EXCLUSION OF HEARING AND DESTRUCTION OF THE VESTIBULAR APPARATUS IN THE RABBIT

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The conditions of an experiment often demand the exclusion of hearing or of vestibular function in animals. The operative technique of destruction of the cochlear and vestibular apparatus has been well developed experimentally by several workers. Existing methods include a stage of operative approach to the fenestra rotunda or fenestra ovalis, followed by the chemical or mechanical destruction of the vestibular and auditory apparatuses.

However, these methods, although readily available to experimental otolaryngologists, are not so easily carried out in the conditions prevailing in general physiological and pathophysiological laboratories.

The anatomical peculiarities of the position of the cochlea and the vestibular apparatus in rabbits are most unfavorable for a ventral operative approach. For access to the bulla it is necessary to operate at a great depth, the bulla lies in an inconvenient plane, and the approach to it is hindered by the lower jaw. The lateral approach and operative access to the middle ear through the auditory meatus are also complicated and traumatic.

We suggest a method of access to the fenestra ovalis of the vestibule of the rabbit which avoids the necessity of operation. This method may be used when the experimeter requires complete exclusion of hearing or vestibular function.

The oblique tip of an injection needle 0.6-0.9 mm in diameter is sawed off at a right angle. The tip of the needle is then bent to an angle of 90° over the flame of a burner so that the length of the bent portion is 3-5 mm. The external auditory meatus is painted with alcohol. The needle and a syringe are sterilized. The rabbit is not under general anesthesia. The animal is tied down to the bench and its head fixed in the lateral position. The auditory meatus is illuminated and, under direct visual control, the tip of the needle is passed along its internal wall to perforate the tympanic membrane and enter the cavity of the middle ear. The tip of the needle seems to slide off the crest of the lower plate of the upper bony wall of the external auditory meatus. The experimenter at this moment directs the tip of the needle downward with gentle pressure. As a result the needle enters the fenestra ovalis. This gives rise to a sensation of a characteristic crackle, resembling that made by puncturing parchment. After passage of the needle through the fenestra ovalis the second stage of the operation is carried out. This has been well developed by previous workers and is widely employed in practice, and consists of the injection of 96° alcohol and mechanical destruction of the internal ear by means of rotary movements of the tip of the needle. The animal develops spontaneous nystagmus with a rapid component towards the healthy side, the position of the head is changed, and other characteristic disturbances of function associated with unilateral labyrinthectomy appear. The performance of a similar operation on the opposite side abolishes the manifestations of unilateral destruction of the labyrinth and gives rise to the signs of loss of function of both labyrinths (shaking movements of the head and ataxia of the gait) and total loss of hearing.

The entire procedure of bilateral exclusion of hearing and vestibular function takes only 5-10 minutes and is within the competence of any experimenter.

Trial of this method on a large number of animals (over 200) has demonstrated its realiability and convenience. Physiological investigations on rabbits on which this operation has been performed have shown the complete loss of their hearing and vestibular functions. Control morphological examinations on sacrificed animals have shown that complete destruction of the vestibule, the ampullary part of the membranous labyrinth and part of the cochlea takes place. The injection of alcohol supplements the mechanical trauma and leads to the development of connective tissue in the part of the cochlea and vestibular apparatus which remains.

SUMMARY

The authors suggest a method for exclusion of hearing and destruction of vestibular apparatus in rabbits, without any preliminary surgical approach to the fenestra rotunda or ovalis, chemical and mechanical destruction of the cochlea and semicircular canals being carried out with the aid of a special bent needle.