

**The effect of thyroid extract in exophthalmic goitre and in psoriasis / by
A.G. Auld.**

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Publication/Creation

[London] : [publisher not identified], 1894.

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is that E. J.'s wife was previously married, and had borne children by her first husband. Inasmuch as, in such circumstances the wife has had impressed upon her certain features of her former husband, it is somewhat remarkable to find that all the children she has borne by her second husband inherit the malformation possessed by him.

NOTE ON THE OPERATION. BY DR. RAMSAY SMITH.

The case was suitable for operation. The foot was becoming deformed, and walking was difficult and painful, on account of the boy's efforts to keep the supernumerary toe off the ground, or from pressing on the sole of the boot. In choosing the method of amputation several things had to be considered. In the first place, the fifth and sixth toes were united as far forwards as to the nails. This put the oval method of amputation out of account, unless I had made the incision on the outer aspect of the foot, a proceeding that had obvious disadvantages. In the second place the condition of the skin on parts of the supernumerary toe had to be considered—parts were hard and horny, and otherwise undesirable to have in a flap. On the whole I thought it best to use a Λ -shaped incision, and to preserve a flap from the outer part of the supernumerary toe. With this end in view I made the knife enter between the fifth and sixth toes, passed it backwards, keeping the edge well outwards, as far as the articulation with the metatarsal; then, having dislocated the bone, I turned the edge of the knife forwards, keeping it well inwards, and cut towards the front. By this method the tissues were dissected very perfectly from the phalanges of the toe I was removing, thus leaving as much tissue as possible on the outer aspect of the fifth toe and in the flap; this at most was not much, but it included all the fibrous tissue of the part. I united the flap with the side of the foot by five catgut sutures placed deeply. The operation was done under strictly aseptic conditions, and the wound healed without any complication. The result of this method of operating is that the cicatrix has a course from behind forwards along the dorsal surface of the foot, then along the upper outer face of the fifth toe and downwards to the under surface of that toe, whence it passes back a little way. This avoids having any part of the cicatrix on the point of pressure on the sole of the foot, and leaves the contour of the foot exactly as if no supernumerary toe had ever existed.

I did not interfere with the left foot; there was not the same urgent necessity. I had for several reasons to perform the first operation as expeditiously as possible; besides, the surroundings of the patient were very unfavourable to good results, and it seemed easier to keep one wound aseptic than two; and, lastly, I wished to see the result of the first operation in order to find out if the method could be improved upon in amputation of the toe of the other foot.

The boy was able to walk in about a fortnight. A photograph taken nineteen days after the operation, and several days after the boy had been walking in boots, shows the appearance of the cicatrix at that date. I have placed alongside of the foot the amputated toe which, although somewhat altered by being preserved in spirit, gives an idea of its comparative size. The left foot, which was almost identical with the right, is shown for the purpose of comparison.

ON THE EFFECT OF THYROID EXTRACT IN EXOPHTHALMIC GOITRE AND IN PSORIASIS.

By A. G. AULD, M.D.,

Assistant Physician to the Glasgow Royal Infirmary.

The following brief notes of two cases seem worthy of publication in view of the questions which are at present occupying attention, and awaiting more definite observations.

EXOPHTHALMIC GOITRE.

It has been alleged that Graves's disease is benefited by thyroid extract, though I have not come across any reliable data on the subject. A consideration of the facts and suggestions so ably propounded in the last Bradshawe Lecture

by Professor Greenfield¹ would tend to lead one to the opposite conclusion. To bring the matter to a practical test may be so far possible, although in cases of active Graves's disease the difficulties and pitfalls encountered are self-evident. The following case, however, seemed peculiarly suited for this purpose, and at the suggestion of my friend Professor Charteris the treatment was begun by giving one of Burroughs and Wellcome's tabloids every three days. Dr. Charteris also closely watched the case along with myself.

The patient, a young woman aged 26, had been under my care for two years for Graves's disease. For the first year the symptoms were typically developed, but the patient then got gradually better until latterly the disease seemed to be in a dormant or resting condition. At this time the thyroid gland itself was considerably enlarged throughout, but this enlargement was of a variable character, showing temporary fluctuations. A slight, but by no means obtrusive, degree of exophthalmos was present; the pulse-rate was from 90 to 100, and the temperature normal. As soon as the treatment was begun, the pulse and temperature were recorded twice daily. By the end of the first week, the exophthalmos had become much more pronounced, a symptom commented on by both the friends of the patient and by herself. The right eye was more affected than the left. The patient also complained of returning pulsation in the neck, which had become more swollen, and she felt weaker and out of sorts. After two weeks there was in addition diarrhoea, and the patient was paler and thinner. In the third week the dose was suddenly increased to two tabloids per day, continued for nine days, when sickness and perspiration ensued. The heart's action rose from 99 to 138, and the temperature record for a fortnight was as follows: Morning (before treatment) 98°, evening (after first tabloid) 100°; morning 99°, evening 99°; morning 100°, evening 100°; morning 99°, evening 100°; morning 100°, evening 99°; morning 99°, evening 99°; morning 100.6°, evening 99°; morning 100.6°, evening 100.8°; morning 100.4°, evening 99°; morning 100°, evening 99°; morning 100.6°, evening 101°; morning 100°, evening 100.8°; morning 99°, evening 99°; morning 100°, evening 100°. The sudden increase in the dose did not affect the temperature.

These facts speak for themselves. It seems to me that the effect of the thyroid extract was to rekindle the symptoms of the disease, and so support the view that Graves's disease is caused by a hypersecretion on the part of the thyroid gland.

PSORIASIS.

The papers of Dr. Byrom Bramwell, on the treatment of psoriasis by thyroid extract,² induced me to make a trial in a case which came under my care at the Royal Infirmary, on May 4th. The patient was a young man, aged 19, thin, anæmic, and undergrown. The arms and legs were covered with angry-looking inflamed patches, while frequent patches also occurred on the trunk. He had been taking a mixture containing iron, quinine, and arsenic, with alleged benefit. The disease, the patient said, came out every year about February, and tended to get well towards the end of the summer; usually, however, a few patches were left over the knees. He was given one tabloid daily of the thyroid extract with no other treatment, and by the end of a week every trace of the disease had disappeared.

I freely admit the remarkable character of this result, for even granting that the disease in this case had a natural tendency to disappear, it seems clear that the thyroid treatment had a marked, nay a specific, effect. I have observed marked desquamation of the skin follow thyroid feeding in some cases of myxœdema, and it is probable some skins are more susceptible than others. It is advisable to continue the treatment for some time after the disappearance of the psoriasis to prevent a relapse.

¹ BRITISH MEDICAL JOURNAL, December 9th, 1893.

² BRITISH MEDICAL JOURNAL, October 25th, 1893, and March 24th, 1894.

The late Professor G. Brugnoli, of Bologna, has bequeathed the bulk of his estate, amounting to about £40,000, to the Ospedale Maggiore and the University of Bologna. Substantial legacies are left to the Mutual Help Medical Society, to the Medico-Chirurgical Society of Bologna, and to the Royal Academy of Sciences.

A REPORT ON SOME RECENT CASES OF "MALIGNANT" INDIAN SYPHILIS TREATED WITH THYROID EXTRACT.

By J. DUNCAN MENZIES, M.B., SURGEON, R.N.
[COMMUNICATED BY THE DIRECTOR-GENERAL R.N.]

DURING the homeward voyage from Bombay in H.M.S. *Euphrates* I had an opportunity of studying the therapeutic action of thyroid extract in a few bad cases of syphilis. The patients were all invalids, lying in the military hospital, having been sent down from their respective stations for change to England. They were all in a very weak, sickly state, the disease being complicated by malarial fever, bowel complaints, etc. All mercurial and alterative treatment was suspended for the time, in order to watch the effect of the remedy. With the kind permission of Brigade-Surgeon-Lieutenant-Colonel F. Lyons, A.M.S., the senior medical officer in charge of troops, I was enabled to make the following notes:

CASE I.—C. C., aged 23. Private.

History.—Disease contracted at Allahabad, 1893.

Symptoms.—Very severe type of syphilide, a rupial rash, with almost constant fever; swelling of the ends of the long bones and joints; marked cachexia and emaciation; does not seem to be improving; will probably be a permanent cripple. I visited the patient on April 4th. He was then in a very weak condition, much disfigured by the eruption. Two large sores implicated the nose, and he had several similar ulcers on his body. The thyroid course was commenced this day. Thyroid tabloid (B. W. and Co.) (grs. 5) daily in water. April 6th. Desquamation noticeable on face. April 8th. Crusts on nose dropped off. April 9th. Arms improving, slight thyroidism present. He continued thus till April 14th, when the medicine had to be stopped on account of severe epistaxis and pyrexia. Ergot and turpentine were prescribed. Next day the treatment was resumed, and 10 grains were given. April 18th. Manifest improvement of arms; sores all cracking and drying up. April 22nd. Slight ague attack. Right leg much better; ulcers healed, leaving pigmented scars. Joints less swollen. April 27th. Transferred to Royal Victoria Hospital, Netley.

Remarks.—This patient was distinctly benefited by the new medicine. The serous crusts dried up and separated in a remarkable manner.

CASE II.—A. P., aged 24, bombardier, Royal Artillery.

History.—Admitted to hospital, May 22nd, 1893. Disease contracted at Allahabad. Invalided by medical board at that place, January 15th, 1894.

Symptoms.—True primary lesion, severe secondary stage. By November, 1893, the patient had become extremely debilitated, anæmic, and emaciated. The body was covered with a sloughy, rupial eruption; the head and face being the part chiefly affected. Improvement nil; growing weaker; permanently unfit to serve as a soldier.

Previous Treatment.—Mercury in all forms; iodides, nutritive and supporting diet, etc.

When visited on April 4th, the patient was in a terrible state, his face, head, and body being a mass of irregularly shaped sores. He had no pyrexia at first and his pulse was fairly good. One tabloid was given daily till April 8th, when the dose was increased to 10 grains a day. The beneficial effect of the new medicine soon showed itself. On April 11th the rupial crusts exhibited white, circular, desquamating edges. April 16th. Dose 15 grains. April 21st. Ship at Malta coaling. Not so well; cough, coryza, and dyspnoea. Temperature, 104° ; pulse, 120; respirations, 30. Symptoms aggravated by coal dust. The thyroid extract was omitted. He was ordered cough linctus, and linseed meal to chest. April 22nd. Temperature, 104° ; pulse, 120; still very low. Arsenic and phenacetin; port wine and extras. On April 23rd the temperature was 102.2° , the pulse 100, and he had passed a better night. At the evening visit the thermometer marked 104° . He was ordered quinine, gr. xv., at once, and on April 24th the temperature was 98° , and he was much better. One tabloid was given. He would take nourishment in small quantities only. On April 25th the large deep oval sores on the scalp were healing rapidly and satisfactorily. On April 27th he was disembarked to ambulance train.

Remarks.—A serious and anxious case. The patient was in a desperate state on embarkation at Bombay. In spite of the high fever and unfavourable conditions of life on board ship in a crowded hospital, I think the man's general condition was improved by the new remedy.

CASE III.—M. R., aged 26, driver, Royal Artillery.

History.—Admitted June 25th, 1893. Disease contracted at St. Thomas's Mount, Madras. Venereal complaints prevalent in the station. Typical sore. Secondary stage developed July 26th, 1893, before primary lesion had quite healed. A papular rash appeared, followed by a dull red, indolent, ulcerating syphilide.

Previous Treatment.—Antisyphilitic; mercury hypodermically, etc.

On April 4th 5 grains of extract were ordered. On April 6th the skin was improving, acting freely; desquamation commencing. April 12th. Dose increased to 10 grains; eruption not so dusky; pink granulations under scabs. On April 14th the dose was increased to 15 grains, and on April 17th to 25 grains, which was well borne. On April 18th two large ulcers on the left shoulder were rapidly drying up. A bedsore on the left hip was much better. No thyroidism was noticed. The pulse was 96 and regular. Warm permanganate fomentations ordered to facilitate

desquamation. Wine and extras. On April 20th the face was still very red, but the unhealthy cachectic look of the man was fast disappearing. All the larger sores were granulating. On April 22nd there had been a further advance, and the general health was much improved.

Remarks.—This man was in an advanced stage of syphilitic cachexia when received at Bombay from the dépôt at Deolali, and had been over ten months in hospital.

CASE IV.—T. H. S., aged 21, private.

History.—Admitted from the station at Bareilly December 8th, 1893. Disease contracted on station October, 1893.

Symptoms.—Extreme debility, cachexia, emaciation, pains in long bones; copious rupial rash on trunk, scalp, and extremities.

Previous Treatment.—Mercury, arsenic, nerve tonics, general support; improved slightly in hospital. A medical board at Moradabad recommended change to England, January 22nd, 1894.

The patient, when placed under my care on April 4th, was in a miserable corrupt state, his body being covered with foul, discharging, malodorous sores. On April 10th desquamation was noticed after 10-grain doses of extract. The old scars were actually peeling, and his general condition began to improve. The crusts over the ulcers became detached, leaving flat, pigmented, healthy granulation areas. On April 14th a large ulcer on the left hip was closing. On April 17th the dose was increased to 20 grains. Pulse 96; no untoward symptoms. On April 20th the face was desquamating freely; an ulcerated patch involving the right upper eyelid showed pink granulations. The sores were dressed with simple ointment. On April 22nd the dose was reduced to 15 grains, as there had been slight diarrhoea on the previous day. The patient continued to gain strength, and was disembarked on April 27th.

Remarks.—This was my best case. No recurrence of the eruption took place. Old cicatrices took on a healthy action, and the pigmentation in a great degree disappeared. I should like to draw attention to the following considerations: 1. The exceptional virulence of the poison. 2. The undeniable value of thyroid extract given alone, without any mercurial preparations. 3. The hygroscopic and absorbent properties of the powdered extract. I have found it useful for insufflation and dusting purposes. "Tabloids" are very susceptible to moisture. Three other cases came under my notice: (a) Rupial ulcers of face and arms. (b) Ozæna, with ulceration of nasal passages. (c) Hereditary syphilitic patient with a broken down gumma of calf. These men also decidedly progressed under the new treatment. I am inclined to regard the remedy as a powerful skin tonic and adjuvant to the mercurial and alterative treatment of syphilis.

MEMORANDA:

MEDICAL, SURGICAL, OBSTETRICAL, THERAPEUTICAL, PATHOLOGICAL, Etc.

URTICARIA FOLLOWING THE ADMINISTRATION OF IODIDE OF POTASSIUM.

Mrs. L., a middle-aged healthy looking woman was taken on May 28th, 1894, with a somewhat severe attack of general urticaria. She complained of prostration, pain in the head, nausea, and general febrile symptoms.

The attack could not be traced to any irritating ingesta in her diet; it lasted about four days, during which time she was obliged to keep to her bed. At my last visit, she showed me a prescription she had commenced taking on May 26th, which she had been ordered for rheumatism. I found it contained potassium iodide, and she was of opinion that the medicine had not suited her; as she felt her "eyes water" and seemed to sneeze a good deal after taking the first dose.

From May 26th to 28th she had taken in all 25 grains in divided doses of 5 grains.

As urticaria is a somewhat exceptional eruption after iodide of potassium I thought the foregoing case not altogether devoid of interest.

GEO. W. SEQUEIRA, M.R.C.S. Eng., L.S.A.

Jewry Street, Aldgate.

SCARLET RASH AFTER ENEMATA.

DR. SUCKLING, in his contribution of June 2nd, points to the possibility of a rash resembling scarlet fever being due to an aperient enema. Mr. Staveley, on June 30th, states that a similar skin condition may be met with after the use of brisk aperients in chronic constipation, and also in later stages of acute intestinal catarrh when peristalsis of the paralysed gut is established. In all these cases he points out that indican is present in the urine.

It seems to me that a kindred phenomenon may be found

cases and in some of the American cases simple exploratory incisions have been made, and the existence of blood extravasation under the periosteum established. Thus far as to anatomical results. And now as to the clinical addenda to our knowledge. Mr. Holmes Spicer has drawn the attention of ophthalmic surgeons to three examples of the curious eye affection which I have already referred to in the first part of this lecture. After pointing out the association of this special form of orbital hæmorrhage with other scorbutic signs, he suggests, in the case of a handfed child of seven months, that a similar orbital hæmorrhage was the only scorbutic sign. This is a difficult doctrine to accept, but I believe it to be sound. Out of seven of my cases in which orbital hæmorrhage occurred, four presented the orbital symptoms before the limb symptoms, and in some of these the limb symptoms were slight, there being great local tenderness, much irritability, but little swelling.

I have spoken of hæmaturia as one amongst the symptoms of our typical group. Dr. Gee, and subsequently Dr. John Thomson, have pointed out that occasionally hæmaturia may be almost the solitary manifestation of scurvy in infants, and that it may immediately vanish after the employment of fresh food. Sir William Roberts has told me that he has observed examples of this scorbutic hæmaturia, without other symptoms, but responding to antiscorbutic diet. I have notes of two cases of hæmaturia in which, though no bone lesions were to be felt other than rickets, there was an excessive irritability, resentment to the slightest touch of the lower limbs, and some amount of anæmia. They had been fed on preserved food, and one of them immediately responded to antiscorbutics; the other I have been unable to trace. These cases lead me to mention another example of what may be called a borderland condition. There are cases of rickety infants in whom, though no lesions pointing to scurvy can be detected, the irritability and tenderness are out of all proportion to the signs found. The substitution or increase of what may be called "living food" in the diet, will often entirely eliminate this irritability and tenderness, just as in the typical cases which I have already described. I find that Dr. Cheadle and Dr. Eustace Smith have noted a similar experience. Just as we are familiar with a vanishing point of rickets, we may possibly have to recognise a vanishing point of scurvy. The collective experience shows that some of the cases have had an early infancy with much stress and storm in the way of digestive disturbance. The artificial food upon which ultimately they have been nurtured is a sort of survival of the fittest, as being the one attended with least diarrhoea and vomiting; and it is whilst assimilating this artificial food that the scorbutic symptoms have developed. But I wish to emphasise the statement that in chronological order the symptoms of our disease cannot justly be regarded as the last term of a condition of marasmus. It is not in the least comparable to the appearance of purpura at the close of a chronic wasting disease. Further, it is recorded that, in a great many cases, at the onset there is no obvious digestive disturbances, or one only of very moderate degree. Many of the later reports state that the children were well clothed with fat, and regarded by the friends as well nourished. The immediate determining cause of the catastrophe is difficult to ascertain. In some of the cases, as in adult scurvy, a slight accident—bruise or fracture—seems to have started the complaint.

One of the most suggestive results of the collective experience relates to the social state of the children amongst whom the disease predominantly occurs. The clinical *tout ensemble* of a typical example is as striking in its own way as that of myxœdema or acromegaly. If this were a common disease in our large out-patient departments of the general hospitals and the children's hospitals it would be recognised; but amongst the very poor it is not a common disease. Of the 33 typical examples which have come under my care since 1883, only 6 were hospital cases. The others were the children of well-to-do people with healthy surroundings and good homes. There was nothing to suggest either wilful neglect or faulty hygiene in any gross sense. We may speak with confidence of what we ourselves observe as to the relative frequency of a disease in different groups of people; but it is somewhat rash to generalise as to the change of type of any disease in different times. Never-

theless, I will hazard the statement that this disease is probably more frequent now than, say, twenty-five years ago. It is, I think, inconceivable that men of the authority of Jenner and West and Hillier should not have insisted upon it if this group of symptoms had often occurred within the common range of their experience. I observe that Dr. Northrup, in his valuable summary of the American experience, states that it seems probable that the disease is increasing in frequency in America. Is there anything noteworthy of late years about the bringing up of the infants of the well-to-do classes? I think it may be safely stated that, besides the increasing difficulty of getting the mothers to suckle their infants, there has been an enormous increase in England and America in the employment of proprietary infant foods. The proprietary foods are much more extensively used among the well-to-do than among the poor. But different forms of condensed milk have also come into extensive use, and to a considerable amount among the poor.

Is there any other reason why the poor, though by no means exempt from the disease in question, should suffer from it in a remarkably less degree than the rich? I believe that an important suggestion made by Dr. Cheadle gives a second clue to this remarkable difference. The children of the poor at a much earlier period than those of the well-to-do receive small portions of the same food as that of which their parents partake. No doubt in consequence of such indulgence there are occasional primary digestive disturbances. Nevertheless, some breaks are made in the monotony of the diet, and probably some antiscorbutic article of food is taken. Among the children of the poor, potatoes especially are given at a much earlier period than to the children of the well-to-do. Thus, although the children of the poor are rickety, they are much less frequently scorbutic than the children of the rich.

Thus, to sum up, the children of the poor suffer less from scurvy than the children of the rich, because poor parents cannot afford to buy the proprietary food which the rich parents buy, and because the poor parents, even when they use condensed milk, give their children a mixed diet at a much earlier period than rich people give it.

Are there any addenda to be made to the former results obtained in respect to the diet of the children who were attacked with this disease? I think there are. Permit me to speak first of the results of my own later experience on this point. It still stands out as a striking fact that the proprietary foods are the great offenders, especially those which are prepared with water and with condensed milk, or with a very small amount of cow's milk. Condensed milk is responsible for a fair number. The disease also occurs when very diluted cow's milk is used, and especially when for some reason, after a long employment of considerably diluted milk, the dilution is suddenly carried to a further stage, even with or without the substitution of some artificial food. The disease also occurs when peptonised milk has been given over long periods. Several definite examples have been observed in infants to whom for several months as much as a pint and a-half and one quart of formalised sterilised milk have been given in the twenty-four hours. By this preparation I mean milk which has been deprived of half its quantity of casein, and which has been subsequently sterilised, and in several cases stored for some weeks. I think there is reason to suspect that the boiling of cow's milk and prolonged sterilisation (especially at high temperatures) lessens in some degree its antiscorbutic quality. In Germany and in America the sterilisation of milk has become much more systematised and extensively adopted than with us. Professor Heubner, of Leipzig, in his summary of conclusions in regard to scurvy in infants, speaks with the greatest caution on this point. He is very emphatic against prolonged sterilisation, or sterilisation at high temperatures. The same suggestion is embodied in the summary of the American experience to which I have referred. Any extensive employment of the storing of sterilised milk for long periods by the dairy companies is, I believe, attended with risk; but when we consider the risks of the dissemination of various diseases by unscalded milk, and the serious primary digestive disturbances that arise in connection with it, it would be a retrograde step to say a word in discouragement of the routine practice of scalding milk. There is, I think, a way

of meeting the difficulty. If I have made my meaning clear, it will be abundantly manifest that as a rule it is the prolonged use of a defective diet which induces the symptoms which we have considered. The early cases of infantile scurvy are very exceptional. The age at which we ought to be on the *qui vive* for the initial symptoms of scurvy is about the eighth month of infantile life. If by that period a moderate quantity of scalded milk have been given (say, 1½ pint in the twenty-four hours), then, instead of adding one of the proprietary foods as is the common practice, we may ward off the occurrence of scurvy by the addition of gravy or meat juice to the milk, but still better by the addition of some carefully sieved potato. The fear of non-assimilation of starch has prejudiced us unduly against the use of living food. Should it be found that potato, cooked and sieved and given with milk and gravy, is not tolerated (which is a very rare event), we have in small quantities of the juice of fresh fruits a ready method of anticipating scorbutic symptoms. There is still one other point to which I must refer as one of the alleged results of the later experience. I refer to the possibility of scurvy appearing in infants at the breast.

At the discussion on infantile scurvy at the Berlin International Medical Congress, Dr. Pott stated that he had seen one example of twin children suffer from the disease although breastfed. No details are given as to whether the mother was scorbutic or as to the total amount of milk taken by the infants; but it is stated that their suckling was impossible on account of the soreness of the mouth. No information is given as to other scorbutic symptoms, and it seems an open question whether the stomatitis was really scorbutic. The case scarcely invalidates my original contention. In the *Deutsches Archiv für klinische Medizin* for 1880 there is the record of an epidemic of scurvy by Dr. Kuhn, of Moringen. There are 13 cases of infants recorded, several of them quite young, and being suckled by mothers who were scorbutic at the time. These infants suffered from severe catarrh of the mouth, from bronchitis, and from some skin affections, for example, pemphigus, erythema, and in a few cases petechiae. Some of them died, but I fail to find any account of *post-mortem* examination. The details are too meagre to help us in our inquiries. The time at my disposal will not permit me to refer at length to the criticisms which have been offered to the view held by Dr. Cheadle and myself as to the pathology of this disease. They may be summarised under these three headings: (1) That the disease is nothing more than acute rickets; (2) that the food conditions under which the disease arises are different from those under which undoubted scurvy arises; (3) that although the group of symptoms and the pathological appearances present a close resemblance to those of scurvy, these infantile cases cannot be considered true scurvy because they do not occur in an epidemic or endemic form.

With the first view—that the disease is nothing more than rickets—I have dealt at length in the course of this lecture, and I need not further discuss it. The German physicians, so far as my reading has gone, have relinquished it entirely. With respect to the second criticism—that the food conditions under which the disease arises are not truly scurvy-producing—I have given reasons for the opinion that the diet employed does not come under the category of living food, adequate in quality and amount. I have also shown that inadequacy of living food, *plus* a basis of rickets, gives the simplest explanation of the typical case. The immediate result of antiscorbutic treatment seems the most conclusive answer to this criticism, and in a crude way would seem to be a measure of the proportion of scurvy present in any given case. The third objection—namely, that the scorbutic nature of these cases cannot be accepted because the cases do not occur in epidemics—has been urged recently by Dr. Hoffmann in his work on constitutional diseases. In common with many of the German school, Dr. Hoffmann is dominated by the epidemic doctrine of scurvy, and by the hypothetical view that the efficient cause of it is some micro-organism. On that hypothetical view I will express no opinion, but English physicians since Lind's time are not dominated by the epidemic doctrine. The many undoubted sporadic cases are to them just as significant, and in some respects more instructive, than those which occur in epidemics. With these examples our cases come into the closest relationship,

and a perfect series may be traced from infancy, through childhood, to adult life, in which the differences of symptoms are explainable by the different physiological activity of the tissues specially involved.

SIXTY-SECOND ANNUAL MEETING
OF THE
BRITISH MEDICAL ASSOCIATION.

Held in BRISTOL July 31st, and August 1st, 2nd, 3rd.

PROCEEDINGS OF SECTIONS.

SECTION OF MEDICINE.

FREDERICK T. ROBERTS, M.D.Lond., F.R.C.P., President.

A DISCUSSION
ON FUNCTIONAL DISEASES OF THE HEART.

I.—R. DOUGLAS POWELL, M.D., Lond., F.R.C.P.,

Physician Extraordinary to the Queen; Physician to the Middlesex Hospital; Consulting Physician to the Brompton Hospital.

THE subject which I have the honour to introduce for discussion to-day is one of such wide and ill-defined limits, that I fear I shall have great difficulty in keeping within the time at my disposal, and in bringing out those points which are for special discussion; but I shall do my best, and, by the aid of the diagrams and tables which I have had placed on the wall, I hope to be able somewhat to shorten what I have to say.

The term "functional diseases" (which is not of my choosing) has in recent times excited some controversy, but I am bound to say that I think it is a very excellent term to cover that large class of disorders of the heart which cause a vast amount of discomfort, and sometimes an acute degree of suffering, which lead up in many instances to distinct cardiovascular changes of a morbid kind, and which are yet, in the early periods, not associated with any actual structural change of the heart. An old friend of mine was once consulted by an American lady on account of her health, and, after going through the whole of her symptoms with his usual thoroughness and care, he informed her that she had no disease of any organ whatever. The remark of the lady was, "Well then, doctor, I guess any way I don't function well." Functional disease of the heart may be described as a state in which, without any organic change that we can discover, it yet does not "function well." "A perverted action and sensibility of the heart, not dependent upon structural change."

I venture to think, however, that we must somewhat enlarge the scope of this definition. It is impossible in clinical medicine adequately to consider the heart as a working organ without taking also into consideration the conditions of the vascular system generally. We cannot but perceive that the heart and arteries constitute an interdependent mechanism, in whose grasp the blood is held—a mechanism regulated by an involuntary nervous system, in its turn watched and in part controlled by our consciousness; and this wider scope of our subject necessitates the substitution of the term "cardio-vascular system" for "heart" in our definition.

UNDUE PERCEPTION OF THE HEART'S ACTION.

Now, the first group of cardiac disturbances of which I shall have to speak brings into strong relief the close association between the small vessels and the heart of which I have been speaking. It is characterised by an undue consciousness on the part of the patient of his heart's function. This is a very common disorder, and amongst people of nervous temperament it sometimes amounts to positive suffering and disease. I have under my occasional observation at the present time a brother and sister, aged respectively 46 and 42, who have a very strong nervous inheritance. Their father died insane; their mother died of ascending paralysis

TABLE I.

Cardio-vascular Hyperæsthesia.	Source of Altered Innervation.	Exciting Cause.	Method.	Rhythm.
1. Undue perception of heart's action, whether normal or altered	Central neurosis, hereditary	{ Mental shock Nervous exhaustion	Variable degrees of arterial tension	Variable, with varying tension
2. Oppressed heart's action with raised arterial resistance. Paroxysms of palpitation, see also Table II, Nos. 2 and 4	Central	{ Mental overstrain Nicotine Constipation Uric acid surcharge Uremia	Vasomotor vagus irritation	Regular, with arrhythmic interludes
3. Angina pectoris (a) Vasomotoria (b) Vera (certain forms of) in which the vasomotor excitement causes embarrassment to a heart structurally diseased	Cardiac plexus	{ Mental emotion Peripheral excitation (a) Surface (b) Visceral	Vasomotor excitement causing secondary cardiac embarrassment	Slow and laboured or quick and disorderly

TABLE II.

Heart's Action Accelerated.	Source of Altered Innervation.	Exciting Cause.	Method.	Rhythm.
1. Paroxysmal palpitation under mental excitement	Central	Intense volition in emergencies	{ (a) Shock, vasomotor inhibition (b) reaction, vasomotor stimulation (c) Intra-cardiac pressure vagus control (d) Vessel relaxation from altered blood	Regular
2. Paroxysmal palpitation from indirect vagus irritation	Visceral irritation Central irritation	Dyspepsia Gout	Vagus inhibition	Irregular
3. Paroxysmal palpitation from direct irritation	Cardiac plexus	{ Cardiac overstrain Pericarditis Endocarditis	{ Sympathetic irritation Vagus irritation	Irregular
4. Paroxysmal palpitation from vasomotor relaxation	Central	{ Nerve storm Hot bath Amyl nitrite, etc.	? Anæmia of vasomotor centre	Variable
5. Sustained hurry of heart with paroxysmal increase] (tachycardia)	? Central	{ Mental shock Mental overstrain Physical overstrain	?	Regular

TABLE III.

Heart's Action Retarded.	Source of Altered Innervation.	Exciting Cause.	Method.	Rhythm.
1. Sustained retardation (bradycardia) { congenital sequel to acute illness from overstrain	? Cardiac periphery	{ Sequela of acute fever Malarial influence Influenza Uric acid retention	Results of ? neuritis Morbid blood affecting heart muscle	Regular.
2. Paroxysmal retardation (1) from increased intracardiac pressure	{ (a) Hæmic (central (b) Peripheral Central (rare) nerve storm Injury to visceral nerves, blows, etc. Cardiac plexus	{ Raised arterl. tension Influenza Uric acid diathesis Surface chill ?	Vasomotor and secondary vagus irritation ? Vagus	Regular.
" " (2) from nervous shock			Vagus excitation	Irregular, with low arterial tension.
" " (3) from cardiac neuritis or neurasthenia		Influenza, diphtheria, etc.	Impaired nervous conduction	Variable, with low arterial tension.

of fourteen years' duration; their grandmother was on the verge of insanity, and their brother is highly neurotic.

With regard to the gentleman aged 46, when a student at the age of 17 he overworked himself. He had a seizure of some undefined kind, losing consciousness for a time. He left the student's life and went into business. Since that time he has been a victim to irritable heart and insomnia. He is extremely sensitive to noises, and is subject to occasional chilliness which is quite independent of external temperature, sometimes finding it necessary to put on extra clothing on a hot summer's day. He is always conscious of palpitation of the heart; under slight provocation his heart's

action becomes very disturbed. Unless he keeps quiet for an hour or more after the midday meal, his heart functions grow more and more disturbed as the day goes on. He is subject to neuralgia, and whilst the pain lasts his heart symptoms may be in complete abeyance; this is one of the features frequently met with in this class of disease. I see sometimes an old lady who rings the changes upon various vagus neuroses; at one time suffering from sighing dyspnoea and then perhaps an attack of irregular heart's action, approaching on two or three occasions to syncopal angina; again with enormous distension of the bowels from paresis of the abdominal section of the vagus; then again she will

have a bout of neuralgia in some form or other, her heart and abdominal symptoms being then in abeyance. The gentleman of whom I was speaking has no cardiac disease whatever. His heart beats with the accentuated rhythm common in nervous individuals; otherwise there is no morbid sound, and the outline of dulness is normal. His general health is, so far as can be seen, fairly good; his pulse ranges at about 88. It is apparently regular, but if it be observed closely, it is found to vary in degree of tension from time to time, this tension being, moreover, of a somewhat high range. His illness, though not severe, is enough to incapacitate him from business. His sister is affected very much on the same lines, but her cardiac affection is very much more pronounced; she is occasionally the subject of very great cardiac discomfort, which she uses all kinds of grotesque expressions to describe.

With regard to the management of these cases, it is very important to remember that with people suffering from this form of cardiac disorder, the best plan is to treat them on those robust lines so well indicated by Dr. Goodhart in his address to the Harveian Society, namely, by steady encouragement; not ignoring their illness, but encouraging them to make the best of their unfortunate inheritance, which is often associated with some advantages of another kind, insisting upon much fresh air and physical and mental exercise short of fatigue, and, above all things, avoiding drugs, especially sedative drugs, to make them sleep.

OPPRESSED HEART'S ACTION.

The second grade is one in which the patient's consciousness is not so much drawn to his heart by a kind of introspection, as compelled towards his heart by a perceptible excess of labour of that organ, owing to increased arterial tension. The symptoms in these cases are those of excessive arterial tension. The patient complains of some headache, with a tightened feeling across the brow and dull pain behind the eyes, and he experiences, in variable degree, a consciousness of labour about the heart, giving him a constant and harassing feeling of discomfort, and often a vague anxiety which pervades his busy life, amounting sometimes to a sense of impending calamity. And it is this sense of anxiety about the cardiac region which at last induces him to seek advice, much in dread as to what the opinion will be. We cannot fail to recognise in this last very common feature an infinitely mitigated degree of that peculiar mental terror which is so characteristic a feature of most cases of angina pectoris. The peculiar uneasiness is referred to the region of the apex beat and the base of the ensiform cartilage; sometimes a fluttering feeling is complained of, due to local muscular tremor or vibration, when there is no palpitation present. During the more marked symptoms the urine is increased and of low density; in the intervals it is often highly charged. These are some of the characteristics of these attacks which are of variable duration from one to many days, with recurrences. The subjects are mostly middle-aged, and mostly males; but sometimes they are of the female sex. The men particularly are given to excess in food, with a decided deficiency of exercise. They begin the day by rising late, and continue by scrambling through their breakfast, rushing to catch trains (generally quite close), hurrying through their business, and returning greatly fatigued to a perhaps full dinner, sleeping for a time afterwards, and perhaps doing their correspondence after that; then they have a more or less restless night. They are frequently great smokers, and in many cases there is an element of gout mixed up with their other troubles. The pulse is generally rather slow, with variable tension; and any slight shock or trouble, neglect of the bowels or an approaching gout storm, will cause the tension of the pulse to become very marked, with great increase of cardiac discomfort. The heart is sound, at least in the early stages; there may be slight increase of the area of dulness; the apex beat is obscurely felt; the first sound is obscured, the second intensified; but one may see that there is no lesion of the heart.

COMBINED CASES.

Now from amongst these two groups of cases comes a third class of persons presenting the combined features of the two—persons who have generally a very strongly pronounced

nervous inheritance, in whom under the effects of flatulence, dyspepsia, and the like, or the approach of gouty paroxysms or more often after surface chill arising from immersion in the sea, driving against a cold wind, etc.—a cardiac storm is brought about, attended with acute suffering and all the symptoms of angina pectoris. At and about the time of attack these people are especially the subject of high-tension pulse of varying degree. During the attack they have the pronounced cardiac symptoms, oppressed and disturbed action, with pain more or less acute, and radiating in directions we are familiar with—the pronounced restlessness, agitation, and fear of death, etc., and other symptoms which are observed in angina.¹ Restlessness is a great feature of these attacks. Instead of stopping short as a man stops who is the subject of true angina, these people tend to move about their rooms, walking to the open windows for air; they sometimes, if on horseback, continue their ride. This form of angina (vasomotor) affects people earlier in middle life than true angina; it also affects quite young people, and occasionally persons of advanced years. Young people thus affected are always, so far as my own experience goes, of the male sex; no doubt this may be attributed to over-smoking, alcoholism, sexual excess or other morbid habit. When old people, on the other hand, are affected, they are almost invariably of the female sex. I will mention a case which I have several times seen in consultation with Dr. Dickinson, of Sloane Street.

A. D., aged 72, married, has had four children. Father died suddenly of bursting of abdominal aneurysm; mother of diabetes; one brother of dropsy, probably renal; one sister of consumption; one sister of asthma, and a sister living has diabetes. The patient has passed uric acid calculi, and has had two attacks of broncho-pneumonia. She is a thin, bright-eyed woman, of vivacious manners and nervous temperament. For twelve years she has suffered from attacks of pain at the heart, which are brought on by physical exertion, or passing into a colder atmosphere, or the excitement caused by seeing visitors, and frequently on commencing a meal. This pain is situated behind the sternum, and spreads upwards to the throat, jaw, under the tongue and ears, thence to the shoulders and down the arms; it is also felt to some extent in the back, but leaves the cranial vertex free, and never goes below the waist. The bowels are habitually confined, but are kept diligently regular by cascara. The urine shows absence of albumen and sugar; the pulse is hard, tense, and has been observed to become more so during the attacks; rate 76. The heart sounds are normal, the action somewhat forcible. Since the beginning of 1894 these attacks have, under trinitrine treatment, to some extent become less frequent, but have lately been replaced by attacks of palpitation, during which the pulse is soft and the heart's action very irregular; these attacks are remedied by ether and strophanthus, and have taken place since the liq. trinitrin. was left off, and are, therefore, not immediately caused by that drug. I may add that this lady has no sign of disease of the heart, but on the several occasions on which I have seen her, usually soon after an attack, the pulse has always been thready, incompressible; and on one occasion, when a mild attack came on during my visit, it perceptibly hardened.

It is important to recognise the part played by the vasomotor system in the mechanism of these affections, because the whole of our effective treatment is based upon it, being first of all that of the attack of disturbed heart's action by remedies of the class of cardio-vascular sedatives; secondly, the removal of arterial tension by appropriate treatment of its causes in each case; thirdly, digitalis becoming useful in the later periods of the malady, at the time when the heart, after an attack, has become wearied or enfeebled by more or less change in the texture of its walls.

It is important also to bear in mind, whilst we are describing disturbed function of vasomotor incidence in healthy hearts, varying from mere discomfort to actual anginal seizures, that the same mechanism holds good in the case of diseased hearts, and we may have a series of symptoms on a similar graduated scale, but attended with the special gravity attached to the damaged heart.

ANGINA PECTORIS.

There is abundant evidence of the power of contraction of small vessels to embarrass the heart. I need not speak of direct experimental evidence, familiar to us all, nor of physiognomical evidence, such as "dead hands," and the like, leading up even to Raynaud's disease. Clinical evidence is furnished by the features of the pulse, which, as appreciated by the finger and recorded by the sphygmograph, can only be explained by increased peripheral resistance in-

¹ I have dealt with the symptoms of angina pectoris variation at some length introductory to a discussion on the subject at the Medical Society in 1891 (see *Transactions*).

duced by vessel spasm. The pulse characteristics are depicted in this diagram, which was drawn to illustrate a case

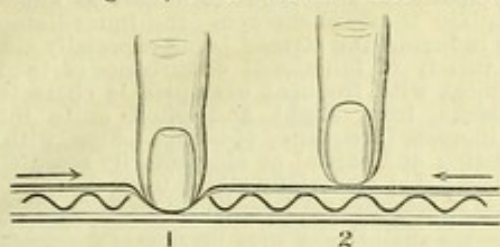


Fig. 1.

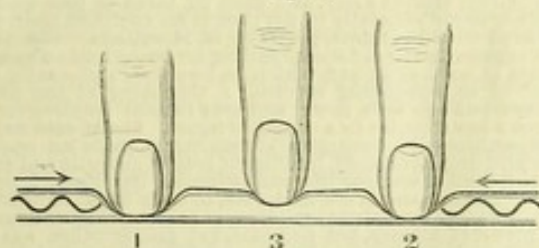
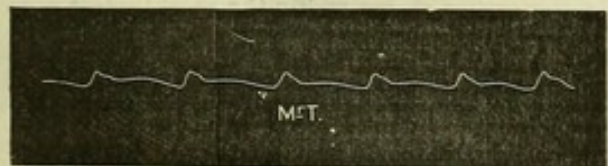
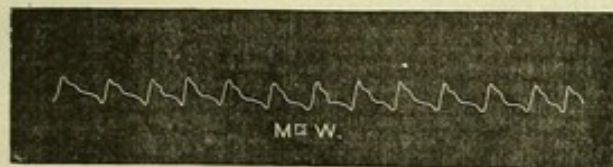


Fig. 2.

of vasomotor angina recorded in my paper read before the Medical Society; its hardness, fullness between the beats, and peripheral reflux are characters which can, I think, only be explained by such a degree of resistance in the small vessels that if one of the tributary vessels be partly or completely closed it fills up from collateral channels communicating with its peripheral end. I wish particularly to draw attention to peripheral reflux as the clinical test of high-tension pulse. On pressing the radial with one finger and feeling it with a second finger beyond, the pulse is felt nearly as well by the second finger as by the first. On gradually bringing the second finger down (2, Fig. 2) we find that the pulsation is appreciable only on the peripheral side of this finger, so that whilst the pulse is perfectly stopped by the first finger a second beat is felt from the periphery by the second finger.

The sphygmographic tracings of the high-tension pulse are well known, the sloping ascent, broadened summit, wave and gradual descent. I will not dwell upon that subject, but I should like to draw the attention of all those skilled in sphygmography to these two diagrams, one of high tension rapid pulse, and the other of high-tension slow pulse. It will be seen that while the features of high-tension pulse are fairly well marked, yet that the dichrotism always more or less obscured in high-tension pulses is here postponed in the tracing, presenting us a wave of second rise towards the end of the descending line.



I cannot but think that in explaining the production of this delayed dichrotism in the pulse we have to take more into account than in the production of a normal pulse this reflux from the periphery as a factor, which is so distinctly felt by the finger when examined critically as shown in Fig. 2.

Clinical evidence of the dependence in many cases of real anginal seizures upon vasomotor spasm increasing intracardiac pressure may, I think, be found in the observation that the development of a mitral murmur will in

some cases at least be coincident with the disappearance of the anginal attacks. The first case that presented to me this feature was that of a gentleman, aged about 54, engaged in anxious and pressing business, and who had been for some years the subject of gouty glycosuria; he complained five years ago that occasionally while walking over London Bridge he would be seized with sudden pain at the heart, causing him to stop instantly, and either stand still or lean against some support. After a few minutes he would get on slowly and carefully, being stopped once or twice on his way. He had had several of these attacks, and an ether and ammonia draught containing 1-minim doses of nitro-glycerine gave him relief. His heart was distinctly and considerably enlarged, but there was no murmur present until two years ago a mitral *bruit* was developed; since that time he has hitherto had no attack. I may say that this gentleman's mother died suddenly in a railway carriage, and his sister dropped dead of heart disease. My belief is that his mitral incompetence has served as a safety-valve against excessive intracardiac pressure, and so has kept him free from attack.

As therapeutical evidence it may be urged that the whole modern treatment of angina—a treatment that has immensely influenced the prognosis of this still sufficiently terrible disease in its most serious forms—is based upon the assumption that in a large proportion of cases its cardio-vascular mechanism is a functional disorder, the nature of which I have attempted to describe.

In the annexed table I have placed the physiological features of the angina pectoris seizure, and, for contrast, beside them under the same numbers, the special features of normal attacks of asthma; in the one case the obstruction of the cardiac functions from arterial contraction, and in the other the obstruction of the respiratory function from bronchial contraction are noted and the similitudes of the two affections indicated.

TABLE IV.

Asthma = Obstructed respiratory function from spasmodic contraction of bronchioles.	Angina = Obstructed cardiac function from spasmodic contraction of arterioles.
1. Excitation of spasm = peripheral, visceral, central (haemic).	1. Excitation of spasm = peripheral, visceral, central (haemic).
2. Special pulmonary lesion = none in the early stages.	2. Special cardio-vascular lesion = none in the early stages.
3. Chief factor = bronchial hyperaesthesia—a neurosis.	3. Chief factor = cardio-vascular hyperaesthesia.
4. Consequent lesion = emphysema and its consequences.	4. Consequent lesion = atheroma, thickening, dilatation.
5. Attendant lesions = many and various, none of them essential.	5. Attendant lesions = any variety of heart disease, none essential.
6. Prognosis = depends upon attendant or consequent lesions present, that is, upon integrity of motor mechanism.	6. Prognosis = depends upon integrity of the heart, that is, upon soundness of motor mechanism.
7. Family history = includes some one or more of various neuroses, asthma, epilepsy, hysteria, diabetes, insanity, chorea, Graves's disease, etc.	7. Family history = includes similar neuroses.

Within the scope of each malady certain cases are included which require special explanation and nomenclature.

Excited or unduly frequent action of the heart has been so recently and so ably discussed by Dr. Sansom at the Medical and the Royal Medical and Chirurgical Societies and in his well-known work, and also by Dr. Bristowe, that, although it naturally forms a very essential part of the subject now before us, I shall but touch upon it very lightly. It has appeared to me that we meet in practice with five kinds of rapid heart action.

First, there is the ordinary palpitation of sudden excitement or emotion, or sudden effort. Now, so far as I have observed—but I think that this point might very well form the subject of careful experimental observation, and in these athletic days the material for such observation should be abundantly at hand—so far as I have observed, such cardiac disturbances are of central origin, and arise from some sudden stimulation of the sympathetic and vasomotor systems, the first result being, no doubt, momentary relaxation of cerebral vessels from shock or intense volition; and, secondarily, contraction of peripheral vessels and violent action of the heart. The ardour of battle, the intense motor volition of the athlete in the first struggle, and the sudden reaction of the brave man to peril, are attended with these phenomena, the effect and object of which are to raise the general blood

pressure to the point necessary for prompt and energetic action of cerebro-spinal centres. Flushing of the face, with throbbing neck vessels, followed by pallor, and a tightened radial artery are, if we may judge from such cases as come within our observation, the phenomena we may observe. Weakhearted or timid people are apt to get syncope under the strain; but in the better equipped, after a variable time, if the necessity for effort or brain function continue, the more languid vagus, stimulated by intracardiac pressure, controls the heart beats to a slower rate, whilst the small vessels supplying the muscles are relaxed by the altered blood rendered more acid from rapid tissue change; the first stress in the pulmonary circulation is also relieved, and the subject gains his second wind or his capacity for more sustained effort. It is not difficult to perceive here the close alliance between this series of physiological reactions and the more sustained phenomena of functional disorder, with raised or prolonged arterial tension, of which I have been speaking.

This form of functional heart disturbance is thus purely physiological, and is the best instance of functional disturbance that one could give. It is probably a survival of the conditions now more rarely called into play under which, in times of personal strife and danger, prompt thought and instant action would alone protect the individual. In the present age the same mechanism is called forth by the less intense mental shocks and minor worries so frequently besetting the actively engaged business and professional man, becoming less actively but more abidingly effective in the direction of raised arterial tension and its consequences, alluded to under the second heading of Table II and the first and second of Table I (page 1035).

Greatly increased rapidity of heart's action is, in cases of what may be truly called physiological palpitation, associated with regularity of action. The second sound is intensified and sometimes reduplicated, the first sound banging but wanting in definition. In cases where the excitement occurs in combination with a full stomach or in an unstable nervous system there may of course be irregularity and tumultuous action. In palpitation, on the other hand, occurring from the reflex or direct causes next to be spoken of the rhythm is almost always irregular, often varying greatly in the same attack. But let us further remember that the same mechanism may be started in the subject of a diseased heart, and with fatal results.

A second form of functional disturbance is very common in persons of unsound heart, whether from valvular disease or dilated hypertrophy; this variety of disturbance is almost always of reflex origin, and consists of increased rapidity of action with disordered rhythm. The exciting cause of the disturbance is generally reflex, and especially dyspeptic distension of the stomach or bowels; but possibly, although I venture to think very rarely, it may be central in gouty individuals, the tendency in these cases being more often to slowed action. No doubt partial inhibition of the vagus portions of the cardiac nerves is responsible for this effect, and the reason that the cardiac disturbance from this cause is more frequent and notable with unsound hearts is that the organ is already fully occupied with the work of maintaining the circulation, and a slight disturbance of its function causes embarrassment and disordered effort. The severe and prolonged bouts of palpitation common in mitral stenosis and gouty thickened heart would come under this heading.

Direct irritation of the cardiac nerves in pericarditis, and sometimes in endocarditis, will cause rapid and irregular action. Toxic drugs, such as nicotine and digitalis, when pushed beyond its slowing effects, will also cause it, but these are exceptional causes. Overstrain is also a cause of acceleration, and under this heading I would place those remarkable cases of irritable heart so admirably described by Da Costa as common in soldiers during a campaign, in which there is a persistent quick action of heart with precordial and left shoulder pains, and bouts of severe palpitation under slight exertion or digestive disorder, at first unattended with any notable alteration of physical signs, and possibly subsiding without such signs developing, but in severe cases proceeding to obvious enlargement of the heart. I used to see a fair number of such cases at the Brompton Hospital, but they had mostly passed on into the stage of hypertrophy, with more or less vessel degeneration. One

would regard some direct damage to the cardiac nerves, both at their sympathetic and vagus terminals as almost necessary to explain these phenomena, the immediate effect of exercise in inducing the attacks being especially significant.

Another variety of functional disturbance of the heart, of which we meet with frequent examples, is characterised by sudden attacks, from slight and often quite inadequate causes, of increased frequency of heart's action, with lowered arterial tension and partial or momentarily complete loss of consciousness. Let me briefly allude to a case:

Miss Q., aged 28, consulted me on account of her being subject for the past four years to fainting attacks, with momentary loss of consciousness. At first the attacks came on at the close of the monthly period, and terminated with hysterical symptoms, but not so of late. She will have three or four attacks a day, and then go three or four weeks without one. They occur generally by day, but at no specified hour, and are never attended with involuntary escape of secretions. She describes the attacks as preceded by a "slack" feeling for about half an hour, an ill-defined sense of want of power, which is, however, sufficiently marked to warn her of an impending seizure. A throbbing at the heart and throat follows, and she falls down, and may remain helpless for a time varying from a few minutes to a couple of hours. She is said to be pale and her extremities cold during an attack, but there is no convulsion. She is a bright, well developed, intelligent lady of neurotic and energetic temperament, fond of outdoor life and animals. Her heart is sound in all respects. The catamenia are moderate, of four days' duration every fifth week. There is no asthma, epilepsy, chorea, or rheumatism in her family or personal history, but her paternal grandmother was insane, and her brother, if hard worked, gets twitching of the facial muscles. In lighter attacks she does not necessarily lose consciousness. Whilst under examination she had a slight seizure, falling back in the chair, the limbs flaccid, the head falling loosely, slight twitching of the left angle of the mouth, momentary unconsciousness. The pulse continued regular, but was quickened and of low tension; the pupils were dilated, and remained so for some minutes afterwards. There was no notable change of colour.

TACHYCARDIA.

We next come to consider that very interesting group of cases of sustained hurry of heart with paroxysmal increase to which the term tachycardia has been given, and should, I think, be strictly limited. I can, however, only briefly speak of this condition.

One of the very first cases recorded was that by my late colleague, Dr. Cotton (1867), in whose large experience it was unique, and who I remember at the time was much interested about it. Many cases have been recorded since under the terms "runaway heart," "rapid heart," "paroxysmal hurry of heart," and "tachycardia." That cases of this disease are serious would appear from the high mortality (12 deaths out of 41 cases, all fairly representative), from the long duration of those that survive, and from the few permanent recoveries, there being a great tendency to relapse. The evidence afforded by the following salient features of the disease seems to me convincingly in favour of its purely nervous origin, and of the view that any heart changes that ensue are secondary. The chief features observed in typical cases are:

1. A persistent hurry of pulse lasting for periods varying from hours to many weeks, during which the pulse is rapid, from 120 to 200 or more, regular, small, of sustained, I should say, rather than of high tension.
2. Intervals of severe palpitation attended with precordial pain, notable distress, and more tumultuous, irregular action of heart.
3. Although murmurs may be heard and the cardiac dullness may be broadened during attack, in the intervals the dimensions and sounds of the heart may in the earlier stages be perfectly normal.
4. In the earlier stages and in the most typical cases the heart hurry has been observed to begin and to finish quite abruptly. This was so in Dr. Cotton's case and in Sir T. Watson's, in the latter the pulse suddenly changing from 216 to 72, with subsidence of all symptoms, whilst he was still in the room.
5. So far as exciting cause can be stated, it has been for the most part mental shock, mental or physical overstrain.
6. Lastly, as with the cases of irritable heart recorded by Da Costa, it is only in the later periods of the disease, when secondary changes have occurred in the heart, that remedies of the digitalis class are found useful.

Cases of this disease, carefully separated from obvious and concealed Graves's disease with which they are closely allied, are very rare, and whilst the disease itself may be most appropriately combated by nervo-vascular sedatives; a course of digitalis with arsenic or iron comes in usefully to tone up the wearied heart after a paroxysm of palpitation, and in the

later stages of the disease. Dr. Sansom has found the galvanic current to the vagus useful, and doubtless, as in the very analogous cases of exophthalmic goitre, the strong brine baths of Nauheim, by their stimulating effect on the vagus centres, will prove of value.

I have no time now to consider cases of functional disturbance of heart in exophthalmic goitre. Exophthalmic goitre is indeed a functional hurry of heart due to manifest local, and some general, vasomotor paralysis. Its alliance with tachycardia is very close indeed, and in some cases—those few which I have seen—it has been very difficult to decide on which list to place them. There may be no goitre, there may be no exophthalmos, but always hurry of heart, and yet there is something suggestive of the same neurosis.

In one case of moderate tachycardia, pulse constantly above 100, besides small beady eyes, suggestive but not typical, the lady has another remarkable neurosis, which she finds most annoying but impossible to conquer—namely, she cannot make a start to do anything involving even slight mental anxiety, without an attack of vomiting as an invariable preliminary.

It may well be, as I think Dr. Sansom has suggested, that it is a mere question of extent of central neurosis and precise position of centre whence nervous discharges proceed, whether we shall have one function or more disturbed. I hope in the discussion these points may be further elucidated.

BRADYCARDIA.

The slow pulse, the slow irregular pulse, and the slow pulse with intermediate heart beats, are all conditions occasionally met with. An abnormally slow pulse of below 50 is met with as a sequel to diphtheria, influenza, typhoid, and no doubt some other acute diseases; it sometimes slows down to extinction in diphtheria; I have never observed it do so in any other disease. In cases of influenza I have known the pulse slowed down to 45 and 32, but more usually to between 50 and 60, and it has commenced within a few days of the termination of the fever. I have observed the disorder of the circulation attended with marked excess of urea in the urine. The heart sounds are feeble, with prolonged pause; the pulse soft, compressible as a rule. The normal heart's action is, as a rule, resumed within a fortnight or so, but I have observed the slow, languid pulse, with languid peripheral circulation and mental fatigue, continue for several months. The pulse has been known to remain permanently lowered after fever. These cases, in all probability, have at least two sources of origin: first, a neuritis of the cardiac nerves, probably within the heart; secondly, a partial inhibition of the cardiac muscle by a morbid condition, undue acidity, of the blood with which its structure is infiltrated.

A slow and irregular pulse is (excluding senile cases), so far as my experience goes, met with most commonly in young people, and especially in young males about or soon after puberty. Early excess in smoking is a distinct cause; probably morbid sexual habits also, although I have not myself been satisfied on the point. I am sure that in some cases physical over-fatigue of heart has been a cause. Increased arterial tension is usually present, and cardiac hypertrophy, which may only be temporary, follows. These are the cases of cardiac hypertrophy which the patient outgrows. I have met with a few cases in which epileptic vertigo has been present. The slow pulse with intermediate heart beat has been regarded by M. Triplin as a distinctly epileptic feature, but it is certainly observed in gouty conditions. I have seen a case in an old gentleman in whom there was certainly epileptic vertigo but also marked high tension pulse of renal and gouty source, and in whom during convalescence from a cerebral seizure attended with acute gout, a nervous shock caused the pulse to drop from 50 to 25. His circulation was, nevertheless, fairly sustained and he was able to walk about. On auscultation a small intermediate beat was heard each beat recorded by the pulse. This double beat with slow pulse is very commonly observed when digitalis is gradually pushed to the verge of excess, the further stage being rapid and disorderly between beats.

THE newly-established Faculty of Medicine in the University of Lemberg was formally opened by the Emperor of Austria in the latter part of September.

II.—PAUL M. CHAPMAN, M.D. Lond., F.R.C.P.,

Physician to the Hereford General Infirmary.

FUNCTIONAL disease of an organ is generally understood as a considerable, and more or less lasting, defect or aberration in the performance of work, this being unaccompanied by appreciable organic change in the tissues of which the organ is composed. Appreciable *post-mortem* deviations from the normal, either in structure or in arrangement of parts, are called organic changes. Changes in the nerves supplying the part are less easily appreciable *post-mortem* than are the grosser changes. Since function is influenced by nerve changes, we are therefore led to consider alterations in performance of nervous origin to be the sole examples of purely functional disease. In other words, all functional diseases of the heart are considered to be of nervous origin, direct or reflex.

I do not quite agree with this view. I look upon the term function, when applied to the heart, to be peculiarly relative to vital activity of movement. We should all be agreed that great functional alterations occur in cases of organic disease, which are conservative and healthy, which tend to the preservation of life though the alteration of function may be great. On the other hand, to give a good example, the alteration of activity which is shown in the excessively short time contractions exhibited by fatty hearts, though accompanied by and in a sense due to organic change in the muscular fibre, and not due to nervous changes, should, being a demonstrable alteration in vital performance of a kind not conducive to well being, be taken as a genuine exhibition of functional disease. It is an alteration in the irritability of muscle, not of nerve, but is a real functional disease, because it is demonstrable as an alteration in contractile power. To express it clearly in another way, functional disease, being an alteration in activity, can only be exhibited in performance. It can, for that reason, never be understood through *post-mortem* examination. It can only be understood through study of the phenomena exhibited by living tissues in a state of vital activity. It is, therefore, no discredit, as is often idly imagined by the ignorant, to speak of a disease as "functional." The use of the term may be most proper and helpful when employed by one familiar with the physiology of his subject. Too many practitioners have only one cardiac drug, even as Englishmen have only one sauce, and show their disrespect for function by administering digitalis indiscriminately in all cases of organic change. Forgetting that it is function rather than tissue which is within the reach of the poison they administer, they are none the less proud of their disbelief in functional disease; and, thinking themselves "practical" men, they ignore those very practical and suggestive facts which are taught us by the study of a living physiology.

The short persistence in ventricular contraction when the muscular fibre is fatty is such a physiological fact, and is demonstrable by the cardiograph. While not assuming that it is the sole cause of an abnormally short contraction, the presence of a very short contraction is highly suggestive of fatty degeneration of the heart's muscular fibre. It has to be compared with the normal duration of ventricular contraction for different pulse rates, for which I must refer to my published tables.

For examples of functional heart disease we are, therefore, bound to look at the parts called into play during active contraction; these are nerve and muscle. The abnormalities noticed may or may not be associated with valvular or other structural diseases, but these are not of their essence.

A summary of the physiology of the heart bearing on the explanation of certain functional diseases would be out of place here. The immense advance in our knowledge is as yet only to be partially found in our textbooks, and is scattered in English and foreign journals. The slowing of the pulse owing to irritation of the cardiac end of the severed vagus is often called depressant; the individual beats, however, gain in amplitude and power. Removal of the influence of the vagus or stimulation of the accelerator nerves is, on the other hand, followed by extremely rapid pulse, but there is here a loss of work done in the individual contractions. The condition known as "tachycardia," or rapid pulse, is due to a nerve influence of this nature. I have met

with it as almost the sole sign of tuberculosis of the meninges of the base of the brain, the pulse frequency reaching 200, with apyrexia and an unclouded intellect.

We assume the same kind of interference, associated with a number of other very interesting symptoms, amongst the phenomena of Graves's disease, accompanied sometimes with slow, perhaps more frequently with rapid, pulse. The first question which arises is, What is the real mode of action of the vagus on the heart?

Very suggestive are the experiments of Gaskell¹. After irritation of the vagus the power and work of the heart are increased, as also the readiness of the heart muscle to transmit excitement. When the heart is contracting irregularly, irritation of the vagus restores regular contraction. According to Gaskell the vagi are to be classed among the "trophic" nerves—that is, they bring about constructive changes, their action is to promote the building up of tissue, and their function is to nourish by this means. Not only in their obvious effect of slowing the pulse are the vagi antagonistic to the accelerator nerves; in their very nature they are opposed to them. The accelerator nerves bring about a destruction or dissolution of substance; the so-called inhibitory influence of the vagi is one of construction or building up. According to Gaskell, therefore, the influence of the inhibitory nerves is exercised in no more roundabout manner than that of the accelerator nerves.

It has indeed been observed by others that section of the vagi in birds and rabbits leads to fatty degeneration of the heart muscle. Still further, when one vagus has been divided, and the body generally has undergone no changes, atrophic and degenerative changes, though not necessarily fatty, have been observed in different parts of the ventricular wall, according as to whether the right or the left vagus has been severed. Death ensued, not through general somatic degenerative changes, but from direct degeneration of the heart muscle owing to deprivation of the trophic influence of the vagi.

Supporting this view from another point, Brown-Séquard found that when two rabbits were bled to death, if the vagus of one of them were excited just before death the heart of that one beat both more strongly and for a longer time than that of the other.

Still further in the same direction Laffont found that direct irritation of the ventricle during simultaneous excitation of the vagus did not produce the deleterious effects which were observed when the vagi were not synchronously excited.

I have thought of these facts in the consideration of certain cases of tachycardia occurring in Graves's disease. Coincident with the rapid pulse and enlargement of the thyroid gland there has been general wasting and increased excretion of urea; the heart has become dilated, its action irregular, and loud mitral murmurs have appeared which can be too readily assumed to be organic. All these signs and symptoms may disappear, but the manner of disappearance is interesting. For instance, in one patient of mine, a grown-up young lady, during the increase of the heart and thyroid symptoms, with distinctive exophthalmos, a gradual emaciation set in, till in a year her weight had fallen to 86 lbs. This condition persisted for a while, until gradually she began to gain in weight. As her body weight rose to 90, 100, 110, and 120 lbs., and upwards, the symptoms of tachycardia, exophthalmos, and thyroid thrill progressively disappeared. The whole of the improvement has been continuously and directly coincident with increased general nutrition. I purposely refrain from saying they are directly due to it, but the coincidence is striking, and I am inclined to lay much more stress upon trophic influences through the combination of facts which I have given.

A word on the treatment of the disease may not be amiss. Belladonna has been recommended. It would be imagined that belladonna, being an accelerator stimulant and a depressant of the heart and vagi, would be harmful in this disease on any other than a homeopathic hypothesis. I am happy to say that I have found it useless. The most beneficial results, I believe, are to be gained by continuous treatment with arsenic and iron, together with the use of strophanthus, extending over a long period. I have been sur-

prised to so frequently read and hear of Graves's disease being for the most part an incurable disease. It is true that nutrition is profoundly affected, and that its duration extends over two years at least, but as far as my own observations go I am inclined to think that most patients eventually recover if treated carefully and intelligently.

III.—J. A. LINDSAY, M.D.,

Physician to the Belfast Royal Hospital.

DR. LINDSAY said he would address himself to one phase of the subject—How, in a doubtful case of cardiac disorder, associated with anæmia, dyspepsia, and rheumatism, to draw the line between organic and functional disease? The points on which he was in the habit of relying were the following:

A. *History*.—A history of rheumatism was of great weight in a doubtful case, pointing (not, of course, conclusively) to organic disease.

B. *Symptoms*.—The symptoms in the two cases might be practically identical. The influence of exercise might be of value, but required to be interpreted carefully. In many functional cases exercise greatly aggravated the symptoms, but, as a rule, this aggravation was much more marked in organic cases.

C. *Physical Signs*.—An apical systolic murmur was not, as the older writers believed, conclusively of organic disease. He agreed with Dr. Sansom that this murmur was sometimes present in functional cases, though, in his experience, he had nearly invariably found a left basic systolic murmur present also. Signs of hypertrophy or dilatation were strong presumptive proof of organic disease, though it must be remembered that prolonged functional palpitation might produce a certain amount of hypertrophy. As regards treatment, removal of the cause was the most important point in functional cases. Iron and arsenic were the best drugs.

IV.—A. ERNEST SANSOM, M.D.Lond., F.R.C.P.,

Physician to the London Hospital.

DR. SANSOM thought that it was very important to face the question of the subjective symptoms referred to the heart in their relation to the objective and physical signs. There was a danger that some affections might be considered as hysterical or neurotic, which were due to more serious conditions of disease. He had observed recently a case in which severe paroxysmal precordial pain, without any of the usual signs of cardiac disease, had a fatal issue. There was danger also that the diagnosis of fatty degeneration of the heart, if communicated to a patient, might cause worry and misery to that patient. Contrary to the usual notion, fatty degeneration of the heart was a very rare cause of sudden death, and then only through disease of the arteries. Fatty infiltration in these and alcoholic subjects, however, was a condition which should be recognised and was fraught with danger.

V.—G. A. GIBSON, M.D., F.R.C.P. Edin.,

Assistant Physician, Royal Infirmary, Edinburgh.

DR. GIBSON desired to bring before the Section two points in regard to cardiac pain. In the first place he called attention to the nature of such pain, and supported the view enunciated by Dr. James Mackenzie, that it was a referred or somatic pain. In the second place he wished to express his own opinion that cardiac pain was almost invariably associated with structural changes in the heart itself, and cited, in support of this belief, such cases as the alcoholic, tea, and tobacco heart, in which that organ, on careful examination, was found to be almost if not quite uniformly dilated.

VI.—R. SHINGLETON SMITH, M.D.Lond., F.R.C.P.,

Senior Physician Bristol Royal Infirmary.

DR. SHINGLETON SMITH spoke of the comparative difficulty of the diagnosis of neuritis of the cardiac nerves; hence arose one of the difficulties in determining between functional and organic disease. He also pointed out that the functional condition and its derangements were always present with the organic, and that the one was often the preliminary to the other. He alluded to the production of organic valve failure as a sequel to such conditions as exophthalmic goitre and

¹ *Journal of Physiology*, 1885-86.

long-continued anæmia, and to the production of fatty degeneration of the heart muscle in cases of anæmia and phthisis. He insisted on the great importance of these functional disturbances over the mere presence of a *bruit*, and to the fact that even a *bruit* might be of functional and temporary character. He drew attention also to the influence of peripheral resistance, and its control by the action of such drugs as amyl nitrite, and showed sphygmograms of a case of local asphyxia of one hand, in which the absent pulse was restored by amyl nitrite, at first temporarily and then permanently.

VII.—P. WATSON WILLIAMS, M.D.Lond.,

Assistant Physician, and Physician to the Throat Department, Bristol Royal Infirmary.

DR. WATSON WILLIAMS suggested that the persistent arterial tension which was so very generally present in patients who were the subjects of angina pectoris was, as a matter of fact, a physiological attempt to meet the necessities of certain pathological states—those, namely, that were attended by increased arterial tension which was nearly always present in cases of angina pectoris. That being the case, the occurrence of vasomotor spasm in angina might be regarded as the result of exhaustion, and consequent irritability of the vasomotor centres. Acting on this hypothesis, he had been in the habit of treating cases of angina pectoris with cardiac tonics; even digitalis in the less grave cases was capable of relieving the tendency to anginal attacks, although the remedy *par excellence* in angina pectoris was cactus grandiflorus. These means must, of course, be combined with an endeavour to remove all causes of the persistent increased tension.

VIII.—HARRY CAMPBELL, M.D.Lond.,

Physician to the North-West London Hospital.

DR. CAMPBELL concurred with Dr. Douglas Powell as to the influence of heredity in predisposing to cardiac neuroses, but was sceptical as to the value of the recurrent radial pulse in estimating blood pressure. He expressed the opinion that the most common form of functional heart disease was that which occurred in women during the reproductive period of life in association with other symptoms of general nervousness, such as headache, flushes, mental depression. The cardiac disturbance in these cases might last uninterruptedly for hours, even for days, together. Much more frequently, however, it took the form of short seizures of a few minutes' or perhaps even a few seconds' duration only. Evidently such seizures were due to a wave of disturbance spreading over the cardiac centres, and might aptly be termed heart-storms. The patient was suddenly seized with violent palpitation or marked irregularity of beat, the heart "fluttering," "turning over," or "stopping dead." With this she trembled, turned hot or cold, or both in succession, was breathless, or might have a choking sensation, felt faint, and, in severe cases, "as if she were dying." Pain, or a less-defined sensation, might be felt at the heart, and ascend to the throat, or beyond it, into the head. Sometimes the left arm turned numb or cold, and even became semi-paralytic. Such heart-storms might occur as auræ to the epileptic or hysterical fit, but much more frequently they constituted part of the so-called flush of heat, which was highly complex in nature, and bore many resemblances to the genuine epileptic fit. If these flushes were inquired into carefully, it would often be found that they were attended with cardiac disturbance, and it was not surprising, when this was marked, that these seizures were regarded as purely cardiac, its true nature being entirely overlooked, just as when the faintness which almost invariably attended the flush passed into unconsciousness, the nature of the case was thought to be sufficiently indicated by calling it syncope. Fainting in women was generally a manifestation of the flush storm; but cardiac disturbance might not only form part of an epileptic, hysterical, or flush storm: it might occur as a symptom of that numerous array of unclassified nerve storms which we might term anomalous nerve storms. He desired to emphasise the fact that the cardiac seizures described generally occurred as part of a complex nerve storm, that the nerve perturbation was by no means limited to the cardiac centres, and indeed

did not necessarily originate in them. The influence of exercise in exciting these attacks was noteworthy; they might be induced by going up stairs, even by gentle walking and by stooping. In one patient lifting the left arm in hanging out clothes occasionally excited them. It must not therefore too hastily be assumed, in a doubtful case of organic disease of the heart, that it was necessarily organic if effort unduly disturbed the heart action. He was not aware that the occurrence of tremor in connection with these cardiac paroxysms had been pointed out. Tremor was a well known accompaniment of Graves's disease, and the paroxysm of fear; and it would therefore appear that it was essentially related to the cardiac disturbance which was so pronounced a feature in both these conditions. The state of the breathing in these heart storms was of interest. It was not surprising that the respiratory movements should be modified in derangements of cardiac action, seeing that these movements played an important part in the circulation, notably the pulmonary circulation. In rapid action of the heart it would, he believed, generally be found that they were increased in frequency. In treating heart storms in women, the general condition of the patient should be considered, and all sources of peripheral irritation removed. In regard to specific drugs, a mixture of perchloride of iron, strychnine and nitro-glycerine would very often be found useful.

IX.—HENRY HANDFORD, M.D.,

Physician Nottingham General Hospital.

DR. HANDFORD alluded to the want of more precise knowledge of the influence of the action of the cerebral cortex on the heart. There were many cases which were not explained satisfactorily by any action of the vasomotor centre, and in which the alterations in vascular tension were secondary and not primary. In general terms, the influence of mental worry and distress was recognised in producing persistently rapid action of the heart. Such cases required mental rest rather than too much bodily rest. While not allowing excess in exercise any more than in anything else, it was necessary to treat them as mental cases rather than cardiac—to send them into quiet country places or small seaside resorts. Dr. Handford further alluded to the frequency of pseudo-angina and other neurotic cardiac disturbances in association with epilepsy, and expressed the opinion that such attacks were in a few cases due to the frequent and sudden alterations in vascular tension common in epilepsy, but in many to local cortical nerve storms such as, when general, constituted an epileptic fit.

X.—W. J. TYSON, M.D., F.R.C.S.,

Medical Officer Folkestone Hospital.

DR. TYSON observed that bradycardia or slow pulse was a symptom not infrequently connected with organic disease of the heart; on the other hand, there were many instances in which, on careful examination, no organic trouble could be discovered. As low temperatures were more rarely met with than high ones, so slow pulses were less frequently encountered than quick ones. These slow pulses occurred under different conditions: (1) In diphtheria and influenza, which might be classed as acute cases, and happened for the most in early life; and (2) cases coming on as more or less a chronic condition, and occurring in late life. This class came on more often in men than women. Another peculiarity about the slow pulse was that tall men seemed more liable to it than short ones. When the pulse reached a certain number, on an average 20 to 24, then insensibility commonly happened, the patient going through what appeared to be an ordinary convulsive fit, doubtless connected with brain anæmia, and not in any way associated with epilepsy. In 1879 and 1880 there were recorded in the BRITISH MEDICAL JOURNAL 11 very interesting cases of slow pulse; the average age was 72; 8 of the cases were males, and in 4 of them symptoms of syncope were seen. Lastly, there was the slow pulse produced by the taking of heavy meals at bedtime, occurring for the most part in men, and at late periods of life. Dr. Tyson said that he had seen two deaths in this condition: the cause was probably twofold; the first was mechanical, the stomach pressing from its fulness on the

heart, the horizontal bed position aiding; the second was irritation of the pneumogastrics from the undigested food, and consequent slowing of the cardiac rhythm.

XI.—JAS. BARR, M.D.Glasg.,

Physician, Northern Hospital, Liverpool.

DR. BARR referred to cardiac irregularity, and showed how the causes and symptoms of so-called functional and organic diseases were linked together. He pointed out that damming back of the blood in mitral and other organic diseases of the heart, and also in functional diseases, the right side of the heart was stimulated to act in advance of the left. As a consequence there was produced doubling of the first sound of the heart, and marked irregularity in the pulse. The right side of the heart was more sensitive than the left, and Dr. Barr had seen the right auricle acting for some hours after the rest of the heart had ceased to beat. Whether it were believed that the rhythmic action of the heart was regulated by the mechanism of the cardiac plexus, or—with Dr. Gaskell, that the cardiac muscle was capable of rhythmic contraction, independently of the nervous system—it would be acknowledged universally that the contraction was induced by the stimulating influence of distension with blood. When the right side of the heart was slightly dilated, or the balance of the blood pressure disturbed in the two sides of the heart, then the right side was stimulated to act slightly in advance of the left, and a tumbling action of the heart and other symptoms consequent on the irregularity ensued.

XII.—J. M. RATTRAY, M.D.Aberd.,

Surgeon Frome Cottage Hospital.

DR. RATTRAY referred to the treatment of that form of functional diseases of the heart—sustained heart hurry without physical signs—which was probably mental in origin. He had tried and been disappointed with all the methods of treatment suggested by the former speakers, but had no experience of *cactus grandiflorus* as used by Dr. Watson Williams. Latterly he had been well pleased with paraldehyde, which he found effectually slowed the heart's action and caused amelioration of the mental anxiety so frequently associated with "fast heart."

XIII.—FREDK. T. ROBERTS, M.D., F.R.C.P.,

President of the Section.

DR. ROBERTS congratulated Dr. Douglas Powell on the excellence of the discussion which his most useful and interesting paper had elicited. Dr. Roberts maintained that purely functional diseases of the heart existed, and gave examples. At the same time, he recognised the great importance of cases in which there were changes in the heart or its nerves, which it might be very difficult or impossible to detect; as well as of those in which functional disorder was added to gross organic cardiac disease. He made some remarks on "referred pains" in relation to the heart, but uttered a warning against paying too much attention to these supposed pains. In conclusion, he discussed some points relating to the classification, causation, diagnosis, and treatment of functional cardiac disorders.

THE IRREGULAR HEART AFTER INFLUENZA.

By ARTHUR ERNEST SANSON, M.D., F.R.C.P.,

Physician to the London Hospital, etc.

In this communication I propose to consider the evidence, from the clinical aspect, of cases observed by myself in which irregularities of the heart's action have been manifested after attacks of influenza. I cannot pledge myself that in all these the cardiac rhythm was perfectly regular before the attack or attacks of the disease; nor do I assert that other morbid influences may not have concurred to produce the symptoms. The links of evidence, however, appear to me to unite in a complete chain, and I hold that there is an irresistible conclusion that one of the effects of the *materies morbi* of influenza is a long-continued disturbance of the heart's action in the sense of irregularity.

From an analysis of 100 cases in which I considered that morbid affections of or referred to the heart were in causal

relation with influenza, I found the relative frequency to be: Pain in the heart region, 23 cases; morbid acceleration of the heart's contractions (tachycardia), 37 cases; irregularity of the heart's action (arrhythmia), 25 cases; abnormal retardation (bradycardia), 5 cases; organic diseases of the heart, 10 cases.¹

I now propose to consider an analysis of thirty cases in which irregularity of the heart was manifested after influenza, and I think that these may be conveniently viewed in certain groups, though I shall call attention in the proper place to associated symptoms which are common to many or all.

GROUP I.—CASES PRESENTING SOME OF THE SIGNS OF GRAVES'S DISEASE.

As an example I will take the following:

A lady, aged 35, of very good physique, suffered from an attack of influenza in January, 1892. At the age of 16 she had a fall from her horse which occasioned, it was said, concussion of the spine, and for a long time she wore spinal supports. She made, however, a complete recovery, and for nine months previously to her acute illness she had been quite strong, and had done much walking exercise. Two months after the influenza she began to suffer from pain in the region of the heart, especially a "catching pain" on stooping, and occasionally a sense of deadness down the left arm, with "pins and needles" on recovery. I saw the patient in June, 1892. I found that the physical signs in regard to the heart were quite normal but the rhythm was irregular. The irregularity was rhythmic in the manner of coupled beats, which are well shown in the sphygmogram (Fig. 1). There was a decided prominence

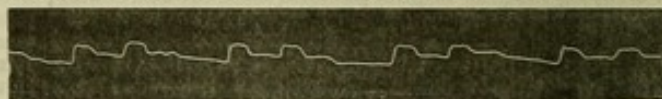


Fig. 1.—Coupled beats in a case manifesting some of the signs of Graves's disease after influenza; female patient, aged 35.

of the eyeballs (exophthalmos), and the upper eyelid was abnormally retracted (Stellwag's sign). There was no von Graefe's sign. The patient was treated chiefly by a weak continuous galvanic current (about 2 milliampères) from the nape of the neck to the region of the vagi (each side of larynx and trachea) repeated three times daily for six minutes.

After four months there was very considerable general improvement. The heart was still irregular; it did not present the phenomena of coupled beats, but often there were groups of four pulsations. Sometimes, however, there were intermissions at irregular intervals. Occasionally slight attacks of palpitation occurred, but usually the normal rate of the heart was not quickened; it varied only between 80 and 84 on all occasions when I observed it. Paroxysms of indigestion, with sternal pain and discomfort, referred to the throat ("vagus storms" as I have termed them), occurred sometimes. The exophthalmos and the Stellwag's signs passed entirely away. In February, 1893, I found the pulse quite regular, and, except for occasional slight manifestations of dyspepsia, there were no morbid symptoms.

Deferring for a short time a consideration of the signs more especially indicating an alliance with Graves's disease, I will consider some that were manifested in this case in their relation with those of all the series.

1. *The Forms of Cardiac Irregularity.*—In this case there was some rhythm in the irregularity; the beats were coupled at one time, in groups of four at another. In a second case I noticed an alternating pulse, a stronger being always followed by a weaker ventricular systole. In a third case the rhythmic irregularity was exemplified by a stronger being followed by two weaker systoles. This grouping seemed to be constant, and it is vividly registered in the sphygmogram (Fig. 2). In a fourth case there were groups of three pulsa-



Fig. 2.—Rhythmic irregularity; grouped beats in a case manifesting tintus aurium after influenza; male patient, aged 62.

tions. In the majority, however, there was no rhythm in the irregularity, and in a considerable number of cases such irregularity was extreme to the degree of "delirium cordis." There was no relation between the form and degree of irregularity and the subjective symptoms; in the most pronounced irregularity (just as I have found to be the case in the arrhythmia generally which is not associated with organic disease) there might be no sense of discomfort or pain at

¹ Report of paper and discussion on Cases manifesting Pain at the Heart or Morbid Acceleration of the Heart's Contractions (Tachycardia) subsequently to Influenza, BRITISH MEDICAL JOURNAL, June 16th, 1894, p. 1395.

heart, whilst in the cases manifesting a slighter irregularity or intermission the subjective symptoms might be severe.

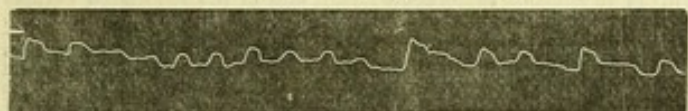


Fig. 3.—Arrhythmic irregularity; heart symptoms (pain, faintness), four months after influenza; female patient, aged 58.

2. *The Signs of Præcordial Pain and Cardiac Discomfort.*—There were subjective symptoms referred to the heart or its immediate neighbourhood in 15 cases—just half the total number. This is a far larger proportion than I found in those in whom the legacy of influenza had been morbid acceleration of the heart's action (tachycardia); in the latter only a minority suffered from cardiac pain or discomfort. I have seen the most pronounced painful crises after influenza in patients who presented no morbid objective signs in regard to the heart. Yet it must be recognised that in one half the cases of post-influenzal irregularity of the heart some symptoms of pain were manifested. In four cases the pain was very severe, resembling angina pectoris. In one it was described as "excruciating agony," radiating to the chest and abdomen; and in another acute pain, with sense of pressure, occurred paroxysmally over the sternum, and extended down both arms as far as the elbows, being worse on the left side. In one case there was a soreness as of a knife cutting. In two cases there was a feeling of impending death, without severe pain. In three there occurred feelings as if the heart stopped, together with a sense of faintness. In three the movements of the heart were felt to be attended with pain. The heart was felt to thump, and in one the thumps shook the whole body; in only one case, however, was extreme irregularity felt and timed as a subjective sensation.

3. *The Association with Paroxysms of Dyspepsia.*—I have said that these were notable symptoms in the case I have mentioned; they were present in twelve of the thirty cases. In the case of a man of 29 they were described as "extreme agony," the pain being abdominal with radiation over the chest, associated with flatulence and diarrhoea; the patient complained that the throat felt dry and there was difficulty in swallowing. In another case, that of a man aged 46, the pain at the time of the attacks was chiefly in the interscapular region. There was extreme nausea and sometimes vomiting occurred; diarrhoea alternated with constipation; flatulence was distressing, and there were perspirations and intense depression. Although there was in many cases a continuous enfeeblement the attacks were paroxysmal, in some cases occurring during the night. The symptoms, other than those I have previously mentioned, were in some of the cases dyspnoea (in some instances alarming), rigors, sneezings, faintness and sensations of sinking, suffocation (as from a grip at the throat), and enfeeblement or loss of voice. To paroxysmal attacks, having like characters, I have previously given the term "vagus storms."² They seem to resemble the gastric crises which occur in some of the subjects of Graves's disease, but I have found them much more pronounced in the cases of irregular heart (from all causes) than in those of rapid heart (from all causes).

4. *The Association with Symptoms of Multiple Neuritis.*—In the case previously described such symptoms were manifested for varying periods. They were a "deadness" of the left arm, with sensation of "pins and needles" at intervals, together with enfeeblement of the muscles. The signs passed away, but recurred on many occasions from two to eight months after the attack of influenza. In another case there was numbness of both hands, more marked in the left. In a third there was numbness of the left thumb. In a fourth, a lady who had suffered a severe attack of influenza in Paris at Christmas, 1889, there were severe pains in all the limbs soon afterwards. Six months after the attack there were burning pains and varying numbness in all the limbs; nine months after both arms "seemed to go to sleep," and there were severe pains in both knees and in both great toes. In a fifth case there were severe pains in both arms as far as the

elbows, worse in the left arm. In a sixth (a lady, aged 32, who manifested some exophthalmos, and suffered an almost constant pain in the heart region with nocturnal exacerbations, there were pains and tenderness in both calves such as one observes in alcoholic polyneuritis. The attack of influenza had occurred four months previously to my observation; any causation by alcohol was entirely excluded. In a seventh case there was pain above the left hip and down the left thigh, as well as in the calf on the same side.

It is to be noted that in some of these cases the pains and perversions of sensation were not continuous but remitting. I did not observe the signs of Raynaud's disease in any of these, but I have seen an example of well-marked Raynaud's disease in direct sequence to influenza. The association of Raynaud's disease and polyneuritis has been often observed. In several cases the pains were long lasting, and there was distinct impairment of muscular power. The experience of many observers leaves no room for doubt that multiple neuritis may be a direct consequence of influenza, though it may be manifested at periods remote from the original disease. I have myself observed many cases of post-influenzal neuritis.

Having considered certain manifestations in the case cited as an example in their relations with those of the whole series of cases presenting signs of cardiac arrhythmia after influenza, I come now to a brief review of the characteristics of the special groups—namely:

5. *The Association with some of the Signs of Graves's Disease.*—In the case quoted there was decided proptosis, and a retraction of the upper eyelids, but those signs passed completely away. There was no thyroid enlargement. In a second case, a lady aged 32, four months after an attack of influenza, I noted decided exophthalmos associated with the cardiac arrhythmia. In a third case, a gentleman aged 36, Stellwag's sign was manifested.

In several instances I have noticed a tremor of the levatores palpebrarum when the lids are closed. I ask for evidence in regard to this sign, for it has seemed to me to precede the more marked lid signs in Graves's disease. Tremors of the trunk and limbs have been manifested in some of these, as in other cases of Graves's disease. In a fourth of this group of cases the patient, a lady, aged 54, complained of aching and swelling of the throat soon after an attack of influenza in January, 1892. About the same time she suffered from palpitations and paroxysmal attacks of flatulence. There was an almost constant nausea. She was observed by me nine months after the attack. The pulse-rate was about 100, but the action was irregular, and there were occasional intermissions. The thyroid was considerably enlarged, the enlargement being most marked in the right lobe. There were pigmentations of the skin, especially a brown staining of the neck. No exophthalmos nor lid signs were manifested.

From the evidence of the cases that I have observed, I cannot doubt that disorders closely allied to Graves's disease can be initiated by influenza. It may be objected that the signs in some of the cases mentioned were but slight, and that the complete ensemble of symptoms of Graves's disease has not been presented. I have shown, however, in a paper recently read before the Royal Medical and Chirurgical Society, that in cases manifesting the rapid heart after influenza all the cardinal signs of the disease may be evidenced. I have also shown that the irregular heart may be a characteristic of typical Graves's disease.³ I here show that the irregular heart, manifested after influenza, may also be associated with many of the signs of Graves's disease.

This observation cannot but be of interest in the discussion as to the pathology of so-called exophthalmic goitre. A theory has been strenuously advocated that hypertrophy of the thyroid, attended by the resorption of the too abundant secretion of the gland, is the cause of the tachycardia of Graves's disease. It would seem very improbable that such would cause extreme rapidity of the heart's action in some cases, and extreme irregularity in others. The theory is rendered still more improbable when, as in the cases observed by me, there has been no relation between the size of the thyroid and the degree of pronouncement of the cardiac signs and symptoms. I consider that the evidence tends much more

² *The Irregular Heart: a Clinical Study.* Transactions of the Medical Society of London, vol. xvi.

³ Annual Oration, Transactions of the Medical Society of London, vol. xiii, p. 482.

strongly to the conclusion that lesions of the cerebro-spinal system are the prime causes of the phenomena, and that, according to their position, they produce morbid acceleration (tachycardia), irregularity (arrhythmia), or abnormal retardation (bradycardia).

GROUP II.—CASES MANIFESTING PERVERSIONS OF THE AUDITORY FUNCTION.

A lady, aged 25, suffered from an attack of influenza in January, 1890. Urticaria followed. Ever since the attack she has been subject to carache and to attacks of the nature of aural vertigo. I saw her in February, 1891. The heart sounds were normal, but the rhythm was irregular. The attacks of aural vertigo were always followed by palpitations and rachialgia, the pain being from the sacral region to the occiput.

Very similar symptoms were manifested in another case, a lady, aged 26, who first came under my notice nearly two years after an attack of influenza. There were severe paroxysms of giddiness, with vomiting and feelings as of impending death. The heart rhythm was irregular; a systolic murmur was heard over the pulmonary artery, but there were no signs of organic valve disease.

In a third case, of a lady, also aged 26, after two attacks of influenza (in 1890 and 1891) there were very similar symptoms, together with pain at the heart and such general weakness that the patient could scarcely walk, the sensation being as of treading upon cotton wool. Here also there was irregularity of the heart rhythm, the rate of the pulse varying between 88 and 94.

In a fourth case, of a lady, aged 70, who had a severe attack of influenza in Paris at Christmas, 1889, there followed the signs of multiple neuritis, and three months after the attack distressing tinnitus aurium with insomnia. The pulse was irregular.

A fifth case was that of a man, aged 62, who said he had been well and strong until an attack of influenza in January, 1893. Palpitations occurred soon after. I saw him in May, 1894. He was slightly deaf, and complained of tinnitus aurium, the noise being as of a steam engine. There were attacks of palpitation with subjective sensations of irregularity and stoppage of the heart. The general pulse rate was 80 per minute. The irregularity on the sphygmogram is shown in regular grouping—a more ample succeeded by two less ample systoles. (Fig. 2.)

It is the consensus of a large number of observers that aural diseases, as well as tinnitus aurium and auditory vertigo, are often the direct consequences of influenza.⁴ The immediate relation between auditory disturbances and irregularity of the heart may be deemed by some more problematical. I have found, however, that out of 47 cases of irregular heart not associated with organic heart disease, 10 were accompanied by disturbances of the organ of hearing or by nasopharyngeal irritations.⁵ In this series of 30 cases of irregular heart observed after influenza there were 6 associated with auditory disturbances. About one-fifth of the cases in each series manifested disorders of the auditory mechanism; the association between such disorders and irregularities of the heart cannot, therefore, be looked upon as fortuitous. It is well known that cardiac symptoms—palpitations, faintnesses, and painful crises—often occur in the subjects of auditory vertigo.

It is an interesting and a practical question whether the symptoms are due in some cases to a reflex from the nasopharyngeal mucous tract. I have noted a case in which severe auditory vertigo attended by very pronounced irregularity of the heart's action disappeared after the removal, by Dr. Woakes, of a fibrocystic growth from the middle turbinate bone, the patient making a complete recovery. In many cases after influenza I have observed small submucous hæmorrhages in the uvula, velum palati, and pharynx. In many instances local treatment of the nasal and pharyngeal mucosa has been followed by much improvement in the symptoms. I have prescribed local applications of weak solutions of nitrate of silver or sulphate of copper, and a 5 per cent. solution of cocaine hydrochlorate. An oil spray by the parolein atomiser of menthol and oil of eucalyptus (2½ per cent. of each in parolein) has seemed to me to have been of much advantage.

GROUP III.—CASES MANIFESTING GOUT OR HEREDITARY TENDENCY THERETO.

A gentleman, aged 58, who had been the subject of typical acute gout, came under my notice complaining of severe cardiac symptoms after two attacks of influenza. The first attack, two years previously to my observation of the case, had been accompanied by pleuritis with pneumonia and by acute nephritis. The second attack, one year ago, had also associations with pneumonia and acute nephritis. At the time of my observation the subjective heart symptoms were distressing, and the irregularity of the heart's action extreme. The dyspnoea for some periods assumed the rhythmic character of Cheyne-Stokes breathing. There was much oedema of both legs. The urine, of specific gravity 1020, contained granular and epithelial casts with many crystals of uric acid, some

aggregated in rosettes. The prognosis seemed to be very grave: there were great fears of the imminence or existence of chronic interstitial nephritis (in addition to the acute form), and of the associated cardiac hypertrophy and arterio-sclerosis. Considerable improvement, however, took place, and when I saw the patient twelve months afterwards—though there were subjective feelings of irregularity of the heart at times and of precordial discomfort—the heart outline was fairly normal, and during the time of my observation the rhythm was quite regular, the rate being 72 per minute. There was so good a recovery that the last time I saw my patient, some months afterwards, he was presiding over a large assembly, and seemingly in good health.

In a second case, a man aged 27, whose father and brother had suffered from acute gout, nephritis occurred coincidentally with or immediately succeeding an attack of influenza. Subsequently irregularity of the heart with much subjective discomfort became manifest. In a third case, a young man aged 21, with a very marked family history of gout, influenza was followed by marked irregularity of the heart rhythm and by acute pains referred to the precordia.

I mention the following case as giving, I think, cogent evidence of the effect of influenza in inducing cardiac irregularity. A gentleman, aged 63, had been frequently under my care during eleven years. He had disease of the upper lobe of the right lung, which assumed fibroid characters and had become practically inert, some emphysema being manifested. The lung had long ceased to give trouble, but there was much complaint of dyspepsia. Nevertheless, the patient became fat and did not stint himself of the good things of this life. There were gouty associations in the family history. In November, 1893, I saw the patient during an attack of influenza. Neither at this time, nor at any of my previous observations had there been any noticeable irregularity of the heart's action. The patient took a sea voyage. I saw him on his return seven months after the attack of influenza. He had experienced no symptoms of cardiac discomfort. I found, however, an extreme irregularity of the rhythm (Fig. 4). At the time of my observations the

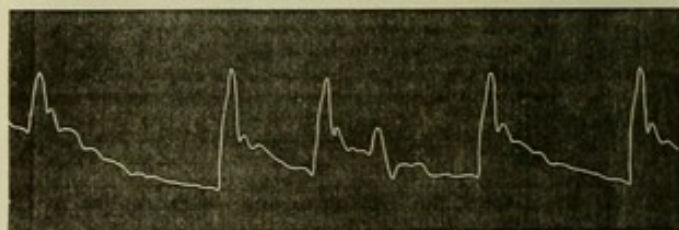


Fig. 4.—Extreme irregularity in a probably gouty subject; observed seven months after influenza; no cardiac symptoms; male patient; aged 63.

patient was entirely ignorant of any cardiac disturbance, and I forebore to give the slightest indication that any such was in evidence.

I have frequently observed that the degree of irregularity is in no way commensurate with the subjective symptoms. A most riotous action—a delirium cordis—may be manifested without the proprietor of the heart being aware of anything wrong with the circulatory mechanism. On the other hand, a similar irregularity may be accompanied by grave subjective signs. The tracing (Fig. 5) was from a case in which these were severe.

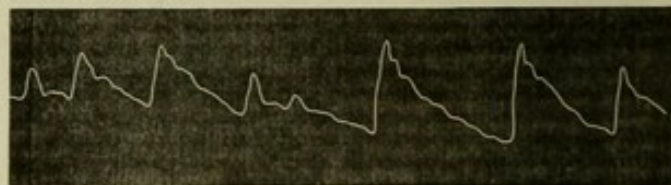


Fig. 5.—Extreme irregularity; rhythmic dyspnoea of Cheyne-Stokes character; observed four months after influenza in the subject of alcoholism; male patient, aged 62.

The patient, a man aged 62, suffered from an attack of influenza in January, 1893, accompanied by "congestion of the lungs." There had been a five years' history of dyspepsia, and over-indulgence in alcohol was undoubted. Difficulties of breathing had been manifested ever since the attack, and at the time of my observation there was rhythmic Cheyne-Stokes dyspnoea. Improvement took place and, I believe, still continues.

I have just mentioned a case in which this symptom, so often of fatal import, was manifested after influenza and yet the patient recovered. In a third case under my care at the London Hospital, when the influenza was immediately followed by signs of spinal pachymeningitis, there was typical Cheyne-Stokes dyspnoea, and yet the patient made a good recovery.

It has been my experience that the implication of the nervous system with or after attacks of influenza has occurred with marked severity in the subjects of gout or the inheritors of a gouty tendency and in those who have been prone to alcoholic indulgence.

⁴ Cf. Althaus, *On Influenza*, London: Longmans and Co., 1892, pp. 247-257.

⁵ *Transactions of the Medical Society of London*, 1892, vol. xvi, p. 105.

PATHOLOGY.

In the cases of irregular heart after influenza there seems to be no evidence of disease of the myocardium, but the series of phenomena tends to the conclusion that the irregularities of rhythm are due to a disturbance of the nervous mechanism of the normal cardiac reflex. In the rapid heart (tachycardia) it seems probable that the vagus is in *minus* action—that there is some lesion of paresis in its cardiac branches; possibly an irritative lesion of the sympathetic or cardiac accelerator agencies may be a concurring case. In the irregular heart, for the most part, it would appear probable that the vagus is in relatively *plus* action. Either some lesion of irritation affects its nuclei of origin or its fibres in some parts of their course, or else a lesion of paresis of the cardiac accelerator agencies leaves it relatively in the ascendant. Professors Roy and Adami⁴ have shown that an excitation of the vagus brings about irregularity of the heart by weakening the contractions of the auricles. Thus the rhythmic stimuli reaching the ventricles from the auricles are diminished or suppressed, and the ventricles tend to take on a rhythm of their own. The interference of the two rhythms produces an arrhythmic irregularity. When a weakened auricular impulse fails to excite the ventricular contraction, there is an intermission or a delay in the subsequent contraction; and these events may be repeated in rhythmic sequence. In extreme irregularity in the dog, the observers quoted state, the vagus may lose all control, and the ventricular wall and the muscoli papillares may fail to act in any correlation. It may be, therefore, that irregularity can be due either to an increase of action of the vagus, or to an annihilation of its action. The nervous mechanism of the cardiac reflex is undoubtedly very complex, and we may adopt as a working hypothesis the simple formula that a morbid change in it generally may have its expression in irregularity of the cardiac rhythm. The immediate cause of the lesion may be hæmorrhages, for we know that blood extravasations are common accompaniments or sequelæ of influenza, or a neuritis caused by the toxins of the disease-producing microbes. We know that the effects may be manifested at very varying periods from the original disease.

TREATMENT.

It may be questioned at the outset whether in certain of the cases any form of treatment is necessary. We may detect at all times of our observations a great, it may be an extreme, irregularity, which the evidence shows (with the highest probability) to be habitual; and yet, not only is the patient unconscious of any perturbation, but the circulatory and nutritive needs of the organism seem to be served in a perfectly adequate manner. The subjects of the rapid heart as well as of the irregular heart may present no symptoms referable to the circulatory disorder for months or years. It is in the highest degree important in such cases that the skilled observer should refrain from calling the attention of the patient in any way to the condition of irregularity, for once the mind is directed to it, subjective discomfort and distress are often initiated. It is rarely, however, that some associated symptoms are not present, and the treatment then resolves itself into putting the patient into the best attainable condition of comfort. Dyspepsia is usually the chief condition calling for therapeutic interference, and it may be paroxysmal or constant—a cause or consequence, an accompaniment or legacy, of the vagus storms. It has seemed to me that the best results have been from treatment by pancreatin and papain, with alkalies and bismuth after food. Small doses of arsenic (as two or three minims of Fowler's solution three times a day) have been added in some cases with seeming advantage. In the painful crises, hypodermic injections of $\frac{1}{4}$ or $\frac{1}{2}$ grain of hydrochlorate of morphine have been used, but opiates are generally ill-borne. Antipyrin or phenacetin—especially the latter—has seemed to me to be of much advantage, not only in the treatment of the headaches which so often are manifested, but of the abdominal pain and discomfort. I have given the phenacetin in from 5 to 7 grain doses in wafer cachets, adding to it, in some cases, camphor, musk, or caffeine citrate. For the insomnia, chloralamid, in doses of 20 to 25 grains nightly, or

on alternate nights, has been generally successful and free from all adverse consequences. Sulphonal is not so innocent, and chloral hydrate and opiates are harmful.

In the treatment of the irregularity itself, when the disordered action of the heart is felt by the patient, and is a source of discomfort and distress, I have found all cardiac tonics, with one exception, inefficacious. Digitalis has proved not only useless but, I think, even harmful. In this regard my experience corroborates that of M. Huchard of Paris and other able observers. The one exception is belladonna, which has seemed to act beneficially in some cases.

I feel convinced that the irregularity can be reduced and the subjective symptoms ameliorated by the employment of weak continuous galvanic currents from the cervical spine to the regions of the pneumogastric nerves. The method, as adapted to the treatment of the rapid heart of Graves's disease, has been fully described by the late Mr. H. W. D. Cardew,⁵ who observed several of my cases, and recorded the sphygmographic evidence before and after treatment. Though the results were less favourable than in the cases of rapid heart there was good evidence that the arrhythmia became reduced. Subsequent experience has confirmed me in this opinion, and I feel sure that the subjective symptoms have been lessened by the method. The batteries employed were those of Schall of four to six cells (current about two to three milliamperes). The larger electrode (the anode), well moistened with hot water, is applied to the nape of the neck just above the vertebra prominens; and the smaller, similarly moistened, is held in the groove outside the larynx and trachea on the right and left sides alternately.

The applications should be made for six minutes three times a-day, and it must be quite understood that the signs of improvement are slow to be perceived; there is seldom much amendment under six months. The method is so simple that the patient or nurse can find no difficulty in carrying it out under the direction of the medical attendant. It has seemed to me to give better results than any form of medicinal treatment.

THE TREATMENT OF CHRONIC DISEASES OF THE HEART BY BATHS AND GYMNASTICS AS PRACTISED AT NAUHEIM.

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THE baths and waters of Homburg, Aix-les-Bains, Baden, and many other Continental resorts are well known to Englishmen generally, and their therapeutic value fully recognised. Very few English people, however, have ever heard of Nauheim, and it is even almost a *terra incognita* to the members of the medical profession, although in Germany it is a recognised and much frequented health resort, during the season as many as 1,500 baths being given daily. As we are bound to consider any treatment which may possibly prove of value to our patients, I thought it would be of interest to the members of this Association if I brought to their notice the treatment of chronic diseases of the heart as practised at Nauheim, as, from a personal visit to the place recently, I feel convinced that a most valuable therapeutic measure is offered by the special means there adopted. Owing to the kindness of Dr. Schott, of Nauheim, whom I cannot sufficiently thank for the trouble he took in affording me opportunities of observing the treatment he adopts, I was able to investigate over forty of his cases then under treatment, and, in addition to obtaining their clinical histories from themselves, to ascertain their then physical condition.

The treatment of chronic diseases of the heart by baths and gymnastics is of the more interest as Dr. Schott assured me that it is quite possible to make artificial Nauheim baths, and his exercises when once learnt may be practised anywhere. To this point I shall again refer.

Nauheim is situated in the Taunus, being reached by rail from Frankfort-on-the-Maine in about forty minutes. The season commences in May and lasts until the end of September. The special treatment there adopted for diseases of the heart, as already stated, is by baths and gymnastics,

⁴ Contribution to the Physiology and Pathology of the Mammalian Heart, *Phil. Trans.*, vol. 183, 1892, B., p. 283.

⁵ *Lancet*, July 4th and 11th, 1891, pp. 6 and 64.

and although these are generally practised together, for purposes of explanation it will be better to consider them separately.

THE BATHS.

There are twelve springs in Nauheim, known as Nos. I to XII; only four, however, are used—Nos. VII and XII for baths, and Nos. VIII and X for drinking the waters.

The beneficial effect of the baths on patients suffering from cardiac disease was first mentioned by Beneke in 1859, and in 1872 the same observer wrote still more emphatically on the subject in a monograph published in Berlin,¹ and from time to time other articles have appeared by the brothers Schott, Groedel, etc., but they have attracted but little notice in this country.

The springs used for baths (Nos. VII and XII) contain certain mineral salts in solution, chiefly chloride of sodium (about 2.8 per cent.), and chloride of calcium (0.2 per cent.), together with small quantities of iron, manganese, iron lime, etc. The chief characteristic is, however, the large amount of carbonic acid contained, partially combined with the salts and partially free. Thus, in Spring No. VII, in 1,000 grammes there are 889 c.cm. of free carbonic acid, and in Spring XII in 1,000 grammes 1,066 c.cm.

For medical purposes the baths are used thus:

1. Warm brine baths without carbonic acid.

1A. Warm brine baths with addition of "mother liquor," obtained from the neighbouring salt works after the salt has been abstracted.

2. Warm brine baths with a small amount of carbonic acid.

3. The same, but water being allowed to run in during the bath.

4. Effervescing baths: the natural water from Springs VII and XII.

5. Effervescing running baths.

(1). The warm brine baths (temperature about 95° F.) are used for patients with great cardiac weakness. The duration of the baths is at first about 8 minutes, the time of immersion being gradually increased. The patient takes three baths on successive days, and then rests for a day. If improvement is manifested the strength of the bath is increased by the addition of "mother liquor."

After a variable number of baths the patient changes to "2," the natural water, which has been exposed to the air for a time in the form of a spray, so that a large proportion of the carbonic acid has escaped. The temperature of the bath is usually about 89° to 92°, and the time of immersion from ten to twenty minutes. On first entering the bath there is a feeling of chill, followed in about half a minute by warmth, which is maintained as long as the whole body (with the exception of the head, of course) is immersed, but if the arm, for instance, is raised out of the water the chilly sensation is again experienced. A certain amount of oppression is felt, confined chiefly to the epigastrium, but this, patients told me, passed off after a few baths. The effect upon the heart, as judged by the pulse, is manifold. Even upon the healthy heart an alteration in pulse-rate is noticed; in my own case it was reduced four beats per minute, the volume of the pulse being at the same time increased.

Upon a diseased heart the effect is very marked. The number of beats per minute is decreased; if there is irregularity this disappears to a more or less marked extent, the volume becomes greater, and the general character of the pulse steadier and quieter. The respiration becomes slower and deeper, and the patients describe the relief to their subjective symptoms as being very great. The effects last at first from one to three hours, the time gradually increasing with the duration of the treatment.

With the kind permission of Dr. Schott, I will here give the outline of a case which well illustrates the effect of such a bath:

Dr. G., aged 51, a medical man, had suffered from attacks of gout since 1886, and in December, 1890, also suffered from asthmatic paroxysms. From December, 1890, to May, 1891, the cardiac symptoms were so severe that he could scarcely walk; there was urgent dyspnoea, oedema of the extremities, etc. Aortic stenosis, with considerable cardiac dilatation, was then diagnosed. He went to Nauheim in May, 1891, and took a course of baths with great benefit, so that he was well able to pursue his ordinary course of life. The improvement was maintained until January of this year (1894), when the symptoms returned, and he again went to

Nauheim on May 21st. I saw him on May 22nd. He had then slight wheezing respiration; the pulse was 90 per minute, irregular in force and rhythm. The heart was considerably dilated, the apex-beat being indistinctly felt in the fifth interspace, 2 inches outside the nipple line, and the dullness extending from the third rib above and to about three lines to the right of mid-sternum. On that day he took a warm brine bath, containing a small amount of carbonic acid, at a temperature of 89.6° F. Owing to his having walked to the bath, his pulse was a little quicker than when I first saw him (102 per minute), and, owing probably to the presence of a stranger, this was not reduced below 100, but the irregularity almost disappeared, and the volume was markedly increased, whilst at the same time the wheezing character of the respiration was lost, and he expressed himself as feeling much easier in every way.

To resume, after a variable number of baths, the natural effervescing baths are employed, the temperature being 88.3° or 91.4° F., according to which spring is employed. The same sensations are experienced as described above, but the effects on the pulse are more marked. My pulse was reduced from 72 to 60 in three minutes, and did not regain the former rate until about two hours after the bath, the sensation of oppression over the epigastrium was also more marked. The effect of the gas was peculiar, each minute hair on the body being covered with multitudinous bubbles, which escaped on the least movement. No fatigue was felt after a bath. I did not have an opportunity of observing a patient in the bath. The stream baths have similar but again more marked effects, with the exception, however, that during the bath the pulse-rate is slightly raised, but the increase in strength and volume is more marked than in any of the baths. Thus during the bath my pulse rose from 72 to 74, but half an hour afterwards it fell to 64 and remained so for about three hours.

As regards the explanation of the effect of the baths I can say but little. Dr. Schott considers that a reflex action is set up, starting from the sensory nerves and passing down the vagus to the heart. Certainly there is a slight general irritation to the surface of the body, for on getting out of the bath one's skin is quite red. Before discussing what are the most suitable cases for this treatment, I will pass on to the second division of the Nauheim treatment, namely, the gymnastics.

THE GYMNASTICS.

Oertel was the first to show that to make a patient lie perfectly quiet was not always the best treatment for chronic affections of the heart, but that considerable benefit might be obtained by graduated exercises, and he therefore introduced the "*terrainercur*," or hill climbing. It is, however, difficult to accurately gauge the amount of exertion used by the patient, and there is therefore some danger that too much strain is put upon the heart, and thus the good effects of the treatment may be frustrated. To more carefully control the actions of the patient Zander introduced his mechanical appliances, but this treatment also has many drawbacks. Both the above methods are employed at Nauheim in conjunction with the baths, but only to a limited extent, but the form of so-called gymnastics to which I would particularly call attention are the "resistance gymnastics," introduced by the brothers Schott, of whom, however, only one (Dr. Theodore Schott) is now living, but he has carried the system to a commendable degree of perfection.

A better term in English than "gymnastics" would be "exercises" or "movements with resistance." They consist of certain movements of the arms, trunk, and legs: extension, flexion, and rotation. Each exercise is made extremely slowly and regularly, and is resisted by the doctor or trained attendant. No one exercise is performed twice in succession, and a pause is made between each. The force exerted to resist the movement is carefully regulated according to the condition of the patient; and any sign of breathlessness, such as working of the *ala nasi* or sudden quickening of the pulse, is an indication that the movement has either been made too quickly or that too much resistance has been applied (probably the former), and a rest should be immediately ordered. Needless to say, that should an attendant be employed he must be most perfectly trained. After the patient has practised the exercises a few times he will be able to judge by his own sensations whether the right amount of resistance has been employed. If an attendant is not available another form of Schott's treatment may be employed, known as "self-resisting gymnastics," in which, instead of the muscles being quietly brought into action, as in the manner already described, they are held perfectly rigid, all

Zur Therapie des Gelenkrheumatismus und der ihn verbundenen Herzkrankheiten.