

# Diagnostic value of the fistula test in patients with fixation nystagmus

## Wartość diagnostyczna próby przetokowej przy współistniejącym oczopląsie fiksacyjnym

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### ABSTRACT:

The aim of the study was to evaluate the fistula test in patients of chronic otitis media with cholesteatoma and co-occurrence of fixation nystagmus. The results show limited diagnostic usefulness of fistula test due to the absence of a typical fistula nystagmus and prevalence of fixation instability. However, vestibular-spinal reactions and vertigo were observed in the test, which points to the usefulness of these symptoms in diagnostic procedures.

### KEYWORDS:

perilymphatic fistula, fixation nystagmus

### STRESZCZENIE:

W pracy określono negatywny wpływ oczopląsu fiksacyjnego wrodzonego na oczopląs wywołany w próbie przetokowej. Stwierdzono, że oczopląs fiksacyjny uniemożliwia wywołanie reakcji przedsionkowo-okoruchowej, dominując nad odpowiedzią oczopląsową z błędniaka z przetoką na kanale poziomym. Inne odczyny przedsionkowe w postaci zawrotów i zbachania kończyn górnych były obecne podczas przeprowadzania próby przetokowej według Lucea. Wskazuje to na konieczność ich analizy w takich przypadkach.

**SŁOWA KLUCZOWE:** przetoka perylimfatyczna, oczopląs fiksacyjny

Pathological changes within the inner ear, typically cholesteatoma, less often granulation tissue, may cause bony wall damage in the lateral canal in the form of a fistula. This creates conditions for causing pathological lymphokinesis; pressure increase in the middle ear causes changes to intracranial pressure transferred by the vestibular aqueduct or excessive fluid movements further in veins of the membranous labyrinth [1].

The fistula test, as described by Luceae, allows for clear and straightforward detection of these pathological changes in outpatient centres. It assumes the direction of nystagmus: pressure increase of 25 mmHg in the inner ear results in nystagmus being directed to the fistula, whereas its decrease is indicated by nystagmus being directed to the opposite side. The fistula can also be induced in the positioning test - positional fistula

symptom, by pressure on large neck vessels - vascular fistula symptoms or by stimulating the labyrinth with galvanic current - galvanic fistula symptoms. With a higher pressure, of 90-100 mmHg, so-called fistula symptoms without fistula in congenital Syphilis, Meniere's disease, otosclerosis and inflammatory lesions of the middle ear without fistula can be observed. The direction of nystagmus in pseudofistula is reversed in relation to the direction in a typical case, therefore is recognised as holding no diagnostic value. Changes in pressure then affect the round window causing lymphokinesis [2].

The implementation of the fistula test is necessary in any case of chronic media otitis with cholesteatoma, however, the most valuable confirmation of fistula occurrence is the CT scan, endoscopy or beta-2-transferrin detection [3].



Fig. 1. Patient M.K. fixation alternating nystagmus with open eyes.

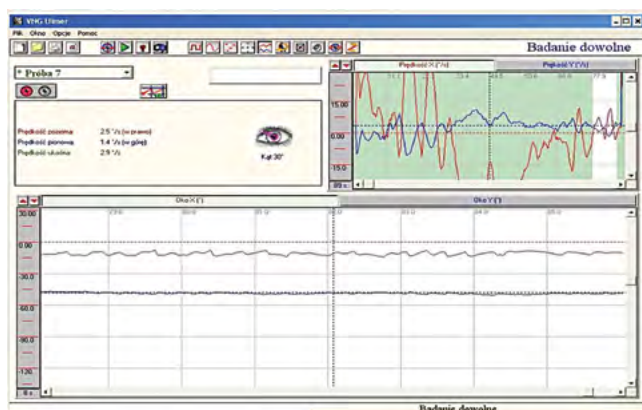


Fig. 2. Patient M.K. fixation nystagmus - two-phase reaction to the left during fixation absent.

The occurrence of fixation nystagmus, congenital or acquired, poses a major difficulty in interpreting fistula test outcomes. It results from dysfunction of neural mechanisms controlling eye movements, located in vestibular nuclei, formation of reticular brain stem, medial longitudinal fasciculus, cerebral cortex, opticum tectum and cerebellum [4]. Nystagmus may be a typical two-phase eye movement and may be of pendular, jerk, dissociated, disconjugate or periodic alternating type. The most common are horizontal eye movements, less often rotational and rarely vertical movements. The relief of fixation most often changes its form and, in case of two-phase reaction, its direction. Fixation nystagmus can be an inherited autosomal recessive or a dominant trait and associated with the X chromosome [5]. If acquired, this type of nystagmus is usually pendular, with likely occurrence of oscillating vision and neurological symptoms, however does not distort optokinetic nystagmus. These demonstrations are not correlated with congenital nystagmus, which often distorts horizontal- but not vertical- optokinetic nystagmus [6]. The accurate assessment of fistula results in patients with and co-existing fixation ny-

stagmus posing diagnostic difficulties as the diagnosis is based on clinical grounds with no additional examinations yet available.

The following results of patient examination are presented to show the chronic cholesteatomatous otitis media incidence during the detection of the functional vestibular status in the fistula test.

## CASE STUDY

Patient M.K., aged 30, record entry 1582/2013, diagnosed with chronic cholesteatomatous otitis media and circumscripta labyrinthitis in the right ear. The condition after right attico-antromastoidectomy in 2004. Congenital fixation nystagmus, periodic alternating type.

Audiometric examination of the right ear revealed an air conduction threshold of 110 dB; the bone conduction study confirmed lateralization to the left ear. Left ear: normal hearing. The VNG examination of visuo-oculomotor and vestibulo-ocular reflexes revealed alternating nystagmus with open eyes.

Upon fixation removal, the examination confirmed nystagmus to the left.

The observation of the eye movements during the Politzer test revealed the pendular nystagmus.

The fistula test was undertaken in conjunction with the balance test. The deviation of both arms during an increased air compression in the auditory canal was also found, however no such deviation was observed when the pressure dilated. The patient reported feelings of spinning and dizziness. Moreover, the examination revealed hypermetric saccades in both eyes; similarly, involuntary eye movements were distorted. The inversion of optokinetic nystagmus was recorded. Means of the caloric test were used to record dysrhythmia in both towards the expected direction of the slow phase eye movement phases with predominance of pendular movements and first-degree canal paresis in Dix-Hallpike test. The HRCT examination of temporal bones revealed a 0.5-mm hypodense band in the form of perilymphatic fistula in the horizontal semi-circular canal.

The patient underwent a radical surgery of the middle right ear, including removal of cholesteatoma and closure of fistula with cartilage tissue.

## ANALYSIS

The results of fistula examination in connection to nystagmus



Fig. 3. Patient M.K. fixation pendular nystagmus during fistula test.

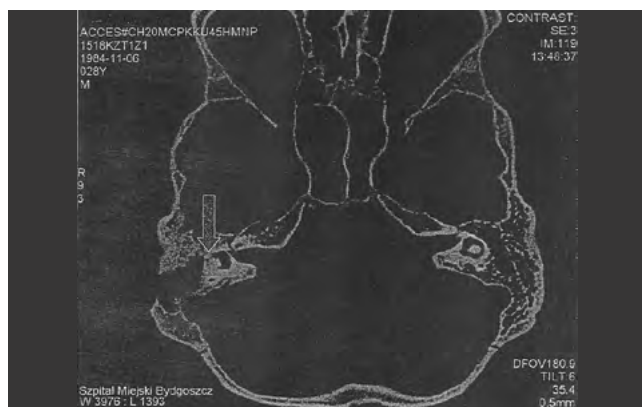


Fig. 4. Horizontal semicircular canal fistula.

response show that this method cannot be used in the diagnostic process. Observed pendular eye movements during the fistula test can only confirm changing response of eye movements, typical in fixation nystagmus, as well as domination of central mechanism dysfunctions over receptor afference [7].

In addition, the other symptoms of labyrinth irritation caused

by pressure changes, i.e. vertigo and vestibular reactions, were noted during the examination. Reported by the patient dizziness was symptomatic for peripheral vertigo and deviation of arms towards the slow phase of induced nystagmus in increased pressure was consistent with a direction of lymphokinesis towards the cupula. Respectively, the absence of deviation to the direction of endolymph during negative pressure may confirm a weaker stimulation of the canal receptor, as described by Ewald's second law [8]. The presented examination outcomes suggest its limited value in observing nystagmus response in the fistula test in such patients and the importance of detection of other fistula responses in this method. The diagnostic usefulness is not only limited to the observed presence of vertigo and arms deviation, but also to head and trunk tilt without support. Vestibulospinal reflex and vegetative reactions are characterised by a lower stimulation threshold in comparison to nystagmus, shorter latency and prolonged duration, hence their value in diagnosis of induced nystagmus. Consistent with the direction of endolymph flow, deviation of upper limbs usually occurs faster than induced nystagmus and is perceived by some researchers as latent nystagmus [9].

It is worth noting that in the case of effective fistula obstruction by cholesteatoma mass or granulation tissue, it is possible to obtain negative test results in the scope of all three symptoms, i.e. vertigo, postural disorders and nystagmus.

## CONCLUSIONS:

1. In patients with perilymphatic fistula and concurrent eye fixation distortion in the form of fixation nystagmus, the Luciae fistula test may have a limited diagnostic value.
2. In these cases it is recommended to assess the formation of other vestibular reactions, i.e. vertigo and vestibulospinal reflexes during the fistula test.

## References

1. Druss J.G.: Pathways of infection in labyrinthitis report of three different types. *Arch Otolaryngol.* 1929; 9 (4): 392–494.
2. Ukleja Z.: Badania doświadczalne i kliniczne mechanizmu objawu przedsionkowego. *BTN Bydgoszcz* 1963, 3–20.
3. DeSa-Souza S., Claussen C-F.: *Modern concepts of neurootology.* Prajakta, Mumbai 1997, 43–44.
4. Kornhuber H.H.: Physiologie und klinik des vestibulären systems. *Archiv für klinische und experimentelle Ohren-, Nasen- und Kehlkopfheilkunde* March 1969, 194 (1): 111–148.
5. van Vliet A.G., Waardenburg P.J., Forsius H., Eriksson A.W.: Nystagmographical studies in Aland eye disease. *Acta Ophthalmol (Copenh).* 1973; 51 (6): 782–90.
6. Aschoff J.C., Conrad B., Kornhuber H.H.: Acquired pendular nystagmus with oscillopsia in multiple sclerosis: a sign of cerebellar nuclei disease. *J Neurol Neurosurg Psychiatry.* 1974 May; 37 (5): 570–7.
7. Bronstein A.: *Oxford Textbook of Vertigo and Imbalance.* Press 2013, 1–13.
8. Kubiczkowa J.: Do Kliniki odruchów przedsionkowo – rdzeniowych. *Otolaryngolog. Pol.* 1974, 28, 465–467.
9. Wodak E.: Über die physiologischen Grundlagen der vestibulär und nichtvestibulär bedingten Bewegungstäuschungen. *Practica Oto\_Rhino\_Laryngologica* 1957; 19: 34–37.

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