Varicella-Zoster Virus: Chickenpox and Herpes Zoster

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Understanding Varicella-Zoster Virus (VZV)

VZV, an alpha herpesvirus, is responsible for two distinct clinical manifestations:

Chickenpox (Varicella)

The primary infection, chickenpox, typically presents as a generalized exanthematous rash. It is generally a benign illness, especially in childhood.

Herpes Zoster (Shingles)

Reactivation of the latent VZV leads to herpes zoster, commonly known as shingles. This localized entity is particularly prevalent among the elderly and immunocompromised.

VZV establishes latency in dorsal root ganglia after primary infection, capable of later reactivation.

Epidemiology of Chickenpox

1

Human Reservoir

Humans are the sole known reservoir for VZV, facilitating its transmission.

2

Transmission & Replication

Chickenpox is acquired via the respiratory route, with initial viral replication occurring in the nasopharynx or upper respiratory tract.

3

Childhood Prevalence

Historically, chickenpox was a ubiquitous childhood infection, with over 90% of cases affecting children under 13 years, irrespective of gender or race.

Primary infection occurs in susceptible or seronegative individuals exposed to VZV.

Chickenpox Incubation and Infectivity

The incubation period for chickenpox, from exposure to the appearance of the vesicular rash, typically spans 14 to 15 days, though it can range from 10 to 20 days.

Secondary attack rates among susceptible household siblings are remarkably high, ranging between 70% and 90%, underscoring its contagious nature.

> Patients are infectious approximately **48 hours before** vesicle formation and generally remain so for **4 to 5 days thereafter**, until all vesicles have crusted over.

Epidemiology of Herpes Zoster

01

Latency Establishment

Following primary infection, VZV establishes latency within the dorsal root ganglia.

02

Reactivation & Age

Reactivation leads to herpes zoster, a sporadic disease that affects all age groups but is more common in the elderly, impacting over 20% of the population.

03

Immune Balance

Reactivation is influenced by the delicate balance between the virus and host immune factors.

04

No External Exposure

Most herpes zoster patients do not have a recent history of exposure to other VZV-infected individuals, as it stems from internal reactivation.

05

Early Childhood Cases

Cases in children under two, born to mothers who had chickenpox during pregnancy, suggest in utero infection with early life reactivation.

Clinical Manifestations: Chickenpox

In immunocompetent children, chickenpox is typically a benign, self-limiting disease. Mortality rates for unimmunized children are less than 2 per 100,000 cases, but this risk increases more than 15-fold in adults.

Presenting Symptoms

- Rash
- Low-grade fever
- Malaise

Prodromal Phase

Some patients may experience a prodrome 1 to 2 days before rash onset, characterized by lassitude and a fever of 100° to 103°F lasting 3 to 5 days. Subsequent symptoms include pruritus, anorexia, and listlessness, which resolve as the illness abates.

Skin Manifestations of Chickenpox

The hallmark of chickenpox infection is its distinctive skin manifestations, which progress through several stages:

Lesion Progression

Lesions evolve from maculopapules to vesicles and then scabs, often present in varying stages simultaneously.

"Dew Drop" Appearance

Early vesicles are often described as "dew drop like," round or oval, with central umbilication as they heal.

Purulent Transformation

If vesicles do not rupture quickly, their contents can rapidly become purulent.

Distribution

Lesions typically begin on the trunk and face, spreading centrifugally across the body in successive crops over 2 to 4 days. Mucosal involvement (oropharynx, vagina) can also occur.

Crusts typically fall off within 1 to 2 weeks, leaving slightly depressed skin areas.

Non-Cutaneous Complications of VZV

Neurologic Complications

- **Cerebellar ataxia**
- **Encephalitis**
- **Cerebral angiitis**
- **Meningitis**
- **Transverse myelitis**
- **Reye's syndrome**

Non-Neurologic Complications

- Varicella pneumonitis
- **Myocarditis**
- **Nephritis**
- **Bleeding diatheses**
- **Hepatitis**

These complications, though less common than cutaneous manifestations, can lead to severe morbidity and mortality.

Neurologic Complications: Detailed Overview

Cerebellar Ataxia

- Occurs in 1 in 4,000 cases among children under 15 years.
- Can appear up to 21 days post-rash, but acute presentation often within 1 week.
- Symptoms include ataxia, vomiting, altered speech, fever, vertigo, and tremor.
- CSF typically shows lymphocytosis and elevated protein levels.
- Generally benign in children, resolving within 2 to 4 weeks.
- VZV DNA can be detected in CSF via PCR.

Encephalitis

- A more serious CNS complication, potentially life-threatening in adults.
- Reported incidence: 0.1% to 0.2% of cases.
- Characterized by depressed consciousness, progressive headaches, vomiting, altered thought patterns, fever, and frequent seizures.
- Illness duration: at least 2 weeks.
- Mortality rate: 5% to 20%.

varicella pneumonitis

•A serious and life-threatening complication.

occurs more commonly in adults and in immunocompromised persons.

Among adults, it is estimated to occur in 1 in 400 cases of infection and, not infrequently, in the absence of clinical symptoms.

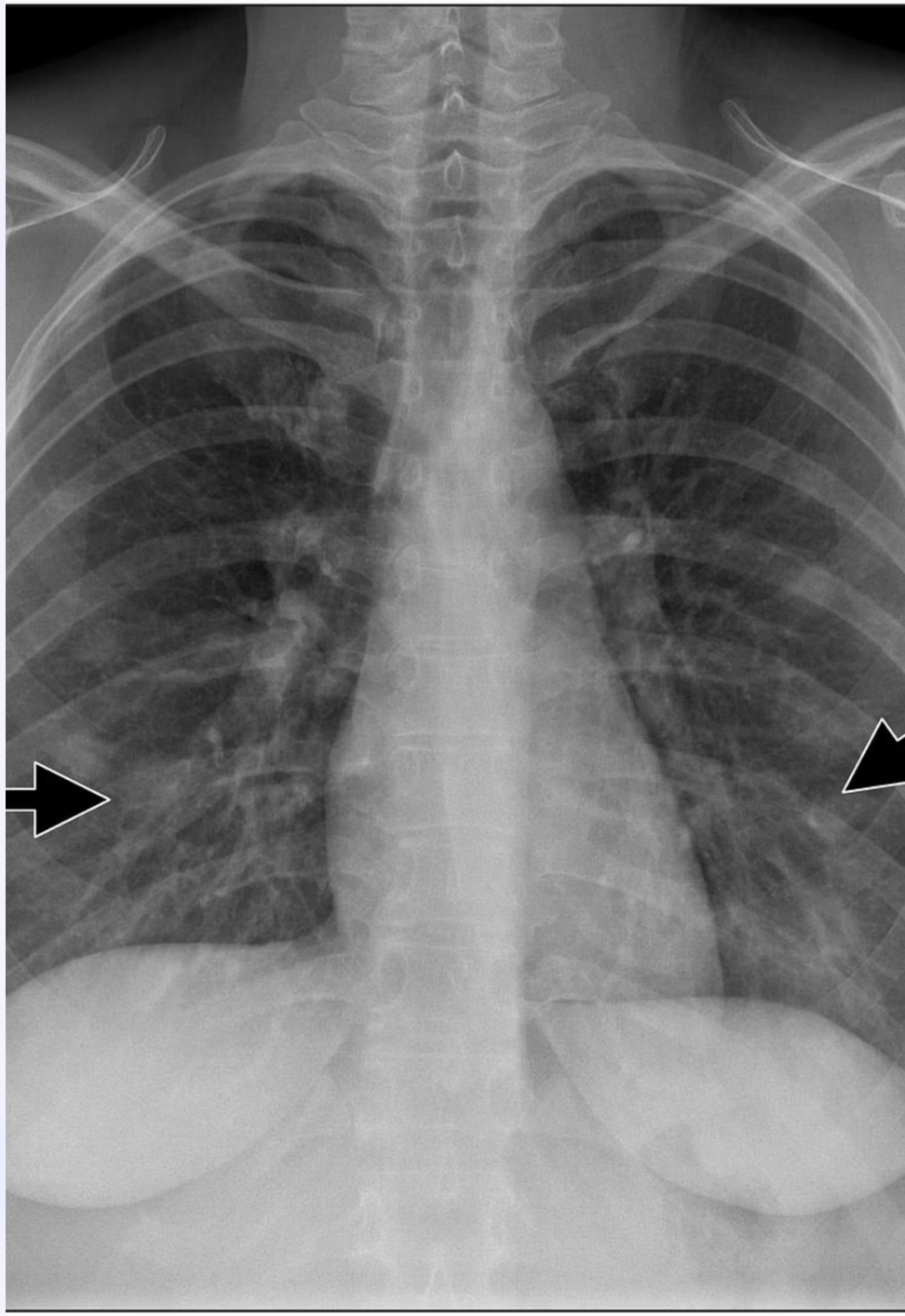
Clinical presentation

Varicella pneumonia usually presents 1–6 days after the onset of the rash and is associated with tachypnoea, chest tightness, cough, dyspnoea, fever and occasionally with pleuretic chest pain and haemoptysis.

However, chest symptoms may start before the appearance of the skin rash

Pregnant women during the second and third trimesters of gestation are particularly vulnerable to pneumonitis with primary infection.

Chest radiographs usually reveal nodular or interstitial pneumonitis.



varicella pneumonia

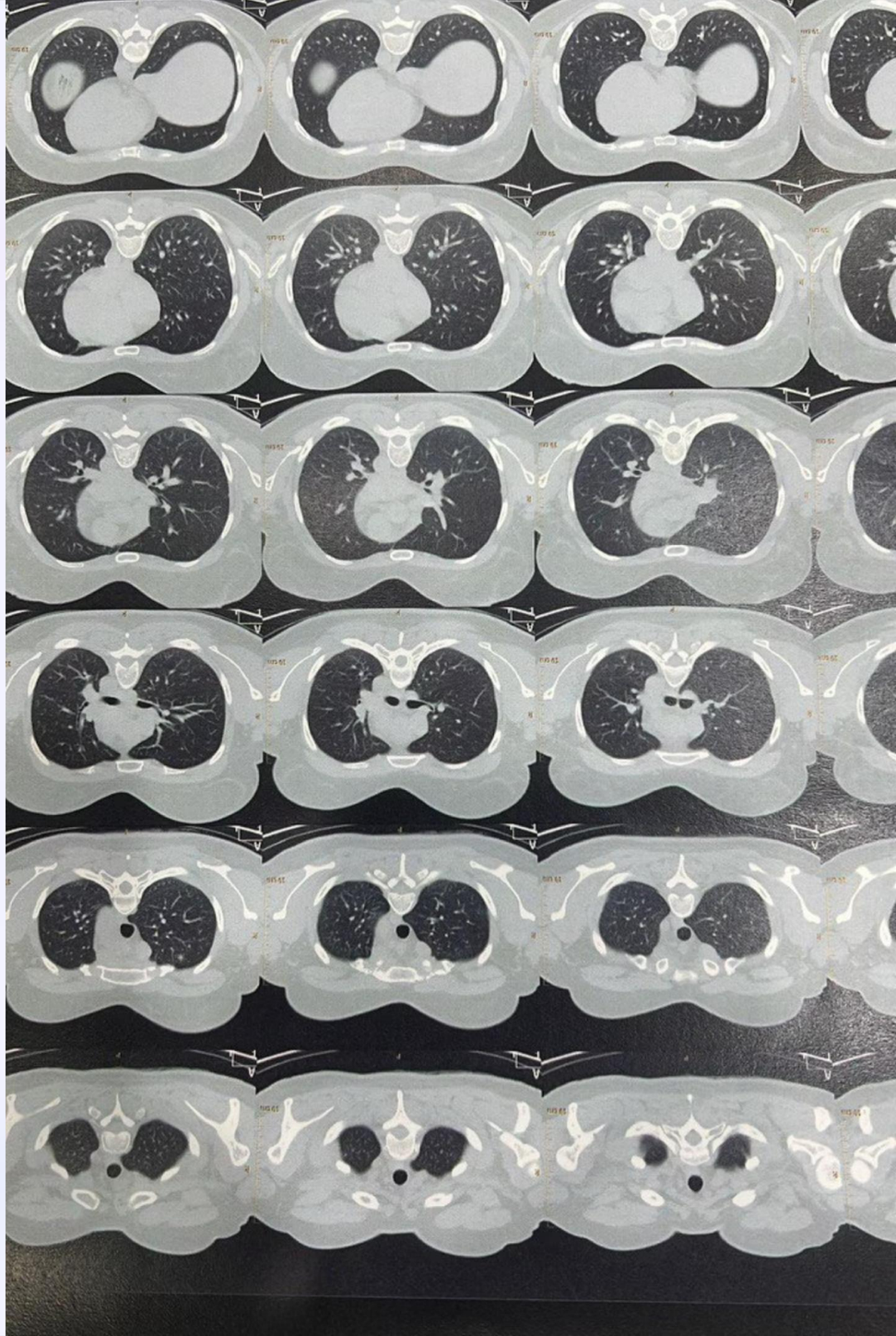
Physical findings are often minimal and chest radiographs typically reveal nodular or interstitial pneumonitis 11.

The presence of new chest symptoms has been shown to be strongly associated with the documentation of radiological pneumonia .With the exception of hypoxia, physical signs are a poor guide of severity

The risk of developing respiratory failure requiring artificial ventilation is difficult to predict early in the disease.

Radiographic abnormalities were detected in nearly 16% of enlisted military personnel who developed Varicella in an outpatient setting yet only one-quarter of these had a cough and only 10% of those with radiographic abnormalities developed evidence of tachypnoea

Therefore, the data indicate that asymptomatic pneumonitis may exist more commonly than might be supposed.



Risk factors for varicella pneumonia

There is a strong correlation between pneumonia and the development of new respiratory symptoms.

1- Previous or current smokers were also at increased risk of developing pneumonia. It is possible that smokers have an enhanced primary viraemia, secondary to the effects of smoking on the nasal mucosa, and this predisposes pneumonia. Furthermore, that smoking renders human alveolar macrophages more susceptible to infection by herpes viruses.

2- Increased number of skin spots (>100 spots), *i.e.* severity of rash, was a factor that increased the risk of developing pneumonia, which may be a reflection of enhanced viraemia.

3- A history of contact with an index case was another factor predisposing to the development of pneumonia. This could be a consequence of these patients having closer contact with the index case and therefore receiving a larger "infecting dose" with an enhanced primary viraemia. children who get chickenpox from siblings usually have a worse disease with more spots.

4- The third trimester of pregnancy was shown in univariate, but not multivariable, analysis to be associated with an increased incidence of pneumonia.

5- Duration of fever was shown to be independently associated with the incidence of pneumonia (odds ratio (OR) 5.6, 95% confidence interval (CI) 2.4–13.0) in a retrospective setting.

6- patients with chronic obstructive pulmonary disease develop more severe pulmonary complications in comparison with healthy individuals

Diagnosis of Varicella Pneumonia

Varicella pneumonia is diagnosed by considering :

1-clinical symptoms (rash, cough, fever, difficulty breathing)

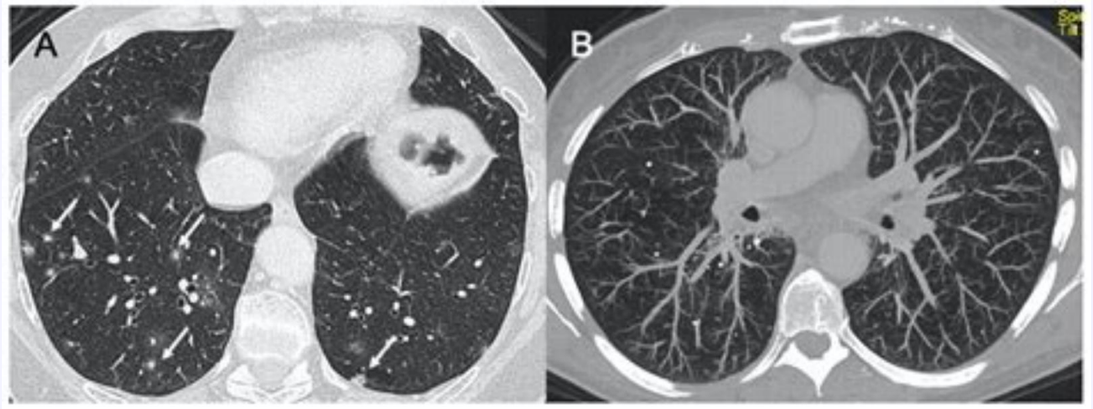
2-Imaging tests like chest X-rays and CT scans showing characteristic lung abnormalities :On a chest X-ray, varicella pneumonia typically presents as multiple ill-defined pulmonary nodules that may be fleeting and confluent, meaning they can appear and disappear or merge together. In the acute phase, these nodules are often 5-10 mm in size. If the pneumonia heals, the lesions can calcify, appearing as diffuse, small, round, and randomly distributed densities throughout both lungs.

3-and laboratory confirmation of the varicella-zoster virus (VZV) DNA through Polymerase Chain Reaction (PCR) in blood, sputum, bronchoalveolar lavage (BAL), or skin lesions.

how long does varicella pneumonia last

Varicella pneumonia can last from several weeks to several months, with radiographic clearing occurring after skin lesions disappear and pneumonia symptoms resolve, although some nodules may persist and calcify indefinitely.

Early symptoms like fever and cough are common, and while the infection is treated with antivirals like acyclovir, recovery time varies significantly depending on the severity of the infection and individual health factors.



Treatmentof Varicella Pneumonia

- Acyclovir has been associated with successful treatment of Varicella pneumonia, It has become standard therapy for patients with or at risk of developing complications of Varicella infection. a clear benefit of acyclovir in reducing severity of the skin rash in immunocompetent adults when administered at <24 h of rash onset
- Currently, the consensus is to use acyclovir daily for 7–10 days and this use should be tailored to each patient's clinical assessment.

- The antiviral agents licensed for treatment of VZV include aciclovir, valaciclovir and famciclovir. VZV is ~10-times less sensitive to aciclovir compared with the Herpes Simplex virus.
- Valaciclovir is the valine ester of aciclovir and improves oral bioavailability from ~15% to ~75%. It is broken down after absorption to valine and aciclovir. Famciclovir is similarly well absorbed.
- With serious illness, such as pneumonia, it is important to appreciate the necessity to use *I.V* therapy (by slow *i.v.* infusion).
- However, some clinical response in uncomplicated chickenpox and/or shingles has been demonstrated with oral aciclovir, valaciclovir and famciclovir, the better absorbed preparations probably being preferable.

- Corticosteroid use adjunctive to current therapy was assessed in one study that included 15 patients, who were all admitted to ICUs. Six received corticosteroids and showed significantly shorter hospital and ICU stays, and no mortality was recorded.

- Varicella pneumonia can progress rapidly to fulminant respiratory failure despite maximum conventional support; this type of respiratory failure is potentially refractory. This argues for the use of extracorporeal membrane oxygenation/life support (ECMO/ECLS), which have been shown to be beneficial.

Herpes Zoster

Herpes zoster, or shingles, is characterized by a unilateral vesicular eruption with a dermatomal distribution.

Thoracic and lumbar dermatomes are most commonly involved.

The onset of disease is heralded by pain within the dermatome that precedes the lesions by 48 to 72 hours.

Early in the disease course, erythematous, maculopapular lesions appear and rapidly evolve into a vesicular rash.

Vesicles may coalesce to form bullous lesions.

In the normal host, these lesions continue to form over 3 to 5 days, with the total duration of disease being 10 to 15 days.

However, it may take 1 month before the skin returns to normal.

Herpes Zoster

Herpes zoster may involve the eyelids when the first or second branch of the fifth cranial nerve is affected; herpes zoster ophthalmicus is a sight-threatening condition.

Although lesions on the tip of the nose are said to presage corneal lesions, absence of such skin lesions does not guarantee corneal sparing.

Ophthalmologic consultation should be requested for any patient with suspected herpes zoster ophthalmicus.

Unusual cutaneous manifestations of herpes zoster,

involvement of the maxillary or mandibular branch of the trigeminal nerve, which results in intraoral involvement with lesions on the palate, tonsillar fossa, floor of the mouth, and tongue.

When the geniculate ganglion is involved,

Ramsay Hunt syndrome may occur, with pain and vesicles in the external auditory meatus, loss of taste on the anterior two-thirds of the tongue, and ipsilateral facial palsy.

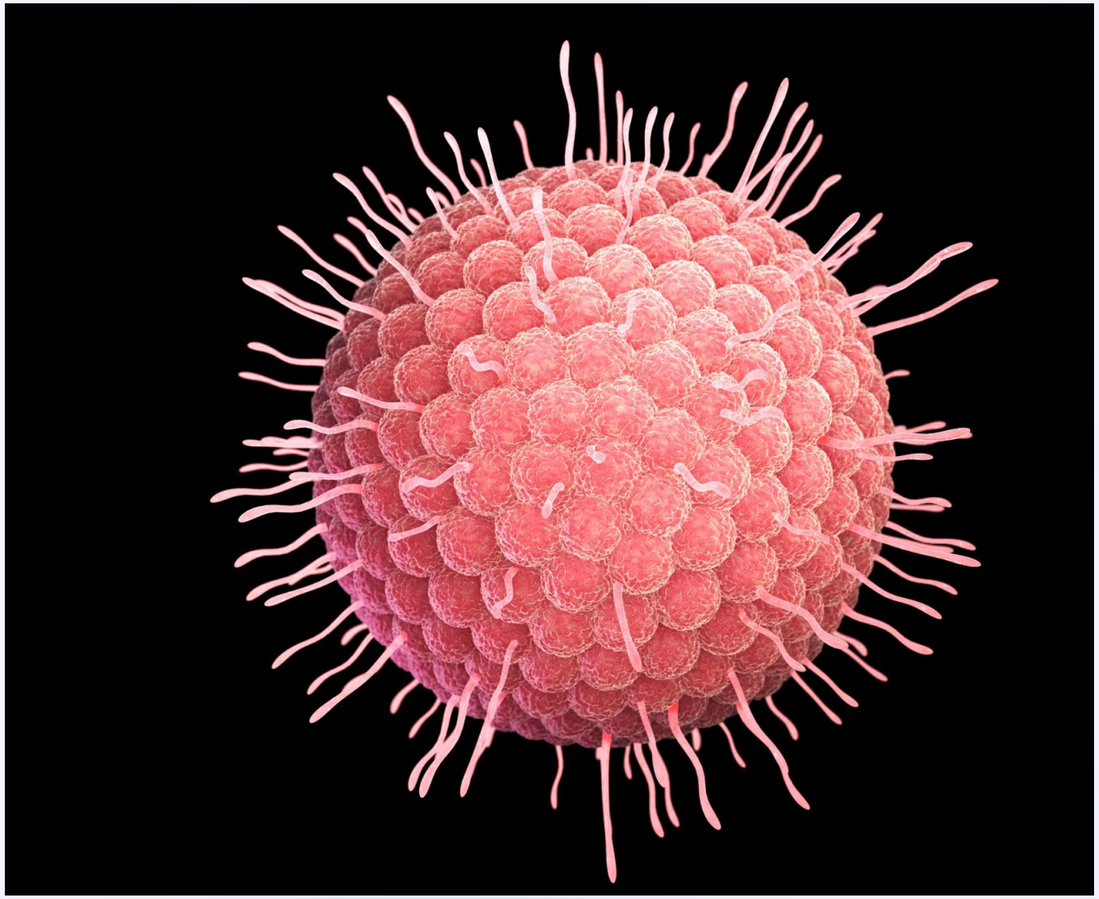
Herpes Zoster

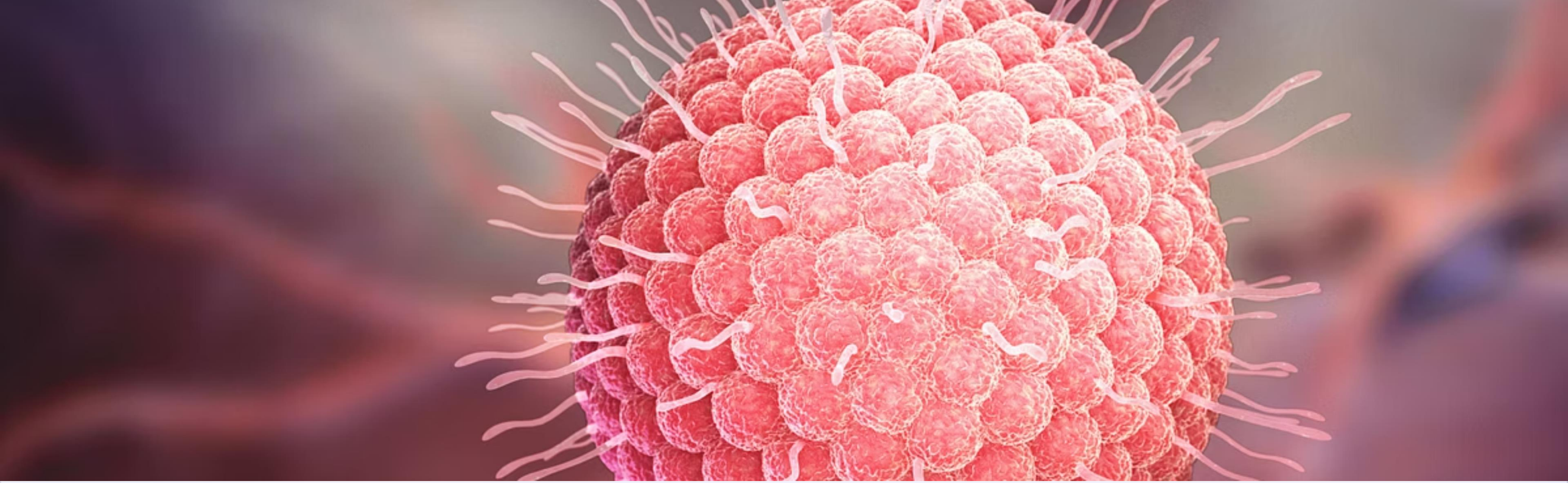
herpes zoster defines three phases of pain:

acute, subacute, and chronic.

The most signi!cant clinical manifestations of herpes zoster are acute neuritis and, subsequently, PHN.

PHN, although uncommon in young people, may occur in 25% to 50% of individuals older than 50 years. Up to 50% of adults older than 50 years have debilitating pain that persists for more than 1 month.





Thank you for your Attention