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Varicella zoster virus – need for better infection prevention and control

PERSPECTIVES

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New knowledge regarding the infectiousness and less frequent clinical manifestations of the varicella zoster virus should have consequences for infection prevention and control, clinical diagnostics and treatment.

The varicella zoster virus primarily causes chickenpox. Herpes zoster is a typical late manifestation with reactivation of latent virus in sensory ganglia. Chickenpox is a highly contagious disease. Herpes zoster has been assumed to be less contagious, but studies have shown that reactivation of the varicella zoster virus also leads to significant spread of the virus (1–4). There has been increasing evidence in recent years that the varicella zoster virus can cause vasculitides, particularly in cerebral arteries (5–9).

Chickenpox can be prevented through immunisation, but this is not included in the Norwegian Child Immunisation Programme. We assume that this is due to doubts regarding the use of live virus vaccine and uncertainty in relation to long-term effects. Immunisation likely results in weaker immunity than having had the disease, so widespread immunisation may lead to an increased incidence of chickenpox in adolescents and adults, and more herpes zoster in the elderly. Clinical symptoms of chickenpox may be suppressed with acyclovir, but this treatment is seldom undertaken.

Prophylactic measures for selected patient groups after exposure to the varicella zoster virus have previously been discussed in the Journal of the Norwegian Medical Association (10).

The number of patients with seriously impaired immunity and haematological and neoplastic diseases is increasing, and a growing number receive immunosuppressive drugs. For these patients, varicella zoster virus infection could have a more serious clinical course (11). The question is whether we take sufficient account of this in diagnostics and infection prevention and control.

Risk of infection

Varicella is highly infectious and infection is both airborne and through contact (10). Localised herpes zoster is considered to be less infectious, but this may have been underestimated.

A case of herpes zoster on a hospital ward in the USA resulted in three secondary cases of chickenpox among healthcare personnel (1). Two of those infected had not entered the patient's room or been otherwise exposed to the virus. The patient's room had slight negative pressure, but the door opening directly onto the corridor had no airlock. Mapping of air currents revealed a lively exchange of air between the room and the corridor. The authors of the study recommended strict isolation for *all* patients with varicella zoster virus infection.

A study of 184 patients with herpes zoster in Scotland documented secondary varicella cases in close contacts of 5.4 % of the patients (12). An immunocompromised hospital patient with herpes zoster in England gave rise to 11 cases of chickenpox: five hospital personnel, two fellow patients (one of whom died) and four visitors (13). This underlines the importance of robust containment around immunocompromised patients with herpes zoster, as they are assumed to have larger amounts of virus in their lesions and therefore pose a greater risk of infection.

Covering of herpes zoster lesions has a bearing on the risk of infection. A study from Japan showed that an ordinary gauze dressing easily allowed the virus to pass through, and the virus could be detected on the surface of the dressing and in the room's air filters (2). Occlusive, impermeable hydrocolloid dressings providing full coverage gave no detectable spread of the virus on the surface or in the room. Varicella zoster virus DNA was detected in throat swabs of two out of seven herpes zoster patients. The authors of the study assumed that pharyngeal deposition of the virus occurs on inhalation of particles from the patients' own herpes zoster, and that further transmission from the throat is conceivable. Occlusive, impermeable dressings are recommended when this is anatomically possible.

Reactivation of varicella zoster virus in oral mucosa and droplet transmission is another possible route of infection. In a study of 54 patients with herpes zoster, a polymerase chain reaction test (PCR test) determined that all were positive for varicella zoster virus in saliva early in the course of the disease, and a small number again tested positive after 15 days (14). This reactivation theory is supported by a positive saliva test in one

patient in whom incipient herpes zoster was suspected due to the nature of the pain, but who had not yet developed visible lesions. Infectious virus was found in tissue culture in one of two patients when this was tested (14).

Parents who have had chickenpox and are seropositive are occasionally temporary carriers of the virus in nasopharyngeal secretions when their own children have chickenpox (15). The risk of infection that this represents is unknown, but it is appropriate to consider sickness absence if they are healthcare workers.

Infection prevention and control

All healthcare workers who are in contact with immunocompromised patients or patients susceptible to infection should ideally be able to document varicella zoster virus seropositivity. No such requirement exists today. Many workers in these occupational groups have grown up in countries where chickenpox is not as common a childhood disease as in Norway. Healthcare workers who are neither immunised, nor have had chickenpox, are potential carriers of infection in the incubation period. Hospital outbreaks are known to have been caused by persons in the incubation phase (16).

The American Centers for Disease Control and Prevention recommend a leave of absence or reassignment for non-immunised, seronegative healthcare workers from day 8 to day 21 following exposure to both chickenpox and herpes zoster (17). Norway has no corresponding guidelines (18).

In cases of herpes zoster, the Norwegian Institute of Public Health's guidelines recommend initiating standard measures to prevent infection and contact infection routines until scabs have formed on the entire rash (18). We agree with the Institute of Public Health that patients with herpes zoster should preferably not be in wards with immunocompromised patients; if that is the case, they should be kept in an isolation room. The guidelines do not directly require separate rooms for all herpes zoster patients, except in maternity wards (18). We believe that all patients with herpes zoster should have separate rooms irrespective of the ward concerned and the extent of the rash, and furthermore that separate rooms should be maintained until all scabs have detached. In addition, personnel should consistently use surgical masks. High virus loads detected in saliva on PCR examination in the early phase of herpes zoster, and the incidence of infectious virus shown by growth on tissue culture, support this (14).

It appears that some Norwegian hospitals ought to tighten their infection prevention and control measures with regard to both chickenpox and herpes zoster. The measures need not necessarily be the same in all hospitals. Special attention should be paid to nosocomial infection in wards containing patients with impaired immunity.

Immunisation

We believe that selective immunisation of especially vulnerable patient groups should be considered. Some relevant groups might be seronegative persons who are to undergo transplantation, patients with chronic diseases such as juvenile arthritis and kidney

disorders, and non-immune teenagers and adults, especially women who are planning a pregnancy (18). Immunising close contacts of persons at risk of a serious course of chickenpox is essential, particularly if the vaccine is contraindicated for the patient her/himself.

In selected wards, the Centers for Disease Control and Prevention recommend checking healthcare workers for seropositivity to the varicella zoster virus and offering immunisation when relevant (17). In our opinion, this practice should be considered in wards with especially vulnerable patients. Legally this may represent a grey area, and in Norway we have no legal basis for compulsion.

The World Health Organization is clear in recommending immunisation for healthcare workers who have not been immunised as children, whose medical history regarding chickenpox is uncertain, and who work with vulnerable groups for whom varicella zoster virus infection may take a serious course (19). Premature babies and neonates, children and adults with impaired immunity, haematological and malignant diseases, and recipients of organ transplantation are examples of such vulnerable patient groups.

Norwegian anaesthesiologists propose widespread immunisation for the varicella zoster virus in persons over 64 years of age to reduce the incidence of herpes zoster and above all postherpetic neuralgia, which is difficult to treat and often leads to severely reduced quality of life (20). This stance has international support (21). The usual vaccine with live attenuated varicella zoster virus should likely not be used, but rather a type that is specially designed for named, age-related indication (21).

Complicating disease

Meningoencephalitis caused by the varicella zoster virus is a well-known but rare disease, and frequently manifests itself clinically as aseptic meningitis (22). Varicella pneumonia is also well known and easy to diagnose, but sometimes difficult to treat. Secondary staphylococcal or streptococcal infections following chickenpox can be serious.

Our impression is that clinicians rarely consider possible varicella zoster virus infection in cases of stroke. However, sequelae in the form of stroke after chickenpox or herpes zoster do occur (5). Improved angiographic diagnostics and detection of the virus in cerebrospinal fluid reveal varicella zoster virus-related cerebrovascular incidents in patients in various age groups (6, 8, 23, 24).

In children, it is especially important to consider varicella zoster virus as a cause of cerebrovascular episodes (23). Not all have preceding symptoms typical of chickenpox. Adequate diagnostics and rapid antiviral treatment are essential for the outcome.

Varicella zoster virus arteritis should always be considered in cases of stroke in the first months following herpes zoster, particularly after herpes zoster ophthalmicus (25). A Swedish study indicates an elevated risk of stroke in the first year after herpes zoster, especially in younger patients (26). In these patients, arteritis is found with accompanying stenosis or occlusion as solitary or multiple lesions in large as well as small cerebral arteries. Varicella zoster virus DNA in cerebrospinal fluid is most frequently detected in immunocompromised patients (6). Although we have not found comparative studies, high intravenous doses of acyclovir appear to be clearly indicated

(27). We suspect that varicella zoster virus arteritis in the central nervous system is underdiagnosed and usually proceeds without causal treatment. For giant cell arteritis of the temporal arteritis type, both causal factors and treatment strategy are still somewhat unclear due to assumed false positive immunohistochemical findings in some studies (27–29).

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