and respiratory mechanisms. I confess I find his case of peculiar scientific interest, but am content at present to sketch it in outline.

2. Less definite in constituent features, but equally suggestive of periventricular dysfunction, are cases distinguished, *inter alia*, by yawning. One may be taken from a previous communication¹² by way of example.

C. L., male, aged 25, has had peculiar fits for about one year, recurring on an average at fortnightly intervals. They are constituted by continual yawning, with constant voiding of urine, and are followed by violent giddiness, headache, and occasional vomiting. A family history of epilepsy has been obtained, but no organic signs have been seen on repeated examination.

One may perhaps hazard the speculation that these phenomena represent some disorder of periventricular visceral centres concerned in the regulation of sleep and of fluid interchange, with radiation to other visceral centres situated in the floor of the fourth ventricle.

3. Another rather unusual but interesting visceral association is provided by those cases of ordinary epilepsy which appear to have as a regular accompaniment *rise of temperature*. I do not here refer to the fever which develops when repeated severe general fits occur, as in status epilepticus, but to individual attacks, separated it may be by long intervals, in which elevation of temperature is found. Doubtless some such cases are simply explained by the temporary occurrence of some intestinal toxæmia accountable for both the fit and the fever, yet in other instances the question arises whether the latter may not be of neural origin. I have in mind the case of a schoolboy of 16, who for two years had had an occasional epileptic fit; in each instance associated with muscular effort (wrestling, swimming, running, and in the gymnasium), the attack consists of brief loss of consciousness, pallor, and involuntary micturition, without any convulsive movements (tonic or clonic) being in evidence. On each occasion the temperature has shot up after the attack to 103° or 104° F., coming down the same day, or the next, as suddenly as it has run up. No ready explanation for this occurrence has been discovered, even with the most careful search over the somatic systems. At the most, a severe generalized fit will not raise body heat more than half a degree. For the above and one or two somewhat similar instances it seems conceivable that a neural (neuro-sympathetic) mechanism is implicated.

4. When the semeiology of still other epileptic varieties is carefully scrutinized the fact that they appear to consist of little else than *isolated neuro-sympathetic disturbance* must be allowed. The remark is clearly apposite in respect of many examples of petit mal, so-called. Cases which the clinician has great difficulty in classifying, the choice lying between "faint" and "fit," belong here. Syncopal attacks are in essence visceral, and often indistinguishable from forms of fit; if of circulatory etiology they are considered "faints"; if of neural, they are "fits." But here, too, we may be labouring a distinction without a difference. An elderly gentleman has suffered from rare major epileptic fits for many years; since he has become slightly arterio-sclerotic they have ceased, but what he calls "sensations" have taken their place. These recur nearly every day. He was seated in my consulting room and my blood pressure instrument was on his left arm; asked a question about his old school, to my surprise he vouchsafed no reply; grasping the table with his left hand, and the arm of the chair with his right, he sat motionless, turned a greyish colour, and his respiration immediately accelerated in a rapidly rising series of ever shorter and quicker breaths, becoming slower again in about half a minute and the arrhythmia ending with a deep sigh. He immediately remarked, "Oh, I was at such and such a school," naming it as though he had not been aware of the seconds that had thus passed. Petit mal, of course, is merely a descriptive epithet; but, neurally considered, the symptom-complex in the case was surely limited to the visceral ganglia of the floor of the fourth ventricle, a disturbance there (whether vascular or neural I know not) bringing in its train that transient clouding of consciousness known as an "absence épileptique." Isolated escape of this and

analogous kinds represents on occasion all that there is of epileptic semeiology.

If we could but discover the secret of inhibition and of de-inhibition, if we had some scientific means of reinforcing the former at the moment when escape from control is imminent, could we but determine that switching off of the current which in some patients can be effected by potent stimuli aroused through other channels at the crucial moment, our treatment of epileptic episodes would not be so nugatory as it often proves to be.

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STREPTOCOCCAL SEPTICAEMIA AND APLASTIC ANAEMIA.

CASE REPORT.

BY

D. A. ABERNETHY, M.B.Oxon., F.R.C.S.Ed.,
A. G. GIBSON, M.D., F.R.C.P.,

AND

A. WATSON RUSSELL, M.C., M.B., Ch.B.

THE patient whose case we record was a girl aged 18; she had never been robust, though she had enjoyed moderately good health. The tonsils had been under suspicion owing to a tendency to sore throat. On the evening of November 13th, 1929, there occurred pain over the left costal margin. The temperature was 104°. This kept up and was of the high remittent type when seen by two of us (A. W. R. and A. G. G.) on November 16th. Nose bleeding and ulceration of both tonsils had occurred on the 15th. She was a well-made girl, well nourished, coughing up blood, which apparently came from the nose. She was not unduly anaemic. The left cheek had a slightly bluish tinge. The pulse was 118, respirations 20; the fingers were not clubbed; the skin was normal in texture and clear of blemish or petechiae; there were no glands to be felt in the neck, axillae, or groins. In the chest there was a slight diminution of breath sounds towards the left base behind, but no interference with movement and no signs of fluid. There was nothing definite on examination of the abdomen. On November 19th the urine contained albumin; blood, and a few casts, with a moderate number of long streptococci. The signs in the left side of the chest were unaltered, but the left lumbar region was tender, and, though it was difficult to feel, the kidney appeared to be enlarged. The epistaxis continued until November 21st, and the albumin in the urine persisted.

On November 25th the temperature was of the high remittent type at the 102° level, and the patient was markedly anaemic. The sclerotics were greenish, as was the tint of the skin. The left lumbar and hypogastric region was tender, and one small petechial haemorrhage was noticed under the left breast. There were no signs of infective endocarditis nor of severe renal disease, and the blood in the urine had disappeared, leaving a trace of albumin only. The fever persisted; she became extremely ill with low muttering delirium at times, restlessness, and a return of the epistaxis on November 27th and 30th. She was treated by iron (Blaud's pill) and antistreptococcal serum (seven injections each of 10 c.cm., four of which were concentrated serums) on every second day and adrenaline chloride 10m daily. On December 5th she was given a

transfusion of blood, 1½ pints, which she stood well, though she had a rigor afterwards. She vomited on this and the previous day.

The progress, despite the transfusion, was downward, and on December 10th towards the evening the patient was breathless, anxious, restless, and in the early stages of cardiac failure. Adrenaline, which had been given in doses of 10 minims daily since November 27th, subcutaneously, was injected every three hours, and Fraisse's ferruginous ampoule 1 c.cm. was given intramuscularly; the following day the patient was slightly better, though she vomited three times and could not retain enemata of glucose with brandy. It was then noticed that she had a number of petechial haemorrhages over the chest. Some days before this, on December 4th, the right lobe of the thyroid had become enlarged and was slightly painful, but the gland was well defined at this spot and showed no infiltration nor any external signs of haemorrhage. On the morning of December 12th her condition was extremely critical. She was semiconscious and restless, the respirations were rapid, and she complained of cramp-like pains in the legs. There was a large ecchymosis under the skin of each heel, surrounded by a flushed area, which looked like incipient gangrene, and there were areas of anaesthesia over the shins. As the patient appeared to be dying of anoxaemia a second transfusion was given of 1½ pints of Group II blood.

The result of this transfusion was a striking improvement, for the following day she had a boiled egg for her breakfast and enjoyed fish for dinner, whereas the previous day (December 11th) she could retain nothing given by the mouth and very little given per rectum. The temperature following this transfusion did not rise above 100° and fell to normal by December 27th.

On December 24th the thyroïdal swelling, which had become general and harder, pointed on the right side, and a fair quantity of pus containing streptococci was evacuated under gas. The wound gradually healed under treatment by fomentation.

After the second transfusion her colour became natural, though her general aspect was anaemic. From this time on she was given adrenaline and iron, and made progress. Rheumatic pains affecting both feet were present in the early days of January. On January 7th there was nausea, and on the 8th it persisted and the patient became drowsy. Pain appeared in the left loin on January 10th, and continued with rheumatic pains in the leg and knee for several days. Nausea also persisted. Fever again became evident on January 8th. There was tenderness in the left loin, and the left kidney was suspected of causing this tenderness. On January 9th the urine contained a trace of albumin; in the deposit were pus cells and others from a transitional membrane, together with some long-chain streptococci. On January 21st the urine contained albumose as well as a slight amount of albumin. Pain on that day had appeared in the left knee. On January 24th she had a bout of pain in the loin, called for the bedpan, and after what appeared to be a spasm passed two small masses of membrane, yellowish in colour, one 2 inches long and 1/3 inch broad, the other elongated, with striations on the surface 1/2 inch by 1/2 inch by 1/8 inch. The membrane had the ordinary structure of a pyogenic membrane and contained numerous streptococci; the urine following this attack contained pus. The temperature fell to normal on the next day (January 25th), and the pain ceased. Frequency of micturition was marked on the 25th and 26th, and the appetite returned on the 27th. From that date she made good improvement; the pus and albumin in the urine persisted for nearly a fortnight, but all signs of abnormality, including albumose, had disappeared by February 20th.

The Blood Condition.

The following are the blood counts made at different stages throughout the illness.

			Total No. per c.mm.
November 26th, 1929.			
Red blood cells 1,450,000	Polymorphs ... 17%	.....	909
Haemoglobin 24 per cent.	S. lymphocytes ... 34%	.....	1819
Colour index 0.85	L. lymphocytes ... 49%	.....	2621
White blood cells 5,350			

December 5th.				Total No. per c.mm.
Red blood cells 850,000	Polymorphs ... 20%	.....	208	
Haemoglobin 18 per cent.	Lymphocytes ... 58%	.....	603	
Colour index 1.1	Endothelials ... 17%	.....	176	
White blood cells 1,040	Mast cells ... 5%	.....		

Blood platelets very few. Nucleated reds present. Moderate degree of anisocytosis. No gross poikilocytosis or polychromasia. Size of red cells 7.32 microns (Eve).

December 5th, blood transfusion.

December 10th.				
Red blood cells 1,170,000	Polymorphs ... 30%	.....	450	
Haemoglobin 24 per cent.	Lymphocytes ... 52%	.....	783	
Colour index 1.09	Endothelials ... 11%	.....	165	
White blood cells 1,500	Mast cells ... 4%	.....		
	Eosinophils ... 1%	.....		
	Myelocytes ... 2%	.....		

Four nucleated red cells seen. There was little alteration in shape and none in colour of the red cells. Platelets were extremely rare. December 12th, second transfusion.

December 16th.				
Red blood cells 1,330,000	Polymorphs ... 29%	.....	490	
Haemoglobin 30 per cent.	Lymphocytes ... 63%	.....	787	
Colour index 1.1	Endothelials ... 7%	.....		
White blood cells 1,250	Mast cells ... 1%	.....		

Size of red cells 7.4 microns. Slight polychromasia. Two nucleated reds per 100 white cells.

December 23rd.				
Red blood cells 1,640,000	Polymorphs ... 36%	.....	430	
Haemoglobin 32 per cent.	Lymphocytes ... 57%	.....	934	
Colour index 1.0	Endothelials ... 6%	.....		
White blood cells 1,640	Mast cells ... 1%	.....		

Anisocytosis and poikilocytosis moderate. No polychromasia or punctate basophilia seen. Platelets present in small numbers. One normoblast seen.

December 30th.				
Red blood cells 1,900,000	Polymorphs ... 52%	.....	962	
Haemoglobin 40 per cent.	Lymphocytes ... 41%	.....	758	
Colour index 1.0	Endothelials ... 6%	.....		
White blood cells 1,850	Mast cells ... 1%	.....		

Slight polychromasia and anisocytosis. Red cells 7.8 microns.

January 5th, 1930.				
Red blood cells 2,060,000	Polymorphs ... 35%	.....	997	
Haemoglobin 54 per cent.	Lymphocytes ... 50%	.....	1425	
Colour index 1.3	Endothelials ... 14%	.....	798	
White blood cells 2,850	Eosinophils ... 1%	.....		

Size of red cells 7.7 microns. Anisocytosis but no poikilocytosis or polychromasia. Platelets very few.

January 13th.				
Red blood cells 2,250,000	Polymorphs ... 68.5%	.....	2733	
Haemoglobin 50 per cent.	Lymphocytes ... 25.5%	.....	1359	
Colour index 1.1	Endothelials ... 5.0%	.....		
White blood cells 5,450	Mast cells ... 0.5%	.....		
	Myelocytes ... 0.5%	.....		

Size of red cells 8.30 microns. Morphology normal.

January 20th.				
Red blood cells 2,620,000	Polymorphs ... 47%	.....	2209	
Haemoglobin 52 per cent.	Lymphocytes ... 31%	.....	1457	
Colour index 1.0	Endothelials ... 21%	.....	987	
White blood cells 4,700	Eosinophils ... 1%	.....		

Size of red cells 7.64 microns.

January 27th.				
Red blood cells 2,240,000	Polymorphs ... 52%	.....		
Haemoglobin 50 per cent.	Lymphocytes ... 44%	.....		
Colour index 1.1	Endothelials ... 4%	.....		
White blood cells 5,200				

Size of red cells 7.64 microns. Some poikilocytosis and anisocytosis.

February 3rd.				
Red blood cells 2,960,000	Polymorphs ... 44%	.....	2134	
Haemoglobin 54 per cent.	Lymphocytes ... 45%	.....	2182	
Colour index 1.2	Endothelials ... 9%	.....		
White blood cells 4,850	Eosinophils ... 1%	.....		
	Mast cells ... 1%	.....		

Size of red cells, 7.64 microns. Some poikilocytosis and anisocytosis.

February 10th.				
Red blood cells 2,960,000	Polymorphs ... 28%	.....	1232	
Haemoglobin 56 per cent.	Lymphocytes ... 61%	.....	2684	
Colour index 0.94	Endothelials ... 8%	.....		
White blood cells 4,400	Eosinophils ... 2%	.....		
	Mast cells ... 1%	.....		

Size of red cells, 7.64 microns. Slight degree of anisocytosis and poikilocytosis.

February 17th.				
Red blood cells 2,680,000	Polymorphs ... 47%	.....	2115	
Haemoglobin 60 per cent.	Lymphocytes ... 44%	.....	1980	
Colour index 1.1	Endothelials ... 9%	.....		
White blood cells 4,500				

Size of red cells 7.64 microns. Still slight anisocytosis and polychromasia.

				Total No. per c.mm.
February 24th.				
Red blood cells 3,240,000	Polymorphs	...	16%	296
Haemoglobin 68 per cent.	Lymphocytes	...	66%	1221
Colour index 1.0	Endothelials	...	16%	296
White blood cells 1,850	Eosinophils	...	1%	
	Mast cells	...	1%	
Size of red cells, 7.81 microns.				
March 3rd.				
Red blood cells 3,910,000	Polymorphs	...	12%	264
Haemoglobin 72 per cent.	Lymphocytes	...	80%	1760
Colour index 0.92	Endothelials	...	8%	
White blood cells 2,200				

Red cells almost normal in appearance and by Eve's halometer 7.48 microns (normal).

It will be seen that throughout there was a very grave anaemia with a high colour index, reaching on January 5th the figure 1.3. The white count in the most serious part of the illness was very low, and the total polymorph count extremely so. The size of the red cells was never enlarged as determined by Eve's halometer, except on one occasion (January 13th), when it was increased and in the pernicious zone. The whole gives a picture of serious interference with the bone marrow, but with some evidence of activity of that tissue. The interpretation of these counts is that the patient suffered from an aplastic type of anaemia (agranulocytic anaemia). The last blood count, though the patient was apparently convalescent, showed a moderate degree of anaemia of this type.

The Cardio-vascular System.

The pulse from the early stage of the illness was fast, and was seldom recorded below 100. When the anaemia was most marked in the early days of December it varied about 120. It appeared to be higher after the first transfusion. On December 11th the pulse was recorded up to 152; on this day the patient appeared to be dying; she was extremely pale, was breathless (respirations 48), and orthopnoeic. Injections of adrenaline chloride 1/1000 of 0.5 c.cm. at three-hourly intervals caused great relief to the breathing and a lowering of the pulse rate. Subsequent to this the injections were repeated thrice daily until December 30th, when they were reduced to two a day. It was reduced to once a day on January 7th and discontinued on February 7th.

Remarks.

The case in one aspect was one of streptococcal septicaemia. The illness began with a sore throat. Fever persisted altogether in the first instance for twenty-nine days at a high level. Though no blood culture was made streptococci were identified as the causal agent of the renal haemorrhage on November 19th. Streptococci were the cause of the thyroidal abscess which was opened on December 24th; the same organism was found in the sloughs passed in the urine on January 24th. The damage so obvious in the kidney and the thyroid appeared also in the bone marrow, as shown by the nature of the anaemia, the rheumatic pains, and the presence of albumose in the urine.

In the matter of therapy only the most important drugs and measures are mentioned. The first blood transfusion appeared to have some effect, but the second following the increased dose of adrenaline appeared to act in a marvellous way. The action of the adrenaline appeared to serve more as a cardiac stimulant than as a haemopoietic, such as appears to be so clear in a previously published case.¹

As convalescence was established the patient returned to her home and ceased to be under our observation. The blood count, it will be seen, was not normal, and as the patient is young there is room for hope that some, if not complete, restoration of function of the bone marrow may ultimately ensue. It may be mentioned, however, that the patient in the case previously described by one of us¹ still retains the blood count of an aplastic anaemia.

Since the above was written the patient, after leading a normal life again, suffered from a severe tonsillitis and died after a short illness.

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THE DIRECT COMPARATIVE DIFFRACTION METHOD OF DEMONSTRATING MEGALOCYTOSIS.

BY

J. H. MALLOY, M.B., Ch.B.,

CHEADLE, STAFFORDSHIRE.

Two noteworthy articles by Pijper¹ and Eve² appeared in the literature of the past year describing instruments for the practical application of the diffraction phenomenon to the diagnosis of pernicious anaemia. Both instruments show advance in the direction of simplification of necessary apparatus for convenience in clinical use. Edwards³ has described a modification of Pijper's instrument with a simpler form of illumination.

The "direct comparative diffraction" method is a further simplification. Exhaustive examination of blood films fails to show that it sacrifices efficiency for simplicity. For the practical diagnosis and control of the treatment of pernicious anaemia, I have found that the results compare advantageously with those obtained by either Eve's halometer or Edwards's modification of Pijper's "diffraction micrometer." My personal observations have been controlled and verified by the untutored observation and discrimination of a large number of individuals of varying intelligence, who merely described what they saw in complete ignorance of the significance of their findings.

The only essential apparatus is a normal blood film with which to compare films taken from cases suspected of suffering from the disease. Any source of artificial light may be used, but candle light is probably best on account of its softness. The flame of any small cigarette lighter with an exposed wick gives excellent results and is easily carried.

Principle of the Method.

The method depends on the following facts. If a light is observed through a blood film held close to the eye a diffraction halo is seen which varies in intensity with the thickness of the film and the size, quality, and distance of the light. The halo consists of two zones, the inner of which is a yellow disc surrounded by an orange ring. The outer zone consists of concentric coloured circles of red, orange, yellow, green, blue, indigo, and violet, from without inwards. Interposed between the two zones and actually belonging to the inner one is a red ring, which mingles to a varying degree with the orange and violet. For the test this red ring is taken as the dividing line between the two zones.

If the light is observed through two blood films, one in front of each eye like spectacle lenses, actually only one halo is seen. In reality it consists of the superimposed haloes of the two films. The production of diplopia separates the haloes and presents them side by side for comparison as to size. The haloes for the corresponding films are on the same side as the films. The diplopia can be produced by a voluntary internal squint or by placing a prism, such as is found in refraction test cases, in front of one eye with the base to the inner side.

The inner zone is the one chosen for comparison. By comparison with the halometer and modified micrometer I have found that the central disc varies in size inversely with the average size of the red blood corpuscles. It is possible to note variations of 0.1 degree according to Eve's scale. The greater the degree of megalocytosis the more accurate is the discrimination. Comparatively speaking, the difference in the size of the haloes which would give readings of 4.7 and 4.1 degrees respectively by Eve's scale might be taken as the difference between a halfpenny and a sixpenny piece; 4.3 and 4.1 degrees as the difference between a florin and a halfpenny.

Making of Films.

Wash the slides with soap and water, rinse thoroughly, dry with a towel and polish with a piece of silk. To obtain a drop of blood, pierce the lobe of the ear, which need not be sterilized, with a sterile medium-sized surgical needle. Squeezing the lobe does not affect the test. Take the drop on one end of the slide, allow it to spread along