brane a ferment which, when absorbed, digests the proteids of the body, forming albumoses and an organic acid. These digested products are the agents in producing death, in causing fever, the depression and the paralysis which follows diphtheria. It is clear from the cases of diphtheria which have been described that the diphtheria products found in the body do not all come direct from the membrane. In Case 1, for example, only small flecks of membrane were found in the larynx, and yet in the body a large quantity of the diphtheria products was discovered. The large amount of albumoses and organic acid found in the spleen also shows that something more than absorption from the membrane is going on. There is no reason to suppose that these products merely accumulate in the spleen, and their specific physiological action shows that they are foreign to the organism. It is more probable that the ferment absorbed from the membrane digests the more or less stagnating proteids in that organ, and we know, indeed, that the spleen contains a proportionately larger quantity than the blood of bodies formed from proteids, such as uric acid, xanthin, etc.

ON LABYRINTHINE DEAFNESS TREATED BY PILOCARPIN.

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OF the various papers I have published on the treatment of deafness by pilocarpin the last appeared in the *BRITISH MEDICAL JOURNAL* for May 17th, 1890. In this, in order to arrive, if possible, at an explanation of the effects produced by the drug, I entered at some length into a consideration of the pathology of labyrinthine deafness, and in elucidation of the behaviour under treatment of the fresh series of cases now to be reported, I will here briefly recapitulate my former remarks upon this subject.

The anatomical evidences of labyrinthine disease in its early stages are congestion and small-cell infiltration, and sometimes suppuration or complete destruction of the membrane of the labyrinth. The inflammation may extend along the sheath of the auditory nerve, but is commonly limited to the labyrinth itself, its walls becoming thickened, and its cavity occupied by caseous deposit with, perhaps, bands of fibrous tissue. There may be destruction of the membrane of the labyrinth, causing degeneration and atrophy of its nerve endings, or, as is more commonly the case, these latter are constricted, and their action is paralysed by the organisation of fibrous tissue in the thickened membrane. The pathological features appear to be much the same in the great majority of cases, whatever the initial cause. How so unpromising a condition as labyrinthine deafness can be benefited, or, as in some cases, practically cured by the subcutaneous injection of pilocarpin, cannot as yet be proved by reference to known facts; but a possible explanation is to be found in the stimulation by the drug of the secretory nerve fibres. Its effect in promoting the formation of wax in the outer ear (usually absent in cases of labyrinthine disease) may be the accompaniment of increased healthy secretion in the middle ear, and consequent softening, or even removal, by the absorbents of old accumulations therein, pressure upon the nerve endings being thus relieved, and their functions more or less restored. The action here supposed to take place in the ear after the lapse of sometimes very considerable periods is certainly paralleled by what has been observed in peripheral neuritis affecting other parts of the body.

It has been urged in opposition to this view that in many cases of labyrinthine disease pilocarpin is quite useless. It is, however, obvious that it must remain so in all those cases in which there is either bony thickening or, whether from locomotor ataxy or from direct inflammatory action, there is destruction of the membrane and atrophy of its nerve endings. It would, in short, be impossible, from purely negative evidence, to come to a legitimate conclusion as to the scope of the employment of pilocarpin in labyrinthine disease.

Large numbers—indeed, most of the supposed cases of this affection sent to me as unamenable to its action—have proved to be quite unsuitable for its exhibition, being examples of every other sort and condition of ear disease, including long-standing perforation of the drumhead.

Inasmuch as my last paper on "The Treatment of Labyrinthine Disease," with its record of cases, was productive of various adverse criticisms, some of which appeared to call in question the maturity of my conclusions, I determined, before writing again on the subject, to thoroughly reinvestigate it during an additional prolonged period, both in hospital and private practice. The interim has afforded me the opportunity of testing the permanency of the good results reported to have accrued from the use of pilocarpin.

As the outcome of my further study of the disease, its symptoms, and its modes of treatment, I would offer to such practitioners as have not yet had experience of its relief by means of pilocarpin the following observations:—

(a) The case must first be carefully diagnosed as actually one suitable for treatment with the drug. Labyrinthine deafness, it must be remembered, is not a disease of common occurrence.

(b) The larger number of the patients that hear better in a noise (when in a train or omnibus, for example) do not derive much, if any, benefit from pilocarpin, if used independent of other remedies.

(c) The best test of hearing is to employ a large tuning-fork with a wooden handle, acting as a sounding-piece, to put on the head. Some of the small tuning-forks commonly used are worthless to the aural surgeon.

(d) Cases in which the tuning-fork on the forehead is heard indifferently or scarcely at all may be suitable for treatment with pilocarpin.

(e) Patients with a syphilitic history are usually much relieved, and the possibility of hereditary syphilis in a given case must be borne in mind.

(f) The very large number of patients that say they hear worse after a cold are mostly unsuitable cases.

(g) Patients who say they can hear when they are spoken to very distinctly or whose deafness began with a difficulty of discriminating sounds, or who cannot make out general conversation, and hear worse when tired, nervous, or feeling out of health are more promising cases than the last mentioned.

(h) In arriving at a diagnosis, the state of hearing as tested by the watch and the condition of the drum-head should be noted.

(i) Some cases of marked aural vertigo derive benefit from pilocarpin.

(j) If middle-ear disease is associated with mischief in the internal ear, the Eustachian catheter should be passed from time to time for the injection of vapours.

My usual method of administering pilocarpin is to inject into the back of the arms a solution of the nitrate of a strength equal to $\frac{1}{2}$ gr. to 10 minims. The dose at first, $\frac{1}{2}$ gr., is gradually increased to $\frac{1}{4}$, $\frac{1}{2}$, or, if well borne, $\frac{3}{4}$ gr. The effect is speedily manifested by diaphoresis and copious salivation. After each injection I give half a drachm of salvolatile in a small tumblerful of water. The patient is then made to lie on a sofa, and is well-covered with rugs, the head being enveloped in a shawl. When the effects are wearing off the wraps are removed, but only by degrees, in order to avoid the risk of catching cold. In the event of faintness or other discomfort from the exhibition of the drug I give brandy at once, which I keep ready at hand, and find the best restorative. Untoward symptoms need not be apprehended if the precaution of beginning with the small dose above mentioned be strictly adhered to.

Due attention to the foregoing particulars will enable me to reduce to comparatively few the number of cases amenable to treatment with pilocarpin. The histories of the following patients, some of whom, with others similarly affected, were sent to consult me by well-known practitioners, have been given mostly in the patients' own words, and speak for themselves. They serve, it will be found, both to illustrate the remarks just made and to corroborate the deductions arrived at in my previous papers.

CASE I.—Miss A. E., aged 39, treated by me three years ago, in answer to a letter I sent in February, 1892, writes as follows: "I am delighted to tell you that the improvement in my hearing is fully maintained.

When, three years ago, I first consulted you, I required a trumpet to hear a person speaking at my side in a raised voice. I could not hear a speech or sermon in any seat in any building, even with a trumpet. I now do without a trumpet entirely, and can hear a clear voice by my side slightly raised above the ordinary pitch, and with satisfaction to myself and the speaker. I can also hear speeches and sermons, if seated favourably. We think it most remarkable that my hearing could be improved after seventeen years of steadily increasing deafness. In 1869 I came to you in despair, deafness was gaining so rapidly, and then I could not hear a clock tick, and only what was said to me in a loud voice through a trumpet was audible. I may add that this lady had been treated regularly for seventeen years by means of inhalations, catheters, and the Politzer bag. Had I never relieved any other patient with pilocarpin, this case alone would have warranted me in going on with the remedy.

CASE II.—P. G., a barrister, aged 44, sent to me by Mr. Edgcombe Venning, thus recently reported of himself to me: "Deaf in both ears for three or four years, the right ear slightly, the left very deaf, and unable to hear conversation when the right ear was stopped. Commenced treatment by injection of pilocarpin, on February 22nd, 1891. First noticed change in hearing on March 20th. Found I could hear and appreciate conversation with the left ear, which I had been unable to do for about two years previously. My wife and friends likewise noticed the change. On March 25th I heard the chirping of birds outside the house, inaudible for years; and in conducting an arbitration case I sat with the witnesses on my left, which I had always avoided doing, and could hear them very well. On March 31st could hear persons talking to each other, and could join in conversation, a thing for a long time most difficult and trying to attempt. Later on, in April, dined with a friend, who, without suggestion on my part, remarked that I had not asked for a single observation to be repeated during the whole of dinner." "I noticed during the treatment that the noises in my left ear, which had been almost incessant for four or five months, steadily decreased. They are now nearly gone, ceasing entirely at intervals." In February, 1892, he further writes: "Ever so much better, and keep my hearing."

CASE III.—Miss M., aged 33, was treated by me for four weeks, and then, as she was going abroad, I transferred her to the care of Professor Politzer, who, under date November 17th, 1891, says: "I have the honour to give you herewith an account of my observations concerning Miss M., who came to consult me. According to her indications, her ear disease had lasted for six years, during which time her deafness had been progressively increasing. The buzzing in the ears is not constant, but is felt for a certain time every day. There is no hereditary disposition, and the tympanic membranes are normal. The improvement from treatment with injections of pilocarpin and massage of the ear-drum was very marked. I advised Miss M. to take up the treatment again under your care."

CASE IV.—Colonel W., aged 49, sent by Sir Joseph Fayrer, August, 1890, had suffered for four years in India from deafness of both ears, with constant annoying tinnitus aurium. He had had syphilis. After six weeks' treatment the hearing of his left ear was restored and that of the right slightly improved. In February, 1892, he called to say that his left ear was in as good condition as when he left off the treatment, and the tinnitus was far less.

CASE V.—Mr. B., aged 30, writes: "Before the pilocarpin I could not hear deep sounds, such as a waggon coming along the road, and sounds on the piano below the B-flat nearest the centre C on the piano were absolutely inaudible. Now, however, I can hear every note in the piano, and I am safe in the street from cabs, etc. People tell me that I am nothing like so deaf as I used to be, and that I have steadily improved." This patient was seen also by Professor Politzer.

CASE VI.—Surgeon-Major W., aged 56, writes: "I had rheumatic fever fourteen years ago, followed the next year by a severe attack of mumps, after which I had much deafness in both ears, with tinnitus. I carefully adhered to usual treatment by politzerisation, inhalation of ammonium chloride, and tonics, but with no avail. I was treated by injection of pilocarpin from the end of February, 1891, for six weeks, deriving very considerable benefit, both as to hearing and tinnitus. The hypodermic mode of administration is both agreeable and instantaneously effective." After further suggesting that pilocarpin may have a beneficial effect in catarrh, muscular rheumatism, and lumbago, he concludes: "I am indeed very grateful for the immense improvement in my hearing."

The next cases I will very briefly summarise, giving where feasible the patient's own comment upon the results of treatment.

CASE VII.—A. N., barrister (sent by Dr. Gowers), deaf for many years; first seen December, 1890. "My people are delighted with the improvement in my hearing, which is remarked upon by everyone." He still heard remarkably well in February, 1892. Six weeks' treatment.

CASE VIII.—Miss B., unable to follow general conversation. "Heard every word at church without an effort. I had not done this for eight years." Six weeks' treatment.

CASE IX.—Mrs. A., deafness 20 years (sent by Dr. Leadam), hitherto unbenefited by treatment. After five weeks under influence of pilocarpin, able to hear general conversation perfectly. Her sister's hearing was similarly restored.

CASE X.—Mr. H., long deaf (sent by Dr. Broadbent). "Now I sit at my ease and hear without any apparent effort." Five weeks' treatment.

CASE XI.—Miss C., aged 25 (sent by Dr. Pavy in December, 1888), had been very deaf for six years, and unable to hear unless addressed in a loud tone; tuning fork very indistinctly heard; under pilocarpin the improvement was most marked, and she is now able to hear general conversation fairly well.

CASE XII.—S. V., aged 52, deaf 20 years, during which time was subjected to frequent administrations of ammonium chloride vapours and insufflations from the Politzer bag, and notwithstanding much worse during the last six or seven years. "I am thankful to say I can hear as well as most people." Five weeks' treatment.

¹ Cases I, VIII, and X I have recorded previously, but I mention them again because the patients hear as well as after they were first treated two years ago. I have lately heard from both.

CASE XIII.—F. H., very deaf eight years (sent to consult me by Mr. Oliver Maurice, of Reading). "Just a line to thank you very much for curing my deafness." Four weeks' treatment.

In the three next cases aural vertigo was a prominent symptom.

CASE XIV.—Concerning this case Dr. Easton writes: "The patient, Miss R., you saw with me in May, 1890, was much benefited by the injection of pilocarpin you recommended. She had been suffering for nearly two years with tinnitus, accompanied every week or ten days by attacks of vertigo. I commenced injecting one-twelfth of a grain of pilocarpin on May 29th, increasing the quantity gradually to a quarter of a grain. On June 6th the tinnitus was much less. On June 13th she could hear a watch tick an inch from the left ear, whereas at first it was perceptible only when in actual contact. During the whole time (six weeks) that I continued the injections, she had no return whatever of vertigo, and I hear the improvement is maintained up to the present date, February, 1892."

CASE XV.—Miss M. had suffered for several years from labyrinthine mischief with aural vertigo, aggravated to such an extent during the last twelvemonth that she was unable to venture out alone. Dr. Moore, of Maidenhead, carried out the treatment with pilocarpin for five weeks, and the patient, who came to report herself to me some time afterwards, appeared to be quite well.

CASE XVI.—Captain J., aged 53 (sent by Dr. Pollock), commander of a large steamship, was obliged to discontinue his work on account of constant giddiness, which caused him to fall down. He had been deaf for many years. After five weeks' treatment he resumed his duties, and subsequently he wrote: "I thought you would be pleased to hear that up to the present I have had no attacks of vertigo."

In further illustration of my subject, I would advert to the testimony of Dr. Bronner in the *Lancet* for September 28th, 1889. He points out that improvement under treatment with pilocarpin cannot reasonably be hoped for where long-continued disease has caused much thickening and calcification of the membrana tympani, ankylosis of the ossicula, or extensive changes in the internal ear or auditory nerve; that one ought to be satisfied in chronic cases if it can merely arrest the progress of disease; and that in some acute or subacute conditions it may not only do that, but may even restore normal hearing. He, moreover, advocates the use of the Eustachian catheter in addition to injections of pilocarpin, when the deafness is not entirely due to affections of the internal ear. Dr. Bronner then proceeds to remark that he has used pilocarpin with very good results. One of his patients, a girl, aged 12, with a history of congenital syphilis, and suffering from a subacute affection of the middle and internal ear, could not hear the watch at all, even in contact, or loud speech at 2 metres, but after twenty injections of pilocarpin, she heard the watch with the right ear at 20, and with the left at 6 inches, and could distinguish whispers at more than 5 metres with either ear. I now learn from Dr. Bronner (February, 1892) that since the publication of his paper he has treated with pilocarpin ten cases. Of five of these, having a history of congenital syphilis and exhibiting symptoms of disease of the internal and middle ear, four did well and one did not improve. Of four others who had suffered from acquired syphilis two were much benefited. One case of subacute inflammation of the internal ear was very successful, as at first the watch was not heard on contact or a loud voice at two yards, and after treatment the watch was audible with the right ear at 12 and with the left at 18 inches, and a whisper at more than 4 metres with either ear.

In conclusion, I would reiterate my previous contention that, when suitable cases are chosen for treatment, pilocarpin is a most valuable remedy in labyrinthine deafness, especially that due to syphilitic taint. I do not pretend to deny that in not a few instances of indubitable labyrinthine disease the drug has proved inefficacious; but, on the other hand I maintain that with enlarged experience, due regard being had to the rules for diagnosis above indicated, one's powers of distinguishing individuals of the comparatively small class of patients likely to gain benefit from its administration are continually receiving accessions, past failures are rendered capable of explanation, and some approach can be made to a definite prognosis.

INSURANCE AND MEDICAL EXAMINATIONS.—It is interesting to note, writes a correspondent, that the Prudential Insurance Company paid last year in fees to medical men £50,000.

SMALL-POX is said to be increasing in Bombay, and fifty-two deaths occurred last week.

MEDICAL MAGISTRATE.—On the recommendation of the Lord-Lieutenant of the County, the Lord Chancellor has appointed W. Langford Symes, L.R.C.P., etc., of Kiltellan, to the Commission of the Peace for the County of Wicklow.