ON THE INFLUENCE OF ALTITUDE AND PRESSURE ON THE "VITAL CAPACITY" OF MAN.

By F. CRESSWELL HEWETT, M.R.C.S., late R.N.

THE influence of altitude upon the spirometric measurements of the expired air (vital capacity of Hutchinson) is a subject that has not met with much attention. Rattray, in his researches on climate, published in the *Proceedings of the Royal Society* (1869-72), incidentally mentions that an ascent of 2,000 feet at Ascension lessened the "vital capacity", as judged of by the spirometer, from 266 to 249 and 243 cubic inches. In seeking to verify these results, I determined, as an opportunity offered, to carry out more extended observations upon the subject. Two officers of H.M.S. *Northumberland* (Lieutenants Campbell and Simpson), whose "vital capacity" had previously been frequently noted, volunteered; observations being taken during a period of three days, the altitude of the place of observation, at Madeira, as determined by an aneroid barometer, corrected for temperature, being 2,950 feet, this agreeing with the altitude given by Dr. Hartung in his *Geologische Beschreibung der Inseln Madeira, etc.* The observations commenced on the morning after the arrival of the party at the mountain, being taken twice daily, morning and evening, before breakfast and before dinner, at about 8 A.M. and 6 P.M. respectively. The vital capacity index is taken from the mean of three trials, the height of the barometer and temperature being noted at the same time.

A.—Previous Vital Capacity=325 Cubic inches.				B.—Previous Vital Capacity=270 Cubic Inches.			
First Day.				First Day.			
Mean v. c. in c. in.				Mean v. c. in c. in. Bar. Tem. (F.)			
1. 290	}	290.5		1. 226	}	241.3	27.78 61
2. 291				2. 246			
3. 290.5				3. 252			
1. 290	}	293.6		1. 247.5	}	257.5	27.72 57
2. 291.5				2. 260			
3. 299.5				3. 265			
Second Day.				Second Day.			
1. 290	}	293.6		1. 267	}	263.6	27.70 55
2. 292				2. 263			
3. 299				3. 261			
1. 298	}	295.5		1. 259	}	257.3	27.65 52
2. 289.5				2. 253			
3. 299				3. 260			
Third Day.				Third Day.			
1. 308	}	310		1. 252	}	258.8	27.64 55
2. 312				2. 262			
3. 310				3. 262.5			
1. 314	}	313.8		1. 254	}	263.5	27.61 52
2. 327.5				2. 268			
3. 320				3. 268			

The previous vital capacity was determined by a series of trials similar to the above; the barometer fluctuating between 30.31 and 30.01 inches; the thermometer between 62 and 69 degrees Fahr.; the maximum variations in the vital capacity being 15 and 19 cubic inches respectively.

If we look at the vital-capacity index under the heading of "trials", we find that there is both in the case of A. and B. a considerable variation in the number of cubic inches registered in each separate series. In the case of A., we find a difference of nine cubic inches between the maximum and minimum indications on the morning of the second day; whilst, in the case of B., there is a difference of six cubic inches. Although, of course, the highest indication registered the true vital capacity, the examination of the whole series of trials leads us to the conclusion that these differences are due to the incomplete filling or emptying of the lungs; and that in a series as the present, where the same cause of error is always acting, for purposes of comparison, the mean of the three trials will be the safest index for our purpose.

Taking, then, the means of the several trials as a fair expression of the vital capacity, we find, in comparing the means, that there is a gradual increase from the morning of the first day to the afternoon of the third. In the case of A., there is a progressive increase from a vital capacity of 290.5 cubic inches to 313.8, or an increase of 23.3 cubic inches; and so, also, in the case of B. (the progression being interrupted on the second day), there is an increase from 241.3 cubic inches to 263.5 cubic inches, or a total increase of 22.2 cubic inches; the amount of increase being strikingly similar in both cases.

Looking now at the thermometric and barometric records, we find that 9 deg. Fahr. and .17 inch embraced the whole of the fluctua-

tions of temperature and pressure, the former ranging between 61 deg. Fahr. and 52 deg. Fahr., the latter between 27.78 inches and 27.6 inches. These changes, being so minute, cannot come to our aid as explanatory of the progressive increase of the vital capacity in both cases, the only explanations remaining being either (1) increased proficiency in the art of "blowing"; or (2) an accommodation of the lungs to the decreased pressure, whatever cause that first occasioned a diminution in the vital capacity being removed or neutralised. The first cannot be explanatory; for, at the sea-level, the vital capacity is almost constant in both cases during a similar series of observations; and, moreover, the steady increase above noted could not be explained by increased proficiency in "blowing", as both had been accustomed to "blow", and had evidently reached their maximum capacity, as evinced by the uniformity of the vital-capacity index during the series of trials at the sea-level.

There only remains the second hypothesis to consider—viz., the gradual removal or neutralisation of some impeding cause to the introduction of air to the lungs. Firstly, are we to consider that the diminution of vital capacity is due to decreased pressure upon the pulmonary tissue, causing the presence of an increased amount of blood in the lungs, and that the diminution of the vital capacity was due to the increased space taken up by the blood, and was an index of the superfluity? and that we are to account for the re-established "vital capacity" by the subsidence of the pulmonary hyperæmia; or, this subsisting, is there compensatory dilatation of the pulmonary air-cells? This latter is most possibly the explanation for the diminished pressure on the lungs still existing; there would be still cause for the hyperæmia, and, therefore, without dilatation of the pulmonary air-cells, still cause for a diminished vital capacity.

Comparing the previous vital capacity with the results of the experiment, we find that, in the case of A. with a previous vital capacity of 325 cubic inches, there was at first a diminution to 290 cubic inches, or a total decrease of 35 cubic inches; which deficit, on the afternoon of the third day, was reduced to only 5 cubic inches. In the case of B., with a previous vital capacity of 270 cubic inches, this was reduced to 241 cubic inches, or a deficit of 29 cubic inches, which deficit was lessened on the third day to 6.5 cubic inches.

From these observations, we may deduce the following conclusions.

1. The vital capacity of man is at first reduced by a diminution of pressure.

2. After a few days, the average capacity is re-established.

ON CEREBRO-SPINAL MENINGITIS.*

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IN the present paper, I propose to sketch briefly, and make a few remarks upon, eight cases which were probably examples of the above-mentioned disease. They were all hospital patients. I am indebted to Dr. Coates for the use of notes of three of them (Cases II, VII, and VIII).

CASE I.—George R., aged 12, a schoolboy, became an in-patient on January 25th, 1875. He cut his finger with a hatchet a month previously. His illness began, two weeks before, with headache, loss of appetite, and vomiting. He got out of bed several times without knowing what he was doing. On admission, he complained of pain in the occiput and left side. He could open and shut the mouth well. The head was thrown back; the muscles of the neck were rather firm; the knees were contracted; the flexor muscles somewhat stiff. During his illness, the tongue was fairly clean, and his appetite good. The bowels for a considerable time were obstinately confined; afterwards the motions were passed involuntarily. Once there was slight difficulty in swallowing. The urine was normal, but often passed in bed. Several times, there was much sweating. The nights were sometimes good, sometimes bad—from pain; at others quiet, but sleepless. There was much retraction of the neck, and great pain on trying to bend the head forward. Opisthotonos existed for many days, with occasional spasm of the legs. Once it was difficult to make him open the mouth. The tongue was always well protruded. At one time, there was blowing with the mouth, also temporary drawing down of its left angle, and, at the same time, right internal strabismus. Twitching of the mouth, and slobbering out of its right corner, also occurred. The pupils were always normal, once rather large. The legs became flaccid, and the arms and hands seemed to lose all power, and eventually the right

* Abstract of paper read before the Bath and Bristol Branch.

arm was quite paralysed. One day, the breathing was occasionally stertorous. He was rather stupid now and then, and once lay half-insensible on his back. There was considerable pain in the back of the neck, especially on movement, also varying pains in the left side, trochanters, and knees. Asthenia and wasting were marked. The morning temperature varied between 97.4 deg. Fahr. and 103.4 deg. Fahr., averaging about 99 deg. Fahr. The evening temperature varied between 99 deg. Fahr. and 103.2 deg. Fahr., averaging over 100 deg. Fahr. The pulse varied between 54 and 108; usually it was but little accelerated, and once only a little uncertain in rhythm. Respiration, as a rule, was slightly hurried. The treatment consisted of nourishing diet, chloral to relieve pain, and extract of physostigma. The latter was given in one-eighth of a grain doses every six hours on January 22nd; on the 23rd, every five; on the 25th, every four; on the 31st, every three hours; on February 5th, every six hours. On February 22nd, it was omitted.

CASE II.—Catherine H., aged 2, living at Weston, was taken ill on April 24th, 1875, with sickness, headache, and retraction of the neck. She fell into a well fourteen days before, but suffered no visible injury. She kept crying, and, when touched, was very hyperæsthetic all over. She was arched up like a bow. The motions and urine were passed in bed. She was very feverish, and much wasted. There were no bed-sores. A few days before death, the child lay in a half-conscious state, and died quietly on May 22nd, 1875, the symptoms having continued unrelieved. No *post mortem* examination was permitted. The treatment was at first liquor ammoniac acetatis, and afterwards the liquor hydrargyri perchloridi.

CASE III.—Henry T., aged 13½, a butcher's boy, living at Lambert's Buildings, was admitted on April 5th, 1875. He was taken ill on March 29th with frontal headache, followed the next day by pain down the whole back and vomiting. The head had been retracted and turned to the right side since the second day. The illness began without appreciable cause. He lay in bed crying, from pain from the occiput to the sacrum, extending over the whole dorsal surface. There was much tenderness when he was touched. There was also pain half-way down the back of the right thigh and over the surface of the abdomen, which was also tender. The tongue was dry in the centre; the edges were whitely furred. Bowels confined. Temperature, 103.4 deg. Fahr.; respirations, 30; pulse, 108. During the illness, the appetite was usually fair; the tongue was more or less coated, and often very dry; thirst prevailed; sickness was very common; and the bowels were nearly always, sometimes obstinately, confined. There were great emaciation and weakness. The urine was normal until April 21st, when it was albuminous. On the 22nd, it was acid, smoky, and the specific gravity 1020. It became more and more bloody till the 27th, on which day it was clear. It was again albuminous on the 30th; on May 1st, bloody; on May 3rd, there was no albumen; from the 4th to the 9th, it was albuminous; on the 10th, it was bloody again; on the 13th, clear but albuminous; on the 20th, alkaline from amorphous phosphates; no albumen, but some hyaline granular and epithelial casts; on the 24th, it was normal. Some nights were very bad; but hypodermic injection of morphia generally ensured a good one. There was occasional sweating. The right ear became dusky inflamed from pressure, and two large bedsores formed over the trochanters. They perfectly healed. Great retraction of the neck and opisthotonos existed nearly all the illness through, gradually relaxing towards the end. Once he could not clench the right fist well, nor extend the fingers. The pupils were often unequal, the right being usually larger than the left; occasionally they were dilated. He was very deaf. There was occasional nocturnal delirium. The day the urine became albuminous, he seemed quite unconscious and very much changed; but the day after he was quite rational. Very severe pain was suffered all the time. It affected the forehead, back of the neck, shoulders, right arm, gluteal regions, and legs; and there was much hyperæsthesia. The respirations varied from normal to 44 per minute. As a rule, they were rather accelerated. Coarse râles were discovered on the day the albumen appeared. The pulse was not quite regular then. It varied between the normal and 144, being usually over 90. The temperature varied in the mornings between 97.8 deg. Fahr. and 104 deg. Fahr.; the evening temperature between 98 deg. Fahr. and 104.4 deg. Fahr., generally over 100 deg. Fahr. He left the hospital well on June 14th. The treatment consisted of generous diet and wine. Bromide of potassium and chloral were at first added, with hypodermic injections of morphia sometimes combined with atropia. The latter were of immense benefit in relieving the pain. The extract of Calabar bean was ordered two days after admission, in one-eighth of a grain doses every four hours; next day, every two hours; next, one-sixth of a grain every hour; next, a quarter of a grain every hour; three days afterwards, a quarter of a grain every half-hour; next day, half a grain every half-hour. This last dose was

continued for twenty-four hours, and then the drug was abandoned. He subsequently took iodide of potassium, ergot, perchloride of mercury, bark, and phosphorised cod-liver oil, with aperients.

CASE IV.—Clara S., aged 3½, was admitted on April 1st, 1875. She was taken ill fourteen days before with frontal headache and vomiting. Three days afterwards, the head became retracted. On admission, the muscles of the back of the neck were in a state of spasm, and the child complained of much pain in the head, crying out in her sleep, "Oh dear, my head!" Temperature, 101 deg. Fahr.; respirations, 24; pulse, 115. During the attacks, the nights were fair. The appetite was pretty good; but there was a great deal of vomiting, with furred and dry tongue. The bowels were at first regular, afterwards more confined, and the breath offensive. There were much emaciation and debility. The urine was normal. The pupils were once dilated. There was much retraction of the neck, and warping towards the right side. She had considerable pain in the head, chiefly the forehead and back of the neck. Once she was drowsy. The hair fell off very much. The pulse was generally over 130. The respirations were a little hurried. The morning temperature varied between 97 deg. Fahr. and 101.4 deg. Fahr.; generally under 100 deg. Fahr.; the evening temperature between 99 deg. Fahr. and 102.6 deg. Fahr.; generally over 100 deg. Fahr. Generous diet was given. Bromide and iodide of potassium were first tried; then juice of conium and calomel were added. Quinine followed, and afterwards bichloride of mercury and bark.

CASE V.—Henry H., aged 2½ years, was admitted on March 15th, 1875. The mother stated that she had lost one child from convulsions; another died a fortnight previously from a similar complaint to that from which this child was suffering. He was taken ill a month ago with sickness, thrice in one day, and diarrhoea. He had been quite healthy up to that time. The sickness did not recur; but he rapidly lost flesh, and presented symptoms like those now present. He had bed-sores; lay with his eyes half-open; the pupils widely dilated on moving. He kept rolling the eyes about. The head was tonically retracted. There was no actual paralysis. He kept moving his limbs about, drawing the legs up, and opening and shutting the mouth. The *tâche cérébrale* was not marked. He screamed, ground his teeth, and coughed. Temperature, 100.1 deg. Fahr.; respirations, 20; pulse, 104. He had fair nights all through, and did not appear to suffer very much pain. He was sick very often, and had no appetite for some time. The bowels sometimes were very loose, at others very confined. Once there was a smart attack of diarrhoea. As he was getting better, the abdomen became tumid, the veins full, and the liver somewhat enlarged. This may have been due to the quantity of food he took during convalescence. The pupils were always very widely dilated, and vision was, no doubt, at times very imperfect. The head was retracted, and the legs were drawn up. He occasionally ground the teeth. If lifted up, he would fall backwards immediately, as if he had no power over his body and limbs. The temperature was once over 100 deg. Fahr., but soon became normal. The pulse was very rapid at first. He was emaciated and weak a long time, and could not walk alone. On June 3rd, he left quite well. He took iodide of potassium and bark; afterwards syrup of the iodide of iron and phosphorised cod-liver oil.

CASE VI.—Alice C., aged 3 months, became an out-patient on May 3rd, 1875. Ten days previously, on taking her from the cradle, her mother found the head drawn back and the legs drawn up. The child cried much, and once or twice was sick. She still suckled, but was much wasted. She cried loudly when the head was moved forwards. She was ordered a grain of hydrargyrum cum cretâ three times a day.—May 13th. The neck was just as retracted. She cried very much; she had very bad nights. The powder was repeated twice daily, with five grains of bromide of potassium every night.—May 17th. She had no appetite. The neck was the same. She evidently suffered much pain. She cried incessantly.—May 24th. The head was not quite so retracted. She was ordered a grain of iodide of potassium, four grains of bromide of potassium, and two grains of ammonio-citrate of iron, three times a day.—May 27th. She was greatly emaciated. Cod-liver oil and steel wine were ordered. The child became gradually worse, and died a few days afterwards.

CASE VII.—Arthur N., aged 12, living at Limpley Stoke, a quarry-boy, was admitted on April 24th, 1875. On coming home on March 13th, having been quite well, he complained of pain at the back of his head, and the neck soon became retracted. There was no sickness. He had been delirious on and off, and, on several occasions since, had vomited round worms, the last four days ago. Three weeks ago, he became hemiplegic on the left side. The bowels were at first confined, but were now regular. When admitted, he lay in bed with the head turned to the left side, and complained of great pain in the back of the neck when it was moved. There was left hemiplegia, the tongue was

protruded to the left, and the mouth drawn to the right side. He could not tightly close the left eye. The left half of the tongue was more flabby than the right. The left arm and leg were wasted, and the thigh and leg were hyperæsthetic. There was a slight tendency to œdema of the left foot. There were a few yellow opaque sudamina over the abdomen and chest. He complained only of pain in the thigh and in the back of the neck when not touched. Tongue clean. The pupils were equal and normal. He passed urine in bed. The nights were bad at first; were relieved by morphia, and soon were good without it. The appetite remained fair. The motions were usually passed involuntarily. No worms were evacuated after santolin and jalap. There was constant incontinence of urine. It was normal. The pupils were equal and normal. When he left the hospital on August 26th, the paralytic symptoms were but little relieved. All through, he had much pain in the neck, left leg, and arm. This gradually abated. The pulse was usually quick, but became normal before he left. The temperature never exceeded 100.2 deg. Fahr., and soon subsided. Treatment consisted in the administration of iodide and bromide of potassium, the hypodermic injection of morphia, then the hypophosphite of soda, and subsequently the syrup of the iodide of iron, cod-liver oil, and strychnia.

CASE VIII.—John G., aged 14, stable-boy, was admitted on October 15th, 1875. He was taken ill five days before with pain in the head and legs, and sickness. He had slept badly, with talkative delirium. The bowels were open several times a day. On admission, the head was retracted; there was pain all over it and in the thighs. The tongue was a good deal furred, and moist. His appetite was better than at first. The bowels were regular. He was slightly deaf. The first two nights were bad, with much talking and shouting; hypodermic injections of morphia gave him a succession of good ones. The sixth of a grain had to be used. This lost its effect after a short time, and the nights were restless. The dose was augmented with success, and the morphia was left off on October 30th. The tongue was furred and foul at first, then became dry, and there was much thirst. The bowels were more or less confined unless medicine was given. The pupils were normal. The neck was much retracted, so that he could not lie on the back; it was gradually relaxing. There had been a great deal of pain in the head, back of the neck, and right thigh; it was much abated on November 2nd. He had been very deaf. Herpes came on the upper lip. At the beginning, the urine was loaded with urates, very acid, with a specific gravity of 1023. It gradually cleared, and became neutral. On October 23rd, albumen appeared; it was absent the next day. The urine was alkaline. On the 30th, he was very apathetic; on the 26th, respiration had been slightly hurried. The pulse had never exceeded 108; one day, it was a little intermittent. The morning temperature varied between 100 deg. Fahr. and 103.8 deg. Fahr.; the evening temperature between 103.4 deg. Fahr. and 105.6 deg. Fahr. On October 31st, it sank in the morning to 98.6 deg. Fahr.; in the evening to 99 deg. Fahr. On November 1st, it was 98.6 deg. Fahr. The case is not yet complete; but there is every prospect of speedy recovery. Treatment has consisted in the administration of the bromide of potassium all through, with hypodermic injections of morphia. The iodide of potassium was given at first, and a blister applied to the nape of the neck. November 22nd. He is quite well.

REMARKS.—At the outset, the question naturally arises, Were these cases examples of cerebro-spinal meningitis? If they were not, what disease did they represent? Were they tubercular meningitis? If so, the results of that malady were never so favourable in eight consecutive cases. For six out of eight to recover is an event unknown in the practice of any single person, or even in the collective experience of the whole profession. The numerous cases that have come under my care have always terminated fatally. Nor do I remember to have seen one in which persistent retraction of the head occurred. Case VI perhaps approximates rather closely to this disease; and, taking into consideration the tender age of the child (although epidemic meningitis attacks infants), and the absence of *post mortem* evidence, I am rather doubtful as to the diagnosis in this instance. The peculiarities of the pulse so common in tubercular meningitis were absent in all those under consideration, with trifling and temporary exceptions. And it is rare to get so many successive cases of such long duration. In all except one, there was a total absence of convulsions. Many other points of contrast could be noticed, did time permit. Were they simple cerebral meningitis? This complaint is generally ushered in by violent convulsions, with intense fever, headache, and rapid breathing; and runs a hurried course, very seldom lasting longer than six days, and often terminating in two. Were they tetanus? The first case had a history of cut finger, which was somewhat calculated to mislead. There was no previous injury in all the rest; so that, if they were tetanus, they must have been idiopathic in their origin. There were no exacerbations of

the painful spasms, as in lock-jaw; no trismus; no marked difficulty of swallowing; and fever and more or less head-symptoms were present. But, granting they were cases of cerebro-spinal meningitis, did they come under the sporadic or the epidemic variety? This point is of great interest and importance. Sporadic cerebro-spinal meningitis, in which the membranes of the base and ventricles of the brain, with the sub-arachnoid space of the spinal cord, are especially inflamed, is, according to Dr. Gee, comparatively common in London. The symptoms are similar to those of the epidemic form of the disease, so far as the meningeal condition is concerned. Herein lies the chief difficulty. It is well known that there are three distinct varieties of the malady:—Firstly, the simple form, in which there is a predominance of the nervous phenomena; secondly, the fulminant, in which there is terrible blood-change, evidenced by hæmorrhages into the skin, and accompanied by marked depression of the vital powers; thirdly, the purpuric form, in which the former two exist in varying proportions together. In each epidemic, cases are observed which link together all three forms of the disease; and even the symptoms of them all may be grouped together in one individual. Our cases were clearly of the simple kind, although it is interesting to note the renal hæmorrhage which occurred in No. 3 Case. It is certainly worthy of notice that all of them occurred between January 7th and April 24th, 1875, except the last. During that period, I saw one or two others of a suspicious character, but have purposely excluded them from present consideration. Since I have been in practice, I have seen no cases at all resembling them. There can be no doubt that they did not represent an epidemic constitution of any severity. This is proved by the comparative mildness of the cases themselves, their chronic course, and the limited nature of the outbreak. The patients lived in various quarters of the city; one at Limpley Stoke, and another at Weston. Still, it is somewhat remarkable that so many exactly similar cases should have been under treatment at the same time.* Perhaps some of my brethren here can offer, from their experience at that period, some evidence towards the solution of this difficulty. I cannot but think myself that there must have been an epidemic origin to account for the coexistence of such a number of cases. The ages of the patients furnish another point of interest. They varied from three months to fourteen years. It is stated that in some epidemics children mostly suffer. This would coincide with what took place on this occasion. Many points of resemblance may be noticed between the symptoms in the several cases presented. Thus, in the initial stage, six out of the eight had intense headache, mostly frontal; the other two being too young to express themselves on this point. It is, however, a significant fact that they screamed and cried a good deal. Six had vomiting; all had retraction of the neck; in two, it was also drawn to one side. Pain down the spine and general hyperæsthesia were also prominent symptoms. With regard to temperature, I felt at the time that the thermometer would have registered much higher had the cases been more recent when they came under observation. Case VIII corroborates this impression. The temperature was sometimes considerably lower in the evening than in the morning. The pulse ran high in some of them—up to 150 or 180; the younger the child the higher the pulse. There seemed to be some relation, although not a very strict one, between the temperature and pulse. Yet sometimes it was surprisingly slow, being in the first case as low as 66 per minute. The rapidity of respiration seemed in all to depend upon the febrile movement. The asthenia, rapid wasting, and tendency to bed-sores, were remarkable. Vomiting, obstinate constipation, or involuntary action of the bowels, occurred in nearly all. The condition of the urine in Case III was remarkable. I attribute this to the elimination of some morbid material, and it seems to me to link the case with the purpuric variety of the disease. It is strange that temporary albuminuria occurred also in Case VIII. The frontal and occipital headache, pains in the neck, back, legs, sides, abdomen, and arms, the general hyperæsthesia, retraction of the neck and opisthotonos, and spasms of the legs, occurred too frequently to be accidental symptoms. Delirium and fleeting unconsciousness happened three or four times; but there was general torpor in them all. The condition of the pupils and eyes, and the various degrees of paralysis, demanded attention. I cannot divine the etiology of these cases. Supposing them to be examples of cerebro-spinal meningitis, its causation is wrapped in obscurity. It seems to prevail especially in cold seasons of the year. High and low latitudes, healthy and unhealthy places, well drained and badly drained, suffer alike. Some believe it to originate in an analogous manner to the zymotic class, others do not recognise any resemblance. Diseased grain has been blamed as the cause. Although there is evidence to the contrary, the Massachusetts Medical

* The mother of one of the children stated that she had lost a child fourteen days before from the same sort of illness.

Society agreed in its non-infectious nature. It attacks more children under 14 years of age than adults. With regard to treatment, a variety of remedies was employed. The bromide of potassium, chloral, and henbane were useful in relieving pain; but the hypodermic morphia carried off the pain, and I believe Case III would have succumbed without it. It would require much more experience to state positively the value of the other drugs employed. I am inclined to believe the disease is very little influenced by drugs. The cod-liver oil, especially phosphorised, was of undoubted service during convalescence. I can also recommend the ice-bag to the spine. The Calabar bean seemed to produce no physiological effect. It was obtained from three different sources, and I believe was well prepared. Yet one patient took it in fair doses for a month, and another in very large doses. Twenty-four grains in twenty-four hours is a considerable quantity for a boy only 13½ years old. But there was no more loss of motor or reflex activity of the cord nor diminution of pain; no more enfeebling nor slowing of the heart's action, nor interference with respiration, than during the time the patients were not taking the medicine. Nor did it produce any giddiness, torpor, excessive secretion of tears and saliva, vomiting or purging, muscular twitching, or the least contraction of the pupils. It would seem that the bean cannot be so poisonous as it has been stated to be. I think much of the success of these cases is due to the *vis medicatrix nature*, a power which has a far higher place in the cure of disease than we often suspect or allow. I should be much disposed, were any new cases to come under my care, to push belladonna, with purgatives and other eliminants. Such an occurrence may at any moment enhance the interest and importance attaching to this group of maladies. The few drops of silently falling rain to which we pay but little heed may usher in a terrific storm, pregnant with destruction, desolation, and death.

P.S.—I should be grateful if any members who may have seen similar cases would kindly communicate them to me, as the matter will be more fully discussed at a subsequent meeting of the Branch.

THE PRESENT EPIDEMIC OF SCARLET FEVER IN BRISTOL.

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I.

THE *bête noire* of health officers is here in force; and has, after a struggle of seven months, set our regulations at defiance, and re-asserted its usual fatal character. I will give an account of my knowledge of it in the form of short propositions.

History of the present Epidemic.—A few cases, isolated and at different points, appeared in the autumn of 1874. These were, so far as I know, successfully stamped out by isolation and disinfection. Cases kept dropping in at intervals during the winter of 1874 and 1875. By redoubled energy, we succeeded in keeping the disease within narrow limits, and at isolated points. All infected houses and clothing were disinfected. Drains in localities wherein the disease prevailed were kept saturated with disinfectants, viz., sulphate of iron and carbolic acid. Handbills containing instructions and cautions for the prevention of its spread were freely circulated.

With the approach of spring, the cases multiplied; in the summer, still more so; until, last week, we had 28 deaths from it in a population of 196,000. Judging by the history of former epidemics, I do not think we have yet reached the highest point, which, in the epidemic of 1870, was 35 deaths in one week. We still disinfect and do our utmost to prevent its spread; but I acknowledge most freely (as with regard to this disease I always have) that we have utterly failed to produce much effect on it, except to postpone it in an epidemic form for four or five months. During the quarter ending September 30th, we lost 161. In Bristol, the disease, as an epidemic, has very regularly observed a cycle of about four years; of the cause to which this is due, I can form no opinion.

Type of the Epidemic.—A small proportion of the cases have been of a most malignant character, the poison destroying life in eighteen or twenty-four hours by acting on the blood, and through the blood as a depressant on the nervous system. Death in these cases has taken place before there has been time for the development of the rash on the skin. A considerable number of the cases have been of the middle type, usually called "scarlatina anginosa". Many of these have died from excess of zymosis and throat-affection; but, judging by the returns of mortality and the frequent entry of "scarlatina", "dropsy", or "nephritis" in the returns, I believe that more than one-third of the

fatal cases were originally light, and became fatal through an affection of the kidneys, produced by exposing the skin to cold during the convalescent stage. Having formed this opinion, I had a handbill of cautions on this head circulated extensively among the poor. I believe it has done some good. This form of death is more frequent among the poorer class than among the rich.

In connection with this subject, I append a letter which I have received from my friend Dr. Gray, the experienced medical officer of the Children's Hospital. As the letter is, in my opinion, a very original communication and a most important one, I give it in full, hoping that Dr. Gray will publish a more extensive account of his experience in a separate paper.

"Bristol Hospital for Sick Children, Royal Fort,

St. Michael's Hill, November 20th, 1875.

"My dear Sir,—May I draw your attention to what I believe to be a sufficiently marked feature of the present scarlet fever epidemic to deserve special recognition, viz., the occurrence of a number, probably no small proportion, of cases of the latent form of the disease? I would include not only those where dropsy has followed an attack of the fever so slight as to have escaped notice, but also those in which the renal complication was primary; for it seems to me certain that here and there cases have occurred, without rash and without sore-throat, in which at the very outset the whole force of the poison has fallen upon internal organs—cases for which the term "scarlet fever" is literally a misnomer, and which can only be regarded as such from the fact of their occurring during an epidemic of that fever, and also because they seem to be quite as capable of communicating the poison as those in which it develops itself in the usual way. It is solely on account of the importance of this latter point that I have ventured to trouble you on the subject, because I think you will agree with me, that such cases are very likely to be a means of propagating the disease in an insidious and dangerous manner that is easily overlooked. I suppose I must have observed nearly a dozen of them, the last having presented itself only on Thursday; and I have thought that perhaps the occurrence of this latent form has not happened to come under your notice, as no reference has been made to it in your reports. You will know best whether there is any use in cautioning the public to beware of it. Probably you would think it futile to bid them beware of an invisible enemy! The only effective precaution that I can see lies in their being very suspicious just now of every attack of illness in their children, until its non-identity with scarlet fever becomes quite manifest.

"I imagine that isolated cases of this obscure kind do occur in most epidemics, but they must surely have been unusually numerous during this one.

"If I can furnish you with any further particulars that would be of any interest to you, I shall be happy to do so.—Believe me, my dear sir, yours sincerely,

"JOHN H. GRAY."

"David Davies, Esq., Medical Officer of Health."

As my paper is given in the capacity of a public officer, I offer no views on the medical treatment of the disease.

LIGATURE OF THE EXTERNAL ILIAC ARTERY WITH CARBOLISED CATGUT, FOR ANEURISM IN A SYPHILITIC SUBJECT.

By A. B. R. MYERS, M.R.C.S.Eng., Surgeon, Coldstream Guards.

PRIVATE A., Coldstream Guards, aged 33, service fifteen years, was admitted into hospital October 4th, 1874, for a large pulsating aneurismal sac implicating the right external iliac and femoral artery. Three weeks before admission, the patient strained himself in running, and soon afterwards observed this swelling, but he failed to report himself sick until compelled to do so by pain. In 1863, he was in hospital for the first time, and only for twelve days; for primary syphilis. The following year he was under treatment twice for a most severe secondary pustular eruption, which was treated with mercurial fumigation; and since then he has been in hospital eight times with specific ulcers of the leg, which, as a rule, readily healed under an iodide of potassium treatment, leaving, however, very brown stained cicatrices.

On admission, the sac, circular in shape, had a diameter of three inches, and pulsated very strongly; and, owing to the patient's great muscular development, much force was required to compress the external iliac sufficiently to even partially arrest the circulation.

It is needless here to record the treatment day by day of this case; suffice it to say that to November 20th mechanical and digital compression with and without the administration of large doses of chloralhydrate were tried, with great perseverance and to the utmost endurance