THE PATHOLOGY OF DEAF-MUTISM.

By J. S. FRASER, Edinburgh.

(*From the Laboratory of the Royal College of Physicians, Edinburgh.*)

PROBABLY the best method of classifying cases of deaf-mutism is to divide them into :—(1) those due to an error in development (constitutional or congenital deaf-mutism); and (2) those due to inflammatory conditions (inflammatory or acquired deaf-mutism), though it must be admitted that a sharp boundary line between these groups cannot always be drawn.

(1) Under developmental or congenital deaf-mutism there are two groups:—(*a*) the sporadic form, well known in this country; and (*b*) the endemic form, frequently seen in Switzerland.

(2) The inflammatory or acquired variety includes cases due to (*a*) traumatism; (*b*) congenital syphilis; (*c*) meningitic labyrinthitis; and (*d*) labyrinthitis following otitis media.

(1) (*a*) **Sporadic Congenital Deafness.**—In this there are four subgroups:—

(i) Aplasia of the whole labyrinth (Michel's type) is very rare and is probably due to non-formation of the otic vesicle in the first month of fœtal life.

(ii) Malformation of the bony and membranous labyrinths (Mondini's or Alexander's type). The bony capsule of the cochlea is flattened from base to apex and the normal arrangement of the scalae is present only in the basal coil. In the upper part there is a wide common space. Corti's organ may be absent or may show an embryonic form, while the cochlear ganglion is situated centrally in the modiolus and does not take a spiral course. The condition corresponds to that seen in the lowest mammals, the duckmole and echidna. A similar condition of the cochlea is seen in the second and third months of fœtal life. The development of the cochlea takes place from base to apex, so that if development is arrested at a certain point, the septa between the higher scalae fail to form, and consequently we have the production of a wide space (cloaca) at the apex of the cochlea.

Figs. 1, 2, 3 and 4 are from a case of congenital deaf-mutism in an idiot boy. They show almost total absence of the labyrinth of the left ear (Figs. 1 and 2)—a condition approxi-

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mating to Michel's type—and deformity of the cochlea of the right ear (Figs. 3 and 4)—Mondini's or Alexander's type of congenital deaf-mutism.

(iii) Malformation affecting both the cochlear and vestibular apparatus. This form is said to be associated with retinitis pigmentosa and feeble mental development. The vestibular reactions are greatly diminished or absent, and the patient's gait is uncertain. The most marked features on microscopic examination are hypoplasia of the sensory epithelium in both parts of the membranous labyrinth, atrophy of the cochlear and vestibular ganglia, alterations in the blood-vessels and changes in the brain. The conditions found in the labyrinths of waltzing mice are somewhat similar to those described above. (No specimen.)

(iv) Sacculo-cochlear malformation (Scheibe's type). About 70 per cent. of cases of congenital or developmental deaf-mutism belong to this type, in which the utricle and canals (pars superior) are intact and the vestibular apparatus reacts normally to the rotation and caloric tests. Hearing remnants are often present. On microscopic examination the saccule and cochlear canal (pars inferior) are usually collapsed but may be abnormally dilated. Corti's organ is, as a rule, absent in parts and in others malformed. The membrana tectoria does not reach the malformed Corti's organ but in some places is tucked into the internal spiral sulcus, while in others it is attached across the scala media to the stria vascularis. The stria itself may form a polypoid projection. The spiral ganglion is usually atrophied.

Figs. 5, 6, 7 and 8 are from a case of congenital deaf-mutism of Scheibe's type in which the cochlea and saccule are malformed but the vestibular apparatus is normal. Figs. 5 and 6 are from the left ear and show dilatation of the cochlear canal, extreme malformation of Corti's organ, membrana tectoria attached to stria vascularis (Fig. 5) and membrana tectoria lying on Hushke's tooth (Fig. 6). Figs. 7 and 8 are from the right ear of the same patient.

Figs. 9, 10, 11 and 12 are from a congenitally deaf white bull terrier. Note that congenital deafness and albinism are often associated.

(1) (*b*) **Endemic or Cretinic Deafness (Siebenmann's Type).**—According to Nager the average number of deaf-mutes in Europe is eight in ten thousand, but in Switzerland it is twenty-four in ten thousand. In more picturesque language,

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it has been said that deaf-mutism in Europe diminishes from the Alps towards the sea.

Stein states that 25 per cent. of cretins have normal hearing, 45 per cent. slight deafness, 25 per cent. severe deafness, and 5 per cent. absolute deafness. Nager gives the following figures:—among cretins there are 29 per cent. of deaf-mutes and 32 per cent. hard of hearing.

Microscopic examination of the ear shows myxomatous thickening of the submucous tissues of the middle ear often filling up the window niches. The tympanic cavity may even be obliterated. In one of Nager's cases the malleus and incus were deformed and the long process of the incus and the head and posterior limb of the stapes were adherent to the facial canal (Fig. 13). There may be thickening of the footplate of the stapes, or even bony ankylosis to the margins of the oval window. The whole wall of the promontory may show hyperostosis (Fig. 14). Endostoses have been reported growing into the hollow spaces of the cochlea, vestibule and canals, with resulting deformity of the scalae, etc. Few writers have reported any gross abnormality in the labyrinth itself, but in one of Nager's cases the cochlear duct was dilated in the lower and collapsed in the upper part. Alexander found marked degenerative changes in Corti's organ. The vestibular apparatus is normal. Nager states that the condition arises about the sixth month of fœtal life and continues even after birth.

According to Nager, tuning-fork tests show that many cretinic deaf-mutes are really only hard of hearing. This degree of deafness, however, in conjunction with the feeble mental development of the patient, results in deaf-mutism. Nager further states that the deafness is not always due to defects in the ear but may be caused by changes in the cerebral cortex.

Figs. 13 and 14 are from microscopic slides from cases of endemic or cretinic deafness kindly presented by Professor F. R. Nager, of Zürich. Fig. 13 shows the deformed stapes adherent to the posterior margin of the oval window and facial canal. There is also well-marked malformation of Corti's organ in all coils and absence of the spiral ganglion in the basal coil. Fig. 14 shows deformity of the stapes, hyperostosis of the promontory and marked narrowing of the round window niche which is filled with connective tissue.

(*a*) **Inflammatory or Acquired Deaf-Mutism.**—(*a*) *Deaf-mutism may be due to trauma*, e.g., fracture of the cranial base

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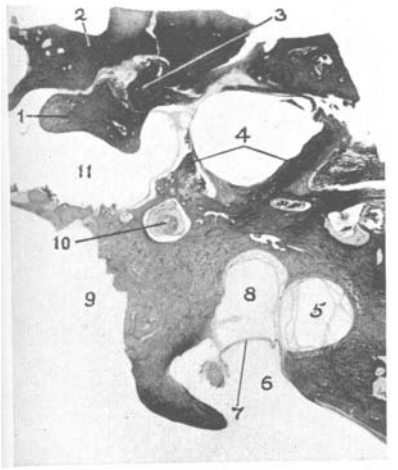


FIG. 1.

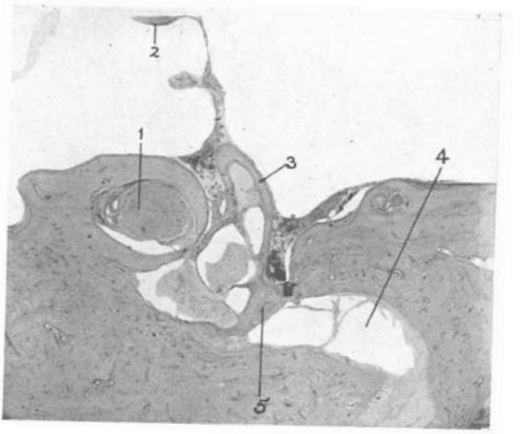


FIG. 2.

FIG. 1.—From a case of congenital deaf-mutism in an idiot boy. Horizontal sections through left ear. No. 52. × 4 diam. 1, Incus. 2, Outer wall of aditus. 3, Malleus. 4, Tensor tympani tendon and muscle. 5, Basal coil of cochlea? 6, Internal meatus (note absence of cochlear nerve). 7, Dura mater in fundus of meatus. 8, Probably perilymph space of maldeveloped cochlea. 9, Posterior fossa: normally this position would be occupied by the vestibule. 10, Facial canal. 11, Internal attic.

FIG. 2.—From same case as Fig. 1. Horizontal section through left ear. No. 110. × 12 diam. 1, Facial nerve. 2, Incus. 3, Anterior crus of stapes (note that the posterior crus is adherent to the facial canal). 4, Vestibule. 5, Deformed footplate of stapes.

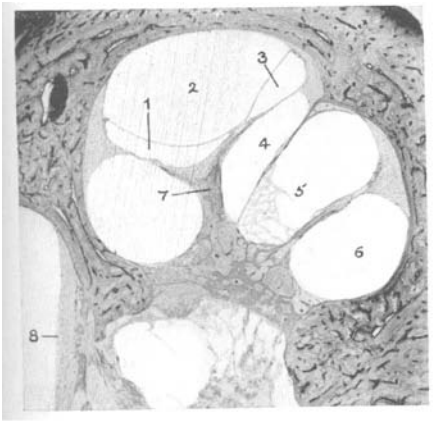


FIG. 3.



FIG. 4.

FIG. 3.—From same case as Fig. 1. Right ear. Section 234. × 12 diam. 1, Scala media of upper part of basal coil. 2, Cloaca. 3, Cochlear canal, and 4, Scala tympani of the rudimentary middle coil. 5, Scala vestibuli of lower part of basal coil (note remains of embryonic connective tissue). 6, Scala tympani. 7, Rudimentary modiolus. 8, Lower part of saccule.

FIG. 4.—From same case as Fig. 1. Right ear. Section 234. × 50 diam. Showing scala media of basal coil, which is collapsed. Corti's organ and membrana tectoria are rudimentary but the stria vascularis and the spiral prominence are well formed.

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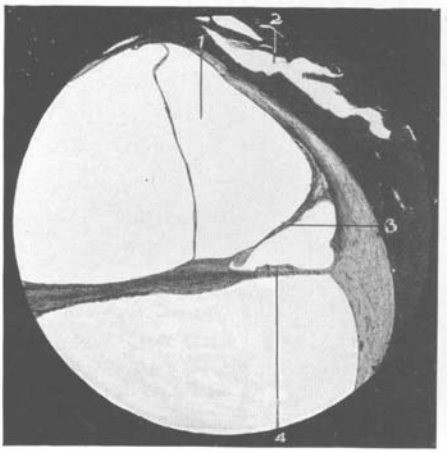


FIG. 5.

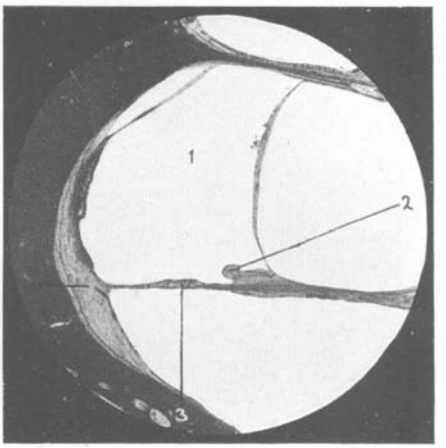


FIG. 6.

FIG. 5.—From a case of congenital deaf-mutism of Scheibe's type. Left ear. Horizontal section through upper part of basal coil, No. 250. × 45 diam. 1, Dilated cochlear duct. 2, Split in the bony capsule (artefact). 3, Adhesion between membrana tectoria and stria vascularis. 4, Rudimentary Corti's organ.

FIG. 6.—From same case as Fig. 5. Horizontal section through lower part of left middle coil, No. 250. × 45 diam. 1, Dilated cochlear duct. 2, Membrana tectoria lying on the apex of the limbus. 3. Rudimentary Corti's organ. 4, Spiral ligament showing dropsical degeneration. The stria vascularis appears to be well formed.

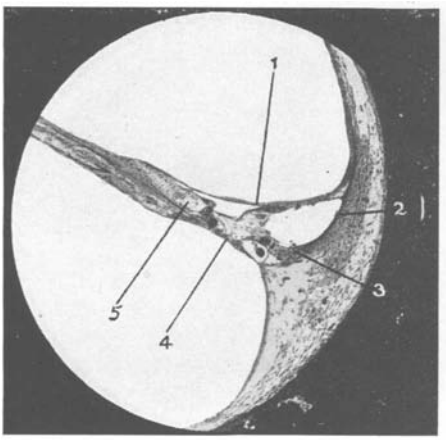


FIG. 7.

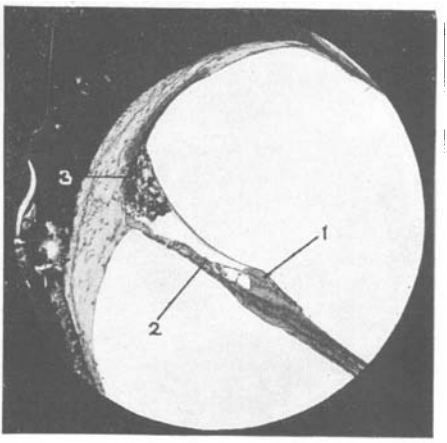


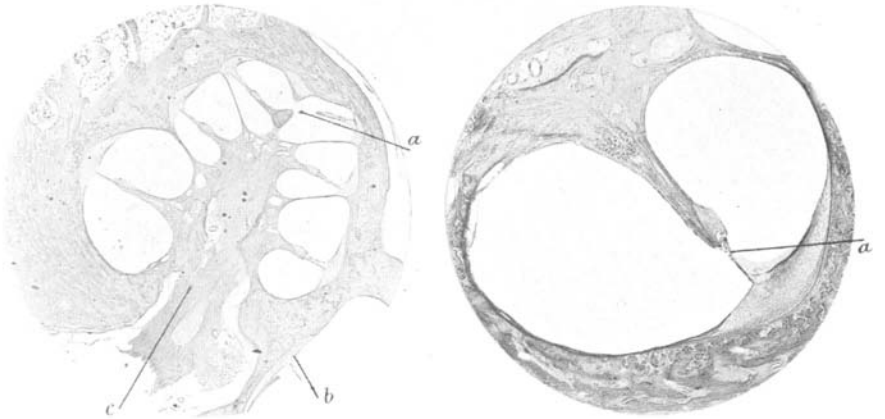
FIG. 8.

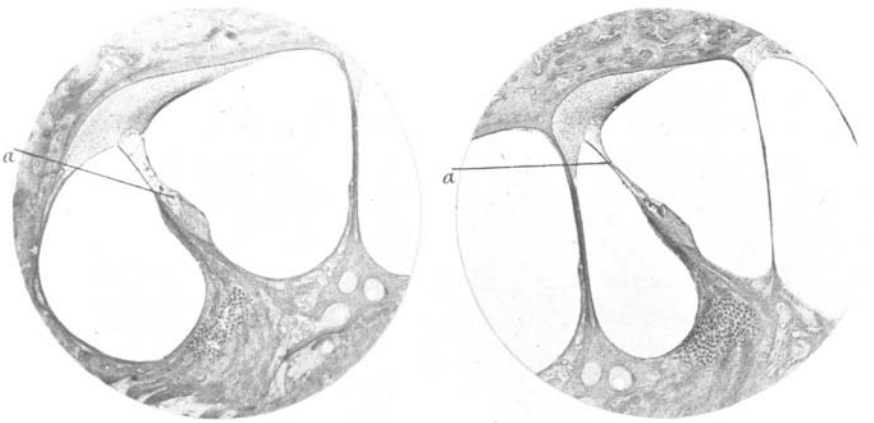
FIG. 7.—From same case as Fig. 5. Right ear. Vertical section through upper part of basal coil, No. 55. × 50 diam. 1, Reissner's membrane depressed and attached to deformed Corti's organ. 2, Position of stria vascularis, which is absent. 3, Position of spiral prominence. 4, Basilar membrane. 5, Membrana tectoria tucked into internal spiral sulcus. It will be seen that there is a complete malformation of the epithelium lining the cochlear canal, which is represented by at least four spaces in the section.

FIG. 8.—From same case as Fig. 5. Vertical section through lower part of right middle coil, No. 55. × 50 diam. 1, Membrana tectoria, which lies beween the origin of Reissner's membrane and the limbus. 2, Rudimentary Corti's organ. 3, Great proliferation of stria vascularis, which occupies the outer third of the narrow cochlear canal.

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9 10





11 12

FIG. 9.—Horizontal axial section through right cochlea of congenitally deaf white bull-terrier pup. Section 120. × 10 diam. Note that the bony capsule and modiolus are normally formed. *a*, Helicotrema ; *b*, Collapsed saccule ; *c*, Normal cochlear nerve.

FIG. 10.—Horizontal section through lower part of basal coil of right cochlea of same case. Section 150. × 30 diam. *a*, Collapsed cochlear duct. Note that the spiral ganglion and nerve are normal.

FIG. 11.—Horizontal section through upper part of basal coil in same case. Section 150. × 42 diam. *a*, Membrana tectoria tucked into internal spiral sulcus. The cochlear duct is collapsed and Corti's organ malformed.

FIG. 12.—Horizontal section through upper part of middle coil in same case. Section 150. × 45 diam. *a*, Complete collapse of cochlear duct, Reissner's membrane being adherent to the basilar membrane. The membrana tectoria as in Fig. 11. Note well-developed ganglion cells.

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FIG. 13.—Endemic deafness. Specimen kindly presented by Professor Nager. × 5½ diam. Shows 1, Head and posterior crus of stapes adherent to facial canal and posterior edge of oval window. 2, Facial canal: the nerve is very small.

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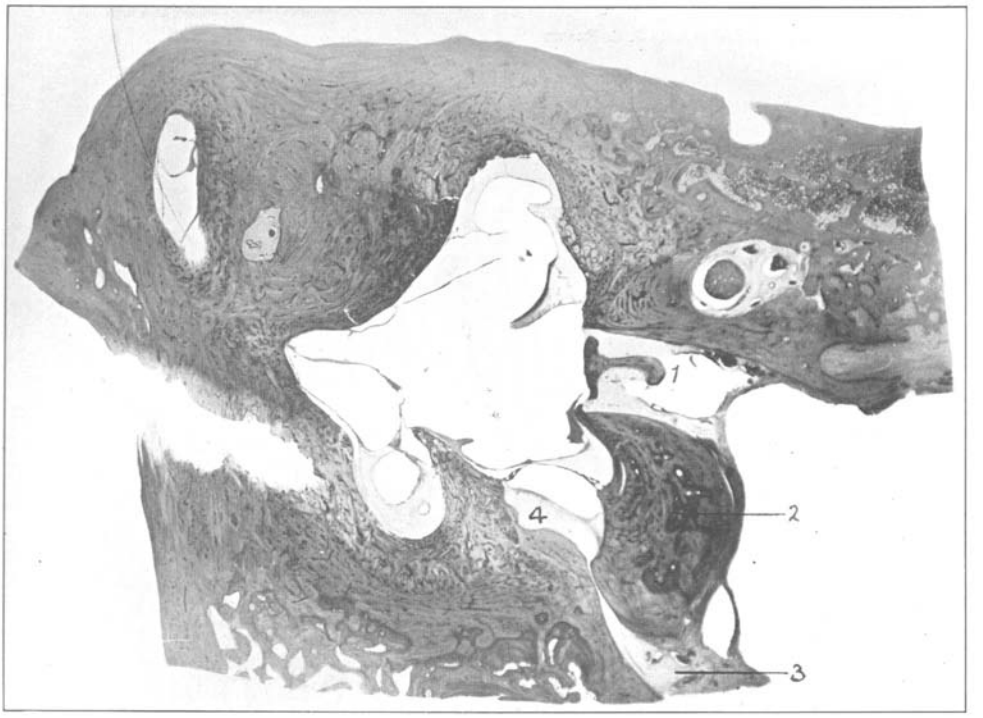


FIG. 14.—Endemic deafness. Specimen kindly presented by Professor Nager. × 6 diam. 1, Deformed stapes in oval window; there is considerable thickening of the submucosa of the oval window niche. 2, Greatly thickened promontory; it is the periosteal bone which is specially involved. 3 and 4, Marked narrowing of niche of round window, which is filled up with connective and fatty tissue.

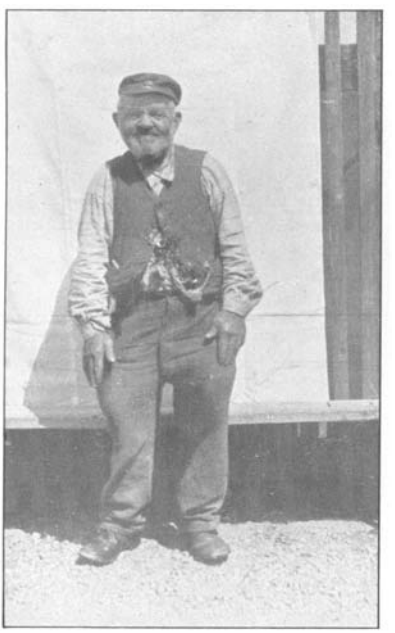


FIG. 14*a*.—Endemic cretinism. Photograph kindly presented by Professor Nager.

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FIG. 15.—Fracture of cranial base with injury to labyrinth capsule. Horizontal section through right ear just above round window, No. 235. 1, Fracture of promontory. 2, Both peri- and endolymph spaces of posterior canal contain blood. 3, Vestibule with slight hæmorrhage. 4, Line of fracture reaches canal for nerve to ampulla of posterior semicircular canal. 5, Basal coil of cochlea with hæmorrhage in all three scalae.

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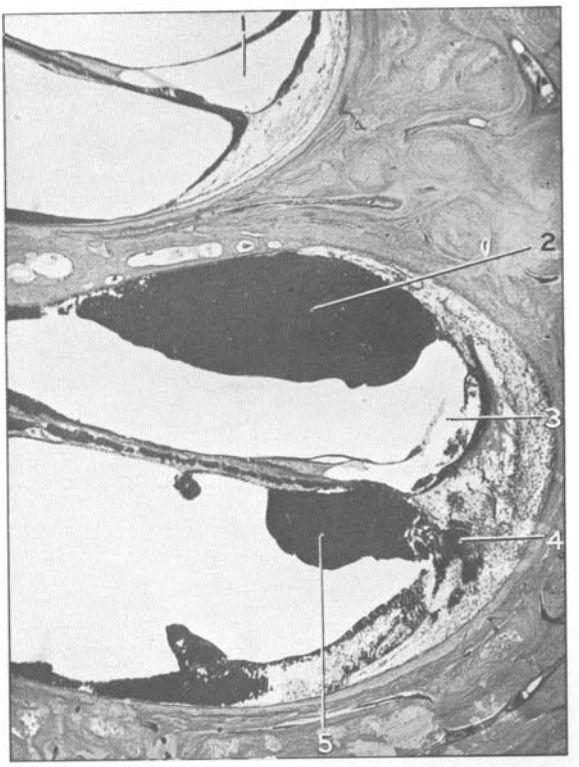


FIG. 16.—From same case as Fig. 15. Horizontal section through right ear, No. 78. × 30 diam. 1, Scala media of middle coil, with slight hæmorrhage. 2, Blood in scala vestibuli of basal coil. 3, Rupture of Reissner's membrane. 4, Blood in spinal ligament. 5, Blood below basilar membrane.

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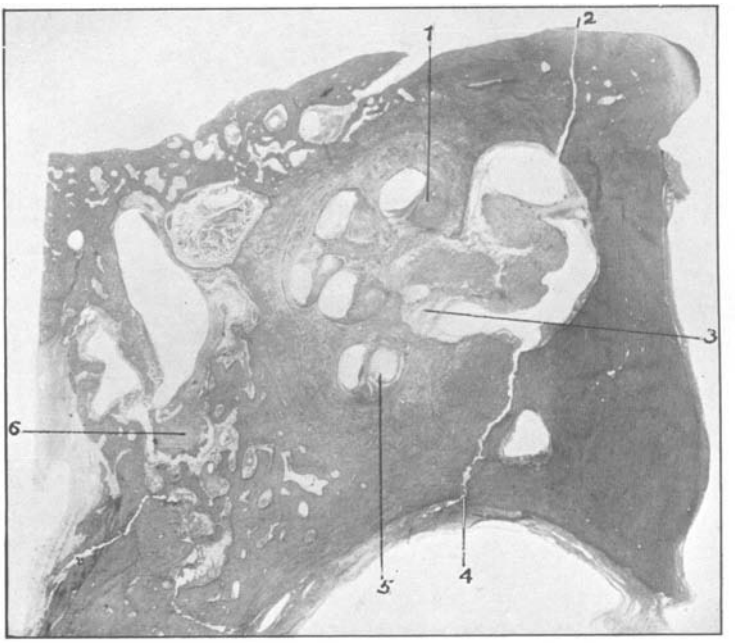


FIG. 17.—From a second case, showing fracture of the labyrinth with otitis media, labyrinthitis and meningitis. 1, Scala tympani of basal coil filled with hæmorrhage. 2, Fracture. 3, Cochlear nerve. 4, Lower end of fracture. 5, Basal coil. 6, Exudate in tubal part of tympanum.

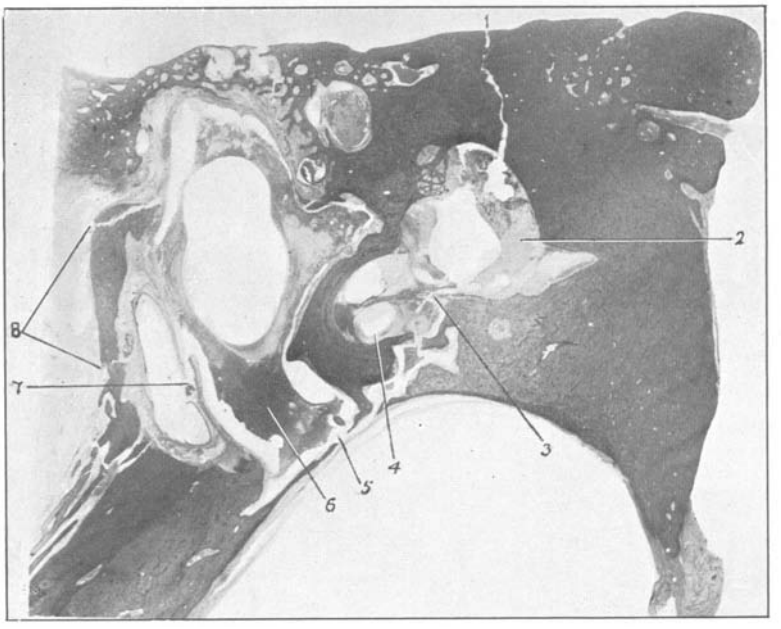


FIG. 18.—From the same case as Fig. 17. 1, Fracture. 2, Exudate in vestibule. 3, Fracture of bony spiral lamina. 4, Scala tympani. 5, Fracture of tympanic floor. 6, Exudate in tympanum. 7. Perforation of drumhead. 8, Fracture of meatal wall.

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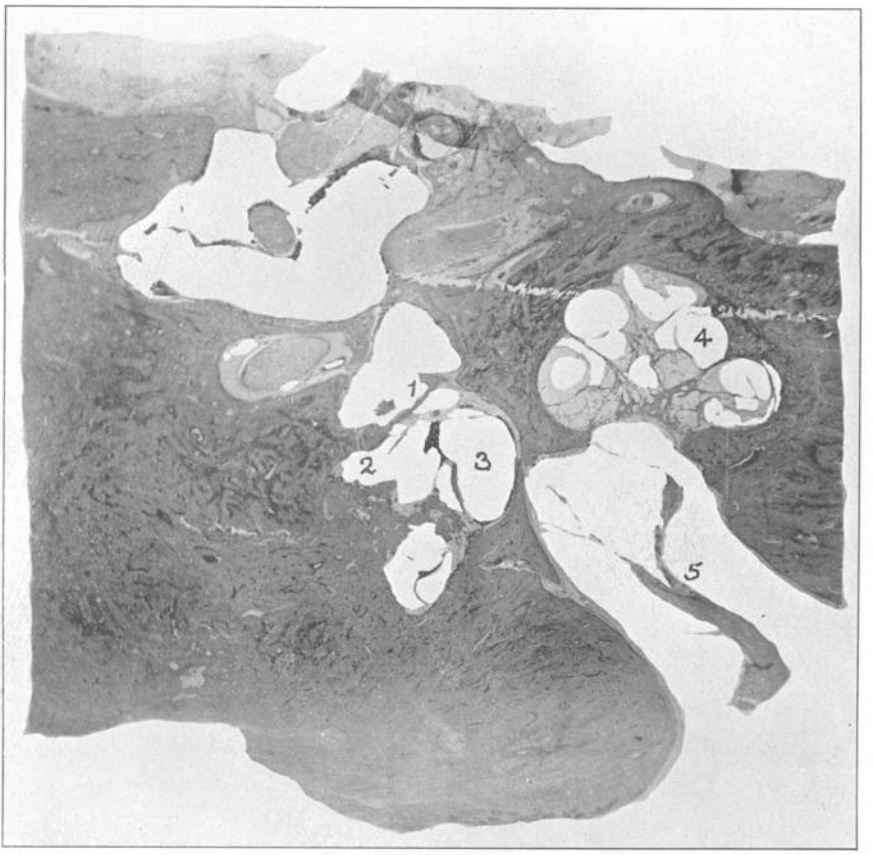


FIG. 19.—Deaf-mutism due to fracture of skull in childhood. × 6 diam. 1, Footplate of stapes. 2, Perilymphatic space of vestibule largely filled up with new-formed bone. 3, Dilated saccule. 4, Cochlea: the basal coil especially shows new-formed bone and connective tissue. 5, Markedly atrophic 8th nerve.

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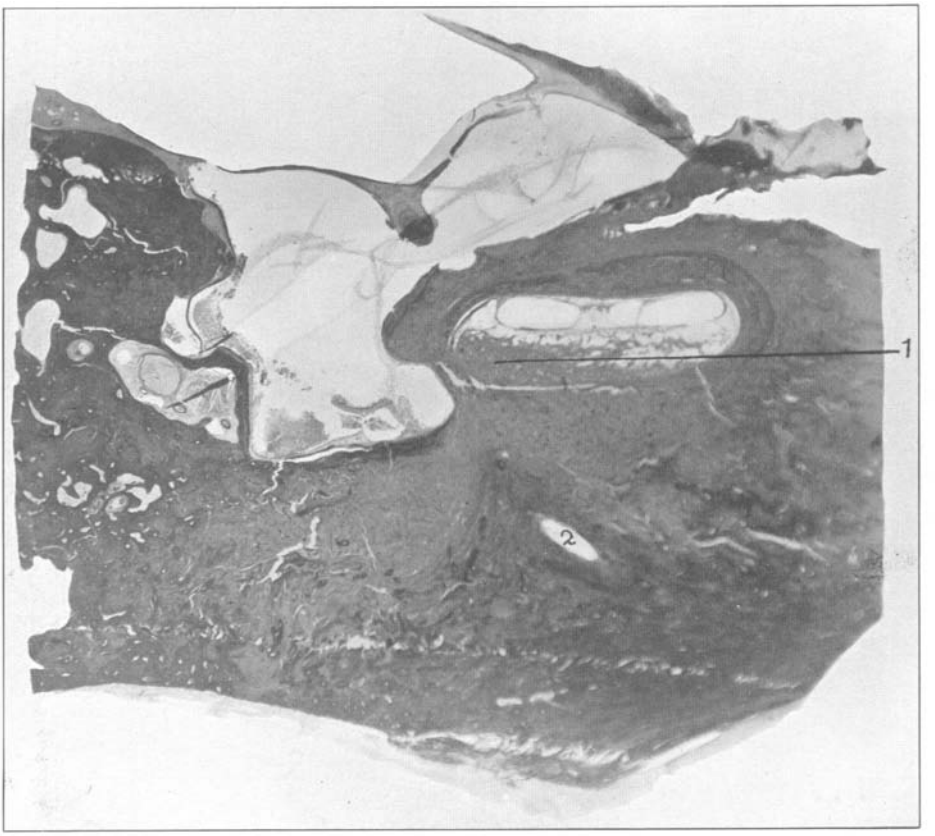


FIG. 20.—Deaf-mutism due to fracture of skull in childhood. × 6 diam. 1, Scala tympani of basal coil of cochlea entirely filled up by new bone and connective tissue. 2, Aqueduct of cochlea.

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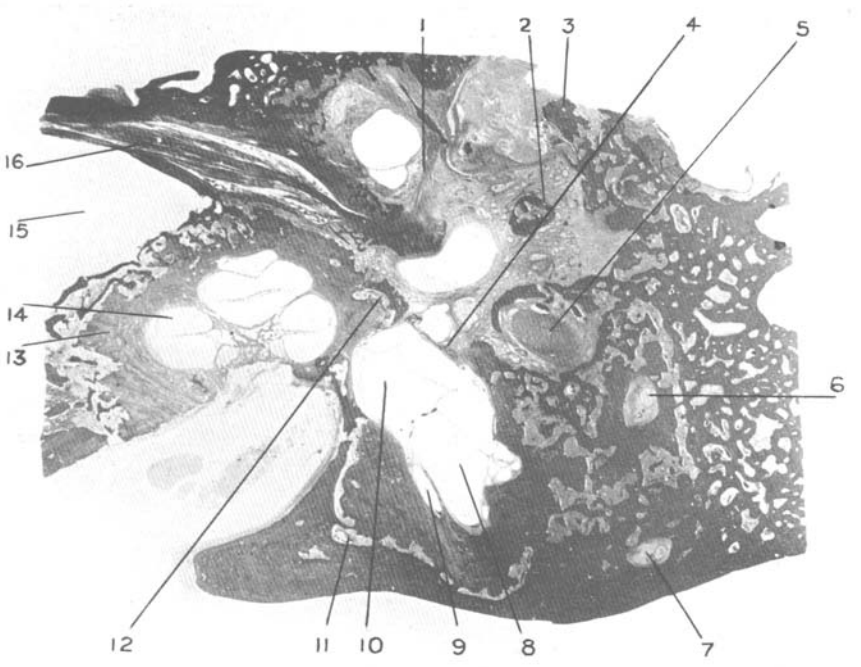


FIG. 21.—Congenital syphilitic disease of the ear. Horizontal section through left ear. No. 282. × 5 diam. 1, Tendon of tensor tympani. 2, Long process of incus. 3, Necrosed bone being extruded into external meatus. 4, Footplate of stapes. 5, Facial nerve. 6, External canal, the perilymph space is filled with granulation tissue. 7, Posterior canal, also filled with granulation tissue. 8, Utricle. 9, Ductus endolymphaticus. 10, Dilated saccule. 11, Osteoclastic marrow which, higher up, erodes the internal meatus. 12. Osteoclastic marrow in bone of promontory in anterior margin of oval window. 13, Bony capsule of cochlea. 14, Dilated scala media of basal coil of cochlea. 15, Carotid canal. 16, Tensor tympani muscle. Note the erosion of the bony capsule of the cochlea by the osteoclastic marrow.

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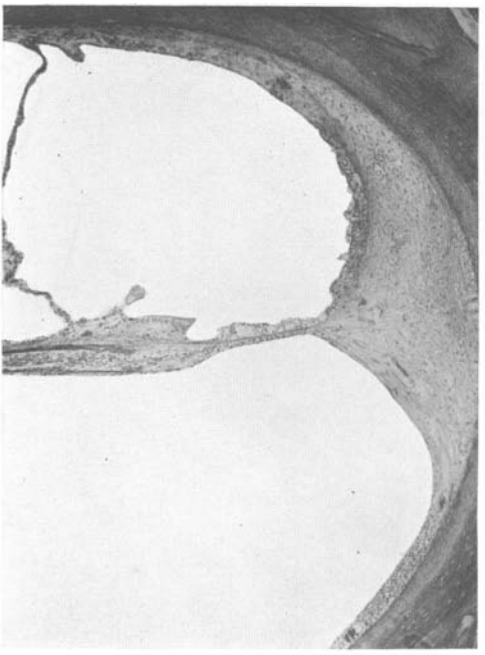


FIG. 22.—From same case as Fig. 21. Left ear. Section 320. × 50 diam. Shows condition (degenerative neuritis) of Corti's organ in basal coil.



FIG. 23.—From same case as Fig. 21. Left ear. Section 340. × 210 diam. (Kulschitzky stain.) 1, Vein in modiolus. 2, Spiral ganglion of basal coil, showing *atrophy of nerve cells.*

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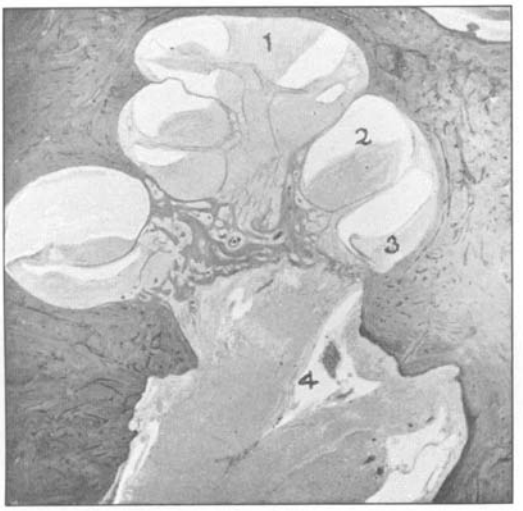


FIG. 24.—Neuro-labyrinthitis following epidemic cerebro-spinal meningitis. × 9 diam. 1, Helicotrema with purulent exudate. 2, Scala vestibuli. 3, Scala tympani containing pus. 4, 8th nerve in internal meatus surrounded by pus.

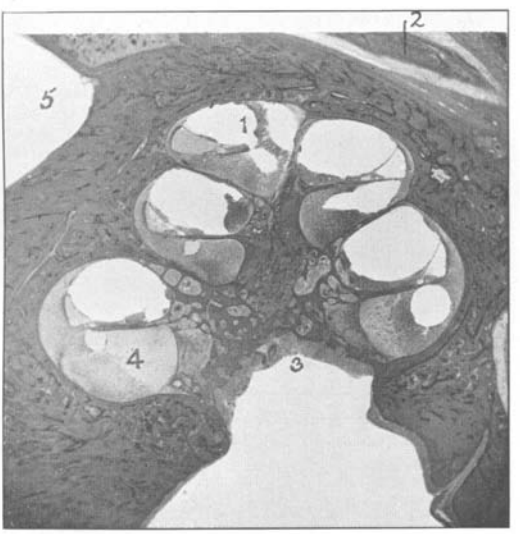


FIG. 25.—Neuro-labyrinthitis following measles and pneumonia. × 9 diam. 1, Helicotrema with purulent exudate. 2, Tensor tympani. 3, Fundus of internal acoustic meatus with pus (the nerve was unfortunately pulled out post-mortem). 4, Scala tympani of basal coil containing sero-purulent exudate. 5, Carotid canal.

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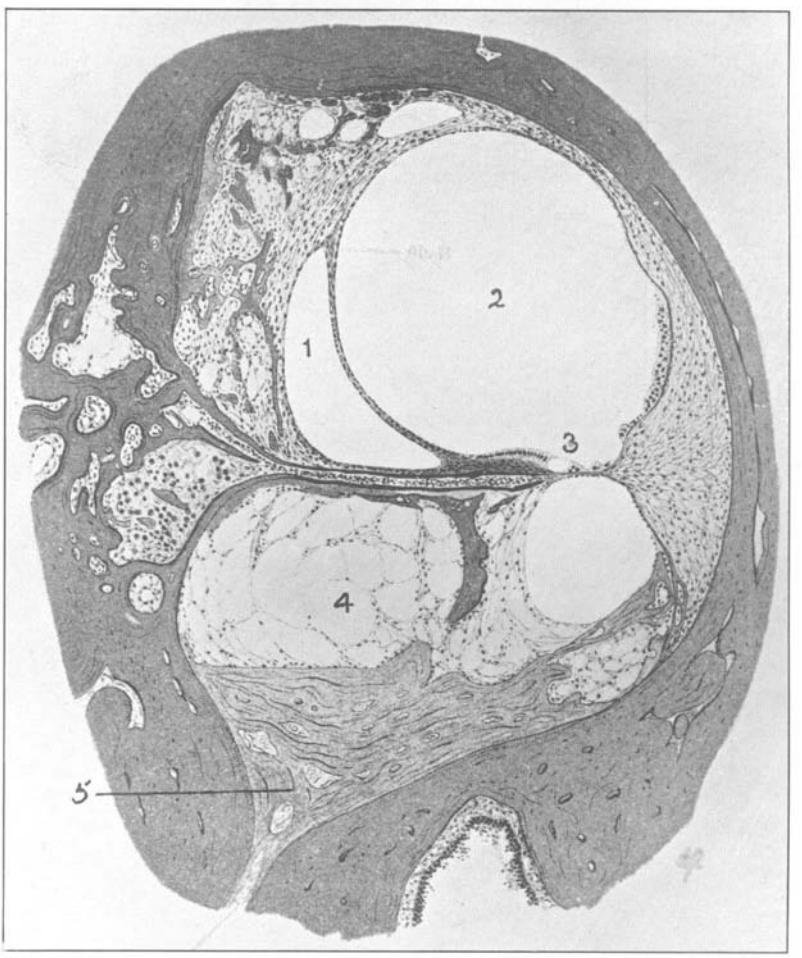


FIG. 26.—Professor Nager's case of deaf-mutism due to neuro-labyrinthitis following measles and meningitis. 1, Remains of scala vestibuli which has been greatly narrowed by new bone and connective tissue formation and also by dilatation of 2, the cochlear canal. 3, Atrophic Corti's organ. 4, Scala tympani filled with connective tissue. 5, Cochlear opening of perilymphatic aqueduct filled up by new bone formation.

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FIG. 27.—Deaf-mutism following purulent otitis media and labyrinthitis. Right ear: horizontal section 120. × 6 diam. 1, Basal coil of cochlea showing new bone formation. 2, Spongification of anterior margin of oval window. 3, Connective tissue in tympanic cavity: note that the radical mastoid operation had been performed. 4, Footplate of stapes.

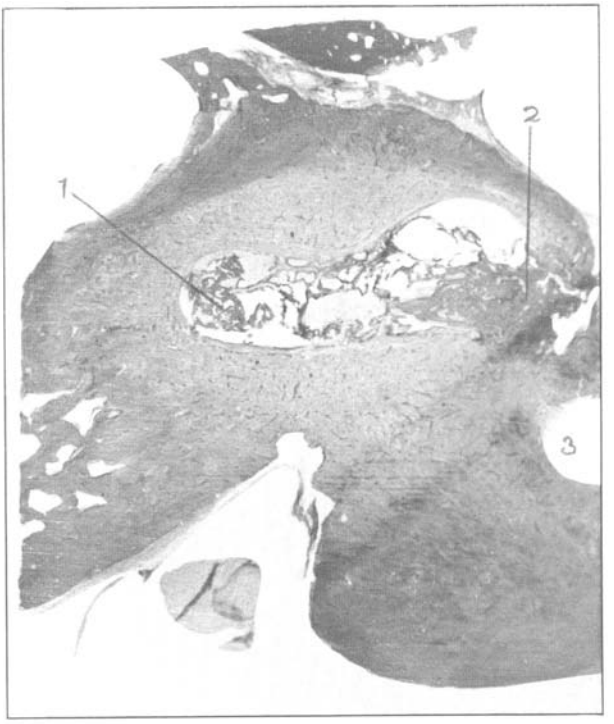


FIG. 28.—Right ear: horizontal section 193. × 6 diam. 1, Upper part of basal coil of cochlea filled with new bone. 2, Scala tympani and round window niche obliterated by new bone formation. 3, Ampulla of posterior vertical canal, normal.

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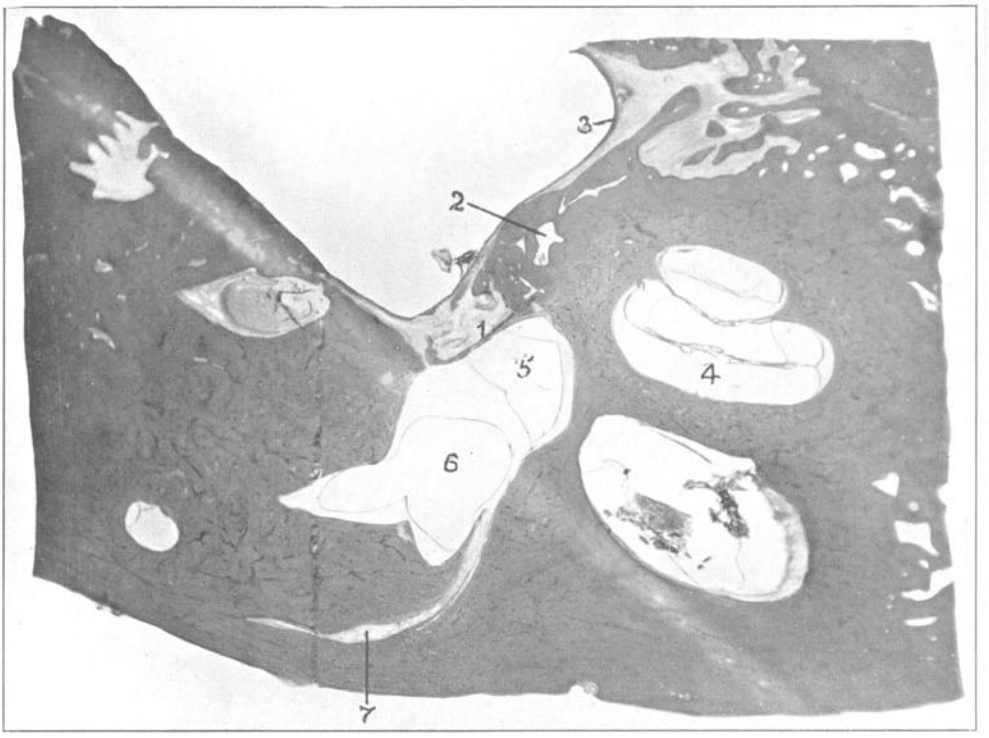


FIG. 29.—Left ear: horizontal section 279 (× 6½ diam.) showing 1, Footplate of stapes. 2, Spongification of labyrinth capsule in anterior margin of oval window. 3, Squamous epithelium lining radical mastoid operation cavity. 4, Cochlea: the scala media is dilated but Corti's organ is fairly well formed. 5, Dilated saccule. 6, Dilated utricle. 7, Aqueduct of vestibule.

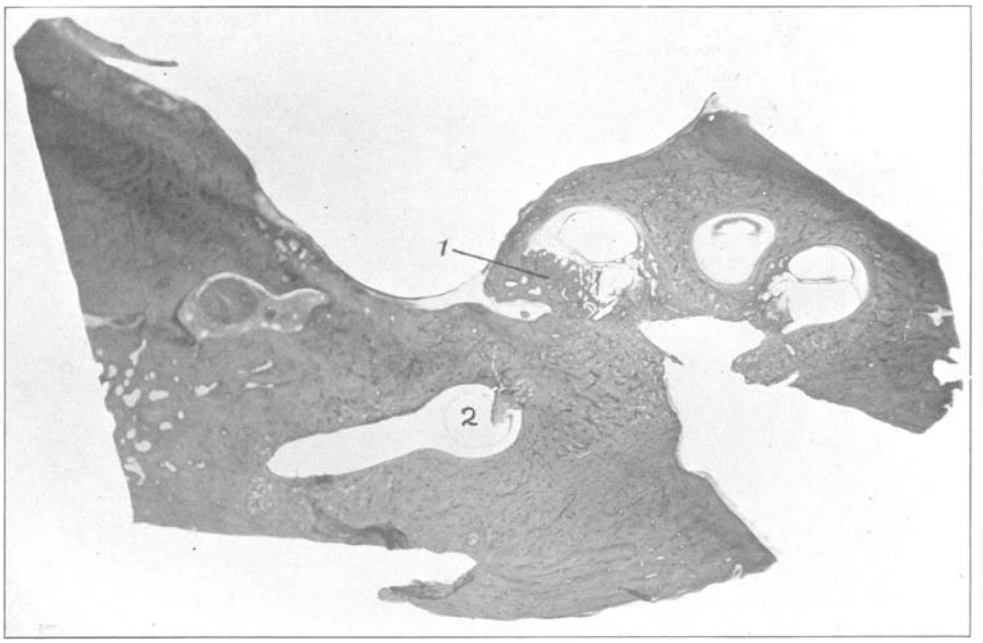


FIG. 30.—Left ear: horizontal section 353 through basal coil of cochlea. × 6 diam. 1, Scala tympani in region of round window filled up by new bone formation. 2, Ampulla of posterior vertical canal, normal.

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involving both labyrinths. About 3 per cent. of cases of acquired deaf-mutism are of traumatic origin. Unless the injury to the labyrinth occurs during the first ten years of life, deaf-mutism does not result. Nager's patient was a man, aged 64, who at the age of 4 received a severe head injury. Microscopic examination showed normal middle ears. The labyrinth capsules showed traces of old vertical fracture at right angles to the long axis of the petrous pyramid. The canals were filled up with new bone and the perilymphatic space of the vestibule greatly reduced by connective tissue and bone formation (Fig. 19). The cochlea also showed bone formation (Fig. 20) in the perilymph space, great dilatation of the cochlear duct, and degeneration of the neuro-epithelium.

Figs. 15 and 16 are from a case of recent fracture of the base showing fracture of the labyrinth capsule with hæmorrhage into the inner ear. Figs. 17 and 18 are from a second case, showing fracture of the labyrinth with otitis media, labyrinthitis and meningitis. Figs. 19 and 20 are from the above-mentioned case of deaf-mutism due to fracture of the skull in childhood (kindly presented by Professor Nager).

(*b*) *Congenital Syphilitic Deaf-Mutism.*—There are two views as to the nature of the pathological changes in this condition. One group of observers holds that congenital syphilitic deafness is due to syphilitic meningitis and secondary neuro-labyrinthitis. The other view is that the condition is secondary to otitis media which, in syphilitic children, does not clear up but breaks through the windows or invades the bony capsule of the labyrinth and so reaches the hollow spaces of the inner ear. In Gradenigo's case both labyrinth windows were destroyed and the vestibule and cochlea were practically filled up with new formed bone and connective tissue. The canals were completely obliterated. In Schlittler's case there were remains of a past inflammation in the middle ear as shown by bony ankylosis of the joint between the malleus and incus and spongification of the anterior crus of the stapes and of the neighbouring part of the oval window niche. The inner ear showed new connective tissue and bone formation in the perilymphatic space, with marked dilatation of the cochlear duct and atrophy of the epithelial nerve endings. Schlittler concluded that the condition had been one of genuine primary otitis interna.

Figs. 21, 22 and 23 show the changes in the middle and inner

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ear in a case of the late form of congenital syphilitic deaf-mutism (J. S. F.).

(*c*) *Deaf-Mutism due to Labyrinthitis following Purulent Meningitis.*—The original focus of infection may be situated in the nose and paranasal air cavities and the naso-pharynx (especially in epidemic cerebrospinal meningitis), the parotid gland in mumps, the bones in cases following osteomyelitis, the lungs in measles, pneumonia and influenza, or the tonsils in scarlet fever. Probably the next stage is a blood infection, as a result of which the organisms are carried to the meninges and set up purulent meningitis. From the meninges the infection passes to the labyrinth, within the pia arachnoid sheaths of the eighth nerve, or along the aqueduct of the cochlea. In the first stage of neuro-labyrinthitis the hollow spaces of the inner ear are filled with blood-stained serum which later becomes purulent and results in complete destruction of the membranous labyrinth. This is followed by the formation of granulation and connective tissue and finally by new bone formation. The base of the cochlea is more affected than the apex but in some cases the cochlea is completely obliterated.

Meningitis may occur in the fœtus in utero but such a condition is difficult to prove. Cases of deaf-mutism, however, have been recorded in which the patient was apparently deaf from birth and in which microscopic examination of the middle ear showed normal conditions. The appearances present in the labyrinth corresponded to those seen in undoubted cases of meningitic labyrinthitis.

Fig. 24 is from a case of neuro-labyrinthitis due to epidemic cerebrospinal meningitis (J. S. F.). Fig. 25 is from a case of meningitis due to measles and pneumonia (J. S. F.). Fig. 26 is from a case of deaf-mutism following measles and meningitis, kindly presented by Professor Nager.

(*d*) *Deaf-Mutism due to Labyrinthitis following Middle-ear Suppuration.*—Denker states that middle-ear lesions alone do not produce such severe deafness as to give rise to deaf-mutism. If, however, the otitis media invades the labyrinth through the windows on both sides, bilateral labyrinthitis is set up and, if the child is very young, results in deaf-mutism.

Microscopic examination in these cases shows, as a rule, not only evidence of middle-ear suppuration but also closure of the round window niche by new formed bone. Here again the

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changes in the basal part of the cochlea are more marked than in the apical coil. The vestibule usually shows dilatation of the utricle and saccule, with connective tissue and bone formation in the perilymph space. The canals are often obliterated.

ILLUSTRATIVE CASE.

Alexander Mercer (case not previously recorded). The patient was first brought to the Royal Infirmary, Edinburgh, in 1910, at the age of sixteen months. Examination showed bilateral purulent otitis media. Enlarged tonsils and adenoids were removed. Six months later the radical mastoid operation was performed *on both ears* at another hospital. The patient was brought back to the Royal Infirmary in August 1923; at that time he was being educated at Donaldson's Hospital as a deaf-mute. The patient's parents stated that he had been late in learning to walk. Examination showed masses of desquamated epithelium in the operation cavity on both sides. The boy appeared to hear loud sounds, though his cry was that of a deaf child. Cold syringing of each ear produced prompt nystagmus. The patient died in a medical ward in December 1929, aged 21 years, of aplastic anæmia.

Microscopic Examination of the Right Ear.—The medial wall of the middle ear is lined by squamous epithelium. Beneath this there is a thick layer of connective tissue, and below this again there is erosion of the periosteal bone. There is considerable dilatation of the Haversian spaces in the bone of the anterior margin of the oval window. The Eustachian tube is closed by connective tissue (radical mastoid operation). There is a break in the bony canal of the facial nerve and the nerve itself has protruded through this gap (possibly result of operation) (Fig. 27). The crura of the stapes are absent, and the niche of the oval window is largely filled up with connective tissue: there is, however, no bony ankylosis of the stapes. The round window niche is obliterated by new bone formation (Fig. 28), and the basal coil of the cochlea and the perilymphatic aqueduct show a similar condition. (Apparently the infection of the scala tympani in the basal coil had burst through the basilar membrane and cochlear canal and involved the scala vestibuli.) Elsewhere in the cochlea the scala media is greatly dilated, practically obliterating the scala vestibuli. The spiral ganglion cells are degenerated, especially in the lower coil, and there is here a considerable amount of small cell infiltration. Corti's organ is degenerated in all coils.

The neuro-epithelium of the utricle is healthy, but the otolith membrane is detached (artefact?). The saccule is more or less collapsed. The aqueduct of the vestibule appears to be normal.

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The membranous semicircular canals and cristae are healthy (Figs. 27 and 28).

Microscopic examination of the left middle and inner ear shows somewhat similar conditions. The round window niche is filled up by new bone (Fig. 30). The saccule is dilated and its membranous wall is in contact with the medial surface of the footplate of the stapes (Fig. 29). The neuro-epithelium and otolith membrane are present. The aqueduct of the vestibule appears to be somewhat dilated. In the basal coil Corti's organ is atrophied, but in the middle and upper coils it is fairly well formed, the pillar cells and membrana tectoria being clearly seen. The cochlear canal is dilated. There is almost complete degeneration of the cochlear ganglion in the basal coil, with small-celled infiltration. The utricle and canals are normal, as are also the nerves in the internal meatus (Figs. 29 and 30).

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The Pathology of Deaf-Mutism

In dieser Mitteilung teilt der Verfasser die Fälle von Taubstummheit ein in solche mit Entwicklungsstörungen und solche denen entzündliche Vorgänge zu Grunde liegen. In der ersten Gruppe nennt er die in diesem Lande wohl bekannte sporadische und die in der Schweiz (d. h. in den Alpengegenden) häufig vorkommende endemische Form. In die Gruppe der entzündlichen Fälle gehören Beobachtungen von Taubstummheit nach Traumen, kongenitaler Syphilis, meningitischer Labyrinthitis und Labyrinthitis nach Mittelohreiterung. Verfasser berichtet über einen besonders eindeutigen Fall und demonstriert zahlreiche Mikrophotographien von diesen und ähnlichen andern Fällen.

Dans cette communication, l'auteur fait une classification des cas de surdi-mutité dûs à des vices de développement et de ceux dûs à une cause inflammatoire. Dans le premier groupe, il range la forme sporadique bien connue dans ce pays, et la forme endémique fréquemment rencontrée en Suisse. La forme inflammatoire comprend les cas dûs au traumatisme, à l'hérédo-syphilis, à la labyrinthite méningetique et à la labyrinthite consécutive à la suppuration de l'oreille moyenne. Il en donne un exemple typique et ajoute de nombreuses microphotographies de ces cas et d'autres cas similaires.

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