Herpetic whitlow: An occupational hazard
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Herpetic whitlow is a herpes virus infection that involves one or more digits of the hand. The first person to recognize this form of herpetic lesion was Adamson, in 1909, when he described herpes febrilis attacking the fingers. In 1959, Stern and associates, were the first to identify herpetic whitlow as a potential hospital-acquired infection when they discovered 54 occurrences among the nursing staff of a neurosurgical unit. That same year, Blechman and Pascher became the first to report an occurrence of herpetic whitlow in a dental professional. Herpetic whitlow, although initially rare, is receiving more attention in the literature as it becomes a recognized occupational hazard among health care professionals. Unfortunately, there has not been any mention of this occupational hazard in the anesthesia literature since 1970. Many anesthesia care providers are not familiar with the infection or their increased susceptibility to it.

There are more than 100 varieties in the herpes virus group, five of which are known to cause disease in humans. These are the varicella-zoster virus, Epstein-Barr virus, cytomegalovirus and herpes simplex viruses type 1 (HSV-1) and type 2 (HSV-2). Herpetic whitlow is caused by either HSV-1 or HSV-2, since humans are the only known natural hosts of the herpes simplex virus. Studies have demonstrated that 60% of the cases are caused by HSV-1, while the other 40% are the result of HSV-2. In addition, studies have demonstrated that HSV-1 occurs more often on the hands of medical personnel, whereas HSV-2 is more prevalent on the hands of the general population. All of the herpes viruses exhibit a potential for latency, so
herpetic whitlow may be either a primary or recurrent infection.\textsuperscript{4, 7, 13, 15}

After the initial infection, the viruses invade the nerve tissues supplying the affected area. The neurons of the peripheral ganglia and Schwann's cells of the sensory nerves act as reservoirs for the virus until it is reactivated.\textsuperscript{17, 18} There are a variety of factors that may stimulate the recurrence of a herpetic whitlow infection. Some of these are stress, immunosuppression, trauma or surgery to the nerve tissue, menstruation and severe illness. However, the frequency of recurrence is individualized.\textsuperscript{10, 15}

Epidemiology

Herpetic whitlow is uncommon in the general population. Its routes of transmission determine which groups of people are at risk for developing herpetic whitlow. There are three main routes of transmission: (1) direct contact with a herpetic lesion, (2) contact with virus-bearing saliva and/or saliva-coated items and (3) autoinfection, such as nail biting in a person with either a herpes labialis (cold sore) or stomatitis infection.\textsuperscript{6, 7, 15}

Herpetic whitlow results from the herpes simplex virus being introduced through some break in the epidermis of the fingers. Any cut, scrape or minor trauma is sufficient to compromise the integrity of the epidermis.\textsuperscript{9, 14, 15} Those at high risk for developing herpetic whitlow are people with active herpetic lesions elsewhere on their bodies, nail biters who have either herpes labialis or stomatitis and people who have direct contact with the saliva of persons with either oral or genital lesions. Health professionals at high risk include anesthetists, anesthesiologists, dentists, intensive care nurses, respiratory therapists and dental hygienists.\textsuperscript{5, 7, 9, 10, 13, 14}

The incidence of herpetic infections in hospital personnel is probably higher than anticipated. The reservoir of herpes simplex virus is extensive, since 90-96% of the adult population possess antibodies indicating previous exposure to the virus.\textsuperscript{19-21} Herpes simplex virus is endemic, with the majority of infections being subclinical, resulting in 10-20% of the U.S. population being clinically affected by the herpes simplex virus. By 15 years of age, the majority of the population possesses antibodies. However, the higher the socioeconomic status of an individual, the less likely it is that he or she has ever experienced a herpes simplex virus infection. In two research studies conducted in Great Britain, an estimated 49% of nurses lacking antibodies was reported by Stern and associates, and only 32.8% of students in a study by Juel-Jensen were found to possess antibodies.\textsuperscript{2, 22} This resembles the epidemiological pattern of the United States.\textsuperscript{8} Because of their presumably higher socioeconomic status, medical personnel have a low incidence of antibody. These factors, in combination with an increased exposure to the herpes simplex virus through contact with respiratory, oral or genital secretions, result in a higher incidence of herpetic whitlow among medical personnel in the high risk groups.\textsuperscript{8, 16, 19-24}

Clinical characteristics

Primary herpetic whitlow lesions are much more inflammatory and persistent in nature. The initial symptom is pain, tingling and/or burning of the distal phalanx of the finger. This usually occurs after exposure and an incubation period of 2-7 days. This pain is usually followed by swelling, erythema and the formation of several 1-3 mm vesicles upon an erythematous base over the next 7-10 days (Figure 1). These vesicles may coalesce into honeycombed-appearing, bullae-like lesions that may have a hemorrhagic appearance. After 10-14 days, the pain and swelling decrease abruptly, and the vesicles crust over and heal. This is followed by peeling and the appearance of normal skin (Figure 2). It is believed that viral shedding ceases at this time. In rare cases, herpetic whitlow has been associated with fever, malaise, lymphangitis and lymphadenitis.\textsuperscript{2, 5, 7, 9, 11, 14-16, 18, 20, 25-27}

Herpetic whitlow is a self-limiting infection that usually resolves within two to three weeks. If the vesicles are incised and the digital pulp space violated, the course of the infection can be prolonged by a secondary bacterial infection. Viral encephalitis can also occur.\textsuperscript{2, 5, 6, 9, 11, 15, 26}
Recurrence has been reported in 30-50% of the infected individuals, although this varies. Previous herpes infections and the subsequent development of antibodies do not afford immunity from reappearance. Recurrent infections are usually less severe but never subclinical, since lesions will always occur at the site of the original infection or some other mucosocutaneous site. Recurrences are associated with prodromal symptoms of pain, paresthesia and/or hypersensitivity at the site of infection. The recurrence of herpetic whitlow, like other herpes simplex virus infections, suggests that the infection probably persists for life.

Diagnosis

To the untrained eye, the clinical diagnosis of herpetic whitlow may be difficult, and it is often misdiagnosed as some other infection or inflammatory process, such as a bacterial paronychia. The clinical diagnosis of herpetic whitlow can be made on the basis of the symptoms and the clinical appearance of the finger. The occupational setting should suggest the diagnosis, especially when a health care provider in a high risk area presents with a digital lesion.

The clinical finding that distinguishes a herpetic whitlow lesion from a paronychia is the lack of a tense pulp space in the digit. Grouped vesicles on an erythematous base are also characteristic of herpetic whitlow (Figure 1). The vesicular fluid is serous rather than purulent, as in bacterial infections. In addition, there is pain that is described as more intense than is suggested by the physical findings, as well an absence of leukocytosis.

Laboratory tests that are helpful in confirming the diagnosis are the: (1) Tzanck test, (2) serum antibody titers, (3) viral cultures, (4) fluorescent antibody detection and (5) DNA hybridization.

The Tzanck test is a simple, rapid test to confirm the diagnosis. A fresh vesicle is unroofed, and the base is scraped with a #15 scalpel blade. The scrapings are spread onto a glass slide, stained by the Giemsa method and examined by light microscopy for multinucleated giant cells, often with viral inclusion bodies, which are specific for the herpes virus. The Tzanck test is a simple, rapid test to confirm the diagnosis. A fresh vesicle is unroofed, and the base is scraped with a #15 scalpel blade. The scrapings are spread onto a glass slide, stained by the Giemsa method and examined by light microscopy for multinucleated giant cells, often with viral inclusion bodies, which are specific for the herpes virus.

Serum antibody titers are diagnostic if there is at least a fourfold increase in titers, which indicates an active infection. The patient's blood must be drawn in the acute phase of the disease and again three weeks later.

Viral cultures are the most sensitive diagnostic study. Fluid is obtained from an early lesion and inoculated onto a viral culture medium. Herpes simplex grows rapidly and will produce characteristic plaques within 24-48 hours. Viral culturing also allows for specific viral typing.

Treatment and prognosis

The most important stage in the treatment of herpetic whitlow is its recognition.

Treatment is symptomatic, because herpetic whitlow is a self-limiting infection. Analgesics and...
limb elevation are utilized to decrease discomfort and prevent complications. Dry compresses are helpful in protecting the lesions from secondary infection. Antibiotics are necessary only if a bacterial superinfection with associated lymphangitis is present. Deep surgical incision is contraindicated, since violation of the digital pulp space predisposes the individual to a bacterial superinfection, usually staphylococcus. In addition, surgical incision can lead to delayed healing and, potentially, to viral encephalitis, which complicates the course of the infection. Minor surgical procedures may be useful in treating herpetic whitlow. A simple incision or unroofing of the vesicle may be performed to relieve pressure in a tense bullae when there is considerable pain. Uncomfortable subungual lesions may benefit from the segmental resection of the nail to relieve the pressure and pain. However, a major complication of this intervention is an increased incidence of autoinoculation.

Acyclovir is a synthetic antiviral agent that has demonstrated inhibitory activity against both herpes simplex viruses type 1 and type 2. Acyclovir can be used in topical, oral and intravenous routes of administration and is selectively taken up by infected cells. Acyclovir interferes with the DNA replication within the herpes simplex virus. There were no acyclovir-resistant strains of herpes virus reported in the literature reviewed.

Topical acyclovir, used as a 5% ointment, is effective in shortening the clinical course of herpetic whitlow. The duration of symptoms and viral shedding has been decreased in primary infections. However, in recurrent infections, the duration of viral shedding is reduced only when treatment is initiated in the prodromal phase or within the first several hours of the onset of the lesion.

Oral acyclovir has been shown to prevent recurrences. Gill and associates demonstrated a rapid disappearance of the prodrome and no occurrence of cutaneous lesions when therapy using 800 mg orally twice daily for five days was begun at the first sign of recurrence. Laskin used 400-1,000 milligrams per day for up to six months without adverse effects to prevent recurrences. But since oral acyclovir does not affect latency, all test subjects developed recurrences within two weeks of discontinuing the drug. To date, intravenous acyclovir has been shown to have the most profound effect, according to Schwandt and associates, who feel that the intravenous route is the most effective way to administer the drug. Therefore, the use of acyclovir is accepted as a chemotherapeutic treatment for herpetic whitlow, not a cure.

Because herpetic whitlow is a self-limiting infection, the prognosis is good. Its clinical course, unless complicated, is one of spontaneous resolution in about 3-4 weeks. Even with chemotherapy recurrences may occur, but these are generally less intense and of shorter duration. If surgical incision and violation of the pulp space can be avoided, patients are able to return to work sooner. There have been reports, although uncommon, of the occurrence of permanent disabilities such as pain, paresthesias or hyperesthesia that have necessitated career changes.

Prevention
Herpetic whitlow can be prevented! Important factors in its prevention include the detection of active herpetic lesions on patients, the identification of health professionals with active herpetic lesions and the use of gloves whenever respiratory or oral secretions are handled. Once active lesions have been identified on patients, health care providers need to be placed on glove isolation. Health care personnel with active lesions should avoid direct patient contact until the lesions become crusted, because the open lesion contains infectious virus (C. Lopez, 1987, personal communication). Once the lesion crusts over, the health care provider can return to direct patient care if gloves are worn. Infected personnel should avoid working with immunosuppressed patients or those at high risk for herpetic infections, including neonates, pregnant women, burn patients and transplant recipients.

Wearing gloves when coming into contact with oral or respiratory secretions was advocated as early
as 1959 by Stern and associates. The practice is still controversial, despite conclusive evidence in the literature that gloving can prevent occurrences of herpetic whitlow in health care personnel. In 1975, Harmony and associates observed that routine gloving of both hands prevented new occurrences of herpetic whitlow among nursing personnel. In 1975, Orkin labeled this recommendation as excessive both from an epidemiologic and an economic perspective. A review of the epidemiologic data on workdays lost and medical costs incurred indicates such a contention is unfounded. Orkin further contended that gloves should be worn only in cases where anesthesia personnel come into contact with patients who are likely to harbor the virus. Chang and Gorbach agree with Orkin and note that gloves need not be worn in the care of asymptomatic and presumably uninfected patients. But, is such a recommendation rational? Definitely not, considering that up to 10% of the population may be asymptomatic carriers of the herpes simplex virus. Therefore, the rational approach would be to consider all patients infected, at least potentially. If contact is made with respiratory, oral or genital secretions, hand-washing with soap and water may prevent an occurrence of herpetic whitlow by inactivating the herpes virus, which has a lipid surface.

When health care personnel acquire a herpetic whitlow infection, the department or hospital should allow for economic compensation, since herpetic whitlow is a recognized occupational hazard. Such a policy should be instituted to discourage the premature return of personnel to patient contact, thereby decreasing the incidence of transmission.

Summary

Herpetic whitlow can be caused by either HSV-1 or HSV-2. Health care personnel who are at high risk, such as anesthetists, anesthesiologists, dentists, intensive care nurses, respiratory therapists and hygienists, may experience a higher incidence of herpetic whitlow than the general population. Because of the possible direct contact with infected secretions, herpetic whitlow should be considered an occupational hazard. Therefore, a national survey of practitioners should be conducted in order to establish herpetic whitlow as an occupational hazard.

The diagnosis of herpetic whitlow is not difficult, if a health history of minor digital trauma followed by a localized vesicular lesion is obtained. Once suspected, the diagnosis of herpetic whitlow can be confirmed quickly and easily by a Tzanck test or viral culture.

Treatment is symptomatic, since herpetic whitlow is self-limiting and resolves spontaneously in about three weeks. Surgical incision, other than simply to open or unroof a tense and painful vesicle, must be avoided to prevent disastrous sequelae such as bacterial infection or viral encephalitis. There is no cure for herpetic whitlow, but administration of acyclovir has proven to be effective as suppressive therapy in preventing recurrences and in reducing viral shedding.

Herpetic whitlow can be prevented by wearing gloves on both hands when exposed to oral, respiratory or genital secretions. The loss of tactile ability is no excuse for not wearing gloves. Likewise, the cost incurred by gloving is minimal when compared with the cost of an occurrence in terms of lost work days, medical costs and workers' compensation insurance. Good hand-washing practices also can help prevent occurrences of herpetic whitlow.

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