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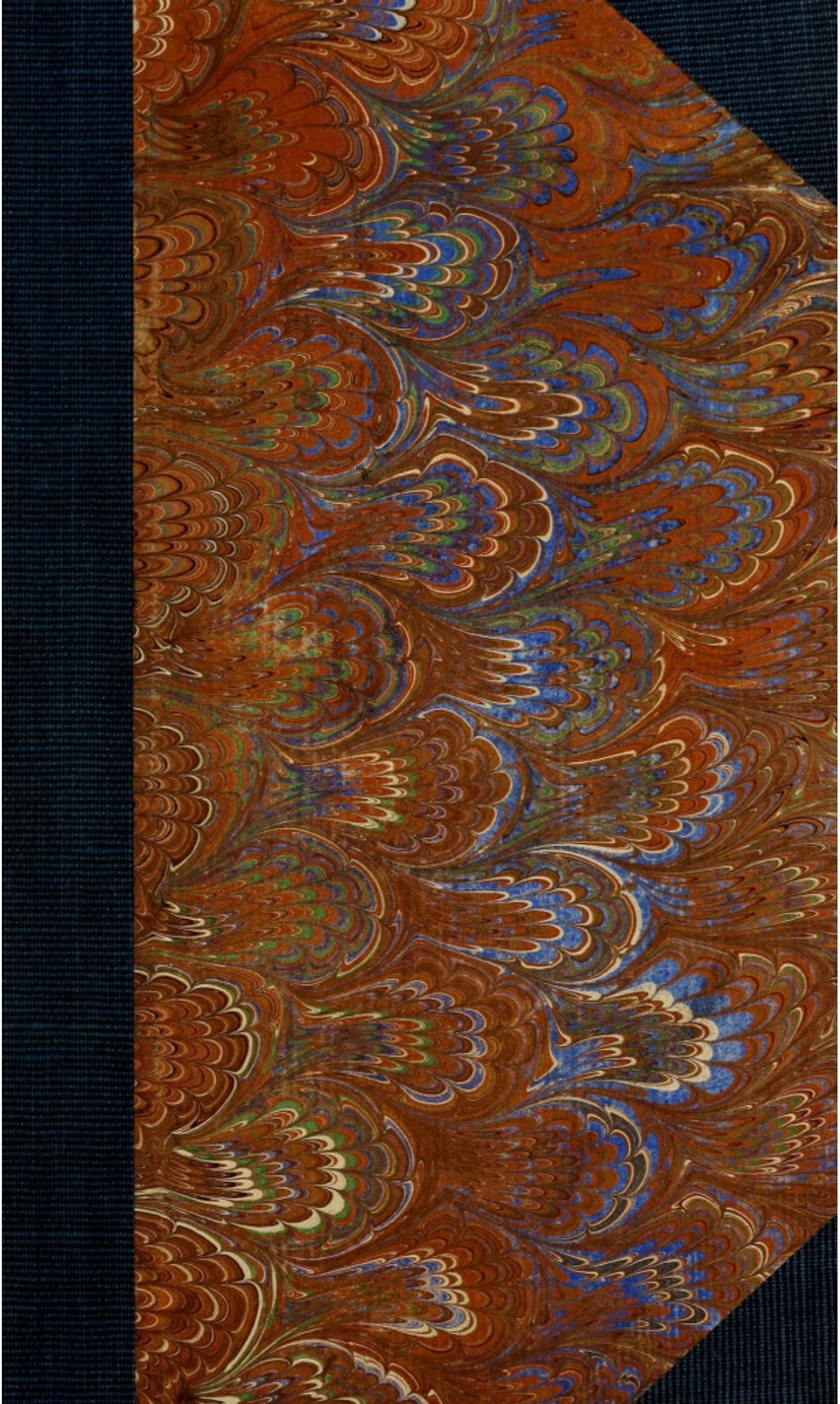

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EXTRAORDINARY
CASE
OF
SARAH HAWKES

Sarah Hawkes

as she at present appears

Joseph Robins. Bride Court London 1836.

THE

EXTRAORDINARY CASE

OF

SARAH HAWKES;

ONE OF EXTREME DEFORMITY, CURED BY A METHOD

FOUNDED UPON SIMPLE PRINCIPLES.

BY EDWARD HARRISON, M. D.

F. R. A. S. Ed.

PRINTED FOR THE BENEFIT OF THE PATIENT.

London:

JOSEPH ROBINS, BRIDE COURT, FLEET STREET.

1832.

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PREFACE.

At no period in the history of the world have the Arts and Sciences advanced so rapidly, or led to such unlooked-for and astonishing conclusions, as we have seen in our own day. While one set of men is engaged in contributing to the conveniences and elegancies of life, another is equally zealous to promote the health and comfort of society.

Released from the trammels of the schools, and from the domineering authority of great names, philosophers have begun to think and to act with an independence hitherto unknown. To this cause may be imputed the numerous changes and improvements which have recently, and in a most conspicuous manner, characterised sundry departments of *Medicine*. Some of these, cultivated from very early ages, have, of late, assumed an aspect altogether surprising; and in others the ardour of inquiry has been revived after having lain dormant for many centuries.

In no matter of detail has this been more happily exemplified than in the knowledge and treatment of certain affections of *the Spine*. These, in the early

ages, were much investigated and successfully remedied. HIPPOCRATES bestowed a considerable share of his attention upon them, and adopted such methods of cure as shewed that he well understood their nature and importance.

In his chapter on *Dislocations*,* the Father of Medicine treats of vertebral luxations at considerable length; and recommends the employment of mechanical means for their cure. His observations and directions, however, are wholly confined to incurvations induced by *violence*. The remedies were selected with considerable judgment, although they were unnecessarily complex; but I believe they were, in many instances, successful. As he made no attempt to cure deformities arising from *constitutional causes*, his treatise is, on that account, very imperfect, or rather defective.

GALEN and CELSUS followed in the same track; and each, being attentive to the subject, contributed materially to enhance the labours of their illustrious predecessor; but, like him, they confined their curative attention to injuries inflicted upon the spine, by *falls*, *blows*, and other species of *accident* or *violence*.

Although spinal complaints are frequently the consequence of hurts, they more commonly proceed

* Hippocrates de articulis. Sect. vi.

from latent defects or derangements in the general habit; and, where violence has been applied, it is often dangerous to attempt a cure by replacing the vertebræ; but, in *constitutional* deformities, relief may always be safely attempted; (excepting in those rare cases where the *structure* of parts is affected) while, in recent instances, the treatment seldom occupies more than a few weeks; and should never be deferred; because the disease acquires strength; or, in other words, becomes confirmed by delay. By judicious interference the sufferer is speedily restored to health and vigour; but where the proper remedies have not been resorted to, the subject falls a prey, sooner or later, to some complaint either originating in, or aggravated by, the spinal malady. Strength and activity become sensibly impaired; the patient is tormented with a variety of painful and obstinate symptoms, in different parts of the frame: one, if not more, among the internal organs is uniformly affected, so as to make it impossible to enjoy good health. While at rest, the mis-shapen spine performs its offices tolerably well; but the slightest bodily exertion produces languor, debility, and an oppression, relievable only by long rest and quietude. It is in this way that invalids pass from youth to age, constantly ailing. They are never in a condition either to partake of amusements, or to engage in business, like other people.

Such is a faint picture of the miserable condition of these unfortunate persons, who ought to rouse our warmest sympathies—being alike useless to themselves, and burdensome to others. Of all the unhappy situations to which human beings can be reduced this is, surely, the most lamentable; and persons thus afflicted are the more to be pitied, because they are deprived of hope—the last solace of the wretched—if curative means be neglected, until the distorted parts become too firmly fixed in their deviation to admit of correction.

In the early stages, however, no disorders are more tractable, or more easily cured. The restoration of distorted vertebræ has been effected in three weeks—even where the aberration was very considerable. I published a case of this description several years ago, in the *Medical* and *Physical Journal.** The young lady continues straight, and in good health—is married, and the mother of a healthy family. Such facts cannot be too generally known, in order that false impressions may be removed by their promulgation, and because opposite statements have been industriously circulated by prejudiced and ignorant speculators;—by those unacquainted with the disease, and with what has lately been accomplished in this branch of the pro-

* See Vol. 51, p. 351.

fession. Such authorities are, consequently, unworthy of the smallest credit; being utterly unqualified to hazard any opinion upon the subject. Medicine is a practical art, which can be acquired only by intercourse with the sick, and comparing the effects of different methods of treating their complaints.

By publishing the following case, and accompanying it with remarks of my own, I am aware of the responsibility which I encounter. Persons brought up with bigotted notions, and influenced by prejudices, imbibed at an early period, may view the unexampled issue of this singular malady with doubt, or suspicion. Such will not easily believe that an unparalleled deformity in the back and limbs could be removed by any treatment; or, if correction of the distortion were possible, that it would be safe to undertake it. Where organs of the most influential and delicate nature are much deranged, they will contend that rectification must be productive of the utmost danger to health and life. This conclusion is erroneous, and originates in a mistaken view of the subject. Others, influenced by motives less pure and disinterested, are still more averse to subscribe to truth: they raise difficulties and objections of another kind—boldly denying the statements; accusing those who make them of entertaining unworthy views, and of being impelled by disingenuous

considerations. I should be justified did I pay the greater attention to this appeal, because such inuenda have been frequently hazarded with respect to my practice,—even where the results were less startling.

Strange reports have been communicated to me, both in conversation and by letter, concerning difficulties being raised and objections started as to my practice in this case, by persons entirely strangers to the patient, and by some residing even at a distance, which, if allowed to pass without refutation, might operate to the disadvantage, and, probably, retard the highly encouraging progress of the cure. In compliance with the wishes of my friends I have been induced to rebut a few of the more prominent misrepresentations.

I.—A few days after the commencement of the treatment, a medical gentleman, who had paid the patient considerable attention both at *Dunmow* and in *London,* expressed himself in the following laconic stile:—" You may succeed in extricating the arm, and bringing down the feet; but no alteration can be made in the back; for that is out of your power, as the vertebræ are united together. They are consolidated and anchylosed from one end of the spinal column to the other," To this speech, delivered with unusual energy and animation, I calmly replied, " You have addressed me in the *language of London;*

I know it to be the universal opinion here that the vertebræ are, in such unhappy instances, firmly joined by a bony union and cannot be separated. In a few days I shall have her turned upon her face, in order to examine the back. I shall then be able to form a better judgment of her situation and adopt my plan of cure with more chance of effect." Our next interview was truly clinical. On my entering the girl's room he rushed forward, and seizing my hand before a considerable number of persons, uttered the following exclamation—"The improvement is remarkable—it is astonishing; it is really *miraculous*."

Among those who were present was the mother, who afterwards asked him—whether, if she had acted upon his advice, and gone home when the arm was released, the child would have attained her present situation? He replied that he was lost in wonder and amazement, and dared not hazard a conjecture about her. The progress of events and his own connexion with them having, at length, removed all scruples, he has surmounted his prejudices, and become, I believe, not only a convert to, but even a zealous advocate for, the new doctrine. Others have likewise been convinced by their own observation; but there are still many who affect incredulity, and deny the facts: these, however, have not seen the case. In the mean time the practice has been steadily advancing in estimation, and has now to

boast of numerous patrons; though all of them have not the candour to acknowledge the quarter to which their obligations are due.

II.—A professional friend of the writer who had personally witnessed the great and important change in this girl, as well as the nature of the treatment, reported that several practitioners, to whom he endeavoured to explain it, denied his statement, and unanimously declared that remedial changes in the mis-shapen spine are impossible, under whatever management.

III.—From a third quarter I have learnt, that one of the drawings having been shewn to several medical men, who could not deny the fact of improvement, they signified that the vertebræ must have been soft, or imperfectly ossified, otherwise no contrivance could have wrought any alteration in their arrangement: and this I understand to be the explanation generally given where the facts are admitted. Let us inquire into the truth of this allegation. The vertebræ being naturally covered with strong fleshy muscles and ligaments it is impossible to discover exactly, at any time, what may be their precise condition; we must, therefore, restrict ourselves to conjecture, or to probabilities. Nevertheless those who have daily watched the changes and witnessed the proceedings are more likely to arrive at just conclusions than entire strangers both to the patient

and the treatment. In the case before us, after most careful observation of every particular, during many months, I have found no pretext for supposing either that the bones are now, or at any time were, softer, less ossified, or more pliant than others of the same age;—to the best of my judgment they are healthy and sound. In every manipulation and mechanical attempt to overcome their deviations the changes were obviously effected, through the ligaments and articulating structure. These gradually and sensibly gave way, during the proceedings. As they continued to stretch, the vertebræ were seen to move, and assume more appropriate situations. The alterations of arrangement were observed by many persons, and rest upon a foundation which cannot be shaken. Nor is this the only instance where corrections have been effected in the mis-shapen spine. In my practice they are of daily occurrence, and have been witnessed by too many competent judges to admit of doubt or cavil. I am the more earnest in maintaining this important principle, because it is the ground-work of my success in curing these deformities; it is the pivot upon which my practice has turned from the commencement, and upon which it still hinges. The farther I proceeded in the interesting inquiry, and the more extensive my opportunities of observation became, the stronger was my conviction that the development

of pathology, and the elucidation of the phenomena of the living frame, will ultimately be found in a knowledge of the healthy and disordered state of the spinal nerves.

Continuing to hear from different quarters that, notwithstanding all the care which had been taken, several persons still remained unbelievers, I determined to give the greatest possible publicity to the case, and thereby enable the incredulous to judge for themselves, as to the truth of the statements, as well as the success of the practice. With this view, announcements were sent to the Medical Journals, that S. Hawkes might be seen by the faculty and others. Many availed themselves of the offer; and I believe they not only admitted the facts, but went away perfectly satisfied with the information obtained.*

* In these it was stated that a medical gentleman (conversant with the history and progress of the case) would be in attendance on *Mondays* and *Saturdays*, at four o'clock, for the purpose of explaining the pathology and mode of treatment.—My own visits were previously arranged and announced to the company present on those occasions. The management of the case was also, under my careful superintendance, confided to Mr. C. W. Hoyland and Mr. John Thornber, two young gentlemen, at the time prosecuting their professional studies in London. One of these (a perfect stranger to me) introduced himself for the purpose of witnessing my method of treatment. They were not only privy to every transaction; but, as they carried my directions into effect, are fully competent to declare whether the statements made by me be correct or not. Sarah

I should be perfectly justified, in the present instance, did I oppose the names of many persons of unimpeachable judgment and veracity, who visited the sufferer at *Dunmow,* and also in *London,* before I had any opportunity of seeing her. Since I undertook the case, some of these (medical practitioners) have attended with me, and witnessed the progressive stages of the recovery. Had I practised any deceit, or resorted to any trick, they would have been apt enough to see, and quite ready, as well as competent, to expose my manœuvres: on the contrary, they, as well as others—perfect strangers to me—who had been attracted by the wide-spread rumours of the extraordinary case, have been frequent spectators, and are in a condition to attest the truth of my statement. On them I, therefore, rely, and to them I shall refer should the facts be denied or misrepresented. I might appeal to both sets of objectors, by saying that, after the astonishing discoveries made in the Arts of late, and which have been applied to such mighty purposes of a practical nature, it is by no means to their credit that a single step in Medicine should excite their surprise, their disbelief, or their jealousy. Within the memory of the living generation balloons have

Hawkes still occupies the same lodgings, and is constantly visited by those who are induced, by professional or other curiosity, to satisfy themselves about her case.

been invented, and brought to a degree of perfection truly marvellous. Had our fathers been told that, in a few years, men and even women, would voluntarily mount into the air in a basket, and, after sailing about for hours together, descend to the earth in safety, they would have treated the notion as the offspring of a wild imagination. Who, among the same people, would have believed that by the steam of boiling water navigation would be rendered so safe, pleasant, and regular, as well as speedy; that sailing vessels, for the purpose of conveying passengers and letters, would be superseded by others furnished with boilers and machinery? Railways too, which have within a *very* few years been established, admit of the transit of many tons of goods at a rate of velocity far surpassing that of the swiftest horse—and this improvement, at a very *recent* period, would have been regarded as little better than a dream. Since, therefore, such brilliant and unprecedented improvements have taken place in the *Arts*, surely a discovery in *Medicine* is hardly deserving the name of a wonder! It should neither excite astonishment nor incredulity: if, therefore, any industrious member of the profession should have the good fortune to impart an improvement to the faculty, is he to be *condemned?* One would think he merits other treatment.

But let this pass. It is the duty of the members

of a profession, *singular* almost for pretensions to and connexion with philosophy, to divest themselves of untenable prepossessions—ere they are *compelled*, by the march of improvement, to lay them down; and to regard, without childish and discreditable jealousy, the suggestions of those whose industry and perseverance may have been rewarded with results which they neither hesitate to disclose, nor wish to conceal the means by which they have been brought about. They should be the last to lament the introduction of new, if successful, methods of managing disorders heretofore considered untractable. England has been too long the hot-bed—the nursery-ground of medical prejudices—the native soil of professional apathy; feelings which (I blush to say it) are almost unknown among our brethren in other countries. Let me exhort the faculty—than which no order in society is more enlightened—to assume an elevation in the scale of honourable liberality worthy of themselves, and to promote the lustre of a profession which has often been declared to be of Divine Origin.

It is well known that, when the great Harvey announced his discoveries concerning the circulation of the blood, little, if any, credit was given to him by such physicians and other medical philosophers as had attained the age of *forty!* And it is just matter of reproach that men, arrived at the full

possession of their powers, with the advantage of previous education, and, probably, also, of extensive opportunities for observation and research, should close their eyes to a new light—for no other than one, or both of two unworthy reasons—*Prejudice*, or *Indolence*:—the *former* existing in contracted minds, open to the admission of one primitive consignment of ideas only, and incapable of accommodating any which may subsequently be presented;—the *latter*, often the failing of worthy men; though, not the less injurious to professional and general interests.

But these were errors of other times, which have, till too late a period in the history of mankind, spread their influence over every thing dear to *philosophy*, and—I had almost said—*humanity*. Let us hope that a brighter era has dawned, and that happier prospects are before us!

CASE, &c.

SARAH HAWKES, now in the 14th year of her age, is small, and of delicate constitution. She (at present*) is afflicted with a most extraordinary, and, probably, even singular contortion of figure, amounting to almost the highest degree of deformity. The inferior extremities have lost the power of motion entirely, while, at the same time, their sensibility is morbidly increased. The toes are turned inwards, and press upon the soles of the feet, with such firmness that they cannot be moved, even by considerable force;—the nails not having been properly cut from the commencement of the ailment, and not at all for these last three months, in consequence of her being unable to bear the handling of them for that purpose. The hip, knee and ancle joints are stiff and immoveable; the knees and ancles resting firmly upon each other respectively: the right arm is lodged between the thighs, with the hand turned upwards.† In this manner it has been confined during the last two years. Her trunk and lower extremities are retroverted to such a degree that the feet rise above the left shoulder, and can there be laid hold of by the patient with her left hand. The fore part of the

* Nov. 13th, 1831 † See plate I.

trunk and the inferior extremities describe together more than three-quarters of a circle. The fore part of the crest of the right ilium actually passes five or six inches under the edge of the sternum. The right buttock is forced under the scapula of the same side. The middle of the spinal column presents the shape of a horse-shoe, with the toe slanting upwards, and the heels turned into the right flank. In this strange and distressing position the patient is obliged constantly to remain; having lived, for the last two years, entirely upon milk, and the pulpy parts of fruit, either fresh or dry. The pulse is feeble; appetite languid; respiration always difficult, but more so when the atmosphere is moist, or any one stands near her bed. Her voice is weak, and the utterance of a few words exhausts her. The right cheek and arm of the same side frequently assume a blackish hue simultaneously, and on these occasions breathing becomes so laborious and irregular that death is expected every moment; and not only so, but sometimes appears to have actually taken place. Her breath emits at all times a disagreeable odour: the heart also appears to be raised considerably from its usual site, and frequently palpitates, conveying a very uneasy sensation, which she herself describes as a violent fluttering in the upper region of the chest.

On account of the awkwardness of her posture the urine is necessarily received upon folded cloths; and she is frequently called to void it. This fluid is very offensive; she knows, however, when it escapes; and can, for a few seconds, retain it.

The fæces are discharged involuntarily and unconsciously, upon the right cheek; and, if not prevented by interference, would glide to the mouth, the head being fixed

Sarah Hawkes

in her State of Deformity.

A *The Feet.*
B *The Umbilicus.*
C *The Left Arm.*
D *The Right Arm.*
E *The Ribs & Sternum raised.*
F *Great Trochanter of the right Thigh.*
G *The Knees.*
H *The Right Thigh.*
I *The Head fixed & inclining towards the left with the Chin resting upon the Top of the Sternum.*

immoveably to the sternum. The evacuations are always dark and fœtid—when solid it is of large size, being retained longer than usual, in consequence of the sluggish action and insensibility of the rectum.

She herself accounts for the origin of this distortion from the circumstance of having received a blow on the neck from the fist of another person, of so violent a description as to drive her over a form; when she fell down in a fainting fit. On recovering her senses, and attempting to eat her dinner, she was alarmed at finding a difficulty in swallowing, and by perceiving an unusual lump in her throat—both of which still remain. In the front the lump is very conspicuous, and nearly the size of a pullet's egg, cut in two lengthwise. The posterior surface is uneven; but there is a particular indentation in the lower part. The cervical vertebræ are huddled together, forming an irregular tumour. By these subluxations, or misplacements, (which will be more particularly adverted to hereafter) the chin is pushed over to the left, and made to rest continually upon the chest.

In little more than a week, after the violence alluded to, five or six fits of a similar nature were experienced. Soon after the first she had cold and hot pains in the loins; and lameness in the right hip. These continuing to increase, she was compelled, after several ineffectual struggles, to confine herself to bed; that is to say, on August 28th, 1828; and never since that period has she been able to rise. About five weeks after she was thus confined, she was visited with a peculiar and indescribable sound in her back and head; resembling the cracking of the fingers, or the snapping of a stick—the report being distinctly perceptible in the room below that which she occupied. It

began at the bottom of the spine, ascending rapidly to the lower part of the neck, accompanied by increase of heat through its course; this was again, however, quickly followed by cold in the same parts. Arrived at the neck, the noise was there loudest; and the cause apparently struck into the lump within the throat.

At this epoch the right arm became violently agitated; the left was suddenly drawn back, with the fingers bent and stiff: the eyelids opened and shut in quick succession; vision became indistinct, and the voice failed. The chin was forced upon the breast with strong convulsions, while the mouth remained wide open. After the pause of a few seconds, the snappings darted again into the back of the neck; now ascending to the top of the head, where they suddenly stopped, making, at the time of their cessation, an unusually strong report. The mother of Sarah Hawkes described the course of these noises with the greater confidence, because at night she lay with her own head close to that of her child; in order the better to observe and trace the order and movements of this singular phenomenon. When the noise reached the head, it was accompanied by greater heat than elsewhere, (perceptible to other persons besides the patient) and a greater degree of cold invariably succeeded. The vertex and sides of the head were also, for a short time afterwards, so benumbed and insensible, that she could not feel a smart stroke or pinch inflicted upon any part of them.

In this way the rattling continued, incessantly harrassing the poor girl for more than a month;—at the end of which it entirely ceased. On first hearing the sounds, (and for some time afterwards,) her mother was so fully convinced of their proceeding directly from the ribs, or

vertebræ rubbing against each other, that she frequently turned the child, expecting to see an evident movement in some particular part, and thus ascertain the exact spot whence the noise proceeded: but these examinations always ended in disappointment; for neither she nor any other person, after bestowing the greatest care and vigilance, could perceive the slightest disturbance, either in the spine or ribs. Both were, at all times, tranquil. No unusual motion could be observed or felt, although the crackling was audible enough, and, apparently, confined to a particular spot, to which eyes and fingers were both directed.

This perplexing symptom had scarcely taken its departure, before she became constipated in her bowels. During twenty-nine successive days no alvine evacuation took place: the belly became exceedingly swollen, and was very painful, while there was a remarkable glistening of the integuments. About the same time she was attacked with frequent spasms in the face, eyes, and right hand, but most of all in the mouth; the chin being now drawn down upon the sternum, where it remained fixed for fifteen weeks and three days. During this period she lay speechless, with her mouth continually open, excepting when forcibly closed with a bandage. It at last suddenly and spontaneously shut; and in the course of an hour she was able to speak a few words.

This attack was scarcely over, before the body, and, after it, the limbs began to bend backwards; but there was no return of the fits, cramps or spasms. Her deformity continuing, however, to increase, attained its present magnitude, which, in fact, it acquired within the first three months. From that time matters have remained nearly

stationary; and, during the whole period, in spite of her melancholy and helpless situation, the general health has remained unimpaired, with the exceptions already mentioned. In the course of her confinement she was bled repeatedly in the arm, and had setons, issues, blisters and leeches successively applied to different parts of the back: but neither they, nor any of the routine means usually employed, at all relieved the symptoms, or retarded the progress of the complaint.

Before she left her native place, *(Dunmow)* she was examined by not less than forty medical men, some of whom went from the metropolis, and from more distant places, for the purpose; she had removed to *London,* and been exhibited there upwards of a month before I heard of her. The object of this journey was, partly to obtain alms; but chiefly to procure, if possible, some alleviation of her afflictions, through the benevolent exertions of the faculty. An amiable young lady, whose figure I had restored, (by which means she had been rescued from pulmonary consumption) called to inform me of Sarah Hawkes, and desired me to "visit the poor girl, as an object of compassion and wonder;" not having the slightest idea that any relief could be administered. A few days after I had attended to her request, she called again upon the girl; and, observing the hand already at liberty, and seeing, that considerable benefit had been obtained in other respects, she wrote to me as follows:—

"I went to-day (Nov. 22nd) to visit little Sally Hawkes, and was much pleased, as well as gratified, to find the extraordinary improvement in her. I will not say surprised, after having myself received so much benefit from your skill." * * *

Nov. 15*th*, 1831.—Upon this day I commenced the treatment, by thrusting folds of soft linen between the knees and ancles, in order to separate them from each other. On the day following I could stir the arm a little. Upon the 19th, the limbs being considerably parted, I had the pleasure of removing the arm from its long imprisonment; but so great was the pain, upon taking it from its confined situation, for a few minutes only, that she urgently desired to have it replaced. Having disengaged the arm, I directed my attention to the back, in order to ascertain the extent of the deformity, and devise appropriate means of treatment. Upon turning her over, for this purpose, I found great irregularities in all the cervical vertebræ. One of the lower was driven forward, leaving an evident hollow behind. These discoveries being made, I resolved upon stretching the neck, hoping by this measure to replace all the vertebræ; and success justified my most sanguine expectations; the experiment leading to the immediate restoration of the natural state and appearance of the neck.

Frictions, from the first, were almost continually applied to the arm and scapula; in which parts the power of motion was rapidly increased; and on the 22nd (seven days only from the beginning of my interference,) the arm was finally released, and restored to perfect liberty; and, though it is yet weak, she can move it in every direction, as well as the other.

Nov. 24*th*.—Sarah Hawkes was this morning carried from her bed (where she had lain, without removal, curved in her body and limbs, as described*, for more than three

* See plate 1.

years ;) and, soon after the removal, she threaded a needle with her right hand.

27th. She has been turned upon her face for the three last days, in order to permit a sketch to be taken of her back, as well as to have it and the cervical vertebræ well rubbed. In this posture she remained for six or eight minutes, the first time; and has borne the change better upon every repetition. The tumor of the cervical vertebræ on the outside, is entirely reduced, and the neck sensibly elongated. She now swallows, with ease, and says that the lump which she had felt in her throat, from the time of receiving the blow, has quite subsided, since the extension of her neck yesterday, the 26th.

30th.—Has eaten two boiled eggs, and bread and butter several times, with great pleasure.

A shield* was yesterday forenoon placed upon the back, and confined *in situ* by means of a pair of stays. The unnatural and unsightly hollow of the back was filled up (almost entirely) with linen and tow. She wore the shield till I removed it this morning. The hollow of the back is already diminished, and the front of the body is straighter. The *longissimus dorsi* and *sacro-lumbalis* of the left are driven sideways by the curved spine, and considerably

* What I call the *shield* is a piece of thin deal, glued to leather on the inside, and stuffed with soft materials. It is constructed of various forms and sizes, to suit every species of deformity. In the present instance it was twelve inches long, and seven broad—of a long oval figure, extending from the nape of the neck, and resting on the nates. Several longitudinal incisions were made through the wood on each side, the better to adapt it to the shape of the back and sides. The shield being firmly secured by a pair of strong stays, the patient was turned and replaced, as well as possible, upon her back.

raised, especially in the loins; but there is so much tenderness in the spinal region, and over the back in general, that the slightest touch gives considerable pain.

Dec. 8th.—Since last report she is, in every respect, much better. She can now move freely every large joint of the lower extremities, and, to a considerable extent, in whatever position she may be lying. The right arm and hand have, for several days, been quite well, and the protuberance in the left side of the belly is nearly gone. The hollowness in the loins is also much lessened, and the muscular enlargement on the left side of the spine has almost disappeared. The tenderness of the back too has nearly subsided, for she can now bear to have it smartly rubbed for a considerable time, and even derives pleasure from the operation. She is in good health, is more plump, and generally much improved in appearance; sleeps well and swallows with perfect ease. Her diet is usually *tea* for breakfast with bread and butter.—*Mutton chops* or other *animal food, with potatoes and bread,* for dinner. She takes *tea and toast* in the afternoon, and her supper consists of *sago* or *tapioca,* with a small quantity of white wine.

Dec. 20th.—The patient is, in every respect, better: the limbs have freer action, and the fore part of the trunk exhibits but little deformity. The lumbar hollow is also reduced; the muscular enlargement is nearly gone; and the only tenderness remaining is over the eighth dorsal vertebra, where the seton was placed. This was kept open seven weeks and then dried up, without having afforded any relief.

Jan. 10th. 1832.—She daily improves—has the proper feeling, and free use of all her limbs. The right arm has,

for some time, recovered its natural strength; but though the lower limbs are active they are still weak. The only defect remaining in her back, is a slight curvature in the lower dorsal and upper lumbar portions of the spine, with a slight hollowness in the left loin.

Feb. 12*th.*—Her health continues excellent; she sleeps well, and increases in flesh. The slight remaining curvature is confined to the three inferior dorsal vertebræ, which were formerly the most distorted. The feet have recovered; and, to all appearance, have regained sufficient strength to sustain the whole weight of her body; though the right (which was always the weaker) is still more infirm than the other.

May 8*th.*—Of late there has been no perceptible difference, either in the strength or the activity of her limbs. Attention has, therefore, been chiefly directed to the vertebræ, as mentioned in last report. Two have, for some time, been wholly replaced; but the middle one, (which formed the top of the præternatural arch) having still resisted the means employed, and continued a little out of the line, a small piece of wood, grooved in such a manner as to prevent it from slipping, was placed on the right side of the spinous process, in opposition to and close connexion with it. Thus secured, the vertebra was compelled to enter the column, and was restored to its natural situation. On removing the apparatus it was found undisturbed; but slipped back again immediately. In order, therefore, to confine it more effectually, a smaller shield, made of the same materials, was placed upon the most obstinate vertebræ, and firmly bound there by an elastic woollen belt, which kept it tight and firm at all times. Under this treatment the recession daily became less, and the replace-

ment easier; rectification proceeding until the bone resumed its proper and permanent place in the spinal column.

July 24th. — Since last report the vertebræ have remained stationary. The spinal column has also been repeatedly examined, both before she left the crib and after returning to it, by experienced practioners, several of whom were entire strangers to me, and declared to be perfect. Sarah continues to enjoy excellent health. She has walked for a few minutes in her room six different times, at intervals of a week. She has the unrestrained use of her lower extremities, moving them freely in every direction, both in bed and while on foot. They are so weak, especially about the knees and ancles, that she requires, in walking, to be supported by a person on each side. The whole of the right limb is found, upon placing her weight there, to be more infirm than its fellow. She had not even attempted the erect posture for upwards of four years, when she first arose from the couch. The change of posture induced giddiness with a disposition to faint, but she has continued longer erect, and borne each trial better than the former.

She has lately increased in stature and so much in thickness, that her stays required to be enlarged several inches in width.

Nov. 29th, 1832.—She has been gradually advancing in strength and activity since the date of the last report; and is now perfect in her figure, health, and every other particular. The right lower extremity has also recovered its natural vigour. She continues to walk about her room, without inconvenience, at short intervals.

GENERAL REMARKS.

The increased attention paid of late to the spinal column and its numerous diseases, and derangements, has amply repaid inquiry; and has led to the most unexpected results. By this means we have discovered that whenever the spine is mis-shapen the subject of the distortion suffers from a variety of interminable pains and chronic ailments, which embitter existence, diminish usefulness, and generally abbreviate the term of life.

It is presumed that this narrative will, by no means, tend to lower the interests or lessen the impetus already given to this novel investigation.

In presenting to the public the case of *Sarah Hawkes* I would solicit attention to the most extraordinary instance of recovery from personal deformity and helplessness that has ever been witnessed, perhaps, in any age or country. Nothing at all approaching to it has occurred within my own experience, nor have elaborate researches and inquiries enabled me to detect a parallel example. As already observed,* a gentleman of considerable professional eminence, who knew this afflicted girl at *Dunmow*, exclaimed when he visited her on the 24th of November, (not a fortnight after the commencement of the treatment,) "the improvement is remarkable; it is wonderful; it is really

* See page xi. *Preface.*

miraculous." In this short space she had recovered the free use of her right arm; the lower limbs and trunk had become much straighter; she had moreover regained the power of moving slightly her toes, ancles, knees, and hip-joints. Her diet had, from necessity, been wholly restricted, ever since the occurrence of the accident, to milk and the pulp of fruits; but, deglutition having been, by this time, greatly relieved; she has for the last few days eaten with pleasure, boiled eggs, bread, butter, buns, and tapioca mixed with a little white wine. These articles she swallowed with facility, and declared that, after so long a period of privation, they were highly gratifying.

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This evening she was visited, upon my invitation, by *Sir Astley Cooper* and other eminent practitioners, who carefully inquired into the history of her case—observed the melancholy state to which she had been reduced, examined what method of treatment had been adopted, and ascertained the extent of the benefits received. After a minute investigation, of nearly an hour, Sir Astley, in particular, expressed his approbation of all that was doing, his confidence in the restoration of her figure, and (as I understood) ultimately of all her faculties. On retiring, he signified his readiness to attend again, whenever I should apprise him of my wish to that effect. Relying upon this assurance I waited upon him, a few weeks afterwards, (at his residence) during the progress of the cure. He received me with urbanity, and appointed a time for seeing my patient again; but, instead of coming himself, he sent his assistant with an apology, when a large party of medical gentlemen were assembled for the purpose of joining in the examination. The message included a statement that Sir A. would visit *Sarah Hawkes* on any future

day that might be convenient to me. My reply was to the effect that I should not call upon him again until the patient was quite well, but if he chose to see her before the completion of the cure, and signified such a wish to me, I would, with pleasure, give him the meeting. In this state matters remained until I wrote the annexed note, which, for fear of accident or miscarriage, I entrusted to a person on whose accuracy, in the article of delivery, I could rely :

"Holles Street, May 23, 1832.

"Dr. Harrison presents his compliments to Sir A. Cooper and is sorry that he could not make it convenient to visit Sally Hawkes according to his own arrangement. As she continued sensibly to improve from the time alluded to, Dr. H. did not wish to make any new appointment, till she was quite well. He now writes to say that her health, her figure, and the use of her limbs being all completely restored, he shall have great pleasure in meeting Sir A. Cooper, at No. 6, Meard's Street, Dean Street, on any early day that it may be agreeable to himself to see Sally. Dr. H. will then explain the several means employed, and in what manner they effected recovery."

As no answer has been returned to this communication, nor any explanation given, I am at a loss to account for *Sir Astley's* motives in declining the interview; I am the more surprised at his conduct on this occasion, because, I am told he has repeatedly expressed astonishment, both at the magnitude of the deformity and the benefit derived from my treatment.

I may here be permitted to add, that many similar,

though less extensive, deformities have been cured by me upon the principle adopted with Sarah Hawkes. Some of them, with full explanation of the treatment, have been several years before the public, and others are in preparation for the same ordeal.

In the mean time, it is a duty I owe to the afflicted to say, and—in so doing, I am impelled by no desire, either to give offence, or to hurt the feelings of any one,—that, had an illustrious stranger, who lately came among us, labouring under a spinal complaint, been treated in an *early stage* of the malady upon the plan above recommended, the incurvation would, probably, have been speedily corrected, and good health as certainly restored.

Instead of this happy result the tender sufferer has, under the antiquated and ineffective system, descended prematurely to the grave, her earthly course concluding almost before it had begun.

ON DISLOCATIONS,

AND THEIR CONNEXION WITH THE PRESENT CASE.

As I shall endeavour to trace the formidable array of symptoms to the protrusion of a single vertebra, it may be advantageous to commence this inquiry with a few general remarks upon the different species of luxation.

This young girl was, one forenoon, violently struck upon the neck, with the doubled fist of an adult female, and, immediately afterwards, fell over a bench or form, upon the floor, in a fainting fit. Five or six visitations of a similar nature followed one another, in the course of eight or ten days. She then took to her bed, for three weeks; but finding herself somewhat relieved she got up again and contrived to crawl about, for two or three weeks more. She was then obliged to return to bed, and she has never since been able to rise, for a single moment, from, or even to change, her posture in it.

On recovering from the first fit, she felt a lump in her throat, and, on attempting to eat her dinner, for the first time in her life, experienced considerable difficulty in swallowing. Both have remained unrelieved through the whole course of her distressing illness. The lump was not merely troublesome to herself, but could be distinctly seen by others. According to the mother's account the swelling projected forwards, beyond the rest of her neck; and, in

appearance, resembled half a pullet's egg cut lengthwise. The uneasiness in swallowing, and protuberance in the neck were present from the first, and continued unaltered till I stretched it several times, by pulling with great force at the chin and back of the head. From that moment she felt relieved. When I pulled the neck, she heard a snapping noise, and was sensible of an inward motion, which she said left a hole or vacancy in the throat. Scarely had I left the room when she exclaimed "Mother! the lump is gone, and I am sure I can swallow any thing." From that moment deglutition became easy, and the protuberance disappeared. The face, too, having lost its obliquity, looked directly forward, nor did the chin rest any longer upon the chest. From this improvement in the state of the neck, the head also had risen higher, and stood erect. The cervical vertebræ having resumed their natural places, the neck became considerably longer, and the enlargement behind, (which led a talented physician to believe that suppuration had actually formed in the part,) was already gone. On seeing her, a few days afterwards, he expressed his astonishment at the altered appearance of the neck—he exclaimed, "at my former visit it was short, thick, and protuberant behind; but it is now quite natural—What has occurred to produce this agreeable change?"

That a great improvement had been effected in the condition of her throat was evident, not only from her own statement, and the ease with which she swallowed, but from the more shapely appearance of the neck before and behind; and this remarkable alteration and alleviation of her afflictions were produced by changing the relative situations of the *cervical vertebræ.*

The blow was severe enough to drive her over a bench,

or form, (such as is used in schools) upon the floor; and she was taken up senseless. After the accident she was tantalized with the miseries of starvation, for three years; having both inclination and food sufficient to eat, but tormented with loss of the power of swallowing.

The inconveniences here described were produced by the dislodgement of the sixth cervical vertebra from its proper place. It had been forced forwards into the throat, and contracted the œsophagus by pushing the back of this soft and unresisting tube against its anterior paries. This is the only conceivable cause of the reduced dimensions of that organ, as well as the girl's inability to swallow solids for so long a period. Respiration continued tolerably easy, because the firmer structure of the wind-pipe kept it in a state of distension sufficient to admit air enough for the purpose required.

There are many medical men who still deny the possibility of vertebral dislocations, from whatever cause. I shall, therefore, take the liberty of recording some of the reasons which led me first to advocate a different doctrine, and found upon it my pathology in cases of vertebral distortion. Having already treated the subject at considerable length, I shall here restrict myself to a brief detail, and refer the reader elsewhere for clearer elucidation.*

The spinal column is a complex organ, composed of a variety of parts, curiously put together. These are easily deranged, although it is a prevalent opinion that they cannot be displaced: but if any of the parts slip, ever so little, the joint is really dislocated; and when entirely disunited,

* The reference is to my work, entitled "Pathological and Practical Observations on Spinal Diseases."

the dislocation is complete. In order to decide this important question, and to silence opposition, I instituted a series of experiments which have succeeded entirely in removing any doubt. I have, in my museum, the skeleton of a rabbit, shewing partial luxation between the occipital bone and the atlas. It is a custom with sportsmen to kill their wounded or mutilated game, by inflicting a smart stroke behind the head, which produces immediate death, with scarcely any struggle on the part of the animal. Being desirous of ascertaining for myself the nature and course of these matters, I procured several rabbits, which were killed in Mr. Tuson's anatomical theatre, by one smart blow, given to each, in the nape of the neck. After a short agitation in the limbs, probably arising from lingering vitality, all became quiet, and we proceeded to investigate the immediate cause of death. An evident separation was apparent between the occipital condyles and the atlas. The component parts of the joints still adhered to each other (as may be seen on inspecting the preparations) being overlapped, as it were, more or less. Such a state constitutes *dislocation;* but, unless the bones are entirely detached from each other, and disunited, the dislocation is deemed partial or incomplete. Some admit the fact of subluxation in brutes, but deny it in man. The case of *Williams* the murderer (recently executed) furnishes a complete answer to this objection. When he was hanged, the spectators remarked that, after suspension, his sufferings were remarkably short. In pursuance of the sentence of the law, his body was ultimately removed to the theatre of Mr. Tuson, for the purpose of dissection; and on examining the head, as well as its connexion with the vertebral column, an evident luxation was discovered between them.

The left condyle of the occiput projected considerably over the theca, and could be felt protruding into it. I impute the sudden extinction of life, in this man, to the pressure of the condyle upon the spinal cord, above the origin of the phrenic nerves. When their functions are interrupted, respiration stops, and life is immediately extinguished. It was not, however, a perfect luxation or dislocation. The truth of the foregoing statement may be easily proved by examining the parts, which are, I believe, still preserved, and may be inspected by application to Mr. Tuson.

It is thus clearly ascertained that the vertebræ do admit of partial or incomplete dislocation, from external violence; and it is equally true that the same result is frequently produced by constitutional causes. Of the latter the work above referred to records many examples. If the constituent parts of the joint be only *partially* separated, be the separation ever so small, the joint is equally *dislocated*, but unless the removal be complete, the disease is, in technical language, designated *subluxation*.

It is of the greatest consequence to successful practice that this distinction should not be lost sight of, because, although many articulations will not admit of the former, they are all liable to the latter; and, where practitioners neglect to furnish themselves with this knowledge, or to apply it to practical purposes, loss of reputation is the usual and just consequence. They have frequently also the mortification to hear that some bold pretender, or irregular person, such as may be found in every district, has eclipsed them by succeeding in restoring the free action of the joint, through means, which self-confident persons, clothed in professional orthodoxy, thought proper to despise, or neglect. But the sick, not to be diverted from

their object by empty clamour, will give the preference to those whom they conceive to deserve it.

From the want of due distinction, among the varieties of *dislocation*, innumerable cripples are now suffering from an erroneous notion entertained of their complaints. *Most of those who are seen limping about this metropolis with a long leg and a short, owe their misfortune to a bend in the lumbar portion of the spine, and not, as is commonly supposed, to any injury about the hip-joint.* Such a twist forces up one edge of the pelvis, while it depresses the other. The limbs, in connexion, partaking of the obliquity, become of unequal lengths—not from any disproportion in themselves, but from the irregularity inflicted upon their attachments. This very common defect is generally overlooked, and often confounded with disease of the joint; but no two complaints are more unlike, or require to be distinguished with greater care. Confounding them leads to erroneous practice, and incurable lameness: but when the real nature of such ailments is discovered in time, the lameness proceeding from the state of the lumbar spine may be speedily removed, (a fact which extensive experience enables me to guarantee,) and the limbs made to correspond exactly. Upon the advantages resulting from such a procedure, there can be no occasion to enlarge; they must, necessarily, speak for themselves.

A practice has obtained a footing in this country, and is even popular with many; although I attempted, several years ago,* to shew, and succeeded, I think, in proving that, as concerns the objects contemplated, it is wholly inoperative and useless: but while its patrons and advo-

* See "Pathological and Practical Observations, &c."

cates do not hesitate to recommend their system to invalids, none of them venture to enforce the measure by referring to authenticated cases, in which it has succeeded, or even been found salutary. By such references alone do I wish to ensure confidence. Let the encouragers of other modes adopt the same ingenuous course, and they will enable all parties to arrive at satisfactory conclusions, on points of vital importance to millions of the human race. I allude more particularly to the muscular system; and shall slightly advert to a few circumstances connected with it; because, under existing difficulties, many will feel surprise, if not disappointment, should nothing be said about the curative influence of the muscles in spinal diseases generally, and especially on the present occasion, when their extensive contraction effected so much in the production of the complaint.

It has been admitted that, in Sarah Hawkes, the distortion of the trunk and limbs was entirely owing to the violent and irregular action of the voluntary muscles situated upon the contorted parts; but it does not appear that the muscles immediately attached to the vertebræ were peculiarly affected in any stage. They might, and probably did, combine with the rest to produce the general spasm, although even that was not manifested by any obvious symptom. In forming remedial indications no particular regard was bestowed upon them at any period, nor did they contribute in the least towards the cure. The rectification of the bent spine was effected by means wholly independent of them. When the back first came under consideration, the sufferings of the patient were so much increased by the posture, that I found it impossible to keep her long enough upon her face and chest to permit me to

make an accurate examination. Every part was, at the first glance, seen to be much deranged, and out of its proper place. As the spinal column assumed better dispositions, the whole back acquired a more natural conformation. The muscles, in particular, following the movements of the spine, gradually returned to their former situations along with it, and are now firmly established in them. This was evident at all times, but most so, on the left side, in front and contiguous to the bent spine. Here the displaced *longissimus dorsi* and *sacro-lumbalis* had, together, formed a considerable ridge in advance of and close to the three most protuberant vertebræ, as already described. This swelling proceeded from no enlargement of the muscles; for they, as appeared in the sequel, were sound, and corresponded with their antagonists of the same denomination. The extraordinary fullness was, therefore, owing entirely to their unnatural position on the back, and to no other cause. The muscles were, from first to last, quiescent and inactive. In this extraordinary case, therefore, we have a singular proof that the most contorted and mis-shapen spines are capable of entire replacement, without either muscular assistance or interference. So convinced am I of the fallacy of the popular doctrine, and of its inability to produce any beneficial change in spinal deformities, that I never depend upon the muscles, or call them into play. My efforts are wholly directed to the articulating structure of the vertebral joints; in consequence of which I invariably find that through it, I am able to subdue the defective arrangements of the spinal column, under every variety of mutation: nor can they (as far as I know) be restored by any other practice. This, at least, is certain—that hitherto they have effectually resisted every other method; while

some, with equal parade, affect to rouse the muscles into action, according to their peculiar motions, and make invalids assume many grotesque postures, to no good purpose, however long the manœuvres are continued, or however they may be varied. But facts being preferable to conceits, however well concocted and ingenious, I shall conclude by urging the abettors of this doctrine, *(as I have often done before,)* "to produce well authenticated examples of their success, *illustrated by casts and engravings.*" To these calls they have not hitherto responded, conscious, no doubt, of their inability to defend a practice, which, *unless aided by recumbency*, has not, I maintain, abated the deformity of a single individual.

ON MUSCULAR CONTRACTION.

The first thing which claims notice in this singular case is, the rigid tonic, or constricting spasm in the muscles of the trunk and limbs. Not one of these entirely escaped, and many of them were permanently contracted, and continued so, during more than three years. When she became my patient, the left arm alone, of all the extremities, retained its natural power, through the whole course of her illness, though at one period it was occasionally convulsed.

Before entering upon the investigation of symptoms, I think it may be advantageous to give a brief sketch of *the nervous faculties*; after which, the general reader, more especially, will be better prepared to understand the details, as well as to trace the symptoms to their source, in the spinal column.

For our present purpose we may comprehend the nervous system under three divisions.

I. *The organs of sensation.*—These are the media by which the mind communicates with external objects; they are the avenues through which perception finds its way to the intellectual constitution of the reasonable being; in other words, by means of them impressions are interchanged between the sensorium, *(or brain,)* and all that may be beyond the narrow compass of the physical frame.

These organs are five in number—four of which are, for obvious reasons, placed in the head; viz., those of *sight*, *smell*, *taste*, and *hearing*. In Sarah Hawkes none of these was at all impaired, excepting the first, which participated, by sympathy, in the disorder of other parts of the nervous system. The last organ, (that of *feeling*,) consists of nerves universally distributed throughout the system, which could not, from their origin, destination, and extensive communication, escape unhurt, as they are enveloped in the same coverings with the nerves of motion.

II. The great sympathetic, or ganglionic nerve, is expanded upon the viscera: this remained undisturbed throughout the whole of her illness.

III. The muscles situated on the outside of the body were, to all appearance, alone affected in the course of this singular malady. These constitute an apparatus of vast extent and importance, producing, by their contraction, all the changes of position and situation, observable in the actions of animals. Locomotion, and all other movements, are effected by these active organs. They are to be met with in every part of the frame, and present the greatest diversities of shape and figure, in order that they may more conveniently discharge their respective functions. In the human subject they are divided into two great classes, which may be denominated the *external* and the *internal:* the first vary much in point of size; are attached to the skeleton, to the organs of sense and of voice, and to the skin. They contract under the direction of the will, and assist eminently in performing the animal functions.

The second are hollow, often resemble membranes in appearance, and perform offices similar to those of vegetables.

The external muscles (which are also called *voluntary*, or muscles of animal life) are very numerous; but their amount cannot be precisely ascertained, some anatomists setting that down as *one* which others consider to be a combination of several. We may safely estimate them at more than 300. In general a muscle is described as having a belly and two extremities, one fixed, and the other moveable. They are surrounded by cellular substance, which keeps them distinct and free to act; they are supplied with a great number of nerves, each being furnished with at least one; many of them with more; and all the nerves involved in the derangement of Hawkes's system, emanated from the spinal cord. The muscles are possessed of great irritability, and perform their functions through the nervous influence, upon which their activity totally depends. This is well seen in the interior movements of muscles in a state of excitement.

When the nervous influence is exerted upon a particular muscle, the fleshy fibres are suddenly bent in different parts of their length, and are, at the same time, sensibly shortened; by which, what is termed *muscular contraction*, is produced. Hence the attitudes and changes which are displayed in various parts of the body. The gestures, voice, movements in the various organs, (the skin included,) as well as those which execute the internal functions, are all referrible to this one cause.

Many opinions have been entertained, and much ingenuity has been exercised upon the investigation of muscular action; but the success has not been equal to the labour. The property on which this action depends is one of those mysteries connected with the impenetrable subject of vitality which we cannot approach even with probable conjec-

ture, much less reach with satisfactory explanation. There is nothing known, of an analogous nature, to which it can be compared; and we must, therefore, be contented with observing its phenomena.

A free circulation of blood, through the muscular vessels, is indispensible to their contraction; for a muscle is rendered paralytic, by tying the artery. The unrestrained access of nervous influence is equally necessary. Of this there are proofs incessantly occurring, and we take advantage of our knowledge of the fact in the treatment of many diseases. This action may be involuntary or irregular, but still it springs from the nervous centres, although the effects take place in the fleshy parts of the muscles. Muscular contraction, arising from the approach of the fibrous parts, in a manner peculiar to animated beings, is exerted with enormous force. The power, too, with which a muscle contracts, is in proportion to the number of its fleshy fibres, and the extent of surface to which these are attached; but the degree of contraction, or the extent of motion, is in proportion to their length. The limits of contraction differ in the long and circular muscles; for the former do not contract more than one-third of their length; while the circular fibres of the stomach, which (in the utmost extent of their dilatation, may be expanded to a foot in circumference,) will, after long fasting, be reduced to a circle of not more than an inch. In circular muscles it must be stated, that fibres do not run completely round; they are collected in bundles, and terminate at particular places, some beginning where others end. Each may, therefore, admit only of a limited contraction, while the dilatation just mentioned may be the sum of the whole.

Whatever may be the variation of muscular contraction,

the phenomenon is attributable to nervous influx. Its intensity its thereby regulated, as also its extent and rigidity. The contraction is more or less vigorous, and continues for a longer or shorter period, according as this influx is more or less rapid, intense, or prolonged.

In attempting to explain the cause of muscular action, we shall pass over all other hypotheses as being more ingenious than well founded, confining ourselves to that which favours the opinion of an affinity between *electricity* and this phenomenon. The nervous power, acting, in the first instance, on the muscles, it is natural to infer that this influence (whatever it may be) produces muscular motion. Again—among the conjectures relating to nervous matter, that which ranks it among imponderable substances, or considers it to be a modification of electricity, seems to carry the greatest share of plausibility. It is not quite essential to our present purpose to narrate, at any length, how, both during life, and for some time after death, the nervous influence has been successfully replaced by a current of the electric or galvanic fluid, thus reviving the chief resemblances of life, muscular contraction, secretion, the evolution of heat, digestion, &c. The new discoveries in physical and chemical science have shewn that *electricity* exercises vast sway in the production of all the phenomena observable in Nature — that it is extensively diffused through space, and is the most powerful of all natural agents. Upon the whole, then, we have great reason to believe that *the nervous power is only a modification of the electric*; and that muscular action is, in some respects, an electrical display.

Numerous experiments, of a highly interesting nature, have been made, both at home and abroad, to ascertain

the possibility of resuscitating animals recently killed, by passing the galvanic fluid through different parts of their bodies. Those recorded by Dr. Ure* are the most interesting, scientific, and conclusive. An athletic malefactor, about thirty years of age, having been suspended in the usual way for nearly an hour, was subjected immediately to the action of the galvanic fluid. The spinal cord being laid bare above the atlas, and the sciatic nerve in the left hip, a third cut was made into the heel on the same side. "The rod connected with one end of the voltaic battery was now placed in contact with the spinal marrow, while the other was applied to the sciatic nerve. Every muscle of the body was immediately agitated with convulsive movements, resembling a violent shuddering from cold. The left side was generally most powerfully convulsed at every renewal of the electric contact. On moving the second rod, from the hip to the heel, (the knee having been previously bent,) the leg was thrown out with such violence as nearly to overturn one of the assistants, who, in vain, attempted to prevent its extension." Having succeeded in producing the most violent contractions in the *external or voluntary* muscles, Dr. Ure next tried the efficacy of galvanism upon the *internal or involuntary*. For this purpose the phrenic nerve, or that which runs to the diaphragm, was laid bare three or four inches above the clavicle, and a small incision made under the cartilage of the seventh rib. The galvanic fluid being then set in motion, "full, nay, laborious respiration instantly commenced. The chest heaved, and fell; the belly was protruded, and again collapsed, with the relaxing and retiring

* See "Dictionary of Chemistry."

diaphragm. This process was continued, without interruption, as long as I continued the electrical discharges."

This highly interesting narrative will receive illustration and confirmation, by viewing it in connexion with the natural history of certain fish, so far as regards a remarkable power which they possess of displaying electrical action. I allude to the *gymnoti,* or electrical eels, which have long been considered objects of great curiosity and amusement. Each of these has an extensive voltaic apparatus placed upon the back, seemingly in communication with the brain and spinal marrow; and it serves the twofold purpose of catching food, and defending the animal from its enemies. Their prey, being first stupefied by an electrical discharge, is easily seized; and the eels possess the power of making this discharge with such force as to paralyze, and even to destroy, large animals.

The Baron de Humboldt, in his Personal Narrative of Travels to the Equinoctial Regions of the New Continent,* gives an interesting account of some observations made upon the *gymnoti.* There are several *torpedoes* or electrical fish mentioned by him; but the real gymnoti are very common in the rivers of America; though the natives see them less frequently than they feel their shocks when swimming in the water. It was with the utmost difficulty that any were obtained at *Calabozo,*† although the waters about there are filled with them; the Indians being exceedingly averse to meddling with them. It was found

* Vol. iv. chap. 17, of the Translation by H. M. Williams.

† Calabozo is a town in the province of Venezuela; lat. 8° 54′ N., 156 miles S. of Caraccas, and the same distance N. of the Orinoco, situated near some tributary streams to this river; in which, as well as the Amazon and other large rivers, the fish abound.

very difficult to catch them in nets, on account of the readiness with which they bury themselves in the mud. There are certain plants (named by the Baron) which intoxicate or benumb the animals, but these would, by enfeebling, have unfitted them for the purpose in view. At length the Indians brought about thirty wild horses and mules from the Savannah, and drove them into a pool. The noise of the horses roused the eels, which crowded under the bellies of the quadrupeds, and a battle ensued. The Indians, by means of long reeds and loud cries, prevented the horses from running away; while the astonished and stupefied fish defended themselves by repeated electrical discharges. Several horses sunk beneath these invisible strokes. A few made their escape, but fell exhausted with fatigue, and benumbed by the strokes of the eels.

After a protracted contest the *gymnoti* dispersed. They require long rest and abundant nourishment to repair their galvanic force. After the combat subsides the fish approach the shore, in a timid manner, and are taken by small harpoons, fastened to very long cords: when the cords are very dry, the Indians feel no shock in raising the eels into the air.

These animals live in waters, the temperature of which is 26° or 27°; the electric force diminishes when the water is colder. Animals endowed with electromotive organs are never found in the air, but in a fluid that is a conductor of electricity. Some gymnoti measured from 5 feet to 5 feet 3 inches. The skin is constantly covered with a mucous matter, which conducts electricity twenty or thirty times better than pure water. The back is marked by two rows of small yellow spots, every one of which contains an

excretory aperture. No electrical fish (and seven sorts are certainly known) is covered with scales.

The gymnotus is possessed of a swimming bladder, resting upon the electrical organs, which fill more than two-thirds of the animal. The medullary substance of the brain displays but a feeble analogy with the albuminous and gelatinous matter of these organs.

The first shocks of a large and vigorous gymnotus are very severe. Humboldt never received so strong a shock from a large Leyden jar as he did by placing both his feet on an eel just taken out of the water. He was affected, during the rest of the day, with a violent pain in the knees, and in almost every joint. "To be aware of the difference between the sensation produced by the pile of Volta, and an electrical fish, the latter should be touched when it is in a state of extreme weakness. The gymnoti and the torpedoes then cause a twitching (Subsultus tendinum) which is propagated from the part that rests on the electrical organs, as far as the elbow. We seem to feel, at every stroke, an internal vibration, that lasts two or three seconds, and is followed by a painful numbness." The electricity, however, Monsieur de Humboldt considers to be the same; although the sensation of a weakly charged phial and the fish is different.

In Dutch Guiana (Demerara) electrical eels were formerly employed to cure the paralytic.*

The electric action of the fish depends entirely on its will. They often tried the fish without receiving any shock; and it depends upon the gymnotus to direct the shock towards a particular point. If two persons touch

* Something analogous to this is alluded to among the ancients, and particularly by Galen.

the belly of the fish with their fingers, an inch asunder, sometimes the one, and sometimes the other, will receive the shock. The fish sometimes appeared to direct its strokes from the whole surface of its body, and sometimes from one point only.

The electrical organ acts only under the immediate influence of the brain and the heart; for, on cutting a very vigorous fish through the middle, the fore-part only gave shocks. The action upon the organs of man is transmitted from the fish, or intercepted by the same bodies that transmit or intercept the electrical current of a conductor, charged by a Leyden phial or Voltaic pile.

Sparks have been seen by placing the gymnotus in the air, and interrupting the conducting chain by two gold leaves pasted upon glass, and a line asunder; but no one has yet seen a spark issue from the body of the animal. The nervous system would appear to be subject to the same agents as the nerves of other animals. On baring their nerves they undergo muscular contractions at the simple contact of two heterogeneous metals; and M. Fahlberg, of Stockholm, found that the fish was convulsively agitated by feeble discharges from a Leyden phial, passed through its skin. Their muscular flesh is eatable; but the electrical organ is disagreeable to the taste, and is separated from the rest of the body, the greater part of which it fills. M. de Humboldt does not relate any dissection of the fish, or give any description of the electrical organ, beyond what is contained in this abridgment. He thus concludes his account:—

"The brilliant results, which Chemistry has obtained by means of the Pile, have occupied all observers, and turned attention, for some time, from the examinations of

the phenomena of vitality. Let us hope that these phenomena, the most awful and the most mysterious of all, will occupy, in their turn, the sagacity of natural philosophers. This hope will be easily realized, if they succeed in procuring anew, living gymnoti in one of the great capitals of Europe.* The discoveries that will be made on the electromotive apparatus of these fish, much more energetic and more easy to preserve than the torpedoes, will extend to all the phenomena of muscular motion subject to the will. It will, perhaps, be found that, in most animals, every contraction of the muscular fibre is preceded by a discharge from the nerve into the muscle; and that the simple contact of heterogeneous substances is a source of movement and of life in all organised beings.

"Did an ingenious and lively people—the Arabians—guess, from remote antiquity, that the same force which inflames the vault of Heaven in storms, is the living and invisible weapon of inhabitants of the water? It is asserted that the electrical fish of the Nile bears a name in Egypt that signifies *Thunder*."

We are indebted to *John Hunter* for an anatomical examination of the *electrical* organs of fish, which may be alluded to, by way of appropriate appendix, to M. de Humboldt's account. These animals are furnished more profusely with nerves than appears to be required for the ordinary purposes of nature. In some of them the nerves, distributed upon the galvanic apparatus, proceed from the brain; in others they take rise in the spine; but in all they can be distinctly traced into the electrical organs, where they are distributed and finally terminate. To these the

* It should be remarked that the gymnoti are tameable.

fish are indebted for the extraordinary powers which they display, or withhold, at pleasure. They can also direct the electrical discharge to any precise point, and repeat the shock with the same degree of force more than 100 times in a minute. The fluid is never accumulated in any particular spot, as in a Leyden phial; nor has it been seen to issue from the fish, or known, on its escape, to make the least noise. Received into a suitable medium, and at some small distance from the animal, it becomes visible, and displays the ordinary characters of electricity under other circumstances.

Are we to conclude, from these established facts, that the fluid does not exist in the fish ready formed; but that it is produced or excited at the time of the demand for its application? And may it not be probable that the base only of the electric matter is furnished to them, which, upon combining with some proper substance, at the moment of escape, is changed by this union into true electricity? Upon some such supposition we might readily understand why the fluid is not *accumulated* in these animals. It would appear farther to be capable of explaining certain circumstances connected with physical electricity, which have hitherto been difficult of comprehension.

Tremors arise from imperfect muscular action, the irregular or diminished supply of which occasions *palsy*. Permanent contractions cause tonic spasms and tetanus; and when these are uncontrollable and inordinate, they are denominated *clonic* or agitatory. These various effects may proceed from causes acting directly upon the muscles, or upon the nervous cords, and also upon the spinal column itself. Muscular action, however, is never wholly discontinued. It is least active in sleep. In that state the head

inclines forward, and the limbs are drawn backwards. The relative strength of antagonist muscles is worthy of attention. We find the flexors are stronger than the extensors; for the body, in the quiescent state, is always curved. The cause of this superiority, in point of strength, is referrible to the greater size and number of the fibres of the flexors; and it is by this superiority that the uterine fœtus is bent into a sort of ball.

Some authors have maintained that the nervous influx is not necessary to the contraction of muscles, possessing irritability as a property essential to themselves; but as we never find this subsisting for any length of time, independently of life, we must consider it as a condition of vitality, and wholly subservient thereto.

Having established the indispensable connexion of muscular action with the nervous power, there can be little hesitation in referring all the sufferings of our patient to undue pressure upon the spinal marrow. The sixth cervical vertebra being driven forward into the throat, carried the marrow with it; whereby the vertebral tube became altered in its calibre and direction, the important contents partaking of the derangement, insomuch that the cord itself, and also the nerves issuing from it, through the notches of the part, were rendered incapable of conveying a healthy impulse to the organs connected with them. These suffered, consequently, in their functions, and a general spasm was produced in the external muscles. The flexors being naturally more vigorous than the extensors, they prevailed over them, and, in the course of three months, drew the trunk and limbs into the grotesque and extraordinary attitude described in the first engraving. Admitting the foregoing explanation in its fullest extent,

and that it accounts, satisfactorily, for all that took place *below* the neck, how shall we be able to embrace in it the explanation of what was seen *above* the injury? In the various fits which came on, there were twinklings of the eyelids, dilatation of the pupils, falling of the chin, and loss of voice—forming a very conspicuous train of symptoms; and all these appeared either in the face or in a part of the neck, higher up than the displaced vertebra. It has been already shewn that the spinal nerves suffered in every stage of this disorder, and that they are to be met with in all parts of the frame; for, although no nerve, arising below the sixth cervical vertebra, passes direct to the organs mentioned, several intermix much with nerves which do proceed to them, and by *sympathy*, or some other immediate impulse, communicate to them the regulation of their functions. The chin and eyelids receive their nerves from different branches of the fifth pair. The iris, in which the pupil is stationed, obtains its supply from the ophthalmic ganglion, consisting of fibrils from the third and fifth pairs. The organ of voice is chiefly furnished from the recurrents, and several spinal nerves, through the medium of the superior cervical ganglion. The fifth pair issues from the medulla oblongata; the third from the crura cerebri; the recurrent branches of the par vagum from the medulla; and the spinal nerves, referred to, from the superior cervical vertebræ. It follows, therefore, that the affected organs receive their nervous influence from a higher source than the displaced vertebra. Although this be anatomically true, the nerves situated below have such an extensive intercourse and uninterrupted communication with the others, that impressions made upon one set are promptly conveyed to the rest. These connexions lay the

foundation of those curious sympathies which are so prevalent in the living system, and have, by no means, received the attention they deserve. Enough, however, has been done to encourage perseverance; nor is it too much to say that a new light has already broken in upon this department of *Physiology*, which, when duly taken advantage of, will lead to unexpected and important results.

Although I have adopted the ordinary classification of muscles, I am aware that it is defective and objectionable. The terms *voluntary* and *involuntary*, as employed by the best authorities, have a direct tendency to mislead. There are no muscles, strictly speaking, *voluntary*, because they do not invariably obey the will; and, in few instances, has a disorder been met with in which the muscles in question were so generally affected as in the case of Hawkes; yet the patient could exert no influence over any of them during several years. We observe a similar loss of control in *tetanus*, and in the common *cramp*, as well as in many other convulsive complaints, which may be said to attack persons in perfect health.

On the other hand, those called the *involuntary* muscles are, to a certain extent, under command;—respiration, the action of the intestines, and of the bladder, (which are usually considered *involuntary functions*) are illustrative of this remark. But a noted example of an involuntary organ being subservient to volition has been recorded by the celebrated Dr. Cheyne.* He attended Col. Townsend in his last illness, and this gentleman had the power of extinguishing, or rather of suspending, the action of the heart at pleasure; a power, however, which he discovered

* Who died in the year 1742, and is best known as the author of a work on what was styled "The English Malady."

himself to be possessed of, within a short time of his death.* Now, if any organ of the body be entitled to the distinction of *involuntary*, as regards its action, it certainly is the heart. In opposition to the above statement, it may be said, that, as the exceptions arise either in disease, or, at any rate, very seldom occur, they deserve little or no attention; but the language of science should be clear and distinct, otherwise our ideas will be confused. To get over the difficulty in the present case, I would propose the discontinuance of the terms *voluntary* and *involuntary*, and that the muscles be styled either *external* and *internal*, or those of *animal* and of *organic life*; these terms being well defined and understood. By substituting them for the others, we shall free this part of our subject from unnecessary obscurity.

* This singular account is quoted at large in Dr. Gordon Smith's Principles of Forensic Medicine, though for a different purpose of illustration.

ON THE INCREASED DEGREE OF TENDERNESS.

In the back of this child there was an unusual degree of tenderness, when she was turned over for the first time. It was not confined to any distinct spot, or particular set of muscles, but extended, more or less, over the whole. As the spinal column regained its ordinary figure the pains abated; and, without the aid of medicines or applications of any description, for some time,* receded altogether. The greatest sensibility was, at all times, in the situation of the seton, and by the 20th of December the pains were confined to the marks of this remedy. In less than two months, however, from the commencement of my treatment, she not only could bear to be touched, but derived pleasure from the parts affected being smartly rubbed by the palm of the hand. Such pains are usual attendants upon *incurvations of the spine,* in which cases, *leeches, caustic issues, blisters* and *setons,* constitute the ordinary routine of practice; and they were all resorted to in this case without avail. On my removal to London I found, in such cases, that the neighbourhood of the spine invariably displayed abundant proofs of these cruel and useless expedients. It was the engrossing practice—no other being thought of; but sometimes they *appeared to* do

* See page 8.

good, as quietude, to some extent, was necessarily observed at the same time. The relief, when any was obtained, was erroneously referred to them; but, according not only to my own experience, but to that of others, no irritating local applications have ever of themselves been of the slightest benefit, and they have been persevered in rather because they were sanctioned by time and great names than from any remedial advantages obtained from them. That a coarse, painful, and troublesome practice, of more than equivocal utility, should have been so long blindly followed, shews that the medical faculty are not distinguished for consideration—that they are, in general, more capable of following the track of others than of chalking out a path for themselves.

I have not found it necessary in a single case of spinal malady to adopt any active local plan. Constant recumbency on the back has of itself removed the pains in that quarter, and the tenderness has often (according to the statement of patients) much sooner receded than where rest had not been associated. The affection has been generally ascribed to inflammation in the spinal cord; but not to dwell upon the impracticability of ascertaining the true state of the cord, (inclosed and inaccessible as it is within a thick bony tube,) I must withhold my assent to the doctrine. Dorsal tenderness in these complaints often continues of the same intensity for many years: but it is the nature of inflammatory pains not to remain stationary; they are always progressing either towards recovery or some other termination. For this reason I deny the existence of inflammation in the usual forms of spinal curvature, being of opinion that the symptoms admit of an easier and more consistent explanation. The numerous muscles

situated on the back and trunk receive (as has been already explained) their nervous supplies from the cord: the bundles at their departure from the vertebral holes dividing into several branches, one turns round, and passes to the muscles of the back. In making this detour on ordinary occasions, the nerves glide along, and are neither stretched nor pushed against the bony sides or mouths of the holes; and the nervous energy meeting with no impediment, moves along the destined channels to its ultimate termination, where the proper offices or functions are correctly performed. In the misshapen or deranged spinal column, the results are very different. The vertebral notches are displaced from their proper situation, and assume other directions, the two sides thereby ceasing to correspond exactly. On these occasions it is found that the mouths of the notches have assumed a new termination, and an unnatural presentation; to which single cause, and its influence over the nerves of motion must be imputed many of the chronic pains which, in these disorders, afflict the back and limbs; and I am the more confident that the *rationale* now offered is correct, as it is every way consistent with my own experience. This much, as least, is certain—that pains and functional derangements, which had, for years, resisted every other treatment, have been permanently cured by restoring or improving the structure of the vertebral pillar.

The above-mentioned displacement of, or disagreement in the vertebral notches is no fanciful picture of my own: it rests upon an unerring anatomical basis, and may be easily verified by examining and comparing healthy with deformed spines—a thing that may be done in any tolerably furnished museum.

ON THE PARAPLEGIA.

There is much discrepancy in the opinions of medical men concerning the nature of *Paraplegia.* While the majority considers it to be a disease, the seat of which is in the brain, they admit that it manifests itself only in parts, deriving their nervous influence from the spinal marrow. In coming to this hasty conclusion they reason from insufficient data, and set out with a fundamental error. As far as my own experience enables me to form a judgment, the seat of Paraplegia is never in the brain, but is always an affection of the nerves of motion, the medulla ollongata, or the spinal marrow. This is a pathological distinction of great practical importance; and, if it be true, remedies applied to the brain are never of the least benefit, but must frequently do absolute mischief. As a proof that, in the present instance, the disorder was independent of the brain, the mental faculties never suffered in any stage of the complaint. The mind was always in full vigour; and, although the sufferer was resigned to her situation, she felt acutely her forlorn and melancholy situation. Had the malady been seated in the brain, the intellectual faculties would have been more or less disturbed. Their continuing otherwise, however, affords the most convincing proof that the *paraplegia* was in some other organ. In confirmation of this conclusion it may be farther observed, that as the

deformity of the back was corrected, the paraplegia abated—the one improvement keeping pace with the other; consequently, we cannot help deciding that this disease was situated exclusively in the spinal column. To the same conclusion we should be led, by attentive consideration of the symptoms; for although the lower extremities had lost their activity, their sensibility was morbidly increased. Both these faculties are derived from the spinal marrow, but the nerves furnishing them issue from different portions.

The nerves of *feeling* originate from the posterior column;—those of *action* from the anterior. In traversing the vertebral holes the two portions continue separate and distinct; but, on escaping out of them, they are collected together, and, (involved in the same coverings,) proceed to the remotest divisions of the frame. As these nerves remain at first apart, and are only joined together at their exit from their bony notches, we can easily understand why they should be differently affected by the same causes, and exhibit (as in the present instance) a contrariety of symptoms. In misshapen backs the vertebral notches I have already stated* do not exactly fit one another as in well formed spines, aud therefore the bony mouths cease to make their natural presentations. Such want of correspondence is discoverable in every distorted spine, although it is more apparent in some instances than in others. Persons unaccustomed to the inquiry, and who have not themselves carefully examined misshapen skeletons, would be surprised at observing in spinal distortions the alterations of form and of anatomical agreement as regards the verte-

* See page 43.

bral holes. The difference is not only obvious, but *striking.* In some the two sides of the notches considerably overlap one another whereby their calibre is reduced. The tubular ends also form a waving line from one extremity of the column to the other, and in which no two of the notches correctly fit. By these irregularities the nervous bundles are driven against the hard sides and mouths of the bony canals, so as to impede and derange their important functions. The effects are never manifested in the large trunks; they are only perceived at the ultimate terminations, shewing themselves under many different aspects. Where the pressure is considerable, or the irritation great, the effects are in accordance. When the nerves of motion suffer, be it ever so little, the corresponding muscles are debilitated, and subject to cramps. Should the nerves of feeling be also driven against the bony edges sensibility is, in slight cases, greatly increased, but in others it is blunted or quite destroyed. From this single cause variously applied and differing in the mode of action, the two sets of nerves suffer in many ways, and to a great extent. Still it appears to me that, under all circumstances, the paraplegic symptoms, in similar cases may, be traced to nervous irritation or pressure in the vertebral holes or mouths, according as the different sets of nerves are respectively acted upon. In this particular instance the nervous power was more affected in the motory, than the sentient branches; for in the former it was either wholly suspended, or was, at any rate, so much impeded that the corresponding muscles lost their activity, and were completely paralysed.

In the latter, the nervous influx continuing to perform its accustomed movements, the feeling was morbidly augmented: and it may be farther observed that, as the limbs

recovered their faculties, along with the correction of the spinal column, the result affords the strongest confirmation of my opinion that the paralysis was induced by some faulty condition of the back bone, which either prevented the free entrance of nervous energy into the chords at their separation from the spinal marrow, or arrested its progress in the vertebral holes, or at their exit from these. That the infirmity of the limbs was occasioned by some deficiency of nervous power cannot, I think, admit of a doubt, any more than that the impediment was situated somewhere in the spinal column. Had this been the only recorded example of increased pain and defective muscular action, attendant upon misshapen backs, my observations would be less worthy of notice; but when I assert, (after no ordinary experience) that these symptoms are constantly present, and are, moreover, always relieved with every improvement in the vertebral pillar, the argument appears in a new light. It assumes a more imposing character: nay, it even establishes itself as a pathological principle of the most extensive application. This discovery (of the most unostentatious pretensions) has been fully explained in my Essay on Spinal Diseases, and in subsequent communications in the periodical Journals. I have shewn, over and over, that in deformities of the spine its nerves loosing, their healthy actions, produce cramps and interminable chronic pains in the muscular apparatus. I have also proved that although these distressing symptoms continue to harass the sufferer, year after year, and simulate many structural diseases, they are generally *functional to the last*, and admit of a cure by merely correcting the deformed spine. In order to demonstrate, and establish the full value of this most important discovery, it will only be necessary to

add—first, that the muscles liable to suffer are distributed over the whole of the human body, and are also to be found lining several of its cavities.

Farther.—For the reasons already given the functions of the internal organs are likewise deteriorated in most instances of the distempered spine, because they either derive their nerves immediately, or indirectly, from the spinal cord. To this fertile source of constitutional disturbance, (which happily did not increase the miseries of this girl,) may be referred many indications of diseased lungs, which either torment invalids through life, or, by inducing structural mischief, terminate their miserable existence at an early age. Palpitations of the heart, dyspepsia, and defective biliary secretion, often originate from the same cause; and these are certain sources of family as well as individual unhappiness, which are referrible to the same origin. In fact every organic and visceral derangement might be comprehended under the influence of this one source; for, as the spinal nerves pass to the most remote parts of the frame, nothing, from the crown of the head to the soles of the feet, can remain perfectly sound where these are much affected.

ON THE CUTANEOUS DISCOLORATION.

Another remarkable circumstance in this case remains to be noticed. Whenever Hawkes was carried only from one part of the room to another, or if her right foot was slightly touched, breathing became so short and difficult, that serious apprehensions were frequently entertained by the parents, that her life had actually passed away. On these occasions, the skin of the same foot assumed a blackish hue. It looked (the mother says) like a dark-colored raddish, or the countenance of a person almost strangled, and gasping for breath. The part was always hotter than natural. The heat and discoloration appeared together, and ascended swiftly along the same leg, thigh, and side of the chest to the arm and cheek. Having taken possession of the whole of the right side, they would remain stationary, and of the same intensity, for seven or eight minutes after the body was again at rest. The deep color then began to fade, and assume a brighter and lighter shade. So far was the heat from diminishing along with the change of complexion, that, as the latter abated, the temperature increased, and extended from the affected parts to the rest of her body. The skin then became of a florid red. Having endured the heat for several hours, perspiration came on, and continued, in a moderate degree, some time longer, until the paroxysm finally terminated.

This scene, and these distressing circumstances occurred almost daily, from the frequent changes of apparel, and of position, which her unhappy condition rendered necessary.

Although I have recorded these curious symptoms in the order of their relation to me, by the mother and others, who witnessed them, I do not venture to enlarge upon them, or to enter into any particulars concerning their nature. Referring them to some occult and inexplicable condition of the nervous energy, I shall leave their origin and exposition to be elucidated by future pathologists better acquainted with the laws and intricacies of this important system.

REMARKS UPON THE TREATMENT.

The remedial means employed in the case of HAWKES were as simple as they were efficacious. They were limited to mechanical contrivances, based upon anatomical principles.

The suffering invalid, as well as many others, will, perhaps, be surprised to learn that neither internal medicines nor external applications were either required or recommended throughout the whole course of this curious and interesting case. While under treatment elsewhere, abundance of both was administered. Her provincial medical attendant had absolutely exhausted the usual resources of the healing art, and had rung the changes with a persevering humanity, which is highly honourable to his feelings and anxiety.

The subsequent treatment being exclusively my own, and not having been many years announced to the profession, it is but reasonable to conclude that he had no opportunity of becoming acquainted with it. The method had been indistinctly contemplated by me when an undergraduate in the University of Edinburgh. At length, (in the year 1818*) an opportunity occurred of carrying my long meditated scheme into effect, which was embraced with eagerness, and pursued with anticipations which were fully realized; and I can now assert, without fear of valid con-

* Pathol. and Pract. Observations, p. 149—166.

tradiction, that the farther I have advanced in this branch of the curative art, and the more my information has extended concerning spinal disorders, the stronger is my conviction that my plan is superior to any other in the correction of vertebral deformities; and it will lead to the knowledge of the true method of curing a large class of nervous and other diseases, hitherto not inaptly denominated the *opprobia medicorum*. If simplicity of practice be a criterion of excellence in Medicine, as well as in the Arts, my process is entitled to the greatest consideration. Nothing can be plainer in the conception, or less complex in the execution.

One general principle guides me in all cases of this nature; but the modes of adaptation must vary according to circumstances; how these were applied in the present instance has been already related.* The result happily is, that a young female, presenting the most hideous deformity has, by art, been restored to that beauty, symmetry and activity which Nature had originally bestowed upon her; but of which she had for years been deprived by the consequences of violence inflicted on a particular spot.

The symptoms in the case of Sarah Hawkes were unquestionably referrible to the 6th cervical vertebra being driven forward; and the fixture of the dislocation, or rather subluxation upon this bone in particular, is clearly established, because the patient herself uniformly declares that she knows the exact spot, having suffered so much in the part, and having frequently had her attention drawn to the depression in her neck. The restoration of this vertebra to its natural situation was the simple basis upon which the

* See pages 7 and 8.

cure proceeded. With some change of position, as to the shields formerly mentioned,* as circumstances arose to require it. The deviation of the spine (which is a very rigid organ) being once overcome, other parts were, with little difficulty or delay, restored to *their* proper arrangement. Some resistance was experienced on the part of the three lower dorsal vertebræ, which formed the crown of the arch; but to overcome this we required only a small shield, formed upon the principle elsewhere described. By degrees they fell into their proper places, where they are now firmly established. This cure was the affair of six months only; while, under long established modes of practice, years are spent in unavailing torture. Such occurrences may be daily encountered in this line of practice, and in every rank of life. Mis-shapen trunks, with consecutive bad health, are to be seen in all families, which it is impossible, by any contrivance, to conceal. The introduction of the practice of Vaccination has prevented much ugliness of countenance on the part of the risen and the rising generation. The proverbial elegance of form and healthiness of those now in the prime or vigour of man and womanhood is mainly to be attributed to the highly improved method of rearing children; while spinal deformities still remain a disgrace to medical men, who even permit their own offspring to grow up under their eye with deformities visible to others, while they are frequently unnoticed by themselves, and even were they aware of the circumstance, the probability would be, that their attempts at correction must prove unavailing.

* See page 8.

ON THE INJURIOUS EFFECTS OF SPINAL DEFORMITIES UPON THE HUMAN CONSTITUTION.

Diseases and anomalous symptoms, produced by deformities, afflict various parts of the system, or conformation: they, however, have their principal if not *sole* seat and origin in the nerves which issue from the spine; and their *physiognomy* (if I may thus express myself) is discoverable in the annexed parts of the human fabric:—

1*st*, *In the Figure.* If we examine the human body with attention, we cannot fail to perceive, that all its parts are so fashioned and placed as to concur towards the beauty and perfection of the whole, nor that they are, by nature, admirably adapted to their different purposes. The head rests upon the neck, where it moves different ways, as on a pivot, in order to turn to which side it pleases, and for the eyes to see all that passes. The shoulders are constructed to bear heavy burdens. The capacious chest is formed of hard, strong ribs and bones to guard and protect the heart and lungs. The diaphragm separates the chest from the belly;—which encloses the stomach, the liver, the intestines, kidneys, and bladder; these, again, rest upon the hips, thighs, legs, and feet. The form, construction, situation, and size of these several portions of the frame, bear an exact correspondence to one another;

otherwise their motions would be impeded and weakened. No member, in a well-arranged frame, is imperfect or deformed; none are useless, superfluous, or hurtful to the rest: they are each of them fashioned to sustain their due share in the active scenes of life, and to produce harmony in their respective operations. For these purposes, the different parts must bear a strict relationship and conformity to one another; where these are destroyed, the appearance is always unsightly and offensive—oftentimes quite disgusting. In a well-executed statue, the trunk constitutes two-fifths of its whole length. It is this correct disposition which pleases the eye in the beau ideal of our Apollos and Venuses; this regular proportion, equally with the correct shape of the several parts, is indispensable to the perfection of the whole, and to display the agreeable combination which every one admires. A tutored eye sees the slightest defects at a single glance, and can point them out; the uninstructed perceives them too, and is equally disappointed, though he may be unable to give utterance to his thoughts, or explain the reason. The exact correspondence of members, in shape and freedom of action, produces the symmetry which is so pleasing. When the limbs and trunk are of unsuitable lengths and thickness, the disproportion and want of harmony are easily perceived, however they may be padded and adorned. A thick, clumsy body is very disagreeable to the sight, especially in young women, and cannot be concealed under any disguise. The head or limbs seldom suffer in this respect, of themselves; but Hippocrates tells us that "the spine becomes distorted in persons of sound health, by many ways. This is a fact agreeable to nature and actual experience. Pains and old age, also, produce the same calamity."

Here we have the recorded observations of a long life spent in the habitual discharge of a laborious profession, and they have been verified in every subsequent period. It may be truly said, that few people become old, and preserve their natural figure unimpaired, or carry themselves upright. There is generally a stoop forwards, showing itself by the roundness of the back, between the shoulders. Or the loins, losing their natural hollow, stand outwardly prominent. Occasionally, the bend includes all the dorsal and lumbar vertebræ. In deformities of the latter region, the sufferer cannot raise his feet from the ground; he walks with difficulty, requires the support of a stick, and shuffles in his gait: the legs are chilly and numb, often swell, and are subject to chilblains in cold weather. The back is liable to be contracted at every period, but mostly in the old and young. Growing and delicate females are the chief sufferers: with them, the spine becomes twisted, without any apparent cause, at this period, *unless especial care be taken to prevent it.* This is a truth of daily confirmation, and cannot be too strongly impressed upon all parents and instructors of youth; because what is very easily *prevented* is often of difficult *cure.* The judicious or imprudent management of a few years in early life often leads to durable good or bad health, according to the use that is made of them. With girls, the whole spine is more or less incurvated; the chief deflection is to the right, between the shoulders, and to the left in the loins. This deformity is less striking to superficial observers than the hump-back, or posterior curve. It is, however, easily detected, by the unnatural shortness, as well as unpleasing thickness and clumsiness of the waist. In this species, the trunk is always rigid

and inflexible. This leads, necessarily, to an awkward and restrained carriage, which cannot be prevented or counteracted by the sly looks and continual hints of mothers, or unceasing exertions of the unhappy daughter to counteract it. Examples of this sort are daily seen; *nor can they be overcome, except by correcting the spinal pillar,* because the bad habits, as they are called, proceed from a fixed cause—the anatomical alterations and displacements of the vertebræ. Whenever these give way, and desert their places, (be it ever so little,) people only deceive themselves, who suppose that they will recover their lost stations by any alteration of carriage and change of posture, however long these may be endured. I make this assertion, and these remarks, with more earnestness, because an opposite opinion has been generally entertained, and is, I believe, still enforced by some medical practioners of the highest honour and respectability. The attempt has already been made upon a large scale by the late amiable Mr. Cheshir, as well as by many others, and has entirely failed, after a long probation. It is, therefore, a settled point, that, whenever the spinal column has lost its correct form, this mode of treatment will do no real service, however long the trial may be continued. The wise method of proceeding, and the only effective one to benefit the unhappy sufferer, is to replace the extruded vertebræ. The sooner this is undertaken, the better. Every other interference is manifestly unavailing and useless. It is true, that with great care, *long continued,* the spine may be prevented from getting worse; but who would stop short of perfection, where so much is at stake?

2*ndly. In the Countenance.*—In forming our bodies, the benevolent Creator has not only attended to our wants

and conveniences, but likewise to ornament and beauty. The last is visible in the harmony of the figure, the exact proportion of the limbs, and the pleasing mixture of colours in a fine and delicate skin. While the outer parts declare the superiority of man over other living creatures, his face, directed towards the heavens, proclaims his dignity, and the preeminence of his station. The face, so to speak, takes the features of the soul, and moulds itself accordingly. Its restless and powerful action upon certain portions of the visage increases their bulk, as other organs are enlarged by exercise. In this way, the ruling passion, indelibly marked upon it, is revealed to the by-standers, and becomes a true index of the disposition, however it may be obscured by artifice, or attempted to be concealed by refined manners. Thus we are intuitively led to form an opinion of persons at first sight. We instantly press towards the open countenance, and as involuntarily recede from the contracted brow. Even children are observed to give a decided preference to some strangers before others; and the sagacious dog, the faithful companion of man, makes his own selections. The choice with both is instinctive, and generally good.* It is founded on the peculiar look and appearance stamped upon the features, which disclose the inward workings of the mind. When it is tranquil, they are calm and composed; but when it is

* "The ox," says the Scripture, "knoweth his *owner*," to which may be added—that the horse knows his *master*—*i. e.* can distinguish his accustomed rider from the person who ministers to his wants. LAVATER would have been paramountas a *Characteriser*, had PHRENOLOGY not superseded PHYSIOGNOMY; still we acknowledge that certain faces are letters of recommendation; and bad features *seldom* indicate that their possessors are desirable acquaintance.

agitated and disturbed, the countenance becomes a lively picture, in which the passions are painted with equal force and strength. Each has its peculiar impression, and each change in the face is characteristic of some affection of the heart. The eye, in particular, so clearly expresses them, that we cannot mistake or be insensible to its emotions. The exquisite brightness of a clear skin, and brilliant tints of the complexion, are delightful to behold. They impart a fascination to the countenance, which is overpowering and irresistible. These, though doomed to fade in advanced life, are liable to many accidents, which hasten their decay, and obliterate the traces of their former attractions; and one of the greatest enemies to beauty is a deformed back.

These mischievous effects of the crooked spine upon female beauty and loveliness are well known: it has been frequently remarked and lamented, although the cause was never properly explained, or the nature of the connexion attempted to be pointed out. This intercourse I shall endeavour to prove, by referring to established laws of the living system. Several large nerves are distributed upon the face, to enliven and give expression to the countenance. While the spinal pillar is in good order, the nerves perform their different offices regularly and well; the nervous influence passes freely and quietly along to the destined organs, and their movements are correctly performed; but when the spinal column becomes distorted, the nervous trunks, (pressed and fretted as they then are in the vertebral holes,) do their duty imperfectly. The irritations propagated along the cords appear chiefly in their ultimate ramifications. Here, by disturbing the facial muscles and secreting organs, they produce very distressing manifestations and unseemly re-

sults. These are more conspicuous in the face, than in any other portion of the frame, because it is most exposed to view, and is, moreover, largely supplied with nerves: these are the portio dura, or nerve of expression, and several branches of the fifth pair. Although neither of them issue out of the spine, they are joined to several of its nerves in the neck, and elsewhere. It is through this combination that the incurved spine imparts its disordered condition to the countenance. The face always suffers to a great degree on these occasions. Let the skin be of the brightest hue, and the complexion of the loveliest bloom, both will disappear in a short time: the roses die away prematurely, and the clear skin changes to a dirty yellow or muddy brown. Afterwards, the countenance becomes wrinkled and furrowed. It is contracted, and appears careworn. The health suffers, decrepitude and premature old age follow in the train. These distressing and afflictive consequences are the inseparable accompaniments of deformity. In the early stage of maturity the effects are less striking; but, before the thirtieth year, they begin to show themselves. They keep enlarging their dominion, and increasing their sway, as age advances. They gradually acquire complete possession, tormenting the constitution with unceasing pains, with many depraved sensations, with continued weakness, and, at last, with inability to perform the common duties of life.

At an early age, I accidentally met with an accomplished lady of about seventeen, whose alterations of personal appearance will best illustrate what I wish to convey to the reader. Burke's chivalrous description of the fascinations and beautiful face of the unfortunate consort of Louis the Sixteenth was strictly applicable to what I then beheld.

More than twenty years had passed away before my second interview. Never can I forget the changes which a gibbous back had wrought in this lovely female! Not only were the lillies and roses faded, but the eyes had lost their lustre, and the countenance, (which beamed with animation and enchantment,) was become languid, contracted, and wrinkled. The clear and bright tints of her complexion had long been exchanged for a dull and muddy brown, or olive hue. She was moreover feeble, and almost worn out, at the early age of forty. This is by no means a solitary instance. Premature spoliations, originating in spinal complaints, and blighting the happiest prospects of marriage and usefulness, are not only of frequent occurrence in both sexes, but have been often individually noticed by myself, and others.

3*rdly*, *In the Health*.—Of all the blessings given to man, health is the greatest; and, while enjoyed, the least valued. In the dawn and meridian of life, he lives as if pains or death would never overtake him. Sated and cloyed with the variety of enjoyments, he flies from pleasure to pleasure, restless and unsatisfied. Though continually disappointed, he is always in pursuit of fresh amusements, and quits them with the same disrelish and feelings of disappointment and ennui. At length the spell is broken—the charm vanishes! Assailed by disease, reflection comes; but while it augments his sufferings, it is often unable to relieve them: year after year he is tortured with pains, and in pursuit of ease; he then bitterly laments his heedless career, and would gladly exchange all his wealth for a sound constitution. To obtain it, he travels from Spa to Spa, and flies from one medical man to another, as chance directs, or as officious advisers, equally ignorant

of disease and of his ailments, think proper to recommend. Thus he continues to the last, the sport of accidents, and prey of the designing; for as hope never forsakes the wretched, he never wholly abandons himself to despair.

4thly, In the Usefulness.—Man comes into the world the most helpless and dependent of all created beings. Most animals contrive, as soon as they are born, to make use of their limbs to seek their food, and act according to the instinct given to them; they are not subject to the cruel disorders which afflict us, and so often destroy our constitutions. In truth, these are the effects of irregularities and intemperance which assail us in the cradle, and accompany us to the end of our earthly journey. If we lived according to nature, like the beasts of the field, we should, like them, be healthy, strong, and active;—we should carry on life to the ultimate period assigned to it by the Divine Architect. The animating materials—the *pabulum vitæ*—being at length exhausted through long and continual employment, the machinery would cease to move, and we should expire like the dying embers of an unreplenished fire. To secure this freedom from pain, and prolongation of existence, we must make, according to ordinary calculations, many sacrifices. We must subdue our inordinate propensities, and change our habits. We must lead frugal and rational lives, equally remote from intemperance on one side, and slothful indolence on the other. But having to deal with man as he is, and not as he ought to be, his life is at best short and transient; though, to judge from the conduct of most people, this does not appear to be a received truth: nor does he generally consider the purposes for which he was placed in the world, or the claims which society has upon his exertions. How-

ever careful he may be, accidents snap the thread of life before it comes to its full length. But, independent of casualties, so long as man gratifies his most inordinate appetites, ministers to his preposterous passions, and indulges his wanton caprices, he will continue to be the sport and prey of a thousand ailments and infirmities, created by his excesses and debaucheries. These are never-failing attendants upon his excesses. They introduce old age prematurely, and contract the span of life. Of the millions who enter upon the stage with excellent natural constitutions and the brightest prospects, how few reach the ultimate verge of mortality! And of the number, scarcely one remains free from tedious diseases, and infirmities which imbitter life during his short pilgrimage. Many are the production of cold, and other exposures; but it is also to be taken into account, that not a few are the effects of palpable or concealed spinal deformities: which, of whatever species, weaken the limbs, and debilitate the frame so as to unfit the possessors for active or laborious pursuits; they often wholly paralyse exertion, and create useless members of the community. Of this truth, I have seen many proofs: the unhappy and helpless cripples, unable to assist themselves, were dependent upon others in performing the commonest actions. In such humiliating circumstances, these may endure life for many years, but cannot be said to enjoy any of its blessings or advantages.

5*thly, In the Functions.*—The spine is placed in the middle of the body, like the sun among the planets; both being the animating organs of their respective systems. If the sun should cease to impart warmth, the earth would become a solid sphere, and the beings inhabiting it lifeless clods. For analogous reasons, if the spinal marrow be cut

through above the atlas, the body immediately sinks down inanimate. Owing to acquired temperature in the globe, the animals might not die immediately on the sun's rays being withdrawn; and the nervous property diffused through the living frame would preserve its irritability and muscular motion for a short time after the separation; but in either event death would be inevitable, and near at hand. In order fully to comprehend the extensive influence and real importance of the spinal chord and nerves, in health and disease, we must trace their anatomy, and demonstrate their ubiquity in the human constitution. Feeling is exclusively a nervous property; and as every part of the body possesses sensibility, it follows that no portion of the frame is destitute of nerves. It is true, that bones and tendons in their healthy condition exhibit no signs of feeling on being cut or pinched; but in a diseased state they are often exquisitely painful, which shows, if anatomy had not traced them into this structure, that nerves enter into their fabric. As they penetrate into every portion of the constitution, and are acknowledged to display such wonderful powers on some occasions, we may reasonably conclude, that they perform a leading part in every instance. Accordingly, we see that old spinal deformities are always attended with nervous symptoms, and that they vary from each other as the incurvation is established in a higher or lower region. This difference in the manifestations is so constant and uniform, that I find no difficulty, after a short inquiry, to fix upon the afflicted portion without any personal examination.

The correction of distorted spines claims attention for the weighty reasons already given. But I urge it also to free the sufferer from many distressing afflictions which,

although they may not of themselves destroy life, imbitter existence, and are removable in no other way. Having observed that an endless variety of chronic pains and nervous maladies torment crooked persons, which disappear along with the deformity, I was led, in an early period of my new practice, to imagine that they are in some way or other dependent upon misshapen spines. This suspicion arrested attention; and, by prosecuting the idea, I soon discovered that when the column loses its natural form, the vertebral notches are always distorted, and the two parts of them cease to correspond, and to fit exactly, as in health. When this irregularity takes place, the nerves, in traversing them and issuing out of their twisted mouths, become pinched, stretched, and irritated. Their functions are in consequence impaired, vitiated, and irregularly performed. The disordered actions do not, as might have been expected *à priori*, show themselves in the nervous trunks or masses immediately acted upon, but in the remote branches. This curious fact prepares the mind for most important, as well as unexpected disclosures. So long as no successful efforts were made to reduce misshapen backs, the connexion between them and distant pains remained mysterious and inexplicable: hence many victims of erroneous doctrines were suffered to wear out a miserable existence, when their afflictions might have been easily removed, had the cause of them been understood and proper means adopted.

The cure of spinal distortions has introduced us to a better knowledge of these hidden maladies, and revealed a most extensive and valuable law of living matter, which displays itself occasionally in every division of the frame, and under the greatest variety of manifestations. When

it affects nerves running from the spine to the voluntary muscles, these are tortured with cramps and spasms, or become torpid and paralytic. At other times, it produces the most obstinate and violent pains in the trunk and limbs. The external senses are also more or less under the dominion of the spinal nerves, from their immediate distribution, or from their anatomical connexion with nerves running to them, Some of the senses suffer from both these causes.

Vision is impaired, and frequently lost for a time, in spinal complaints. This happens most commonly when the irritation is communicated to a branch of the fifth pair: not that it is wholly confined to this nerve; the third and sixth are sometimes affected from the same cause.

Remote as the eyes are from the back, no organ of the human body is more liable to suffer in spinal cases. The faculty of sight is under the management of five distinct nerves, which, (excluding the optic) are either anatomically joined with the spinal nerves, or great sympathetic. Owing to this intimate and extraordinary communication, vision is often impaired, and sometimes lost, in these maladies. Many examples have occurred to me, and some are recorded in my *Essay on Spinal Diseases.* Only upon a recent Sunday, I visited a former patient, who had been cured more than ten years of a bad lateral curvature. A similar infirmity produced incurable pulmonary comsumption* with an elder sister, and would, had it continued unsubdued, have destroyed my patient long before this day. I found her in excellent health, enjoying one of the finest forms and most

* See an interesting essay in the *London Medical Repository* for 1824, entitled, "Observations on Spinal Consumption, and its Distinction from Phthisis Pulmonalis and Tabes Mesenterica, by William Gaitskell, Sen. Esq. M.R.C.S. &c."

blooming complexions in this great metropolis. Such, notwithstanding the misrepresentations of interested persons, are the uniform results of my practice, where the cautionary rules are properly observed.

The mother was reduced to a miserable wreck of what I had seen her only a few years ago. The lumbar spine formerly gave way in a severe accouchement, and the gibbosity had been gradually increasing from the first. At my last visit she could scarcely stand or crawl; walking was next to impossible. Her countenance appeared pale, shrunk, and much older than her years. One eye had, without any known cause, wasted away, and the sight of the other was nearly lost. Although it is impossible to trace the melancholy catastrophe to any certain cause, I am inclined, from witnessing the distressing effects of spinal complaints upon the eyes and other parts, to impute the deprivation of sight, in this instance, to a sympathy between the misshapen backbone and eyes, through the communicating nerves,

The industry of anatomists and physicians has been assiduously applied, in all ages, to elucidate the operations of the nervous system, and discover the hidden source of its morbid actions. For these purposes the brain and its coverings have been dissected under all possible conditions. The anatomical structure of the different organs of sense has been examined with the greatest minuteness and circumspection; still the nature of mind, and its mysterious connexion with the cerebral functions, are involved in their primitive obscurity. The inquiry has hitherto been too subtile for human ingenuity to develope, and will probably remain for ever concealed from the most penetrating genius. Had equal attention been directed to the spinal column,

we should, ere this, have been better acquainted with its various alterations of external form, with the circulation of the blood in it, with the several changes produced in the bony part of the theca spinalis, in the chord, its investing membranes, and the nerves distributed upon the voluntary and involuntary muscles.

It must be obvious, that a disorder which affects so many different textures,—is so extensive in its depredations, and complicated in its nature,—deserves to receive a careful investigation, and that it will amply reward the industrious cultivator.

The several effects of spinal distortion upon the different internal functions have never, so far as I know, been circumstantially developed, or perhaps fully understood, by physicians. Now that we have acquired the *faculty of removing distortion in all its varieties, and restoring the spinal column to its natural shape*, a better opportunity is afforded to investigate the healthy and diseased condition of the spine; by which means we shall be able more clearly to discover the symptoms which originate in it, and to explain the physiology and pathology of this very important organ, under all its varying circumstances and peculiarities.

In the first place.—Distortion of the cervical vertebræ produces difficulty in swallowing, accompanied often by heat of the fauces and œsophagus. There is likewise a dry tickling cough, with quick and uneasy breathing. Conversation, or reading loud, soon induces fatigue, and the voice is unusually feeble. The œsophagus and trachea derive their nerves partly from the cervical vertebræ, partly from the recurrents, the glosso-pharyngæal, laryngæal, &c. These being deranged by the displacement of the bones, are

prevented from properly discharging the functions of deglutition and of respiration in the higher parts of the trachea. Swallowing is further impeded by an alteration of the muscular insertions at the back of the œsophagus.

Luxation of the lower cervical and upper dorsal bones, by displacing or compressing the spinal nerves running to the cardiac and pulmonic plexus, perhaps also the par vagum, and great sympathetic, leads to palpitations of the heart from slight occurrences, to faintings, uneasy breathing, to hiccough, and profuse perspirations about the breast and face. For the same reason, dislocations of the upper dorsal vertebræ induce chronic affections of the stomach, attended with a vitiated digestion, and unmanageable idiosyncrasies. The liver is also disordered, and its functions vitiated. Instead of sound bile, secreted in proper quantity to contribute towards the assimilating process, we have a scanty supply of thin, pale, and effete fluid. Probably, too, the functions of the pancreas, the spleen, and duodenum, with which we are less acquainted, are similarly affected, from a depraved condition of the splanchnic nerves.

Displacement of the lumbar vertebræ is accompanied sometimes with frequent and hasty calls to make water, or inability to retain it, at other times with defective secretion. The urine is voided with difficulty, or passes unconsciously, is commonly turbid, and of a brownish colour. It has a disagreeable, often an ammoniacal smell.

The connexion between the upper lumbar bones and bladder is so strong, that pressure applied to replace them commonly produces irritation of the bladder, with an urgent propensity to discharge its contents. The several inconveniences and distressing symptoms induced by this dis-

tortion have led the most experienced to believe, that their patients were, in many instances, sustaining the miseries of stone or gravel, when, in fact, their whole misfortune proceeded from the spine. Though the bladder is affected by applications made to any of the three superior lumbar vertebræ, it is, according to my experience, most sensible to impressions acting upon the second. This is the part to be selected when we wish to influence the bladder by means of blisters, and other outward irritants, The changes observed in the properties of the urine on these occasions are so many proofs that the bladder is not, what it has been generally denominated, a mere reservoir. Had it been destined only to admit and retain the urine till fit opportunities arose for its convenient expulsion, no chemical alterations would ever be observed to take place in the bladder. Phosphate of ammonia is a constituent of healthy urine; and what is called its urinous smell depends upon the evolution of ammonia during the putrefactive fermentation. New combinations being made in the process, ammonia is liberated, and escapes in its gaseous form. It is evident, from the appearance and smell of paraplegic urine, that it undergoes great changes, and consequently that, in such cases, the bladder exercises a secretory as well as a retentive power; the knowledge of this fact will assist our inquiries, and enable us to form a clearer judgment of those complaints than we have yet done.

The stools, in disorders of the lumbar vertebræ, are commonly blackish, resembling tar, pickled walnuts, or laver, in appearance and consistency. Their odour is generally unpleasant, and not unlike the washings of a foul gun.

The food undergoes numerous changes in its progress

through the stomach and small intestines. It descends from them into the head of the colon, liquid and inodorous: there it receives the fæcal smell. The figure is imparted in the cells of the colon, and probably in it the fæces are also destined to suffer further alterations before they are discharged. The blackish colour, and nauseous smell, of the alvine evacuations, in curvatures of the lumbar spine, have led the faculty to employ strong cathartics for their removal, under an erroneous idea that the malady which produced these unhealthy appearances was fixed in the cavity of the intestines. By thus overlooking the spine and distempered condition of the nerves, they mistook the effect for the cause. Now that we are better acquainted with the source of the mischief, our indications of cure should, in future, be directed with greater propriety and efficacy.

The lumbar division most frequently gives way, and the reason is obvious. It has the greatest weight to bear, is least protected, and its soft intervertebral substances are the thickest. This portion of the spine possesses greater flexibility than the rest. Sometimes the vertebræ bulge outwards; at other times they incline inwards; more frequently still, they assume the lateral direction. With females this is by far the commonest deformity, and prevails among them to such an alarming extent, that *very few, placed above the condition of laborious occupations, are entirely exempt.* I have already shown the injurious effects of the bent spine upon the bladder and great intestines, but they are, by no means, confined within these narrow limits: its powerful influence is equally felt in the procreative system. The nerves issuing from the lumbar vertebræ pass directly to the male and female genitals,

Over both they exercise, at all times, a powerful sway. These, as with the great operations of nature, are little noticed in the healthy condition. No sooner do the vertebræ give way, than the nervous bundles coming from them suffer in their primary functions. The nervous property no longer possessing its sound condition, ceases to promote fecundity, or to communicate to the sexual members the ecstatic orgasm so indispensable to their perfect movements. The congress deprived of this grateful stimulus is languid and joyless. The consequences are sterility and barrenness. Hippocrates observed, more than two thousand years ago, that "where deformity takes place below the midriff, the body is of slower growth, the beard and hair appear later, and with such persons the conjugal rites are seldom prolific." This curious and interesting fact, derived entirely from experience, has been confirmed in all succeeding ages; but I am not aware that any explanation was ever attempted before I ventured to cut the gordian knot, and point out the true cause.* This I have done by tracing it to a faulty condition of the nerves distributed upon the generative system, in consequence of their proceeding from the deformed lumbar spine.

Secondly.—Branches of the spinal nerves are distributed upon the muscles, and other parts of the neck, chest, back and abdomen. They, whenever the communicating vertebræ are affected, produce spasms, and a great variety of anomalous and irregular pains, which, from being misunderstood, are very seldom relieved. The girding sensation over the stomach has been generally referred to the spine.†

* Dr. Harrison's Essay on Sterility, &c.

† See Pott's Chirurgical Works.

There is a similar constriction in the lower part of the belly, when the lumbar vertebræ are displaced. The pains so produced extend also over the abdomen, the hips, and upper part and inside of the thighs, as far as the knees. Should the distortion, (as often happens,) occasion an elongation, or shortening of the limb, by altering the disposition of the pelvis on that side, the affection is generally misunderstood, and treated for inflammation in the hip joint. Several such cases, and so mistreated by the most eminent practitioners, have lately been submitted to my consideration, and cured by replacing the spinal connexion. A careful inquiry into the origin, aud patient investigation of the attendant symptoms, will always reveal their source and nature to the industrious and candid practitioner. Pains are generally excited in spinal cases during the action of the limb: they commonly vanish when it is at rest, or in an easy position, to recur again on its being put into motion. Were the pains of an inflammatory tendency, they would be more constant, be accompanied with pyrexia, and would soon finish their course. Symptoms induced by spinal derangement continue to harass the patient as long as the cause remains: hence we may account for their obstinacy under every method of treatment which has been hitherto devised.

In the third place.—The arms receive their nerves from the four lower cervical and first dorsal vertebræ. The inferior extremities are furnished with their nerves from the loins and sacrum.

Pressure upon the spinal marrow in the neck and top of the back, induces paraplegia equally in the superior and inferior extremities. When it is placed any where in the

spine below the commencement of the brachial nerves, these remain free, but the lower limbs become affected. A slight impression made upon the brachial or cruval nerves produces transient pains, cramps, numbness, occasional twitchings in the flesh, coldness, and loss of feeling in all the parts placed below the source of the disorder. Greater pressure induces a deadly coldness, insensibility, and entire loss of motion in them.

6*thly. In the Duration of Life.*—The desire of life is strongly implanted in man, and prevails at every age. So great is its hold upon his mind, that, in order to prolong existence, he will submit to the greatest privations, endure painful operations, and consent to the most distressing mutilations.

He has, it is true, more wants than the brute creation; but he has also more faculties, talents, and industry, to make every thing around him subservient to his use and pleasure. Seduced by self-love, he is apt to fancy, at the approach of death, that he is called too soon out of the world, not considering that he may owe the mortal distemper under which he languishes to his own irregularities, indulgences, and misconduct.

When a man dies, there are always causes which infallibly bring him to his end. One person falls under some mortal disease, the effect of his own imprudence; another by a sudden and unforeseen accident; this one perishes by fire, and that by water; but by far the greatest number are, in some way or other, their own executioners.

Although I have no intention to enter into the ordinary causes of mortality, there is an infirmity, into the circumstance of which I wish to inquire, because it shortens, as

well as embitters, life. I enter upon the investigation with greater pleasure, since it generally admits of being eradicated.

Hippocrates has observed, that persons afflicted with spinal diseases have few enjoyments, are in constant suffering, and seldom maintain existence to their sixtieth year. The calculation is founded on incontrovertible facts, and their truth has been verified in every subsequent age. In misshapen figures, the delicate and complex machinery cannot play so freely and easily as where the frame is well arranged in all its parts. Many of the most important organs are sensibly displaced, in consequence of their close connexion with the vertebral pillar, and therefore act with labour and difficulty.

In the sanguineous system, the unceasing efforts of the heart to propel the contained blood produce enlargement of its parietes and alteration in the valves. The arteries and veins emanating from it become, in process of time, structurally diseased, so as to impede and otherwise disturb the circulation. This leads to many inconveniences and obstructions, to the deposition of fresh materials through the body, and removal of the old.

The lungs perform their offices imperfectly, and with labour. This produces accumulation of blood in them, and what has been (lately) denominated *hepatization;* also obstructions, tubercles, vomicæ, and premature death, For the same reason the liver, stomach, and kidneys fail at an early age, and death makes his appearance long before the period originally intended by nature, and before the stamina are generally worn out.

To sum up all—in *considerble* deformities of the spine the unhappy sufferer is never at rest. His trunk, however

disguised, is short, thick, clumsy, and stiff; the face loses its attractions and enchantment; health is destroyed; activity and the constitutional powers are lessened; never-ceasing pains harass the frame. To add to his other miseries, the chief ends of creation are in him blighted and defeated through his bodily infirmities; and, as in pity for such interminable miseries, the wretched victim is doomed to an early grave.

In conclusion:—I have, in the revolution of the two last years, published a series of essays illustrative of spinal disease. My chief motive for this undertaking was, to lay before the public several misrepresented cases, in order to correct the outrageous and flagrant calumnies which had been in private circulation concerning them, for a long time, and to a great extent. I had hardly commenced the exposition of these falsehoods before a mass of additional information was spontaneously brought to me, which not only astonished me, but exceeded all that I had heard or imagined. Stories the most extravagant in themselves, and wholly destitute of probability, had been industriously propagated; and, (it grieves me to add,) some of them by medical men in high stations. Having, I trust, repelled these mendacious accusations, and set myself right with the public, I gladly relinquish a disagreeable and painful subject, to draw a few deductions from cases and comments.

First. In every one of the cases, the treatment pursued sensibly lessened the deformity.

Secondly. In none was it injurious to health; on the contrary, it was generally beneficial:

Thirdly. Nor have any relapses occurred where my directions were strictly obeyed.

Fourthly. In the few instances of death, at different periods, after the cures were completed, the suffering organs, as already remarked, were found to be sound and natural. Hence it follows, that in vertebral incurvations, as the disturbed parts only are acted upon through the spinal chord, or nervous trunks in the vertebral notches, the organs remain free from structural mischief, however long the agitations may be continued.

Fifthly. This extensive law, first noticed and traced to its source by myself, establishes one of the most interesting epochs in medical science; it will give a new direction and fresh impulse to medical knowledge: it moreover unfolds a principle in disease, which will exercise a powerful influence over the curative indications and measures to be hereafter adopted in practice.

But—*Sixthly.* Whether constitutional and local derangements from other causes ever remain for a long time functional, like those proceeding from the spine, is a question that I am unable to decide.

Seventhly. All diseases are at first fixed in some portion of the nervous system: and while situated there, are entirely functional.

Eighthly. Diseases cured in this early stage leave no visible traces behind them. On the subdual of symptoms, the parts are found to have preserved their natural appearance and arrangement unimpaired.

Ninthly. When disease commencing and located in any part continues to rage there, it sooner or later extends its dominion, and implicates the textures. In this way functional disturbance is converted into structural disorganization.

Tenthly. That since all internal complaints are at first

functional, the morbid collections preserved in museums, however curious to see, are of limited usefulness to the sick, because they reveal only the consequence arising in the progress of disease. They do not point out, nor can they place before us, or bring to light, the morbid lesion, the proximate cause, or real nature of complaints. We generally know the causes; we observe the symptoms; and dissection points out the changes produced. These are more or less evident to the senses; but there are many invisible links lying concealed between these several points, which the acutest vision, aided in every possible way, has been unable to detect or perceive: nor is it likely that we shall ever make the discovery, or penetrate so far into the arcana of the living body. The disclosure is evidently impossible, so long as we remain entirely ignorant of the nervous essence. This subtle property, like the principle of attraction in the natural world, is, although concealed from observation, the vital and animating part of living beings. It is not only the power first acted upon, but it regulates and controls through life every operation of the animal economy. *Excipit in primis vires extrema reponit.*

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