ISSN: 0976-3031

Available Online at http://www.recentscientific.com

CODEN: IJRSFP (USA)

International Journal of Recent Scientific Research
Vol. 9, Issue, 8(E), pp. 28599-28602, August, 2018

International Journal of Recent Scientific Research

DOI: 10.24327/IJRSR

Research Article

AN OVERVIEW OF LESS KNOWN PRION DISEASE

Shailla Cannie*

Shri Mata Vaishno Devi University Principal, Shri Mata Vaishno Devi College of Nursing

DOI: http://dx.doi.org/10.24327/ijrsr.2018.0908.2488

ARTICLE INFO

Article History:

Received 13th May, 2018
Received in revised form 11th June, 2018
Accepted 8th July, 2018
Published online 28th August, 2018

Key Words:

Prion, Encephalopathies, Creutzfeldt Jacob Disease, Prion Protein

ABSTRACT

Prion diseases are uniformly fatal, often rapidly progressive, neurodegenerative diseases resulting from the transformation and accumulation of a native protein, the prion protein, into an abnormally shaped protein, called the Prion. The history of Prion disease commenced in the year 1920, when Hans Gerhard Creutzfeldt reported a 22 year old woman with a mysterious and progressive focal syndrome of CNS that was clinically identified by psychomotor abnormalities and cortical symptoms. Researchers have shown that the disease occur in most of the developed world at a rate of 1 to 1.5 cases per million per year. The treatment is aimed at alleviating the symptoms and making the patient as comfortable as possible. The preferable recommendations in prion disease is Genetic Counselling involving pre and post test counselling of patients by including an assessment of capacity and discussion of the risks and benefits of testing.

INTRODUCTION

Prion diseases are uniformly fatal, often rapidly progressive, neurodegenerative diseases resulting from the transformation and accumulation of a native protein, the prion protein, into an abnormally shaped protein, called the Prion. Human prion diseases such as Creutzfeldt Jacob Disease come in three forms: Sporadic, Genetic and Acquired. [1] For many years it was believed that this family of diseases was referred to as transmissible spongiform encephalopathies including Scrapie and Jakob-Creutzfeldt disease which were caused by slow viruses.

As an unorthodox cause of dementia in human's prion disease present as rapidly progressive cognitive and behavioural changes associated with visual and cerebellar impairments, extra pyramidal and pyramidal signs. Additionally these disorders as a group share a spongiform degeneration of the encephalon and amyloid plague formation [10, 11]

Definition

Transmissible Spongiform Encephalopathies, which are also known as prion disease, are unique infectious and invariably fatal neurogenerative disorders of humans and animals that results from the misfolding of a normal cell protein into an abnormal protein.

Purpose

Prion diseases are uniformly fatal, often rapidly progressive, neurodegenerative diseases resulting from the transformation and accumulation of a native protein, the prion protein, into an abnormally shaped protein, called the Prion. The purpose is to create awareness in respect of the disease which is not common.

History of Prion disease

The history of Prion disease commenced in the year 1920, when Hans Gerhard Creutzfeldt reported a 22 year old woman with a mysterious and progressive focal syndrome of CNS that was clinically identified by psychomotor abnormalities and cortical symptoms. [1] The autopsy of this patient revealed prominent gliosis (It is a nonspecific reactive change of glial cells in response to damage to the central nervous system) with non inflammatory focal lesions of the cerebral cortex.

The precise nature of the transmissible infective agent in TSE has been the subject of intense debate and speculation for several decades. In fact, Prions were described as "small-proteinaceous infective particles.'' Researches have shown that the disease occur in most of the developed world at a rate of 1 to 1.5 cases per million per year. [7]

Corresponding author:* **Shailla Cannie
Shri Mata Vaishno Devi University Principal, Shri Mata Vaishno Devi College of Nursing

Epidemiology of Prion disease

The following diseases are associated with the unconventional agents. The epidemiological assessment of CJD exists only in certain countries where surveillance units follow development of every new case. Kuru is transmitted horizontally with cessation of cannibalism rituals in the area of New Guinea where both genders eat brains of dead individuals. [1]

Man

Kuru

This disease is most commonly optically discerned in women, probably because of the fact that the encephalon and other internal viscera were given to women and children whereas the muscle to men. At the peak of epidemic, over 90% of all deaths in women were due to Kuru. With the cessation of cannibalism in the 1950s, the incidence of Kuru gradually disappeared, first among the children followed by adolescents and young adults. [6]

Clinical Features

- Vague Prodrome characterized by malaise, arthralgia and headache
- Gait instability, balance problems, frequent falls
- Inability to walk or sit without support
- Gait ataxia accompanied by dysmetria, dysarthria, in coordination of upper extremities
- Various movement disorders such as clonus, chorea, emotional incontinence with inappropriate laughter and convergent strabismus
- Presence of Dementia in later stages [1,8]

Creutzfeldt-Jacob Disease

CJD has an ecumenical distribution and had been reported in 50 countries. Epidemic clusters have not been documented in the majority of countries affected. However, several foci have been identified in Czechoslovakia, Italy Hungry, and Israel. There is a conventionally high incidence of CJD in Libyan-born Israeli Jews. Up to 15% of all cases of Creutzfeldt Jacob Disease have a family history of disease consistent with autosomal dominant transmission. The onset of disease in familial cases is significantly earlier than in sporadic cases. It is the most common human Prion disease form, but still in rare form with an annual incidence range between one and two cases per million per year worldwide. [1, 6]

Clinical Features

- Non-specific behavioural abnormalities including anxiety, asthenia, depression
- Loss of appetite, weight loss, fatigue, dizziness
- Alteration in sleep pattern, social regression
- Development of forgetfulness, progressive decline of higher cortical functions (reasoning, abstract thinking, calculation and judgement) in later stage
- Minority of patients present a combination of cognitive impairment and neurological deficits
- Progression of disease leads to myoclonic jerks, athetoid movements, parkinsonism
- Terminal stage represents collapse into coma, death due to thromboembolic complications [8,11]

Gerstmann-Straussler Syndrome

The duration of both Kuru and CJD ranges from 6 months to a year and therefore the incidence and prevalence are approximately equal. However, GSS was categorized as TSE in 1981 when its transmissibility was discovered. The Gerstmann Straussler Syndrome is associated with strongly seropositive Voltage Gated Potassium Channel (VGKC)-complex antibodies. This disease typically occurs in fourth or fifth decade and manifest with cerebellar ataxia and motor deficits. [1, 6]

Clinical Features of Gerstmann Straussler Syndrome

- Cerebellar involvement such as Ataxia
- Dysarthria
- Later dementia
- Parkinsonism
- Cortical blindness, deafness and gaze palsies [8,11]

Transmission of Prion

1. Refolding model
2. Seeding model

The two models represent conformational conversion of PrP(PrP^C) to the protease-resistant aggregated form of PrP (PrP^C).

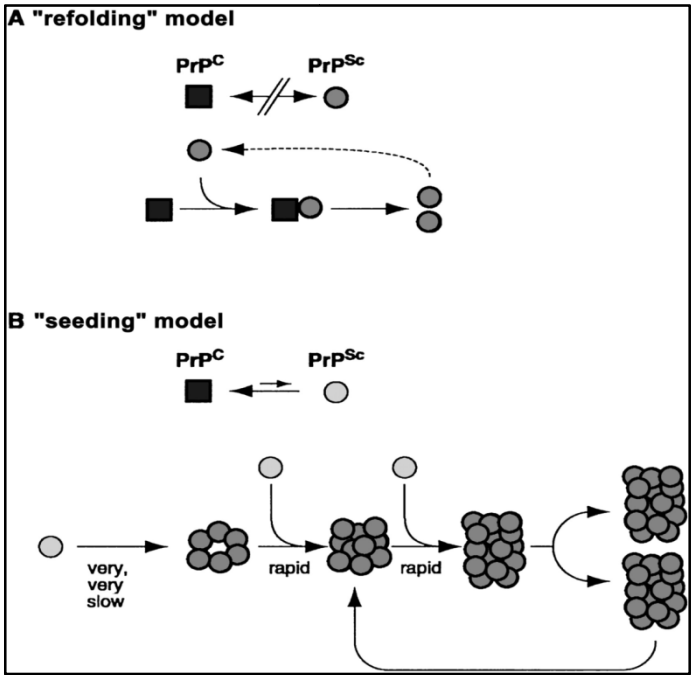


Figure 1 Refolding Model

The Refolding model: - The model shows conformational changes which are kinetically controlled, a high activation energy barrier prevents spontaneous conversion at detectable rates. Interaction with exogenously introduced PrP^{Sc} causes PrP^C (Protein Prion) to undergo an induced conformational change to yield PrP^{Sc}. This reaction could be facilitated by an enzyme. With certain mutations in PrPC, spontaneous conversion to PrP^{Sc} may be rare, explaining why familial CJD or GSS syndrome arise spontaneously, late in life. [2, 4]

Seeding Model:- PrP^C and PrP^{Sc} are in equilibrium, with PrP^C strongly favoured. PrP^{Sc} is only stabilized when it adds onto a crystal-like seed or aggregate of PrP^{Sc} (dark symbol). Although

seed formation is rare, once a seed is present, monomer addition ensues rapidly. The aggregates must be continuously fragmented, by generating increasing surfaces for accretion to further view exponential conversion rates. [3]

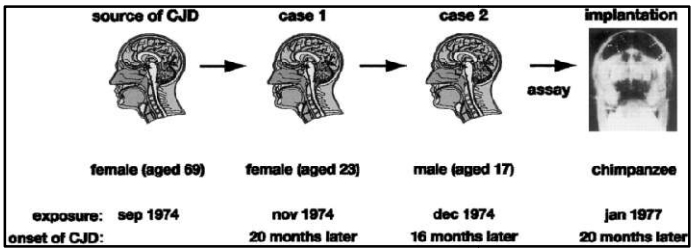


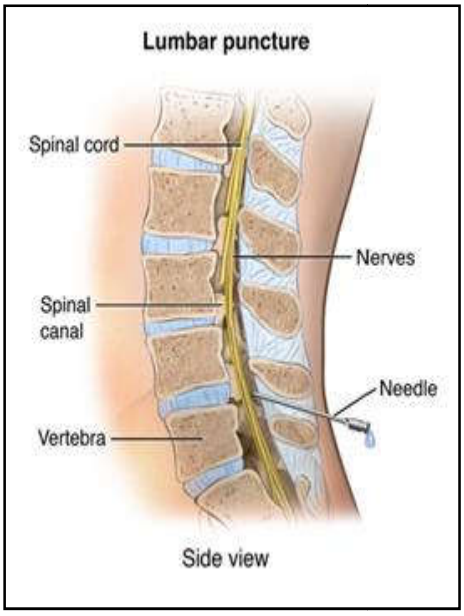
Figure 2 Seeding Model

The transmission of sporadic CJD into two persons via intra cerebral electrode is visible in the figure. An electrode that has been inserted into cortex of an unrecognized CJD patient and decontaminated after each use with benzene, 70% ethanol and formaldehyde vapour was used in succession on 2 additional patients who subsequently developed CJD. After these events, the tip of the electrode was implanted into brain of a chimpanzee, where it again caused lethal spongiform encephalopathy. [3]

Clinical Manifestations/Neurodiagnosis

The tests include

- MRI scans of the brain
- Samples of fluid from the spinal cord (CSF markers)
- Electroencephalogram, (EEG) which analyses brain waves but the pattern typically, occurs late in the disease. The results are positive in about 70% of patients with CJD
- Blood tests
- Neurologic and visual examination to check for nerve damage and vision loss
- Mini Mental Status Examination [1, 5]



Treatment

There is no known treatment available for Prion disease to date. Many drugs have been tested by researchers and none of them has shown consistent benefit. The treatment is aimed at alleviating the symptoms and making the patient as comfortable as possible. [1] The preferable recommendations in prion disease is genetic Counselling involving pre and post test counselling of patients by including an assessment of capacity and discussion of the risks and benefits of testing, implications of positive and negative result and the strategies for reducing the anxiety.

In addition, a complete behavioural health assessment should be considered in all cases to fully address the individual's reaction to the results. Patients with high risk of untoward psychological reaction or destructive behaviour should be a special concern to anyone screening for CJD and a referral to psychiatry should be initiated as well. [12, 5]

Universal Precautions for Prion Disease

Risk of infection	Tissue
High	Brain (including dura mater) spinal cord and eyes (cornea)
Low	CSF, Liver, lymph nodes, kidney, lung and spleen
None	Pheripheral nerve, intestine, bone marrow, whole blood, leukocytes, serum, thyroid gland, adrenal gland, heart, skeletal muscles, adipose tissue, placenta, tears, nasal mucus, semen and vaginal secretions [1,9]

General Precautions

Standard precautions should be utilized for all patients with known or suspected CJD. Adscititious precautions are not necessary. Gloves should be worn for handling of blood and body fluids. Masks and protective eyewear should be worn if exposure to blood or other material that is potentially infectious to mucus membrane or skin is anticipated. [1, 10]

No special precautions are required for disposal of body fluids. These types of fluids could be disposed of by designating into sanitary sewer. Blood or blood contaminated fluids should be managed as per the state regulations of medical waste.

Laundry of these patients should be managed as required by the Occupational Safety and Health Administration on blood borne pathogens. No supplemental precautions are required.

Decontamination of contaminated Medical devices

High risk tissues defined as encephalon (including dura mater), spinal cord and eyes from high risk patients and semi critical or critical items:-

Must be cleaned, sterilized by autoclaving at 132^0 C for 1 hour or immersion in sodium hydroxide 1N (normal) or 10% sodium hypochlorite solution for 1 h is recommended for materials that come in contact with tissues of patients with suspected or confirmed CJD. Standard methods of sterilization (e.g. exposure to formalin) are ineffective. [11]

CONCLUSION

Prion diseases so far are unique conformational diseases because they are transmissible by misfolded protein, not only under experimental conditions but additionally naturally, predominantly by ingestion. Albeit in certain cases the inception of an experimental amyloidosis can be expedited by the injection of amyloid into a predisposed host. Prion protein is encoded by the genome of its host; we can only speculate the form of PrP which has originated as a messenger protein. [13]

References

1. Benjamin JS, Virginia AS, Pedro Ruiz, Comprehensive Textbook of Psychiatry, tenth edition, Kaplan and Sadocks, Wolters Publications, Vol 1
2. Prusiner SB. Molecular biology of prion diseases, Science, PubMed, 1991, vol. 252
3. Jarrett JT, Lansbury PJ. Seeding one-dimensional crystallisation of amyloid: a pathogenic mechanism in Alzheimer's disease and scrapie, *Cell*, 1993, vol.73
4. Orgel LE. Prion replication and secondary nucleation, *Chem Biol*, 1996, vol.3
5. Raymond GJ, Hope J, Kocisko DA, *etal*. Molecular assessment of the potential transmissibilities of BSE and scrapie to humans, *Nature*, 1997, vol.388
6. Bernoulli C, Siegfried J, *etal*. Danger of accidental person-to-person transmission of CJD disease by surgery, *Lancet*, 1977, vol.1
7. Gibbs CJJr, Asher DM, Kobrine A, *et al*. Transmission of CJD to a chimpanzee by electrodes contaminated during neurosurgery, *Jurnal of Neurol Neurosurg Psychiatry*, 1994, vol.57
8. www.hopkinsmedicine.org/healthlibrary/conditions/nervous system
9. Johan K, Westermark G, Engstrom U, *etal*. Acceleration of amyloid protein A amyloidosis by amyloid –like synthetic fibrils, Proc Natl Acad Sci USA, PubMed, 1998, vol.95
10. True HL, Lindquist Sl. Ayeast prion provides a mechanism for genetic variation and phenotype diversity, Nature, PubMed 2000, vol.407
11. Gambetti P. Kong Q, Zou W, *etal*. Sporadic and familial CJD, Classification and characterisation, *Br Med Bull* 66(1), 2003
12. Prusiner SB. Prions. Proc Natl Acad Sci USA, PubMed, 1998,
13. Maddox RA, Pearson M, Minino A *et al*, improving CJD incidence estimates by incorporating results of neuropathological analyses, US 2003-2011, Presented at Prion 2015 International Research Congress.

How to cite this article:

Shailla Cannie.2018, An Overview of Less Known Prion Disease. *Int J Recent Sci Res.* 9(8), pp. 28599-28602.
DOI: http://dx.doi.org/10.24327/ijrsr.2018.0908.2488

****