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## *The Relation of Chronic Sepsis to So-called Functional Mental Disorder.*(1)

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It is interesting to recall that fifty-five years ago Maudsley wrote as follows:

> "There is no want of evidence that organic morbid poisons bred in the organism or in the blood itself may act in the most baneful manner upon the supreme nervous centres. The earliest and mildest mental effect by which a perverted state of blood declares itself is not in the production of positive delusion or incoherence of thought, but in a modification of mental tone.
>
> "The further effect is to engender a chronic delusion of some kind.
>
> "A third effect of its more acute action is to produce more or less active delirium and general incoherence of thought."(1)

Of all forms of chronic septic conditions of tissues the surgeon meets those affecting the hard tissues are most difficult to treat, and I propose to confine my observations to septic processes in these tissues, and to examine their relationship to a disturbance of emotional tone.

Chronic septic processes involving the hard tissues set up two types of reaction therein—rarefaction in the immediate vicinity, and condensation or sclerosis at the periphery of the infective centre.

The disease of bone which has proved interesting is that affecting the jaws. The ear and nasal passages are also important areas where bony septic processes occur there; these may be caused by, or intensified by, similar conditions affecting the jaws.(2)

In the jaws many tissues become involved in a reaction to infection which, in its chronic form, is essentially ulcerative. The bone, however, is different to bone in any other location on account of its permeation by blood-vessels, nerves and lymphatics connected with the teeth. The lymphatics are important in that they may be concerned in general dissemination of infection as well as in relation to erysipelatoid facial phenomena sometimes seen. I need not discuss the importance of the fifth nerve in this connection, lymphatic drainage and reflex phenomena. Infection of the jaws arising from the teeth may reach the bone in one of two ways:

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From the gingival trough of the gum margin through the lymphatics and so to the periodontal membrane, or through the pulp canal.

It has been estimated (3) that if all the teeth are affected by advanced periodontal disease, the surface area absorbing poison is just over twenty square inches. Such an extreme condition is seldom seen, but it is not uncommon for a third of the surface area of the teeth to be involved in the disease. In many cases of periodontal disease there is infection of the bone far beyond the immediate vicinity of the roots of the teeth, so that a cubical rather than a superficial area is infected.

T. B. Hartzell (4) considers that the lymphatic drainage of the tissues contiguous to the teeth is the most perfect in the body, and he states that the very method of attachment of the tooth in its socket increases the danger of general infection.

**"The elastic nature of the periodontal membrane makes it possible for the teeth to bear the shock of mastication, but the same elasticity favours the transmission of infection. If there is infectious material around the tooth the strain of mastication forces the tooth downwards so that the root acts as a plunger, injecting the septic matter into the surrounding tissue."**

I invite your attention to a few cases of emotional disturbance, radiograms of whose jaws show bone necrosis, etc. The first group are cases occurring in general practice. They illustrate the presence of disturbed emotional tone associated with bodily symptoms; they represent one end of the scale of toxæmic reactions. The bodily symptoms are perhaps the more obvious.

The second group comprises cases who, having had dental extraction for bodily symptoms, subsequently developed mental symptoms necessitating certification.

At the other end of the scale is a group of certified cases showing bodily toxæmic reactions of a similar character to those shown in the other groups.

In each of the three groups we should probably find some of the same organisms present; possibly different varieties may be responsible for different symptom reactions, but we cannot ignore the quality of the soil, although the seed may be similar.

Long-continued infection with these organisms produces a varying degree of emotional reaction, depending on, possibly, the "endocrine-immunity capacity" of the individual. Let us therefore regard these organisms as important factors of environment operating on the emotional mechanism.

The first group—bodily symptoms preponderating in the clinical picture:

**Case 1.—J. M. B—, æt. 42, male. Under treatment for neuritis for years; severe headaches for several months. Ordinary physical examination negative; colour good, no loss of weight. Very depressed; pessimistic outlook on life;**

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threatened to commit suicide. Dentist said teeth were sound but pocketed. Radiogram taken; dark shadow round first right lower incisor and replacement by granulation-tissue of interdental papilla.

(Pyorrhœa frequently commences in this location in the lower jaw—the mandibular symphysial junction.)

The tooth was removed, and except for a slight attack of lumbago a few weeks after extraction recovery was complete, depression and headaches lost. Is now fit and at full work.

CASE 2.—O. S—, æt. 50, director. Since age of 35 has suffered from neurasthenia, indefinite malaise, lethargy, indigestion, feeling of unfitness for work, depression.

Condition had become alarmingly worse by October, 1922, when a physical examination was negative apart from a greyish-yellow colour and a furred tongue. Dentist could find nothing wrong with the teeth. Radiogram taken; shows much condensation around roots of crowned molar, whose long root can vaguely be seen above the line representing the floor of the antrum. Tooth removed; root found diseased and protruding into infected antrum. Antrum drained. Immediately after extraction tongue became foul and patient felt very depressed. After a month a slight improvement in general condition; antrum gradually healed. General improvement thereafter steady. Patient has now a healthy bronzed colour, a clean tongue, he feels very fit and energetic. Can do a hard day's work with normal fatigue.

CASE 3.—T. H—, director. About age of 50 developed general malaise, loss of weight, indigestion, insomnia, high blood-pressure, pains in the head, unstable emotional state, very depressed, ideas of unworthiness; was sure his business was going to pieces. His family had to keep him under constant observation. Seen by three doctors. The third recommended dental extraction gradually performed. Under recuperative treatment for three years, including a world tour. A constantly recurring pain at the back of one eyeball resulted in a radiogram being taken in Canada. This showed more infected teeth and an unerupted canine. These were removed, and following the removal of the unerupted eye tooth the eyeball pain disappeared. He is now in charge of his business and enjoys life in a typical north country way. Radiograms show large periapical granuloma around root of screw-crowned tooth; unerupted canine, an inch long, well embedded in bone, which in one part shows some rarefaction. The next film shows considerable areas of rarefaction around two teeth. The next film shows a small periapical infective change around one tooth.

CASE 4.—The patient, a doctor, from the age of 16 to 25 years had several teeth decay and had had them stopped since, when he dates the development of periods of very definite depression and alimentary disturbances, included amongst which was what he described as "a peculiar feeling of emptiness in the epigastrium which was truly awful"—the epigastric sensation. About a year ago, when æt. 39, he noted his heart began to drop beats; the condition became worse and he had to take digitalis. In January of this year teeth were radiographed and a small periapical shadow was seen. (The size of a periapical granuloma is no criterion of its danger.) The tooth and gum on the surface appeared healthy. Tooth was removed. He has since improved in all his symptoms, and has not experienced any acute depression as formerly.

CASE 5.—D. W—, æt. 28, female. Bad cardiac "heredity," including a brother unexpectedly found dead in bed.

Long history of alimentary disturbance regarded as appendicular, loss of weight; later pulse became intermittent, marked depression present. Radiographed: six periapical granulomata found. Following extraction of affected teeth tongue became very coated and there was no improvement apparent for several weeks—in fact she was somewhat worse. Now in robust health and depression has cleared up. Formerly a chronic invalid.

I have submitted these cases to illustrate—(1) a few of the various symptoms which may be met with associated with chronic septic conditions of the jaws in supposedly sane persons. (2) The exacerbation for a variable period of the bodily and emotional symptoms

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following surgical interference. This exacerbation may be variable in intensity and the system showing the reaction. (3) The subsequent improvement following removal of septic teeth may not be immediately obvious even after an exacerbation has passed off.

Sir Frank Colyer has informed me that in his experience a year may elapse before a definite improvement can be recorded in bodily diseases. With this improvement can generally be noted a gain in weight.

The next group are persons whose emotional tone was probably disturbed in association with bodily symptoms, for which latter cause surgical treatment became necessary, and who, following that treatment, showed an intensity of emotional disturbance necessitating certification. I link this group with the exacerbation group.

CASE 6.—A woman, æt. about 40, had had all her teeth extracted under local anæsthesia for advanced pyorrhœa. On admission, first attack, she was wildly delirious and emaciated; the pulse was weak, thready, extremely intermittent; extremities cold and showed gravitational cyanosis. Coincidently with the improvement of the septic mouth, the healing of which was very delayed, her circulatory condition improved and she became stuporose. Later her temperature rose—she was putting up a fight—with the symptoms of an influenzal "cold." During this pyrexia she began to talk. She then rapidly improved, gained weight, and was discharged.

I regard the influenzal cold as the reaction ensuing on the destruction and possibly excretion of the organisms remaining in the healed tissues, carried off by leucocytes, through the mucosæ of the air-passages. I gathered that a local anæsthetic was employed, but I do not think the symptoms can be attributed solely to its use.

CASE 7.—A man, æt. 42, first attack, was admitted with gums not healed following dental extraction, apart from which he showed no sign of gross bodily disease. His emotional tone appears to have become obviously disturbed during the week following extraction. He developed fear delusions, passing on to excitement and confusion. In three months he was well. A local anæsthetic had been employed.

CASE 8.—Male, æt. 32, first attack, had been noted by his landlady to have been "going silly for a fortnight" before certification was rendered necessary by a suicidal attempt, the development of delusions and violence. Three months before he had had a dental clearance for extreme oral sepsis, on medical advice, because he "could not keep his food down." Following this he became forgetful and gradually became worse as described. On admission the predominant features were auditory hallucinations and a delusion of hypnotism. Bilateral pulmonary fibrosis was present. Weight, 7 st. 12 lb.; height, 5 ft. 1 in. The anæsthetic employed was nitrous oxide.

CASE 9.—A male consulted a doctor for various indefinite symptoms of a bodily character, pains in the head, etc., who ordered two upper molars to be extracted. Nine days afterwards he was certified as having various delusional ideas and associated conduct.

I now submit a few certified cases to illustrate the association of bodily changes with emotional disturbance and bone infection.

CASE 10.—Mrs. C—, æt. 40, on emerging from a period of wild confusion developed cuticular whitlows of both forefingers and later a boil on a buttock. Pulse was noted to be irregularly intermittent, dropping as many as five or six

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beats consecutively; colour pale, with fleeting blushes. She was still emotionally unstable. Gums oozing thin pus. Pulse gave no response to digitalis. Teeth radiographed. Bone around the remaining teeth showed early rarefactive changes with thickening of the periodontal membrane. On removal of these the pulse immediately improved and coincidentally her emotional state. She was discharged. Two months after dental extraction the pulse dropped only a very occasional beat.

The radiographic extent of the damage is not a guide to the virulence of the infection.

CASE 11.—A girl when 16 had an attack of stupor lasting for several months. At the age of 18 developed delusions of poisoning and emotional instability, culminating in an attack of wild excitement, hallucinated, displayed crucifixion attitude, grimacing, destructive, wet and dirty. Medicinal treatment produced no satisfactory result. Extraction of some carious teeth and infected stumps was carried out. For a few days following extraction she was worse mentally. Later the catamenia returned, having been in abeyance for several months. She then made a rapid mental and physical improvement, and within two months gained 2 st. on her admission weight.

This case illustrated very well the exacerbation phenomena.

CASE 12.—W. H. G—, æt. 59, male, first attack, auditory hallucinations, grandiose delusions, suspicious his food was being doped (it was), impulsive, noisy, blood Wassermann negative. Had lost all his teeth except those shown in radiogram, which shows extensive bony changes. Gums not purulent.

CASE 13.—H. W—, a chronic case of delusional psychosis; general bodily health good. Radiogram shows two well-marked periapical shadows and other chronic bony changes.

I exhibit other radiograms from various patients of the dementia præcox type which show changes in the bone.

(*a*) Granulomatous mass around stumps.
(*b*) Loss of apices of interdental bone around lower incisors with thickening of periodontal membrane.
(*c*) Rarefied bone around teeth under a massive bridgework which had been in position for years—and his photograph.
(*d*) Periapical granuloma around stump.
(*e*) Periapical granuloma around stump showing condensation at periphery.
(*f*) Periapical granuloma around tooth with stopping.

CASE 14.—Another film shows an unerupted canine in a woman who has suffered for many years with depressed persecutory ideas with exacerbations during which one gathered visual hallucinations appeared.

CASE 15.—Another film shows periapical rarefaction around stumps in a case of recurrent excitement.

Often radiograms will show buried stumps, roots, etc. I have met with many cases in which dentures have been fitted over stumps, and in the mucosa around signs of streptococcal infection are manifest.

I do not propose to discuss the varieties of reflex irritation from septic teeth, but I would like to submit a photograph showing elevation of the shoulder during a period of noisy excitement in a boy, æt. 16, who has some septic roots and a very carious tooth on the same side lower jaw as the shoulder elevation. During the periods of excitement facial pallor was marked.

From the material I have submitted I wish to emphasise a few points.

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The presence of toxæmic symptoms indicates the necessity of a thorough examination. The teeth and gums may superficially appear normal. As Sir Frank Colyer points out, the absence of objective symptoms is no proof that damage, and possibly irreparable damage, is not in progress (4). The local inactivity of a septic focus is no criterion of its clinical import and danger. Dr. Watson Williams states that patients whose septic gingivitis is most purulent, and whose pockets of pus are numerous, often suffer less in general health than do a large group in whom the pyorrhœa is latent (8). Infection may exist deeply in the jaws. Simple removal of an infected tooth may not be enough.

Dr. Stanley Colyer (9) has shown that the bone may be deeply infected. He obtained a pure culture of *Staphylococcus aureus* from the bone of the edentulous jaws of a man, æt. 24, about five months after the extraction of his teeth. The patient had been exceedingly ill, and no cause could be found for his condition. It is in connection with this deep infection of bone, which radiograms show may be extensive, that interest centres, as well as in degenerative changes set up in other tissues by long-continued infection.

I should like to quote briefly from the Mitchell Banks Lecture of 1921 by Mr. C. J. Bond (10):

> "Latent infection," he says, "is essentially a question of the incarceration of organisms in cells or among cells. The factors which set free the imprisoned organisms and bring about the recrudescent infection are such influences as interfere with the vitality of, or disturb the arrangement of the cells which form the enclosing barrier.
>
> "These influences may be trauma, chemical or thermal, *but there is also reason to believe they may be of a more general character, such as all conditions which depress the health and vitality of the body as a whole.*"

This point is of interest in considering the possible recurrences of general symptoms following local treatment. The migration of leucocytes carrying undigested organisms is also dealt with in this lecture. The relation of this migration to the development of purulent reactions is suggestive in considering osteodental sepsis.

H. Waller has shown that in the case of mothers nursing their infants—the children failing to gain in weight, and even vomiting their feeds—there was evidence that the trouble was attributable to the septic condition of the mouth of the mother, for, with the removal of the septic teeth, the children rapidly gained in weight.(11) I have seen an oral septic maniacal case who, having developed several cuticular pus reactions associated with intervals of quiescence, proceeded to develop during two consecutive periods of quiescence an abscess in each breast. The pus contained streptococci and staphylococci. After evacuation each soon healed, and was quite a different type of abscess to what one meets with in general work.

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If this migration and excretion affects the mammary gland and the skin, one may reasonably expect similar processes to affect other systems where diseases, as described by Sir William Wilcox, are set up.

I conclude that clinically an important relationship can be demonstrated to exist between prolonged emotional disturbance and chronic septic processes occurring in hard tissues, especially in connection with the jaws. The emotional disturbances are toxæmic reactions, the quality and intensity of which will depend on the "endocrine-immunity capacity" of the individual. Mental disorders are constants, the product of several variables, some of which are dependent variables.

I wish to express my indebtedness to my colleagues and several friends in general practice for interesting observations.

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*The Early Treatment of Mental Disorder: A Critical Survey of Out-patient Clinics.*[1] By J. G. Porter Phillips, M.D., F.R.C.P.Lond., Physician Superintendent, Bethlem Royal Hospital, London, S.E. 1.

As students of psychiatry we must remember that the human being is merely a biological unit always to be studied and considered by the quality of its reaction to the environmental impositions made upon it by the social body to which it belongs.

[1] A paper read at the Annual Meeting held in London, July 10, 1923.

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