The possibility that Alzheimer's disease could be transmitted by surgical procedures has been raised by researchers studying prion diseases.

They have reported an autopsy study of eight young or middle-aged patients with prion disease (linked to treatment with cadaver-derived human growth hormone) in which the Alzheimer protein amyloid β was also detected. They note that such pathology is rare in this age range and none of the patients had mutations associated with early-onset Alzheimer's.

"Our research argues that we need to rethink our view of Alzheimer's and related diseases and evaluate the risk of it being transmitted inadvertently to patients by medical and surgical procedures long known to carry a risk of transferring prion infection," the scientists, led by John Collinge, MD, MRC Prion Unit, University College London, United Kingdom (UK), noted.

"There is absolutely no suggestion from our work that Alzheimer's disease is contagious or that there would be any risk to relatives, spouses or carers of patients with Alzheimer's," they added. "Concerns relate to medical or surgical procedures where patients are injected or transplanted with material that might contain amyloid protein seeds or from surgical instruments contaminated with such seeds."

But outside commentators have emphasized that there is no evidence of transmission from blood donations or surgical procedures at present.

In the study, published in Nature on September 10, the UK researchers conducted autopsy studies, including extensive brain tissue sampling, of eight UK patients aged 36 to 51 years with Creutzfeldt-Jakob disease (CJD) contracted from medical procedures.

A major route of such transmission is treatment with human growth hormone (HGH) extracted from cadaver-sourced pituitary glands, some of which were inadvertently prion-contaminated.

They report that such treatments stopped in 1985 after reports of CJD among recipients. As of 2012, 450 cases of CJD have been identified in countries worldwide after treatment with cadaver-derived HGH and, to a lesser extent, other medical procedures, including transplant and neurosurgery.

The current research shows that in addition to prion disease in all eight brains sampled, six exhibited some degree of amyloid β pathology (four widespread) and four of these had some degree of cerebral amyloid angiopathy. The authors examined a cohort of 116 patients with other prion diseases and found no evidence of amyloid β pathology in the brains of patients of similar age range or a decade older who did not receive HGH treatment.

The researchers say the study suggests "that healthy individuals exposed to cadaver-derived HGH may be at risk of iatrogenic Alzheimer's and cerebral amyloid angiopathy, as well as iatrogenic CJD, as they age."

They postulate that as well as prions, the pituitary glands used to make the HGH might have contained the amyloid β seeds that caused the amyloid β pathology observed.

"The results should prompt investigation of whether other known iatrogenic routes of prion transmission, including surgical instrument use and blood transfusion, could also be relevant to the transmission of Alzheimer's and cerebral amyloid angiopathy and other neurodegenerative diseases," they conclude.

No Cause for Panic

The research attracted much media attention, with headlines such as "Can You Catch Alzheimer's?" But many
healthcare organizations issued statements playing down the findings, emphasizing that there was no evidence of transmission of amyloid proteins from blood transfusion or surgical procedures.

In a statement on the research, Eric Karran, PhD, director of research at Alzheimer's Research UK, said, "Previous research has suggested that the amyloid protein may behave in a similar way to the prion protein responsible for CJD, but this study provides evidence that amyloid could also be passed between humans through contaminated brain tissue."

"While the findings sound concerning, it's important to remember that human-derived hormone injections are no longer used. It's unusual for people of the ages studied in this research to have amyloid in the brain, but we don't know whether they would have gone onto develop Alzheimer's and there is currently no evidence that people who received human-derived growth hormone have a higher rate of the disease."

"The findings are from a very small number of people, but deserve further detailed investigation of those who received these transplants. The study highlights the potential for research into prion and CJD to provide important insights into diseases like Alzheimer's too. It will also be important to investigate whether proteins linked to other neurodegenerative diseases, including other forms of dementia, could be transmitted in a similar way."

Dr Karran added: "Current measures in place to limit contamination with the prion protein and minimize CJD risk from hospital procedures are very rigorous and the risk of developing CJD from surgical contamination is extremely low. While it will be important for further studies to explore any potential implications of today's research, there is currently no evidence to suggest that the amyloid protein could be passed through dental surgery or blood transfusions. The biggest risk factor for Alzheimer's is age, along with genetic and lifestyle factors. If further research was to confirm a link between historical tissue contamination and Alzheimer's, it would only likely be relevant to a tiny proportion of the total number of people affected."

In an accompanying editorial published as "News & Views" in Nature, Mathias Jucker, PhD, University of Tübingen, Germany, and Lary C. Walker, PhD, Emory University, Atlanta, Georgia, also reassure that this suggested transmission of amyloid β pathology occurred in the uncommon context of long-term treatment with cadaver-derived HGH.

"So far, there is no indication that Alzheimer's disease can be transmitted between people under ordinary circumstances. Furthermore, the replacement of cadaver-derived HGH by genetically engineered growth hormone has eliminated the risk that growth-hormone treatment will inadvertently transmit brain disorders between humans," they write.

"However, it is conceivable that the human transmission of Aβ seeds can occur under other conditions, which must now be carefully defined," they caution.

They conclude that the current findings "should stimulate new research in this direction, and, more generally, will inspire further investigation into the mechanisms that govern the formation, transmissibility and toxicity of misfolded protein seeds in neurodegenerative diseases."


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