THE PARATHYROIDS.

These glands were first described as distinct entities by Sandström, while Gley was the first to attribute to them functions apart from the thyroid. But in 1907 Forsyth concluded that they were merely portions of the main thyroid gland which had not yet formed vesicles, and that all the intermediate stages between thyroid and parathyroid tissues occurred. Berry, as the result of 1,338 operations for the removal of goitre without the occurrence of tetany, altogether discredits any separate function for the parathyroids; but as he states he always leaves a piece of gland at the hilus, he presumably does not completely remove them. The consensus of opinion at the present time seems to be that the general effect of the parathyroids on metabolism is antagonistic to the thyroid, and that they play a special part in the fixation of calcium in the tissues. If the nervous system lacks calcium it becomes more irritable, and tetany is likely to occur. It is possible, however, as pointed out by Noël Paton, that it is the accumulation of methyl-guanidine which occurs after parathyroid removal that causes tetany, since injection of this substance will produce a similar effect. Parathyroid secretion may distoxicate methyl-guanidine. Korenchevsky has repeatedly produced tetany in rats by destroying their parathyroid tissue, which forms a distinct encapsulated structure in these animals, with the electric cautery. Clinical observations by Hurst, Cordier, and G. H. Clarke support the view that parathyroid disease causes tetany, tremors, and fibrillary twitchings, among other symptoms, which can be relieved by administration of parathyroid extract. That these glands have some effect in checking calcium loss has been shown by comparing the output of calcium salts on thyroid and parathyroid extract. Quite recently Vines has shown the value of parathyroid extract in promoting the healing of ulcers of the skin and stomach. He suggests that various chronic infections damage the parathyroids and thus prevent healing by diminishing the amount of ionizable calcium salts in the blood. Walter Edmunds has noted that after parathyroidectomy animals may be kept alive longer by an exclusive milk diet, with the addition of calcium lactate. He also quotes Eppinger, Falta, and Rudinger, who found that the removal of the parathyroids, one by one, tended more and more to favour the onset of glycosuria. This would suggest that the parathyroids work with the pancreas and fall into the anabolic group, while antagonizing the thyroid, which belongs to the katabolic group. It also raises the question as to whether the increased calcium loss in diabetes may be due to parathyroid deficiency.

CONCLUSION.

We are thus led to the conclusion that the position of the thyroid gland in the endocrine system is that of a powerful activator of metabolism. In this respect it co-operates with the adrenals and pituitary, and antagonizes the pancreas and parathyroids. On the nervous side it co-operates with the sympathetic nervous system, both being stimulated to increased activity by it and lowering the threshold to it. In this way it plays an important part both in external and internal defence. Externally it leads to greater manifestation of energy in the direction of fight or flight; internally it quickens the reactions to bacterial invasion. An important way in which it accomplishes this is by mobilizing the blood sugar. This increased supply of sugar may either be used for muscular energy in external defence or for heat in the febrile reaction of internal defence. As a provision against waste of this sugar the kidney threshold is raised to prevent its escape into the urine, so that despite hyperglycaemia there may be no glycosuria. Yet this blood sugar may exceed even this raised threshold, so that some escapes. This is particularly likely to occur during emotional excitement, when the gland is apt to enlarge. It interacts also with the gonads, and the undoubted fact that it plays a more active part in female metabolism may be due to its origin from the uterus of a Palaeostracan ancestor. This interaction may account for the disturbances which are so apt to occur in the gland after an artificial or natural climacteric. That in the former instance this is likely to take the form of intermittent hyperthyroidism may be due to the gland being still in full activity; in the latter instance hypothyroidism is more common, presumably because the gland is already undergoing retrogression. The combination of a distressing emotion of matrimonial origin with a toxæmia of alimentary origin is the most fertile cause of hyperthyroidism, and the biological consideration here presented may help to explain why this is the case.

RHEUMATOID ARTHRITIS DUE TO INFECTION
OF THE NASAL ACCESSORY SINUS.*

BY

P. WATSON-WILLIAMS, M.D.LOND.,

LECTURER ON OTOTOLOGY, RHINOLOGY AND LARYNGOLOGY, UNIVERSITY OF
BRISTOL; SURGEON FOR EAR, NOSE, AND THROAT DISEASES,
BRISTOL ROYAL INFIRMARY.

In this ancient city of Bath which our medical colleagues have made renowned throughout the world, not as the Mecca of the rheumatic, for that it has been long before medical practice could be termed a science, but as a centre where exceptional clinical opportunity has been utilized for scientific research and post-graduate study, it is with a certain sense of diffidence that I chose for the subject of my address such a group of diseases as rheumatism, neuritis, and arthritis.

The recognition of the infective nature of a considerable percentage of clinical syndromes loosely designated rheumatism, rheumatoid arthritis, chronic articular fibrositis, neuritis, and so forth, has led to investigations directed to the many possible sources of such infection. While the teeth, gastro-intestinal and genito-urinary tracts have received due consideration, there lies in the nasal accessory sinuses a possible source of chronic systemic infection which merits more attention than has hitherto been accorded to this region. And if, as I hope to show, the nasal sinuses may contain the cause even in a percentage only of such intractable diseases, it is the more important that these nasal cases should be recognized inasmuch as it is relatively easy to determine the presence or absence of nasal sinus infection.

Why a nasal source of the infection in rheumatoid arthritis is so liable to escape attention, and how it is that the joint affection is more prone to arise in patients whose nasal symptoms are slight rather than in cases where there is profuse purulent rhinitis, I shall endeavour to explain below. Before doing so I submit brief notes of some cases which have benefited so definitely by treating the infection of the nasal sinus that it seems to leave no room for doubt that by such treatment the source of the joint disease was eliminated. Of three examples the first illustrates the earlier or slighter forms of articular fibrositis; the other two were typical cases of chronic rheumatoid arthritis (fibrositis) of long standing.

CASE I.

Miss E. R., aged 40, was referred by Dr. Mary Morris, of Bath, on account of chronic fibrositis, involving several finger-joints, gradually developing for two years; chronic rheumatic pains in the legs and feet, central frontal headaches, and an occasional subjective sense of foul odour. For four years she had noticed some post-nasal catarrh, and this led her medical attendant to suspect a nasal source, particularly as treatment for pyorrhoea had failed to relieve her. Furthermore, the patient, formerly of a bright and active disposition, was mentally repressed. Examination of the nose revealed no nasal discharge whatever, yet the history of post-nasal catarrh and the general condition of the patient was so suggestive of a latent infection of an accessory nasal sinus that exploration of the sinuses seemed warranted if only to eliminate such a source of infection as a cause of the serious disease that menaced her health. Exploration of the maxillary antra, sphenoidal sinuses, and the left posterior ethmoidal cells was made by means of my suction syringe, so as to obtain a "deep-sea fishing" from each cavity. No pus was obtained, though the left antrum and the left posterior ethmoidal cell yielded turbid contents. On bacteriological examination by Dr. Kay Mouatt, both the maxillary antra yielded cultures of *Staphylococcus pyogenes aureus*, and the left ethmoidal cell staphylococcus, together with a bacillus that "is frequent in influenza-like catarrhs"; the other sinuses were uninfected. A solution of 1 in 10,000 mercury binoiodide was injected into each cavity, and the diseased antrum was opened and drained. The patient rapidly improved and was further benefited by autogenous vaccines from the cultures. Not only did the rheumatic swellings largely resolve, but the general health improved and she regained her former cheerful disposition and betook herself actively to games.

The second example is of interest, not only on account of the very long history of the joint affection, but also as being one of the very large percentage of cases of appendicitis occurring in association with chronic infective rhinitis.

CASE II.

Miss B. D., aged 46, had suffered from rheumatism in the left knee from the age of 14 and in the right from one year later. This condition persisted without much change till, sixteen years later, the left wrist and finger-joints became involved; not very long afterwards she had an attack of neuritis in the left shoulder. Ten years before I saw her she began to suffer from pains and stiffness

* Abstract of the Presidential Address to the Bath and Bristol Branch of the British Medical Association.

in both ankles and the right wrist as well as the left. She had undergone five courses of baths at Bath in different years and for three years had been treated at Vittel. In 1906 her appendix was removed.

She had had some nasal trouble on and off since 1884 when she first consulted the late Dr. Edward Woakes, and at varying intervals she had consulted three other rhinologists for nasal catarrh.

On examination of the nasal passages there was little to be seen beyond some strings of opalescent tenacious mucous discharge, unseen except by endorhinocopy. Cultures of the contents of the sinuses obtained by exploratory lavage were made by Professor Walker Hall, who reported that the maxillary antral cavities were sterile, but that the sphenoidal sinuses yielded *Staphylococcus aureus* and *Streptococcus brevis*. Fuller details of the case, particularly with reference to the pathological investigation, are given in a report to the Royal Society of Medicine.¹ The sinuses were disinfected by injecting colloidal argentine and great improvement followed, particularly when later the infected sphenoidal sinuses were opened and drained. She lost all her headaches and her stiff joints became more supple and free from pain, but the most striking feature was the very marked diminution of the chronic rheumatoid arthritis, swelling of the wrist, and the absence of pain—an improvement which had been maintained when I saw her a year later.

CASE III.

W. B., a man aged 54, had well-marked typical fibrositis in the left wrist and finger-joints of three years' duration; this had been followed by similar involvement of the right wrist and finger-joints, the knee-joints and one ankle. He had been through a course of baths and massage, first at Buxton and a year later at Bath; he was considerably relieved of the joint pains for the time being on each occasion. The patient had chronic catarrh, deafness, and slight rhinitis, and was mentally depressed. The successful result obtained in the previous case led me to explore this patient's nasal sinuses. The left maxillary antrum was found to contain much thick pus, the right was clear. The right sphenoidal sinus yielded a heavy growth of *Staphylococcus albus*. The sinuses were washed out and disinfected, and all the joints and swellings and pains were strikingly improved; after opening and draining the involved sinuses all the old pains had gone, and the stiffness and swellings of the joints abated.

In the course of a discussion following the contribution I made on this subject in the Laryngological Section of the Royal Society of Medicine several speakers cited examples occurring in their own practice. Mr. O'Malley, for instance, referred to a man, aged 50, with orbital cellulitis and a history of rheumatoid arthritis for twenty-five years; he opened the ethmoid region, evacuating foul-smelling pus, and eighteen months later the patient came again, saying, "The extraordinary thing is that I have no aches and pains in my joints now, whereas previously they had ached for years and years." At the same discussion Colonel Sharp cited an instance of fleeting rheumatic pains and well-developed melancholia in a woman. Many forms of treatment were tried in vain by her physician, and she was referred to Colonel Sharp to examine her tonsils, in the hope that something might be found to account for the rheumatism. But the tonsils and nose were healthy, except that the left sphenoidal sinus contained slightly milky fluid. The sinus was opened and drained, and within three days the melancholic regained her usual cheerful disposition, and in ten days she left, quite free of rheumatic pains—a good result which continued up to the time of the report several years afterwards. It is difficult to avoid the conclusion that in this patient the melancholia, as well as the muscular rheumatism, was directly due to toxic infection from the left sphenoidal sinus, and it is noteworthy that, so mild apparently was the sinus infection, that there were no localizing symptoms, the infective source being discovered here almost accidentally. A well-marked example of melancholia attonita due to nasal sinus infection was seen by me, in consultation with Dr. Wilson Smith, about two years ago.

CASE IV.

A lady, aged 57, had suffered from purulent nasal discharge for about seven months, associated with headache and increasing loss of memory and mental depression, culminating in a state of mental stupor. Dr. Wilson Smith suspected that the nasal disease caused the mental condition, and examination of the nose revealed polypoid degeneration in the right middle meatus, with pus coming from the right frontal sinus and the right maxillary antrum. These sinuses were opened and drained. The pus from the right antrum yielded staphylococci, with a few streptococci; the left antrum and sphenoidal sinuses were apparently sterile. Several decayed teeth were subsequently removed. There was no great mental improvement for nearly a month; then her mind began to clear, and two months after the operation she was almost herself again mentally.

Many instances of profound mental depression, and in not a few suicidal impulses, have occurred among my cases of nasal sinus infection, but I think the examples I have cited

are sufficient to emphasize the profound, and sometimes disastrous, effect on the central nervous system of a toxic infection from the nose.

To explain the relation of the general systemic manifestations to a source of infection in the nasal sinuses, I may digress for one moment to take the simplest and probably most common of all sources of toxic systemic infection, that due to enlarged tonsils and adenoids, so commonplace that the lessons such cases afford are apt to escape attention. A typical patient suffering from diseased tonsils and adenoids is listless, apathetic, with so-called poor circulation, and recurring nasal catarrh. With the removal of the septic adenoid masses of the nasopharyngeal and faucial tonsils the whole picture is changed and the transformation from a listless, apathetic, anaemic child with poor circulation is only to be accounted for by the removal of the sources of a persistent septic infection. One of the most striking facts about these cases is that often enough it is in those children in whom the tonsils and adenoids are relatively small that the greatest benefit results, and that in others where the hypertrophy is great the general symptoms are comparatively slight. We cannot say that the larger the tonsils and adenoids the more pronounced are the evil effects resulting from their presence; we are driven to the conclusion that the aggregations of lymphoid follicles called tonsils are in fact protective up to a point, and that when the hypertrophy proceeds *pari passu* with their ingestion of the infecting organisms the balance is largely held and the septic absorption inhibited until the tonsils have become overwhelmed by the infecting organisms.

When we turn to a consideration of nasal catarrh as a source of systemic infection we are confronted with a similar paradox. It will often be found that a patient whose nose is full of polypus and constantly streaming pus from one or both nostrils, looks bright, ruddy, and robust, and even fat, whereas another patient, who has nothing but a slight non-purulent nasal discharge, is depressed, thin, and sallow, and obviously in very poor health. I think the explanation is that, given an infection when there is a profuse outpouring of polymorphonuclear cells with phagocytosis, the invading organisms are so largely inhibited or ingested that the patient is protected from toxic absorption, whereas in other cases, where a similar infection exists with but a few pus cells, toxic absorption is more pronounced. We see precisely analogous conditions in *post mortem* wound infection: if the point of infection forms an acute abscess it is usually a local inconvenience, but if the infection spreads up the lymphatics there is infinitely graver danger of acute general septicæmia. It is necessary to emphasize the fact that the slighter and apparently harmless nasal discharges may be clinically more virulent and more prone to cause systemic infection than the profusely purulent discharge, otherwise we may fall into the error of arguing that, because with definite purulent discharges from the nose systemic infection is unusual, it must follow that with the less marked nasal trouble the nasal origin of an infection must be even a more remote contingency. This very natural error leads us to overlook the possible import of a slight nasal or post-nasal catarrh, particularly as a patient suffering from a painful affection, or who is feeling decidedly ill, does not pay much attention to such a trivial complaint in his nose or throat. No class of case serves better to support this view than the result of toxic infection of the optic nerves from nasal sinusitis, because in the ocular manifestations we can to some extent measure the damage done by the poisoning and the benefit following the removal of the source of infection by opening and draining the involved and infected nasal sinuses.

If we take one of the simplest examples of a canalicular neuritis due to sphenoidal sinus suppuration we observe that the optic nerve sheath lies in close contact with the very thin upper part of the outer wall of the sphenoidal sinus, forming sometimes a bulging prominence in the sinus wall, sometimes running in a thin bony canal through the cavity of the sinus. But the usual result is that toxic absorption through the thin sinus wall involves first the inner aspect of the optic nerve sheath, and consequently the inner fibres of the optic nerve are the first to suffer, with resulting contraction of the temporal visual field. The contraction of the visual field may be considerable before the central visual acuity is affected, and if the involved sinus is opened and drained there is good prospect of recovery of vision and of the visual field expanding to normal.

REFERENCE.

¹ Transactions, Royal Society of Medicine, 1919, xii, p. 220.