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The Association of Alcoholism, Alcohol Use and Dementia

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Abstract: The discussion concerning alcoholism and dementia has a long and complicated history. In this paper, I review this topic, showing that alcohol can rarely cause Korsakoff's dementia through a thiamine deficiency. In this syndrome, the ability to encode new memory is affected. However, the question of whether alcohol leads to more common forms of dementia is more complicated. Light to moderate drinking seems to be protective against the development of Alzheimer's disease or vascular dementia. Heavy drinking will increase the risk of dementia from Alzheimer's disease or vascular dementia (from stroke). Traumatic brain injury often accompanies the behaviors associated with heavy drinking, and brain injury is a risk factor for developing dementia later in life.

Keywords: Alcohol Consumption, Brain Aging, Cognitive Aging, Dementia

1. Introduction

Whether alcohol causes dementia or not has produced a longstanding and complicated debate.

On the one hand, it has long been documented that heavy alcohol use can lead to problems with short term memory mediated through a thiamine deficit. If that deficiency of thiamine is not quickly corrected, the individual can be left with a permanent inability to encode new memory, or Korsakoff's syndrome.

But these cases of Korsakoff's syndrome are relatively uncommon, while drinking to excess is much more common. What happens when drinkers age? Does drinking contribute to the development of Alzheimer's disease or other dementing illnesses in these elders?

There is growing evidence that cardioprotective factors lead to a decreased risk of Alzheimer's Disease. In essence, what is heart healthy is brain healthy. Data is emerging that drinking moderately is one such cardioprotective factor that helps to decrease risk of heart disease. We will review the evidence demonstrating light or moderate alcohol consumption may protect against dementia or dementia related death in the elderly. The data on heavy drinking generally shows that drinking excessively is associated with an increased risk of dementia.

Is alcoholism associated with dementia, or does it help to prevent dementia? The answer is yes to both. This seemingly contradictory statement needs some further exploration. In the paper, I will first explore dementia secondary to Korsakoff's syndrome, and then study the effect of light to moderate drinking on alcohol before looking at studies concerning the risk heavy drinking contributes to the genesis of dementia syndromes.

2. Dementia from Korsakoff's Syndrome

Alcohol use disorder can lead to problems with short term memory in heavy users. Wernicke-Korsakoff syndrome is the presentation of short term memory problems in alcoholics after a period of heavy use. The cause for this syndrome, however is Thiamine (vitamin B1) deficiency. Patients with alcohol use disorder traditionally have developed this syndrome because they may prefer drinking alcohol to food, and long periods of heavy alcohol use can lead to nutritional deficiency, including thiamine deficiency. In addition, heavy alcohol use interferes with the metabolism of thiamine, further worsening the deficit. Because of this, thiamine is often added to some beers to try to prevent the development of this syndrome. But, still, it is an uncommon, but devastating clinical problem.

In Wernicke-Korsakoff dementia, the patient may first present acutely with a triad of confusion, ataxia, and eye muscle movement problems to an acute care setting or emergency room. Many who are intoxicated often come to

the emergency room with confusion and ataxia of course. It is the presence of eye muscle movement problems or nystagmus that is the key diagnostic component for Wernicke-Korsakoff syndrome. This is a clear medical emergency. The delirium that occurs with the acute onset of this confusion must be immediately treated by giving thiamine intravenously.

Thiamine must be given before any glucose loading. If glucose is given first, the patient's metabolism can "speed up", worsening the thiamine lack, and worsening the cognitive impairment.

If thiamine is given quickly via an intravenous route, the thiamine deficiency can be acutely remedied, leading to a resolution of the syndrome. However, it the syndrome is not caught at its onset, which is all too common in those with alcohol use disorder who may neglect their health, memory problems can persist after this initial event. The memory problems seen are described as "Korsakoff's Dementia", and these patients present with the inability to encode new memory. Long term memory is relatively preserved, but they are unable to form new memories. When presented with new situations, they may "confabulate" or make up situations or examples to try to fit in the conversation. Confabulation is by no means seen only in those with Korsakoff's dementia, but it is a hallmark of the disorder.

Other cognitive abilities remain relatively intact. A patient's visual spatial skills, ability to reason, or to do simple math problems remain less affected. However, the ability to retain and file new information is intensely problematic, and disabling. On typical cognitive screening tools such as the mini mental status exam (MMSE) [1] or the Montreal Cognitive Assessment (MoCA) test [2], an individual will be quite unable to recall words given them to retain, and may well also be unable to recall dates and times since that involves short term memory. Other skills may well be relatively preserved, including verbal skills, or ability to do simple math problems or reason through a problem.

If an individual with Korsakoff's syndrome abstains from alcohol, further deterioration of memory should cease. These unfortunate individuals are left with the inability to retain new information, but their cognitive problems will not worsen. So, in Korsakoff's dementia, the patient presents with short term memory problems with a relative preservation of other cognitive functions.

So then, patients with Korsakoff's dementia from alcohol abuse present with a rather isolated problem of being unable to encode new short term memory which should be stable over time if they stop drinking. But, patients with Alzheimer's dementia present with global cognitive problems which slowly decline over years. In addition to memory problems, they experience a decline in verbal skills or a growing inability to describe situations or tell stories. Over time as well, visual spatial abilities decline as well as judgment, along with the overall ability to manage their own lives.

To test whether Korsakoff's syndrome is indeed a valid concept, this diagnosis was investigated at a nursing home by Oslin and Cary [3]. They reviewed the diagnosis and course of patients and found that about 10% of the patients in their urban nursing home were diagnosed with Korsakoff's dementia. Other patients were suffering from dementia from Alzheimer's disease or dementia from stroke, or Vascular dementia. Those patients suffering from Korsakoff's dementia were overall more cognitively stable. That is, while they had deficits in memory requiring nursing home care, they had less global impairment than other patients with Alzheimer's or vascular dementia. They also were both more cognitively stable, and more functionally stable over time. Thus, this data supports the traditional teaching that those with Korsakoff's dementia, while suffering from the inability to encode new memory, relatively preserved other cognitive functioning, and suffered less decline over time.

Some nursing homes are reluctant to accept patients with substance abuse, fearing they would be more difficult patients presenting an array of behavioral issues. However, a survey of nursing home patients showed that the presence of a substance abuse diagnosis was not a predictor of total cost or of nursing home costs for patients over the age of 65. This held true after controlling for demographic, and clinical factors [4].

3. Mild to Moderate Drinking Can Lower Risk of Dementia in Elders

Caring for elderly individuals with alcohol use disorders is a growing concern. The "baby boomers", or those born in the growth of the United States population between 1946 and 1964 are now aging and requiring more care as they suffer the unrelenting health effects of aging. Those who came of age in the 1960's and 1970's had higher rates of alcohol and substance use disorders when younger, and they continue to carry these disorders with them into old age. In fact, the rates of alcohol and drug use disorders among elders is increasing as these individuals age [5, 6]. Both alcohol use, and binge drinking is increasing in this population of elders compared to earlier birth cohorts [6]. One clinical myth which has persisted is that elder substance abusers do not do as well in treatment. This is not correct. Thankfully, elders with alcohol use disorder clinically do at least as well as younger patients in treatment [7, 8].

Elders with substance abuse are presenting more often to clinical care. While they do at least as well in treatment, the concern that they will present an increasing prevalence of a dementing illness remains. Will this greater prevalence of drinking problems in elders lead to a higher incidence of a more global dementia or Alzheimer's Disease from the chronic effects of alcohol over time? This is indeed a significant public health question. The rates of alcohol use disorder, and other substance use disorders, among elders are rising. Are those who drink more likely to suffer from dementia?

This is a complicated question. It has long been known that those who drink heavily can rarely suffer from

Korsakoff's dementia as I discussed, but it is also established that drinking moderately is protective against cardiovascular disease and stroke [9].

Can drinking then actually protect an individual from developing dementia?

There is growing recognition that what is "heart healthy" is also "brain healthy". This is a developing idea, but stems from growing data that a wide array of cardiac risk factors are important in the development of dementia. That is, a healthy diet, physical activity, and taking statins all protect from developing dementia. And, heavy smoking, and being overweight in mid-life contributes to a higher risk of dementia [10]. This evolving idea states that vascular risk factors may cause small injuries to the brain, leading to a gradual cascade of neuronal damage which then progresses to a gradual dementing illness. So, what is heart healthy is brain healthy.

But, what about alcohol? Alcohol in small to moderate amounts can be cardioprotective.

Those who have a history of drinking in the past, or use alcohol in a light to moderate way have a lower risk of developing dementia [10]. In fact a prospective study in Norway showed that those who drank at least once a month had lower risk of dementia related death than those who abstained from alcohol over a seventeen year follow up period [11]. Likewise, a prospective study in Denmark showed that moderate alcohol consumption (drinking 2-3 drinks per day) was associated with a lower mortality over a thirty six month follow up period. But those who abstained or drank heavily had no such change in mortality risk [12].

In another study, cognitive ability was screened at two year intervals over an average seven year follow up period. Both those individuals who drank moderately, or minimally had lesser cognitive decline on the mini mental state exam or trail-making tests compared to those who did not drink. There were few heavy drinkers in this study, so no conclusions could be made about them [13].

Ilomaki and colleagues reviewed papers on the MEDLINE, EMBASE and PsychINFO databases, and examined a variety of papers on the topic. They found that papers examining light to moderate drinking showed that drinking moderately may well reduce the risk of Alzheimer's disease [14].

So, drinking moderately seems to be associated with a lower risk of dementia, or dementia related death. This is thought to be from the vascular or cardioprotective effects of alcohol on the brain.

4. Heavy Drinking May Be Associated with an Increased Risk for Dementia

But, does the amount of drinking have an effect on the risk? In other words if drinking a small or moderate amount is protective against dementia, what happens to heavy drinkers as they age? Is heavy drinking a risk for dementia secondary to Alzheimer's disease?

A review of one hundred forty three papers examined the effect of either moderate or heavy drinking on cognitive decline and dementia. Studies since 1998 showed that moderate drinking either reduced the risk of dementia as I discussed earlier, or had no effect. Heavy drinking in these studies, however, showed a higher risk or dementia and its associated cognitive decline [15].

Another meta-analysis of fifteen prospective studies provided further insight. Individuals who drank some alcohol had a reduced risk of Alzheimer's disease. In this review those who were heavy drinkers did not show any increased risk of dementia, but the authors wondered about the possibility of sampling bias in these studies leading to this result [16].

Likewise, a review of studies in France and Holland also showed that moderate drinking (three to four standard glasses of wine per day) led to a decreased risk of dementia, and for ischemic stroke. Heavy drinking, however, seems to put patients at higher risk for most types of stroke [17].

The Whitehall II prospective cohort study [18] examined the effects of behaviors on aging in over six thousand adults through a series of cognitive examinations. They found that heavy drinkers who also smoked had a faster cognitive decline as they aged compared to moderate drinkers who did not smoke. In fact, heavy drinkers who smoked had about a 36% faster cognitive decline over the years.

Also, both the risk of Alzheimer's Dementia and vascular dementia were shown to be higher in a study of elderly men in China among those who drank daily compared to those who abstained from alcohol [19].

In yet another study, a forty three year follow up study of twins in Sweden, those who abstained from alcohol or who drank lightly did not have a higher risk of dementia. However, those who drank heavily (12-24 g/day) and very heavy drinkers (those who drank more than 24 g/day) seemed to increase the risk of developing dementia [20]. Studying the same question in Norway, with a twenty seven year follow up period, showed that those who drank frequently (five or more times over the prior two week index period at the index period of the study) had an increased risk of dementia [21]. Likewise in China, a survey showed that heavy alcohol consumption was associated with an increased risk of dementia [22].

This series of studies from around the world show that heavy drinking is associated with an increased risk of dementia, whether the cause is Alzheimer's disease or vascular dementia.

Mild cognitive impairment is a syndrome where the patient experiences memory problems, but these problems are not severe enough to interfere with activities of daily living. It is often, but not always, a prodromal symptom of dementia. Xu, et al. [23] followed one hundred seventy-six patients with mild cognitive impairment over a two year period. Again, light to moderate drinkers had better performance on cognitive testing than those who abstained from alcohol. However, heavy drinkers had a higher risk of developing dementia than did those who abstained from alcohol or those

who were light to moderate drinkers.

So, how can we understand that drinking lightly leads both to a cardio-protective effect but heavy drinking seems to eliminate this protection? The toxic effects of heavy drinking may overwhelm the cardio-protective effects of alcohol in developing a dementia if someone drinks excessively. But it may also be that another factor comes into play.

Brain injury is another factor associated with drinking which puts a patient at risk for developing dementia. Those who drink more heavily may well put themselves at risk for suffering a head injury from a fall, fight, or a motor vehicle accident which are common causes of brain injury. A survey of 295 people with co-occurring mental health and substance use disorders were screened for the presence of a traumatic brain injury. Eighty percent of those in the clinic screened positive for a history of a traumatic brain injury, and twenty five percent reported at least one moderate or severe traumatic brain injury. Suffering a traumatic brain injury was associated with current alcohol use [24]. Brain injury is a risk factor for the development of dementia. Those with heavy alcohol use then seem to be more likely to suffer a traumatic brain injury, which would put them at risk for developing a dementia later in life.

5. Conclusions

The association of alcohol and later dementia is a complicated issue. Heavy drinkers can rarely suffer from Korsakoff's dementia stemming from a thiamine deficit. These unfortunate individuals cannot encode new memory, but other areas of cognitive function remain relatively intact.

Much more commonly, dementia from Alzheimer's disease or vascular injury occurs in elders. What is heart healthy is brain healthy, and light to moderate drinking seems to be protective to both the development of heart disease and dementia. However, heavy drinking is associated with an increased risk of dementia in elders. One reason for this may well be the higher incidence of traumatic brain injury in those with a more severe alcohol use disorder.

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