FRENCH SUPPLEMENT TO THE LANCET

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RETROLABYRINTHINE INVESTIGATION IN OTITIC SUPPURATION OF THE POSTERIOR CEREBRAL FOSSA.

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In the presence of endocranial complications of aural origin otologists are united as to the necessity of including in their surgical interventions the following three processes: evacuation of the original lesion of the middle ear; exploration of the parameningeal lesion which conveys the otitic suppuration to the endocranium; and, if necessary, an attack on the endocranial lesion itself. The most important of these processes is exploration of the intermediate lesion, the link between ear and meninges, because (a) endocranial complications are frequently at the outset only accidents of juxtaposition, a kind of collateral œdema disappearing upon drainage of the otitic lesion and evacuation of the parameningeal abscess; (b) endocranial complications do not arise by chance—they develop at the point where the original lesion comes into contact with the meninges, and the surgeon is guided straight to them by the intermediate lesion. It is generally sufficient to explore this lesion in two directions: (1) at the level of the roof of the attic and the antrum; (2) at the level of the posterior surface of the mastoid. It sometimes happens that this investigation bears no result; a third means of approach is then employed—the internal ear. This last is a new method only employed for about ten years.

Importance of Suppurating Labyrinthitis.

The signs of invasion of the internal ear by infection (total unilateral deafness and absence of the nystagmic reflex) are often observed in otitis with endocranial complications. Injury of the labyrinth always proves the gravity of the infection, but its presence does not necessarily imply that the infection has passed from the tympanum to the endocranium through the internal ear. Whilst attacking the labyrinth, infection may spread to the meninges by means of the roof of the attic or the posterior surface of the mastoid. The establishment of labyrinthitis should not be a signal for neglect of the other routes of infection. It is necessary to point out this restriction of the importance of suppurating labyrinthitis, for although its frequency has been justly insisted upon, its importance in surgery of the ear has been overestimated.

These reservations once admitted, suppurating labyrinthitis, none the less, represents an important intermediate stage between infections of the middle ear and of the endocranium, from two points of view: (1) Infection of the labyrinth often gives rise to defensive lesions which must be respected, but it can also provoke vestibular abscesses, granulations, cholesteatomata, and sequestra, which call for surgical intervention; (2) labyrinthine infection reaching the endocranium can cause localised meningitic lesions (a) in the internal auditory passage, where a kind of intrameningeal abscess is formed to which surgical approach is almost impossible, and (b) on the posterior surface of the petrosa, behind the vestibule, in the neighbourhood of the endolymphatic sac, an extra- or intra-dural abscess can appear, easily reached surgically, and often constituting an intermediate stage leading to encysted meningitis or to a cerebellar abscess. In this way the retrolabyrinthine region is the third area to demand the aurist's attention in labyrinthine lesions with endocranial complications, if and when he has failed to find the connexion between ear and endocranium in the attic or on the posterior surface of the mastoid.

Anatomical Formation of the Semicircular Canals.

Exploration of the retrolabyrinthine region necessitates resection of the bony mass of the semicircular canals; for this process knowledge of the formation of the latter is necessary.

(1) Normally this mass, situate behind the vestibule and within the mastoid antrum, is composed of semicircular canals, notably of the canalis semicircularis posterior and the loop of the canalis semicircularis lateralis. These canals are contained in the labyrinthine capsule, which is of very compact hard bone, well named "petrous"; they are sometimes surrounded by diploëtic tissue, by cells connected with the mastoid cells, or, in exceptional cases, in large, deep, retrolabyrinthine cells.

(2) In a pathological condition two facts are to be remembered: (a) in acute mastoiditis the diploëtic tissue, or even the retrolabyrinthine cells, may disintegrate and form a large purulent mass situate behind the labyrinth, sometimes approaching the internal auditory canal and capable of giving rise to an extra-dural retropetrous abscess; these are really aberrant sinuses of the acute mastoid lesion and have nothing to do with the lesions deriving from the labyrinth with which we are now dealing; (b) in chronic mastoiditis, during the course of chronic otorrhœa, the mastoid cells disappear; a process of condensing osteitis has transformed the diploë into compact bone, and the retrolabyrinthine tissue becomes a bony mass extending from the vestibule to the cerebellar dura mater. If this chronic mastoiditis is complicated with labyrinthitis (the osseous lesions of which have extended to the cerebellar surface of the petrous bone) the following three important levels are encountered behind the labyrinth when approaching the cerebellar fossa from the antrum: (1) the internal surface of the antrum; (2) a very compact bony mass, half a centimetre thick, containing the canalis posterior and the loop of the canalis lateralis; (3) in pathological cases, near the dura mater, at the height of the endolymphatic sac, osteitis and granulations, and sometimes a small extra-dural agglomeration of pus.

Thus the presence of lesions at the level of the retro-vestibular cul-de-sac cannot be discovered by any sign during exploration of the cavity of a petro-mastoid ulcer; these lesions are established by a devious route, infection reaches the vestibulum, and by a deeper and retrograde course arrives at the retropetrous region of the endolymphatic sac. They require systematic search, for their presence is determined by a process of reasoning, not by advancing step by step through osseous lesions, as is usual in exploration of the attic or of the posterior surface of the mastoid.

Conditions Necessitating Retrolabyrinthine Exploration.

Three conditions are necessary to warrant retrolabyrinthine investigation.

(1) There must be a retrolabyrinthine lesion; this is understood, since in chronic otorrhœa infection can only reach the retrovestibular region through the labyrinth. The lesion may be irritative, but that is not enough. Cholesteatoma of the middle ear may set up erosion and irritation of a canal—as digital compression on the eyeball irritates the retina—and may induce intense vertigo. If the nystagmic reflex still exists, the labyrinth is still intact, and there can be no question of opening it, still less of exploring the deep retrovestibular region. The labyrinthine lesion must be destructive; infection has crossed the labyrinth and destroyed it. The absence of the nystagmic reaction proves its destruction. This systematic investigation is necessary; no functional sign gives a clue, for the "quietest" labyrinthine lesions are the gravest.

(2) Infected lesions of the cavities of the ear must be "re-lit"; the signs indicating this reinfection and the first invasion of the endocranium are headache (chiefly occipital), rise of temperature (even very slight), modification of the cerebro-spinal fluid, augmentation of albumin content, hypertension, hyperleucocytosis. In fact, if the lesion is not reinfected intervention can be limited to the middle ear, or to the vestibule if necessary; it is useless to explore the retrolabyrinthine region and the posterior cerebral fossa if they give no sign of pain.

(3) No other intermediate lesion must be found, during the operation, between the cavities of the middle ear and the endocranium. It is obvious that, if an abscess about a sinus,

or an extra-dural abscess on the roof of the attic, has already been disclosed, it is useless to make a systematic search for a retrolabyrinthine abscess. In the absence of such lesions, the first two conditions named being already present, the vestibulum must be opened and explored, and the vestibular cul-de-sac examined. It is true that the results of this examination will often prove negative. It is not necessarily the key to all unexplained instances of spread of infection from the middle-ear to the endocranium. It must not be forgotten that infection may travel by the internal auditory canal, which is practically unexplorable, or by the venous or lymphatic channels. However, the possible existence of a retrolabyrinthine abscess, sufficiently easily accessible, and the results which have been obtained, permit us to advocate a search for it under conditions thus prescribed.

Retrolabyrinthine Abscess.

Lesions encountered in the region of the retrolabyrinthine dura mater are similar in every respect to those observed in the roof of the attic—viz., fistula, osteitis, extra-dural abscess; but empyema of the endolymphatic sac forms an exception. There is here a point of pathological anatomy not yet determined; it may be that pus collects between the membranes of the dura mater without the certainty of a connexion with an endo-lymphatic abscess. In order not to prejudge its histological nature I have called this abscess "retrolabyrinthine." It is a small abscess, never exceeding the size of a large lentil, and always extra-petrous, which latter fact differentiates it from the aberrant mastoidal abscesses always confined to the petrosa. It is also extra-meningeal, never passing the dura mater, and thereby escaping all confusion with encysted meningitis. I have observed five instances of this abscess in about 20 cases of labyrinthine lesion with endocranial complications of otitic origin. About 30 scattered cases are to be found in medical literature.

Technique.

The technique of retrolabyrinthine exploration, although simple enough, is hard to describe.

1. To resect the bony retrovestibular mass and uncover the region of the endolymphatic sac the following procedure is necessary: (a) Lay bare the dura mater before and behind the lateral sinus to the entire height of the lateral portion of the sinus; lay back this cerebellar dura mater behind. (b) Resect the posterior surface of the mastoid, then, further in, the posterior face of the petrosa; the first of these is thin, the second compact and resistant. This resection is done with a drill, or better with a gouge. The operative field is confined by the internal surface of the antrum, and includes the triangular region limited behind by the lateral sinus, in front by the facial sinus, and above by the roof of the antrum. The gouge is first used in a vertical direction from above downwards. The internal surface of the antrum is hollowed out; then the gouge enters the lateral and facial sinuses, working from the apex of the mastoid towards the middle cerebral fossa; the bony mass of the semicircular canals is chipped with strokes of the gouge in order to facilitate the following process. (c) A retrovestibular furrow being thus hollowed out, resection of the mass of the semicircular canals is achieved by placing the gouge this time horizontally, its back against the bend of the facial sinus, the cutting being towards the dura mater at the centre of the cerebellum. The gouge is worked backwards and forwards at first, and a little inwards and outwards, as though aiming for the torcular herophili. It is then pivoted about the bend of the facial sinus and directed towards the occipital foramen; finally, it is directed inwards and outwards definitely towards the basilar occipital process. The posterior surface of the petrosa is resected in proportion, and the dura mater uncovered little by little as far as the region of the endolymphatic sac.

2. The action of the gouge in the second process is facilitated by the following points of indication: (a) It pivots round the bend of the facial sinus, remaining always in a horizontal plane, passing by the fenestra ovalis and the loop of the horizontal semicircular canal. (b) In progressively resecting the mass of the semicircular canals two orifices are laid bare on the same level, corresponding to the opening of the loop of the vertical posterior canal. But the canal of the vestibular aqueduct passes along the loop of that canal; the opening of the latter then indicates that the resection of the semicircular mass is sufficient. (c) The cerebellar dura mater which covers the internal surface of the mastoid and of the petrosa is easily separated until the neighbourhood of the endolymphatic sac is reached, at which point it becomes very adherent. Resection of the posterior surface of the petrosa should then be carried out as far as the dura mater permits itself to hang loose. Where it joins the retropetrous periosteum resection must be stopped; that is

the region of the endolymphatic sac. This last point of indication is the most important.

3. This technique is not dangerous; it requires to be executed in strips in order to avoid cracking the petrosa and tearing the dura mater continuously. When the conditions necessitating retrovestibular exploration are fulfilled it must be carried out in one operation complementary to petromastoidal evacuation. It is useless to intervene in two stages with an interval of 48 hours, for the entire process is extra-meningeal, and if properly conducted is not dangerous. Nor need the possible length of the operation be considered; aural intervention never induces operative shock.

Conclusion.

Resection of the bony retrolabyrinthine mass constitutes a means of reaching the anterior internal portion of the posterior cerebral fossa. It permits of access to—

(1) Extradural abscesses developing on the posterior surface of the petrosa between the lateral sinus and the internal auditory canal.

(2) Cerebellar abscesses very deeply situated; these are the most frequent type, and cannot be reached by any other means—either across the shell of the occipital bone or by the internal surface of the mastoid.

(3) Meningitis, localised or predominant, in the posterior cerebral fossa. By incising the dura mater near the endolymphatic sac the whole cerebral sub-arachnoid space may be drained. This incision, if kept open by means of a piece of gauze, sets up an abundant flow of cerebro-spinal fluid, resulting in marked diminution of headache and general symptoms. In a case of streptococcal meningitis under my own care this drainage clearly assisted the cure.

CEREBELLAR ABSCESSSES OF AURAL ORIGIN.

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CEREBELLAR abscesses have a particular interest among the complications of suppurating otitis, as much because of their variable pathogeny as because of the difficulty of their diagnosis—the latter existing in spite of the recognition of symptoms established by modern semeiology of the cerebellum.

Etiology.

Frequency.—Rare. Bourgeois believed them to be as frequent as cerebral abscesses. At present it is believed that there is about 1 cerebellar abscess to 4 cerebral abscesses; thus Dench¹ has observed 4 cerebellar to 17 temposphenoidal, and Sydney Scott² 12 cerebellar to 42 cerebral. In a third of these cases the cerebellar abscesses were associated with other complications—extradural abscess, thrombo-phlebitis of sinuses, meningitis.

Age.—Exceptional before the age of 10 on account of the high position of the antrum; maximum frequency from 10 to 20 for abscesses following acute otitis, from 20 to 30 for those following chronic otitis.

Sex.—Three times more frequent in the male than in the female.

General causation.—Diabetes and tuberculosis play a disputed part in causation of abscesses.

Influence of traumatism and acute diseases.—Cerebellar abscesses have been attributed to the shock occasioned by gouging; this is a disputable point. They sometimes appear after an acute illness—e.g., measles, scarlet fever, mumps, typhoid.

Influence of the form of otitis.—The preceding otitis is nearly always chronic.

Pathogeny.

Consideration must be given to the following points:—

(a) Routes of Infection in the Petrosa.

1. *Venous route.*—Phlebitis of the venules connecting the middle ear with the sinus lateralis, or of the osseous venules, notably those of the petro-mastoidal canal.

2. *Cellular route.*—Under the influence of attrition by cholesteatoma or of retention of pus infection proceeds, and a process of osteitis destroys the osseous intercellular walls. The pus can also move along the subantral or perilabyrinthine cells or the petro-mastoidal canal, and overstep at any point the cortex of the posterior wall of the petrosa.

3. *Labyrinthine route.*—This is the route of infection in nearly half the total number of cases: it can produce a fistula of the deep surface of the vestibulum engaged with the cerebellar surface, or, more often, a fistula of the posterior semicircular canal; lastly, much has been made