Percutaneous treatment for Herpes Zoster: new hopes...

Poster No.: C-2033
Congress: ECR 2017
Type: Educational Exhibit
Authors: P. Brunner¹, M. Montillet¹, E. Brunner¹, S. Pagliano¹, S. Brunner¹, M. Baque-Juston¹, N. Beydoun¹, P. Champsaur², J.-P. Tasu³;¹Monaco/MC, ²Marseille/FR, ³Poitiers/FR
Keywords: Interventional non-vascular, Neuroradiology peripheral nerve, CT, Percutaneous, Education, Puncture, Acute, Inflammation
DOI: 10.1594/ecr2017/C-2033

Any information contained in this pdf file is automatically generated from digital material submitted to EPOS by third parties in the form of scientific presentations. References to any names, marks, products, or services of third parties or hypertext links to third-party sites or information are provided solely as a convenience to you and do not in any way constitute or imply ECR's endorsement, sponsorship or recommendation of the third party, information, product or service. ECR is not responsible for the content of these pages and does not make any representations regarding the content or accuracy of material in this file.

As per copyright regulations, any unauthorised use of the material or parts thereof as well as commercial reproduction or multiple distribution by any traditional or electronically based reproduction/publication method is strictly prohibited.

You agree to defend, indemnify, and hold ECR harmless from and against any and all claims, damages, costs, and expenses, including attorneys' fees, arising from or related to your use of these pages.

Please note: Links to movies, ppt slideshows and any other multimedia files are not available in the pdf version of presentations.

www.myESR.org
Learning objectives

The purpose of this educational exhibit is to:

- Briefly discuss the epidemiology, pathophysiology and clinical presentation of Herpes Zoster.
- Assess the Herpes Zoster main complication: Post-Herpetic Neuralgia.
- Explain and illustrate a powerful alternative minimally invasive treatment for Herpes Zoster and Post-Herpetic Neuralgia.
Background

Herpes Zoster (HZ) is a common disease characterized by an acute onset of localized maculo-papulovesicular skin rash (Fig. 1). It involves at least one dermatome corresponding to the affected spinal ganglion and is often preceded by localized prodromal pain. All nerves may be involved but HZ mainly affects the thoracic nerves (60%) and the ophtalmic branch of the trigeminal nerve (15%) [1,2]. If skin rash heals within 2 to 3 weeks, it is often followed by severe and disabling pain, Post-Herpetic Neuralgia (PHN) that can persist for months to years, even a lifetime, and may not be relieved in spite of supportive therapy [1,2]. Indeed, if early and efficient treatment of the infection and the pain significantly reduces the risk for PHN, it does not fully suppresses it [1-3].

HZ NATURAL HISTORY:

HZ is caused by the reactivation of the latent Varicella Zoster Virus (VZV) in spinal or cranial sensory ganglia years or decades after primary infection by VZV, also known as Varicella, an ubiquitous infection, which affects nearly all children [1,2] (Fig. 2).

HZ hits predominantly older adults, the specific immunity for the virus decreasing with age because of immunosenescence, allowing the latent virus to replicate in sensory ganglia and to spread along the peripheral nerves to the skin [4,5].

90% of adults had Varicella, 20% of them will develop HZ [6].

HZ, A PUBLIC HEALTH CONCERN:

HZ affects 3-5/1000 person-years considering all age groups across Europe, North America, Australia and Asia.

HZ incidence increases to more than 11/1000 after 50 years of age.

The proportion of people > 60 years old will double in the next decades and HZ cases are expected to increase substantially.

The individual lifetime risk of developing HZ is between 24% and 30%, or approximately 1 in 4 people.

For individuals aged 85 and over, this risk increases to 1 in 2 people.

The recurrence rate of HZ is about 4 to 6 %.

Nowadays, Europe has totalized up to 1.7 million new cases of HZ per year [6,7].
**HZ AND PHN:**

PHN is a neuropathic pain persisting in the area of the HZ skin rash at least 90 days after cutaneous healing, resulting in significant suffering.

The pain is either spontaneous:

- described as constant, deep burning, throbbing and aching

- and/or intermittent sharp, stabbing, shooting, lancinating or provoked by normally inoffensive stimuli (allodynia), which is the most debilitating component of the illness [8,9].

Greater acute pain and age > 50 are two of the main risk factors of developing PHN. It occurs in 10-20% of all HZ patients and 25-50% of HZ patients older than 50. After one year, almost 15% of patients are still in pain, mainly older people [9].

HZ affects both the central and the peripheral nervous systems, preferentially the sensitive fibers (amyelinated). If PHN pathophysiology still remains unclear, two main processes have been identified in its development, sensitization and deafferentation [9]:

- Peripheral sensitization: subsequent to tissue injury, nociceptors sensitization results in spontaneous discharge activity and hyperexcitability;

- Central sensitization: the exaggerated dorsal horn neurons response to afferent stimuli and the expansion of their receptive fields by prolonged nociceptor discharge seem to lead to allodynia without sensory loss;

- Deafferentation: VZV reactivation results in neural damage and inflammation.

**HZ MEDICAL TREATMENT...AND ITS LIMITS [10]:**

Acute HZ:

Acute HZ is defined as HZ lasting for less than three months.

Therapeutics objectives are skin recovery, pain reduction, and PHN prevention.

*Antiviral Therapy*: Valacyclovir, Acyclovir, Famcyclovir...

Antiviral therapy inhibits viral replication and therefore likely reduces neural damage as well as the duration and severity of acute pain, which are important risk factors for the development of PHN. However, despite antiviral therapy, a significant number of patients still suffer from PHN.
Supplementing therapy: oral steroids, analgesics, nerve blocks.

HZ diagnostic delay is frequent in clinical practice and patients are often not treated as promptly as needed to. Moreover, antiviral therapy does not prevent PHN in all patients [11].

Chronic HZ:

Therapeutic objective is primarily pain alleviation and improvement of quality of life.

Drugs: tricyclic antidepressants, anticonvulsants, opioids.

Topical treatment: lidocaine patch, capsaicin patch.

Interventional management: nerve blocks.

Once PHN is established, it can be difficult to manage it effectively. Available treatments have limited efficacy and tolerability. Prevention remains the most effective weapon against PHN. A coherent management strategy must be developed for each patient with PHN [11].

NB: Vaccination by Zostavax* (Sanofi Aventis, France) after age 65 reduces the incidence of HZ and PHN but does not fully prevent from HZ.
Fig. 1: Natural evolution of cervicothoracic HZ.

© Department of Dermatology, Princess Grace Hospital, Monaco, 2016
Fig. 2: HZ is caused by the reactivation of the latent Varicella Zona Virus. A: Vesicular varicella skin rash. B: Maculo-papulovesicular HZ skin rash, characteristically limited to one dermatome.

© Department of Pediatric, Princess Grace Hospital, Monaco, 2016
Findings and procedure details

NERVE BLOCKS IN HZ, BASICS

Nerve blocks target the sensory ganglion of the affected dermatome and/or the affected sensory nerve [12].

Specific contraindication:

HZ extent must be limited to one or two dermatomes. Indeed, "disseminated HZ", i.e. widespread involvement of multiple dermatomes, especially those that are widely separated, contraindicates nerve block.

Active drugs:

- Local anesthetic for temporary block: non-adrenaline Lidocaine 1% (*Xylocaine*, AstraZeneca, France).
- Steroids for temporary block: Cortivazol 3.75 mg/ml (*Altim*, Sanofi Aventis, France), Methylprednisolone 40 mg/ml (*Depo-Medrol*, Pfizer, France).
- 7% Glycerin-Phenol, for long-term block.

NB: 1% *Xylocaine* and 7% Glycerin-Phenol must be suitably diluted according to the type of block.

"Nerve blocks", did you say "nerve blocks"?

Effective concentration of local anesthetic differs according to the type of block:

- Sympathetic block: 0.25-0.5% (partial pain relief)
- Sensory block: 0.5-1% (complete pain relief)
- Motor block: 1.5-2%.

Local anesthetic concentration should be equal or less than 1% to avoid a motor block++. For instance, to obtain the most frequently injected mixture for thoracic HZ: remove 2 ml of 1% *Xylocaine* and dilute it with 2 ml of steroids to obtain 0.5 % *Xylocaine*.

NB: Molecular mechanism of nerve blocks:

- Local anesthetics act on affected nerve fibers within a matter of minutes and last a few hours. They inhibit the sodium channel of the pain afferents,
C-fibers and A-fibers. They spare motor function in typical sensory nerve block doses as they diffuse much better into unmyelinated C-fibers than into slightly myelinated A-fibers.

- Steroids usually take few hours to reach their effect and last longer than local anesthetics but injections of steroids alone cannot be called "nerve blocks", since they cause no anesthesia. They diminish allodynia by blocking C-fibers activation. They also depress inflammation, by inhibiting the synthesis or the secretion of proinflammatory substances. Locally injected steroids have fewer side effects than systemic steroids.
- A longer analgesia than the expected block's duration has been a common observation, raising the possibility of an associated effect on central pain modulation.

Frequency:

- Acute HZ: one block is usually enough to provide fast and effective relief from nociceptive pain. However, a second block may sometimes be necessary to obtain full pain alleviation.
- Chronic HZ: efficiency is more uncertain, but nerve blocks appear to provide some support as part of a multimodal approach to PHN; if one block is not enough to provide full pain relief, a second or even a third block may be realized from six to eight weeks apart.

Complications:

Nerve blocks are minimally invasive ambulatory procedures. Thanks to a solid knowledge of anatomy, complications remain scarce.

Lidocaine must not be injected directly in the vascular circulation to avoid heart rate disorders. There may also be a risk of convulsive seizures associated with lidocaine as it crosses the blood-brain barrier. Those risks are significantly lowered by the correct position of the needle tip, secured by CT guidance. Transient palsy secondary to lidocaine injection may exceptionally be observed.

Steroids injection are sometimes followed by a transient painful reaction. Insomnia, agitation and slight glycemic disorder lasting less than fifteen days may also be observed.

NERVE BLOCKS IN HZ, PUT INTO PRACTICE

As for all minimally invasive treatment, clinical history and physical examination must be performed before the procedure and informed patient's consent is required after checking for general contraindications (coagulation disorder, hypersensitivity, and local cutaneous secondary infection).
All procedures are realized after local surgical asepsis and local anesthesia. Each one relies on the safest and shortest needle pathway to reach the target. It is essential to exactly localize the needle tip under CT guidance.

All procedures are minimally invasive, safe and ambulatory. Patients are monitored for half an hour after the procedure.

**A. Thoracic HZ, Neck HZ, Upper and Lower limb HZ**

**Target:**

The sensory ganglion, at the symptomatic level.

**Technique:** Epidural injection.

- Patient in prone position.
- **The trick:** Precurved spinal 22G needle offers the best way to epidural space for thoracic injection when passing through the costotransverse joint.
- First proceed to contrast (2 ml) epidurography. The contrast must ideally spread one level above and below the chosen metamere for optimal result (sensitivity convergence). Simultaneously to the epidural injection a radiculography of the affected nerve may be observed (Fig. 3-8).

Then proceed to nerve block by injecting:

- 2 ml of 1% *Xylocaïne*\(^*\)
- and 2 ml of *Altim*\(^*\) or 2 ml of *Depo-Medrol*\(^*\).

**B. Ophtalmic HZ**

**Target:**

The trigeminal (Gasser) ganglion.

**Technique:** Oval foramen injection. The oval foramen is located 0.5 cm ahead of the trigeminal ganglion.

- Patient in supine position, head turned to the opposite side.
- **The cutaneous puncture point** is situated on the cheek, laterally and above the labial commissure, under the lower border of the zygomatic arch (temporal bone).
• **The trick**: Precurved spinal 22G needle offers an optimal approach to reach the oval foramen by allowing to circumvent the obstacles. A step-by-step imaging control is necessary and the needle progression is helped by needle tip rotations at each step, allowing to adapt the orientation of the bevel.

• The needle tip must be placed at the entrance of the oval foramen, not too deeply to avoid dura mater breach. Drugs will be carried on the trigeminal ganglion thanks to capillary action along the mandibular nerve (V3).

• When the needle tip is placed at the entrance of oval foramen, insure not to have caused a breach in dura mater by proceeding to an aspiration test simultaneously with Valsalva maneuver.

• Then proceed to contrast injection (0.2 ml) to check for the extravascular location of the needle tip (meningeal artery). Contrast will draw the outline of the Gasser ganglion (Fig. 9-13).

Finally proceed to nerve block by injecting:

- 1 ml of 1% *Xylocaïne*
- and 1 ml of *Altim* or 1 ml of *Depo-Medrol*.

**C. Auricular HZ**

**Target:**

The C2 sensory ganglion.

**Technique:** Epidural injection.

- Patient in prone position.
- Proceed to contrast (2 ml) C2 epidurography (Fig. 14).

Then proceed to nerve block by injecting:

- 1 ml of 1% *Xylocaïne*
- and 1 ml of *Altim* or 1 ml of *Depo-Medrol*.

**TIPS AND TRICKS:**

**Stellate ganglion block**
The stellate (cervicothoracic) ganglion is the control tower of head, thorax, and arms' sympathetic fibers. Therefore, stellate ganglion's block appears to be a possible second-line treatment for Thoracic, Ophthalmic, Neck and Upper limb HZ.

**Technique:** Injection is performed anteriorly to the transverse process of the C7 vertebra and the neck of the first rib, where the ganglion is located (Fig.15).

- Patient in prone or supine position with venous access.
- Monitor heart rate because of a potentially associated risk of cardiac conduction disorder with lidocaine.
- Two different approaches are possible: a posterior approach, passing above the C7 transverse apophysis (precurved-needle) or an anterior direct approach. The needle tip must be positioned slightly anteriorly to the transverse process, just posteriorly to the vertebral artery.
- Proceed to contrast injection (1ml).
- Proceed to nerve block by injecting 2 ml of 0.5% diluted *Xylocaine*.
- This procedure is repeated three to four times three days apart to obtain the best efficiency on pain alleviation.

**TIPS AND TRICKS:**

*Supportive procedures which do not need CT guidance but may be of great therapeutic help*

**Trigeminal nerve branches block**

Facial HZ may benefit from injections targeting the emergence of the sensory trigeminal nerve roots as, for instance, the supra-orbitary and nasal nerves, branches of the ophthalmic nerve (V1) by targeting respectively either the supra-orbitary foramen (Fig. 16) or the internal orbital angle.

Nerve block will be provided by injecting 1 ml of 1% *Xylocaïne* and 1 ml of *Altim* or 1 ml of *Depo-Medrol*.

**Neurolysis of small nerves branches involved in cutaneous localized PHN with allodynia**

Allodynia is described as the most debilitating component of the illness.
Localized PHN (< 1 cm²) with allodynia may benefit from neurolysis by targeting the cutaneous painful zone (Fig.17).

The needle must be pushed 3-4 mm deeply to avoid cutaneous necrosis.

A preliminary diagnostic test must be performed with local anesthetic (< 1 ml) followed by 5 minutes monitoring to evaluate drug’s efficiency.

Then 7% Glycerin-Phenol can be injected (< 1 ml).

Before removing the needle, it is important to flush it out with Xylocaïne* to avoid cutaneous necrosis and to lower the pain initially associated with Phenol action.

**D. Results**

Epidural and nerve roots blocks significantly reduce the incidence of reported pain and/or allodynia [12, 13]. The rational is that interventions decreasing the repetitive painful stimuli and the inflammation during the acute phase of HZ may attenuate the central sensitization and therefore reduce the risk to develop chronic pain.

Nerve blocks have the best success rate if they are performed at a very early stage (at the best during skin rash): they will alleviate acute pain and may help to prevent PHN [12-16].

Antiviral agents are not fully effective to prevent PHN [17-20]. Nerve blocks should be considered as a first choice supplementing therapy during acute HZ phase, especially for elderly patients with less efficient nervous system recovery capacities.

Moreover, nerve blocks, as a supportive therapy, help to decrease oral drugs intake in patients suffering from PHN, frequently associated with disabling adverse effects.

**Our experience** confirms the results previously cited. In the series of 53 patients we injected for HZ pain since March 2014, half patients were in acute HZ phase and were fully relieved after one or two blocks.

The other half patients suffered from PHN. Most of them were improved after nerve blocks but the treatment remained underefficient for about one third of chronic HZ.

Still, pain alleviation, even partial, was observed for all patients. Nerve blocks appeared to be helpful in PHN, especially when they were provided at an early stage of pain.
TAKE HOME MESSAGE

Nerve blocks have shown their efficiency...

...for patients with acute HZ:
One block is usually sufficient to reduce the intensity of pain, the duration of rash and the incidence of PHN.

The sooner the block is achieved (in the first days or in the first weeks) the higher is its probability to succeed in alleviating pain.

...for patients with PHN:
Three blocks provided two months apart may contribute to significant reduction of pain intensity and improvement of PHN.

FREQUENTLY ASKED QUESTIONS

"The steroids injection will not increase the viral spreading risk?"

NO: IF IMMUNITY IS NOT DIMINISHED AND HZ NOT DISSEMINATED.

At the time of injection, cellular immunity has already reached its peak because the procedure takes place at least a few days after the onset of the disease.

Steroids themselves are not hazardous: oral steroids may be administered as short-time therapy for some viral infections without running risk of viral spreading.

"Finally, who do we inject?"

Unfortunately, only the patients sent to us…

Radiologists are not at the front line to treat HZ, as opposed to general practitioners, dermatologists, ophtalmologists, neurologists… but they can provide efficient therapeutic tools and therefore should be recognized as a very interesting ressource in HZ pain management.
Images for this section:

Fig. 3: Thoracic sensory ganglion block. A: Thoracic lateral epidural injection through the costotransverse joint on axial CT. B: Thoracic epidurography C, D: Contrast spreading two levels on either side of the pathological metamere on coronal (C) and sagittal (D) CT.

© Department of Radiology, Princess Grace Hospital, Monaco, 2016
Fig. 4: Thoracic sensory ganglion block. A: Costotransverse joint access for thoracic epidural block (axial CT). B: Thoracic epidurography and radiculography (MIP axial CT). C: Contrast spreading on either side of the affected metamere, associated with pathological nerve root’s radiculography (coronal CT).

© Department of Radiology, Princess Grace Hospital, Monaco, 2016

Fig. 5: Cervical sensory ganglion block. A: Contrast outlines the sensory ganglion during cervical interlaminar epidural injection (axial CT). B, C: Epidural contrast spreading on either side of the block’s level (sagittal (B) and coronal (C) CT).

© Department of Radiology, Princess Grace Hospital, Monaco, 2016
Fig. 6: Lombar sensory ganglion block. A: Lombar foraminal access for lumbar epidural injection (axial CT). B: Lombar epidurography and contrast spreading around the sensory ganglion (axial CT).

© Department of Radiology, Princess Grace Hospital, Monaco, 2016
**Fig. 7:** Cervical sensory ganglion block for Upper Limb HZ. A: Upper limb HZ skin rash. B: Cervical foraminal access for cervical epidural injection (axial CT). C: Cervical interlaminar access for cervical epidural injection (axial CT).

© Department of Radiology, Princess Grace Hospital, Monaco, 2016

**Fig. 8:** Lombar sensory ganglion block for Lower limb HZ. A: Lower limb HZ skin rash. B: Foraminal access for lumbar epidural injection with radiculography of the affected nerve (axial CT). C: Interlaminar epidural access for lumbar epidural injection (axial CT).

© Department of Radiology, Princess Grace Hospital, Monaco, 2016
Fig. 9: Gasser ganglion block for Ophtalmic HZ. A: Skin rash in left ophtalmic HZ involving the left part of forehead and the left eyelid. B, C: Needle tip rotations allow to adapt the bevel's orientation, therefore to find the way through the Gasser's ganglion (MIP axial CT). D: The needle tip is placed at the entrance of the oval foramen (MIP axial CT) E: Curved needle offers an optimal approach to reach the oval foramen (MIP axial CT).

© Department of Radiology, Princess Grace Hospital, Monaco, 2016
**Fig. 10:** Landmarks for Gasser ganglion block. A, B: VRT reconstructions of the cranial base. C: Spinal needle (22G), curved and straight, the curved one being the most convenient tool for oval foramen injection. D: The cutaneous puncture point is situated under the lower border of the zygomatic arch.

© Department of Radiology, Princess Grace Hospital, Monaco, 2016

**Fig. 11:** Gasser ganglion block for Ophtalmic HZ. A, B, C: Different approaches for oval foramen injection (axial CT). D: Needle tip at the entrance of oval foramen (MPR CT).

© Department of Radiology, Princess Grace Hospital, Monaco, 2016
Fig. 12: Gasser ganglion block for Ophthalmic HZ. A: First, the needle tip is placed at the entrance of the oval foramen (axial CT). B: Then, contrast is injected, diffusing around the mandibular nerve (V3), confirming the extravascular and extradural position of the needle tip (axial CT).

© Department of Radiology, Princess Grace Hospital, Monaco, 2016
Fig. 13: Breach of the dura mater during oval foramen injection: pulling a few millimeters back the needle is necessary before to realise the Gasser ganglion block. A: The needle tip is placed at the entrance of the oval foramen (axial CT). B: Contrast spreading around the Gasser's ganglion (axial CT). C, D, E, F: Contrast outlining the tentorium cerebelli (arrows), witnessing a breach of the dura mater (axial (C), sagittal (E) and coronal (D, F) CT).

© Department of Radiology, Princess Grace Hospital, Monaco, 2016


© Department of Radiology, Princess Grace Hospital, Monaco, 2016
Fig. 15: Stellate ganglion block. A,B,C,D: Posterior approach with curved needle, passing above the transverse apophysis. E,F: Direct anterior approach.

© Department of Radiology, Princess Grace Hospital, Monaco, 2016
**Fig. 16:** Supra orbital nerve block, branch of the ophthalmic nerve (V1).

© Department of Radiology, Princess Grace Hospital, Monaco, 2016
Fig. 17: Peripheric neurolysis provided by injection of localized shoulder PHN: the needle must be pushed 3-4 mm deeply to avoid iatrogenic cutaneous necrosis, then flushed out with lidocaine.

© Department of Radiology, Princess Grace Hospital, Monaco, 2016
Conclusion

Nerve blocks are an efficient tool to alleviate pain in the acute phase of Herpes Zoster, therefore suggesting promising effects for prevention of Post-Herpetic Neuralgia. It appears logical and necessary to offer nerve block therapy to as many patients suffering from acute Herpes Zoster as possible when they are older than 50, therefore with a higher risk of Post-Herpetic Neuralgia.

Nerve blocks are less efficient when Post-Herpetic Neuralgia is established, but might be tried, as effective relief of pain is a very desirable treatment goal. They provide temporary pain alleviation and thus allow to diminish oral drugs intake, therefore frequent and disabling associated iatrogenic adverse events.

Incorporated into global and multidisciplinary management, Herpes Zoster percutaneous treatment appears as a new challenge for interventional radiologists and an encouraging minimally invasive ambulatory treatment for suffering patients. It is also a new hope for patients who never completely recovered from their painful encounter with Herpes Zoster.
References


