A CASE OF HYSTERIA SHOWING SPONTANEOUS HYPERVENTILATION TETANY.

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THE condition of spontaneous hyperventilation tetany has received some attention recently, and in many cases it has been impossible to demonstrate adequate biochemical changes to account for the tetanic manifestations, which so closely resemble the more recognized clinical types of tetany. The reason for the apparent spontaneity of the attacks has remained obscure beyond the general trend to recognize it as " functional " in most cases. In view of this recent interest, and of the atypical clinical manifestations in this case, the following observations on a single patient are put on record. A few previous cases treated at the Maudsley Hospital, but differing from the present one in the absence of loss of consciousness during the attacks, are also briefly reported.

CASE-HISTORY.

The patient, a probationer nurse, aged 20, was admitted to the Maudsley Hospital because of frequent fits and other symptoms diagnosed as hysterical.

Family history.—Both sides of the family show unstable nervous tendencies, including heavy drinking on the father's side. There had been much family discord all her life ; her father and mother being separated, she, the youngest of four siblings, lived for varying periods with each parent.

Past history.—Infancy and the milestones of development were normal. She had low average results at school, which she never liked, and where she finished in standard 7, at the age of 14. Since school she has had four different positions, each lasting about a year till she became dissatisfied.

Previous illnesses.—At the age of 10 months she had whooping-cough, during which she had fits apparently similar to the present ones ; they started suddenly on the third day and then recurred at two-hourly intervals for the next three days, during all of which she was blue, and appeared unconscious. She recovered, but had frequent colds subsequently, and, till the age of 7, similar fits about once a year, followed by bouts of bronchitis with cough and temperature.

At the age of 15 she was admitted to a hospital for persistent cough, which had lasted for months, and pain in the right iliac fossa similar to that which she had with her periods. Appendicectomy was performed ; during the second week after the operation she became restless, had retention of urine, and her wound reopened (due to her interference, it was thought). She was diagnosed as chorea and sent to a convalescent home, from which she was able to return to work after 3 months.

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Menstrual history.—Her menses started at the age of 11 ; her periods were regular (7/28), with a rather heavy loss and pain in the right iliac fossa. After the appendicectomy her periodicity was 7/35, with more loss (2–3 diapers per day), and she had leucorrhœa. With her periods she has always had headaches and faintness on stooping.

Personality.—As a child she was " such a little monkey " and never still. She was obstinate and bad-tempered, and consequently had few friends, though wishing for them. She was reserved and would day-dream a lot. Her mother was " the only one who understood her ". She had few interests, but during the last four years had been " very religious ". She often used to tell tales, which were rather obviously lies. She was moody and demonstrative, and " always went to full extremes ". She was always tired, and thought a lot about her health. She never took alcohol, and rarely smoked.

History of present illness.—Her present symptoms began 3 months before her admission. She had then been a probationer nurse for one month, and was finding the work too hard. Her only friend among the nurses had just left ; and after much hesitation she had just terminated a rather close friendship with a married man. She then began to feel miserable and tired, had attacks of palpitations and flushing, and would often sigh. She did not notice any dyspnœa on exertion. She missed one menstrual period and the next one lasted 5 weeks, during which she was admitted to the wards because of a fainting attack. She then went off her food, vomited, had dysuria and retention of urine, and began having terrifying dreams. Arrangements were made to give her an anæsthetic for a pelvic examination. Five hours after the operation and shortly after she had been told that nothing abnormal had been found, she had her first fit. She then remained in bed, having frequent fits, day and night (hourly for part of the time), and persistent vomiting. She was then transferred to the Maudsley Hospital.

Condition on admission.—Physically she was of small pyknic build, well nourished, and slightly pallid. Examination revealed only a general increase of reflexes and clamminess of her skin. Blood-pressure 120/80, pulse 80, respirations 20 ; she never showed any pyrexia. Her blood-count showed 12·1 grm. % of hæmoglobin and 4½ million red cells (this responded to iron treatment), but no other abnormality.

She was rather sullen, but with a little persuasion would talk quite freely. An examination of her mental state revealed no abnormality other than intelligence on the lower limits of normal, and hysterical moodiness. The psychogenic factors and the nature of the fits are discussed later. She was having about 16 fits in the day and 2–3 in the night.

The following estimations were found to be within normal limits : blood bromide, 25 mgrm.% ; blood sugar after 14 hours' starvation, 95 mgrm.%. Cerebro-spinal fluid : calcium, 4·9 mgrm.% ; protein, chloride and cells normal. Wassermann reaction negative in blood and cerebro-spinal fluid.

Progress.—After admission she was gradually trained to normal habits of eating, micturition and general behaviour, and came out of her listless state. By the end of 6 weeks she was sufficiently co-operative to discuss her situation freely, and was assisting in some of the ward duties, though still having about 6 fits in the day and 2 in the night. After 5 weeks' amenorrhœa she had a period lasting 5 weeks (which removed any suspicion that her previous menstrual abnormality had been due to an abortion, but diminished her hope that she would ever recover). Psychotherapy consisted in discussing possible solutions of the unpleasant features of her situation, but she failed to co-operate.

During the last few weeks an unsuccessful attempt was made to reduce the number of her fits by hypnosis, but the occurrence of a fit as soon as the hypnosis became moderately deep would terminate rapport.

Finally, for financial reasons, she had to leave hospital and went as a voluntary patient to a mental hospital. During her stay there her fits soon diminished in frequency to about 1 per week, and she was discharged after 6 weeks. After a further 6 weeks of good health and hardly any fits, she " completely collapsed " and began having frequent fits, and was readmitted to a general hospital.

Description of the Fits.

These occur both at night and during the day. She states that they occur, during the periods of depression with a general hot clammy feeling that come over her, if she cries and " lets herself go ". No other anxiety feature occurs at this stage, during which she knows that she can arrest the onset of the fits by not " letting herself go ". If she does not arrest them, she soon feels a tightness in her chest, followed by tingling in her fingers which spreads all over her and she " goes off ".

Her eyes now turn up, she starts breathing regularly and rapidly (70–80 per minute), and lies limp, with occasional small twitches visible in parts of her muscles, especially in those of her face ; her tendon reflexes are now more exaggerated and Chvostek's sign is positive.

Within half a minute of this onset she begins to toss about violently, often bruising herself, is apparently unconscious, and has the same rapid respiratory rhythm except for interruptions by muscular contortions.

Within a further half-minute she goes off into rigid tonic opisthotonos, with her arms and legs extended, fists clenched and carpopedal spasm. She is now unresponsive to all painful stimuli, but with corneal reflexes present ; the spasm prevents elicitation of Babinski's and Chvostek's signs, and she can be lifted like one complete rod, by a hand placed under the nape of her neck. Her pulse is now slowed (60), full and bounding, her colour is slightly pallid, her skin moist, and her extremities colder and clammy. Her breathing remains the same, with in addition stridor and often foam at the mouth. After about 3 minutes she falls back limp, with her breathing a little easier and slower (60–70 per minute). Then after a further half-minute this sequence of convulsive, tonic and atonic stages is repeated several times till, in one of the atonic phases, her breathing becomes irregular and slower, and within two minutes she becomes fully conscious. She now feels clammy, scared, dyspnœic without palpitations, sleepy, and has a headache which goes off when she is left to go to sleep ; her breathing still remains about 40–50 per minute, but shallow and without apparent distress for a further ½–2 hours.

When she was asked to hyperventilate (40–50 per minute seemed to be the slowest at which she could) she regularly passed into a fit after about 90 seconds : suddenly the respiratory rhythm would jump to its own tempo of about 80 per minute with the other accompaniments following exactly as

in her spontaneous fits. Not infrequently in the atonic stages of her fits she could be roused by shaking etc., and the fit terminated; but this was not so at other stages. It did not appear that the patient did the overbreathing voluntarily; and she denied this strongly, maintaining that once she gave way to her miserable feelings she could not stop the sequence.

It will be noticed that extreme hyperventilation precedes the motor phenomena of her fits, and is a prominent feature of all the stages, while at the height of the fit she is unconscious. The feeling of tightness in her chest, paræsthesiæ in her extremities, laryngeal stridor and tetanic muscular spasm are present as in hyperventilation tetany, of which she would therefore seem to be rather an extreme form. Generalized tonic convulsions have been described by Geerl Jørgensen (1932) and others as a manifestation in cases of parathyroprival tetany. Other cases of tetany have also been described by Rossett (1924) and others where the position of the hands is not the usual *main d'accoucheur*.

Biochemical Changes During the Fits.

Estimations were made of calcium and titrable alkalinity of venous blood removed before and during the fit (tonic stage) on several occasions. On another occasion samples of arterial and venous blood were withdrawn under oil, at similar stages, for pH and total CO_2 content. Another morning, under starving conditions except for the last sample, urine was collected by catheter for measured periods before, including, and after a fit. All these results are recorded together in Table I, where it will be seen that the only significant change observed during a fit is a slight gaseous alkalosis which is confirmed by all the methods used. The slight rise of blood calcium during the fit may not be beyond the limits of experimental error in these results, but a similar slight but significant change has been found in this type of tetany by Grant and

Table I.—*Biochemical Changes during Fits.*

Venous serum (vacuum venule). (Figures in brackets of a second series of observation.)		Arterial blood (under oil) with anti-coagulant dye.		Venous blood (under oil) with anti-coagulant dye.		Catheter urine.			Specimen times.
Calcium (mgrm. per 100 c.c.).	Titrable alkalinity.	pH.	Total CO_2 (vol.%.)	pH.	Total CO_2 (vol.%).	Vol. per hour.	S.G.	pH.	
10·3 (8·9)	0·0312 N. (0·027 N.)	7·43	57	7·39	68	26 c.c.	1023	5·0	Before fit.
10·4 (9·9)	0·0318 N. (0·029 N.)	7·46	50	7·42	60	190 ,,	1004	6·0	During tonic stage of fit.
(10·4)	(0·027 N.)	..	..	..	..	190 ,,	..	4·8	After fit.

Note.—While all the above observations were not taken on the same day, in each case the comparable observations (before, during, and after the fit) were taken on the same day. The series of results recorded in brackets in the first two columns were taken on another day—during a period of alkali therapy, instead of acid.

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Goldman (1920) and several others. The cerebro-spinal fluid was withdrawn on one occasion immediately after the tonic stage of a fit, but the violence of the fits in this patient prevented any proper investigation of the cerebro-spinal fluid changes. (For what it is worth, this specimen removed during the fit showed calcium of 5·4 mgrm. per 100 c.c., compared to 4·9 mgrm. per 100 c.c. of the resting specimen of another day.) McCance (1937) and Carmichael (1937) have shown rather conclusively that any calcium changes in the cerebro-spinal fluid are of little significance in this condition, despite the findings of Barnes and Greaves (1936).

Calcium chloride (8 c.c. of 5%), injected intravenously during the tonic stage of the fit, was found always to arrest the respiratory and motor phenomena of the fit within about 4 seconds, and the patient would be completely awake within 2 minutes of this injection. Practically identical results were obtained by the injection of calcium gluconate (8 c.c. of 10%), but after a slightly longer latent interval (15 seconds) and less suddenly. The application of a rebreather bag and mask would also arrest the fits after a slightly longer

TABLE II.—*Effects of Injection of 8 c.c. Calcium Chloride 5% Intravenously during a Spontaneous Fit.*

Time.	Respirations per minute.	Observations.
0 minutes	32	Started tossing, and deep breathing.
3–6 ,,	65–75	Tonic stage; stertorous breathing; foaming at mouth.
6–9 ,,	55–65	Tossing.
10 ,,	65–72	Tonic stage recommenced.
12 ,,	72	Still fully-developed tonic stage; injection of calcium given.
5 seconds after injection	..	Lies back quiet and limp with only an occasional shallow respiration.
7 seconds after injection	40	Establishment of shallow regular breathing; still lying, quiet, atonic, apparently asleep.
30 seconds after injection	40	Eyes open and she gradually awakens.
2 minutes after injection	40	Fully awake, talking, lying listless; mentions that she has a headache, but apparently desirous of not being disturbed and she goes off to sleep.
2 minutes till 135 minutes after injection	40–58	Lying lax, limp, sleeping most of the time, with shallow breathing.
140 minutes after injection	25	Ditto.

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TABLE III.—*Effects of Injection of Calcium Gluconate* 10% 8 *c.c. under the same Conditions as those in Table IV.*

Time.	Respirations per minute.	Observations.
15 seconds after injection	40	This was the first sign of any effect, and she now became atonic, with regular shallow breathing.
60 seconds after injection	40	Begins to awake.
2 minutes after injection	..	Fully awake, as at this stage in Table II.

TABLE IV.—*Effects of Application of Rebreather Bag, and of Intravenous Injection of Sterile Water during an Induced Fit.*

Time.	Respirations per minute.	Pulse per minute.	Observations.
0 minutes	40	88	Asked to overbreathe deeply.
1 minute	40	80	Small fibrillary twitchings in muscles.
2 minutes	60	65	Eyes turn up; rapid breathing suddenly sets in; she lies limp. Chvostek +.
2½–3½ ,,	60	60	Tossing about.
3½–6 ,,	70	60	Tonic stage with stridor; foam at mouth. Injection of sterile water at 4 minutes without any observable effect.
6–7 ,,	66	64	Tossing about.
7–9 ,,	70	62	Tonic stage.
9–9½ ,,	66	62	Tossing about.
9½ ,,	70	62	Tonic stage.
10 ,, (bag 0 m.)	70	62	Application of rebreather bag.
10½ minutes (½ m.)	44	64	Became lax, with occasional tossing, and breathing markedly deeper.
12 ,, (2 m.)	36	70	Awake and responded with signs. Bag removed and she talked normally.
13 ,,	40	70	Breathing becoming shallower.
14 ,,	58	86	Breathing very shallow; from now it gradually decreased in rate.
45 ,,	28	80	Asleep.

interval (30 seconds); this did not occur with the mask open to the air. The above observations involving venepuncture were controlled by the injection of sterile water on other occasions, and a considerable pause was always made after the prick before the injection of the fluid. Thus raising either the blood calcium or the alveolar CO_2 tension was sufficient to arrest the fit, which confirmed its tetanic character (Tables II–IV).

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By trial periods at different stages of her treatment, acid or alkali in large doses by mouth, and also calcium both by injection and orally, were found to have no influence on the tendency to spontaneous attacks (Table V). A short period of 4 days on luminal gr. j *t.d.s.*, had only the effect of making her more drowsy. Some observations on the pharmacological responses of this patient to vegetative drugs are recorded in Tables V–VIII; while they are definitely

TABLE V.—*Absence of Effect of Treatment with Acid, Alkali and Calcium on the Frequency and Duration of the Spontaneous Fits.*

Dates.	Treatment.	Number of fits per 24 hours.	Average total duration of fits per 24 hours.
July 29–Aug. 11	*Nil*	11 (9–14)	100 minutes.
Aug. 11–Aug. 22	,,	5 (3–7)	50 ,,
Aug. 22–Aug. 29	Am. chlor. by mouth, 90 gr. per day	5 (3–7)	50 ,, (30–70).
Sept. 5–26	Am. chlor. by mouth, 225 gr. per day. Ca. gluconate intramuscularly, 30 c.c. 10% per day	4 (3–7)	40 minutes.
Sept. 26–30	*Nil*	5 (3–7)	40 ,,
Oct. 1–17	Alkali by mouth (pot. cit. and sod. bic. āā, gr. 240 per day)	5 (4–7)	40 ,, (20–50).

TABLE VI.—*Effects of Injection of Pilocarpine gr.* $\frac{1}{5}$ *Subcutaneously under Starving Conditions.*

Time after injection.	Pulse.	Respirations.	Blood-pressure.	Saliva.	Observations.
0 minutes	70	22	110/80	..	..
4 ,,	84	22	..	(started)	Flushed, feeling hot.
8 ,,	70	22	110/80	..	,, ,,
12 ,,	68	22	125/80	..	..
15 ,,	90	22	125/75	..	Started sweating.
30 ,,	80	22	130/90	250 c.c. (to this time)	Feeling cold, attacks of shivering.
55 ,,	81	54 (deep)	110/85	50 c.c. (further)	Cold clammy extremities, body hot and sweating; still attacks of shivering.
60 ,,	88	52	..	..	Still the same. Jerks ++.
80 ,,	86	50	120/85	75 c.c. (+) (further)	Attacks of shaking and coldness of extremities diminishing.

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TABLE VII.—*Effects of Injection of* 1 *c.c. Adrenaline Subcutaneously under Starving Conditions.*

Minutes after injection.	Pulse.	Respirations.	Blood-pressure.	Observations.
0 minutes	70	30	120/80	..
5 ,,	82	30	120/70	..
10 ,,	80	40	120/65	Palpitations felt.
15 ,,	84	42	130/65	,, ,,
20 ,,	80	35	130/65	,, ,,
30 ,,	80	35	130/65	,, ,,
45 ,,	80	35	130/65	,, ,, but less.
50 ,,	80	35	130/70	No palpitations.

TABLE VIII.—*Effects of Injection Intravenously of Atropine (Danielopoulu).*

Time and injections.	Pulse-rate. Resting.	When standing.	After lying down again.
Before start	70	..	..
Injection gr. $\frac{1}{100}$. 0 minutes.			
5 minutes	80	90	80
13 ,, Injection gr. $\frac{1}{100}$.			
18 ,,	99	110	98
21 ,, Injection gr. $\frac{1}{100}$.	95	..	..
26 ,,	104	105	100
41 ,, Injection gr. $\frac{1}{200}$.			
46 ,,	100	112	100
66 ,, Injection gr. $\frac{1}{100}$.	102	..	..
71 ,,	100	120	100

Results.—P. = 70 (original pulse); S. = 100 (maximum pulse in recumbent position). R.V. (relative inhibitory value of vagus) $= \frac{30 \times 100}{70} = 43$.

abnormal and might indicate some factors in the liability to spontaneous fits, no conclusions have been drawn.

PSYCHOGENESIS.

The patient's family had been unstable, her home life unsatisfactory, and her personality in many respects hysterical from childhood. Definite hysterical symptoms had appeared at the age of 15. The present illness may be attributed to the difficult situation in which she found herself at its onset—with work beyond her capacity, her lover given up, and no friends. Vasomotor and menstrual symptoms, anxiety, and later such hysterical disturbances as vomiting and retention of urine supervened.

It is of interest that the first fit occurred after hearing that the examination which she had just undergone offered no hope of treatment, while she was only partially recovered from the anæsthetic. This fit might be considered as an emotional outburst similar to crying or a fit of temper, modified by her physical state of partial consciousness, starvation, etc. However the fits were caused in the beginning of the illness, in its later stages they almost ceased only when her environment could not be dominated by them, or it was easy and pleasant, and the mechanism of precipitation at this stage would appear to be essentially hysterical.

She did not respond to psychotherapy, and she was unwilling to follow the suggestion that she might give up nursing (for which she was intellectually and emotionally unfitted). Adaptation in society was also made difficult by her dependence on her mother (for whom she wished to make sacrifices), by her expressed aversion to friendship with men, and by her pride in being "unsexed". These were based on long-standing faulty emotional development and training. She had no desire to change her present status or outlook until her dismissal from her hospital staff, and the associated necessity of being treated in a mental hospital, altered the situation, and gave her an impetus to get better, which psychotherapy alone had been unable to accomplish. The course of events following this change would confirm the view that the condition was mainly psychogenic, using pre-existing mechanisms in the typical hysterical way. As shown by her later relapse, the present state of her mental health is still precarious.

Discussion.

There can be little question that this is a case of spontaneous hyperventilation tetany. The ascertained association of the fits with a slight gaseous alkalosis, due to overbreathing, is in line with the recognized findings in experimental hyperventilation tetany in normal men (Collip and Backus, 1920; Grand and Goldman, 1920, and others), and also with the abnormalities that have been found in most cases of spontaneous hyperventilation tetany. Even in McCance's (1932) patient, in whom he was unable to show any biochemical change, tetany did not develop when the alkalosis was prevented by the use of a rebreather bag during the overbreathing. Apparently one significant abnormality in these spontaneous cases is their excessive liability to tetany from overbreathing and its associated gaseous alkalosis. Rosett's placing of the normal limits for the time of onset of tetanic signs during overbreathing within 10–30 minutes contrasts sharply with the rapidity of their development in these cases—the present patient being, in that respect, perhaps the most extreme reported. Nevertheless the correction of the gaseous alkalosis, or intravenous calcium, removes the tetany, just as it does tetany induced by experimental overbreathing in normal men. The shortness of

the latent period after the injection of calcium chloride before the arrest of the fit in this patient (5 seconds) suggests a central mechanism for the phenomenon (possibly carotid sinus, possibly cerebral); this explanation of the tetany is also favoured for the more classical cases of hyperventilation tetany by Rosett (1924), Flick and Hansen (1925) and others.

In this patient there were during the illness menstrual abnormalities suggestive of hyperœstrinæmia (or deficiency of the antagonists), which might be correlated with the observations of the increased susceptibility to tetany with hyperœstrinæmia in parathyroidectomized animals (Mathien, 1934), and patients (McCullagh and Kearns, 1935). This endocrine abnormality, and the automatic imbalance shown by the vegetative pharmacological tests in this patient, might be factors in the abnormal susceptibility to tetany in this condition.

The other striking feature in this condition is the spontaneous onset of the attacks. The overbreathing seemed to supervene in this patient when an affective state of irritability and depression developed. Goldman (1922) has recorded attacks of spontaneous hyperventilation tetany during pain, nausea, acute infections and excitement. The attacks in this condition may be compared with anxiety attacks, sighing, crying, vaso-vagal attacks, and the "suffocating turns" described by Baker (1934). Christie (1936), in a study of respiratory tracings in neurotics, has described periodic sighing as characteristic of hysterical patients. In severer cases he found these replaced by short periods of overbreathing, during which tetany sometimes developed. A tracing taken from the patient described here under basal metabolic rate conditions shows these features. Thus, while the physiology of this abnormality of respiration remains obscure, it would seem to be closely related to sighing and crying.

Of interest in this case is the close intermingling of psychogenic factors with physiological abnormalities of a vegetative and biochemical nature. While the liability to tetanoid fits may be constitutional, it is of interest to note their occurrence during whooping-cough in her infancy, due presumably to purely physical factors—anoxæmia, effects of coughing, and possibly cerebral vascular damage. Shannon (1935) regards many of these childhood fits as partly tetanoid in character. To what extent in the present illness physical causes participated with the psychogenic ones discussed it is hard to assess; mild anæmia, starvation, anæsthetic effects, depletion of calcium by menorrhagia, and possibly persistent infantile cerebral damage, etc., may all have had some influence.

Spontaneous hyperventilation tetany is perhaps most frequently found in association with a hysterical illness, though loss of consciousness, as seen in this patient, is rare. Guttmann (1927), in discussing the occurrence of tetany in hysterical patients, considers that it is a preformed mechanism (probably constitutional) apparently released by a combination of anxiety (angst)

and over-breathing, since in the attacks both of these features are observed to precede the tetany. The predisposing situation to such illnesses is frequently one in which a patient of excitable and hysterical personality finds herself unable to get any enjoyment and " life ", and the illness may be ushered in by a period with much crying and irritability. During the illness signs of anxiety and vegetative instability (flushing, vomiting, etc.) are also frequently seen. The fits seem closely related to so-called affect epilepsy, and are possibly functional disturbances intermediate between the hysterical and epileptic types of fit. At the Maudsley Hospital, there have been several cases complicating a hysterical neurosis, but it has been found that the attacks generally disappeared when the patient was able to make a satisfactory adjustment to her environment. Three illustrations are quoted briefly below :

CASE 1.—Miss B. S—, aged 17. She was admitted because of " heart turns " (epigastric pain, nausea, feeling of suffocation, and giddiness and faintness) of three months' duration. During the latter part of the illness these were associated with tingling and tetanic spasms of hands and legs. She had always been treated as " delicate " by the family who had very strict puritanical standards of conduct, and the patient reluctantly led a restricted life. Physical examination revealed no abnormality other than a congenital heart lesion of mild degree. Blood-calcium 11·3 mgrm. per 100 c.c. Following a discussion of her problems and possible adjustment to them, she was discharged free of attacks and has remained so for 2 years.

CASE 2.—Miss R. D—, aged 28, was admitted complaining of severe loss of weight and of energy, vomiting, headache, irritability, and frequent crying and " turns ". She has always been shy and easily frightened, and had been the " delicate ", spoilt child of the family. After winning a scholarship she spent 7 years at an art school and has since done " free-lance work ". Her family are all very strict Roman Catholics, but since going to the art school the patient has led a rather " wild " life (which finally culminated in an entanglement with a married man). Since attending the art school she has been subject to " turns " of suffocation with tingling and stiffness in her hands and legs when in embarrassing or difficult situations ; and during the year before admission, these have been very frequent, and associated with the other symptoms which confined her to bed most of the time. After 6 months' treatment in the hospital she is (3 months later) now back at interesting work, which does not involve the " artistic " life, and she is free of symptoms.

CASE 3.—Miss E. B—, æt. 23, was admitted for investigation of attacks of spontaneous hyperventilation tetany which she had had about 3 or 4 times a year since the age of 14, her only other symptom being general asthenia. The attacks occurred if she became over-excited (in any way), over-tired, or over-heated (e.g., in hot baths) and were quite typical—first faintness followed shortly by palpitations and a sense of suffocation which made her breathe heavily and culminated in tingling and stiffness of her extremities. During her childhood she lived with an uncle who was a drunkard, and of whom she was terrified. She had always been timid, " delicate ", and easily tired, she has led a quiet life mostly with her mother, and disliked her work. Her condition is unaltered as yet : physical examination revealed no abnormality. Blood-calcium 10·5 mgrm. per 100 c.c.

It is relevant to note the description of hyperventilation tetany in spontaneous hypoglycæmia by Wilder (1934), in encephalitis lethargica by Barker

and Sprunt (1932), Harrop and Loeb (1923) and others. West (1931) described fits very similar to those in this patient in a child with a parapituitary cyst. The relation of tetany to tonic fits occurring with other intracranial lesions is not clear. It would thus appear that this type of tetany can result from pathological brain lesions or nutritional disturbances, as well as functional nervous disturbances, where it is presumably released by psychogenic mechanisms; but unfortunately, though we know that a gaseous alkalosis is a factor in the manifestations of the attacks, the essential abnormality, shown in the spontaneous onset and the abnormal liability to tetany, remains obscure.

In conclusion, I wish to express my indebtedness for all the biochemical estimations to Dr. Mann and others of the Staff of the Central Pathological Laboratory of the L.C.C. Mental Hospitals. My thanks are also due to Prof. Mapother for permission to publish these results.

Summary.

1. Spontaneous hyperventilation tetanic fits are described in a hysterical patient, who had had apparently similar fits during whooping-cough in infancy. A psychogenesis is shown to be closely related to the present illness. Three other illustrative cases are briefly described.

2. Observations were made of the biochemical changes during the fits, and of methods of inducing and terminating them. A gaseous alkalosis was found to coincide with the fits, and they could be terminated either by correcting this or by giving calcium intravenously; but calcium, acid or alkali therapy had no definite influence on the tendency to attacks.

3. The abnormal susceptibility to hyperventilation tetany, the disturbance of respiratory control seen in these patients and the close intermingling of psychogenesis with physiological abnormalities seen in this patient are discussed; the nature of these latter essential abnormalities is still obscure.

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