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INFLUENZA IN RELATION TO THE ONSET OF ACUTE PSYCHOSES.

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INTRODUCTION.

SIR GEORGE SAVAGE¹ considered that of all the infectious diseases influenza is the most likely to be followed by mental disorder. This as a rule is of a favourable type, but it is not infrequently the starting point of final dissolution.

The most dangerous ages are early youth and critical periods such as the climacteric and the puerperal condition. Harris,² discussing influenza as a factor in the causation of psychoses in a paper based on the study of 18 cases observed by him in Massachusetts, found that the psychosis bore no relation to the character of the influenzal attack, being liable to occur after mild as well as after severe attacks. The symptoms in most cases developed in less than two weeks after the febrile period, but in some cases might not appear for three months. Delusions and hallucinations were the commonest symptoms in this series, being present in ten of the 18 cases. Depression was the most pronounced symptom in only three cases, whereas excitement and destructive tendencies were present in 14. Although any form of psychosis may result, dementia was the commonest in this series, being found in eight cases. The average age of the patients so diagnosed was 27 years. Pierce and Wilson,³ reviewing the observations made on the subject in 1919, quoted the work of Menninger⁴ who found that apart from the febrile deliria there is an interval of from two to eight days between the termination of the influenza and the onset of the psychosis. They found many writers were convinced that there is always some latent predisposition. All seemed to agree that the type of influenza has nothing to do with the resulting psychosis. Weber⁵ noted delirious states with motor agitation and hallucinations; these developed within four to ten days. He considered the prognosis was good. Pierce and Wilson stated that their experience was much less fortunate. A large number of cases were under treatment presenting marked motor agitation, very vivid hallucinations of sight and terrifying delusions. In some cases there were also both auditory and olfactory hallucinations. The associated

type of influenza varied. Bronchopneumonia was present in many of the cases but the severity of the symptoms was out of all proportion to the physical signs found. No instance of recovery was recalled.

It appears to be an agreed observation that the character of the influenzal attack bears no relation to the character of the ensuing psychosis; further, it has been noted that there is no parallel between the extent of the affection of the lungs which may occur and the severity of the mental symptoms.

The lungs are not, however, the only part of the respiratory tract which becomes involved in influenza. The infection begins in the upper respiratory tract and may especially affect those cavities lined with mucosa which are inside the skull and adjacent to, but outside, the immediate brain case—the nasal sinuses and the middle ear. After recovery from the more general symptoms the infective process may persist in a chronic form, showing periods of exacerbation and remission with corresponding recrudescence of symptoms, both local and general, and producing pathological changes in other parts of the body.

Influenza and the accessory sinuses of the nose is discussed by Fraenkel⁶ in a paper based on post-mortem examinations of 60 cases. In only 16 cases were the sinuses found to be intact—in other words, they were implicated in about 75 per cent. Forty-seven of the cases occurred in males and 13 in females. The third decennium was chiefly affected (27 cases). The sphenoidal sinus was most frequently involved, in 12 cases by itself; in 15 cases with the antrum of Highmore on one or both sides; in eight with the antrum and frontal sinus. The antrum was next most frequently attacked, in eight instances independently of any other sinuses. The frontal sinus was only once affected independently. The character of the morbid process was almost exclusively an exudation, often of a hæmorrhagic nature. Hæmorrhagic effusion was found in 13 of the 35 cases of sphenoidal sinus disease; nine times in the antrum and three times in the frontal sinus. Purulent exudation was only slightly less frequent, being found 11 times in the sphenoidal sinus and antrum cases respectively and three times in the frontal sinus. Serous effusion was decidedly rarer, being present five times in the sphenoidal sinus, eight times in the antrum and never in the frontal sinus. In a smaller number of cases the sinuses contained mucus. Sometimes the diseased sinus contained no fluid and the morbid process was then only shown by the cedematous appearance of the normally thin and transparent lining of the sinus. On bacteriological examination, *B. influenza* was easily found in 22 cases, but in only five in pure culture; in all the rest other micro-organisms were present, such as streptococci and pneumococci.

Similar evidence as to the frequency of involvement of the nasal sinuses in influenza is given by Gerber⁷ of 210 cases of frontal sinusitis of which the causation could be established; a "cold" was given as the cause in 91 cases, influenza in 61 cases, and all other acute and chronic infections, injuries, etc., in

58 cases. Influenza, therefore, apart from "colds," accounts for 29 per cent., and this figure should probably be higher, as a "cold" is very often really influenza.

Milligan⁸ draws attention to the effects of influenza in producing an acute hæmorrhagic type of reaction in the external, middle and internal ear and mastoid antrum. He notes in cases of influenzal mastoiditis of the fulminating or destructive type that headache is especially severe, the initial temperature unduly high and the patient's mentality unduly depressed or exalted—a condition he considers due in all probability to a concomitant and sudden increase of intracranial tension, or, in other words, to a serous meningitis.

During the first quarter of 1927 an epidemic of influenza occurred and was responsible for the largest number of deaths from this disease in England and Wales in any first quarter since 1919, when the terrible pandemic occurred. The return of deaths in the city of Birmingham shows during this period a rapid increase for those attributed to influenza, bronchitis and pneumonia. The deaths from influenza, which during the first three weeks of January had been in single figures, rapidly rose during the following weeks to a maximum of 57 and then gradually fell to single figures during the first week of April. During this period many cases of acute psychosis were admitted to the mental hospitals with histories of influenza; and in the remaining months of that year, and in early 1928, cases were admitted from whose histories and clinical correlations it could be deduced that the influenzal epidemic of 1927 had played a part in initiating or precipitating their psychoses.

Cases are still met with where the onset of symptoms leading eventually to a certified mental state began during the influenza pandemic or subsequent epidemics of the early twenties.

CLASSIFICATION OF CASES.

The cases where influenza was known to be a factor in the causation of psychoses fall into two groups in relation to the onset of psychosis and the attack of influenza, viz., (1) the immediate, and (2) the delayed group.

THE IMMEDIATE GROUP.

In the cases of this group a very definite connection with an influenzal attack was traced. The group can be subdivided into three sub-groups in regard to their state on admission.

- (A) Profound general toxæmia predominant.
- (B) Toxæmia and mental symptoms both marked.
- (C) Mental symptoms the predominant condition.

(A) *Profound General Toxæmia predominant.*

On admission the cases so classified showed a mental state of delirium and symptoms of profound intoxication especially affecting the circulatory system. Three cases are submitted illustrating this class. The second and third

are cases where the septic products were unable to escape freely from the nasal sinuses. This "closed" sepsis was found associated with a persistence of mental symptoms after the alleviation of the general toxæmia and the subsidence of the delirious state. It was more serious in the second patient, and associated with this was the exhibition of more intense mental symptoms, especially before the "closed" sepsis had been converted by operation into "open"; the stimulus of non-specific protein therapy was also afterwards required before recovery ensued.

CASE I. Under the care of Dr. Kathleen A. H. Sykes. M. E., housewife, age 53. Admitted January 31, 1927. First attack.

Previous History.—No psychotic heredity. Between the ages of six and ten the patient was subject to periods of transient confusion, a dreamy state with loss of power over limbs. Later, health good. Happily married. Two children, alive and well. No miscarriages. Menopause about 50, no loss or discharge since. Always bright and appetite good. Had an attack of sciatica in 1926.

Clinical History.—Three weeks before admission she had influenza and laryngitis (all the family developed influenza) and a week later became "rather excitable." The excitement grew worse, she became uncontrollable, threatened suicide by cutting, imagined a plot against her, asserted her husband was the ringleader of the plot and took a strong dislike to him; she raved and screamed.

State on admission.—Profound toxæmia with complete confusion and excitement. Continually rolling head from side to side and shrieking. Wet and dirty. Tongue very dry, cyanosed and cracked; fauces inflamed and cyanosed; deep cracks in lower lips; pharynx dry, the mucosa glazed, strings of inspissated mucus stretching from wall to wall. Swabbing the throat brought away green pus. Temperature 97.2°: resp. 20: pulse 96 and feeble. Heart dilated, sounds very feeble, mitral systolic murmur. B.P. 132/100. Peripheral circulation poor. Lungs, scattered rhonchi. Nervous system and urine normal. Blood: Wassermann negative. Gynæcologically: chronic septic cervicitis.

Clinical Course.—Antistreptococcal serum and collosol calcium were injected during the days following admission. After the third injection the patient gradually became calmer, the head rolling and shrieking ceased and the mouth and throat became moist. The treatment was continued and on February 7 she regained normal consciousness. Thereafter she continued to improve, aided by bowel irrigations, ultra-violet light and local gynæcological and nasal and throat treatment. Chronic nasopharyngeal sepsis was found on nasal examination.

By the commencement of March she appeared to have made a complete mental recovery. Blood pressure 174/120. Appetite good. Slept well, no dreams. Facial colour and hearing good. Discharged recovered, March 10, 1927.

October, 1927. Very fit and well.

May, 1928. Still keeping well; had some sciatica during the past winter. Sleeps well, appetite good. Blood pressure maintained at levels on discharge.

In this case the influenzal infection produced an exacerbation of an existing chronic nasopharyngeal sepsis with involvement of the nasal sinuses, resulting in the production of a hyperacute toxic confusional state. The sinusitis was undoubtedly directly associated with the head movements. The toxic process caused a fall of blood pressure which rose to its usual figure on recovery, and has remained so since discharge. There was no very marked pulmonary condition on admission to account for the toxæmic state, which was

the result of an intensification of a chronic "open" septic state of the mucosæ of the upper air passages, and was relieved by serum treatment.

CASE II. Under the care of Dr. Kathleen A. H. Sykes. E. S. R., female, married, age 37. Admitted February 7, 1927. First certification.

Previous History.—No psychotic heredity. Childhood normal. Became a forewoman in machine shop, where she did well, later married. Two children. No miscarriages. Had had "influenzal colds" not severe enough to require stay in bed. Not alcoholic.

Clinical History.—Been working hard looking after family. Teeth had been getting bad for some time, but she refused to have them seen to. During month preceding admission lost weight. Became depressed, dreamy and apathetic. Acute mental symptoms developed a week before admission and at the time when the influenza epidemic was prevalent. Became confused; suffered from visual hallucinations; was terrified, talked nonsense loudly, mistook identities, struggling and violent. Sleep bad last four days.

State on admission.—Menstruating profusely; the acute symptoms necessitating certification therefore developed coincident with the premenstrual phase.

Complete confusion. Apathetic, depressed. Speech, a rapid inconsequent muttering. Apparently the subject of auditory and visual hallucinations. Resistant to nursing attentions. Impulsively violent to those around her. Seriously ill. Phlyctenular conjunctivitis (left). Heart dilated, sounds soft and poor quality. mitral systolic murmur. Regular but feeble pulse rate, 82, later becoming 100 to 120. Intensely pale. Temperature normal. A few scattered rhonchi in lungs. Tongue dry. Ulcerated septic gums. Superficial ulceration of congested soft palate, especially left side. Septic roots under a denture. Bilateral ptosis, worse on the left. Wassermann negative.

Later it was found that the uterus was partially retroverted, chronically subinvolved, and from the cervix came a thick, curdy, mucopurulent discharge.

Clinical Course.—Antistreptococcal serum mitigated the symptoms of profound toxæmia. Septic roots and carious teeth extracted at intervals. Gynæcologically treated with antiseptics. Ear, nose and throat examination.—Tonsils, pus in both; post-nasal space, pus on left side; ears, both drums showed scar of an old healed perforation. Transillumination of sinuses: right antrum dim; left antrum black; frontals clear. Anterior rhinoscopy: wet septic nose.

She was still very ill and general treatment was carried on. Later a general sinus examination, with the use of Watson-Williams suction syringe technique, gave the following results: mucopus in right sphenoid; mucopus in left ethmoid; from the left antrum pus escaped under pressure.

The left antrum was drained intranasally. Convalescence from operation was satisfactory and the patient began to show definite physical improvement so that she was able to be up and about. Catamenia which had been in abeyance returned. She said her head felt clearer but she was still, though less, confused. She showed slow physical and mental improvement but was able to go out on parole with friends. She gained weight but sleep was variable. At times she showed impulsive behaviour.

Although tonic treatment was continued the next menstruation was missed and mentally she appeared stationary; auditory hallucinations were evidently still present. Apparently did not recognise her children.

The "closed" sepsis had now been converted into "open" and therefore recourse was had to non-specific protein therapy to provoke a focal reaction. T.A.B. was given intravenously. A good reaction was obtained, temperatures up to 104.6°, herpes around lips and nose, and such severe pain in back that no more injections were given. From thence onward a definite mental improvement ensued. Catamenia returned, followed by further physical and mental improvement, and thereafter continued regularly. She showed a gain of two stones on admission-weight. Colour good. Blood pressure, which before operation had been 114/78 recumbent, was now 132/80 recumbent. Eyes clear;

only a few dilated vessels in left conjunctiva. Conduct, manner, conversation normal. Insight gained into her case. Able to describe her auditory and visual hallucinations without embarrassment. Said her mind became definitely clear a week after T.A.B. treatment and that at the menstruation following she had a "moving-about sensation" in her head and after the completion of the period her head felt clearer.

Discharged recovered after a satisfactory month's trial, January 1928. Subsequent mental progress satisfactory.

In this case the patient was in a state of profound toxæmia precipitated by an attack of influenza, although there were no sudden acute influenzal symptoms as generally shown by a healthy person. There was a history, however, of repeated "influenzal colds." Such influenzal symptoms as might have been present were probably rapidly succeeded by the development of the acute delirious hallucinated state, the symptoms of which were intensified by the premenstrual phase of the menstruation present on admission. The septic roots (covered by a denture) were doubtless responsible for the antral disease, and upon this gradually progressive chronic septic condition an influenzal infection was superimposed.

In this case also there was no parallelism between the pulmonary condition and the mental symptoms displayed. The causation of the toxæmic state was in the skull and, although the serum undoubtedly mitigated the intensity of the toxæmia, recovery did not ensue until "closed" sepsis in the nasal sinuses had been opened and drained, and a focal reaction (indicated by the herpetic reaction) induced by non-specific protein therapy.

CASE III. Under the care of Dr. Jane W. Stocks. E. A. B., housewife, married, age 29. Admitted April 27, 1927. First certification.

Previous History.—No psychotic heredity. Four brothers and one sister alive and well. Non-alcoholic. Always of a nervous disposition. Happily married. No domestic worries. No miscarriages.

Clinical History.—Instrumental delivery of her first child nine and a half months before admission to mental hospital. Suckled the child. Later developed insomnia.

Contracted influenza, February 1927, followed by pneumonia and pleurisy; became depressed, later excited and talkative; expressed persecutory ideas, with evidence of auditory hallucinations. On account of pleuritic effusion was admitted to a general hospital but mental state became such that certification was necessary. She was rambling, laughing in a strange way, singing almost continuously; she imagined she saw a lion, an octopus and a peculiar kind of fowl in the ward.

State on admission.—Weight 6 st. 4 lbs.: very poorly nourished, and pale. Very seriously ill, yet resisted nursing observations and attention. Temperature 100.4°. Cardiac sounds faint and distant, no murmurs; pulse irregular, fairly well sustained; poor peripheral circulation.

Pleuritic effusion to lower angle scapula on left side. Bronchitis and dry pleurisy at base, right. Tongue dirty, gums unhealthy, some decayed and septic teeth.

Pupils reacted to light and accommodation; no nystagmus, plantars flexor, deep reflexes brisk. Kernig absent. Clonus both ankles. Muscular tone poor. Abdomen nil. Urine, sp. gr. 1030; acid reaction. Slight trace of albumen. Blood: Wassermann negative. Widal negative to all groups.

Noisy, excited, restless, exalted, attention not held, appeared to appreciate simple questions but replies wandering. Triple disorientation. Alternately burst into tears and song. No insight. Judgment lost. Fleeting delusions.

Clinical Course.—During the last days of April and first week of May the temperature varied between 97° and 99.8° , pulse up to 108; later, the temperature became persistently subnormal.

By the middle of May the patient was on the whole quieter, but physically she regressed. Chest condition remained much the same. Some foul bloodstained stools were passed.

By the end of May, some slight physical and mental improvement was noticed, but she was still confined to bed. At the end of the first week in June improvement maintained; she was less confused, quieter and sufficiently amenable for a gynaecological examination. An acute inflammation of vulva, vagina, Bartholin's glands and cervix was found with a mucopurulent discharge. The condition suggested gonorrhœa but the bacteriological findings were negative. Antiseptic dressings applied.

By the beginning of July she showed gradual improvement but would only answer simple questions in monosyllables. Still confused, memory impaired; said she was not married and had no memory of where she was before admission. Physically much improved, gained weight, colour better and chest condition had cleared. Dental treatment and actinotherapy given. Progress continued slowly but she appeared to be stabilising into a chronic state.

A review during the early part of October showed slow thought processes, orientation fair; she realizes she has been ill and confused ("mithered") and displays some appreciation of her present condition. Is troubled with a "voice" in the right ear, realizes it is not real but it is a source of worry. Her head is heavy, as if there were a ton weight on the top. At times has a bad headache and then the weight sensation gets worse and passes on to the back of the head. Appetite good, bowels regular and sleep is better. States she has been subject to colds from a child, used to get constant "sore throats," has had them so bad that she could not swallow. Willing to have her tonsils removed.

The ear, nose and throat condition was as follows: chronic follicular tonsillitis especially marked on right side. Wet septic nose. Retraction of both membranæ tympani. All sinuses dim on transillumination, especially right antrum.

On October 21, 1927, under general anæsthesia, she was operated on. Tonsil dissection: both very adherent. Adenoids: a large pad removed. General sinus examination, with the Watson-Williams suction syringe technique: sphenoidal sinuses, hæmorrhagic returns; antra, pus in left antrum.

On November 9, 1927, the following notes were made: throat satisfactory. Albumen nil. B.P., recumbent, 118; sitting 112; standing 120. Weight 9 st. 1 lb. Mentally a considerable improvement. The "voice" has gone completely, no buzzing in ears, no dizziness or headaches, weight on top of head has gone and head feels lighter. Volunteers that her vision is better. Her responses are brisker and her facial expression (previously fixed and puzzled) is now normally mobile.

November 10, 1927. Sent out on trial in care of relatives.

December 8, 1927. Doctor's, visitor's and relative's reports satisfactory. Discharged recovered.

May 1928. Visitor's report. Interviewed patient and her sister. Sister stated her condition was very satisfactory in every way. Appetite, sleep and weight satisfactory. She was bright and contented. Menstruation (which had been in abeyance during her stay in hospital) started in December 1927, and had been regular since. Had had a very mild attack of influenza this year, lasting only two days.

In this case the influenzal infection was responsible for an acute exacerbation of a pre-existing septic infection in the upper respiratory tract and its extension to the nasal sinuses, producing a hæmorrhagic type of reaction in the sphenoidal sinuses and a purulent type in the maxillary antrum. Associated was a bowel infection, responsible for the foul hæmorrhagic stools; there was also an acute infection of the lower genital tract.

The patient presented a picture of a massive infection of the mucosæ of the alimentary, genital and respiratory tracts, the latter involving also the pleuræ. With the subsidence of the inflammatory states in the trunk there was also a relative improvement of the inflammatory process in the mucosæ of the nasal sinuses, which did not however return to the status obtaining before the onset of the influenzal attack. Parallel with the subsidence of the acute processes there was an improvement in the general physical health and a reduction of the acute delirious hallucinated state to one of quiet subacute confusion with persistence of hallucination, although in lowered intensity, together with headaches and head pains. These latter symptoms varied, and it is probable that these variations were dependent on other exacerbating factors, such as the phases of the reproductive cycle, in her case moliminal reactions.

A certain stabilization had now been reached but the balance was insecure and with the onset of winter it would be reasonable to expect a re-intensification of symptoms. The removal of the septic foci in the head was followed by the disappearance of these residual symptoms and the patient became more stable at a higher mental as well as at the physical level.

(B) *Toxæmia and Mental Symptoms.*

This group is illustrated by two cases, admitted during the influenzal epidemic with definite histories of influenza; they showed some general toxæmia, not profound as in those of the previous group. The circulatory disturbance was much less and mental as well as general toxæmic symptoms were prominent in the clinical picture.

The general state presented by these cases was similar to that of the last two cases after the subsidence of the profound toxæmia and before the treatment of the focal sepsis. In one, antistreptococcal serum produced no improvement.

CASE IV. Under the care of Dr. J. M. Mackenzie. H. D. O., male, storekeeper, single, age 20. Admitted March 8, 1927. First certification.

Previous History.—No psychotic heredity. Patient was an eight months' child. Standard VII at 14. Always a steady worker.

Clinical History.—Indefinitely ill for eight months before admission. Lost weight. Influenza six weeks and mental symptoms a week before admission. Sat alone in the dark, lost interest; insomnia; heard imaginary people making noises outside. Exalted, grandiose ideas, talkative, restless, laughing and crying.

State on Admission.—**MENTAL STATE.** Confused, irresponsible, exalted, suspicious. Muttering. Vivid auditory and visual hallucinations. Flight of ideas. Grimacing and attitudinising, rolled his head about, turned it more constantly to left. Food refusal, spoon feeding and constant attention required.

PHYSICAL STATE. Temperature 98.2°; pulse 76; resp. 18. Height, 5 ft. 6½ in.; weight, 8 st. 11 lbs. Viscera showed no organic disease. Tonsils enlarged. Carious teeth. Bilateral ptosis, more on left. Wassermann negative.

Clinical Course.—Abscessed carious teeth removed. Radiogram of sinuses—clear. Remained as before, but weight rose. Antistreptococcal serum produced no improvement. Later his weight fell.

Ear, nose and throat examination.—Ears : normal. Anterior rhinoscopy : a chronic atrophic rhinitis of middle degree. Nasal sinuses : antra both dim, right more than left. Frontals equally dim. Nasopharynx : mucopus on posterior wall. Adenoids. A general nasal infection was present extending to pharynx and fauces.

May 8, 1927. General sinus examination with Watson-Williams suction syringe technique gave evidence of infection of left antrum and right ethmoid. Adenoids removed and tonsils by dissection.

Immediately after recovery from operation he began to talk sensibly, grimacing and attitudinising ceased, became amenable to nursing. Ultra-violet light now given.

By the middle of June, much improved, worked in grounds, well orientated, conduct normal. Some left ptosis still present.

June 19, 1927. Under local anæsthesia : washout left antrum, clear.

July 9, 1927. Weight 10 st. 1 lb. Feels well, looks well, no hallucinations, conduct normal, works well, shows initiative and interest. Has gained insight into illness and states that when he heard the "voices" they appeared to be in the left ear.

July 14, 1927. Discharged : recovered.

February 1928. Visitor reports mental condition quite normal ; no "voices" ; even-tempered, good spirits, sleep and appetite good.

CASE V. Under the care of Dr. J. M. Mackenzie. W. H. P., male, married, brass polisher, age 22. Admitted on February 17, 1927. First certification.

Previous History.—Family : no insane relatives known. Personal : In later childhood and adolescence was subject to frequent illness, "always under the doctor" for, amongst other complaints, "attacks of pain in the head and bilious turns" from the age of 11. At 14, double pneumonia. Although his later school career was marred in this way he nevertheless reached Standard VI before leaving school. Later he appears to have been a good workman, earning up to £4 a week at metal work. His wife reported that as regards health "he had always been a lot of trouble" with bad teeth, jaw abscesses and "all sorts of skin troubles," and in her view he "used to drink a lot."

Clinical History.—During autumn, 1926, he developed boils on the back of the neck, followed at the beginning of November by a bad attack of influenza. As a consequence of this he lost weight, "went like a skeleton," and was away from work for several weeks. He recovered to the extent that he was able to go back to work before Christmas 1926, but after Christmas was unable to continue. Complained of pains in head and insomnia; sat holding his head, apathetic, neglectful; did nothing, would not go to doctor to get panel note. Was to have gone to dentist but refused to do so. At time of influenzal epidemic, February 1927, his condition became worse and certification became necessary.

State on admission.—MENTAL STATE. Stupor, confused, totally indifferent to surroundings, immobile facies, no variation of emotion or interest except perhaps a certain degree of suspicion or fear shown by moving the head away a little when approached. Negativistic, did not speak, made no signs, refused food and required spoon feeding, would not pass urine unless enema given.

Resistive to examination and nursing attention.

PHYSICAL STATE. Temperature 97·6°. Pulse 70. Weight 9 st. 5 lbs. Pale complexion, thin and ill-nourished. No enlarged lymph glands. Peripheral circulation poor. No oedema. Heart : limits normal; sound normal at apex. A semi-musical diastolic murmur replacing the second sound all over the sternum, heard best at third interspace at right sternal border. Pulse : Corrigan type. Lungs : impaired percussion with crepitations at right anterior apex. Tonsils inflamed, mucopus on posterior pharyngeal wall coming from nasopharynx. Palate injected. Teeth carious and roots. Pyorrhœa. Right-sided ptosis. Urine normal. Blood : Wassermann negative. Widal : negative.

Clinical Course.—Five carious teeth and roots removed. Continued stuporose, resistive and resented nursing attention. Habits faulty by day and night if not raised frequently. Much time and patience required for spoon feeding. Bowels, irrigations every second day. Did not recognise his wife at her visits.

May 11, 1927. Ear, nose and throat examination. Very resistive; after much difficulty the following observations were made. Ears: normal. Tonsils: both enlarged, especially right, and septic. Antra: both dim, especially right. Frontals: right dimmer than left. No pus seen anteriorly in nose.

May 25, 1927. General anaesthesia. Tonsil dissection. Right tonsil: deep abscess present; no sign of its presence on the surface. Left tonsil: septic and adherent to capsule. General sinus examination, Watson-Williams technique. Sphenoids: right, nil; left, mucopus. Antra and ethmoids: nil.

Convalescence uneventful. Colon irrigations continued. During summer months began to improve; muscular and facial tone and colour improved. Able to be up and about but progress slow and gradual. Speech began to recover, at first by grunts indicative of assent, later on occasion "yes" and "no" could be elicited and at times commands would be obeyed in a slow sheepish manner. Unable to state where he was.

During this stage he displayed mannerisms when addressed, constantly fidgeting, continually running his right hand through his hair in a puzzled and agitated manner; later the hand only reached his necktie, which he would partially but continually tighten. Later the hand came lower, fidgeting with the waistcoat. This display of agitation subsided later. Colon irrigations were continued. In the autumn ultra-violet course commenced and a short course of T.A.B. vaccine intravenously. Temperatures up to 104.4° F. were obtained with rigors and vomiting; pulse up to 100 and 120.

On October 5 the Charge Male Nurse reported the beginning of a definite improvement. "Has shown remarkable improvement to-day. Responded correctly to questions regarding orientation and is generally 'awake' to his surroundings." From thence onward progress was gradual.

Review at the end of 1927.—Weight 10 st. 11 lbs. Correctly orientated. Does not remember admission. Knows he was ill, too ill and too confused to know what was happening to him. Gives the following details of his own history. For two years before admission he suffered with pains in the head and "bilious spasms"; they recurred about every two months and gradually became worse. The abdominal pains prevented his taking food and "were terrible round the navel." Head pains were frontal; worse on left side. The pain in the head was of a burning character and would at times extend from the left temple region to the back of the head, sometimes worse, sometimes better, but always worse over the left temporo-frontal region.

Pains in the head and abdomen have gone and he feels a "terrible lot better."

Admits alcoholic indulgence in the past which he excuses on the ground of his chronic illnesses. Promises to abstain. His wife has noted a very definite change in his temperament whilst out on parole; formerly miserable and unable to appreciate any recreational relaxation, he now goes about singing and is of a happier temperament. She has never seen him look so well.

He was sent out on trial on January 1, 1928. At the end of the month his doctor's, the visitor's and his relative's reports were satisfactory.

Discharged recovered, February 1928.

March 1928. Reports equally satisfactory. He had returned to work.

(C) *Mental Symptoms predominant.*

This sub-group includes cases where the two conditions of "closed" chronic sepsis and unstable mental state had been in existence for some time.

Normal influenzal symptoms were not manifest, being in all probability masked by the mental symptoms which formed the predominant part of the clinical picture. Confusion was less in evidence than in the previous case.

One case is quoted to illustrate this class.

CASE VI. Under the care of Dr. J. M. Mackenzie. E. A. B., male, married, lead worker, age 49. Admitted on February 11, 1927. First certification.

State on admission.—MENTAL STATE. In a condition of mania. Exalted, restless, noisy, threatening and abusive, rambling and incoherent in conversation, said he was the richest man in the world and that his relatives were trying to murder him to get his money.

PHYSICAL STATE. Temperature 98°. Pulse 70. Weight 7 st. 7 lbs. Cardiovascular, pulmonary and abdominal viscera appeared normal. Nervous system nil. Mouth, pyorrhœa, many carious teeth and roots. Old scar of cut-throat, self-inflicted, over thyroid cartilage, a septic skin eruption on both forearms and an eczematous condition of scrotum.

Blood: Wassermann test, negative. Widal test: negative except for typhoid 14 Oxford units (Army inoculation).

Clinical Course.—Following dental treatment, colon irrigation and ultra-violet light he became calmer and improved physically; the cutaneous sepsis disappeared and he began to gain weight. The improvement continued and at the beginning of May a review of his state elicited correct orientation; he was composed, had apparently gained insight into his state, admitted the facts of his certificate and that he had been talking nonsense. Work, conduct in and out of the hospital satisfactory. He was went out on trial, obtained employment with his firm. Reports at the end of the month were satisfactory.

Discharged recovered June 10, 1927. Weight 8 st. 9 lbs.

During August 1927 another attack of excitement of a more intense character developed, acute symptoms being manifested for four days before re-certification on August 20, 1927.

State on re-admission.—Physical state showed no special change from that noted on discharge, but weight had fallen to 7 st. 13 lbs. Mentally similar to condition on previous admission, but visual and auditory hallucinations were more marked than on the previous occasion. At night very restless. During the next three weeks the intensity of the symptoms subsided.

On September 2 an intravenous injection of T.A.B. was given.

Towards the middle of September a sudden exacerbation of symptoms occurred, almost dramatic because preceded by the period of improvement. During this period he stated that he was poisoned and that electricity was "put on his head" by the staff. At night noisy, chattering and restless. On one occasion he was found in the lavatory plastering faeces on the walls; when remonstrated with he made a violent attack on the night nurse. Later conduct became less intense. On account of the inequality of the nasolabial folds and the variation of his mental symptoms sinus disease was suspected and on October 13 the ear, nose and throat surgeon found: nose: wet and septic, both sides. Sinuses: antra, both dull, especially right; frontals, right dimmer than left. Nasopharynx: pus. Tonsils: buried.

He continued restless, hypomaniacal, erratic and mischievous. Allegations of poisoning and electrification continued.

October 26, under general anæsthesia, a general sinus examination with Watson-Williams technique. Sphenoid: R. nil; mucosa appears normal. L. thickened mucosa; no exudate observed. Ethmoids: R. mucopus; L. mucopus. Antra: R. much pus; L. pus.

Bilateral antral intranasal drainage performed.

Following the operation he became calmer and after a week was much better behaved and slept well, except that on November 7 he had a disturbed night. On the following day the antral washouts gave small clots of pus and thereafter he slept well and conduct by day improved.

On November 23, ear, nose and throat review showed post-nasal space clear. Antral washouts, only flakes of mucus.

On December 7, under local anæsthesia, antral openings cauterized to prevent closure.

From December 8 to 14, 1927, six injections of T.A.B. vaccine, the first three intramuscularly, last three intravenously. Temperature of 102° and rigors were noted. Continuous colon irrigations, two to three gallons at each irrigation, brought away much thick mucopus. Later, irrigations, using nine to ten gallons, eventually gave clear returns. Mentally he was now better than on the previous occasion and able to give a detailed and connected account of himself (see History below).

He was sent out on trial on January 12, 1928, and was immediately taken on again at his works. At the end of the trial period his doctor's, the visitor's and relative's reports were satisfactory and he was discharged, February 1928, as recovered.

Abridged History.—No insane relatives.

Standard VII at the age of 12: entered a leaded-light trade in his teens and except for war service has been continuously employed with the same firm since 1913. In infancy, bronchitis, whoopingcough and scarlet fever. Since age of 14 suffered with frontal headaches and "bilious attacks," i.e., indigestion, anorexia, abdominal discomfort, a burning sensation in hypogastrium, belching, at times vomiting and constipation. Headache came first. Attacks cleared up as a rule with a purge. Associated with these attacks at night he sometimes had a curious sensation in the feet and legs but not above the knees. Tickling, then a sensation of cold and then heat so that he had on occasion to get out of bed and stand on a cold surface. No swelling, blanching or reddening of the skin. Later, bilious attacks passed away and only had headaches after alcohol which he began to take at the age of 17. Later he drank beer rather freely. He excuses this on account of insomnia produced by the sensations in the legs. Appears to have had a mild attack of delirium tremens when 25.

After the War he was sent by his firm to South Africa on a contract. Here he indulged in wines and spirits with the result that he developed a depressed persecutory state and cut his throat to escape from his supposed tormentors. Returning to England was again taken on by his old firm and had no further breakdowns until his first certification. It was six weeks after his first discharge from mental hospital that he had his first drink to induce sleep.

A fortnight before second admission he had had three glasses at night; on the following morning he had a sudden flushing of the head, a hot uncomfortable sensation all over the head, not worse in any one place, and he understands his face went purple. The flushing lasted about three hours and gradually passed off. No visual or auditory hallucinations were associated. Four days before second admission he again felt "uncomfortable in the head," a feeling of "depression or pressure" developed, more on the right side, not the flushed sensation, and all the time it seemed as if he could hear "voices" speaking, more pronounced on the right side. His wife states he suffered with headaches and would sit with his head in his hands; she gathered the headache was worse on the right side. He states that tobacco gave him a headache more on the right side, and for the last fifteen months had abstained from tobacco. Does not remember a definite attack of influenza. Has not had neuralgia but has had bad toothaches and has pulled out several teeth himself in the past.

Explains some of his sensations, e.g., the "electricity" allegations were based on a feeling in his head as if he had two terminals or plates, one on either side of his head. This sensation and the "voices" disappeared after the nasal operation; they were

present before but have not returned since. The antral irrigations following operation have not caused any sensation akin to the "flushing" sensation, etc. The last T.A.B. injections caused a temporary frontal and occipital headache. His head feels clear now. The leg sensation has not been so pronounced and he sleeps better.

As in Case II it may be objected that there is no definite evidence of a history of influenza and it may be urged that alcohol was the real precipitating factor.

The writer is not prepared to deny that alcohol may have played a part in the causation but points out that alcohol had been possible as a precipitating factor (and had formerly when used excessively been so) for a considerable time before the development of certifiable mental symptoms, which did occur actually during the incidence of the influenzal epidemic.

As in Case II, so in this case, it is considered that the influenza infection acted on an individual rendered unstable by long continued chronic closed septic infection in the skull, and so produced definite mental disorder, but left that disease process in a more advanced state than before the onset of the infection. The periodicity characteristic of sinus disease now came into play with reduction of vitality, leading to desire for alcohol; this intensified the pathological process by causing a congestion reaction and the production of certifiable mental symptoms.

The pathological process in the skull was now becoming dominant as shown by the persistence of the abnormal conduct reactions induced by the local toxic condition and irritative factors.

With the cleansing and draining of the sinuses followed by non-specific protein therapy the patient stabilized with a better mental capacity than on the preceding discharge.

The development of the sinus disease in slow and insidious form probably dates back many years to a dental and/or possibly influenzal causation.

DELAYED GROUP.

In this group are cases in which there is no immediate relation between the subsidence of the influenzal symptoms and the development of the manifestations of acute mental disorder. During the interval the individual may be indefinitely ill, due to the incomplete resolution of a low grade sinusitis consequent upon the influenzal infection, or there may be intermittent periods of apparent good health. Later, as a result of some exacerbating agency, the sinusitis again becomes dominant. The symptoms are usually, first insomnia and headache, and later the development of an abnormal mental state.

An example of the first category is the following history given by a husband concerning his wife, who was admitted in a state of confusion: "She had influenza, did not go to bed and has not been the same since. The first thing she could not sleep, became 'low' and then developed depression." In this case antral sinusitis was subsequently proved to be present.

An example of the second category, where periods of good health may be shown between the influenzal attack and the onset of definite mental symptoms, is a case reported by Patrick Watson-Williams.⁹

M., age 29 (neurasthenia, nasal catarrh).

1901, severe influenza. 1903, appendicitis. 1907, appendicectomy. 1908, prolonged insomnia, depression. Went voyage. 1908-1911, health normal.

1911, February, ? influenza slight. Headaches, insomnia, depression. Consulted four physicians. Went voyage. Suicidal, incapable of any mental effort, yet played golf well and looked strong. August, chronic pan-sinusitis. Delusional insanity. Operations on sinuses. Culture showed pure staphylococcus aureus. Cured. Mental recovery complete.

1927. December. Good health for sixteen years.

In this case of occult nasal sepsis an abdominal operation became necessary. Early mental symptoms developed but passed away, to be followed much later, after the exacerbating influence of a slight attack of influenza, by definite mental symptoms of a more severe character. In such cases mental disorder succeeding an operation is usually attributed to the abdominal condition or to the operation, rather than to the primary cause of both conditions, viz., the septic disease in the skull.

A case illustrating the period of illhealth between the attack of influenza and the onset of certifiable mental symptoms is the following.

CASE VII. Under the care of Dr. Kathleen A. H. Sykes. E. M. K., single, domestic, age 45.

Admitted September 14, 1927.

Previous History.—Family: no psychotic history.

Clinical History.—Suffered with headaches for many years. Influenza early in 1927; did not effectually recover; became depressed. During August 1927 condition became worse and finally she was certified.

State on admission.—Menstruation had been in abeyance for three months before admission when she was found to be depressed, agitated, showing considerable fear manifestations, restless and confused. Cutaneous, oral, nasal, bowel and gynaecological sepsis. Wassermann and Widal tests negative. Treatment of oral, bowel and gynaecological sepsis, together with a course of non-specific protein therapy, resulted in some improvement. Hypertrophied and purulent tonsils were dissected and ethmoidal infection treated.

After this the facial colour and sepsis improved considerably. Menstruation returned and was regular. Marked mental and physical improvement succeeded.

Discharged recovered, after a satisfactory month's trial during which the improvement continued, in March 1928. Her doctor's, the visitor's and relative's reports were satisfactory.

In this case (patient's age 45), the onset of acute symptoms was associated with an amenorrhoea which together with the mental state might be attributed to the onset of the climacteric, yet with the removal of septic conditions the function returned and the mental state improved.

Another case illustrates the culmination of recurrent sore throats and "colds" in the production of a mental state.

CASE VIII. Under the care of Dr. Kathleen A. H. Sykes. E. V. M. W., female, single, clerk, age 26. Admitted August 28, 1926.

Previous History.—Family: not psychotic. Mother has chronic otitis media. Personal: Recurrent sore throats and "colds" since 1921. Later catamenia tended to irregularity. During spring and summer (hay season) of 1926 continued with her colds and gradually developed psychotic symptoms beginning with enviromental maladjustment. Could not tolerate the pleasantries of those around her. Symptoms became worse. Confusion developed and became intensified during the premenstrual phase of the menstruation present on admission.

State on admission.—Acute auditory and visual hallucinatory confusion, agitation, restlessness, destructive, wet and dirty, resistive to nursing. Pale, losing weight, dilated rapid heart, poor peripheral circulation. Streptococcal glossitis, tonsils enlarged, septic, containing pus; pharynx congested with mucopus, bilateral rhinitis, uterine cervicitis with mucopurulent discharge. Wassermann and Widal (all groups) negative.

Clinical Course.—The cessation of menstruation occasioned little if any improvement. Catamenia missed in September but appeared in October and thereafter ceased. A course of intravenous T.A.B. resulted in some amelioration of symptoms. Her agglutination capacity was poor, giving only a maximum of 10 Oxford units to para. A., and no agglutinin to typhoid or para. B.

Gynæcological and dental treatment. At the end of October the tonsils were removed by dissection; both were fibrotic and showed evidence of old inflammatory changes. Her weight, which had previously fallen, now began to rise and she became gradually better mentally. A second course of T.A.B. was given and weight still rose so that at the end of December she was heavier than on admission. Catamenia were still in abeyance although aloes and iron were given together with actinotherapy.

In January she began to improve definitely but was still apathetic and easily depressed. Menstruation occurred in March and thereafter a definite mental and physical change was noted. The function continued regular thereafter.

Discharged recovered after a month's trial, June 1927. Her doctor's, the visitor's and relative's reports were satisfactory. Weight on admission, 9 st. 8½ lbs; on discharge, 11 st. 13 lbs. Widal in March 1927, negative to all groups.

Her doctor reports in June 1928: She is mentally and physically in excellent health, has not had to consult him for any ailment since discharge and she has returned to and is working satisfactorily at her former place of employment.

CONCLUSIONS.

(1) In persons without psychotic inheritance but with pre-existing septic diseased states in the head (which may date from childhood and may be responsible for some predisposition to mental disorder) an attack of influenza, by causing an acute exacerbation of the pre-existing pathological process, may precipitate serious mental disturbance even although constitutional symptoms of influenza may be slight or absent.

(2) The pre-existing pathological processes may be responsible, directly or indirectly, for pathological changes elsewhere in the body, and from these collectively further general toxæmia may ensue; when these secondary processes have subsided the original focus in the head does not necessarily return to the status obtaining before the acute exacerbation and some of the mental symptoms displayed during the acme of the acute process may persist.

(3) The mental symptoms and the corresponding pathological conditions of septic foci with deficient or defective drainage may continue indefinitely, being subject to periods of exacerbation and quiescence.

(4) The usual influenzal symptoms displayed by a normal or otherwise relatively healthy person may show considerable differences from those occurring in persons with an existing chronic septic process in the head.

(5) Within the skull, therefore, pathological processes may exist, the extent of which may determine the degree of mental symptoms displayed.

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