larynx. Amongst the former, 94 were completely successful, 17 partially successful, and 3 deaths; whilst amongst the latter, 15 were completely successful, 5 partially successful, and 4 deaths. Out of the total, 5 cases were cancerous, whilst out of the 7 fatal cases 5 were malignant.

In 1872, he published¹ in considerable detail all the cases he could find recorded up to that date in which the thyroid cartilages had been severed for the removal of morbid growths and found that there were 32 in number, excluding the 5 performed by himself or colleagues at Guy's Hospital between 1862 and 1872. Reference to these cases has been freely made in compiling the history of this operation. Out of a total of 37 cases, so far as the operation of thyrotomy was concerned, it was successful or partially so in 31, temporary benefit only in 4 which were cancerous, and only 2 deaths more or less directly due to the operation itself. It will be observed that during this period there was no discrimination whatever in the choice of cases—the majority being performed for papillomatous growth.

(To be continued.)

A NEW SYMPTOM OF LABYRINTH FISTULA.

BY S. H. MYGIND, M.D.,

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IN December, 1916, an elderly woman was brought into the ear and throat department of the Municipality Hospital suffering from a sup-puration of the left middle ear. The disease had lasted for about two months, lately a sudden and severe giddiness had appeared. The patient had for some years complained of congestions to the head, and now these were often followed by giddiness.

On our cleansing out the left ear she became giddy and showed a nystagmus to the left, but it was not possible to produce a real fistula symptom in the ordinary way. There was a slight nystagmus when looking to the right as well as when looking to the left; when looking straight forward the eyes were not kept perfectly quiet. I therefore let her look straight out through the biconvex spectacles of Bartels, and now the bulbi could be seen moving from one side to another with a peculiar "soft" regular rhythm. The movements were of an equal, horizontal-rotatory type and very small. I put my finger on the patient's pulse and discovered that it was beating in time with the movements of the eyes, each stroke of the pulse being accompanied by one movement to the left and one to the right.

This phenomenon I had not seen before. The reason for it, I thought, might be a pulsation in a hyperæmic tissue in a diseased labyrinth, the walls of which could yield to the endolymph, so that it might flow to and fro through the ampulla. Constantly changing movements of the eyes might thus be produced, and each single movement was to be considered as a slow vestibular phase of nystagmus.

Now it struck me that if I were right in my theory, a change of the circulation of blood in the labyrinth would produce an alteration of the

¹ "On the Operation of Opening the Larynx by Section of the Cartilages for the Removal of Morbid Growths," "Trans. Med. Chir. Soc.," 1872, lv, p. 17.

movements of the eyeballs. I therefore put my finger on the left side of the neck and pressed it against the carotid in order to block the flow of the blood to the left labyrinth. Immediately the patient's eyes made a pronounced nystagmus of horizontal-rotatory character to the right healthy side; somewhat later—the finger still compressing the carotid—it stopped and turned to the left. During the nystagmus the patient felt giddy, especially during the nystagmus to the left, which also seemed to be the stronger. Repeated experiments constantly gave the same results.

The operation confirmed my theory; the resection of the middle ear exhibited a fistula in the external semicircular canal, filled up by granulations. After the operation the patient went on all right, but three months later she suddenly developed labyrinthitis accompanied by meningitis, from which she died, although a resection of the labyrinth immediately was performed. The fistula looked exactly as at the first operation.

The case seemed rare and interesting, worthy of publishing, but I did not follow it up. I saw other cases of labyrinth fistula, but had nearly forgotten my observations, when I got a new case last November, that is about a year after the first one.

It was a man, who had chronic middle-ear suppuration on both sides. The right ear had been operated upon three months previously. As the hearing on this ear was so very poor as well before as after the operation, we had not liked to operate on the other ear, in which the hearing was comparatively good. But suddenly the patient was attacked with a severe giddiness with a nystagmus to the left side. In the left ear a large polypus was seen. We tried the fistula symptom in the ordinary ways several times, but without any result. I then remembered my first case, and put my finger on the left carotid of the patient. Immediately both eyes moved slowly towards the left, and then made a strong rotatory nystagmus towards the other side accompanied by giddiness. As I continued my pressure, the nystagmus stopped, but as soon as I let my finger go the eyes moved slowly to the right and then as a quick rotatory nystagmus to the left. A difference between nystagmus to the left and to the right was not to be found. All these phenomena could constantly be produced during several days. The caloric reaction was intact; the post-rotatory reaction perhaps showed a somewhat increased irritability of the left ear.

From this new symptom alone the diagnosis was made; a fistula in the left external semicircular canal filled up with granulations. The operation confirmed this. In the antrum and the middle ear a large massive cholesteatoma was found, sufficiently explaining why the ordinary fistula symptom could not be produced.

Since the operation a pressure on the carotid has not had any effect upon the eyes.

A few days afterwards another patient happened to come under treatment in our department suffering from a chronic suppuration in the right middle ear. Some days before he had had his first attack of giddiness.

It was impossible to produce any fistula symptom at all in this case, neither by compressing or aspirating as usual in the external meatus nor by pressing on the tragus. There was no spontaneous nystagmus. On compressing the carotid nothing abnormal was seen, but the eyes were difficult to observe, as the patient could not keep them steady,

and he became giddy, which circumstance raised suspicions that there might be a hidden reaction. Next day this was really obtained; a pressure on the carotid made both eyes move slowly to the right, followed by a few quick excursions to the left. A continued pressure had no effect, but as soon as the finger was removed there appeared a slow movement to the left and a nystagmus to the right. Giddiness accompanied the movement of the eyes. While the phenomena in the two first patients were well marked and very easy to observe, they were very slight in the last case and only to be seen by a trained eye. In all the cases the symptom was only obtainable by pressure on the carotid on the diseased side, a pressure on the other carotid or on the skin alone had no effect whatever.

In this case also a fistula in the external semicircular canal was diagnosed. The diagnosis was corroborated some days later by the producing of a nystagmus to the right side by compressing the tragus. The operation revealed a small fistula in the back part of the canal, filled with granulations. Since the operation my fistula symptom has disappeared.

The fourth patient was an officer, aged fifty-six, who for many years has had a suppuratation of the left middle ear. He had been perfectly deaf for a long time. Three months previous to coming under treatment he accidentally discovered that a pressure on the left tragus made him very giddy, but this phenomenon disappeared later on. There had been no real attack of giddiness. There was a slight headache and some pains in the left ear. The examination showed a fistula towards the antrum with some granulations and very little secretion. The left ear was perfectly deaf. The caloric reaction was intact; the postrotatory nystagmus only lasted a few seconds, especially to the diseased side.

An "inverse" fistula symptom was found, as compression in the external meatus produced a nystagmus to the sound side, and aspiration a somewhat stronger nystagmus to the diseased side; the slow phase was only slightly pronounced. The accompanying giddiness was only slight. There was some spontaneous nystagmus, now pointing to the one, now to the other side, and sometimes wanting. When the patient's eyes were observed looking straight forward through the spectacles of Bartels, they were seen to move steadily from one side to another synchronous with the beat of the pulse, just as in the first case.

By compressing the carotid a very fine fistula symptom was seen: after a somewhat faint, slow movement to the diseased side, the eyes turned with a strong, principally rotary nystagmus to the sound side. This nystagmus lasted rather long, about 15-20 seconds; first, when the pressure on the carotid stopped, the opposite movements were seen. Repeated examinations constantly gave the same results as to the effect of the pressure, but the eyes did not move each time when pressure ceased, but when they did so the movements were very marked, more even so than under pressure. As I demonstrated the case to the patient's medical man, and explained to him how the movements of the eyes synchronous with the pulse were produced, the patient said: "You are right; I always feel the pulse beating in my left ear, and it is as if what I am looking at is at each stroke pushed to the one side; for instance, when I am reading a book."

While thus the ordinary fistula symptom was inverse, and theoretically might mean a fistula to the vestibulum (a rule that is often

known to fail), my symptom was "regular," and indicated a fistula in the external semicircular canal. This was also found on operating. The fistula was large and oblong, it was dark, and was not, as in the other three cases, filled up with granulations, though such, of course, would have been found deeper down. In the antrum a cholesteatoma was found; above and in front of the facial spur some caries were seen, which accounted for a slight paresis of the facial nerve from which the patient had been suffering from for many years. The possibility, therefore, of another fistula existing leading to the vestibulum cannot be absolutely denied.

After the operation the spontaneous movements of the eyes disappeared. In the first days immediately after the operation a slight nystagmus to the sound side could be produced by compressing the carotid.

This new fistula symptom I have thus found in four cases, which are also the only cases of non-operated labyrinth fistula where I have tried my method. This symptom does not seem to have been described before.

By compressing and aspirating in the ordinary way a "fistula symptom without any fistula" can sometimes be found in patients suffering from syphilis, as first reported by Hennebert. In some of these cases Bárány (1) has also been able to produce a nystagmus by a pressure on the side of the neck; he believes that this is due to a compressing of the carotid. But, first of all, in these rare cases we are not dealing with a real fistula; and, secondly, Bárány has not shown the particular changing of the movements of the eyes by removing the pressure, which alone could prove that the eye movements, produced by compressing the side of the neck, are due to a mechanism corresponding to that of the movements produced by compressing-aspirating in the external meatus. I myself, however, am inclined to believe that such a correspondence really exists. By patients suffering from syphilis we perhaps have to deal with an abnormal vascularisation in a labyrinth, the stapes of which is capable to give way in an abnormal degree.

In the discussion on the Bárány report referred to above, V. Urbantschitsch related that he had several times seen a nystagmus produced by compressing the side of the neck. He does not say anything about labyrinth fistula, and explains it as a "reflectory" nystagmus. In his text-book of otology, to which he refers, I have not been able to find anything that bears any relation to my observations.

Neither is anything to be found in the detailed works of the last years, such as those of Hofer (2) and Ruttin (3), both published from Urbantschitsch Clinic in Vienna.

Ruttin, in the discussion referred to above, reported a case of nystagmus produced by pressure on a large emissarium mastoideum; and O. Beck communicated a case of chronic catarrh of the middle ear, where a nystagmus was produced by vibrating massage of the sternocleidomastoid muscle. In none of these cases was a changing of the nystagmus by cessation of pressure mentioned.

V. Urbantschitsch has since published a peculiar case of cholesteatoma of the middle ear with fistula of the labyrinth, and also fistula symptom produced by compressing-aspirating in the ordinary way; a nystagmus could also be produced by pressure on a certain spot on the back of the head, but only when the patient bent her head to the diseased side. When the spot was made anæsthetic, a pressure on it no longer had any effect. In such a case we have perhaps to do with a nystagmus of a combined reflectory and "vascular" origin.

Rocking, rotatory, uniform movements of the eyes by looking straight forward have been described before in cases of labyrinth fistula by Bárány, Hofer, and Ruttin. Ruttin has explained the phenomenon correctly as consisting of two slow phases of oppositely directed nystagmus, but their origin neither he nor Hofer, who has seen five such cases, have been able to make out, as they have not discovered that the movements are synchronous with the pulse.

I should think that a systematic investigation of this new fistula symptom might perhaps throw some light on the syphilitic diseases of the labyrinth and on some forms of "reflectory" nystagmus; but my principal hope is that it may be of some help in elucidating several questions as to labyrinth fistulas themselves.

I am inclined to believe that the directions of the nystagmus produced by my method, in opposition to the ordinary fistula symptom, gives a more reliable basis for the differential diagnosis—fistula leading to the vestibulum or to the (external) semicircular canal. In the first case we have to expect—by compressing the carotid—a slow phase to the diseased side, followed by a quick phase to the sound side, and by removing pressure just the opposite movements; while we, in the second case, should meet with a slow phase to the sound side and a quick to the diseased side during the pressure, and with the opposite movements when removing it. Thus it will be seen that the carotid pressure generally acts like the aspirating in the ear duct, the cessation of it as the compressing.

When we, by the ordinary method, obtain an "irregular" fistula symptom—that means to say, another direction of the nystagmus than we, in accordance with the localisation of the fistula, should have expected—this has been explained by Herzog (5) in the following way: To produce a flow of the endolymph, strong enough to irritate the nervous epithelium of the ampulla, a moving inward of the fistula by pressure on it is not sufficient. To make the endolymph flow through the ampulla it is necessary that the membrane of the fenestra rotunda moves outwards, and in this way increases the capacity of the vestibulum. But in some cases where the fistula itself is isolated by granulations and cholesteatoma from the effect of compressing or aspiration, this may act instead on the fenestra; this being pushed inwards now makes the endolymph stream the opposite way to formerly, *i. e.* backwards, the seat of the fistula moving outwards. The result is a nystagmus in the opposite direction to formerly, but the site of the fistula is in both cases the same.

I think this is a very plausible theory, but there are certain forms of fistula symptoms which, in my opinion, cannot be explained by it. In cases where a nystagmus to the same side is produced as well by the compression as by the aspiration, I prefer my "vascular" theory.

When sudden movements of the head sometimes are followed by an attack of giddiness and nystagmus in patients suffering from labyrinth fistula, this may be due to a changing of the blood circulation in the fistula, produced by the action of the muscles of the neck (especially in bending backwards). A direct effect on the endolymph by the movement of the head seems less probable, as the experimental postrotatory giddiness generally is wanting or very slight by these patients.

I believe that my fistula symptom also indicates an active inflammation of the fistula. The symptom seems to disappear after the operation, perhaps because there now is room in the middle ear, so that the granulations yield in this direction for the pressure of the blood.

Whether the symptom may occur without there being any fistula we cannot yet tell. Perhaps a very feeble symptom may be seen by a circumscribed labyrinthitis without any fistula. But I should not think that it is to be found in a sound labyrinth, as is the ordinary symptom. Then we must remember that the pressure used by my method, *i. e.* the pressure of the blood, is much less than the pressure produced by the balloon of the old method. I, therefore, also believe that there is not so much risk attached to the new method. Besides, it is very simple, and if the investigator is not experienced in observing the sometimes rather slight nystagmus, it is sufficient to notice whether the patient gets giddy or not. By a pressure on the other side he will be able to control, whether the giddiness is due to an irritation of the labyrinth or to an anæmia of the brain. I think we here have a method of value to every practitioner, for it is doubtless a frequent symptom, indeed, is probably present in as good as all cases of non-operated labyrinth fistula.

How much of these expectations as to this symptom the future will realise it is impossible to say, but it is certain that the phenomenon has in the four above-mentioned cases given valuable indications where other symptoms of labyrinth fistula have been uncertain or entirely absent. It is, therefore, desirable that this symptom should in future become a regular part of the general otological examination to the same extent as the hitherto practised fistula method.

I have to express my thanks to the director of the Ear and Throat Department of the Commune Hospital of Copenhagen, Prof. Holger Mygind, who performed all the operations mentioned in this paper, for allowing me to publish these cases.

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SOCIETIES' PROCEEDINGS.

ROYAL SOCIETY OF MEDICINE—LARYNGOLOGICAL SECTION.

March 2, 1917.

President: MR. T. MARK HOVELL.

Laryngeal Stridor due to Chronic Osteo-arthritis, relieved by Dilatation.—J. Dundas Grant.—The patient, a woman, aged over sixty, had suffered with discomfort in her throat for over fourteen years, and in the early part of 1912 developed a hard cough and noises in respiration observed mainly during sleep. The stridor was extremely