INFECTION OF THE GASTROINTESTINAL TRACT IN RELATION TO SYSTEMIC DISORDERS.

NEUROLOGICAL VIEWPOINT; SPECIAL RELATION OF CLINICAL SYMPTOMS TO REGIONAL DISTRIBUTION OF FOCAL INFECTION.

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In presenting a psychiatrist's viewpoint of the relation of focal infections to systemic disorders before an audience of general practitioners, one must at the outset disabuse the mind of the physician of the timeworn traditional theories regarding the psychoses. Heretofore cases suffering from mental disorders were viewed with alarm by the general practitioner, through no fault of his own, however. The psychoses were elevated to a plane far beyond the vision of the physician. The symptoms were not understood and he felt helpless. The natural outcome of this situation was that psychotic patients were immediately committed to an institution for the insane.

This situation arose largely from our previous lack of knowledge of the causes of the various psychoses, and consequently there was no adequate treatment which could be instituted in the early stages of the mental disorder. Our fundamental knowledge of the psychoses has been based largely on speculation and coincidence, and the causes of the mental disorders were rather obscure and therefore no specific treatment could be instituted.

One of the most prevalent errors as to the causation is that of heredity. So fixed has this become in the minds of the profession and laity, and I might add psychiatrists as well, that it has been considered the principal, if not the fundamental, cause of the psychoses. This fact arose from the rather loose way in which records of heredity were gathered in the old state hospital statistics. Any patient in which there was "insanity in the family" was
noted as suffering from a hereditary taint. This occurred in sufficient numbers to substantiate the opinion that the psychoses were hereditary in origin.

It is needless to go into the various arguments from a biologic standpoint to show that this theory is erroneous. Not only were we in serious error regarding heredity, but such a doctrine was extremely fatalistic. For if a patient was born with the potential elements of mental disorder, then there was little use in trying to prevent the psychosis or to successfully arrest it if it had appeared. Hence, the attitude was adopted that only by methods of training, education and favorable environment could these symptoms be forestalled. But we have seen many cases in which the environment was extremely favorable to the individual, where education and training were all that could be desired, and, in spite of this, psychoses developed.

In spite of the fact that perhaps 70 per cent of our patients give a history of "insanity in the family," especially in the institutional types, largely of the indigent class, there still remains a large percentage in which no hereditary taint can be discovered. The result of some five years' intensive study of the hereditary factors in the psychoses led the writer to a certain degree of skepticism regarding the importance of this factor, and today, while we do not eliminate the influence of an hereditary taint and its consequent inherited predisposition entirely, at the same time we are of the opinion that heredity should not occupy the exalted position it has previously held. As it has no bearing on the prognosis of a given case we believe that discussion is at present merely academic.

Psychogenic Factors. For many years the psychiatrists, in common with the profession at large, voiced the opinion that the psychoses were purely mental disorders caused by hereditary instability, plus psychogenic or mental factors. The physical condition of the patient was absolutely neglected, and our attention was centered alone on the psychogenic factors and the mental symptoms. This gave rise to a fundamental error in that we assumed the psychoses to be diseases of the mind caused by mental factors almost exclusively.

As no demonstrable lesions had been found in the brain cortex, it was considered that these disorders were "purely functional"—in other words that the disease of the mind was independent of any pathologic changes in the brain tissue. With an improvement in the methods of studying brain tissue and the results of our work the last four years, we have slowly arrived at the conclusion that the so-called functional psychoses were in reality caused primarily by disease of the brain and not of the mind, and that the mental disorders were merely symptoms of a diseased brain. The writer, working under Alzheimer in 1905-1906, produced conclusive evidence that there were changes in the nerve cells of
the so-called functional disorders, and this laid the groundwork for the future development of the idea that we must look to the anatomic lesions in the brain if we were to successfully arrest the psychoses, and which is still more important, prevent them in time.

We would emphasize the fact that we do not minimize the importance of the psychogenic factors in precipitating a psychosis as we see a certain proportion of our cases in which such psychogenic factors as grief, worry, anxiety, shock and a host of others are present and undoubtedly play an important role in precipitating the psychosis. However, we have observed many cases in which these psychogenic factors are entirely absent. Hence, we have been forced to conclude that these factors, as in the case of heredity, play an important, but not the most important role, in the causation of the psychoses of the "functional" types.

**Infection.** If then we have destroyed our belief in the important role of heredity and psychogenic factors, what have we to offer in their place as causative factors? Formerly the physical condition of the patient was of minor consideration and many patients were classed as physically normal, which practice we know now was a serious error. We are indebted to modern mental practice for the methods which permit the finding of serious physical disease in apparently otherwise healthy individuals. The work of Billings, Hastings, Rosenow, Barker and Upson of the medical as well as Thoma and others of the dental profession has established, without any question of doubt, the doctrine of focal or masked infections. These infections were formerly overlooked not only in the psychotic patient but in patients suffering from various systemic disorders. This doctrine has been the most important contribution of twentieth century medicine and the application of the methods evolved to determine the presence of chronic infection has added an entirely new chapter to the treatment and prevention of the psychoses.

That local foci of infection which give no local symptoms and of which the patient may be ignorant can cause serious systemic diseases, both by spread of the organisms to other parts of the body and by a dissemination through the blood streams of the toxic products, the result of such infection, is still doubted by many; but we feel that enough work has been done to establish such a doctrine in spite of this skepticism.

Our investigations in the last four years have shown conclusively that the psychotic individual harbors multiple foci of infection which often can be located and eliminated only with the greatest difficulty and persistence on the part of the physician. In order to properly locate and eliminate these multiple foci of infection the psychiatrist has had to call to his assistance the specialist in other branches of medicine. So that today a well-equipped clinic for nervous and mental disorders is only adequate in so far as this principle of group diagnosis is carried out. The growth
of the idea of a diagnostic survey of every individual, whether suffering from mental disorder or other systemic diseases, has been rapid. One need only to mention the success of the Mayo Clinic and of the work of Lewellys Barker at Johns Hopkins to illustrate the trend of modern medicine. Why then should there be any criticism if the psychotic individual is given the advantage of the application of the principles of modern progressive medicine? In view of the successful application of these principles at the State Hospital at Trenton in the last four years, shall we still adhere to the old ideas expressed at the beginning of this paper, or shall we lay prejudice aside which limited the treatment of the psychoses to psychotherapy or the so-called occupational therapy and study the individual as a whole and endeavor to discover any pathologic condition which might be present?

It is only within the writer’s short experience of twenty-one years that the question of the relation of syphilis to paresis was doubted in America. Paresis was considered a disease due to overwork, or mental strain, because it occurred in brokers, bankers, actors, and others who were supposed to be overworked. It was considered purely a mental disease. First a history of previous syphilis in a large proportion of the cases gave a clue to a better understanding of the causation. Then the studies of the brain cortex by Nissl and Alzheimer revealed the fact that very serious pathologic changes had occurred. Finally Moore and Noguchi demonstrated the Spirocheta pallida in the brain tissue in cases dying of paresis. Here we have an example where, step by step, our ideas regarding the causation of paresis underwent a complete revolution and no one would dispute the fact today that paresis is an organic brain disease due to destruction of the brain tissue by the Spirocheta pallida.

The so-called functional psychoses we believe today to be due to a combination of many factors, but the most constant one is the intracerebral, biochemical and cellular disturbance arising from circulatory toxins originating in chronic foci of infection situated anywhere throughout the body and probably secondary disturbances of the endocrine system. The psychoses then, instead of being considered a disease entity, should be considered as a symptom, and often a terminal symptom, of a long-continued masked infection, the toxemia of which acts directly on the brain. As psychiatrists have for years recognized a toxic infectious psychosis, especially in patients who had an obvious infection, acute in character and easily diagnosed, we have not established a new principle when we speak of the toxic origin of some psychoses. But we have extended the diagnosis to include types such as manic-depressive insanity, dementia precox, paranoid condition, etc., in which the infection is not apparent or easily found upon causal
examination. But such infection is only found upon utilizing all the methods of modern diagnosis, so it should not be difficult to adjust our ideas to these views.

If the profession at large can accept this viewpoint, which we feel we have demonstrated beyond a reasonable doubt, then their attitude will be changed from a hopeless, fatalistic one, previously in vogue, to a hopeful one wherein they themselves cannot only arrest many cases after a psychosis has developed, but, better still, by eliminating these foci of infection easily prevent the occurrence of the psychosis. There can be no question that many of the psychoses can and will be prevented when the result of such infection is properly understood by the profession at large. It is obvious that when the psychoses can be arrested by eliminating chronic foci of infection, then by properly treating such patients long before the psychoses appears the mental disorder can be prevented.

**Source of Infection.** We have found that the source and type of chronic infection in the psychotic patient is the same as found in many of the systemic disorders. We may be pardoned, perhaps, if we claim that our work in the elimination of focal infection has gone further than in most clinics. We have utilized what we consider the best methods that have been developed. Some of them, unfortunately, are not in general use, nevertheless we are of the opinion that time will show that all the methods adopted by us are extremely valuable in ridding the patient of multiple foci of infection until better methods are devised.

We have come to regard the infection of the teeth as the most constant focus found in our patients. Without exception the functional psychotic patients all have infected teeth. Briefly they may be divided into unerupted and impacted teeth, especially the third molars; periapical granuloma; carious teeth with infection; apparently healthy teeth with periodontitis; devitalized teeth with either Richmond or gold shell crowns; extensively filled teeth with evidence of infection; and gingival granuloma in apparently vital teeth.

While the progressive men and leaders of the dental profession are awake to all these types of infection, unfortunately the “rank and file” are not sufficiently acquainted with these many forms. Consequently the physician who attempts to rid his patient of focal infection must become acquainted with modern dental pathology. In our younger patients, from sixteen to thirty years of age, no matter what the psychosis may be diagnosed, we find unerupted and impacted third molars in a large proportion of the cases. And we would unhesitatingly advise, when there are clinical evidences of systemic infection and intoxication present, that these should be removed. We have found that they are always infected, and the infection is in some way related to the
fact that the tooth is unerupted and impacted. All crowns and fixed bridgework have been condemned by the best men in the dental profession, and we voice the same opinion. So in order to rid a patient of focal infection a very thorough job must be done and no suspicious teeth allowed to remain. This does not mean that every patient should have all his or her teeth extracted. In fact, in our work at the State Hospital we would not average over five extractions per patient.

Time prevents my going into the question of infected teeth more thoroughly, but I would emphasize the fact that a thorough elimination of focal infection can only be obtained by extraction. All other methods have proven worthless and dangerous to the general health of the individual.

We should like to call attention to the method of removing the infected teeth. In many cases simple extraction is not sufficient even when the socket is thoroughly curetted. When the alveolar process is severely involved the Novisky method of surgical removal is absolutely necessary. Failures to get results from removing infected teeth are frequently due to the fact that diseased, infected, necrotic bone is left and absorption continues even after the teeth are extracted.

Chronic infection of the tonsils is equally important as infected teeth, and the mouth cannot be considered free from infection when infected tonsils are not removed. It is a striking fact that very rarely is a patient admitted to the State Hospital at Trenton whose tonsils have been previously removed, so that over 90 per cent of the patients have to have their tonsils enucleated after admission. That the children of the present generation are having their infected tonsils enucleated will, we believe, have a definite influence on the elimination of systemic and mental disorders later in life. Whatever may be the result of treating infected tonsils with the roentgen ray or local therapy, we feel that today enucleation is the only method permissible.

**Types of Bacteria Concerned in Chronic Infection.** Briefly stated, we have found the various types of streptococci and colon bacilli responsible for chronic infection in our psychotic patients. The streptococcus group composes many strains, as cited below. The colon bacillus group is also made of various strains, differentiated by their cultural reactions in carbohydrate media.

Below is given a table showing the strains of streptococci classified according to Holman. These sixteen types represent the grouping of 1122 strains of Holman, and taken with strains from the literature, the total number is 2463, a sufficient number to come to some conclusion as to their biologic types. While some types can be identified under the microscope, only by their cultural reactions can they be accurately differentiated.
We have so far been able to isolate six strains of the hemolytic group, i.e., the infrequent, pyogenes, anginosus, equi and subacidus, and five strains from the non-hemolytic group, i.e., fecalis, mitis, salivarius, equinus and ignavus. We have found representatives of both these groups in various sources of culture. Occasionally the hemolytic strains are found in the teeth, but more frequently this type is found in the tonsils and gastrointestinal tract. Nine-tenths of the tonsils harbor the hemolytic strains, and often the non-hemolytic strains as well, and it is not unusual to find two or three strains in the culture from the stomach and duodenum, both hemolytic and non-hemolytic types.

Later investigations have shown the "viridans" is a form of the non-hemolytic streptococcus, but not all of the latter can be classed as "viridans." So it is better to substitute the exact type for this term.

It is useless to argue which types may or may not be pathogenic, or which types may be more virulent than others. We have not found that the hemolytic types were more virulent than the other group or that they produced more marked symptoms. In fact, any of these organisms may become so virulent at any time that they cause the death of the patient, although for a long time they may be latent and no marked evidence of their presence shown other than by the fixation tests. We are still of the opinion that the complement-fixation tests of the blood for determining the presence of chronic infections are of value, as are also the agglutination tests for the same purpose. Further standardization is necessary, however, before they can be used as a routine laboratory test.
Dissemination of Infection. From the fact that the elimination of infected teeth and tonsils produced marvellous results in some cases and in others no results whatever, it was logical to conclude that the infection had spread to other parts of the body, through either the lymphatic circulation or the blood stream, and preferably by the former. Secondary infection of the stomach and lower intestinal tract could also come from constantly swallowing the bacteria originating in the mouth, so that we find secondary foci of infection of the stomach, duodenum, small intestine, gall-bladder, appendix and colon. The genito-urinary tract is frequently infected not only by the organism of the streptococcic group but by the colon bacillus group as well. The source of this infection of the genito-urinary tract is not altogether known.

In the females we find at least 80 per cent of the cases have a chronic infection of the cervix uteri, and while the body of the uterus is rarely involved, we more frequently find infection in the adnexia. In the males a certain percentage of the acute psychoses have infection of the seminal vesicles. The prostate and bladder, as a rule, are not involved.

Treatment by Detoxication. It should be evident from what has been said that all surgical measures utilized are primarily for the elimination of the chronically infected tissue. It has no relation to the surgery practised some years ago which was directed toward correcting malpositions and the removal of ovaries and other organs irrespective of infection.

The removal of all infected teeth and infected tonsils is imperative. Surgical measures have been utilized for removing portions or all of the infected colon. The Sturmdorf method of enucleating an infected cervix has proved very successful. When the uterus and adnexa are involved a complete hysterectomy is necessary, and involvement of the seminal vesicles necessitates excision and drainage.

Chronic gastric infection and infection of the small intestinal tract can only be treated by autogenous vaccines or specific serum. Autogenous vaccines are made in our laboratory from the bacteria isolated from the stomach by the Rehfuss method. We have also developed a specific antistreptococci and anticolon bacilli serum made from the organisms isolated in our laboratory. Every patient receives as routine treatment, first, the autogenous vaccine and later the specific serum. But always after infected teeth and tonsils have been removed. The serum has proved especially valuable in the operative cases. Its administration before operation upon the colon has reduced the mortality from 30 to 12 per cent. Therefore if for no other reason its use is justified.

I shall leave to others a detailed discussion of the gastrointestinal infection and the infection of the genito-urinary tract.
Results of the Work. We have outlined above our theories regarding the causation of the so-called functional psychoses. We realize that many theories have been advanced in the last fifty years regarding this subject, but we also want to state that during this time the recovery rate of state institutions has materially diminished. If then we advanced merely a new theory and could not show that the application of such a theory had had unusual results on our patients, we should then be classed with the theorists and our work considered interesting if true. However, we feel that we have substantial grounds for considering that the application of these theories has produced results which, as Meyer states, "Appear to have brought out palpable results not attained by any previous or contemporary attack on the grave problem of mental disorder."

We will confine our statistics to the so-called functional group, which includes dementia precox, manic-depressive insanity, paranoid conditions and the psychoneuroses. In this group, as a whole, for a ten-year period prior to 1918 the recovery rate was only 37 per cent of the admissions. Since 1918 the recovery rate has averaged nearly 70 per cent in the same group. Of 380 cases classified in this group in 1918 only 50 today remain in the hospital, and 9 of these are criminals. A recent survey made of these 380 patients discharged in 1918 shows that after three years, with few exceptions, they are today normal in every respect. Over 1000 patients have been successfully treated in the last three years, and it is gratifying to note that the proportion of readmissions to the State Hospital at Trenton has not increased during this time, and that many of the readmissions are cases that were admitted, the first time, prior to this period of intensive treatment.

Our failures have been confined to the patients with a psychoses of over two years' duration. The cause for such failures we consider is due to the fact that the brain has become permanently damaged and no amount of elimination of such infection has any effect upon the psychosis.

Conclusions. We have produced evidence, both clinical and pathologic, which should set at rest any doubt as to the accuracy of our deductions. The fact that many individuals harbor focal infections and are not insane is no argument against the doctrine that focal infections can cause insanity. We know that only a small proportion of patients contracting syphilis develop paresis. In the same way we know that only a small proportion of those indulging in alcohol excessively develop a psychosis. Some individuals are able to drink a great deal without showing any symptoms, and in other individuals it takes only a small amount to produce a psychosis.

1 On July 1, 1922, the successfully treated cases numbered 1400, and only 50 (or 3 per cent) have returned and are still in the hospital.
One may argue similarly regarding a functional psychosis. The type, specificity and severity of the infection, plus the patient's constitutional lack of resistance, determine whether or not a psychosis will develop. Such factors as heredity and psychogeneses undoubtedly play an important role; more, however, we now think, as precipitating the psychosis rather than as causing it.