

circumstances, show increased uncontrollability cannot be a cause for surprise.

If these behaviour changes which supervene upon an attack of encephalitis are explicable as regressions, they then appear to fall into line with similar phenomena which have been observed to follow attacks of other acute infectious disease and disease of or injury to the brain (*cp.* Still, *Goulstonian Lectures*, 1902), as well as with the anti-social conduct which is so frequently noted as the result of juvenile conflicts and mal-adjustments.

In conclusion, a few words may be said on the subject of treatment. It is clear that, if the theory outlined above is correct, punishment can have little or no deterrent effect, but on the other hand may have disastrous results by the fixation of an anti-social attitude through the creation of a conflict or an inferiority-complex. In one week recently I saw three boys who had suffered from encephalitis charged with offences, one of whom had been committed to a Borstal institution, another to a reformatory, and a third to an industrial school for the feeble-minded. In none of these boys was there evidence of any marked intellectual deficiency. Under the more simple and regulated life of a special institution these, and all their fellow-sufferers from encephalitis, would, in all probability, re-acquire the necessary epicritic control and social outlook which is essential for ordinary life, without the stigma which magisterial action has put upon them. Institutions for their reception are one of the most urgent needs at the present time.

(²) Von C. v. Economo, *Encephalitis Lethargica*, pp. 42, no date.—(³) Diefendorf, *Neurographs*—Huntingdon Number, May, 1908.—(⁴) *Instinct and the Unconscious*, p. 48.—(⁵) *Politics*, I, 2: *ἄνθρωπος φύσει πολιτικὸν ζῷον*.—(⁶) W. Whately Smith, *The Measurement of Emotion*, p. 138.

The Incidence of Chronic Infective Processes in Mental Disorder.⁽¹⁾

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[With lantern demonstration and photographs, etc.]

THE study of chronic septic or latent infection has in general medicine and surgery advanced to such an extent that it is here only possible to deal with a moiety of the subject, and I consequently propose to deal principally with the chronic sepsis met with in the head and female genital tract, my object being to demonstrate and discuss a few of the clinical types met with in those parts of the body.

(¹) A paper read at the Annual Meeting held at Birmingham, July 9, 1925.

If these septic infections exist, then the question arises as to their relationships with the mental condition of the patient. Then comes a study as to how long these processes have been in existence, and whether other factors have also been operating. Often the conditions found are beyond the possibility of cure; only amelioration can be expected, and in a large majority not even that. They are as a rule insidious and hidden, and only at times associated with local pain. In the majority of cases even this symptom is absent.

THE JAWS.

The tissues involved in septic processes are the gum, the muco-periosteum, teeth, bone—principally cancellous—blood-vessels, lymphatics, and the branches of the fifth nerve.

Apart from local destruction there are remote effects produced by swallowing and the absorption *via* the blood and lymph-channels of bacteria, their toxins and the breakdown products of diseased tissues causing general toxæmia. The local ulceration results in nerve irritation.

General toxæmia and nerve irritation are practically always present to a greater or lesser extent together, and usually by the time the patient is certifiable they are well advanced.

The general effects and bodily diseases caused by toxæmia originating in the jaws are too many to discuss now, but they are described in the now expanding literature on the subject, notably in the lectures given under the auspices of the Dental Board of the United Kingdom.(1)

The results of irritation of the fifth nerve are wide-spread, and are responsible for referred sensory disturbances and reflex motor spasms in the head, neck and upper limb.

These abnormalities may begin in one area and gradually extend with the process originating them. They may be due to diseased conditions affecting the teeth, *e.g.*, unerupted, carious, buried or exposed roots of teeth associated with perhaps little involvement of other tissues, or, on the other hand, there may be considerable involvement of deeper tissues, even disease of the jaw-bone—a chronic osteomyelitis.

In the female these motor and sensory disturbances are generally intensified during catamenia, especially in the pre-menstrual phase.

The sensory disturbances in the toxæmic individual may give rise to distorted views, *e.g.*, “the nurses knock me on the head every night,” “the nurse takes my brains away,” etc.

The motor spasm of the muscles of mastication and deglutition may result in the feeling of inability to swallow.

The following case is an example of the kind in which nerve irritation resulting from carious teeth led to depression and suicidal impulse.

F. 372.—Married woman, æt. 28. Headaches since 18, absent or diminished during two pregnancies, worse at menstruation, also at mid-intervals. They became more severe twelve months before admission, and in six months had become "terrific." The scalp became tender, then occurred insomnia, anorexia, depression, and she became unduly emotional. She had a feeling she must get away from everybody, gave back to her husband her wedding ring, wrote letters revealing an inordinate feeling of sinfulness and threatened to throw herself out of the window. She stated her brain was "waving," and that there was a "clashing sensation of nerves at the back of her head."

Physically she was pale, but fairly well nourished.

The films show three carious teeth and a deeply buried root. There is no marked bony change indicative of deep infection, except perhaps round the root.

The photographs show the facial aspect on admission. There is narrowing of the left palpebral fissure due to spasm of the orbicularis and a more prominent naso-labial fold, and carious teeth in the left upper jaw. The improved facial aspects next shown are after removal of the teeth and treatment for an endocervicitis and discharge on trial.

Although coming from a good home she nevertheless gained a stone in weight, her colour improved, and at the end of the month's trial reports from doctor, visitor and relatives were satisfactory. This is a simple case where continuous, persistent local irritation undoubtedly played an important part in the reduction of vitality, which paved the way for the mental depression, and except for some swelling of the gum in the vicinity of the carious teeth, there was little evidence of infection of other tissues. The ear, nose and throat showed no evidence of disease.

Difficulties and disappointments arise when in addition to nerve irritation there is added infection, probably existing over years, multiple in its bacteriology, and extending to all the mucosæ of the head, the ear, nose and throat, and penetrating into the jaws.

Deep bony infection—chronic osteomyelitis—of the jaws.—I now show you some films illustrative of this most important extension of infection, a full account of which will be found in Colyer's *Dental Surgery and Pathology*.

Deep infection of the jaws from the surface arises in two ways, *viâ* (1) the gingiva, and (2) the apical foramina of diseased teeth.

Generally, however, by the time toxæmia is advanced the radiographic results indicate the presence of both modes of infection. The first slide (Fig. 1) illustrates the rarefaction around the apex of

a crowned and root-filled tooth, due to *organisms having obtained entrance through the carious tooth before filling and crowning*—a case of mental depression.

The next slide shows two films taken from another patient at about twelve months' interval. Both show around the apex of a small buried root a zone of infected rarefied bone; the root is the same in both films and the other dental elements in the films are about the same size, but the area of rarefaction in the later film is about twice the size of that in the earlier. On the first admission he refused to have any dental interference, but submitted to medical treatment and showed an improvement. On the second admission he consented to have the stumps extracted. These films illustrate the slow progressive destruction of bone which has gone on during the year. The photographs show, I think, a distinct change for the worse in his facial appearance on the second admission as compared with that on his first.

The next slide shows the effect on the jaw-bone of shearing off the crowns of teeth—probably carious at the time—leaving the roots in position and fitting a denture over them, areas of rarefaction of the bone round the apices of the stumps being the result—a case of melancholia.

The next slide (Fig. 2) represents the condition on admission of the upper jaw of another patient. There is deep bony infection causing destruction of the jaw-bone as a sequel of old roots being allowed to remain. This was a case of noisy confusion, and dental clearance was followed by improvement and he was discharged, the muco-periosteum having apparently soundly healed. Later when dentures were being prepared he was found to have developed a purulent abscess on the site of one of the areas shown in the film; this was opened, and made good healing, dentures being satisfactorily fitted at a later date.

In the younger man than the preceding case, the duration of whose infection had probably been shorter, and his tissues not so poisoned, an active leucocytic reaction resulted in acute abscess formation. Drainage occurred when the stumps, which had been acting like corks in a bottle, were removed.

The next slide (Fig. 3) shows the destruction of the alveolar part of the upper jaw by infected stumps and granulation-tissue in a protracted case, and the next shows the same in further detail. This patient had no free hydrochloric acid in the gastric contents at a test-meal.

The following slide shows rarefaction proceeding in the bone at the roots of two carious teeth. This film demonstrates the importance of radiographing teeth before permitting crowning or filling

to be done. The rest of the teeth were healthy. The thyroid was enlarged on the same side as the carious teeth.

These slides have shown the deep bony *infection, which has probably gained access to the jaw-bone by travelling through the apical foramen.*

As a rule, however, gingival changes are generally associated with these deeper changes, the gum in the vicinity being more swollen and congested, and sometimes cyanotic.

I also show you a series of slides (Figs. 4 and 5) illustrating the changes which occur in the jaw in advanced pyorrhœa—*infection viâ the gingival margin.* All show—some early, some advanced—the erosion of bone around the apices of the teeth by granulation-tissue as compared with the normal (Fig. 6).

It may be objected, however, that the disappearance of bone is confined to the interdental bony papillæ and alveolar walls, and that when the tooth is removed these will be absorbed in any case.

The point I wish to emphasize is that the granulations which cause the bony destruction are infected and constitute a focus of deep infection, drainage being closed by tough swollen muco-periosteum and a tooth or stump. Hence the products of septic activity—toxins, possibly living bacteria and digested tissues have no channel of escape from the focus. The tooth acts as a plunger, and injects this poisonous matter into the lymph-space under the muco-periosteum.

The neighbouring tissues are poisoned by the process and the periodontal membrane of the next tooth becomes infected. The

DESCRIPTION OF PLATE I.

To illustrate article by Dr. T. C. GRAVES.

- FIG. 1.—Well-defined area of rarefaction round apex of root-filled and crowned tooth. Area is well defined on account of condensation layer of bone at its periphery.
- FIG. 2.—Upper jaw. Stumps with area of rarefaction. On side marked left a root, at its apex a large area of rarefaction.
- FIG. 3.—Upper jaw showing septa of antrum below; above the bone is being eaten away by granulations around roots of teeth. The arrow points to a pear-shaped area of rarefaction which has grown from the apex of a deeply-buried root.
- FIG. 4.—Later stage of bony destruction; much bony rarefaction, localized to one tooth; a case of depression. Lower incisors.
- FIG. 5.—Similar process. Arrow points to an area of sclerosis. A case of exaltation. Lower incisors.
- FIG. 6.—Lower incisors. Fairly normal; interdental papillæ well defined. From a youth.
- FIG. 7.—Upper jaw. Central incisor completely isolated from bone by infected granulation-tissue, which has eaten deeply into the bone, causing more loss of bone on that side than there is on the other side, where the jaw-bone is edentulous. The anterior ends of the antra can be seen. On the same side as the tooth the antrum is more dense, indicating an inflammatory process. On puncture the antrum was full of fœtid flocculent pus.

extraction of the teeth is only part of the treatment—the infected tissue is left behind and has to be dealt with.

To illustrate the possibility of the actual destruction of bone far beyond the alveolar walls and that such destruction can be effected by infected granulation-tissue the next slide is submitted (Fig. 7).

These chronic septic processes cause a chronic osteomyelitis spreading under the muco-periosteum and forming deep hidden foci of septic infection which persists in the jaws after dental extraction, and it is for this reason that every case should receive careful consideration before the application of dentures. I have met two cases in which the application of dentures was followed by certification and early death in one case, and another case in which confusional attacks reappeared after the application of dentures, but ceased on their withdrawal. Dentures, unless carefully used, can do much harm by causing fresh infections.

One film (Fig. 7) shows a further point. On the same side of the jaw as that in which this slow infective process is going on there is to be seen evidence of an infected antrum with thickened walls, and the nasal air-passage is reduced as compared with the opposite side, where the antral walls are better defined. Nasal polypi were present. The antrum on wash-out was found to contain foetid flocculent pus, part of a sinusitis and ethmoiditis, and it is not unlikely that the mode of infection was from the infected tissues around the apex of the solitary tooth.

It may be objected, however, that these septic processes and lesions occur in the sane as well as the insane, and therefore these conditions might, in any one case, have nothing to do with insanity. That criticism, I submit, is not a pathological criticism. The term "insanity" is a legal and social line drawn across the path of the study of pathological processes which arise from the interaction of seed and soil, of infection and host.

Elsewhere (2) an endeavour has been made to show the existence and parallelism of emotional and intellectual disturbances associated with oral sepsis in three series of cases: The first, seriously emotionally disturbed, but under treatment avoided certification, the emotional disturbance settling down following treatment of the oral sepsis. The second series supposedly sane, but requiring to be certified because surgical interference had suddenly increased the toxæmic load. The third series, certified cases suffering with oral sepsis whose mental condition had improved after local treatment.

It may be reasonable to assert that those in the second group were unstable before the exacerbation occurred as a result of the surgical interference, yet even in this group it must be admitted

that they had had previously the interference of a continuous drain on their resistance by the toxic process.

However, with regard to those in the first group it would not be fair to assert a mental instability, for they showed a substantial recovery from their emotional disturbance.

I have also endeavoured to press the point of the failure of local resistance. In the outer world there are many people who suffer from septic foci, yet apparently there is nothing seriously the matter with them. They are putting up a resistance to their infection—their mobile defences are tolerably adequate. A constant stream of pus is washing organisms out and keeping them out from interior tissues, and so general absorption does not take place or is lessened by the drainage.

Here is such a case. Her jaw films show a serious state of affairs for a young and sane girl—acute periodontitis (with periapical shadows), and caries affecting many of her teeth. What will be the state of her health twenty years hence if left untreated? At the present moment she is reacting to her periodontal infection, as the photograph shows. As a matter of fact, in addition to the teeth she suffers from throat and ear infections, very commonly associated, and which make treatment difficult. As time goes on, if left untreated, her local tissues will lose the power of reacting, other organisms will gain entrance, a mixed infection will ensue with increased toxæmia. *When the local reaction lessens, the general toxæmic reaction will become more profound.* Although not insane she has certainly improved mentally following removal of some of the worst elements—she is brighter and more alert.

No two cases are exactly alike; soil and seed are both variables. The product of their interaction will, to a large extent, depend upon the resistance of the host, and, on the other hand, upon the duration, intensity and extent of the spread of the toxic process. The duration of the toxic process may have been since intra-uterine life, the foetus sharing the mother's poisons as well as her nutrition. The intensity depends on the infection, whether pure or mixed, and the extent of the spread into the other tissues, setting up fresh foci which in their turn may become multiple infections. I now submit evidence of the further spread into the ear, nose, and throat.

THE ACCESSORY SINUSES OF THE NOSE, ETHMOIDS, ETC.

Just as with oral sepsis, so infection of the nasal sinuses has been met with associated with several varieties of psychotic disturbance. Generally confusion and depression are the two basal symptoms, with which there may be associated excitement. The two processes

involved are nerve irritation and absorption of toxic matter from swallowing large quantities of toxic material, and by its absorption directly into the blood- and lymph-stream. In this connection, Mr. A. L. Yates (3) has shown by injecting 15 c.c. of 0.4 per cent. indigo-carmin into antra where marked stasis due to damaged ciliated epithelium was present that the dye appeared in the urine in three-quarters of an hour, as compared with a similar quantity of the dye which, swallowed on a subsequent visit, did not appear in the urine. The two modes of infection are (1) extension from a jaw infection, and (2) as part of a nasal infection, *e.g.*, influenza.

Considering the septic state of the mouths of most of the cases in which sinusitis has been found here, I regard the jaw mode of infection as the more common.

Mr. Watson-Williams, of Bristol, has recently drawn attention to the presence of mental symptoms in cases of sinusitis. He writes me as follows: "We have regarded some mental impairment, often hardly noticed by the patient until he is cross-examined about it, as so characteristic of latent sinus disease that we always make special inquiry, such as 'Is there any loss of power of concentration?' or, what I have found particularly valuable, 'Is work which was formerly a pleasure, or at least easy, now becoming a drudgery?' Of course these are leading questions, but it is not possible to get at the facts without them. The patients have so often in the course of years gradually modified their activities, imperceptibly becoming semi-invalids, and do not connect as a rule a 'chronic catarrh' with their lassitude, mental or physical."

Mr. W. J. Harrison records similar symptoms in association with chronic nasal sinus inflammation (4). Mr. T. B. Jobson informs me he has had several cases of sinus toxæmia where a very prominent feature has been a feeling of depression relieved by treatment (5).

In a case published by Mr. Watson-Williams (6) bilateral antral sinusitis due to *staphylococcus aureus* had the following symptoms: "Dulling of intelligence, 'queer' manner, failing memory, depression, contraction of the visual fields and sciatica. These conditions improved following endo-nasal operation and drainage, enabling the patient to do a full day's work without difficulty. At one time it seemed that his destination would be an asylum, or perhaps prison." From the report on the case it appears to have been due to a pure staphylococcal infection, and the mental symptoms were those of depression and apathy. Generally the antral infection is part of a pan-sinusitis involving the frontal, ethmoidal and sphenoidal sinuses, and, if of old standing, there may be nasal polypi indicative of a deep infection of bone. Middle-ear disease may also be present. The ethmoidal complication is the most difficult to treat.

Bacteriologically the infection may be mixed. It is possible to have a pure infection in one sinus and a mixed in another. Several varieties of organisms have been found in these cases, *e.g.*, *staphylococcus aureus* and *albus*, streptococci, *B. coli*, *B. pyocyaneus*, pneumobacillus, *B. cloacæ* and diphtheroids. The streptococcal and mixed types are the most intractable and deadly.

This raises the point as to how far, apart from nerve irritation effects, different types of organisms may be responsible for different types of emotional reactions.

The difficulty, however, is to determine the primary infection, for changes in the bacterial content have probably taken place before treatment is reached, and it may be that degenerative changes of a wide-spread character have ensued elsewhere, *e.g.*, rheumatoid arthritis.

The general toxæmic state diminishes the capacity to discriminate, and the disturbed sensation of smell arising from the local lesion is responsible for ideas of poisoning, gassing, etc., for the offensive smell of sinus infection, unlike that of atrophic rhinitis, is nearly always experienced subjectively. As one old patient with this condition and a nose full of polypi described it: "They always keep emptying the privies near me."

Apart from the expression of such and similar ideas, a hint as to the existence of these conditions may be given by neuralgia, unilateral headaches, carriage of the head, slight swelling of the cheek, distorting the naso-labial fold or palpebral fissure, and tenderness on deep pressure over the affected sinus.

DESCRIPTION OF PLATE II.

To illustrate article by Dr. T. C. GRAVES.

Maxillary antra. The left antrum is fairly well defined, but on the right side the corresponding area is very dense.

Ethmoidal masses. A roughly oval patch of light can be seen above the maxillary antrum on the left side. On the right side this area is dull and ill-defined.

Frontal sinuses. On left side frontal sinus is well defined and its septa can be traced. On the right side it is larger and its septa are not so well defined.

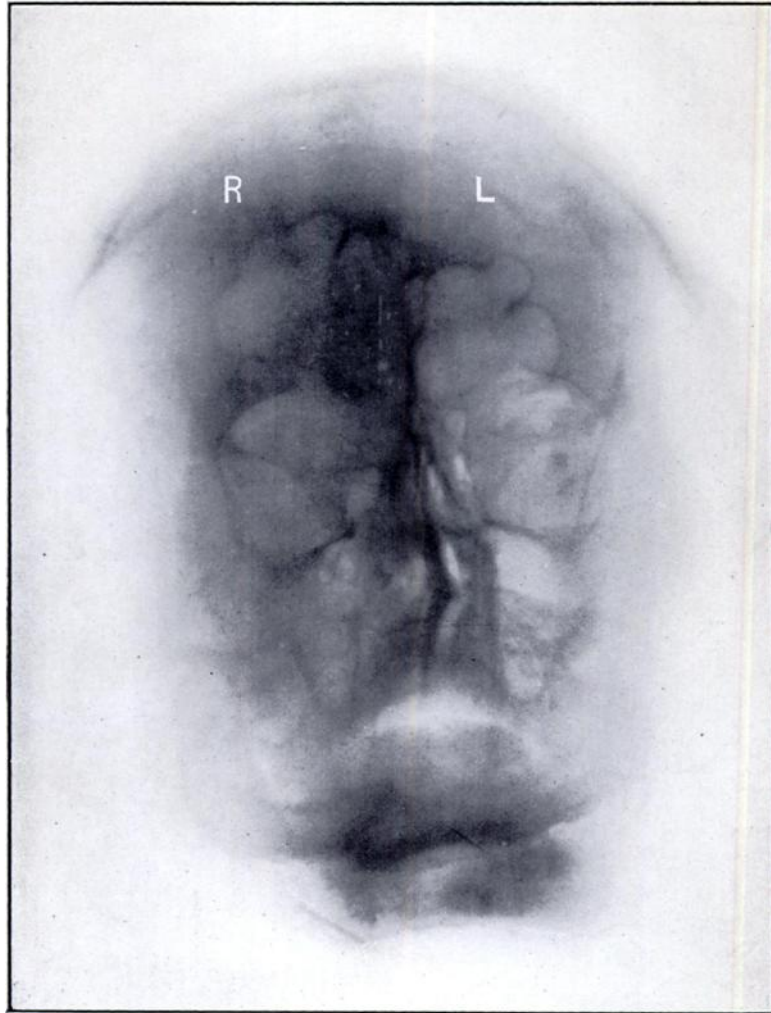
Orbital plates. They can be seen as lines separating the frontal sinuses from the orbits. On the right side this line is more dense and at a lower level than on the left side, due to distension of the frontal sinus pushing it down and the eyeball downwards and outwards.

DESCRIPTION OF PLATE III.

To illustrate article by Dr. T. C. GRAVES.

Light comes through the left antrum better than through the right. Similarly condensation (poor light penetration) of the ethmoidal mass is seen on the right side as compared with the left. The right frontal sinus is more condensed than the left. All are indicative of deep bony infection of the walls of the right sinuses and ethmoidal mass.

PLATE III.



To illustrate article by Dr. T. C. GRAVES.

Adlard & Son & West Newman, Ltd.

To demonstrate the damage which sinus infection of a slowly progressive character can produce the following case is submitted :

Female, æt. 66, depressed, deluded, irritable, fault-finding ; said she was Lord Kitchener's daughter, later stated she was his wife, that he used to send her messages, he visited her as a doctor and not in his own name, that she was very wealthy, etc.

Radiogram of the skull (Plate II) shows a chronic pan-sinusitis and ethmoiditis of the right side ; the nasal passage is blocked by polypi, the whole right jaw-bone is more dense than the left, the ethmoids are involved, the right frontal sinus is much dilated, its septa have largely disappeared, the orbital plate of the frontal is depressed, and the line of the orbital plate of the ethmoid is not visible as compared with its fellow on the left.

The effect of this on the facial appearance is seen in the photographs. The eyeball on the affected side is pushed downwards and somewhat outwards, a mucocele appearance being presented in the upper nasal canthus region, the nasolabial folds are unequal and the right eyebrow is more depressed than the left. Another photograph shows the swollen feet and distortion of the joints of the hands and feet. A radiogram demonstrates the condition of the hands, and shows that practically all the epiphyses are rarefied and periostitis is present on some of the diaphyses—advanced rheumatoid arthritis.

Here we have local damage and general toxæmia arising from a chronic sinusitis which had been going on quietly for years. The case is unapproachable as regards local treatment. Another radiogram (Plate III) from a case of depression, persecutory ideation, homicidal and suicidal, shows evidence of chronic sinusitis of the antrum. Associated therewith was oral sepsis, buried stumps, broken and carious teeth. Facial twitching was much in evidence. The next radiogram shows a similar state of affairs in another case of depression and suicidal intent. Organisms in the pus were staphylococci and streptococci. In his throat he harboured *streptococcus pyogenes* and *streptococcus ignavus*. A radiogram shows the improvement in the illumination of the antrum following surgical treatment.

The next radiogram is taken from a case of acute confusion with destructiveness.

Female, single, æt. 43 ; first attack. Violent, chattered incoherently, shrieked, did not give sensible answers to questions, but made some rambling reply in religious phraseology. Had bruised herself by making signs supposed to be religious, had struck her mother and aunt, and imagined the drawing-room was a chapel and that the Lord Almighty wanted her there.

Later said she was recently married, thought she was on her honeymoon and was about to return home. When she emerged from this state of excited confusion and was able to talk with some degree of coherence one elicited the fact of neuralgic pain over the head. Further inquiry revealed tenderness to a camel-hair brush over the facial distribution of the right ophthalmic and superior maxillary branches around the orbit. Transillumination gave dullness over the right antrum and frontal sinus. Radiogram showed increased density, indicating a bony and membranous change in the walls of the right antrum and condensation in the right ethmoidal mass. Three years before admission she had had a dental clearance for pyorrhœa, having suffered pains all over the head, marked in the occipital region. Following extraction the pain passed from the occipital region to become more localized over the frontal, parietal and vertical regions, and worse on the right side.

The interpretation I put on this is that infection remaining in the jaws after healing of the muco-periosteum reasserted itself in the antrum, causing referred pain.

The duration of the mental symptoms before admission is given as five days. Without knowing this was on the statement of particulars she stated that during approximately this period there had been increased severity of the pain; her nose and throat were worse than they had ever been before; there was a horrible smell and her "whole head felt very bad."

This stage would probably be the dry non-reacting stage with swollen mucosa of the nose and occluded ostium of the antrum. When she came to herself, as she put it, she "had to clear away a lot of filth from her throat"—the reacting muco-pus or purulent stage of the nasal mucosa, with re-opening of the ostium in the hiatus semilunaris. The organisms were *staphylococcus aureus*, *diplococcus crassus*, *streptococcus ignavus* and *streptococcus saprophyticus*.

I conclude, taking into account the radiographic evidence, that this is a case of primary staphylococcal infection with a streptococcal infection superadded, which latter was responsible for the development of acute symptoms.

The next slide shows the thyroid tissue—no acini are seen—from the case of sinusitis and ethmoiditis mentioned in the dental section. The iodine content was negligible, and on section the whole thyroid was almost dead white.

On admission she was a case of continued apathetic amnesic confusion with auditory hallucinations and gave expression to ideas of poisoning, being burned, etc. She had a myxœdematous, pale general appearance, upper lip was swollen somewhat, due to the dental condition. There was a history of hyperthyroid symptoms before admission. Tenderness was present on pressure over the right antrum, the nasolabial fold on that side being a little more puffy than on the left. Blood-count showed: Red cells, 3,400,000; white cells, 3,800; differential count—polymorphs 72, lymphocytes 22, hyaline 6, numerous platelets.

Basal metabolism—the normal figure being 40—varied on different dates between 21 and 28 as a reaction to thyroid medication and returning to the original figures on cessation of treatment. At times she had pyrexia, although the temperature was only 96.8° on admission. The pus from the antral washout was stinking, indicating the activity of secondary infections.

Bacteriological examination gave *staphylococcus albus* and streptococci—*pyogenes*, *infrequens*, *anginosus* and *non-hæmolyticus III*—and *B. Hofmann*.

Abdomen was distended, no free fluid; uterus was enlarged, and a macerated three months' foetus was subsequently found on evacuation. A swab from the uterine cervix gave *B. Hofmann*. The blood was sterile on culture.

Psychotic symptoms had been noted for only two weeks before admission. The condition of the jaw—condensation round the antrum and extensive rarefaction round the tooth point to a state of affairs older than two weeks, the period of duration of symptoms.

She was admitted in March, 1924; she survived very well the evacuation of the uterine contents and the nasal operative measures. At times, under antistreptococcal serum and other treatment, appeared as if she would pull through, but death ensued in the March of this year. The ethmoids at autopsy were full of pus.

One concludes that the original infection was staphylococcal and had been carried for some time, the secondary invaders being responsible for the final manifestations. The climatic conditions of March played their part at onset and death.

As a rule these chronic sinusitis cases, representing, as they frequently do, extension from an oral sepsis with deep bony infection, complicated by neuralgia of long duration, middle-ear disease, infected fauces and tonsils and gastric disturbance from the swallowing of pus over a long period are very intractable cases. Following treatment a certain degree of improvement results, but as a rule the associated ethmoidal infection persists, and, with the onset of winter and sunlessness, relapse tends to occur.

The two photographs I show you illustrate the improvement in the facial appearance of a case following treatment of septic roots and carious teeth and the washing out of an infected right antrum.

He had a trace of HCl, too small to estimate, on test-meal. Total acidity was 31.5 c.c. N/10 per 100 c.c.

THE LACHRYMAL APPARATUS.

Extension of infection from the nose may spread to the lacrymal apparatus *viâ* the nasal duct. I show you a photograph of an elderly woman admitted in a state of confusion exhibiting a purulent dacryocystitis. The infection then had travelled over the face, setting up a septic dermatitis. She has oral sepsis, a dull right antrum, large right nasal polypi pushing the septum over to the left, obstructing the left nasal duct.

Styes on the lid and many allied conditions are often associated with deeper septic infection on the same side.

THE EAR.

Out of 123 cases, mostly direct admissions, examined by Mr. F. D. Marsh, M.C., F.R.C.S., the Visiting Rhinologist, 39 showed varying conditions and degrees of ear disease, chronic suppurative otitis media most frequently, in several cases associated with polypus formation and chronic catarrhal otitis media in varying stages, manifested by retracted or sclerosed drums or chronic adhesive processes involving the bony chain and even the labyrinth. Previous suppurative processes were indicated in a few cases by dry perforations of the drum. In only one case was acute suppurative otitis media seen. The patency of the Eustachian tubes varied in association with these conditions.

In possibly the majority of these cases oral sepsis was also present as well as other foci of infection. Thus, in the case of a young girl, the subject of acute confusion, there were present

pyorrhœa, carious and the septic roots of teeth, acute otitis media and amenorrhœa. Following treatment for these conditions she improved, the menstrual function returned, but with dysmenorrhœa and associated irritability. A polypus was found obstructing the cervical canal; this was removed and the dysmenorrhœa and irritability ceased. She was discharged and is doing well.

In a male case acute destructive excitement occurred with oral sepsis, caries, etc., and chronic suppurative otitis media with a polypus preventing the exit of pus. It was noted that improvement of his mental state was associated with the discharge of pus and a recurrence of his mental symptoms with the cessation of pus discharge—in this resembling antral suppuration.

Treatment of these conditions, securing free discharge of pus from the ear, was followed by cessation of recurrence of excitement enabling discharge on trial, and admission to the Ear, Nose, and Throat Hospital, where a radical mastoid operation was successfully carried out. At operation the mastoid antrum was found to be full of polypi, indicating chronic infection of bone. In this case he had suffered from chronic otitis media since a child, but had of late years neglected treatment, the upshot being uncontrollable excitement.

Some investigations have been made to ascertain the relation of auditory hallucinations to old and recent ear disease. Sometimes the hallucinations are associated with the diseased ear and sometimes with the better ear of the two, but in these latter cases the worse ear may be the one in which the patient is totally deaf. What may pass for, or be thought to be, auditory hallucinations occur, of course, in the absence of obvious ear disease; the individual is, however, often somewhat confused from other toxic causes, and may be the subject of irritative processes elsewhere in the head which are operating through the fifth nerve. Such a case occurred in a male patient with several carious and septic teeth. On improving he stated, and probably truthfully, that he had had intermittent buzzing in the left ear for 18 years before admission. He had no obvious disease of the left ear.

In a confused state the sounds produced by wax may be associated with "voices."

I consider an important factor in the causation of hæmatoma auris is toxæmia of septic origin.

THE TONGUE.

Streptococcal glossitis.—A description of this condition has been given by Dr. Herbert French, who quotes the case of a woman, who "went literally mad with pain and threw herself out of a

window." He regards many cases formerly classified as "neurosis of the tongue" as due to this condition, and *streptococcus pyogenes* is recoverable in nearly every instance. I show on the screen the illustrations which accompany his article (7).

I show you a plaster cast of a portion of the surface of the tongue of a woman who was the subject of persecutory ideation and hallucinations, which shows the superficial fissuring similar to that shown in the illustration of the chronic stage of streptococcal glossitis. Examination of the posterior third of the tongue will often reveal swollen and congested circumvallate papillæ. Sometimes cyanosis is very marked in these structures, similar to that seen in the pillars of the fauces.

THE TONSILS.

In 48 cases out of the 123 the tonsils were found to be diseased; in many of these cases adenoid vegetations were present. Other conditions present were recurrent peritonsillar abscess, recurrent acute follicular tonsillitis, chronic cryptic disease, chronic hypertrophied and infected tonsils, encysted tonsillar abscess.

A very common condition found has been a diffuse œdematous infected tonsil with purplish injected fauces—the chronic rheumatic type. I submit a photograph of the fauces of a case of recurrent depression and some confusion associated with insomnia in the intervals.

The subject, a married woman of middle age, had been under certificate for a short time twenty years before, and now sought admission to the hospital on account of her nervous state. Her drums were retracted, but she had not suffered from hallucinations, although she had experienced a buzzing in the ears. Several years before admission she had been troubled for seven consecutive years with quinsies, which ceased when she became edentulous.

The region is not easy to photograph, but the tonsils and the swollen uvula can be seen. The fauces when at rest are almost blocked by the largest tonsils I have ever seen in a woman of her age. They were infected, and the posterior pillars were red and swollen with œdema.

Another case illustrating tonsillar disease:

Female, single, æt. 31, certified on two previous occasions; admitted on account of depression, vague auditory hallucinations, poor volition, suicidal attempts by poisoning.

Both ears showed evidence of chronic otitis media, an old perforation being present below the malleus on the right side. Right antrum dull and tender. Tonsils were of the chronic hypertrophic follicular type, and descending from the tonsils to the gums of the lower jaw on each side was a red line of injected blood-vessels, which split up into three branches, one passing on to the lingual aspect of the gum, the other on the buccal aspect as far forward as the premolar teeth, and

a third central line which ended in the swollen mucosa at the back of the partly erupted wisdom teeth. Her teeth were good. Local treatment was of no avail and the condition persisted, the interdental papillæ were swollen and their colour a red to purple.

Complete enucleation of the tonsils was performed. The organisms in the tonsils were *Streptococci anginosus, ignavus, salivarius* and large Gram-positive diplococci.

A test-meal before enucleation of tonsils gave HCl 0.03 per cent. and total acidity 36. Three months after operation free HCl was 0.074 per cent. and total acidity 55, and four months after operation free HCl was 0.076 per cent. and total acidity 56.

Following the tonsillectomy the red lines disappeared, the interdental papillæ became pink, her general physical and mental condition improved and she was discharged.

Another case:

Female, single, æt. 17; admitted in a state of noisy confusion and giving expression to ideas of grandeur—the King was her uncle, the Prince of Wales was her brother, and that she was Lady Mountbatten. Resistant to nursing, she heard and answered voices. She had an enlarged thyroid. Menstruation was irregular, missing every other month. She improved physically on medicine, but became pathologically mischievous and very excited, especially at menstruation. Examination of the throat showed infected and enlarged tonsils, and a large mass of adenoids; the pillars of the fauces were congested. The tonsils and adenoids were removed, the latter a large mass. A photograph taken following this operation shows a more sober facial appearance and a lessened thyroïdal enlargement. The mischievousness ceased, menstruation became regular each month. She was discharged, her weight having increased from 7 st. 6 lb. to 10 st. 7 lb.

The latest report from the Visitor is that menstruation is regular, the goitre has gone down and the patient is looking after the home quite satisfactorily.

I regard the acute symptoms as due to an acute infection of the tonsils and adenoids, and the thyroid enlargement as a toxic or infective thyroiditis.

A propos of the point of improved conduct, Mr. E. Musgrave Woodman, M.S., F.R.C.S., informs me that he has had cases of adolescents with improved conduct following removal of infected tonsils and adenoids.

The next photographs illustrate the improvement in the facial appearance following treatment of oral and tonsillar sepsis.

The first photograph shows a bloated face and neck and some degree of exophthalmos, and the second picture a finer appearance and an absence of the exophthalmos. On admission he was a case of confusion; auditory hallucinations; stated he was God. At times he became stuporose and showed waxy flexibility. He has been doing well since discharge.

THE GENITAL TRACT IN THE FEMALE.

When the figures were last totalled, Mr. A. B. Danby, F.R.C.S. Edin., the visiting gynæcological surgeon, had examined 139 women, 82 parous and 57 nulliparous, in whose cases the existence of gynæcological disturbances had been suspected.

The conditions found can, as far as local infection is concerned, be summarized as follows:

(1) *Acute venereal disease*: No cases. (2) *Chronic venereal disease*: No cases in which the gonococcus has been isolated. In suspicious cases films have proved negative. (3) *Acute non-venereal disease*: a small number of cases have shown acute infection processes, and here treatment has resulted in marked improvement. (4) *Sub-acute and chronic non-venereal disease*: These conditions have been found in 99 or 71 per cent.

This group includes all septic conditions of the cervix such as endocervicitis, endocervicitis with erosions, endocervicitis with ectropion, endocervicitis and polypus, old parturient lacerations. With all these a purulent or muco-purulent discharge has been found. A considerable number of nulliparous women have shown a definite endocervicitis with muco-purulent discharge, and in these cases the gonococcus has not been found.

(5) *Puerperal sepsis*: (a) Acute fulminating—here the prognosis has been hopeless, as the patients on admission were in a profoundly septicæmic state, and organisms were isolated from the blood. (b) Acute and subacute group—these cases showed evidence of subinvolution with patulous os and free purulent discharge, and react well to treatment as a rule.

In connection with these infective processes, Mr. Beckwith Whitehouse (8) has recently discussed the question as to whether puerperal infection can arise from a septic focus elsewhere in the body by infection of the uterus *viâ* the blood-stream, and quotes cases to illustrate the relation of puerperal sepsis to chronic maxillary antral infection and chronic otitis media.

He states, "Instances may be mentioned of acute pyelitis supervening upon a suppurating tonsil, chronic pyæmic abscesses occurring in a patient with a suppurating maxillary antrum, or iritis relieved by the extraction of carious teeth with alveolar sepsis. It is not a great step, therefore, to trace the development of uterine sepsis in the placental site of a patient who is the subject of a chronic suppurating focus."

As the majority of these cases showing gynæcological sepsis, with or without evidence of deeper infection such as polypi, have septic foci elsewhere, the question arises as to the relation of these distant foci to endocervicitis, etc. I am inclined to the view that the cause of the deeper infection of the cervix arises from foci elsewhere, and that, as in conditions elsewhere in the body, the secondary infections play their part.

Treatment of the distant focus, however, will not necessarily result in the desired improvement locally or generally until the endocervicitis yields to treatment. This requires team-work.

A case illustrating this may be quoted.

Female, married, æt. 31; continued confusion, disoriented for place and vague as to temporal relationship. Stated her husband was King of Germany, impulsive, excitable, violent; imagined she could hear people talking about her husband. It was noted that conduct was worse during the catamenia.

Foul pyorrhœa, loose, carious teeth. These were removed, but there was some exacerbation of morbid conduct. Her weight increased thereafter.

Gradually became more manageable except during menstruation. Seen by gynæcologist, who found endocervicitis, with much muco-purulent discharge, reddened urethra, etc. Treatment was carried out. She continued to be less excitable and at menstruation excitement became not so marked. Vaginitis disappeared and endocervicitis improved. A year after dental extraction she began to show real signs of improvement and the confusion and excitement passed away. Her husband—evidently a student of character—informed me that “after studying her minutely during the whole of the time spent in her company I could find no trace of the old wilfulness that was almost always present. Instead there seems a more restful spirit, more concern for others; the old arrogant style has entirely disappeared.” She was discharged, and although later had a miscarriage—which is not surprising—she pulled through satisfactorily and had no mental relapse.

As indicated at the commencement, I have only covered part of the subject. In many other parts of the body insidious infective processes play their part in the reduction of vitality. Notably in the portal area, disturbance of the hydrochloric acid content of the gastric juice lets through many organisms, whose activities in the bowel are responsible for an increased load of toxines being thrown upon the liver and the endocrine system. Staphylococci, streptococci (the latter sometimes in pure culture), *Bacillus pyocyaneus* and the food-poisoning group of organisms have been found amongst the intestinal flora.

In relation to pernicious anæmia, Dr. A. F. Hurst has advanced the suggestion that there may be a congenital absence of hydrochloric acid, and recommends for treatment large doses, suitably diluted, of that acid, and it is possible that a cause of this character may be operative in some cases of adolescent mental disorder.

In the urine staphylococci and streptococci have been found.

The bearing of these infective processes on the causation and duration of mental disorder is a matter of opinion. That they play some part cannot be denied, and if by treating them some improvement or amelioration ensues, it is clear that the earlier the case is treated the better.

In the *British Medical Journal* for July 4, 1925, pp. 9–12, will be found a series of articles by Bristol workers on this subject.

I have, in conclusion, to acknowledge the assistance that Sir Frederick Mott, Mr. Musgrave Woodman, and all my colleagues on the Visiting and Resident Staff have given me in making the observations which have been embodied in this communication.

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Delinquency.⁽¹⁾ By W. A. Potts, M.A., M.D., Physician to the Tavistock Clinic, Psychological Expert to the Birmingham Justices.

DELINQUENCY is a big subject, but the time available now is limited, so I shall be able to put only a few facts and a few ideas before you.

First I ought to direct your attention to the Birmingham scheme for dealing with abnormal cases before the courts. This was inaugurated in 1919, thanks to the energy and intuition of Mr. Gerald Beasley. The principle established was that there should be a whole-time medical officer at the prison specially experienced in insanity and mental defect, who could, when called upon by the justices, examine persons remanded in custody, who might be not fully responsible, either through mental defect, or some other mental abnormality. At the same time there should be available a part-time psychological expert to examine similar cases remanded out of custody. This makes expert investigation possible in every case of doubtful responsibility. In the opinion of some a weak point is that the decision as to which cases should be examined rests with the justices. It is a question, however, whether the decision ought to rest with anyone else in the present state of public opinion.

⁽¹⁾ A paper read at the Annual Meeting held at Birmingham on July 9, 1925.