induced me to substitute the term rotatory or rotato-lateral curvature for it. This lateral curvature of the spine, and chest-deformity, apt to succeed recovery from pleurisy, is met with in children and adolescents, especially after the effused fluid has made its way through the chest-wall ("empyema of necessity"), or when it has been discharged by the operation of paracentesis thoracis; doubtless, because in such cases the compression and permanent injury of the lung has been greatest, and the subsequent adhesion between it and the parietes of the chest has been most fibrous and unyielding.

This deformity appears to the casual observer similar to ordinary lateral curvature; and when slight, even the experienced eye may hesitate in diagnosis. When, however, the lateral curvature from pleuritic contraction is investigated side by side with ordinary lateral curvature, although they are in outward appearance similar, no two pathological states, no two related deformities, can be more

dissimilar. The curve after "recovery" from pleurisy is more uniform, and involves the entire column in one sweep; the depression of shoulder on the contracted side is relatively greater; the reduction of capacity of the contracted side applies to the front as well as to the back of the chest; the posterior angles of the ribs on the expanded side, and the internal margin and inferior angle of the scapula, are less salient (compare the two deformities, figures at end of book); and, as before stated, rotation of the vertebræ on their horizontal axes is entirely absent. (It would be interesting to discover whether, in unrelieved cases of pleuritic chest-contraction, after many years' possibly unequal use of the muscles of the two sides of the trunk, any rotatory curve be super-added to the original deformity.)

A pathognomonic difference between marked ordinary lateral curvature and that which ensues upon lung-compression from adherent and shrunken ribs is, that in the former there exists a prominence of the sub-mammary region on the side opposite to that on which the dorsal bulge is situated, whilst in the latter no such mammary prominence exists (compare figures at end). In marked ordinary lateral curvature, the two halves of the chest seem displaced in their mutual relation,—that is to say, the left sub-mammary region, for example (speaking of the common form, in which the principal curve is a dorsal one to the right), appears shifted anteriorly, whilst the right half appears shifted backward. On the contrary, in pleuritic deformity, as the lung (when not interfered with by disease antecedent to the distorting pleurisy) has been equally compressed by the fluid in every possible direction towards its root, the sinking and contraction of the walls of the chest takes place from all directions towards a point situated near the middle of the posterior mediastinum; hence the chest-wall is drawn inwards from above, from below, from behind, and from the side, so that no anterior fulness on the affected side can present itself.

On looking at an ordinary severe lateral curvature of spine, as in figure at end, the observer is there much struck with the bulge of the right side of the chest posteriorly and laterally, and the prominence of the inner margin of the scapula and of the angles of the ribs, and he would emphatically designate this side as the lapsed and most distorted side. On the contrary, in lateral curvature from recovered pleurisy, the small shrunken side is undeniably the diseased one.

In both kinds of curvature, the enlarged side is more sinned against than sinning; but, in ordinary lateral curvature, the larger side unmistakably partakes essentially in the entire pathological state, which, in the spine, ribs, muscles, and ligaments, induces the deformity; whilst, in pleuritic curvature, the larger side is essentially the healthy one, and is only physiologically developed to the utmost extent to compensate for the shortcomings of the contracted side.

Auscultation and percussion tend to confirm the diagnosis which the history of the case and ocular inspection and reflection have established; still, evidence from acoustic exploration is less striking in severe cases of both forms of curvature than would *à priori* be expected.

In slight cases of ordinary lateral curvature, no difference in breath-sounds or in percussion-tone is perceptible between the two sides of the chest; but, in severe cases, when the disparity in size of the two sides of the chest is very great, the resulting immobility of ribs caused by the deformity is greater on the smaller side, and the respiratory murmur is apt to be feebler there. The percussion-tone is usually the same on both sides of the chest.

In slight cases of pleuritic lateral curvature, the smaller side of the chest being the seat of the original disease, and of the only partially recovered and compressed lung, auscultation and percussion reveal the corresponding deficiency of air and its movement within this side, whilst respiration is found to be puerile or physiologically active on the enlarged side.

The more considerable the chest and spine deformity from pleurisy, the greater is the disparity in lung-function on the two sides, especially when spontaneous or artificial evacuation of effused fluid has occurred in the progress of the case. In such cases, auscultation and percussion may show, even after the lapse of years, that the lung on the contracted side has in little or no degree become pervious to air, respiration being almost or wholly carried on by the larger side.

The acoustic explorer of severe instances of both classes of case should not lose sight of the possible coexistence of tuberculous deposit, which may interfere with and modify the diagnosis.

The obstacles to removal of spinal curvature from pleurisy spring, in the first place, from the results of pleurisy numbered 3 and 4, page 73, especially from the degree of fibrous rigidity of the new connecting medium of the lungs, pleura, and ribs. After a time, the articular surfaces of the vertebræ and ribs, the length of the ribs themselves, and of the bodies of the vertebræ on their sides corresponding with the shrunken side of the chest, become impaired or reduced, and oppose recovery, even if the lung itself is susceptible of reëxpansion. Ultimately, the protracted immobility of the affected side places the intercostal muscles, and the remaining powerful muscles attached to the ribs and distributed over the chest, upon that side, in a condition favourable to structural or interstitial shortening of them. Structural shortening of the thoracic muscles ensues after the same manner that it is produced during repose of an articulation in one position from disease. In fact, an analogy exists between the mode of production of a contracted chest from empyema, and of a contracted joint from inflammation. Contracted joints are more difficult of replacement when connected within by firm adhesions, and seamed without with rigid cicatrices. In like manner, the fibrous, ligamentous, or even cartilaginiform bands occupying the proper situation of a pleural cavity, and the existence of

the scar, indicative of discharged empyema, represent in a pleuritic contracture the adhesions and cicatrices of a once actively diseased, but now contracted, joint.

For many years I was accustomed to regard the deformity of the spine and chest after empyema as a necessary and irremediable evil. Observation of the extent to which burn-cicatrices may, in favourable situations, be elongated, and the effect of exercise of the part in preventing recontraction and return of deformity, induced me some years ago to consider whether the deforming influence of more or less dense fibrous shrinking bands and layers of adventitious tissue, resulting from pleurisy, might not be counteracted. A wide difference as to facility of treatment exists between contracting burn-tissue, which exists upon the surface of the body, and the similar, but more abundant, connecting medium between lung and ribs. Another obstacle to the treatment of pleuritic contraction and spinal curvature arose from the tendency to regard the deformity as a happy issue out of a dangerous disease, and one which the physician might reasonably be content to leave alone. My labours in the rescue of joints contracted from strumous and other diseases (see *Treatment of Club-Foot, and Analogous Distortions*, 1839; *On Ankylosis*, 1842) showed the fallacy of a similar practice of *laissez aller* when applied to joint-contractions. An encouraging circumstance in the case of even considerable pleuritic contracture was the fact revealed by *post-mortem* anatomy, that even when the lung has been so long bound down by pleuritic deposits that these have had time to become fibrous and even cartilaginous, the lung-tissue, although comparatively bloodless and dense in tissue, may preserve its vesicular character, and appear capable of expansion, could the dense pleuritic deposit be removed from it. This train of facts and reasoning induced the hope that pleuritic shrinking of chest, and consequent lateral curvature of spine, might be successfully combated and cured, provided the adventitious tissue which encased the lung

were not, from duration of disease, too firm to yield. The first case successfully treated was that of a child six years old, whilst a patient in the London Hospital, in 1850; the model of which remains in the Museum of that Institution (figure at end). Many slighter cases of this contraction and deformity are spontaneously cured by the simple resumption of active habits of life. The necessity for respiration excited by physical exercise of the trunk and limbs suffices to call the lung into renewed activity, when the connecting medium of lung and ribs is a mere film of membrane, or some bundles of adhesions composed of soft *connective* tissue. When the connecting medium is firm, special help for the expansion of the ribs is required.

The child in question was caused to lie upon the sound side, with a broad band passed beneath this part, attached above to the framework of the bed in such a manner as to cause the trunk to be almost suspended in this lateral position. The attachments of the band above the body were gradually shortened, until the weight of the head and shoulders above, and of the pelvis and lower extremities below, powerfully, but gently and painlessly, drew asunder the contracted ribs and replaced the vertebræ. In short, the plan adopted was that recommended for ordinary lateral curvature by Lafond, Shaw, and Lonsdale. (Compare "On Slings in ordinary Lateral Curvature," p. 67.)

The child was placed in this position at first for half an hour daily, the treatment being gradually lengthened to several hours daily; and in a short time it was cheerfully borne during the whole time the child was not engaged at meals, &c., or in running about for amusement. The beneficial effect of the treatment was visible after a few days' application; and at the end of three months the reduction of deformity was so considerable as to leave no doubt of the possibility of obviating, at least in children, this serious termination of empyema (see figures at end).

One of the figures at end is from a model, taken in 1860, of the chest and spine of a young lady at fourteen, contracted through pleurisy, which had occurred two years previously: the effused fluid had been absorbed without external evacuation. Another figure is taken from a photograph of the same patient one year after treatment by slinging on the expanded side, at first for one hour daily, gradually increased until she spent about sixteen hours out of twenty-four on her couch. About one-third of her time, therefore, was employed in outdoor exercises, games, gentle gymnastics or calisthenics. I have recently seen this young lady: she has continued perfectly straight, both sides of the chest being equal in form and equally expansible.

A younger child (aged six), first seen by me two years after the contraction of spine and chest, recovered under the same treatment in six months. I have never, in these pleuritic lateral curvatures of spine, found the need of any spinal support. Indeed, spinal supports or bandages of every description, by limiting the movements of the trunk, are directly counter-indicated. The object in these cases is to favour, by night and by day, the utmost expansion of the contracted side. The slinging as above described, combined with a due proportion of active bodily exercise, fulfils, without any drawbacks, the physiologico-pathological indications of treatment. It will be remembered that I have stated (p. 79) that numerous cases recover without any special treatment. On the other hand, the extreme cases of this deformity, in which the aperture where the empyema was discharged had long remained open, were most rebellious to treatment.

ON SOME PECULIAR FORMS OF LATERAL YIELDING OF THE SPINE.

ALLIED more nearly to ordinary lateral curvature by some of its features, yet wanting others of its more striking characteristics, is a considerable bulging of the ribs of one side posteriorly, with comparatively slight yielding of the dorsal vertebræ to the affected side; this is seen more often in infants. It differs from ordinary lateral curvature in the absence of any indentation, shrinking, or collapse of the opposite side; in the absence, also, of lumbar curve or pelvic obliquity. The bulge itself is different in form from the prominent shoulders and rib-protrusion of "lateral curvature;" seven or eight of the ribs posteriorly being unduly but regularly curved in a prominent cylindrical manner, rather than being especially thrown out at their angles and flattened laterally beneath the axilla, as in lateral curvature. The etiology and pathology of these cases are certainly not the same as in lateral curvature, but they are not quite clear. In some cases, in fast-growing children, a perfect cure has been obtained by bandaging on the prominence a longitudinal air or horse-hair cushion, worn night and day; in more severe cases, a spinal support has been adjusted to maintain pressure on the bulge only, the other parts of the chest being left free to develop themselves, and thus in process of growth extinguish the deformity. Towards the end of growth, and in adults, these cases are intractable; but they do not, like ordinary lateral curvature when left to nature, tend to become seriously aggravated. I have witnessed four cases of this affection in one family, all appearing during the earliest months of life, and probably congenital.

Another peculiar slight dorsal lateral curvature to the right sometimes occurs, in which the shoulder-prominence is unusually marked, owing to the scapula having assumed an almost horizontal position. It would seem to be a great aggravation of the tilting-out posteriorly of the inferior angle of the scapula often observable in slender, fast-growing girls. I am unable to explain through what disturbance of muscular action, or through what influence of very slight displacement of ribs and vertebræ, the scapula can be put into so extreme a position of deformity as that of an almost horizontal position. In such cases, the scapula resumes its vertical position whilst the surgeon holds back the acromion and head of the humerus, and the case is cured by the employment, night and day, for a few months, of a suitable bandage or apparatus.

ACTIVE SPASMODIC LATERAL CURVATURE OF THE SPINE.

I have met with three cases of well-marked considerable distortion of spine, due to active morbid muscular action. Two of these were in-patients of the London Hospital, the third occurred in private practice. All were in young females between the ages of ten and sixteen years. In one, a young lady about sixteen, circumstances were observed in the demeanour which left no doubt of the hysterical character of the disorder; the case was more than twelve months under observation, and underwent no fluctuation in degree, or positive amelioration. The curvature of the column to the *left* in the dorsal region was so considerable as to excite surprise that the anatomical conformation of the spine could permit so considerable a deviation with hysterical suddenness; for occasionally, on distracting the patient's attention, the spine became quite straight. One of the hospital cases was a precocious girl of thirteen, probably of hysterical temperament: the distortion was distinctly spasmodic, and no volitional influence in the production of it was discoverable. The other occurred in

a child of ten years old. Both recovered within a few weeks after admission, by means of tonic diet and regimen, and the favourable social and moral influence of a well-regulated hospital upon such forms of nervous disease. The hospital cases appeared allied to tetanic pleurosthotonos (chronic). Diagnosis was not difficult in any of these cases. In none did secondary changes in the form of ribs exist. The neurose character did not affect the nutrition and development of parts, after the manner of ordinary lateral curvature.

PARALYTIC LATERAL CURVATURE.

In my treatise on the Deformities of the Human Frame (p. 360), I have described a severe form of lateral spinal distortion, due to extreme paralysis of muscles of the trunk and lower extremities; the act of sitting unsupported, and that of locomotion, being quite impossible. The paralysis and resulting deformity were incurable. I have in this treatise (pp. 35, 72) noticed the effect of slighter hemiplegic paralysis upon the spine.

WRY-NECK SPINAL CURVATURE.

Lateral curvature of the cervico-dorsal region, from wry neck, reaches sometimes a degree of importance which justifies special attention to it, as well as to the cure of the wry neck on which it depends. In slight cases of wry neck, the spinal distortion is cured spontaneously by the means which cure the wry neck; but in long-standing adult cases, a persevering course of gymnastic training and education of the neck and shoulder muscles is necessary to cure. It is only when the individual who has been cured of severe wry neck has an uncommon pride of personal appearance, so much so as not to be oblivious of the shoulder and spine deformity when he contemplates his improved appearance in front, that he manifests sufficient energy to overcome that which is visible behind. In

a man of over forty years of age, whom, with the aid of division of the sterno-cleido-mastoid muscle, I cured of severe congenital wry neck, I was surprised to find that he was as energetic in the cure of the spinal curvature as he had been of the wry neck ; for which he was so well rewarded, as to be subsequently unrecognised by friends who had not seen him during the treatment.

ON CONGENITAL SPINAL CURVATURE.

It has been already mentioned that an hereditary predisposition to rotatory or ordinary lateral curvature is frequently manifested; but the actual presence at birth of deformity or distortion of spine is a rarity in orthopædic experience. At p. 81, also, I have expressed the opinion that the peculiar form of distortion there described is probably congenital. The spinal curvature accompanying wry neck is, like the wry neck itself, frequently congenital; so is, sometimes, angular curvature from vertebral disease; and, in cases of well-marked rachitis present at birth, we find the spine weak, and participating in the deformity which is greatest in the extremities. The spinal deformity met with in "monsters," caused by embryonic cerebro-spinal disturbance, comes under the head of congenital spinal curvature. Several writers on spinal curvature have incorrectly treated of congenital distortion as if it were an ordinary event. The truth is, that if we rely wholly on the statements of parents and attendants as to the date of origin of many deformities, both of the spine and limbs, presented to us after the individual has attained to, or passed by, the age of childhood, we shall erroneously conclude the affections to have been congenital. In such cases, the distortion had not been positively noticed until the infant was several months old: the parents, on its discovery, or after they find the distortion is of a more permanent character than they hoped for, infer that the child was born with it. For the most part, the reputed congenital distortions of the spine are cases which have commenced after birth, and been developed under the influence of the various predisposing causes of spinal distortions which I have, under the several preceding sections, fully considered,—debility from imperfect assimilation, rickets, undue and premature sitting up, and paralysis.

ON POSTERIOR CURVATURE OF THE SPINE.

It has already been stated that lateral curvature of the spine is often associated in the same patient with some degree of backward yielding of the column. Often, however, at all ages from infancy to old age, a simple backward giving way of the spine, termed posterior curvature, occurs. This must not be confounded with *angular* curvature—a deformity which will hereafter be considered.

Infants, even as early as the age of five or six months, are brought for consultation on account of the nurse or parent having observed that the infant is incapable of sitting up as strongly as the nurse desires; and that when the child partially supports itself in the sitting attitude, the dorso-lumbar portion of the column projects (backwards) more than is proper to the age. In some of these cases, the projection entirely disappears when the infant is placed in the prone position; in others, especially when the child is a little older, the whole of the projection does not disappear. In both classes of cases, when the child is "sitting up," the spinous processes throughout the dorsal and lumbar regions present a continuous sharp crest, more prominent about the junction of the dorsal with the lumbar region than elsewhere. In the first class of cases, however, the disappearance of this ridge when the child is placed on its stomach is complete; in the second class of cases, the spinous processes of one or two of the last dorsal, with one or more of the lumbar, continue unduly prominent when the child is thus prone. The projection does not disappear even during the struggles which the child is pretty sure to make to turn itself over on the side or back; which shows that the muscles of the back

and loins, even when not having to contend with gravity, are incapable of overcoming the habit which some of the vertebræ have already acquired of constantly bulging from their proper relation to the remainder of the column. The posterior ligaments of this part of the column have become elongated, and the form of the bones has already become accommodated during growth to the habitually bad position of the column. In these cases, there is no question of the existence of any *actual* strumous or other disease of the bodies of the vertebræ themselves. It may, however, be a question whether these infantile cases of posterior yielding of the column lead sometimes to Pott's disease and angular curvature.

These cases of infantile posterior curvature occur in those who have been born weak; in those who have been imperfectly nourished, from deficiency of breast-milk or other causes; in those, especially, whose "artificial" food has been prepared with water instead of with milk,—whose tissues are, consequently, deficient in physical and vital power,—so that the ordinary tendency of nurses to encourage the premature sitting up of the child ends in producing a yielding backwards of the spine, which is more than temporary—in many instances, a veritable deformity. Sometimes the above predisposing, debilitating causes cannot be traced, and it is evident that the mischief owes its origin simply to the nurse's habit of sitting the child up. For the most part, a sound, well-nourished child, in spite of injudicious nursing, passes this period of its life without spinal injury; but it may be well to insist, that the strongest back is reared, other things being equal, where the infant has never been *sat up*, but has been allowed to do so when its own instinctive sense of power has actuated it. Hence the value of the infant not being allowed to live, as it were, in the nurse's lap or arms; but its growth being permitted to go on unhindered, during as many hours of the day and night as possible, on a level, firm cot, couch, or floor; warmly, adequately, but loosely clothed. How often is the physician

met with the remark, "He (or she) will not lie down;" when, in fact, the child has not the ability to sit up when left to its own exertions, and can only roar lustily to the nurse to come to its indulgence.

Happily, when the presence of undoubted giving way of the back is perceived, the alarm of the friends is more than sufficiently excited, and the necessary treatment is readily and easily adopted. This consists in removing the predisposing cause, imperfect nutrition, by suitable diet and good air, and by absolute recumbency, night and day, for a few weeks. This recumbency of the infant will necessarily be, during the greater number of the twenty-four hours, on the back or sides. But when the child requires to be in the nurse's lap, except during feeding, it should be placed as much as possible in the prone position, in which the roused action of the muscles, extending from occiput to sacrum, continually tends to press the projecting vertebræ into their normal position. The child can also be successfully encouraged to amuse itself with toys on the floor in the prone position, with or without the company of the nurse or of its brothers and sisters. As a rule, no bandage, splint, spinal couch or support, is needed. In severe cases, I have witnessed benefit from bandaging lightly on the projecting part an air-cushion, corresponding in size to the projection. When so managed as to keep its place, this cushion, when the child lies on the back, tends to press forward the affected vertebræ; and, being soft, occasions no discomfort, except so little as may lead the child to prefer for a time the prone position. I have watched no case of this nature thus treated that did not thoroughly recover in a very few weeks or months.

It will have been remarked that, in the instances of posterior yielding of the spine hitherto considered in this section, the curve has been a continuous one throughout the dorsal and lumbar regions. In the posterior curvature we have next to consider—viz. that which occurs in boys, girls, ado-

lescents, and old age—the yielding backwards affects the dorsal and the cervical regions, and is, as far as the dorsal is concerned, simply an exaggeration of the curve natural to this region. It usually coexists with undue hollowness of the loins (lordosis), *i. e.* anterior curvature of the lumbar region, which is equally an exaggeration of the natural curve (see p. 91).

Children from three to five years of age, on whom the predisposing causes of debility have operated, and who are permitted to sit up late at night, or who have not sufficient repose in the day-time,—older boys and girls who spend too many hours at the desk, especially those who grow rapidly, or are not very strong,—are apt to become round-shouldered—a state curable, in the early stage, by removal of the exciting cause, and by active out-door games, exercises, and gymnastics, especially such as tend to draw out the upper and front part of the chest, and approximate the shoulder-blades. Shoulder-straps to prevent stooping, as they are termed, designed to hold these parts back, are useful in severe cases, provided they are worn with just sufficient tension to excite irksomeness, and to cause continued voluntary efforts to throw back the shoulders, and escape from the pressure of the straps in front of the axilla. This voluntary effort to escape from the effects of a suitable contrivance is one of the most efficient and durable curative means possessed by orthopædy. Even a spinal support may be necessary.

This posterior yielding of the spine is frequently met with in elderly people. When moderate in amount, it might, from being almost universal about the period of the grand climacteric, be regarded as the normal condition of things; but the example of military men, whose profession demands of them an erect attitude, shows that volition is capable, long after the age of sixty-three, of maintaining a straight spinal column, *i. e.* the natural amount of antero-posterior curvature common in early life.

Chronic rheumatism is sometimes a cause of posterior curvature of the spine in middle-aged and elderly people.

ON POSTERIOR CURVATURE OF THE SPINE FROM ASPHYXIA
NEONATORUM.

A posterior yielding of the column, followed by roundness of shoulders, is observable in all cases of more or less complete "spastic or spasmoparalytic rigidity of the new-born infant;" a form of disease and deformity first described by me in 1843.* Such children, having come into the world under the influence of premature or seriously abnormal parturition, causing asphyxia (asphyxia neonatorum, syncope neonatorum), congestion of pulmonic and systemic circulations, congestion and sometimes apoplectic lesion of the spinal cord or of the brain, present a want of antagonism between the flexors and extensors of the trunk, owing to which they are found to be unable to sit up straight. These cases, in consequence of the original lesion of the nervous centres, and impairment of the voluntary and disturbance of the involuntary powers of the muscles of the trunk, are less amenable to treatment than the cases of simple giving way of the back from debility and premature encouragement of the sitting position, previously described. When associated, as they often are, with injury of the intellectual powers, the prognosis is still more unfavourable. The treatment available is the same as that laid down for the first class of cases (p. 88).

* See "Lectures on Deformities," *The Lancet*, 1843-4; *Treatise on Deformities*, 1853, pp. 114, 138; "Influence of Abnormal Parturition on the Mental and Physical Condition of the Infant," *Trans. of Obstetrical Society*, 1861-2.

ON ANTERIOR CURVATURE OF THE SPINE.

A NOT unfrequent yielding of the column in a forward direction at the lumbar or dorso-lumbar region (lordosis), is met with in delicate, fast-growing children and adolescents, especially such as have suffered from imperfect nutrition—as from want of breast-milk or of animal food, or a too watery diet during the earliest period of life, late hours, &c. This anterior yielding of the column is recognised by undue hollow-ness of loins, with proportionate bulge of the abdomen; though the shoulders, by appearing well thrown back, may delude the parent into the belief that the child carries himself well. A characteristic gait accompanies extreme cases of this affection.

Anterior curvature of the dorso-lumbar region of the spine, and undue hollowness of the loins, often occur also as a curve complementary to a posterior curvature in the dorsal region, the spine then assuming an excessively sigmoid form in the antero-posterior direction, analogous to the sigmoid lateral flexure of scoliosis or ordinary lateral curvature.

In slight cases of anterior yielding of the lumbar vertebræ, the distortion disappears when the patient lies down and the lower extremities are fully extended. When it has existed for two or three years, and the bones, ligaments, and muscles have adapted themselves to the altered relation of parts, the hollowness of the loins does not disappear on lying down, the thighs being at the same time fully extended.

The worst form of anterior yielding of lumbar vertebræ is that which accompanies congenital luxation of hip.

At the origin, anterior curvature of spine is readily removed by pure air, nutritious diet, and tonic medicines, by early hours of rest at night, by recumbency, by exercises

calculated to promote an erect figure, by cultivation of the child's will to hold back the *loins* and shoulders. After a time, when the bones of the vertebral column have adapted themselves to the altered relation of parts, it will be found that volition can be little depended upon for removal of the complaint. A spinal support so constructed as largely to support and hold back the abdomen, and act, through the intermedium of the abdominal walls and contents, directly upon the anterior surface of the lumbar vertebræ, then becomes a necessary part of the treatment, and is successful, if persevered with, in all cases except those which result from congenital hip-luxation. Lordosis sometimes occurs in consequence of partial paralysis of the trunk and lower extremities, and is then accompanied, during the act of locomotion, with a peculiar throwing backward of the shoulders, to avoid falling forward.

In the study of spinal deformity, as in the study of other departments of nature, we find that no abrupt transition from one class of things to another exists. On the contrary, we find in the spine that connecting links, as it were, exist, which lead from one form of curvature to another. Thus, if we take a typical case of scoliosis, *i. e.* rotatory curvature of spine, or, as it is commonly called, ordinary lateral curvature, occurring through habitual standing or sitting awry, and unilateral use only of the muscles of the trunk and limbs, in a previously robust girl, we shall find in her no trace of rachitis; and yet, for the most part, we find that this form of spinal curvature has been commonly due in part to the influence of certain predisposing causes, which have temporarily affected the general health and weakened the organisation. Many cases of lateral curvature are, as we have seen, complicated with knock-knee or in-ankle, or both—affections associated, in some degree, with a rachitic tendency in the economy. This tendency is more marked in severe posterior and anterior curvatures of the spine, from which we pass directly and naturally to well-marked rachitic curvature.

ON RACHITIC YIELDING OF THE SPINE.

THE yielding of the spine of young children, already considered, naturally leads to those cases in which more than general weakness, a true rachitic softening of bones, exists. When this serious constitutional malady displays itself, the posterior, and sometimes the postero-lateral, spinal curvature which often results from it, may assume an extreme degree, and simulate the most severe hump-back of angular or lateral curvature. The diagnosis is established by noting clearly the presence or not of the constitutional or other local signs of either disease (see "Angular Curvature"). Rachitis announces itself by absolutely diminished growth of the entire frame; by the relatively arrested development of the inferior extremities, compared with the large size of the head or the length of the upper extremities; by the harsh, dry, hairy surface; by the disposition to wasting; by the enlargement of the right hypochondrium and abdomen, and of the ends of the long bones, and by the curvatures of their shafts; by flattening of the ribs, &c. The greater roundness of the curvature from rickets often contrasts strongly with the decided angularity of angular curvature; but the practitioner, unfamiliar with distortions, should in the early stages depend upon constitutional signs, rather than upon physical ones. A single prominent *point*, in an unusual situation along the spine, is always strongly suggestive of angular disease.

Treatment.—In the incipient stage, attention should be directed to the constitutional malady by the exhibition of suitable animal diet; by gentle cholagogues; by oleum morrhueæ, earthy phosphates, pure — especially sea — air, bathing, a

limited use of wine, &c. Locally we may apply dilute iodinous and stimulant embrocations; simultaneously employing gentle manipulations, calculated to place parts becoming distorted into better positions. The recumbent attitude should be encouraged so long as the bones of the spine and limbs have not sufficient firmness to properly support the frame. Encouragement may be given to roll or crawl upon the floor, when the child manifests ability to do it. The air cushion and bandage, before described (p. 81), may be available. When children or adults present themselves with posterior curvature, the result of *former* rachitis, much benefit may be obtained from the use of spinal supports, so adjusted as to transmit weight from spine to pelvis, and compress lapsed parts, as in the treatment of ordinary severe lateral and other forms of spinal distortion.

ON ANGULAR CURVATURE OF THE SPINE.

IN treating of this serious deformity, it appears necessary to take into consideration the disease of the vertebral column from which it springs. To do this fully would lead me farther than is here desirable, especially as many excellent articles on the subject have appeared, in different languages, during the interval comprehended between the publication of Pott's once classical work on this disease,—to which his name has been given,—and the sound, practical article of Mr. Shaw.* This affection excites as much alarm as cancer or consumption, and is intimately associated in the popular mind with incurable abscess and paralysis. Angular curvature of the spine, or angular *deformity* of the spine, as it is more correctly called, is the result of the destruction of the bodies of one or more vertebræ—cervical, dorsal, or lumbar; in consequence of which, the part of the column above the disease gradually falls forward, until the lowest of the unaffected upper vertebral bodies, or of the remaining parts of bodies, is arrested by contact with the uppermost of the vertebral bodies situated below the disease: a fusion or growing together of the vertebræ may follow. These conditions are accompanied with a corresponding angular protrusion of the spinous processes behind. In the majority of instances, this angular projection takes place in the perpendicular axis of the column; in many, however, the projection swerves somewhat from the perpendicular. In the neck, the resulting deformity can scarcely be termed angular, the parts appearing rather to be compressed from above downwards by the weight of the head—the neck

* Holmes's *System of Surgery*.

being much shortened and somewhat curved, and the mobility of the part much diminished. Anatomical differences in the structure, form, and proportion of the bodies of the cervical vertebræ, and the relation of the cranium to the vertebral column, explain the difference in the results of disease in this region.

The disease on which this curvature depends is variously regarded as necrosis, as caries of the vertebræ, as inflammation of the ligaments and bones of strumous character, or even as rheumatic arthritis. It might often be designated rheumatico-strumous disease of vertebræ, since so many of the phenomena are common to struma and rheumatism. It is sometimes aptly called tuberculosis of the vertebral column. It begins either in the ligaments or in the bones—in the surface of these, or in their interior: the inter-vertebral cartilages may be loosened, portions of bony matter or of tuberculous matter being found in the abscess formed at the expense of the vertebræ and surrounding structures. The spinous and transverse processes are usually intact.

The resulting distortion is greater in the cervical and dorsal regions than in the lumbar. The higher the part of the column which is affected, the greater is the immediate danger, owing to the more intimate relation of the cervical part of the column to the existence of life itself. When the dorsal region is affected, there is risk of implication of the lungs in the morbid process. When the disease is confined to the lower part of the lumbar and the sacral regions, the danger is as much diminished, as the cauda equina and sacral nerves sink in importance in comparison with the cervical and dorsal portions of the cord. One reason of the smaller danger attending vertebral disease of the lumbar region is, probably, the naturally smaller mobility of this part. The tendency to external or internal irruption of the abscess is much less in the case of low lumbar and sacral disease than when disease occurs in the dorsal or dorso-lumbar region. In the neck, the disease often destroys life without external sup-

puration; *i. e.* luxation of the remains of the diseased vertebræ takes place, causing fatal, and sometimes suddenly fatal, pressure on the spinal cord, before time for external suppuration has been afforded. The disease may exist simultaneously in the cervico-dorsal and in the lumbar regions, and may produce considerable deformity in both situations, and necessarily involve many vertebræ; the patient, nevertheless, recovering his health and strength.

A great source of danger resides in the propinquity of the medulla spinalis, especially when the whole of one or more bodies are entirely destroyed,—the posterior wall of the abscess—encysted, as it were—being formed by the dura mater of the cord.

The length of the trunk is reduced in proportion to the number of the vertebral bodies which have been implicated or destroyed. Recovery of the continuity of the column is complete, at the cost of destruction of one or more vertebral bodies, by a firm ankylosis of the newly opposed vertebræ to each other. It is probable that the periosteal lining of the anterior ligament of the column on the one hand, and the opposed surface of the corresponding lining of the dura mater of the spinal cord on the other, are the efficient agents of this ankylosis.

A very characteristic distortion of sternum and ribs results from the latter being much flattened at their sides, at the same time carrying the sternum forward with their sternal extremities.

We are commonly consulted when the disease is in progress, before the ultimate complete deformity is accomplished. It would be well for the future of our patients if we were consulted before the deformity is visible, or, at any rate, when it is first perceptible. It might be more humble to say, that it would be better for our patients if the diagnosis of Pott's disease in the earliest stage were more generally and more easily effected. Observation shows that this fearful disease is

apt to slumber concealed, giving signs of its presence by no direct symptoms calculated to lead the practitioner at once to examine the spinal region. In by far the larger number of cases, the disease has not been suspected until the undue prominence of one or more spinous processes has excited alarm. Weeks and months the disease may have already progressed, when it is remembered that the child had a fall or received a blow on the back. In some cases, incipient paralysis of the lower extremities has first directed attention to the spine. In one case, as in an adult, for example, the indisposition which precedes the projection of vertebræ has been attributed to pulmonary phthisis; in another, debility, and neuralgia in the lower extremities, or contraction in one leg,—for which an untimely operation was performed,—has for years preceded the appearance of the physical signs of the vertebral disease and psoas abscess. In young children, before the period of the second dentition, in whom this deformity is most apt to occur, the constitutional disturbance, nocturnal suffering, symptomatic fever, or mild hectic, may be very remarkably present. Often the child has, for months before the appearance of spinal projection, been the subject of symptoms denominated “infantile remittent.” Sometimes debility after measles or scarlet fever merges into renewed pyrexia and wasting, the occurrence of the spinal projection explaining the apparently tedious convalescence from the exanthematic or other affection. Often the disease is overlooked, the patient being considered to be suffering from “gastric fever.” Such is the obscurity in the early stage of many cases of spinal strumous disease, that whenever the practitioner interrogates in vain all the internal organs and the members for the source of chronic constitutional, especially febrile, disturbance, and fugitive local pains, he should not take refuge in the supposition of an idiopathic fever, such as so-called “infantile remittent,” or a symptomatic “gastric fever,” but should search the spine for probable disease. The palpable dislike of active

motion ; the cautious, hesitating manner in which locomotion is made ; the disposition to support the upper part of the frame by resting one or both hands upon the table or other support ; the physiognomical expression of suffering, unlike that of other than vertebral disease,—will each be available in diagnosis.

The presence of pain, referred to the diseased part of the spine, is an uncertain sign of vertebral disease, but often a valuable one when considered in connection with other symptoms. Adolescents and adults more commonly complain of pain than young children. It is probable that pain is more constantly an accompaniment of the rheumatic than of the marked strumous cases. Often, when no pain is complained of, we may, without putting leading questions, provoke pain, in cases in which we are uncertain of the existence of vertebral disease, by causing the patient to step or jump off a low foot-stool. If this test does not cause pain, we may repeat the experiment by substituting a higher stool, or a chair. If the spine resists the provocation of this increasingly rigorous test, we may be sure that no disease is present.

The hesitating mode in which the patient prepares himself for this test, especially the stiff, cautious, unnatural manner in which the trunk is carried, is even more significant of vertebral disease than pain would be if elicited by it. It should be borne in mind, that, as soon as this pathognomonic carriage of the patient is perceived, we should stop his preparation to step from the stool, and desist from any such test-effort.

On the contrary, the facile way in which an unsuspecting hysterical patient, who fancies she has diseased spine, performs the act of jumping, completes the diagnosis in her case.

Pain, excited by percussion with the fingers, or by the application of a hot sponge along the spine, is not a reliable help to diagnosis.

Night-crying, and moaning during sleep as if in pain,—

although, when the child is awakened, he does not complain of suffering any where,—is a common occurrence during the early stage of strumous vertebral disease, as it also is of synovitis and osteitis, and indeed of congestion and inflammation in any part of the economy. Although, therefore, when this symptom exists, we may not be justified in referring it to diseased spine, unless other signs of this disease be present, it assists the diagnosis between rachitic affection of the vertebræ and caries. Even with rachitic deformity there may be co-existent derangements of the alimentary canal, in which much sleep-disturbance takes place; but, as a rule, no such painful night-disturbance occurs in rachitis as in strumous disorganisations, especially those of an eroding character in bony tissues.

The night-moan declines, or disappears, on subsidence of the inflammatory stage, but recurs with any relapse, with strain or injury of the part, and with any spread of the original disease.

The spinal cord suffers frequently in the early stages of the disease of the column, before considerable deformity has been produced. The importance of the spinal cord in the economy, and its extensive relations with the thoracic and abdominal viscera, through the nerves leaving the vertebral foramina along the neck, chest, and abdomen, and their communication with the sympathetic, explain the liability to the occurrence of indirect and subjective, rather than unmistakable, local signs. The concurrence of cough, dyspnœa, and bronchial *râles*, with fever, or of anorexia and alternating constipation and looseness of bowels, with fever, not unnaturally divert attention from the spine. In some instances, a direct spread of vascular disturbance from the spinal column to the bronchial or mesenteric glands and structures probably takes place. Often a stream of suppuration follows these directions. The probability of simultaneous tuberculous affection of the pulmonary and alimentary mucous membranes should not be overlooked.

The deformity first presents itself as a single unduly prominent point in the line of the spinous processes; shortly afterwards, two additional prominent points show themselves,—the one above, the other below, the one first detected; presently others appear, until the region of the column involved presents a large, even, rectangular prominence. Mistakes in diagnosis of Pott's disease are often made, both by very experienced general surgeons and by orthopædic surgeons. *Humanum est errare*, especially when a preconceived notion of vertebral disease has been hastily formed from too much *speciality* of observation in medicine or surgery. Surgeons often forget that there exists normally in some subjects a remarkable prominence of one or more spinous processes in the cervico-dorsal region and in the lumbar region likewise. Little girls of the age at which vertebral disease occurs often exhibit a peculiar adipose deposit, over three or four square inches of surface, in the cervico-dorsal region and in the sacral region. I have several times known the normal but large spinous processes, in the situations indicated, mistaken by surgeons for the first signs of prominence of angular disease; and I have known an orthopædic surgeon mistake the plump, healthy adipose deposits natural to little girls possessing *embonpoint*, and regard it as the tumefaction produced by engorgement of tissues in the vicinity of diseased vertebræ. In young women, hysterical complaint is apt to mislead the surgeon. Three years ago, I relieved the friends of a patient of twenty-two years of age from the direful apprehensions of cervical vertebral disease, erroneously diagnosed by a surgeon of high repute, whose skill in most branches of surgery I have no pretension to emulate. In this last case, the patient was forbidden to lift her head off the reclining couch, lest instantaneous death should result from luxation of a diseased axial vertebra into the spinal cord. In a month after this alarming diagnosis was formed, and the consequent injunction was issued, the patient was able to profit actively by the

recreations of an evening party, and has since remained perfectly well. The object in detailing this case is to show the extreme difficulty which sometimes attends diagnosis.

Treatment of Angular Deformity.—It being impossible to draw a precise line between the stage of actual disease and that of deformity, the remarks to be made on treatment necessarily extend somewhat to the disease, although intended mainly for that of deformity. It is a perfectly well understood and rational axiom of medical practice, to insist on complete rest of the spinal column, in the horizontal position, during the disease. But for what length of time is it necessary to confine the patient to recumbency? It has been my good fortune, in consultation with professional brethren, to authorise the release of patients from absolute retention of a recumbent position, which had been preserved day and night for seven long years. It is not remarkable, when we consider the serious consequences attributable to neglect of repose of the spinal column in this disease, that the over-anxiety of the surgeon, unable to distinguish at what stage the upright posture is again permissible, should rather be inclined to “err on the safe side,” and the patient be deprived for an unnecessarily long time of the enjoyment of the erect posture, and the pleasure of walking exercise. The general progress of vertebral disease is quicker in the child than in the adult. A child rarely requires the recumbent position longer than a few months, unless psoas or severe lumbar or abdominal abscess have supervened; whilst an adult may require an avoidance of motion of the column for as long as four or five years. The disease sometimes occurs in so sub-acute or mild a form, both in the child and in the adult, without constitutional disturbance, pain, or other suffering,—some accidental observation of the back having led to the discovery of angular prominence,—that positive, uninterrupted recumbency appears unnecessary even for a day. But in cases so limited, chronic or mild in character, the patient should at least be required to refrain

from carrying weights, from all sudden, violent, active foot-exercise, from equitation, or games likely to lead to shocks or strain upon the vertebral column.

The only safe guide as to the necessity for resort to absolute rest of the spine is the determination whether constitutional or febrile disturbance, indicative of more or less acute and extensive vertebral disease, is still present. It may be laid down as a general rule, that if pain and pyrexia be absent, if the nutrition of the system be fairly good, and the patient present some *embonpoint*, if the spinal prominence has already existed many months without increase, and the individual manifest a capacity and lively desire for spontaneous locomotion, it may be safely permitted, the back being protected from strain and mobility by appropriate mechanical support. In such cases, a well-constructed support tends to prevent the deformity reaching so high a grade as that attained when the patient is simply confined to the recumbent posture. This statement is, doubtless, opposed to the preconceptions of many of my readers. The explanation appears to be, that when the patient has sufficiently recovered to feel no longer that relief from absolute repose which instinctive weakness previously led him to welcome, the habitual effort during the daytime, whilst nominally recumbent on the couch or in bed, to take part in the concerns of family and social life, occasions a frequent flexion of the trunk, which favours consolidation of the diseased vertebræ in the flexed position. The more ready healing of the diseased surfaces would doubtless be brought about, other things being equal, by favouring flexion of the trunk to the utmost degree; but it is probable that even such habitual flexion of the trunk as in some instances takes place during recumbency upon the sofa, or still more when the patient is permitted to walk about with the spine unsupported, not only brings the diseased and suppurating surfaces into contact, but is sufficient to compress those parts of the bodies of the vertebræ, the density and re-

sistance of which are diminished through infiltration with diseased products; to favour, in turn, the disintegration of these; and to add to the original disease, and thus augment the gap to be got rid of by ankylosis of opposing surfaces. We have evidence furnished by the progress of strumous and arthritic forms of joint-disease, that the structure of bones and ligaments may be long modified by the presence of morbid elements in them; but that in time, with amelioration of the general constitution, the morbid elements may be removed, healthy ones supplying their place, and the parts be so restored to primitive strength. Diseases of the joints also exhibit to us the effects of undue pressure upon diseased bones, in causing their disintegration, with deperdition of their structure, and consequently favouring their greater displacement.

It is one of the most difficult things met with in practice to reconcile parents to the necessity of keeping a child recumbent, when, as is sometimes the case in Pott's disease, it is still radiant with restless activity; or to persuade an adult, soon after reaching manhood, and when its absorbing cares and duties require active motion, to confine himself for a few months to the horizontal position. We are constantly met with the observation, that such a one has recovered without lying down,—and we ourselves know many such instances; but no physician or surgeon who knows intimately the nature of angular projection from Pott's disease, when he has, in the early stage, clearly diagnosed the complaint, doubts for a moment the propriety of absolute repose of the back—absolute immobility, if possible, of the affected vertebræ. The pathologist knows that by appropriate treatment at this stage, by immobility of the part, by good air, suitable diet, and supporting medicinal treatment, he may confidently hope to limit the disease to the minimum in extent, arrest it in the earliest stage, and, as far as deformity is concerned, confine it to the one prominent point in the line of spinous processes which has caused the serious alarm. If in any case, in the early stage,

we could predict that without constant recumbency, but with the aid of a spinal support, the case would be one of the fortunate ones, and completely recover in a year or two, a single prominent point in the line of spinous processes remaining, many cases might be implicitly trusted to this treatment, the patient enjoying life and activity in the open air. But at the best, despite the help of spinal supports, such apparently promising cases go on until considerable unsightly angular deformity results. It is fortunate when, in such a case, after the employment for a year or two of a spinal support, the patient does not become the victim of the surgeon's undue confidence in the recuperative energy of his constitution, or in the compensatory benefits of fresh air and exercise, as contrasted with in-door recumbency, supplemented by the use of a spinal carriage; and the parents and friends be so disappointed by the occurrence of one or more of the complications liable to attend angular disease. The more immediately formidable of these complications are—external abscess in the lumbar, dorsal, inguinal, and femoral regions; discharges of pus per anum, or through the air-passages.

There are many cases of strumous vertebral disease in which the characteristic cachexia is in the early stage so strongly marked that the physician is able at once to diagnose the most formidable form of the disease; and in such cases he has no difficulty in inducing the friends to follow out the most rigid recumbency, and adjuvant means of treatment, with the most satisfactory result. It is no uncommon thing to observe a hectic, emaciated, almost atrophic child,—with one or more bumps of vertebral disease, with much engorgement of subcutaneous dorsal tissues, suggestive of imminent external suppuration, the lungs and heart greatly congested, and respiration consequently much laboured,—brought into a condition of safety by removal from the confined air of a great city, by absolute repose of the affected parts, by medical and parental attention to patent wants; the "cure," during the latest

stage, being confirmed and protected by mechanical support. At the present time, it is too much the practice, when the child or adult appears in fair constitutional health, to trust, in the early stage, to nature and a spinal support, and allow the patient to move about through a great part of the day. This practice has arisen, in part, from experience of the complaint as seen in the out-patients' department of a public hospital. The satisfactory treatment of vertebral disease cannot be carried out in the homes of the poor; in these, perforce, absolute repose, spinal couches and carriages, cannot be obtained. Such cases come to a public hospital; the next best remedy to entire recumbency—a spinal support—is, *ex necessitate rei*, recommended. Of patients thus treated, a small proportion recover without serious complication beyond the deformity. The remainder become paralysed, or sink under abscesses, phthisis, &c., either at home or in other hospitals.

As regards this complaint, it is as with many other diseases—the experience acquired during hospital life cannot be exactly applied to private life. This is not the place to give instances confirmatory of this opinion. It is sufficient to say, that the greater number of cases in which, after the complaint had been apparently, for some months, or for a year or two, going on favourably, alarming complications ultimately supervened, were those in which locomotion with the use of spinal support had been permitted—partial recumbency in the daytime having, however, been enjoined. On inquiry, it is found in these cases that the recumbency has been nominal only, and the benefit of the spinal support equally illusory. As mentioned (p. 66) in relation to rotatory or lateral curvature, the spinal support, unless unceasingly supervised, fails to act as intended, in consequence of the incessant growth of the child, and, for the most part, gives no efficient support to the spine, except when the child remains in the sitting posture. In this posture the support acts like an arm-chair to the child. When the child assumes the standing position, the support

slips down over the small-developed pelvis, and ceases in great measure to act. Its principal benefit is that, when well fitted, it prohibits any great flexion of the trunk in any direction. Its principal evil is its *ignis-fatuus* tendency to lead to fatal uses and jerks of the spinal column. When employed in the reparatory stage of the complaint, in combination with perfect recumbency, a spinal shield, splint, or support, if fitted so as to be a source of comfort to the patient, is of the utmost value.

When the disease has sufficiently subsided to permit the erect attitude with proper mechanical support, the instinctive efforts of the patient to carry himself in the erect attitude, and thus momentarily ease himself from the restraint imposed by the apparatus, calls into play the extensor muscles of the trunk to prevent the body falling forward, and they become powerful adjuvant means of limiting the angular protrusion as much as possible. I have watched numbers of such cases for several years, and am quite satisfied that, where the mechanical appliance has been properly devised and adjusted to the case, this practice of the surgeon in following nature's hints, and allowing the patient to profit at the right moment from fresh air and exercise, is the correct treatment.

The use of mechanical support is more needed in disease of some parts of the column than in others. We may say that the higher in the column is the disease, the greater the need of mechanical support, even when perfect recumbency is simultaneously enjoined. It is imperative in the neck, on account of the exceeding structural mobility of this part, especially in certain syphilitico-rheumatic cases, in which necrosis is particularly apt to occur. I have witnessed three cases of sudden death, from pressure on the upper part of the spinal column, in cases in which no mechanical support had been employed. I remember no such suddenly fatal results in cases in which the head had been efficiently supported. Plaster-of-Paris and starch bandages, or gutta percha moulded

to the form of the parts, and securely applied so as to stop all movement, take off the weight of the head from the diseased vertebræ, and transmit it to the shoulders. In serious cases, these materials are preferable to Minervas and the usual head-supports. I have watched numerous such cases do well in which exercise had been permitted whilst the head was well supported. In the back, mechanical support is commonly required; whilst, when the disease has been confined to the loins, I have rarely had occasion to resort to it. I have watched many patients through severe lumbar disease, who have needed nothing beyond recumbency, with general dietetic and medicinal means.

To sum up the results of experience, I would say in regard to the treatment of Pott's disease, or angular vertebral deformity:

Employ recumbency, *i. e.* absolute repose, during the first stage of the disease, the inflammatory or the pseudo-inflammatory, with fever, febricula, or constitutional debility;

Recumbency, with mechanical support, during the second, or middle stage, in which internal suppuration is known to exist, and external abscess is feared;

Partial recumbency, with mechanical support and outdoor gentle exercise, in the third stage, when the diseased action has subsided, and its limits are defined, and consolidation is believed to have advanced.

The first two stages are more protracted in adults, consequently exercise is earlier permissible to young children.

I have nowhere met with any distinct statement of the average duration of vertebral disease at the different ages. An observation extending over a quarter of a century, during which I have more than once tended the child with Pott's disease whose parent had formerly been under my care for the same complaint, enables me to name, as an approximation to the exact truth, three years as the average duration in the child, and seven years in the adult. Many cases present

themselves in childhood in which the entire duration of the disease, starting from the parents' datum—when the alarming "point" showed itself in the back—to the time when the child has been safely permitted to remain only nominally under special care, is embraced within a twelvemonth. But inquiry always elicits the fact that even in these favourable cases the disease had commenced many months previously to the parents' datum, during which the child's general health had been seriously impaired.

Amongst adult cases, even in distinctly strumous individuals, I have watched instances in which the disease ran its favourable course within a year; these were cases in which the disease was easily diagnosed, and successfully combated in the early stage. On the other hand, I have met with cases in adults, in whom the first stage, which was accompanied with very severe pains in the back, had extended over several years. These cases occurred, for the most part, in men, soon after puberty. Thus, I have at present under my direction a gentleman who has gone through the usual hospital studies, preparatory to graduating in medicine: during the whole of this period, as I judge from the sequel, he laboured under the rheumatico-strumous first stage of lumbar disease, mistaken for muscular rheumatism. I know another gentleman, who for several years had in like manner struggled with lumbar pain, as man only can do when engrossed in an absorbing pursuit, during which he made voyages to Australia, rode in jolting public vehicles, and only gave in when indications of paralysis showed themselves. Examination of the back revealed lumbar angular deformity, since the discovery of which the paralysis and deformity have made further strides. A yet more remarkable instance of the conquest of mind over matter, and an illustration of the length of time during which the early stage of vertebral disease may continue in the adult, possibly confined in the beginning to the ligamentous tissues, has been afforded me in the instance of an officer who served with distinction in the

Crimea, and who has the glory of having never been absent from his regiment there, neither from ill health, nor from "urgent private affairs." This gentleman was often at that time a "martyr" to lumbar pains; his father is gouty, and his *physique* is decidedly of that variety apt to suffer from struma. Soon after the Peace of Paris, the untoward lumbar point showed itself, and angular disease and constitutional debility set in. During remissions of the latter, this patient has unwisely persisted in fulfilling his parliamentary duties, the consequence of which is that I am able to cite his case as one spreading over fourteen years. In women, we rarely meet with these protracted cases; the sex is rarely too unsuspecting about pain in the back: hence relief is early sought, with proportionately early benefit.

Something may be added on the relative value of recumbency on the back, in the lateral and in the prone position. All things considered, the dorsal decubitus is the most advantageous, *i. e.* if any single position must be chosen. I am accustomed, however, to sanction the use of the horizontal posture, either on the back, or on the side, or on the chest and abdomen, according to the amount of ease and comfort derived by the patient. Usually, when the first stage of the disease has been ushered in with pain (in many cases, especially the strumous ones, there is little if any pain in the affected part of the spine), any suffering experienced is often referred to the epigastrium, to the abdominal, iliac, or crural regions; and it subsides soon after the horizontal position is adopted. When projecting points of the back become tender from pressure, the prone position affords the greatest security. This must not, however, be continued until the integuments over the anterior superior spinous processes of the ilia become injured. The lateral recumbency may afford relief by change of position, but it requires to be used cautiously and suspiciously, especially when the disease is low down, in which case the affected part is less supported than in either the

dorsal or the prone position. When, however, the horizontal position is deemed advisable, *i. e.* whenever the diagnosis of vertebral disease is clearly made, and absolute repose of the back is demanded, less even depends upon the choice of the kind of horizontal position—*i. e.* whether it be to the back, the front, or the side, that the patient is to confine himself—than upon the thoroughness with which the repose is carried out. It is to be remembered, that in so serious a disease as this is, our object at least should be, if we cannot arrest the disease on the moment, to endeavour, if possible, to limit its effects to one or two vertebral bodies, rather than permit or favour its involving six or eight of them, with correspondingly increased risk of outward abscess and augmentation of deformity. We have to treat no disease in which it is more imperative to apply promptly suitable remedies, and none in which I believe the medical practitioner and friends are more compensated for their pains, in the abridgment of the patient's sufferings, the length of his confinement, and the improvement of his future physical and social condition. The public and the profession have been sometimes wanting in confidence in the power of suitable treatment to arrest and limit this disease. This has doubtless been the consequence of any treatment having too often been deferred, through delay in diagnosis, until the admonition afforded by some complication, such as paralysis or abscess, compelled attention to the case. Surgeons should take courage from the analogous benefits derived from early treatment and entire repose of the part in strumous joint-diseases.

Recumbency may be prescribed in vain, if the individual—with the central pillar of the trunk partially or completely disintegrated and decayed, as it were, by softened and softening vertebral structures—be permitted to sit up during necessary evacuations, to turn the body round from side to side, or from side to front, and *vice versâ*, by the act of his own volition upon the muscles of the trunk, aided by his arms and legs.

When the spine, the central piece of the framework of the skeleton, is in any part of its length partly or wholly destroyed, and so incapable of serving as a fixed longitudinal trunk-stem, by means of leverage upon which alone any considerable movement of the body or extremities can be properly effected, it follows that every such considerable movement must needs tend to disturb the diseased part of the spinal column. It is true that, as a consequence of the pseudo-inflammatory, or in some cases the more active inflammatory, process with which the ligamentous and osseous tissues are affected, considerable engorgement and plastic infiltration of neighbouring structures ensue. It is by means of this infiltration that the weakened and diseased pillar of the trunk is temporarily supported during the early stage of the complaint; and to which it is probably owing that so many cases do comparatively well without total recumbency. The surrounding thickened tissues serve, in fact, as a coffer-dam and shield to the spine, within which the disorganising and reparative processes successively proceed to a fortunate issue, when the concealed abscess does not make its way outwardly, and fuse in its progress the plastic materials of which the temporary shield or splint was composed, or when paralysis does not intervene.

With all the temporary security favoured by adventitious deposits about the diseased portion of spine, and the secondary assistance afforded by the attendants when the patient changes his position on the reclining couch, it is certain that, if considerable disease, especially when tending to external abscess, is suspected, the patient should not turn himself in bed. The attendant and the patient, in reference to the share each has in making the desired alteration of position, should change places. The attendant's share should be primary, or of principal importance; that of the patient secondary. The attendant only should be active in the matter, the patient should be passive. A single ordinary adult female can move an ordi-

nary adult from the dorsal to the lateral or to the prone position, without strain to herself or a jerk or inconvenience to the patient. The means simply consist in causing the patient to lie with an extra sheet beneath him. If the attendant gathers up the side edges of the sheet close along one side of the patient, having one of her hands opposite the patient's shoulder, and the other opposite the pelvis, and begins the movement by drawing the sheet, and with it the patient's body, gently towards herself, she will, by a very slight exercise of her strength, not endeavouring to lift up any part of the patient from the bed, gently roll the patient over on to his side or his front as desired.

When absolute repose is sought, all necessary changes of the patient's position can thus be effected without the slightest muscular effort by the patient; all his natural wants can also be supplied, or even removal to an adjacent bed or couch effected, without the slightest risk of disturbance of the diseased spine. In fine, we treat the decaying or decayed spine as if we regarded it as a fractured one. Elaborate spinal beds, manufactured with express regard to facilitating defecation, &c., may thus often be dispensed with.

By this simple absolute repose, and the adjuvant treatment already mentioned, many diseased spines never progress beyond the single angular point on which diagnosis so often hinges. When external abscess threatens, even when unmistakable fluctuation exists, we should not too hastily assume that an external opening is unavoidable; above all, it is undesirable prematurely to open it. I have observed many considerable lumbar abscesses entirely disappear; and, also, large abscesses, apparently hastening to the surface, gradually disappear, and suppuration reappear in the same spots several months afterwards, discharge, and successfully heal. I have witnessed an inguinal abscess become femoral, subside in bulk, and gradually descend to near the knee, when it was finally discharged by puncture, at the spot where it was really *pointing*, and heal in a few weeks; the patient

recovering activity and apparent health, but sinking a year or two afterwards of pulmonary phthisis. This patient presented the first signs of disease of the vertebræ five years before the abscess appeared in the groin. The disease was correctly diagnosed; but the patient only laid up during the pointing of the abscess, its discharge and cicatrisation.

When we reflect on the information derived from morbid anatomy, that in every case of strumous vertebral disease, which is not arrested in the early stage, the diseased parts are bathed in a purulent collection, whilst external abscess is the exception and not the rule of the complaint, we see the importance of neglecting no treatment which shall keep the parts at rest, and favour absorption of pus. Moreover, as we know that these external abscesses usually communicate with, or have communicated with, the focus of disease,—the bodies of the vertebræ which are affected,—we see the importance of not willingly hastening the possible moment at which the focus of the disease may be laid bare to the agencies which come into action when a chronic abscess communicates with the open air. It seems probable, when an abscess presents externally several years after the first signs of vertebral disease have shown themselves, that at the focus of the disease the reparatory process has made considerable progress, and that even the channel of communication of the outwardly pointing abscess with the focus of disease has been already cut off; so that evacuation of the matter is promptly followed by cicatrisation, and final recovery. Hence the advantage, in my opinion, of delaying operative interference as long as possible: if Nature delays to point, we are bound to wait attendance upon her. These abscesses are commonly “cold,” they often cause no pain, and present no valid reasons for the hasty fears of pus and its burrowings which, in some parts of the body, justly haunt surgeons. The course which these abscesses steer is well known; when allowed to proceed unhindered in it, they more often conduct to safety, than when interrupted by pre-

mature discharge. Since we know, from morbid anatomy, that the diseased part of the spinal column, after the earliest stage, is bathed in pus, though out of sight, the idea of probable external abscess should never be absent from the surgeon's mind. Outward abscess may occur after the lapse of years, the patient having been regarded as long since cured. In such instances, as already mentioned, the channel of communication with the focus of vertebral disease may be closed and healed.

The advent of paralysis during either of the stages of the disease is often the most lasting, if not the most immediately dangerous, complication. As it sometimes is the earliest sign of the disease and of proximate deformity, and as its frequency bears no proportion to the severity of deformity, it is now undoubted that, excepting in disease of the upper cervical region, it depends more often upon the spread of the strumous, tuberculous, or rheumatic disease to the membranes and intimate structure of the medulla spinalis and the nerves, than upon pressure by the lapsed and distorted bones. Its premonitory symptoms are numbness, neuralgic pains, jerking, slow, persistent spastic contraction, with structural shortening of muscles, and occasional temporary loss of power of the sphincters. I have witnessed several cases of adults, in whom tenotomy had been needlessly performed for a lameness which was but the dangerous forerunner of angular deformity, the progress of which had been overlooked. I have been long accustomed, in clinical teaching, to insist that, in the primary examination of a patient, whether affected with internal or important external disease, thorough ocular examination of the body should never be neglected. It is true that, in the urgent necessities of the out-patient department of a hospital, this general ocular examination cannot take place, and that, to a great extent, it may become unnecessary to the physician or surgeon who, often without asking a question, by dint of the habit of prescribing for hundreds of patients daily, from the physiognomy and

bearing of the patient, and simultaneously feeling the pulse and looking at the tongue,—which is often instinctively presented to the doctor's view by the "common" man and child,—takes in at a glance the nature of his disease, his social status, his occupation, and the probable antecedent evil disease-producing influences to which he has been subjected. But here again the practitioner, especially the young practitioner, should be urged to content himself with nothing short of thorough ocular examination of the surface, behind as well as in front. He will find, in the changes of form of chest and back, many important signs of internal disease apt to be overlooked. The undue estimate of the superiority of mediate over immediate auscultation and percussion, has cultivated a neglect of ocular examination in disease.

The proper treatment of the paralysis occurring at the outset, or during the later progress, of vertebral disease, is a serious matter of consideration. The wholesale employment empirically of the setons and issues, in every case of suspected or actual spinal disease, whether paralysis existed or not, which was handed down to us from the time of Pott, and which, thirty years since, was confided in as implicitly as were the dogmas of Galen and Aristotle after the middle ages, has since justly fallen into disuse. But—as in the use of other remedial agents—the reaction against moxas, issues, and active counter-irritants has been extreme. Perhaps the fact that, thirty years ago, the value of a supporting dietetic and general treatment was not understood, that vertebral disease was regarded as inflammatory, and that "stimulating" methods of treatment were interdicted,—moreover, the exhaustion produced by large and numerous issues diligently kept open by strings of peas for many months,—neutralised any benefit derivable from the counter-irritation, and hastened a fatal termination.

A moderate use of these and other means of counter-irritation, such as the solutions of cantharides and iodine, is of un-

doubted service in the early stage of vertebral disease, especially when paralysis threatens. All the approved medicinal means of supporting the constitution—*ol. morrhuæ*, quinine, phosphates and other preparations of steel, laxatives and alteratives, as required by the condition of the secretions and excretions—may be beneficially employed at appropriate moments in the treatment. In my experience, the iodide of potassium exceeds in value any single medicine for relief of paralysis occurring in the progress of vertebral disease, whether a syphilitic taint exists in the case or not. Patients long recumbent are apt to suffer from constipation and from accumulation of *fæces* either in the *cæcum* or in the sigmoid flexure of the colon; the swelling in either situation being liable, when the general and functional signs threaten external abscess, to be mistaken for advancing *psoas* abscess. I have been almost deceived by a loaded intestine, and apprehended too seriously the imminent complication of the premature ripening of a *psoas* abscess on the right side.

In the case in question, more sedulous use of the gentle cholagogues and aperients previously prescribed was urged, and at the same time continuous application of the ice-bag to the iliac region was employed. The tumour disappeared, with relief to the painful jerkings which were complained of in the opposite limb. As regards discutients for abscesses in these cases, whether situated in the back or groin, I can speak highly of the value of local application of ice.

The treatment of the last stage, when the patient has safely traversed the periods of internal abscess, partial paralysis or its threatenings, external abscess and its final cicatrisation, needs some attention, bearing in mind the liability to phthisis during or after convalescence from this form of tuberculosis, especially when hereditary tendency to this constitutional malady exists. The old-fashioned notion of the advantage of creating, at this juncture, an artificial outlet (by means of one or more small issues in the arms or elsewhere) for any

materies morbi which may accumulate in the system, is confirmed by modern pathological observation. I have several times witnessed the occurrence of phthisis, after recovery from vertebral and joint diseases, where no physical signs of tuberculous deposit in the lungs were discoverable at the period of the cessation of the vertebral or the joint disease. I have also several times observed, that when an abscess in the vicinity of the vertebral column has been dispersed by local treatment, suppuration has shown itself within a few weeks or months in some other situation, as in distant subcutaneous parts, or glands. After cure of an articular disease, I have seen enormous discharge from the vagina or rectum, followed by perfect recovery. It is true that in all such cases the abscess in the new situation may be but the product of independent tuberculous activity in the new situations; but it has occurred sufficiently often to justify the impression, that a translation of morbid action from one part to another, excitatory of suppuration in it, rather than a direct translation of pus or metastasis, as was once supposed, takes place. The occurrence of superficial abscesses in different safe parts of the body, in young subjects affected with well-marked strumous angular deformity, should always, in my opinion, be welcomed, and not be unnecessarily subjected to surgical interference.

Pretenders to uncommon skill in rectifying severe angular deformity, long after subsidence of the vertebral disease, have not been wanting. The means adopted have consisted in the use of pressure, in conjunction with an extension bed. I have watched the effects of this treatment in cases in which I had declined to interfere. It is superfluous to mention, that no effect upon the ankylosed angular deformity was produced; but, by the artificial production of additional curves in the antero-posterior direction, an appearance of greater straightness of the spine was outwardly produced, so that the carriage was improved, and the patient was satisfied with the result.

APPENDIX.

To illustrate the external Characteristics of Contraction of Chest after Pleurisy, contrasted with "Lateral Curvature."

[See pp. 73, 80.]

Fig. 1 represents an average case of rotatory lateral, or what is commonly called lateral, curvature of the spine (from a photograph).

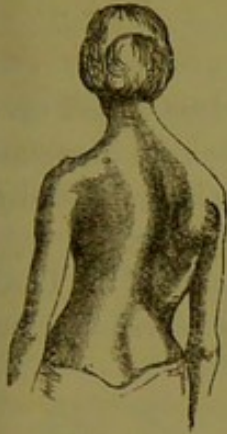


Fig. 1.

Fig. 2 represents an average case of contraction of the chest, and consequent lateral curvature of the spine, after pleurisy. It is the only true form of lateral curvature of the spine. The model, of which this drawing is a representation, was taken from an adult two years after removal of the



Fig. 2.

pleuritic effusion by paracentesis thoracis.

Fig. 3 represents a drawing from the model taken from a young

lady, aged fourteen, who had been affected with pleuritic effusion two years before. The fluid had been spontaneously removed by absorption. It is the simple true lateral curvature of the spine, without the sigmoid twist, which characterises the rotatory lateral curvature of the spine, or scoliosis, commonly misnamed "ordinary lateral curvature."

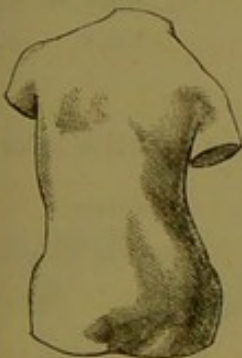


Fig. 3.



Fig. 4.

Fig. 4 represents a drawing, taken from a photograph, of the same patient twelve months afterwards. The intermediate treatment consisted of gymnastic exercises, and the use of the lateral sling (described at pp. 67 and 79), without spinal support.

Fig. 5 represents a drawing, from a model, of the front of a child, aged six years, who had been affected with empyema two years and a half before. The matter discharged itself in the usual situation of the "empyema of necessity," beneath and posterior to the left nipple.



Fig. 5.



Fig. 6.

Fig. 6, taken from a model of the back, exhibits the deformity, as seen from behind, in the same child.

The absence, in these pleuritic contractions, or true lateral curvature of the spine, of any rotation or twist, such as exists in scoliosis (and from which is derived the name), or rotatory lateral, usually misnamed lateral, curvature of the spine, is very striking.

The case represented in figs. 5 and 6 was an inmate of the London Hospital in 1850. The treatment consisted in lateral slinging

during some hours daily, and during the night (see p. 79), without the use of spinal support or gymnastics.



Fig. 7.



Fig. 8.

Fig. 7 represents the front view, and fig. 8 the back view, of the same case, three months after the above plan of treatment was adopted. The improvement is here shown to

have been exceedingly rapid.

Figs. 9 and 10 represent the same case three months later,

when the restoration was almost complete. When it is considered that, the empyema having discharged itself, a fistulous opening had existed for several months, and that consequently the firmest kind of adhesion compatible with the youth of the patient



Fig. 9.



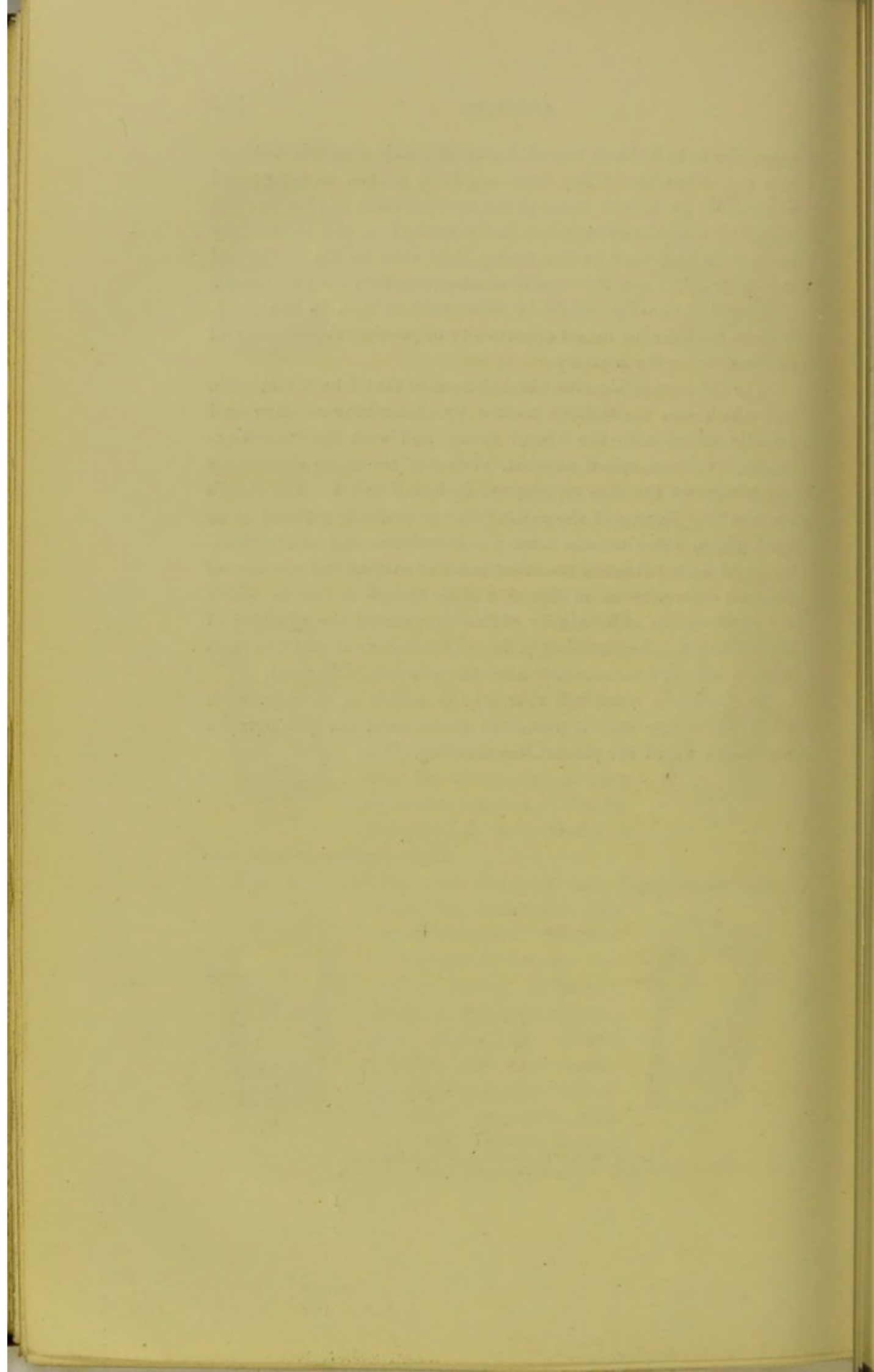
Fig. 10.

had necessarily taken place, the result will appear surprising to

those who have hitherto regarded a considerable pleuritic contraction and deformity of the chest and back as the necessary and unavoidable permanent result of the severest form of pleurisy. It is possible that the adhesions connecting the lung and the ribs are less fibrous and rigid in the young child than in the adult, and that, after adult age, the cure of chest-contraction from empyema, discharged outwardly, would be more tedious than in the child. No case has afforded me an opportunity of proving the accuracy of this surmise, or the contrary.

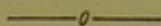
The last case of pleuritic chest-deformity that I have met with, and which was successfully treated by prescribing slinging and juvenile games with the "hand swing" and with the "chest-expander," without spinal support, presented the same appearance and history as the case represented in figs. 3 and 4. The child's age was four years, and the patient was as perfectly restored as at fig. 4 within three months after the commencement of the treatment. I have witnessed no other cases of so great an amount of pleuritic deformity as in figs. 5 and 6, except in one in which the supervention of hereditary phthisis prevented the adoption of the treatment. As stated at p. 79, slight degrees of pleuritic contraction recover spontaneously after the strength is restored.

It should be remarked, that all the models in question were taken whilst the patient remained recumbent; the photographs were taken whilst the patient was standing.



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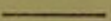
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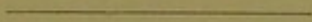
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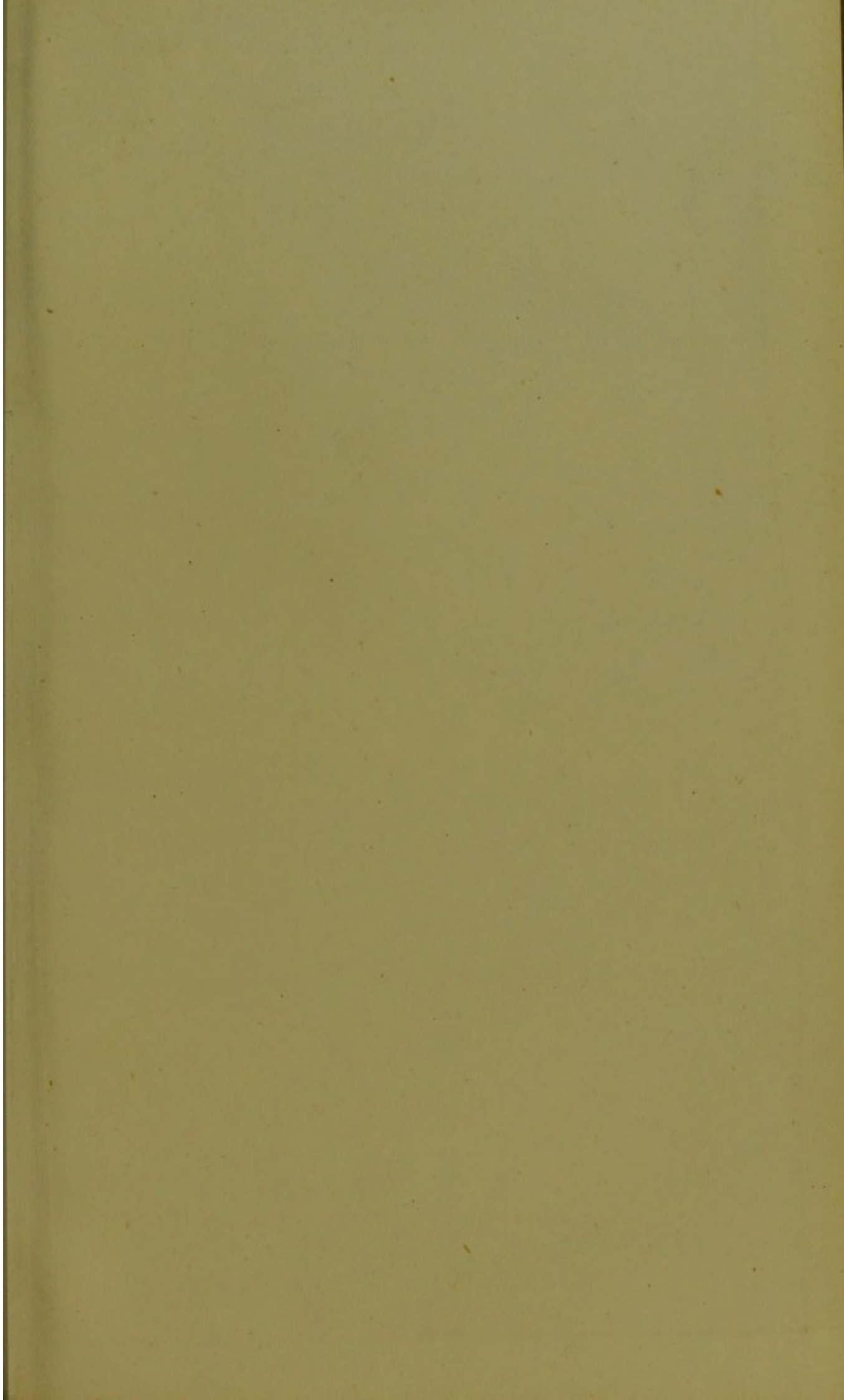
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