

THE EFFERENT COCHLEAR AND VESTIBULAR BUNDLES

G. Rossi and G. Cortesina

Rossi and Cortesina continued the previous study of Rossi with the object to determine the stage at which the Koelle and Friedenwald positive nerve fibres appear in the peripheral rami of the vestibular branch of the eighth nerve in guinea pig. Positive fibres to the K & F reaction for ACHE were found in the peripheral rami of the vestibular branch of the eighth nerve in the guinea pig after the 80th day of life. The AA. also observed an intensively positive response to the reaction at the base of the neuroepithelium of the crest and maculae in the guinea pig (*Cavia cobaya*) after the 85th day of life.

Rossi and Cortesina studied the medulla oblongata in Nissl stained sections, in sections submitted to Koelle and Friedenwald reaction for acetylcholinesterase and in sections submitted to Cajal's reduced silver method of impregnation. They also studied the areas where retrograde cell changes appeared after intracranial section of the eighth nerve and the changes in acetylcholinesterase activity in the membranous labyrinth caused by section of the vestibular nerve before its emergence from the medulla.

From these investigations it has been possible to demonstrate the existence of five efferent K. & F. positive bundles, which connect the medulla to the inner ear.

The examination of the medulla oblongata by means of serial section revealed the existence of two bundles of K & F positive fibres, mostly crossed, originating from the superior olivary complex. The crossed component (**crossed efferent cochlear bundle**) arises from small nerve cells situated in an area delimited anteriorly by the nucleus of the trapezoid body, laterally by the accessory nucleus of the superior olivary complex, and medially by the fibres of the abducent nerve. These fibres can be identified as the crossed olivocochlear fibres described by Rasmussen in 1946.

The uncrossed K & F positive fibres (**uncrossed efferent cochlear bundle**) arising from cells of the superior olivary complex, originate from cells situated ventrally to the superior lateral olivary nucleus, between the medial and the lateral pre-olivary nuclei. These fibres can be identified as the uncrossed olivo-cochlear fibres described by Rasmussen in 1960.

Rossi and Cortesina have demonstrated that when the crossed K & F positive fibres arising from the superior olivary complex have passed over the median raphe, they are joined by another contingent of K & F positive fibres, which arise from cells in the reticular substance, situated at the side of the median raphe in its dorsal half (**direct efferent reticular bundle**). These cells are distributed fairly high at various levels in the reticular substance of the medulla and, to a certain extent, of the pons.

Apart from the bundles of K & F positive fibres originating from the superior olivary complex and from cells of the reticular substance situated along the median raphe of the medulla, Rossi and Cortesina have found two further uncrossed bundles of K & F positive fibres, differing from the previously described fibres in origin and course.

The first of these two bundles is given the name "**direct ventral vestibular efferent bundle**" and arises from a hitherto unreported small nucleus, the Authors call "**interposed vestibular nucleus**". This nucleus is situated ventrally to the caudal end of the lateral vestibular nucleus and dorso-medially to the cranial end of the inferior vestibular nucleus.

The second of these two bundles (**direct dorsal vestibular efferent bundle**) arises from a group of cells situated in the most caudal tract of the ventral part of the lateral vestibular nucleus.

These five bundles of efferent fibres, distinct in origin and course, make up the "**efferent cochlear and vestibular bundles**". They form one large single bundle on the lateral border of the descending root of the trigeminal nerve. This single bundle emerges from the medulla with the vestibular nerve and is distributed to the cochlear and vestibular receptors.

LES FAISCEAUX EFFÉRENTS COCHLÉAIRES ET VESTIBULAIRES

Après une synthèse historique et bibliographique de la littérature traitant le sujet, les résultats d'une série de recherches morphologiques et expérimentales sur le cobaye (*cavia cobaya*) sont exposés. Des séries de coupes du bulbe rachidien furent soumises à la réaction de Koelle et Friedenwald par la recherche de l'acétylcholinestérase, à la coloration de Nissl et à l'imprégnation à l'argent suivant Cajal. De plus les AA. ont contrôlé les zones où, après section intracrânienne de la VIII.ème paire, se manifestait l'altération cellulaire rétrograde, et les modifications que provoque, sur l'activité de l'acétylcholinestérase dans le labyrinthe membraneux, la section du nerf vestibulaire avant sa sortie de la moelle.

Ces recherches ont permis de démontrer l'existence de cinq faisceaux de fibres efférentes qui relient le bulbe à l'oreille interne. cholinergiques, qui relient le bulbe à l'oreille interne.

A côté du faisceau cochléaire efférent croisé et du faisceau cochléaire efférent direct, qui ont déjà été décrits par Rasmussen, ces recherches ont montré qu'un faisceau de fibres (faisceau réticulaire efférent direct) participe aussi à l'innervation efférente de l'oreille interne; ce faisceau de fibres naît de cellules éparses à diverses hauteurs dans la substance réticulaire du bulbe, dans le voisinage immédiat du raphé médian.

De plus les AA. ont montré l'existence de deux autres faisceaux efférents qui participent à l'innervation efférente de l'oreille interne.

Le premier, que les AA. appellent «faisceau vestibulaire efférent direct ventral», naît d'un petit noyau, nommé par eux «noyau vestibulaire interposé», dont l'existence est signalée pour la première fois. Ce noyau se trouve dans une position ventrale par rapport au noyau vestibulaire latéral et dans une position dorsale par rapport au noyau vestibulaire inférieur.

Le deuxième faisceau, appelé «faisceau vestibulaire efférent direct dorsal», naît du noyau vestibulaire latéral dans la partie caudale-antérieure.

Ces cinq faisceaux de fibres nerveuses efférentes, qui se distinguent par leur origine et par leur parcours, constituent le «système efférent cochléaire et vestibulaire».

Sur le bord latéral de la racine descendante du trijumeaux, ils se réunissent en un seul grand faisceau, qui sort du bulbe avec le nerf vestibulaire et se ramifie vers les récepteurs cochléaires et vestibulaires.

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DISCUSSION:

Fex:

Dr Rasmussen (1960) has found a connection of the olivo-cochlear bundle with the central cochlear nucleus. In a personal communication Dr Rasmussen has given me the added information that this connection consists of true collaterals of the crossed olivo-cochlear fibres.

My questions to Dr Rossi are:

1. Have you been able to confirm the findings of Dr Rasmussen?
Then two more questions
2. Do all your five efferent fascicles traverse the anastomosis of Oort?
3. Is the cholinergic nature of the fibres your only criterium as to the efferent nature of these fibres?

Rossi:

1. In our researches we did not observe the existence of collaterals of crossed olivo-cochlear fibres which reach the ventral cochlear nucleus.
2. The anastomosis of Oort is traversed only by the direct and crossed olivo-cochlear fibres, and by some fibres originating from the cells of the reticular substance.
3. The efferent nature of these fibres has been affirmed on the basis of the results of the systematic anatomical research besides that on their positivity to the Koelle and Friedenwald reaction.