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INFECTION CONTROL

EDITORIAL

Containment Precautions in Hospitals for Cases of Creutzfeldt-Jakob Disease

Creutzfeldt-Jakob disease (CJD), a progressive neurological disorder of worldwide distribution, is characterized clinically by dementia, myoclonus, and multifocal neurological signs. Electroencephalography, in most cases, shows high voltage, periodic discharges. Pathological examination of the brains of CJD patients at biopsy or autopsy reveals status spongiosus, vacuolation of neurons and astrocytes, astrocytic proliferation, and, in a minority of cases, PAS-positive "amyloid" plaques. Although the clinical and pathological features of CJD are not suggestive of an infectious etiology, the transmissible nature of CJD has been demonstrated in experimental animals.[1] Furthermore, CJD has been transmitted from human to human by corneal transplantation[2] and by improperly sterilized stereotactic electrodes used during craniotomy.[3] Animal inoculation studies using material from CJD patients have documented transmission of infection from brains, spinal fluid, and extraneural tissues of fatally infected patients. Transmission has not been accomplished using patients' blood, serum, urine, feces, or saliva.

The agent of CJD is similar to the agents of three other spongiform encephalopathies: Kuru of man, scrapie of sheep, and transmissible mink encephalopathy (TME). These agents possess biological and physicochemical properties which differ from those of all other known animal viruses. Among these unique properties are the ability of the agents to produce fatal neurological disease without eliciting inflammation or provoking humoral or cell-mediated immune response, and the resistance of these agents to heat, radiating energy, formalin, and most products used for decontamination in patient care areas and hospital laboratories.

CJD is a rare disorder, with an incidence of approximately one case per million persons per year. Despite a familial incidence of 15-20%, conjugal cases of the disease are extremely rare, and only a handful of cases have been described in physicians or other health care workers. No case has been reported in pathologists — the group of physicians most likely to be exposed to infected organs — or in research workers who handle clinical or experimental material. Nevertheless, the inexorably progressive nature of the disease, the lack of vaccine or treatment, and the extreme resistance of the agent of CJD to conventional methods of decontamination have raised great concern about precautions for dealing with CJD-infected material and have, at times, caused CJD patients to be approached with a degree of caution not far removed from abject fear.

The present issue of *Infection Control* contains recommendations offered by the Centers for Disease Control for containment and decontamination methods in diagnosed or suspected cases of CJD. These recommendations are based on careful review of the existing literature and provide useful guidelines for the care of CJD patients. It should be kept in mind that the precautions listed for surgical procedures, in particular craniotomy, are based on the documented transmission of CJD by contaminated instruments during surgery.[3] The warnings against using as organ donors patients with unexplained dementia are likewise based on clinical experience[2-5] and, indeed, recent cases in which rabies has also been transmitted by corneal transplantation[4-6] suggest that no patient with an unexplained, possibly infectious neurological illness should be considered as a donor for corneal or organ transplant. It should also be remembered, however, that human-to-human transmission of CJD under conditions other than surgery on the brain or its extension, the eye, has never been documented. The threat posed by CJD patients to those involved in their medical or nursing care would appear to be extremely small or perhaps even nonexistent. The recommended precautions for dealing with CJD patients in nonsurgical conditions are based on estimated possibility of risk and not on actual clinical occurrence. There remains a great deal to be learned about the epidemiology and transmission of CJD, and optimal containment measures will not be developed until three major problems have been addressed.

The first major problem in designing optimal containment methods in cases of CJD is that very little knowledge exists about the natural history of infection. The route of transmission of the disease has not been determined, nor has the risk of transcutaneous infection been defined in man. Without this information, containment measures must be imprecise and perhaps unnecessarily rigorous. Similarly, because CJD does not elicit a humoral or cell-mediated immune response, it has not been possible to study the distribution of the agent in human populations. Thus, it is not known whether infection with the agent of CJD invariably produces fatal neurological illness or whether CJD is a rare clinical manifestation of a much more common, usually inapparent infection. It is not known whether the likelihood

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of developing CJD is influenced by subtle variations in host immune defenses or by factors such as the age of the patient at the time of initial infection. It would appear unlikely that a universally fatal illness with a prevalence of one per million per year could be maintained without the occurrence of subclinical infection or the persistence of the agent in some nonhuman reservoir. Ultimately, precautions for handling CJD-infected clinical and experimental material must be based on an understanding of the risk of acquiring infection as well as the risk of acquiring the disease itself, for these two risks may be of very different magnitude.

The second major problem involved in the care of patients with CJD concerns the sensitivity of the agent to physical and chemical methods of decontamination. Although a number of papers have been published listing precautions for the care of CJD patients and for the handling of CJD-infected clinical and pathological materials, these recommendations are based on a small number of studies dealing with mouse-adapted scrapie. Similarly published data do not exist for the agent of CJD. In part, the lack of information reflects the fact that, for many years, studies involving CJD were conducted in primates, with lengthy incubation periods and at great expense. More recently, however, the agent of CJD has been adapted to hamsters, rats and mice. These newer, less costly animal models of CJD should allow detailed investigations into the sensitivity of the agent to a variety of disinfectants under conditions similar to those encountered in patient care and autopsy situations. The concern and uncertainty engendered by CJD patients in most hospitals make such studies very important.

The third — and in many ways most difficult — problem in developing containment measures for CJD-infected patients and materials involves the incorporation of these measures into normal hospital or nursing home routine. Presently, recommended precautions for CJD cases are unlike those for any other infectious human condition likely to be encountered in clinical practice or at autopsy. Hospitals and nursing homes may, by dint of special efforts, apply these precautions in specific cases, but the complexity of these measures makes their use unlikely unless the diagnosis of CJD is virtually certain. Some hospitals and nursing homes may attempt to deal with this problem by simply refusing to accept CJD patients. Unfortunately, patients with CJD are not always easy to identify, and it is likely that many cases of the disease are never recognized and are labelled only as "dementia." Furthermore, the characteristic myoclonus and electroencephalographic changes are frequently absent early in the course of the disease and may disappear once the disease is far advanced, so that even where CJD is eventually suspected, the diagnosis may be made only after repeated neurological and encephalographic examinations or by examination of paraffin sections after autopsy. CJD, then, must remain a diagnostic possibility in every patient with rapidly progressive, unexplained dementia. In addition, the fact that CJD is a systemic infection would suggest that precautions appropriate for CJD should be considered not only in the patient who presents with failing intellect and myoclonus but also in the patient with dementia of unknown duration and course transferred from nursing home or state hospital for surgical procedures such as transurethral prostatic resection or repair of hip fracture, for treatment of medical conditions, or for autopsy. Until precautions for CJD-infected material, such as those published in this journal, can be instituted as a routine, rational part of hospital, nursing home, and autopsy practice, diagnosed cases of CJD will continue to cause extraordinary disruption of normal patient care, while, in the undiagnosed case, unnecessary exposure of health care and laboratory workers to the agent of CJD — however slight the risk — will continue to occur.

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John E. Greenlee, M.D.
Department of Neurology
University of Virginia Medical Center
Charlottesville, Virginia