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Pineal cyst-related sleep disorders – a narrative review

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Abstract

The pineal gland is an endocrine gland, which is responsible for the human circadian rhythm, through the regulation of its hormone – melatonin. The most common pathology of a pineal gland is pineal cyst – its population incidence is estimated as 1-23%, depending on the publication. The most common symptoms of a pineal cyst include headache (87%), visual field defects (54%), nausea/vomiting (34%), and dizziness/vertigo (31%). Among the majority of patients with the asymptomatic pineal cyst, the wait-and-see strategy is proper.

According to the newest meta-analyze, the prevalence of sleep disturbances among patients with pineal cyst estimates to be 17%. The results of direct melatonin level measurements in pineal cysts remain unclear. The study focused on sleep disturbances in pediatric patients with pineal cysts and showed a significantly higher score on Sleep Disturbance Scale for Children (SDSC) in the domains of disorders of excessive sleepiness and disorders of initiating and maintaining sleep than the control groups. The impact of lesion on sleep quality correlated with its size.

The pineal cyst may be considered a rare, and potentially reversible, cause of sleep disorders. Nevertheless, according to the present reports (often opposite to each other), this thesis and the mechanism of its occurrence need to be further researched.

Keywords: sleep disorders, pineal cyst, melatonin, neuroendocrinology, neurosurgery

Introduction

The pineal gland is an organ, which function remained unclear for a long time. Noble French philosopher Rene Descartes (1596-1650) suggested even that this gland is responsible for the connection between mind and body[1]. Presently, we know that the pineal gland is an endocrine gland, which is responsible for the human circadian rhythm, through its hormone –

melatonin. Sleep disorders appears to be one of crucial issue in public health – their global burden is hard to estimate – particular publications appoint values between 2,3% and 76,6% [2]. However the most common cause of sleep disorders is obturative sleep disorder related to obesity (5,9% of adult population), the endocrine background should not be omitted[3].

The most common pathology of a pineal gland is pineal cyst – its population incidence is estimated as 1-23%, depending on publication [4]. The most common symptoms of pineal cyst include headache (87%), visual field defects (54%), nausea/vomiting (34%), and dizziness/vertigo (31%)[5].

Among the majority of patients with an asymptomatic pineal cyst, the wait-and-see strategy is proper. In MRI follow-up the significant growth of lesions occurs in 5-11,4% of patients, whereas a decrease in 7,5% [6, 7]. The scientific literature reports even a case of spontaneous involution of the pineal cyst[8]. Surgery is reserved for patients with symptoms attributable to a mass effect of the cyst – especially headage and hydrocephalus.

However the majority of pineal cyst symptoms are caused by its mass effect, the endocrine disorders may also occur, resulting in sleep disturbances. The main aid of the article is to summarize present knowledge on sleep disorders caused by the pineal cyst.

Methods

To access necessary articles, the literature review was performed using two databases – PubMed and GoogleScholar. Used keywords included “pineal cyst” and “sleep”. Articles written in languages other than Polish and English were rejected.

Results

According to the newest meta-analyze, the prevalence of sleep disturbances among patients with pineal cyst estimates to be 17%[5]. Nevertheless, sleep disorders are easy to omit in clinical practice, which may suggest underestimation – especially for papers reporting no cases of sleep disturbances in pineal cyst patients[9].

The results of direct melatonin level measurements in pineal cysts remain unclear. On the one hand, the observational study reported that patients with a pineal cyst preserved the physiological secretion of the hormone melatonin (as opposed to patients after pinealectomy, who have suppressed secretion of melatonin)[10], but on the other hand a single case report

showed significant impairment of circadian rhythm in a patient with pineal cyst and improvement after melatonin substitution[11].

The study focused on sleep disturbances in pediatric patients with pineal cysts and showed a significantly higher score on Sleep Disturbance Scale for Children (SDSC) in the domains of disorders of excessive sleepiness and disorders of initiating and maintaining sleep than the control groups. The impact of lesions on sleep quality correlated with their size[12].

Discussion

Currently, the most pressing issue on pineal cysts is the reasonability of its long-term follow-up. The most common opinion does not support this treatment, due to the high costs of MRI screening in comparison to the low risk of cyst recurrence[7].

According to other lesions of the pineal gland, the most common (although classified as rare), and potentially the most dangerous is pineoblastoma. But in patients with this neoplasm, melatonin secretion disturbances are not reported more often than hypopituitary insufficiency caused by tumor mass effect[13, 14].

The importance of decreased melatonin levels should be concerned with the plausible protective role of this hormone in oncogenesis[15], especially in (ER)-positive breast tumors [16].

According to other lesions of the pineal gland (with significantly lower occurrence than pineal cyst), sleep disorders also were reported. A published report presented a case of a child, in which insomnia was the first symptom of a germ cell tumor of the pineal region. Melatonin substitution improved sleep length and quality in this patient [17] . In genetic analyses of pineocytoma samples, the high-level expression of genes coding for enzymes related to melatonin synthesis (HIOMT) is observed [18] . On the one hand, this report corresponds with observational studies, providing that almost all patients with pinealocytoma have increased evening secretion of melatonin. But on the other hand, no disorders in sleep quality were reported in these patients, according to polysomnography[19].

Decreased levels of melatonin, resulting in disturbed circadian rhythm, may also be caused by optic chiasm exertion. It may occur in pituitary macroadenoma – in a reported case series one of four patients with macroadenoma pressing the optic chiasm, and one patient with macroadenoma but without pressure had a flattened rhythm of melatonin secretion [20] . In another observational study, abnormalities in melatonin secretion were reported in 70,59% of

patients with non-functioning pituitary macroadenomas [21] . In functional microadenomas, particularly for prolactinoma, melatonin levels and patterns remains proper [22] . Another tumor, which course may affect melatonin secretion, is craniopharyngioma. One observational study suggests that disorders in melatonin secretion may occur in 53,33% of craniopharyngioma patients, resulting in reduced sleep time and quality[23].

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