ORIGINAL RESEARCH PAPER

Anatomy

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PRIONS AS HAZARD DURING HANDLING OF CADAVERS

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Introduction

The past 20 years have witnessed a dramatic resurgence of interest in a hitherto obscure neurodegenerative disease, Creutzfeldt-Jakob disease (CJD(1) Being a member of an anatomy department has its own risks as all other fields. The potential infection hazard by prions during handling of human cadavers is one of them. Cadavers are the main studying materials of teaching in anatomy.(2) The cadaver may cause infection via prions to persons handling cadavers in anatomy.

Prions are proteinaceous infectious particle; an infectious protein particle similar to virus lacking nucleic acid. It is thought to be agent responsible for fatal neuro generative disorders such as Creutzfeldt–Jakob disease (CJD) (1)and Gerstmann–Stra¨ussler–Scheinker disease (GSS) and fatal familial insomnia (FFI). All have been grouped as transmissible spongiform encephalopathies.(TSS) Prions have been shown as main causative agent of TSS. (3,4,5)

Prion diseases are a group of rare fatal neurodegenerative diseases. They affect humans, agricultural, captive and free ranging animals. Unusually, they have genetic, apparently sporadic and acquired forms, and even the genetic and the sporadic forms are experimentally transmissible events in the UK, where an outbreak of a new prion disease in cattle (bovine spongiform encephalopathy or BSE) potentially exposed a large section of the UK population to prion infectivity through a dietary route. The numbers of cases of the resultant novel disease variant CJD (vCJD), have so far been limited and peaked in the UK in the year 2000 and have subsequently declined.(1) Infection of persons have been shown to be via dietary route as infective agent i.e. prions are resistant to fixative agents like formalin which is used worldwide.

Discussion

vCJD (variant CJD), is considered to be a consequence of human exposure to bovine spongiform encephalopathy (BSE) in the food chain by protein resistant to protease. In contrast to sCJD, vCJD occurs in much younger individuals (median age 26 years; range, 12–74 years) and the illness has a longer duration (median 14 months; range, 6–40 months) characterized by loss of motor control, dementia, paralysis, and death secondary to pneumonia. The great majority of cases have occurred in the United Kingdom where there have been 164 vCJD deaths since 1995.

Sporadic CJD(sCJD) affects those aged 60–80 years and results in a rapidly progressive dementia with death occurring on average within 6 months., whose cause is unknown, is the most common form, occurring with an annual frequency worldwide of approximately one case per million population and accounting in the United Kingdom for over 75% of CJD deaths.(1)

The third type is iatrogenic CJD. (iCJD) The first of case of iatrogenic transmission was in 1974 and is the only one considered to be a confirmed case of iatrogenic transmission as there was autopsy confirmation of CJD in both the donor and recipient(6)

Cases of iatrogenic CJD (iCJD), have been reported to be transmitted by dura mater grafting and human pituitary-derived growth hormone exposures by these routes to recipients can probably be viewed as problems that occurred in 20th century(7).

Wardsworth etal in 2011 reported nine brain out of ten and four out of seven appendix ,inoculated mice affected with prion disease in formalin fixed retrograde anonymous screening of lymphoreticular tissue removed during routine surgery .He reported infection of mice by formalin fixed tissue. He showed all cases of vCJD examined show type 2B PrPres, irrespective of brain region assayed and showed PrPres (resistant type of prion protein) type is also found in other lymphoreticular tissues such as tonsil and gut associated lymphoid tissue. (8)

The infectious agent of CJD that is prion, have been shown to adhere strongly to metal, and experiments with metal wires exposed briefly to infected tissue have shown this to be a highly effective route of transmission of infection.(9)

The infectious agent that causes CJD has been called a prion and can be defined as small proteinaceous infectious particles resistant to inactivation by procedures that modify nucleic acids. It might be transmitted by diet or after medical procedures such as surgery, cadaver pituitary-derived growth hormone injections, and cadaveric dural grafts or cornea transplants (10)

Therefore concerns have been raised about transmission by metallic surgical instruments.

Prions are remarkably resistant to conventional means of instrument sterilization. (11)

The CJD agent has been shown to survive well in formalinized tissue, and it has been experimentally demonstrated that transmission of prion from formalinized brain tissue to mice is possible.(12)

Prions have been shown to stay infective even in ash also at 360°C after formaldehyde fixation (13). The evidence of risk to those who handle infected tissue has been supported by case reports of this disease in morbid anatomy workers. (14)

Conclusion

Prions poses a health hazard to staff and students both while working on cadavers. Each cadaver plays as an effective infective agent and may lead to iCJD. The cadaver who arrives should reach with detailed report about cause of death. While working on tissue disposable surgical instruments should be used. As spread has been shown through lymhoreticular tissue and brain tissue; special precaution should be taken while dissecting on these areas. We also recommend Steam autoclaving (instruments, safety gloves, etc.) at 134°C with 30 lbs psi for 60 min (13) Chemical decontamination with 2 N NaOH for 1 h or 1 N NaOH for 2 h is an alternative for non autoclavable materials and surfaces. It is not recommended to use NaOH for aluminium material. Boiling of

instruments in 3% sodium dodecyl sulfate (SDS) at least 3 min is another option. used either alone or in combination with using SDS or NaOH. Alternatively, 5% NaOCl (at least 20,000 ppm free chloride) can be used for 2 h, but this chemical is very irritating and corrosive to steel (14) Further research should be carried out to ascertain its effect especially due to cadaveric grafts or while working during anatomy dissection.

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