A LECTURE ON THE SIAMESE AND OTHER VIABLE UNITED TWINS.*

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PART II.

A LATER case in which twins, united like the Siamese brothers, from the ensiform cartilage to the common umbilicus, were successfully separated shortly after birth, was recorded last year by Dr. Boehm. The twins were females, small, but well developed. The band connecting them felt soft and fleshy, with interspersed hard and knotty cords, formed by the structures of the ensiform cartilage. Before dividing with the knife the band through its middle, Dr. Boehm first dissected up, isolated, and tied the several vessels of the united umbilical cords. The two flaps, or stumps of the divided band, were nearly two inches in length; and their edges were brought together with three points of suture. Union took place by the first intention; but one of the girls, who from birth had appeared weaker than the other, died on the fifth day afterwards. The other is still alive, five or six years of age, and perfectly healthy. Undeneath the skin there is felt, at the site of the cicatrix left by the division, a separation of two inches in length in the longitudinal course of the linea alba.

THE SURGICAL SEPARATION OF UNITED TWINS.

In the two preceding cases related by Koenig and Boehm, the separation of united twins was successfully accomplished by the art of the surgeon. I am not aware that any case of success, except these two, has ever occurred. In medical literature, however, some instances are mentioned in which the attempted surgical disjunction of fully-developed but united twins has proved fatal. Thus, Freyling has described a case of living and healthy female twins united together back to back by the region of the coccyx. When they were four months old, a surgeon endeavoured to divide them from each other; using the cautery instead of the knife. Convulsions and death followed.

Few instances are on record of the attempted surgical disjunction of twins after the death of one of them. Lebeau, in his *History of the Lower Empire*, refers to a case in which it is averred that two children, united together in the region of the abdomen, survived for several years, and, one of them at last dying, the living was cut away from the dead twin, but he only outlived his brother for three days. It is quite possible that such an operation may, if required, be yet performed in the case of the Siamese twins; and not, perhaps, without success.

The Excision of a Parasitic Twin.—Sometimes in double monstrosities one of the individuals is, as I have already stated, very imperfectly developed, forming a kind of rudimentary parasite attached to the person of a viable brother. The parasitical twin is occasionally attached to some of the internal abdominal structures of the more perfect brother, forming a so-called "double monstrosity by inclusion." In other instances, the twin-parasite is so affixed as to appear externally as a kind of subcutaneous double monstrosity. One of the most common positions for these affixed or subcutaneous twin-parasites is the region of the perinaeum, or the sacrum and pelvis. The parasite itself is very variable in its structures. In some cases, it consists of little besides a congeries of serous cysts and nuclei of imperfect cranial, vertebral, or other bones. Occasionally it contains small portions of an intestinal canal, and fragments of other viscera; the whole mass usually fed by the middle sacral artery of the developed twin. Such sacral or perineal twin-parasites have been occasionally removed successfully by surgical operations, by Sir William Blizard, Mr. Wormald, and others. In a case which I described, and published several years ago, my friend Dr. Richardson, of Stockton, removed a large parasitic twin from the coccygeal region of an active and living child. The case was described in the newspapers of the day as that of a child "born with a tail." On dissecting the mass, I found running across it a bone resembling a tibia. Many years ago, I saw and watched, from birth, with Dr. Paterson, of Leith, a sacral tumour of this kind, made up, apparently, chiefly of cysts and condensed intervening walls. It did not grow proportionally with

the individual to whom it was attached; and for years the latter has worked as a clerk, sitting upon, and supported by, his rudimentary twin-brother.

These imperfect parasitic twins have appeared in other positions, as within the scrotum, in the anterior mediastinum, and, it is averred, even within the orbits; and they have been seen attached to the epigastric and umbilical regions, to the neck, to the palate, and to the cheek and jaw.

Last year, when the distinguished American surgeon, Professor Pancoast, of Philadelphia, visited this country, he kindly presented me with various photographs of a twin-parasitic monstrosity, which he had successfully removed from the face of a living child. The accompanying wood-cut represents the external appearance of the heteradelphic growth in this very rare and remarkable case. (Fig. 1.) After the mass was

Fig. 1.

excised, it was found to contain, among a mass of fatty matters, a small stomach, a portion of intestine eighteen inches in length; a pelvic ring of bone, etc.

Survival of Twins united at the Epigastrum, like the Siamese Brothers.

Double monsters, consisting of two twins fully and equally developed, and united from the sternum to the umbilicus, are not of very rare occurrence. The late Professor Otto, of Breslau, has described some fifteen specimens of this type of double monstrosity, belonging to his own collection. But it is seldom that these or other types of double monstrosity are born viable. Exceptional cases, in which double monstrosities have survived, or been reared, are not without physiological interest.

Some years ago, I published a case which occurred in the practice of Dr. Lyell, of Dundee, where the two united children were of the natural size, conjoined in front from the upper part of the chest to the umbilicus; and one of them survived for eighteen hours after death, the other being still-born. On dissection, I found the fusion between the chests and abdomens of the two foetuses to be such that they had a common pericardium, containing two distinct and perfect hearts; a single or united diaphragm; and a large liver, common to both. The other viscera were all double. In a similar case, described by Beaussier, one of the foetuses was, as in Dr. Lyell's case, born dead; but the other lived sufficiently long to be carried to church for baptism.

In the second volume of the *Edinburgh Medico-Chirurgical Transactions*, Dr. Berry has described and figured a case of female twins, united anteriorly (Fig. 2), who survived for seven years after birth. They were natives of the East Indies. In their third year of life, when Dr. Berry obtained a sketch and description of them, they possessed, he states, a strong mutual resemblance; the heads of each were rather long, and the sides much flattened. They were unable to sleep in any position except that of face to face. They appeared, to Dr. Berry, to be connected from their sterna above, down, according to his sketch, to the region of the umbilicus. A ligament could be felt surrounding the band of junction. When the children were separated as far as possible from each other, the distance between the tops of the two sterna measured six and a-half inches, and between the pubic regions, eight and a-half inches. They had only one umbilicus; and were healthy and well developed. Their evacuations were regular, but at different times. They had suf-

* For Part I, see JOURNAL of February 13th, p. 147.

ferred from small-pox at the same time. They were daughters of a woman of the Treaver caste. The mother did not suffer particularly in the birth, and afterwards bore twins, which are living. When the united sisters walked, it was sidewise, and something in the form of a circle. "If," says Dr. Berry, "one only was pinched, the other did not feel it; but if the part uniting their bodies together was pinched, both felt the

Fig. 2.

pain. If medicine was given to one, it affected both. One sometimes awoke, while the other was asleep; but both generally slept at the same time. One was much more lively, and rather stouter than the other. They crossed their heads and arms, to act or look different ways, with ease. They could walk up a stair, and were active when playing with other children." "One of the children," Dr. Berry continues, "was entirely nourished, for some months after birth, by what it received from the stomach, or other part of the alimentary canal, of its sister, and still continues to eat rather less; it is still, however, as healthy, and nearly of as large a size as the other." "The drawing," he adds, "gives a very good idea of the manner in which they are connected, but does not express the compressed or elongated form of the heads."

Instances of Viability among other Types of Double Monsters.

Many examples of the survival, for various lengths of time, of other forms of double monstrosity, are to be found on record. As some of them are not without physiological interest, let me adduce a few of the more remarkable instances among them.

Twins, united together back to back by the sacral region, have sometimes lived. We have a well-known illustration of this remark in the case of the Hungarian sisters, Helen and Judith, who were born in 1701, and died in the convent of Presburg, in 1723, or twenty-two years afterwards. They were connected together, as found after death, by the sacra and coccyges, the fusion beginning at the second sacral vertebra. The pelvic viscera were conjoined to the extent that the vulva was single, but opened above into two vaginal canals. The anal orifice was single, and divided above into two recta. There were two urethrae, opening separately. The two aortae of the two bodies united below, before their division into the two iliacs, as did the two inferior venae cavae; and thus established a free vascular communication between the two sisters. Mentally, they differed from each other in character and temperament. Judith became hemiplegic at six years of age, and grew up smaller and feebler than Helen. The two sisters usually menstruated at different times—proving that this discharge is not the result of mere plethora, as some of the old physiologists taught, for then it should always have occurred simultaneously to both. The call to defaecation, but not to urination, usually occurred simultaneously. One sister was sometimes awake while the other was asleep. They were both attacked at the same time with small-pox and measles; but had other disorders, as catarrh and colic, separately. Judith was repeatedly convulsed, while Helen remained free from indisposition. Judith at last sank under

chronic disease of the head and chest. Helen, who had been suffering for some days previously, under slight feverish symptoms, felt, as her sister's end drew near, her own strength suddenly fail, though her mind and speech remained entire; and, after a brief death-struggle, she expired with her.

In 1856, I saw here, and had an opportunity of shewing to the Edinburgh Obstetric Society, two female children, Amelia and Christina, then about five years of age, who were united together exactly in the same situation as Helen and Judith. They were dark-coloured, and born in Columbo County, South Carolina. One sister was somewhat larger than the other; but they were both strong and well. The coccyges and lower sacral vertebrae were fused together; but placed somewhat sideways, or obliquely. As in Helen and Judith, there was one anal orifice. It opened above into a single large cavity; but the origin of the two intestinal tubes could not be reached. The single coccyx was felt projecting into this rectal cavity. The call to empty the bowels was by no means cotemporaneous in each; and so with the act of micturition. There was an appearance of only a single elongated vulva; but within it were two vaginal and two urethral orifices, and two clitorides. The two sisters did not stand exactly back to back, but slightly sideways. They walked, and even ran—the one backwards, and the other forwards—with wonderful facility. These two sisters, physiologically two separate individuals, are in every sense somewhat different in dispositions and temperaments. Occasionally, when they quarrelled more bitterly than usual, they struck back at each other with their elbows, and knocked with their scapulae. Their minds and mental acts were so separate and distinct, that one sometimes ate while the other was asleep. These two united sisters are, I am told, still alive in the Southern States.

Survival of Double Monsters; Single below, and Duplex above.

We come next to cases where the fusion between the component twins is so great, that some of the extremities, or some portions of the bodies of each, disappear, and yet the dual being is capable of surviving.

There are several instances, for example, of viability among monsters who were double above and single below; or who, possessing two lower extremities only, were provided with one abdomen externally, two chests, four arms, and two heads.

Between thirty and forty years ago, a case of this kind, described in an elaborate memoir by M. Serres, attracted deeply the attention of the medical profession in Paris. The subject of the monstrosity—a native of Sardinia—survived for eight months; belonged to the female sex; and was baptised under the double name of Rita-Christina. The drawing (Fig. 3) shews its external configura-

Fig. 3.

tion better than any elaborate description. On dissection, it was found that the duplicity was perfect above, down to the two hearts, which were placed in a common pericardium. The two livers were united and fused together, each with its own gall-bladder. There was a stomach, duodenum, and jejunum to each child; but towards the commencement of the ileum, the two intestines united together, and henceforth formed a single tube. The urinary bladder was single. The physiological phenomena shewn by each child were carefully watched

during life. They were distinctly dual in mind, though partially single in body. Often one head slept soundly, while the other head was awake, and sucked. Sometimes, one cried while the other smiled. When they slept, tickling the right foot awoke the right head; tickling the left awoke the left head. Each head, when fixed to the mother's nipple, moved and kicked out its appropriate leg. They were hungry at separate times. Christina, the stronger of the two, was much more greedy than Rita, and seemed, in fact, to sustain her weaker sister by the overplus of nourishment which she swallowed. The circulation and respiration were generally synchronous in the two; but not always so. There was a slight degree of cyanosis about Rita, which the imperfect development of her heart and large blood-vessels—as ascertained after death—sufficiently accounted for. At last, Rita was attacked with acute bronchitis, which, in the course of three days, ran on to a fatal termination. Christina, up to the last moments of her sister's life, seemed full of health and vigour, except that her pulse and respiration were somewhat accelerated. She was busily suckling as Rita died, and immediately she let go the nipple, and expired also.

During the reign of James IV, of Scotland, a doable monster, of the same type as Rita-Christina, was born; and several of our old Scottish historians, as George Buchanan, Lindsay of Pittscottie, and Drummond of Hawthornden, have described this double individual. Thus Drummond, in his *Lives and Reigns of the Five Jameses, Kings of Scotland*, after speaking of the marriage of James IV to the Princess Margaret of England, in 1502, observes:

"During the Treaty of this Marriage with England, a Monster of a new and strange Shape was born in Scotland, near the City of Glasgow, the Body of which under the Waste or Middle, varied nothing from the common Shape or Proportion of the Bodies of other Men; the Members above, both for Use and Comeliness, being Two, their Faces looking one way; sitting, they seemed Two Men to such who saw not the Parts beneath; and standing, it could not be discerned to which of the two Bunks above, the Thighs and Legs did appertain. They had differing Passions, and diverse Wills, often chiding others for Disorder in their Behaviour and Actions: After much Deliberation, embracing that unto which they both consented. By the King's Direction, they were carefully brought up, and instructed in Musick and Foreign Languages. This Monster lived Twenty and Eight Years, and dyed when John, Duke of Albany, Governed. Claud Gruget maketh mention of the like Monster, born in Paris before the Marriage of Henry IV, the French King, with Margaret of Valois, but the Birth and Death of it were near together."

John Lindsay, of Pittscottie, whose *Chronicles of Scotland*, written nearly three hundred years ago, were allowed to remain in manuscript till the present century, has described the same double monster in still more quaint terms. "In this meane tyme" (he observes), "was ane marvell seine in Scotland. Ane bairne was borne reckoned to be ane man chylde, who, from the waist vp, was tuo fair personages, with all members and portratours pertaining to tuo bodies; and the back of one was fast to the other, but fra the wast down they war bot on persone. The King caused tak great cair vpoun the vbring of their bodies in on personage, and caused learne thame to sing and play vpoun instrumentis, who within schort quhill became verie ingenious and cunning in the airt of musick, that they could play vpoun any instrument, the one the tenor, and the other the tryble, verie melodiouslie, quhilk moved the people to treat them verie weill. Also they could speak sundrie leadis; that is to say, Latine, French, Italianes, Spanisch, Duch, Dence, English, and Irisch. Thir tuo bodies lived twentie aucht yeires, and," somewhat more dubiously and mythically, Pittscottie adds, "than the one of thame departed, quhilk was verie dollorous to the vther, quhilk was the longest leiver; for the quhilk men bad him be merrie; he would answer, 'How can I be merrie that has my brother as ane dead carcase vpoun my back, who was wont to sing and play with me; when I was sad he would comfort me, and I richt so to him: bot now I have nothing bot dollour in bearing so heaue a burtheine, dead cold, and dissolved on my back, thairfor I pray the Almighty God to delyver me out of this lyfe, that we may be laid in the earth togidder quhairfra we came.'"

In the account of this monster, which the learned George Buchanan gives in his *History of Scotland*, he offers similar details, and avers that "in their various inclinations the two bodies appeared to disagree between themselves, sometimes disputing, each preferring different objects, and sometimes consulting, as if for the common pleasure of both; and what was remarkable, when the lower limbs or loins were struck, both felt the blow in common; but when pricked, or otherwise hurt above, only one of the bodies was sensible of pain, which distinction was most conspicuous in death; for, when the one body had died several days before the other, that which remained, when the dead half became putrescent, wasted away by degrees. I write this" (Buchanan adds) "the

more confidently, because there are many persons of undoubted veracity, still alive, who saw the prodigy."

Not long after this Scottish monster died, one of the same type was born in England. In the *Chronicle of the Grey Friars of London*, the event is entered, under the year 1552, in the following terms. "Item the iij day of Auguste, between x and xi at nyght was a woman in Oxfordshire, at a place callyd Midylton-Stone, at the syne of the Eggyll, viij myle from Oxforde, and the good man's name was John Kenner; and she was delyveryd of a chylde with too heddes, iij handes, iij fette, and but one body; and the mydwylfe kersende (christened) them at home, and was allowyd by the churche; and they lyfvyd xv days; and ett, and one slept wylle the other did wake, and lokyd with a mery chere whann anny persons lokyd at theme." Henry Machyn, citizen and merchant-taylor of London, in his well-known *Diary*, gives an account of the same Oxfordshire monster; but, no doubt more correctly, states that, while two of the four alleged legs and feet were normal, the other two were rudimentary only, and consisted of "one leg with ii feet, havving but ix tooys;" or, in other words, the monstrosity had a third intermediate leg, as in cases described by Hartmann, Maclaurin, and others.

Survival of Double Monsters, with one Twin imperfectly developed.

Several remarkable instances of this description have been observed, the imperfect twin varying much in its own degree of development.

In the 17th century, a double monster of this description shewed himself in many of the chief cities of Europe. His conformation has been briefly described by Pincet, Licetus, Zacchias, and Bartholin, the last giving the figure of him copied in the woodcut. (Fig. 4.) This

Fig. 4.

double monster was born at Genoa, in 1617, and he was twenty-eight years of age when last seen at Basle by Bartholin. The fully developed brother, Lazarus Colledero, had a deformed and imperfect twin-brother suspended from the lower part of his chest, who had been baptised as John, though Zacchias strongly questions if he had a rational soul, and deserved that rite. John had two short, contorted arms, with three fingers only on each hand; one imperfect lower extremity; and the trunk somewhat imperfect also. His head was large, but deformed, and, when unsupported, hung low down; the eyes were generally closed; the mouth open, and yielding a constant flow of saliva. Respiration was scarcely perceptible; there was a pulsation in the chest; he appeared capable of moving the arms, ears, and lips; he did not eat or swallow, and was nourished entirely by the food taken by Lazarus; there was no evacuation from the bladder or intestines; and he seemed to sleep, perspire, and move independently of his developed brother. Bartholin thought that the ensiform cartilages of the two brothers were united together in the band of union between them. One of the most entertaining of our old Scottish diaries is the *Memorials of the Troubles in Scotland*, etc., A.D. 1624-1645, left by John Spalding, Clerk of the Consistorial Court of the Diocese of Aberdeen. Spalding describes the visit of Lazarus Colledero and

his brother to the City of Aberdeen, in 1642, in the following terms; his account of this monster being really, in some respects, one of the best on record.

"About a day or two befor Pashe (he writes-) thair cam to Abirdene ane Italian man monster, of about 24 yeires of aige, haueing from his birth growing fra the breist vpward, face to face, as it were, ane creature haueing heid and syd hair, lyk the collar of the man's hair; the heid still drooping bakwardis and downward. He had eies, bot cloissit, not opnit. He had eires, tuo armes, tuo handis, three fingeris on ilk hand, ane body, ane leg, ane fot with six tacs; the vther leg within the flesh inclyning to the left syde. It had the penis of ane man, but no balcod. It had a kynd of lyf, and feilling, but void of all vther sences, fed by the mannis owne nourishment, and evacuet that way as his wee. This gryte wark of God was admired of be many in Abirdene, and throw the countreis as he trauellit; yet such was the goodness of oure God that he wold go and walk quhair he listit, carying this birth without any pane, yea, or on-espuyt when his clothes wes on. When he cam to the toun he had tuo seruandis awaiting vpon him, who with himself were weill clad. He had his portraiture with the monster drawin, and hung out at his lodging, to the view of the people. The one seruand had ane trumpettour, who soundit at suche tyme as the people sould cum and sie this monster, who flockt abundantlie into his lodging. The ather seruand receaved the moneyis fraith ilk persone, for his sight, sum less, sum mair. And efter there wes so muche collectit as culd be gottin, he with his seruandis, schortlie left the toun, and went southward agane."

Occasionally only the lower or the upper part of the parasitic twin appears; as the body without the head, or the head without the body.

About forty years ago, Mr. Livingston described a curious case of double monstrosity in an adult Chinaman, A-ke, who had an imperfect twin brother hanging from his epigastric region. The imperfect twin consisted of a neck and trunk, with upper and lower extremities. (Fig. 5.) It was suspended by the neck, and looked as if its head were

Fig. 5.

plunged into the thorax of the brother, who was in all other respects well formed, though feeble and breathless. The parasite seemed to have no voluntary motions; but it passed urine, and the penis was susceptible of a kind of partial erection. There was no anus. Weak pulsations could be felt in its carotid and radial arteries; and it was of the same temperature as its brother. Mr. Livingston gives, on A-ke's authority, the apocryphal allegation that, when any part of his brother's body was hurt, he felt as if the same part of his own body were injured: "even the slightest touch, which would be perceptible if applied to his own person, is equally perceptible if applied to his brother." This statement, Mr. Livingston avows, was most satisfactorily confirmed by an ingenious medical gentleman, who, observing A-ke's attention to be fully employed, and his head turned away in a contrary direction, pinched quickly the hip of the parasite. A-ke instantly struck the same part of his own person, just as if that had been the pinched place.

Ambrose Paré describes and figures a double monster of forty years of age, whom he saw in Paris in 1530, and in whom hung from the epigastrum, as in the case of A-ke, a small but perfect human body,

with the exception of the head and shoulders. Palfyn gives another similar case; and in the sixty-ninth volume of the *Philosophical Transactions* is a description of a handsome Gentoo boy who has a little twin brother suspended by the pubes, and consisting of the pelvis and lower extremities. The boy felt, it is averred, like A-ke, what was done to the twin brother; but he could not move its legs or feet, which were cold.

A similar case was described by John Buxtorff. The parasite, attached to the epigastrum, consisted only of a pelvis and two lower extremities, which were of the ordinary temperature; and impressions made upon these rudimentary appendages were perceived, though faintly, by the perfect twin. This double monster, born at Cremona, reached adult life, married, and had several children.

Winslow was called to a girl twelve years of age, and well formed, who had the abdomen and lower extremities of a small twin sister hanging from the left side of the epigastric region. This second boy had an anus, which discharged feces; and it possessed a row of vertebrae connected to the sternum of the larger sister. Winslow was consulted as to whether the parasite should receive the last sacraments of the Roman Church. In the preceding instances, the additional twin was suspended, in the form of, and often with the imperfect structure of an acephalous fetus, from the anterior part of the abdomen of the viable brother. Sometimes not the pelvic but the cephalic end of the parasite projects thus outwardly. If time and space permitted, we might add, for example, many other twin marvels and monstrosities of this kind: as Winslow's account of an adult Italian who had a parasitic, small, but well-developed head adherent to his chest below the cartilage of the third rib; the Javanese who had a small head, with an imperfect neck, protruding from the abdomen; Wirtensohn's case, where a head, neck, and chest stood out from the epigastrum of an otherwise perfect infant; Home's case of a parasitic head placed inverted over the skull of a child that lived till it was four years of age; etc. But the variety, in double and other monstrosities, is interminable: and truly the freaks and wonders of teratology are as odd as they are endless.

Postscript regarding the Siamese Twins.

At the time of the publication of the first part of this communication, I had not seen Mr. Bolton's interesting account of the Siamese twins in the *Philosophical Transactions* for 1830. He notices what I incidentally omitted to state: that, from the position assumed by Chang towards his brother, his spine is considerably curved laterally. He thinks the umbilical herniae are only on coughing pushed forwards as far as the middle of the band. Now, however, they project on each side beyond the middle; though, possibly, an oblique dissepiment of peritoneum may divide them. He gives two or three figures of the band, one of which is copied in the woodcut. He states that, when the brothers

Fig. 6.

were young, this band was much larger in proportion to the size of their bodies than it is now; it was also then larger in circumference, and the bodies of the twins were nearer in contact; but, from continued stretching, it has become elongated, and diminished in its circumference. The band is so insensible, when stretched longitudinally, that one twin could be lifted up and the other suspended by it without pain to either. Mr. Bolton gave asparagus to Chang one day; and, four hours afterwards, perceived its odour in the urine of Chang, but not in that of Eng. Next

day, the same experiment with asparagus was tried on Eng, with similar results. They have not passed entirely through life without a quarrel. Their mother spoke of one occurring when they were eight years of age; and again, while on their first voyage from Siam to America, one of them wished to bathe, as was their custom, to which the other objected, as the day was cold. The difference was soon adjusted; those rare exceptions proving the rule rather than the reverse.

THE ETIOLOGY OF PHTHISIS.*

By PETER EADE, M.D.Lond., M.R.C.P.,
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THE subject of consumption and of tubercular disease in general has always attracted a very large amount of attention on the part of the profession; and this may well be the case, seeing how large a proportion of the human family is cut off by this intractable disease. Of late, the interest attaching to it has received a further sharp, and somewhat sudden stimulus from the views which have been advanced respecting it by Dr. W. Budd on the one hand, and on the other from the published experiments of Villemin, Simon, Clark, Burdon Sanderson, Wilson Fox, and others, showing that the disease, or a condition undistinguishable from it, is capable of being produced in some animals by the inoculation of tubercular or other matters, or in rodents merely by the irritative-inflammation set up by the presence of setons beneath the skin. The addition to our knowledge which we have thus gained is immense; and I think it is not going too far to say, of the minute anatomical investigations of Dr. Wilson Fox in particular, that they have thrown a bright stream of light upon this part of the subject.

But still, even if we could assume that the intrinsic element of tubercle and tubercular disease is an excessive development of lymph-cells and lymphatic products, and could take it for proved—which, however, is not proved—that this process of abnormal development may be set up in man as in rodents by the introduction into the system by inoculation of tubercular or allied matters, it is very clear, as is fully stated by Dr. Fox himself, and endorsed by Drs. Cotton, Wilks, Marston, and others, that the demonstration of these facts is not the whole of the case, and that, in a large majority of instances of tuberculosis, some other etiological element or condition is at work to cause or bring about the fully formed disease; for not only do we find that individuals develop phthisis or other forms of tuberculosis where no suspicion of inoculation or contagion can exist, and where ordinary causes have evidently produced the disease, but also that infants are born into the world with the tubercular diathesis so strongly stamped upon them from the very first, that there can be no doubt that this condition is one which has grown with their growth and development, and is, in fact, a congenital, hereditary, and intrinsic part of their animal formation.

Tubercle, according to present evidence, would appear to consist essentially of cells usually more or less degenerating, and of nuclei; these cell-elements being generally formed in small rounded masses or aggregations, or, in many of these, coalesced to form larger agglomerations. Further, the recent researches by means of inoculation have proved almost to a certainty that these or similar cells or nuclei once formed, are capable, under certain suitable conditions, of multiplying and reproducing themselves—i.e., are endowed with a sort of independent vitality analogous to that seen in other forms of cell-life, and in this respect fairly comparable to the property of proliferation possessed by the cells of cancerous, recurrent fibroid, and other tumours. But the recent investigations of Waller, Cohnheim, and others, have shown that the cells of cancer, like those of all other animal tissue, are not abnormal developments or proliferations of other cells or corpuscles, and there is strong reason further to believe that they are in fact but vagaries of natural elements, unrestrained and unguided growths, as it were, of normal, glandular, epithelial, or connective tissue-cells or corpuscles.

In the *Lancet* for 1863, I called attention to the well-known fact that, in a very large number of instances, primary cancers follow closely upon some injury to the part from which the tumours spring; with a view to the expression of an opinion that the absence of controlling nervous force from the effused and organising lymph-elements was the main cause of their permanently stopping short at the lowest form of life—that of cells. I would venture, to-day, to give some reasons for thinking that a peculiar form of deficiency of nervous power may be an important element in the production of the superabundant cells which constitute

the various forms of tubercular disease, and that this disease may, in fact, be but an expression of a feeble vitality—feeble especially, and primarily, as regards the constitution of the nervous system, and secondarily, as regards the tissues which, from want of due and vigorous innervation, have been either imperfectly and loosely constructed from the first, or have become disordered in their action at a later period.

Cells more or less simple are, there is no doubt, the original and lowest form in which animal life is presented, and the type under which it approximates most closely to the vegetable world. This form of life, too, is the one which is capable of the quickest and easiest multiplication. Higher forms of animal bodies are formed out of such cells, variously modified, elaborated, and combined, to form tissues endowed with properties fitting them for the respective functions they are required to perform.

Every increase in the elaboration of the animal tissues is accompanied by a proportionate increase in the quantity and complexity of the nervous system; and it is most noteworthy, in reference to my present hypothesis, that the development of the nervous centres (especially as seen in the highest animal, man) actually precedes the formation of any other part of the body. There is strong reason, therefore, to believe that those centres exercise a governing and controlling power over the development of the other tissues, all of which are of later formation than themselves. Any original defect, therefore, of this primal nervous governing centre, will permit the body to be less perfectly formed, or, in other words, will tend to allow its tissues to be created on a degenerated type, with a constant tendency to revert more or less to the elements of which they are composed—i.e., cells. A body so created, and gradually growing and enlarging under such defective influences, is exactly the one which would eventuate in the soft, flabby, feebly constituted animal framework which we see in the typical rickety or scrofulous subject, the chief characteristics of whose structures are their general weakness and want of vigour, or rather power of endurance, and their proneness to the development of cells, as shown by ulceration—i.e., a ready disintegration or separation of the cell-elements of the feebly formed tissues; by glandular enlargement—i.e., distension of the lymphatic tubes by the hyperdevelopment of lymph-cells and gland-cells; and by purulent discharges—i.e., the excessive development of cells of pus from the mucous membranes.

This, then, would constitute an explanation of the congenital form of the tuberculous or strumous diathesis—a cachexia in which the body throughout is organised with a less perfect type of tissue, and with its nervous centres unequal to their proper work, either from original defect of formation, or from their being so feebly constituted as to be unable to appropriate to themselves the requisite nerve-force-developing pabulum. In the worst cases of strumous cachexia, the feeble nervous power secreted and available is insufficient from the first for the ordinary and daily demands of the parts which it should supply, and such subjects do rarely reach adult life. In somewhat better types, the nerve-power is equal to this work, but it is immediately used up by the slight extra demand made upon it by organs or tissues, with the result that some form of strumous disease immediately ensues, as is well illustrated in the proneness of the most worked parts of the developing body to degenerate first—i.e., to develop cellular products.

But tubercular disease is not only hereditary and congenital; it may be also acquired, even by the strongest and most robust, when they are placed in suitable circumstances. But it is noticeable here, that these vigorously formed subjects rarely develop other ordinary forms of strumous disease, though they do frequently become the victims of pulmonary phthisis.

I have said that the necessary effect of partial removal of nerve-force is to allow the parts supplied by it to take on a lower form of vital action; and the degeneration will, of course, vary with the cause of the deprival, with its intensity and seat, as well as with the constitution of the individual. Ordinary complete removal of motor or sensitive nerve-influence of course produces ordinary paralysis; but removal of nutritive nerve-influence produces other and distinct effects, as shown by the experiments of Reid and others; whilst the diminution of the combined spinal and nutritive nerve-influence gives rise to what is called suppurative or destructive inflammation—i.e., a process in which destruction pure and simple does not take place, but in which a rapid form of a lower type of growth or development—viz., that of cells, of pus-cells—is allowed to take place, at the expense of the more highly formed tissues. This effect is familiarly seen in the so-called catarrhal inflammation of the bladder which ensues upon spinal disease or injury, and in the suppurative disease which, as has been pointed out by Drs. G. Budd, Sims, and others, takes place in a lung whose nerves have been invaded or compressed by a cancerous tumour in the chest.

The aspect of the subjects of congenital and hereditary tuberculosis appears to me to favour this nerve-view of the disease; for such individ-

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