

## LOCALIZED HEMORRHAGE INTO THE TYMPANUM, WITH INTACT MEMBRANA TYMPANI.\*

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While hemorrhage from the external auditory canal and middle ear is frequently observed as the result of varied and numerous causes, it is desired here to sharply differentiate these cases in which there is an effusion of blood from the tympanic cavity, from cases in which the hemorrhage is limited to the middle ear spaces and in which in the absence of sufficient pressure or infection, the membrana tympani remains intact; the former class being not at all uncommon, while the latter is of sufficient rarity to warrant careful consideration. A distinction must also be made between this condition and an extravasation of blood into the labyrinth; the latter constituting the pathologic basis of the so-called Menière's disease, while in the former the symptom-complex clearly indicates the absence of internal ear involvement, and while the literature would indicate that labyrinthine hemorrhage or effusion is not of great rarity, the opposite seems to be true of the condition of hemato-tympanum.

The source of hemorrhage from the aural tract is usually recognized on visual inspection, and while the majority of such cases of minor degree, originate from the site of erosions or granulation tissue of the external canal as the result of chronic middle ear sup-puration, yet a certain number are the result of the same conditions or transudations in the cavum tympani, but are readily recognized by the presence of blood as seen through the perforation in the drum membrane.

Undoubtedly traumatism plays an prominent role in the majority of severe cases and especially in fracture of the base of the skull when the temporal bone is involved in the line of the fracture. When the injury to the head is unusually severe, however, the membrana tympani, on one side at least, is at the same time ruptured, and the resultant hemorrhage is necessarily profuse and more or less continuous, while it is also associated with the presence of cerebro-spinal fluid and does not remain encapsulated in the tympanic cavity, but rapidly escapes through the drum. A small amount of partially coagulated

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blood may also be found in the tympanic cavity as the result of direct traumatism applied to the tympanic membrane, such as is produced by perforation of the drum by a foreign body, but here again a portion of the effused blood is found in the canal and usually around the tear in the membrane. If the latter be produced by a small, sharp pointed instrument and the patient is not seen until a day or two after the accident, considerable doubt may exist in the mind of the otologist as to the nature of the injury, as rapid healing of the incised tissue occurs and in some cases but little remains except a dark bluish-red mass seen through the apparently normal membrane. Another class which approaches very much in character to the first of my cases is the result of indirect force such as a fall on the head, in which there is produced a fracture in immediate proximity to the Glaserian fissure; here the tympanum is found partially or completely filled with blood and the membrane may remain perfectly normal. The tuning fork, however, shows normal bone conduction, while air conduction is absent on the affected side, and if the hearing for the latter has been temporarily destroyed by the hemorrhage producing complete interference with the sound waves by means of the ossicular chain, the well known reaction resulting from an obstructive lesion of the conducting apparatus, is readily obtained by the tuning fork on the vertex; the patient hearing best by bone conduction in the affected ear.

The following case illustrates some of these phenomena in a most striking manner and at the same time demonstrates the tolerance of the tympanic cavity to the presence of a large blood clot, in the absence of infection.

F. N., male, age 52 years. He had always been healthy, not having had even the diseases of childhood and at no time had he ever any trouble with his ears. One week before being first seen, he stumbled over a chair in a dark room and was thrown to the floor, striking the back of his head. He stated that he was stunned for several minutes, but paid no further attention to the accident until a few minutes later, when the sound of escaping steam became very pronounced in the left ear; he then noticed that he could not hear with this ear. Except for some thickening of the radial and temporal vessels, his physical condition seemed to be perfect and the upper respiratory tract presented no special abnormalities. The right membrana tympani was normal, while examination of the left disclosed a marked degree of retraction; the umbo forming the center of the cone shaped indrawing of the drum. The membrana itself was otherwise normal and showed no evidence of pre-existing

chronic disease, but most striking was the peculiar color: a deep bluish-black of the tympanic contents as seen through the drum. This involved the entire area posterior to the drum head and extended upwards to a line represented by the lower border of the flaccid membrane. The tuning fork, watch and voice were heard normally by the right ear, but on the left there was absolute deafness as regards air conduction; with the tuning fork over the mastoid, bone conduction was normal while, when placed on the vertex, the sound was heard best in the affected ear. With the history of the case, the appearance of the membrana tympani and the results of the functional tests showing an obstructive lesion of the sound conducting apparatus, the diagnosis seemed to be clearly that of an effusion of blood into the tympanic cavity from a rupture of a small atheromatous vessel, resulting from the fall which he had sustained.

He was placed on iodide of potash and given daily pneumo-massage of the membrana tympani, and at the end of a week of this treatment a silver catheter was placed well up in the patulous Eustachian tube and a few drops of sterile, warm water were injected through it into the middle ear cavity. Under gentle aspiration, a portion of the fluid was removed in the same way and decided relief was obtained, while at the same time the original diagnosis was confirmed, by the removed fluid containing small coagula from the hemorrhage in the cavum tympani. This procedure was repeated twice weekly in addition to the other treatment and at the end of two months the tinnitus had entirely disappeared, while the hearing showed eight feet for the moderate voice and 30/45 for the watch.

In this patient the mechanism concerned in the production of the hemorrhage seemed to be fairly well established, the traumatism being sufficient to rupture one of the small arterioles of the cavum tympani, while the amount of blood poured out was sufficient to bind down the malleus and incus; the contraction of the resulting coagulum drawing the drum inwards. While this explains the presence of hemorrhage in traumatic cases, other measures must be found in those instances the result of general diseases, or the effect of adjacent irritation such as the case reported by Haug, in which hemorrhage took place into the drum cavity from the excessive irritation produced by pulpitis of a molar tooth. These cases are apparently not the result of a direct solution of continuity of the vessel wall, but rather result from the effusion or transudation of the serum mixed with a certain amount of the formed blood elements; at the same time there may also be associated some minute breaks in the vascular channels provided the inflammation be intense in degree

with excessive vascular engorgement. The determining factor apparently being an associated diminished intratympanic air pressure dependent upon temporary and absolute closure of the Eustachian tube the support to the superficial vessel walls being thus removed and the conditions necessary to the production of an effusion being greatly enhanced.

The recognition of blood in the tympanum rarely presents any special difficulties even if the membrane be somewhat thickened and partially translucent, as the peculiar color seen through the drum head, ranging from a deep bluish-red to bluish-black, is not seen in any other condition and the partial perspective that is seen under brilliant illumination of the canal, indicating that the color observed is behind and not in the membrane, allows a diagnosis to be made at once. In addition, the auditory tests with tuning fork, etc., will always in uncomplicated cases, show an obstructive lesion of the transmitting apparatus, and the absence of internal ear or labyrinthine symptoms will be of material aid in the recognition of the condition present. Hemorrhage may, however, occur between the layers of the membrana tympani and for a time partially obscure the middle ear changes, but the former condition presents a somewhat different aspect as regards the appearance of the depth of the coloration and it also differs in being much brighter in hue, the blue of the tympanic effusion being replaced by the red of the blood in the membrane and the obscuration of the outline of the manubrium, with, in addition, a loss of lustre of the drum head.

The location of the hemorrhage varies with the amount of blood poured into the cavity tympani; if it be but slight, it occupies the antrum and shows as a faint blue line at the lower border of the drum, while if the discharge is more profuse, the greater part of the cavity will be filled, and in part the various reduplication of the lining mucosa will be pushed aside. As partial coagulation seems to take place somewhat rapidly, one is unable to obtain any change of location in the extraneous contents of the tympanum, such as occurs in non-sanguineous liquid collections. An interesting phenomenon was observed in this respect in the cases coming under my observation, by the small areas of blue color remaining after a larger part of the clot had been removed by the tubal injections, the adhering blood showing most markedly over the region of the promontory and around the manubrium.

Undoubtedly the greater number of cases of hemato-tympanum occur during the course of severe attacks of some of the acute infectious diseases as typhoid fever, influenza and cerebro-spinal menin-

gitis. In these cases the blood in the tympanum results from excessive congestion of the lining membrane and if such patients were examined by the otologist more frequently, especially when the disease is of such severity that a fatal issue ensues, it would undoubtedly be found that hemorrhage into the tympanum was present in a greater number of individuals than is generally supposed. Such a case, the result of epidemic cerebro-spinal meningitis, is the following:

N. C., female, age eleven years. She is a bright, intelligent, robust girl, but her parents state that she is absolutely deaf and when it is desired to communicate with her, everything is written. From the history given by the parents it was at first thought that she was also unable to speak, but careful examination immediately showed that she could talk perfectly normal, but from being communicated with in writing she had acquired the habit of responding in the same manner. She had always been healthy until four months previous to when I first saw her, when she had a severe attack of epidemic cerebro-spinal meningitis. She was delirious most of the time during her illness and had frequent convulsive seizures, while for four days she had severe opisthotonos. At no time previous to the illness had she any trouble with her ears and during the fever her parents state that there was nothing in her actions, nor did any symptoms present themselves to call attention to the auditory apparatus. The deafness, however, undoubtedly commenced at some period during the latter part of the illness, for when she had recovered, the loss of hearing was absolute. A careful study of her nervous system showed no abnormalities except that the knee jerk on both sides was absent; other than this and the deafness she was perfectly well.

The nasal chambers, pharynx and larynx, presented no abnormalities, while examination of the ears showed the external canal to be normal on both sides. The membrana tympani were slightly retracted and thin, while appearing through it and apparently filling the entire tympanic cavity, was a dark red mass which was recognized as coagulated blood. This was nearly black in hue on the right, but on the left side it was not as dark. Tinnitus was not present as in the previous case and the voice, watch and tuning fork showed after repeated tests absence of air conduction on both sides, but bone conduction was normal for each ear. Especial care was taken in making the functional examinations as it was well known that deafness following this form of meningitis is usually the result of serious and permanent involvement of the internal ear and auditory nerve, but after constant trials it was conclusively demonstrated

that the receptive apparatus was not in any way injured; but that the entire trouble was the result of the hemorrhage into the middle ears. The treatment was essentially the same as in the previous case; massage, iodide of potash and washing of the cavum tympani with sterile water through the Eustachian tube; the latter confirming the diagnosis by the presence of particles of old blood clots in the returning fluid. At the end of the first month under this treatment she could hear loud sounds such as thunder and the return of the hearing gradually progressed until at the end of six months she could hear a fairly loud voice at three feet; she was then lost sight of for some time, but when seen again at the end of about a year, the improvement still continued and she could fairly well hear the ordinary conversational voice.

Practically these cases present but two subjective symptoms, marked impairment of hearing and tinnitus, the former varying with the amount of hemorrhage and the rapidity with which the blood is poured into the tympanum. Vertigo in contradistinction to a similar condition taking place into the labyrinth, is not present and while it is possible from the pressure of the blood mass on the stapes with a consequent increase of intra-labyrinthine tension, yet this can only occur when the coagulum becomes excessive in size and such a pressure would of necessity cause bulging of the membrana tympani into the external canal with subsequent perforation.

In addition to the conditions previously mentioned in which hemorrhage may occur into the tympanic cavity, causes have also been observed in diseases of the spleen and lymph glands and in various affections associated with the hematopoietic system as in leukemia and Hodgkins disease; Hektoen has recorded an instructive case of deafness due to the hemorrhage into the middle ear in a case of myelocythemia; while Kummel saw a case of hematotympanum in a patient with pseudoleukemia, in which there was an exudation of blood in each attic space in which the ossicles were embedded. While Pritchard states that the condition has also been found in scurvy, pernicious anemia, hemophilia and purpura. An important form of intra-tympanic hemorrhage is also seen in chronic nephritis when there is a lack of circulatory tonus and weakening of the arterial walls. Usually the outpouring of blood is the result of diapedesis and more frequently involves the membrana tympani, but while a sufficient number of cases have been reported in which the hemorrhage affected the tympanic cavity alone, to warrant the consideration of the phenomena as an important symptom in the course of Bright's disease, yet sufficient causes have not been collected to be of

much value in forming conclusions as to their ultimate termination. Such cases of value have been described especially by Schwartze, Buck and Trautmann.

Finally in acute otitis media and especially as the result of influenza, there may result a hemorrhagic exudation into the tympanum but usually these cases rapidly become associated with the development of pus and perforation of the drum ensues; Braislen having in some cases found the middle ear filled with blood, while in the so-called hemorrhagic otitis media as described by McBride, the onset is extremely rapid and the cavum tympani within a few hours shows the marked phenomena of the presence of hemorrhage.

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