ligamentous muscular bands, which contract the colon, form with it the appendix, and present a part which is insensibly developed, and foreshadows (in furnishing the augmentation of the cæcum) the thinning of the coats, and perhaps in certain cases, the rupture of this intestine, preserving always by this arrangement, of the three bands placed along the length of the colon, an equal and durable force, which would not have been the case if they had been placed transversely and sustained the fundus. It is also to preserve this function, and to render it solid and durable, that nature has thrown a little on one side, the narrowing of the cæcum; the weight of matters thus acts less directly on this part, and development is a little more difficult, and with a slowness which is an advantage. It is quite true that in the appendix there is filtered a mucus; and therefore we should regard it as one of the uses of this part, to furnish a matter capable of lubricating the cæcum, but which, at the same time, is capable of opposing efficiently the extension of the walls of this little intestine which we may regard as a corner stone.

The contraction and the folds of this part, which are larger as the appendix is elevated, and more favorable to turn out the liquor which is filtered into the cæcum, and are intended to prevent the too rapid flow of the mucus, the presence of which in the appendix is necessary to the preservation of its state.

From all these economic views of the use of the appendix vermiformis, it is easy to deduce all the natural or accidental varieties that this part may present in different subjects and all ages. Why, for example, when the appendix corresponds to the fundus of the cæcum, we find it larger and less shrunken? Why, as age increases, this part is found shorter than in subjects where the appendix is placed on the side, and as in this last case, when the appendix is much narrowed and very long, we find in the progress of age the cæcum capacious and its walls very thin. We explain also easily, why women who have had children, have the appendix short, and the cul-de-sac of the cæcum very long; in a word, there are no phenomena which I have mentioned above, which may not be ascribed to this explanation, and confirm at the same time, the use which I believe should be assigned to the vermiform appendix.

TREATMENT OF ACUTE AND CHRONIC PURULENT INFLAMMATION OF THE MIDDLE EAR (OTORRHEA).

Read before the Philadelphia County Medical Society, April 25, 1888.

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The cavity of the tympanum, or middle ear, in health is filled with ever-renewed air by the Eustachian tube, and thus the waves of sound reach the labyrinthine nerve of the ear. It is deeply and securely situated in the temporal bone. It measures 2 lines from the membrana tympani inward, its

breadth and height being about one-half inch, and its shape is the form of a cube. The cavity of the tympanum is apparently lined with a continuation of the mucous membrane of the Eustachian tube, and yet the epithelium is distinct—that of the Eustachian tube is ciliated, whilst in the middle ear it is tessellated, or in squares. This epithelial and subepithelial lining takes the place of a periosteum by transmitting the blood-vessels which supply the bones. This latter fact is important to notice, as any serious affection of this membrane will ultimately react upon the nutrition of the bones forming the cavity, thus resolving a severe catarrh into an otitis. The existence of this mucous cushion is the reason why affections of the middle ear are so numerous in young children. The close contact of the jugular vein to the cavity of the tympanum exposes it to the influence of pus collecting on its floor.¹

In acute otitis media, or inflammation of the middle ear, there are frequently but slight pathological changes in the ear except swelling, deep redness, and small perforations of the membrana tympani. The discharge is either mucus or mucus and pus. This can be shown by the pus dissolving in water, and the mucus found floating on the top.

By the use of anodynes, cocaine, chloroform, morphia, etc., pain is relieved; with the internal use of tincture of aconite, antipyrin, frequent hot foot-baths, with local depletion, inflammation is checked. The parts should be cleansed with a mild, warm, antiseptic wash, and, as a rule, all goes well. The case generally recovers in a short time, without any permanent injury to the hearing apparatus, if not neglected. You, medical gentlemen, are all familiar with this disease in young persons and children, the latter having as many as two, three, and even four, acute attacks during teething, or the result of the exanthemata or cold. This disease is now so well known and, as a rule, so promptly treated, that a much smaller number of cases are now permitted to pass to the second stage of inflammation of the middle ear—the purulent variety—which causes such extensive changes in the hearing apparatus. In such cases of acute otitis media Zaufal finds exclusively the two forms of microbes found by Friedländer and Fränkel in pneumonia, viz.: a large, short bacillus, encapsulated, and a diplococcus, also encapsulated. He has also shown that the exudation in acute otitis media, before rupture of the membrana tympani, contains pneumococci to the exclusion of all other microorganisms, and that these, introduced into the nasal fossæ, can give rise to a meningitis without irruption of the cranial envelope.²

In collecting a large number of cases of suppuration of the middle ear, which includes three or four years, I find that, out of 1,700,454 were acute, while 1,246 were chronic; 18 had facial paralysis, while the balance included polypi, caries, necroses, cholesteatomata and tubercles. Let me dwell, for a short time, upon some of these changes, the most important and extensive of which are found, not in the

¹ Extract from the author's Clinical Manual of Diseases of the Ear, 1871 and 1878. Philadelphia: J. B. Lippincott Co.

² Annales des Maladies de l'Oreille, January, 1888.

meatus or that portion of the ear covered by skin, but in the mucous membrane of the middle ear, back of the membrana tympani, extending into the mastoid cells, and through the Eustachian tube to the throat and nose. After this disease has existed for some time, there is an increase of the bulk of the mucous membrane, caused by excessive infiltration with round cells, and enlargement, with new formation of vessels.

The subepithelial layer, stripped of its epithelium, is replaced by round cells; a suppurating, granulating surface, traversed by many vessels, takes its place. The purulent process leads to destruction of the tissues, to ulceration and wasting of the mucous membrane, which is eaten away so that the bone is often laid bare.

This is especially the case in tubercular otitis media purulenta, and it has been demonstrated by numerous post-mortems that they tend in a very short time (six to eight months) to extensive necrosis of those parts bordering on the diseased middle ear, and extending into the labyrinth, the rapid course of the disease being due to the tubercular diathesis.

It is also often the case, in this form of disease of the ear, that tinnitus and impairment of hearing precede the perforation, which is most generally painless, but with rapid destruction of the drum-head. By the transformation of the round cells into spindle-shaped, there occurs a formation of a firm connective tissue, which leads to abnormal adhesions between the membrana tympani, the ossicula, and the walls of the tympanic cavity, producing permanent deafness. The membrana tympani almost always suffers a loss of its structure, and in severe and protracted cases we have large perforations.

Treatment.—These perforations are most ordinarily treated by a combination of alteratives, so as to modify the nutrition and prevent the destructive tendency from gaining headway. The local application is also of importance, especially such remedies or local means as change the surface of the granulations, gently stimulate and cleanse them. No agent in our hands has acted so promptly and well as very finely *levigated* boric acid, alone or in combination with iodoform, the latter to act as a true antiseptic, using 1 part of the iodoform to 10 of boric acid. Boric acid used alone should be sterilized, by heating before using on a platina foil, as it contains fungi and bacteria when kept for some time. The powder must be carried down to the perforation, and through it as much as possible, so as to reach the diseased mucous membrane and the Eustachian tube with the little instrument I show you. If it is blown in, it adheres to the edges of the auditory meatus, causing irritation, and sometimes small abscesses. This powder has a stimulating and an astringent effect, just as alum used in the same manner. It should be packed carefully, so that the diseased membrane be fully covered. It is not necessary to seal it; indeed, it is almost impossible to cause the retention of the pus in the cavity, as the powder absorbs it, and the former when applied produces a watery discharge by its stimulating effect, so that the patient will be obliged to wipe off the liquid.

As to boric acid causing retention of the secretion in the treatment of necrosis of the temporal bone, or in a large perforation, it has not acted so with me. I have used boric acid since 1881, after my return from Europe, and like its introducer, Friedrich Bezold, of Munich, I have been convinced of its efficacy in these severe cases, and that the objections to its use—*i. e.*, its causing retention of the secretions—as advocated by some, are entirely without foundation. According to his and my own experience, extending over a period of seven or eight years, its use has always been followed by favorable results, so *he* had no reason to modify his statements made in 1870,² as to its therapeutic value. He has also confirmed his opinion of the unreasonableness of these objections by a series of physiological experiments, in which he tested the capacity of absorption of powdered boric acid for fluids outside of the body, before, as well as after, saturation and drying out of the powder with purulent secretion which enclosed in a glass tube covered with a perforated membrane was exposed to the influence of fluids from the ear.

This special mode of treatment is peculiarly applicable to large perforations of the membrana tympani; when the perforations are small they are more effectually treated by a solution of boro-glyceride, carbolic acid, or peroxide of hydrogen.

When the perforation is situated in the membrana flaccida or Shrapnell's membrane, with disease of the attic of the tympanic cavity, we resort to a syringe (intertympanic), or a catheter to which a soft rubber ball with a double valve is attached, to withdraw the fluid, and not let it return when diseased; either of which is inserted into the perforation and the parts washed with a solution of peroxide of hydrogen or an antiseptic. If carious bone be found, covered with polypi, the latter should be snared and the dead bone removed; but if the bone be found only inflamed it should be treated by diluted nitric or carbolic acid, to stimulate the granulations and restore it to its normal condition. All tearing and cutting operations—as these tend to malignant disease—must be avoided; everything should be done with extreme care and gentleness. When pus blocks the tympanum in disease of the middle ear the tuning-fork is heard better through the air than through bone. But when the pus is removed, and the inflammation is reduced the bone conduction will again improve as the pressure has been removed from the labyrinth.

It has been found that functional disturbances in hearing are produced by chronic purulent inflammation, by the cicatrices and changes in the membrana tympani, and adhesions before referred to in the middle ear, after all discharge has ceased. First, the alterations in tension of the sound-conducting apparatus, caused by the cicatrices producing irregular vibrations in the membrana tympani. Second, cicatrices which cause adhesions of the membrana tympani with the promontory, and the articulation of the incus with the stapes, impeding the power of vibration of the ossicula. Third, if the adhesions are confined to the portion of the membrana tympani situ-

² Arch. für Ohrenheilkunde, Band xv, and in the *Ärztliches Intelligenzblatt*, 1881, No. 26.

ated below the handle of the malleus the acuteness of hearing has been found to be considerable, while adhesions in the upper half of the membrane produce more disturbance of the hearing, or deafness, especially when the handle of the malleus is drawn inward and ankylosed with the promontory. Fourth, it has been proved that imperfect hearing power may exist even in cases of extensive destruction of the membrana tympani, and with the loss of all the bones, except the foot-plate of the stapes—that is, if it were movable, and the membrane of the fenestra rotunda was not thickened. The regularity of our perception of tones is due to the deadening of the sounds produced by the ossicles, the membrana tympani can only be properly considered as a sound conductor in connection with the ossicles. Even if fair hearing of speech and music remain, the removal of the membrana tympani, or protecting membrane of the tympanic cavity, is dangerous to life, for it is deprived of a covering which is essential to its continuation in health. To retain and restore to a healthy condition the diseased and ulcerated bones of the ear and the membrana tympani is of the utmost importance.

Extension of this chronic purulent disease of the ear by the Eustachian tube as a pus-carrier, produces disease of the upper part of the nasal cavity, by developing polypi, enlarging the pharyngeal tonsils, adenoid growths, and hypertrophic enlargements of the turbinated bones and ozæna.

We fully agree with Politzer, that combinations of ozæna with disease of the ear are much rarer than we would suppose, from the extension of the process toward the entrance of the Eustachian tube. When the ear is implicated, the mucous membrane of the middle ear becomes most frequently sclerosed. In many cases of deviations of the septum we have found perfect hearing, unless complicated with prior ear disease, or exostitis extending through the whole line of the meatus; these are removed by the dental engine. Such cases suffer from coryza or cold in the head, commonly so called, but are promptly relieved by a 4 per cent. solution of cocaine. There are also many cases of anterior nasal polypus which do not produce deafness.

One of the chief causes of deafness is the extension of the pharyngeal tonsil into the tuberosity of the Eustachian tube, and even into its ostium. In the so-called ethmoiditis of "Woakes" there is not necessarily any causal connection between the ear and these affections; in many cases the nasal trouble has long existed without involving the ear. If the ethmoid cells become diseased, or necrosed near the Eustachian tube, then we may have paresis of the palate attended with a distressing form of tinnitus, as in one case under our care, there was perforation of the membrana tympani from extension of the irritation through the Eustachian tube. In this case the patient recovered under local and constitutional treatment. The removal of the diseased spicula of bone, or hypertrophied tumors from posterior portions of the turbinated bones, improves the deafness of cases of long standing, when attended with retraction of the membrana tympani, the results of naso-pharyngeal disease. There is an abso-

lute necessity that the pressure of the air—which is fourteen pounds to the square inch—should be equal on both sides of the membrana tympani, and all obstructions to this must be removed to attain perfect hearing. It is of importance that our patients, convalescent from chronic purulent ear disease, should breathe through the nose, and be able to shut the mouth, especially when sleeping, to prevent the drying effects on the throat and Eustachian tube. This is accomplished by a mouth-band tied behind the ear, as recommended by Delstanche, in the case of children, after the removal of the cause. The proper treatment of the naso-pharyngeal disease should always precede this, in order to see that nothing obstructs the respiration, and to watch the controverting effects of all operations by the use of nasal tents of laminaria, or those of platinum, or glass covered by soft rubber, and thus keep up nasal intubation.

1502 Walnut St., April 25, 1888.

MEDICAL PROGRESS.

TRANSPLANTATION OF NERVE FROM THE RABBIT TO MAN.—DR. GERSUNG, of Vienna, assistant to Professor Billroth, has recently performed a novel and interesting operation—the transplantation of nerve from the rabbit to man. The case has not hitherto been published in any medical journal but, owing to its general interest, the bare fact had found its way into the lay newspapers. Our Vienna correspondent has received from Dr. Gersung a verbal account of the salient points of this most remarkable operation, which has so far been conspicuously successful. The patient is Professor von Fleischl, the distinguished occupant of the chair of physiology in the University of Vienna. Sixteen years ago he accidentally wounded himself while conducting a post-mortem examination, and severe inflammation of the whole right upper limb ensued. During the course of the disease the terminal phalanx of the thumb became gangrenous. The stump thus left was painful, and later on reamputation was performed. This was followed by the formation of neuromata. For this condition the branches of the median nerve which supply the thumb were first resected, together with the terminal neuromata, and at a later period, when new neuromata began to develop, the central parts of the same nerve, together with the branches of the radial nerve which supply the thumb, were resected. Fresh neuromata now developed on the branches of the median nerve, which were treated, without any success whatever, by the injection of hyperosmic acid and electrolysis. Two years ago the neuromata were resected again, and the resection of the nerves was continued as far as the "ligamentum carpi volare;" on this occasion, the branches which supply the radial and the ulnar sides of the index, as well as the radial side of the middle finger, were resected to a great extent. The forefinger now became anæsthetic, except the dorsal aspect of its first phalanx, which, as is known, is supplied by the radial nerve;