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Review Article

Smoking and Neurodegenerative Diseases

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Abstract

Although it is already known for a long time that smoking promotes and aggravates cardio-vascular and cerebro-vascular diseases, its effect on neurodegenerative diseases is less known. The present article reviews the literature data on the effect of smoking in different neurodegenerative diseases.

Smoking has a clear positive protective effect on Parkinson's disease and on multiple system atrophy. However, for the other neurodegenerative diseases the findings are more dough full, as many other factors like arterial hypertension, hypercholesterolemia, heart disease, stroke and obesity, also are interfering factors. All together, these factors are contributing to increase the severity of neurodegenerative diseases.

Keywords: Parkinson's disease; Alzheimer's disease; Frontotemporal lobar degeneration; Lewy body disease; corticobasal degeneration; progressive supranuclear palsy; multiple system atrophy; amyotrophic lateral sclerosis

Introduction

While age, sex and race/ethnicity are non-modifiable risk factors for cardiovascular and cerebrovascular events, smoking, arterial hypertension, hypercholesterolemia and diabetes are more commonly reported modifiable risk factors [1]. There is a causal association between smoking and ischemic stroke, transient ischemic attack, coronary artery disease, heart failure, abdominal aortic aneurysm, peripheral arterial disease, and arterial hypertension [2].

There is a genetic predisposition to smoking initiation and the association with ischemic large and small vessel stroke but not with cardio-embolic stroke or intracerebral haemorrhage [3].

A strong dose-response relationship is observed between the number of cigarettes smoking and the incidence of ischemic stroke among young men. Although smoking cessation must been the main goal, even smoking fewer cigarettes may reduce the risk of ischemic stroke [4].

Passive smoking increases also the overall risk of stroke [5].

There is recent evidence that medicinal nicotine is potentially harmful for the neurodevelopment in children [6].

Nicotine, on the other hand, by virtue of its short-term action on the cholinergic system, has positive effects on certain cognitive domains, including working memory and executive function [7].

So it appears interesting to review the literature concerning the influence of smoking in different neurodegenerative diseases.

Main Body

Most studies have focussed on the neuroprotective effect of smoking in early Parkinson's disease (PD) [8]. Former smokers have a 20% decreased risk and current smokers a halved risk of developing PD compared to never smokers. Strong dose-response relationships with smoking intensity and duration are found [9]. PD starts more than 3 years later in the smoking PD patients compared to the never-smoking ones. Also motor fluctuations and dyskinesia are

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more frequent and appear earlier after levodopa treatment in the non-smoking compared to the ever-smoking PD patients [10]. However, current cigarette smoking is on the long time associated with faster cognitive decline in PD [11].

The overall literature indicates that former and active smoking is related to an increase for developing Alzheimer's disease (AD) [12]. One study mentioned that a 10-25 % reduction of the number of AD patients could potentially be obtained by the combined prevention of smoking together with diabetes, arterial hypertension, midlife obesity, depression, cognitive inactivity and educational attainment [13]. However, more recent literature founds the current evidence that promotion of AD onset and progression by smoking alone is rather weak [14-15].

There are only a few articles concerning smoking and frontotemporal lobar degeneration (FTLD). One article found that smoking in FTLD has a similar risk profile as in AD [16]. Comparing the influence of smoking on the FTLD behavioural- variant and the primary progressive aphasia, no difference is described. However, a significant percentage of patients with the FTLD behavioural variant subtype smoked more in the last 30 days compared to those with the primary progressive aphasia type [17].

One article mentions that heavy lifetime cigarette smoking significantly reduces the relative risk for developing Lewy body dementia (LBD), similar to the reduced risk for PD [18]. However, another study found no more rapid cognitive decline in LBD compared to AD among smokers [19]. Neuroleptic medication in LBD reduces nicotine binding in the brain [20].

Several studies confirm that smoking has no influence on the disease course and the severity of progressive supranuclear palsy (PSP) [21-23]. Only drinking well water for several years is considered as a risk factor for PSP [24].

Two studies show that smoking protects again Multiple System Atrophy (MSA) [22, 25]. The prevalence of MSA amongst ever smokers is lower compared to never smokers [25].

Concerning the influence of smoking associated with the onset and the progression of Amyotrophic Lateral Sclerosis (ALS) there are divergent opinions as other factors such as nutritional status, including vitamin D deficiency, and co-morbidities, ethnicity and genetic factors and lack of supportive care also appear to be more important risk factors [26]. One study found that smokers have a higher risk of ALS compared to never smokers [27]. A meta-analysis in another study does not support an overall strong association of smoking with ALS risk but suggests that smoking may be associated with a higher risk of ALS in women [28]. Another study found only a weak evidence of a positive effect of current smoking on the risk of ALS. Also no dose-dependence with higher levels of lifetime smoking is observed and may be a false positive result [29]. One study suggests that the combination of the smoking status with moderate levels of physical activity shares a positive correlation with ALS [30].

No articles are found concerning the influence of smoking in corticobasal degeneration.

Conclusions

Although it is already known for a long time that smoking promotes and aggravates cardio-vascular and cerebro-vascular diseases, its effect on most neurodegenerative diseases is less well known.

Only on PD and MSA a clear positive effect of smoking has been found. However, for the other neurodegenerative diseases the findings are more dough full, as many other factors like arterial hypertension, hypercholesterolemia, heart disease, stroke and obesity, also are interfering factors. All together, these factors are contributing to increase the severity of neurodegenerative diseases.

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