CONTRIBUTIONS TO THE PATHOLOGY AND TREATMENT OF TROPICAL FEVERS.

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INTRODUCTORY REMARKS.

FEVER forms so important a class of admissions into our Indian hospitals,—presents such variety of symptoms, according to season and locality,—and so frequently proves disastrously fatal to our European regiments soon after arriving in the tropics, that it is of importance to discriminate, among a crowd of symptoms, those essential to the disease, as it is greatly modified by circumstances. A long experience among European troops in different stations of the Bombay presidency, and the medical charge, for nearly five years, of the European General Hospital at Bombay, having enabled me to collect many important facts relative to febrile disease, I am induced to bring these before the profession, in the hope they may be useful in guiding the inexperienced tropical practitioner to a rational and successful practice. In the clinical record of my own practice, (from which the following observations are drawn), much attention was given to a minute detail of symptoms, indicative of diseased action in the nervous, circulating, and secreting systems; and every opportunity was taken of ascertaining, after death, what morbid changes were visible in the abdominal and thoracic viscera, the brain, its membranes, and the spinal column. I have also availed myself of the experience of others, in tracing the origin and progress of tropical fever among bodies of recently arrived Europeans, who, in addition to the usual exciting causes of disease, viz., exposure to the sun, and the too free use of ardent spirits, are in a state of eubesia, or predisposition, from high health and extreme richness of the blood. On this head I have before me the highly interesting reports, by several medical officers, of fevers which prevailed at Kaira, in Gujerat, among the men of H.M. 4th Dragoons, who, from the 1st June 1822, to the end of December 1826, suffered in an unprecedented manner from severe febrile disease, attended by an almost unheard-of amount of mortality; the regiment having lost during this period 277 men, out of an average strength of 528. The admissions into hospital were 2781 for all kinds of fever. A troop of European horse artillery, of which I was the assistant-surgeon, at the same station, but more favourably located (the barracks being on a dry, elevated ground), remained comparatively healthy, having only lost five men from the beginning of 1821 to the end of 1822, out of an average strength of 138; the fever cases during these two years were 154. The mortality amongst H.M. 4th Dragoons, and also H.M. 17th Hussars, the regiment that preceded them at this station, was such as to oblige the Government to abandon the camp and barracks at Kaira, and remove the 4th Dragoons to Kirkee in the neighbourhood of Poona, where they became comparatively healthy. The improved healthiness of this regiment, and the diminished sick-list of the dragoon regiments which

succeeded them at the same station, are undoubted evidence of the superior salubrity of the elevated site and dry climate of the Dekhan over the low sandy soil, and hot, humid atmosphere of Gujerat, so productive of intermittent and remittent fevers; but whether the exciting cause of such be *malaria* from the soil, or the agency of *galvanic electricity*, as supposed by Sir James Murray, is a matter yet undetermined. Regarding their origin, we can only venture to assert that particular soils and localities produce such atmospheric deteriorations as are capable of giving rise to attacks of intermittent and remittent fever.

The following observations may be arranged under four heads, viz.—
I, TROPICAL FEVER IN GENERAL; II, INTERMITTENT; III, REMITTENT; and IV, CONTINUED FEVER of hot climates.

I. TROPICAL FEVER IN GENERAL.

The ordinary and exciting cause of the intermitting and remitting forms of idiopathic fever within the tropics, is a certain atmospheric deterioration, generated during the decomposition of vegetable matter, to which the name "*malaria*" has been usually given. From the identity of cause in both types of Tropical Fever, we infer the identity of these fevers, which present the same succession of symptoms and paroxysmal progress, differing only in severity. The conversion of intermittents into remittents, during the extreme heat of summer or autumn, and, *vice versâ*, of the latter into the former, on the approach of cold weather, and during winter, would authorize the conclusion that remittents are only intermittents increased in violence and malignity by an augmented irritability of the nervous system, associated with an excess of vascularity in particular organs. Whether this vascular or inflammatory action, during a generally disturbed state of the circulation, take place in the brain, the mucous coat of the stomach and intestines, or other abdominal viscera, it creates a pyrexial state of the pulse during an otherwise apyrexial interval; and the renewed febrile accessions being thus gradually protracted beyond the usual period of duration, so as to leave little or no apyrexial interval, intermittents thus assume the remittent type. It is, therefore, of the utmost importance, in the treatment of these fevers, to keep an accurate register of the relative state of the pulse and skin at various periods of the day, in order to mark their progress, and to enable the practitioner to determine whether the nervous or circulating systems be most implicated in particular modifications of them. They were observed to vary from a nervous to an inflammatory or congestive type, in proportion to the intensity of *malarious* influences produced by season or locality, and the extent of diurnal atmospheric variation dependent on situation and peculiarity of climate. In July 1823, the climate at Kaira, in Gujerat, was unusually cool and healthy, after a very hot, dry season; but the quantity of rain which fell in August being smaller than had been known for many years, the autumnal *bilious remittent* set in among the men of H.M. 4th Dragoons, with very severe symptoms of *gastric* and *hepatic* disease. It gradually increased during September, attained its maximum about the 20th of October, and was not mitigated, or disposed to change to the intermittent type, before the middle of November; fatal cases of this disease being charac-

terized, during life, by much gastric irritability, and after death, by an extremely vascular state of the mucous coat of the stomach and intestines.

The continued fever of the tropics, which chiefly prevails during the hot season, and is caused by elevated temperature, robust health, and the abuse of intoxicating liquors, is connected with derangement of the vascular system, more complete than is commonly incident to remittents. In the former, elevated temperature, and indulgence in spirit-drinking, produce an increased nervous excitability, accelerated motion of the sanguineous system, increase of carbon in the blood, with corresponding diseased secretion of the liver and intestinal canal; which organs, within the tropics, seem to perform the vicarious office of eliminating from the system the unconsumed portion of carbon with which the blood is surcharged in hot climates, consequent on the diminished volume of oxygen received into the lungs. It but differs from remittent fever, in being more exclusively connected with accelerated arterial action and diseased changes in the vascular system; but the disordering influence of the exciting causes of both, is primarily exerted on the nervous system through an increase of excrementitious matter in the blood. Farther researches are, however, required to determine the nature of those chemical changes of the circulating fluid, which, in both remittent and continued fever, precede the derangement of the nervous and sensorial functions.

Under all its modifications, we can recognize Tropical Fever to be the same malady; and that the order of events, though produced by different causes, presents the same successive changes of the nervous, circulating, and secreting systems. It is, therefore, found differing in degrees of affection of such systems, according to intensity of cause, epidemic or endemic constitution of the atmosphere, idiosyncrasy of individuals, and the previous condition of the organs affected. During those years when an excessively hot season is followed by light rain, and concurrent endemic causes favour the production of intense *malarious* influence, remittent fevers are then found prevailing, with a greater affection of the *brain* and *spinal chord* than is met with under other circumstances, when the rains are heavier and more continued, accompanied by corresponding mild weather. At other times, when excessive heat is followed by light rain and great diminution of temperature, the secretory organs, and digestive apparatus, are violently affected; the liver, at such times, pouring forth large quantities of vitiated bile, associated with great derangement of the stomach and intestinal mucous membrane. Dr. Geddes, therefore, in his excellent clinical illustrations of the diseases of India,¹ remarks with great truth, that intensely hot seasons, previous to the setting in of the rains, favoured the production of paroxysmal fever; and that the prevalence of fever during the hot months is great in proportion to the variations of temperature.

The phenomena of febrile disease, seen in its various modifications, will be more fully detailed under the heads of intermittent, remittent, and continued fever. But subdivisions of these diseases into *cerebral*

¹ "Clinical Illustrations of the Diseases of India," by William Geddes, M.D., page 94.

and *gastric, nervous and congestive*, founded on modifications and leading symptoms of disease in particular organs, will be useful guides in the general treatment, indicating how far general or local blood-letting may be necessary to subdue the increased vascular action, or how far the physician may be called on to alter diseased secretions, or remove them from the stomach and intestines by emetics, purgatives, and mercurials, before endeavouring to restore to a healthy state the diseased excitability of the sensorium and nervous system, by the use of bark, quinine, cold affusion, and other tonics.

II. INTERMITTENT FEVER.

Previously to an attack of chilliness or shivering, with which this fever generally commenced at Kaira, the patients had languor, yawning, pain of their limbs, loss of appetite, and deranged biliary secretion. The cold paroxysm was announced by vertigo and nausea at stomach, accompanied by a frequent feeble pulse. In the hot stage there was always severe headache, and sometimes sharp lancinating pain at the epigastrium. Where the patient's constitution was good, and not impaired by previous visceral disease, the headache abated, or disappeared entirely, along with the pain at the epigastrium, on the occurrence of the sweating stage. But where the inflammatory diathesis existed, along with deficient tone of the viscera, the hot stage was protracted, and the sweating stage proved insufficient to relieve visceral congestion until the action of the heart had been reduced by bleeding. This was particularly apparent in quotidian, in which some of the patients were delirious during the hot fit.

After all symptoms of paroxysmal febrile heat and increased arterial action had subsided, the disease occasionally left behind it pain and enlargement of the spleen; but, in recent attacks, it was observable that general deficiency of tone in the constitution had more effect than local congestion in protracting succeeding paroxysms, and disposing the fever to run into the remittent type. Most of the quotidians were spurious, observing no regular hour of attack; and yet there was nothing in the type that might entitle them to be classed among varieties of *tertians* or *quartans*.

The cold stage of the intermittent was occasionally absent, or at least so slight, that the patient was not sensible of it. In one case, instead of the hot fit succeeding the rigor, vomiting, and purging of a fluid resembling the washings of raw meat, followed it. Whenever the disease was ushered in by simple chilliness, it was generally connected with a deeply vitiated secretion of black or brown bile. In such cases the symptoms were less easily removable than where the secreting system was less affected; and whenever the rigors were severe, the solution of the paroxysm was speediest and most complete.

The tertian type, in one instance, was accompanied by inflammation of the colon, in another by local affection of the chest, and in several others by symptoms of liver disease. Two or three cases of the *tertiana duplex* were noticed. On one occasion the first fit of fever occurred at 10 p. m. on the 21st October, had a remission during the night, and an exacerbation on the morning of the 22nd, with an intermission following on the evening of this day, the paroxysm having lasted more than

twelve hours, and beyond the usual period of a genuine tertian. The state of the pulse was, however, pyrexial on the morning of the 23rd, while the state of the skin was natural. This being the true tertian period, a weak paroxysm came on at 3 p. m. instead of 10 p. m.; and a better marked febrile accession following on the morning of the 24th, was protracted four hours longer than its corresponding one of the 22nd; thus running into the next pyrexial accession, which commenced on the morning of the 25th: by which little or no apyrexial interval being left, the fever began to assume the remittent type.

The irregularity of intermittents is not readily explicable, nor is the condition of the system well known under which their various types are convertible into each other or into remittent fever. It appeared, however, that in the above-mentioned case, the increased volume and frequency of the pulse, where there was no headache or heat of skin, prevented the formation of a well-marked rigor at the tertian period, and thus gave rise on the following day to a renewed effort of the constitution to equalize the broken balance of excitability, and restore the impeded action of the secreting system and capillary circulation. No explanation of the cause of such conversions is obtainable from the morbid appearances visible in the brain and spinal chord of those who die of the disease, as such appearances are confined entirely to the vascular system. The state of the sensorium and nerves, preceding such conversions, is only to be inferred from the effect which cold weather has in changing remittents into intermittents, and the power which bark, quinine, and cold affusion, have in the treatment of intermittents, by preventing the return of the paroxysms. We may consider it sufficiently proved, that this state is one of *atony* of the nerves and stagnation of blood in the capillaries of the lungs,—primary effects, as would appear, of *malaria* or whatever other causes injure the existing principle of excitation or stimulus of the blood, and impede its arterialisation in the pulmonary capillaries. Dr. Currie had asserted that accessions of intermittents might be prevented by affusion of cold water, and M. Fleury has successfully employed this means, before the expected paroxysm, for the cure of intermittents without the aid of quinine.¹ The beneficial effect of the remedy evidently depends on the shock thus communicated to the nervous system and general capillary circulation; and it is to the increased tone which quinine and like tonics produce in the nervous system that they owe their curative effect.

Like intermittent fever, asphyxia and algide cholera are diseases in which the blood, being deprived of its oxygen, is loaded with carbon and gives rise to stagnation in the pulmonary capillaries, with accumulation of it in the right side of the heart. In both intermittents and asphyxia, this stagnation is the immediate effect of suspended arterialisation of the blood, which is frequently secondary in cholera, as in this disease the preternatural exhalation from the bowels renders the circulating fluid so viscid as to prevent its transmission to the air-cells of the lungs, and interrupts those chemical changes necessary to the continuance of

¹ "Bulletin des Acad.", as quoted by Dr. Ranking in "Half Yearly Abstract of the Medical Sciences," vol. vii, (1848), p. 204.

vitality and the production of heat. So forcibly indeed was this resemblance impressed on my mind, by many of the cholera cases seen in India, that I could not help regarding this disease as but the cold stage of an intermittent, in which the diarrhoea, superadded, prevented all febrile reaction. The secondary fever which affects cholera patients, after the earlier symptoms are removed, has also much resemblance to the hot stage of intermittents; and the same atmospheric constitution is found productive of both. There is also a fever peculiar to Malwa, one of those "*febres intermittentes algidæ*" which the late Dr. William Gray, formerly staff-surgeon in that district, described to me as the cold stage of an intermittent long continued, and attended by great prostration of strength and occasional diarrhoea. On this analogy of the two diseases, and their origin from similar causes, I find the following remarks on the diseases for May recorded in my report of the European General Hospital for 1839:—"Enlargement of the mucous follicles at the end of the ileum, and in the colon, accompanied by a similar state of the mesenteric glands, has been very generally observed in the fatal cases of cholera which happened during the month. The same alteration was witnessed in numerous cases of the disease, as it prevailed in London during the year 1832; and this morbid physical condition, which is usually attended, in children and in young people, by an excessive sero-mucous secretion, is doubtless favourable to the impression of atmospheric causes which produce cholera, but is not otherwise influential in giving rise to the disease. The immediate causes producing this fatal malady, seem connected with *epidemic* and *endemic* influence, such as produces intermittent fever, and with those atmospheric changes which at particular periods of the year, render it more or less prevalent. The attacks of cholera, when endemic, most commonly happen at the changes of the moon. Remittent or intermittent fevers, with gastro-enteritic affections and diarrhoea, are the most common forms of disease where cholera is prevalent, and partake of the same atonic and congestive character which distinguishes it. These facts justify the inference that "*malaria*" is the cause of both diseases; but I will not venture further than point out their connexion; for we are as little acquainted with the real nature of febrific miasm as we are with the changes of the atmosphere which give rise to epidemics. The state of the latter, however, when *endemic* cholera is most prevalent in India, is a temperature about 85 of Fahrenheit, accompanied by a close and cloudy atmosphere, impregnated with moisture, and succeeded by a fall of rain or an evident change in the weight of the air, marked by depression of the barometer. During the month the admissions for cholera took place chiefly on the 16th, 17th, and 18th, after the rain began to fall; a change which had been preceded by close, sultry weather. Cases of delirium tremens admitted were of a more than usually congestive character, proving rapidly fatal by the patient becoming comatose, his skin cold and pulse feeble, while the bowels were loose; which symptoms seemed to indicate the operation of the same prevailing cause which gave rise to cholera."

Treatment of Intermittent Fever.—It was seldom necessary to do any thing during the cold fit of intermittent in Gujerat. When

the rigors were very severe, however, sixty drops of laudanum were occasionally given with advantage, this medicine moderating the symptoms and restoring the circulation to the surface. It should not, I think, be administered too early, as there is reason to believe that in the commencement of this stage it interrupts the natural chain of events, and produces a tedious hot fit. The best time for giving it is after the cold fit has attained its height.

If the constitution were inflammatory, the previous paroxysms tedious and indisposed to perfect intermission, or if there were any symptoms of local congestion in any of the organs, one full general blood-letting during the hot fit was always attended by success, in rendering the succeeding paroxysms more regular and less difficult of solution. Whenever the natural course of the disease is interrupted by any of the causes mentioned, the patient should be bled, at least once, from the arm. If congestion or inflammation attack the head, the temporal artery should be opened; or if the affection be of the chest, cupping and leeching of the part, followed by a blister, will be necessary. When the liver was affected, and the increased circulation of that organ could not be removed by the usual antiphlogistic means, mercury was employed to produce moderate salivation; and calomel with purgatives was used in all the modifications of the disease. Such were the measures adopted to render the intermissions perfect, and prepare the system for the administration of bark:—quinine at this time not being known for the cure of intermittents. Many of the patients had their heads bathed, during the hot stage, with cold water, and derived much relief from this practice.

Cold douche to the head was more particularly useful in those cases where the regularity of the intermittent was interrupted by a want of tone in the constitution. Men debilitated by former disease and long residence in the climate could not bear general blood-letting in the intermittent; and a partial use of cold douche was found a useful substitute, by bringing on perspiration and relieving congestion of the head. Local blood-letting in such cases was, however, sometimes advisable. The patients had likewise enemata of rice-water and tincture of opium, and at bed-time they took draughts of camphorated mixture, with acetate of ammonia and nitrous ether.

In some cases, salivation proved sufficient to stop the intermittent, but in many more it failed. It was more successful in quotidians than in tertians; and when it did not succeed in curing the former, it generally changed their type into the latter. Bark was of course the principal means of cure, and where properly administered, (when quinine is not obtainable), falls not short of the great character it has acquired. In the cure of intermittents among the native soldiery of India, it is a less expensive medicine than quinine, and is nearly equally efficacious. I found then an ounce of it given in two drachm doses every hour, and immediately before the expected recurrence of the paroxysm, always diminished its severity, and put an entire stop to it about the third or fourth time. In some cases, the severity of the cold fit was increased, but in such, the duration of the hot fit was lessened. It was sometimes necessary, when it nauseated the stomach, to give it in an effervescing draught; and when it produced diarrhoea, it was administered combined

with tincture of opium. To obviate constipation, ten or fifteen grains of the compound rhubarb pill were used ; but where there was much derangement of the biliary functions, brisk purging was resorted to immediately after the cessation of a paroxysm ; sufficient time being thus left for the bark being again given before the period of the next paroxysmal return. Purging was more necessary in quotidians than in the other types. Failures of the bark, which have been recorded, may be ascribed more to a want of foresight in the practitioner, than to want of virtue in the remedy. When types of the intermittent are associated with an inflammatory diathesis, the secretions generally deficient, and no measures taken to remove such before the administration of bark, the medicine may prove worse than useless ; and even in the administration of quinine, a combination of it with a mercurial and James's powder, along with saline mixture and nitrous ether to act on the kidneys, will be found of great utility in the cure.

In one case of quartan, the *liquor arsenicalis* was given, with complete success, after mercury, oxyd of zinc, and bark, had been used in vain. The fever was of several months standing, the secretions from the liver brown and vitiated, and mercury had failed in producing free salivation. The arsenical solution was given in a dose of ten drops, immediately before the anticipated return of the paroxysm, and put an end to it at the third administration. The cessation of the fever was accompanied by a very copious salivation, and a return of healthy biliary secretion.

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(To be concluded in next Number.)

ON THE USE OF CHLOROFORM IN SURGICAL OPERATIONS AND MIDWIFERY.

By JOHN SNOW, M.D.

- I.—*Comparison of Chloroform with Ether.*—II. *Circumstances which forbid its use, or modify its action.*—III. *Mode of administering it.*—IV. *Description of its effects.*—V. *Results of its employment.*—VI. *The cases in which Chloroform is applicable in Midwifery.*—VII. *Directions for its employment.*

I. It is now just two years since the news of the Inhalation of Ether for preventing the pain of surgical operations, reached this country ; and a little more than a year, since Chloroform was introduced as a substitute for it. The result of experience has been, to shew that either of these agents is capable of entirely preventing the pain of the most severe operations ; and that when employed with care, and some little knowledge of their effects, they are free from danger. Although nothing can be effected with Chloroform which might not be accomplished by the aid of Ether, yet it possesses, as was stated by Dr. Simpson on introducing it, certain minor advantages,—in being less pungent, more portable, not leaving a disagreeable odour in the breath, and less frequently causing excitement previous to the insensibility ; and these properties have been sufficient to enable it to be used, to the almost