



**WORLDWIDE**  
Syringomyelia & Chiari Task Force

# SYRINGOMYELIA; UNDERSTANDING THE SPINAL CORD & SPINAL NERVES

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# SYRINGOMYELIA; A COMPLEX DISEASE

- Syringomyelia is a disease that is identified when a cyst or syrinx is present in the spinal cord. Syringomyelia is a disease that affects men, women, and children.
- The presence of a syrinx large and small can cause damage to the spinal cord and extend to damage the spinal nerves.
- Syringomyelia can affect the brainstem as well and when this occurs the term Syringobulbia is used.
- It is important to understand the spinal nerves and the function they serve in the rest of the body to understand why Syringomyelia can cause symptoms. When a patient with Syringomyelia presents with symptoms that cannot be explained by any other cause it is important to take a look at the syrinx and consider possible damage to the spinal cord and spinal nerves.
- It is important to remember that even after a syrinx shrinks or even if it disappears entirely...the damage to the cord and nerves can remain causing symptoms.

# THE CONTROL TOWER: THE BRAIN & SPINAL CORD

- The *brain* gives our body commands so that it knows what to do.
- The *spinal cord* is the highway that the brain uses to send messages out to the rest of the body. When messages need to be sent from our body they travel through the spinal cord to get back to the brain.
- The brain and the spinal cord make up the *central nervous system*.
- The *peripheral nervous system* is the system of nerves that are found branching off from the left and right sides of the spinal cord. These nerves carry the commands that the brain would like the rest of the body to perform.

# THE BRAIN & SPINAL CORD (central nervous system) and NERVES (peripheral nervous system) CONTROL THE FOLLOWING:

- 1. SENSORY FUNCTIONS- control touch, pain, temperature, and pressure.
- 2. MOTOR FUNCTIONS- control voluntary muscle movement
- 3. AUTONOMIC FUNCTIONS- regulate urination, body temperature, heart rate, blood pressure (dilation of blood vessels) and regulate digestion. The autonomic nervous system also works with the endocrine system to control the secretion of hormones. The autonomic nervous system has two main components:
  - A. SYMPATHETIC SYSTEM-responsible for fight or flight response. Results in increased heart rate, blood pressure, and release of adrenaline.
  - B.- PARASYMPATHETIC SYSTEM-responsible for stabilizing the body systems. Slows heart rate and decreases release of hormones.

# DID YOU KNOW?

- We have 31 pairs of spinal nerves! Here is the breakdown:
- 8 Cervical Spinal Nerves
- (Note: There are 7 Cervical Vertebrae and 8 Cervical Nerves; we will refer to the C8 Nerve in this presentation).
- 12 Thoracic Spinal Nerves
- 5 Lumbar Spinal Nerves
- 5 Sacral Nerves
- 1 Coccygeal Nerve
- **\*\*Syringomyelia can damage the spinal cord and spinal nerves!**  
Did you know that even if a syrinx shrinks or goes away the damage that it caused can remain resulting in persistent symptoms and pain? Sometimes symptoms improve with rest and surgery. However, there are cases where symptoms do not improve. We must look at each case individually!

# WITHIN SPINAL NERVES THERE ARE TWO TYPES OF NERVES: SENSORY AND MOTOR NERVES:

*SENSORY NERVES-communicate information to your spinal cord about the position of your body. These nerves also assist with transporting sensations such as touch, temperature, and pain that can be felt on the surface of your skin.*

*MOTOR NERVES-relay information received from the brain through the spinal tracts. The information is used to direct voluntary skeletal muscle movements and are linked to specific muscles.*

# SPINAL NERVES ARE CONNECTED TO SPECIFIC MUSCLES and SPECIFIC AREAS OF THE SKIN.

- Syringomyelia is a disease that is identified when cysts also termed syrinxes form inside the spinal cord. The presence of the cysts over time regardless of whether the cyst is large or small can compress and injure spinal nerves. The damaged nerves control different areas of the body, musculature, and skin surface.
- When a patient presents with widespread symptoms and pain not related to any other cause consider the syrinx. Spinal cord and spinal nerve damage from the spinal cyst also termed syrinx could be the cause!
- Symptom management is crucial in the ongoing management of the disease to prevent further complications!

# DERMATOMES: SPINAL NERVES AND THE SKIN (SENSORY NERVES)

- Did you know? Dermatomes exist for each spinal nerve except for the first cervical nerve?
- Dermatomes are important in assessing the level of spinal cord injury.
- DERMATOMES & AREAS OF THE BODY THEY AFFECT:
- C2 and C3-posterior head and neck
- C3 and C4-Skin of the neck, upper pectoral area, and shoulders
- C5-Lateral aspect of upper extremities above the elbow
- C6-Thumb; forearm, and radial side of the hand
- C7-Middle finger
- C8 -Little finger, medial (middle) aspect of the hand



## DERMATOMES CONTINUED:

- T1-Inner forearm; middle area of the forearm
- T2-Upper inner arm and axilla
- T4-Nipple
- T10-Umbilicus
  
- L1-hip and groin areas
- L2-Anterior thighs, skin in the middle of the mid thigh region
- L3-Top of the thighs, sides of the thighs, middle of the knees, & lower leg
- L4-Back of the thighs, top of the lower leg, & medial (middle) bony prominence of the ankle, middle of the foot, and great toe
- L5-Back of the thighs, lateral (sides) of the lower leg, bottom of the Foot and Toes 2-4
  
- S1-heel, lateral (sides) of the foot, sides of the back of the thigh, and most of the back of the leg, toes 4 and 5; lateral (sides) of the ankle
- S2-Back of the thigh, middle of the lower leg, and groin
- S3-Middle of the buttocks, groin
- S4-Skin over the perianal area and groin
- S5-Skin over the perineal area and across from the anus.

# SPINAL NERVES & MOTOR NERVE FUNCTION:

- SPINAL NERVES ARE LINKED TO MUSCLES:

- CERVICAL SPINAL NERVES-connected to the muscles of the neck, shoulders, arms, hands, and diaphragm
- C3,C4, C5-stimulate the diaphragm allowing your lungs to fill with air.
- C5- stimulates the biceps muscle....allows bend of the elbow
- C6-stimulates muscles in the wrist
- C7-stimulates the triceps muscle; allows you to straighten your arm
- C8 –stimulates your fingers to grip objects

THORACIC SPINAL NERVES-connected to the muscles in the center of the body and the muscles that help control breathing.

- T1-stimulates the ring finger and little finger so you can move them apart.
- T1-T12-stimulate the muscles in between the ribs. Assists in breathing by helping the lungs fill with air.
- T6-T12- stimulate the abdominal muscles so you can cough, keep your posture and maintain balance.

# SPINAL NERVES & MOTOR FUNCTION CONTINUED:

LUMBAR & SACRAL SPINAL NERVES-connected to the muscles in your hip, leg, and foot.

- L2-stimulates the muscles that bend or flex the hip joint.
- L3-stimulates the quadriceps muscle-leg straightens at the knee
- L4-stimulates the ankle muscles; allows for drawing your foot towards your head

SACRAL SPINAL NERVES-connected to the anal and urethral sphincters. May affect bowel and bladder function.

- S1-stimulates muscles around the ankle and allows you to bend your foot and point your toes down
- S2-S4-stimulate sphincter muscles of the urethra and anus.

# AUTONOMIC NERVOUS SYSTEM

- The autonomic nervous system is responsible for regulating body temperature, digestion, urination, keeping the heart pumping, and changing the size of blood vessels to regulate your blood pressure.
- The autonomic nervous system is a part of your peripheral nervous system and it is divided into two parts:
  - 1. Parasympathetic Nervous System
  - 2. Sympathetic Nervous System
- Please note: The parasympathetic and sympathetic nervous systems work together to maintain a balance in the body. When spinal nerve and/or spinal cord damage occurs it can disrupt this balance.

# PARASYMPATHETIC NERVOUS SYSTEM

- RESPONSIBLE FOR THE FOLLOWING:
- Increasing gastric secretions
- Bladder function (contraction of the bladder, urination)
- Sexual function
- Bowel function
- Bronchial constriction-passage of air
- Slowing your heart rate
  
- Please note: Damage to the spinal cord and spinal nerves may adversely affect the above functions.

# SYMPATHETIC NERVOUS SYSTEM

- RESPONSIBLE FOR THE FOLLOWING:
- Decreasing gastric secretions
- Bladder function (relaxes the bladder muscle, body stores urine)
- Sexual function
- Increases respiration rate
- Increases heart rate
- Increases blood pressure
- Enlarges the pupils
- Temperature regulation
  
- Please note: Damage to the spinal cord and spinal nerves may adversely affect the above functions. Damage to the autonomic nervous system may also impair reflexes.

# SUMMARY

- THE BRAIN AND SPINAL CORD ARE VITAL TO FUNCTIONS OF THE BODY.
- SYRINGOMYELIA IS A DISEASE THAT CAN DAMAGE THE SPINAL CORD AND SPINAL NERVES.
- WHEN SYMPTOMS ARE PRESENT THAT ARE UNEXPLAINED BY OTHER COMMON CAUSES CONSIDER THE SYRINX AND SPINAL CORD AND/OR SPINAL NERVE DAMAGE AS A POSSIBLE SOURCE. SYRINGOMYELIA IS A COMPLEX DISEASE THAT DESERVES EXCELLENT ONGOING MEDICAL MANAGEMENT TO MANAGE SYMPTOMS AND PREVENT COMPLICATIONS!
- EDUCATION IS KEY TO MOVING FORWARD WITH REGARD TO THIS DISEASE! CAREFUL RE-EXAMINATION OF THE BRAIN STEM, SPINAL CORD, AND SPINAL NERVE INVOLVEMENT WITH SYRINGOMYELIA ARE CRUCIAL TO MOVING FORWARD WITH RESPECT TO THIS DISEASE. SPINAL NERVE DAMAGE AFFECTS BOTH SENSORY AND MOTOR FUNCTION. HELP US SAVE LIVES!

# RESOURCES:

- **1. Spinal Cord Injury: Hope Through Research**

National Institute of Neurological Disorders and Stroke

[www.ninds.nih.gov/disorders/sci/detail\\_sci.htm#organization](http://www.ninds.nih.gov/disorders/sci/detail_sci.htm#organization)

## **Overview of Spinal Cord Disorders**

Merck Manual

[www.merckmanuals.com/home/brain,-spinal-cord,-and-nerve-disorders/spinal-cord-disorders/overview-of-spinal-cord-disorders](http://www.merckmanuals.com/home/brain,-spinal-cord,-and-nerve-disorders/spinal-cord-disorders/overview-of-spinal-cord-disorders)

## **Syringomyelia Fact Sheet**

National Institute of Neurological Disorders and Stroke

[www.ninds.nih.gov/disorders/syringomyelia/detail\\_syringomyelia.htm](http://www.ninds.nih.gov/disorders/syringomyelia/detail_syringomyelia.htm)



# RESOURCES (continued)

- **Pub-Med**

Hatem, SM, Attal N, Ducreaux D, Gautron M, Parker F, Plaghki L, Bouhassira D. Clinical, Functional, and structural determinants of central pain in syringomyelia.

2010 Nov; 133 (11)

PMID 20852265

**Pub-Med**

Abraham-Igwe C, Ahmad I, O'Connell J, Chavda SV  
Syringomyelia and bilateral vocal fold palsy.

2002 Aug; 116 (8)

PMID 12389694



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