

29th.—Improvement in every respect since last report. Wounds look well and discharge freely. Ligature of the carotid removed.

June 13th.—Pulse 120, regular, and of good strength. Good appetite. Both wounds still discharge, freely, healthy pus, and are gradually closing. *R.* Tr. ferri chloridi, gtt. v. ter in die. Steak, chop, eggs, &c., for diet.

21st.—Up and dressed for the first time.

26th.—Granulations of the wounds are pale. *R.* Ferri et quiniæ citratis, gr. lxxx.; syrupi, ʒ ss.; vini Xerici, ʒ viiss. *M.* ʒ ss. ter in die.

29th.—Is gaining strength rapidly. Wounds are slowly closing. Allowed to go home and continue treatment.

23d.—Has continued to improve, both in strength and appearance, since last report. Only a small portion of each of the wounds remains unhealed. Appetite good. Takes moderate exercise daily.

Aug. 29th.—Has gained strength since last report. Wound of neck has entirely healed. That of the head has a small granulating surface of about one inch long by one quarter of an inch broad. Omit prescription of June 25th, and take of Blancard's pill (iodide of iron) one, night and morning. *R.* Olei morrhue ʒ ij. ter in die.

Oct. 1st.—Has gained twenty-seven pounds since July 1st. Wound has nearly healed.

28th.—Wound has entirely healed. The patient says:—"My general health is much better than before the operation." There is no deformity nor pulsation; the scar on the head is covered with the hair, and that of the neck is easily hidden by the collar. There is partial paralysis of sensation in the supra-orbital, superior maxillary and inferior maxillary regions of the right side of the face.

#### RECENT CONTRIBUTIONS TO THE ANATOMY OF THE TYMPANUM.\*

By J. ORNE GREEN, M.D.

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THE dermoid layer of the tympanum is merely a continuation of the dermoid covering of the external meatus, which, at the external ear, contains all the elements of the cutis in full quantity, but gradually loses some of them as it proceeds inwards, and possesses the others in diminished supply, so that the layer becomes thinner and thinner as we examine from the outer ear towards the central point of the tympanum; the thinnest part is that a short distance from the hammer. Around the hammer itself this layer apparently becomes thicker; but, as we shall see, this thickening is due to a collection of

\* Anatomisch-physiologische Studien über das Trommelfell und die Gehörknöchelchen. Von Dr. Josef Gruber, Docent der theoretischen und praktischen Ohrenheilkunde und Ohrenarzt des k. k. Allgemeinen Krankenhauses in Wien. 1867.

fibres separate from the dermoid layer, which descend in considerable quantity from the upper wall of the meatus.

By carefully preparing a tympanum under water, beginning from the inside and gradually removing the different layers till nothing but the dermoid layer remains on the glass, it is found that a band of connective tissue exists, which begins on the upper periphery with a basis of  $1\frac{1}{2}$ "–2", and extends downwards on each side of the hammer till it reaches its lower end; that then the fibres separate, and some pass centrifugally into the dermoid layer, while the greater part pass round the umbo and unite with the fibres on the opposite side. This band of fibres contains the vessels and nerves supplying the tympanum, and also serves to bind a formation of cartilage which has heretofore escaped observation.

The hammer, throughout that part which is united to the tympanum, is imbedded in that membrane only to one third of its width, while the other two thirds are covered merely with the mucous membrane; this membrane apparently serving only to retain the hammer in its position. If, now, the hammer is removed by cutting through the mucous membrane along the neck and handle and then drawing the membrana tympani away, it is found, as a rule, that there is but an occasional and slight union between the hammer and membrane, which allows the two to be easily separated as far as the umbo; here, however, the union is found to be quite firm. On a tympanum so prepared can be discerned, either with the naked eye or by the touch, that exactly on that part corresponding to the small process and the handle, the membrane is more rigid than in its other parts and must contain other tissue elements. By a magnifying glass, it is seen that here is a cartilaginous formation having a distinct form, namely, that of a deep gutter closed at the upper end, and so forming, as it were, a cartilaginous cap for the small process of the hammer, while the other end is open, becomes more and more flattened, and loses itself gradually in the substance of the membrana propria. The whole form of this cartilaginous formation corresponds with the hammer, and individual peculiarities of the latter are also to be found in the cartilage; for instance, where the small process is but slightly developed the cartilaginous cap is found to be shallow, and *vice versa*. Sometimes, but not always, there is the appearance as if the upper part of this cartilage, corresponding to the small process, was connected with the lower part, corresponding to the handle, by connective tissue. The best view of this cartilage is to be obtained in transverse sections, which show that the cartilage is thickest and most perfect, i. e., composed of the largest and finest cartilage cells, at the upper end, while at the lower end the cells are smaller and imbedded in a great measure in the fibres of the membrana propria. By separating these fibres, the cartilage cells can be found nearly one millimetre deeper than the deepest point reached by the handle of the hammer. Dr. Gruber has found this formation not only in

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human tympana, but also in those of the horse, cow, sheep, pig, fox, hare, rabbit, dog, mouse, cat and rat.

On the anterior surface, the cartilage is lined with a thin layer of connective tissue, between which and the hammer a certain amount of synovial fluid is found. The space in which this fluid is contained begins on the rough part of the neck of the hammer (the spina) and continues some distance down the handle; it is usually most conspicuous on the anterior surface. In those cases where the hammer is separated from the cartilage with difficulty, which must be considered a pathological condition, this layer of connective tissue is even then found between them, showing that the two are never united directly together. The hammer has then the following position; above, attached by ligament to the roof of the tympanic cavity, and below, at the umbo, firmly to the tympanum, while the small process and the outer thirds of the surfaces of the handle lie free in a synovial fluid. Here we have all that is necessary to allow a rotary movement of the hammer in the direction of its long axis; and instead of the union of the hammer and tympanum being a rigid one, as was supposed, it is possible for certain parts of the hammer to move without the tympanum itself taking any part in such movement.

The tympanic cartilage is attached to the tympanum in a very complex way—by the band of connective tissue belonging to the dermoid layer which descends from the upper wall of the meatus, as previously described; secondly, by the fibres of the membrana propria which are inserted into it; and, thirdly, by connective tissue belonging to the cartilage itself, which descends from the upper part of the annulus tendinosus. The deeper fibres of the dermoid layer connect the cartilage with the tympanum, while the side fibres pass partly towards the periphery and partly unite the free edges of the cartilage with the surfaces of the hammer. The fibres from the annulus tendinosus run from the posterior upper end of the tympanic ring obliquely forwards and downwards, and are in this direction more tensely stretched; as soon as they reach the lower end of the neck of the hammer, they turn in circular bands around the cap-shaped end of the cartilage, which they partially cover outwardly, so that while they serve above for a uniting band between the hammer and annulus tendinosus, they also serve to bind the hammer to the cartilage around the base of the small process. Some slight bands of these fibres also pass towards the anterior and posterior segments of the tympanum, so that in the neighborhood of the hammer a ligamentous apparatus is formed which serves to fasten the cartilage in the tympanum, to unite it with the hammer, to strengthen the tympanum and to conduct the vessels and nerves.

The radial fibres of the membrana propria are inserted, not as usually described, on the hammer itself, but on the tympanic cartilage: viz., the fibres of the lower half of the tympanum on the lower part of the cartilage, and those of the upper half on the upper part,

except that in the extreme upper portion of the tympanum, on a spot more than a millimetre in diameter, the radial fibres are greatly diminished in quantity or entirely wanting, which explains why, after applying the air-douche in some cases, small, glistening projections are seen; for the tissue, being here thinner, is blown outwards, and small bladders of air are formed. These circular fibres, which in their course reach the cartilage, are inserted into it in the same way as the radial ones, only a very few of them being inserted on the hammer itself. A small number, however, are inserted neither into the cartilage nor the hammer, but seem to run, as von Trötsch says, over the small process and before the neck.

While, heretofore, the *membrana propria* has been described as consisting of radial and circular fibres only, we find now that a third course of fibres are described, which, rising from the upper segment of the annulus tendinosus, run obliquely downwards towards the median line and on both sides of the tympanic cartilage, and so cross obliquely the course of both the radial and circular layers. They are to be found best developed in the posterior segment of the tympanum, and lie, as can be seen by careful dissection, outside of the radial and circular layers, and next the dermoid covering.

Still another formation in the tympanum is described by Dr. Gruber, which he names the ramifying fibres. By carefully removing the whole dermoid layer and the epithelium of the mucous membrane from the tympanum, these can be seen by a very slight magnifying power, and from their form and position they apparently play an important part in the physiology of the tympanum. This hitherto undescribed tissue consists of bands of fibres varying in size and shape, scattered irregularly over the whole surface of the *membrana propria*, but always to be found in the greatest quantity on the posterior segment. They take their origin from several small masses of fibres like the roots of a tree; these soon run together, form a band of variable width and length, and soon separate again into a number of smaller bands, which are gradually lost in or assimilated with the fibres of the *membrana propria*. The peripheral ends of these bands are situated on the inner surface of the *membrana propria*, and only covered by the mucous membrane, while, as they run towards the centre, they pass outward, and are to be seen between the circular and radial layers. These fibres are of the same nature as those of the *membrana propria*, namely, connective tissue, and probably serve to help the tympanum return to its normal position when too much stretched, either by the pressure of air or by muscular action. All these different layers of the tympanum are connected together by a delicate connective tissue.

The tensor tympani muscle, instead of being inserted, as von Trötsch says, on the inner border and neck of the hammer, inserts part of its fibres on the inner border, while the larger part are inserted on the upper portion of the handle, directly under the chorda

tympani; and what Toynbee describes as the tensor tympani ligament is nothing more than the mucous membrane which covers all the parts within the tympanic cavity, and which, coming from the processus cochleariformis, surrounds the tensor tympani muscle like a sheath, and from it is distributed over the inner surface of the tympanum.

From what has been said of the insertion of the hammer in the tympanum, of the insertion of the ligament of the tensor tympani muscle in the hammer, and from the direction of the muscle itself, it is evident that during contraction not only will the tympanum be drawn inwards and stretched, but the hammer will rotate on its long axis, and the posterior surface of the handle will be turned outwards. An inspection of the articulating surface of the head of the hammer confirms this view, for it will be found that this describes a spiral from above and outwards, downwards and inwards, "running obliquely from the median line (externally) downwards over the posterior surface of the head, and forming a part of the median surface (internally) with its lower end." It is very probable that if such a movement of the hammer was from any cause excessive, the incus, and finally the stapes, would be moved, and consequently an influence exerted on the fluid contents of the labyrinth.

Gruber's experiment shows this movement very satisfactorily; having exposed the tympanum externally, and the musculus tensor tympani in its bony canal, so that it can be seized with forceps, the tympanum and small bones being left in their normal position, a needle with a straight bristle attached is drilled into the small process perpendicularly to the plane of the tympanum. Now by drawing on the muscle, it is seen that the end of the bristle, which must describe the same movement as the small process in an exaggerated degree, describes the arc of a circle from backwards, outwards and upwards in a direction forwards, downwards and inwards, showing that the hammer not only is drawn inwards by the contraction of the muscle, but also turns on its longitudinal axis. The pathological appearances also point to the same result, as in secondary shortening of the muscle (Politzer) often more of the posterior surface of the handle than of the outer border of the hammer is to be seen in examination, and the outer border is drawn towards the anterior wall of the meatus. The two segments of the tympanum are differently affected by this contraction of the muscle, the posterior becoming nearly a plane surface, while the anterior is relaxed and becomes concave.

Several of the new formations here described are to be seen in the examination of patients, and it is also now well established that other anatomical parts previously considered invisible are occasionally to be seen, the knowledge of which is necessary to explain occasional appearances on the tympanum. The oblique fibres from the outer meatus are often to be seen in examination of patients with

catarrh; for the tympanum being drawn inwards, and the hammer turning on its long axis, this band of fibres is stretched, and becomes visible as a yellowish white line coming from the posterior upper wall and passing forwards and downwards towards the small process of the hammer. The fibres which serve to fasten the tympanic cartilage are often visible as yellowish white lines running downwards and backwards nearly to the middle of the tympanum; these were formerly considered to be the outer edges of the different parts of the hammer. It is not infrequent to see the edges of the niche of the fenestra rotunda as a grayish spot on the tympanum, and, if that membrane is very transparent, the descending process of the incus appears as a white line behind the handle. Occasionally the union of the incus with the head of the stapes is to be seen, and very seldom indeed one side of the stapes. The anterior and posterior folds of the tympanum, first described by Dr. Gruber as an important diagnostic point in the drawing inwards of the membrane in catarrh, run forwards and backwards from the small process of the hammer, and become more developed the greater the prominence of the small process. They are formed in a perfectly natural way by the small process pressing the expanded membrane before it, as would be the case in pressing at any one point on a tissue tensely stretched. If the small process is very prominent, a superior fold also is formed, and it is by no means unusual to see all three on the same tympanum.

Only by an exact knowledge of the minute anatomy can the appearances found in disease be explained, and Dr. Gruber, in these recent "studies," has already cleared away much that was misty in aural surgery.

*Vienna, October, 1867.*

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#### TREATMENT OF NASAL CATARRH.

By W. W. GARDNER, M.D., of Springfield, Mass.

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THE treatment of catarrh has been heretofore so generally a matter of temporizing that our medical bank in this respect is nearly bankrupt of ideas or facts. Undoubtedly this condition results from the unwillingness of patients to submit to means necessary for a radical cure, so long as they can get relief from "dry ups."

Recently, the introduction of the "nasal douche" has opened anew the field of investigation, and with hopeful prospects of adding to our knowledge of the treatment, and perhaps to the pathology, of the disease. My observations, while using the douche the past year, lead me to believe that the factor attending catarrh, and often its continuance, depends upon the retention of decomposed and dried