Update and Review of Post-Polio Syndrome (PPS)

Southern Nevada Association of Polio Survivors
February 21st, 2015
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Objectives

- Review Polio and Post–Polio syndrome (PPS)
- Describe epidemiology PPS
- Identify the signs and symptoms
- Compare and contrast current treatment options both non–pharmacological and pharmacological
- Discuss pain in PPS and current pain management
- Provide a brief history of polio vaccines, what is currently available their significance
Background:
Polio and Post-Polio Syndrome
Poliomyelitis or polio is a disease caused by the poliovirus.

- Affects the nervous system:
  - Attacks the motor neurons in the spinal cord
  - Causes localized inflammation in the nervous system

Visit [www.neuroanatomy.wisc.edu/SClinic/Weakness/Weakness/html](http://www.neuroanatomy.wisc.edu/SClinic/Weakness/Weakness/html) for more information.
Dr. Lauro Halstead introduced the term "post-polio syndrome" in 1986.

Served at the Medstar Health National Rehabilitation Hospital for 26 years.

Specialized in spinal cord injury and post polio syndrome.

wamu.org/programs/metro_connection/12/11/02/polio_survivor_and_doctor Chooses_new_path
Contracted polio when he was 18 years old in Madrid, Spain

Survived on a plywood ventilator in the children's hospital run by nuns

Became a renowned physician

Treated polio patients and people with spinal cord injuries

Post–Polio Syndrome (PPS)

- Only occurs in Polio survivors
- Can affect polio survivors at any age
- Results in the mild to moderate muscle weakness most commonly in the lower limbs
- Affects people about 15 years or more after the initial polio attack
- Not contagious
- Not life-threatening
Polio virus damages or destroys motor neurons

Compensating for the lost neurons, the survived neurons sprout new fibers

Results in a “recovery period”, with added stress on the nerve cells bodies to nourish the new fibers

Overused nerve cells cannot handle the stress resulting in the degeneration of the new fibers and ultimately the nerve cells themselves

http://www.poliosurvivorsnetwork.org.uk/archive/lincolnshire/library/trojan/pathophysiology.html
Epidemiology – Polio

Worldwide statistics:

- Polio affects children ≤ 5 years old
- Irreversible paralysis: 1 in 200 infections
  - Between 5–10% will die from breathing complications
- 99% decrease in cases since 1988
  - As of 2013, only 416 reported cases
  - Estimated 350,000 cases in 1988
Worldwide statistics:

- As of 2014, only 3 countries remain polio-endemic
  - Afghanistan
  - Nigeria
  - Pakistan
    - 125 countries were polio-endemic in 1988

- Global efforts to eradicate polio have resulted in the decreases

- Polio was considered eradicated in the USA as of 1979
Epidemiology – PPS

- There are not exact statistics

- About 60% of polio survivors from 1940’s and 1950’s have developed PPS

- Study done in 1995 estimated that there are about 1 million polio survivors in the US, with 443,000 people who had paralytic polio
Transmission – Polio

- Incubation of polio virus is 6 to 20 days
- Mostly fecal–oral transmission through contaminated food or water
- Oral–oral transmission is possible
- Persons are infectious as long as the polio virus is present in feces or throat
  - Present in throat 1 week after onset of illness
  - Present in feces approximately 3–6 weeks
Risks include:

- Patients with severe polio symptoms have a higher chance of developing PPS
- Longer recovery time from initial polio infection
- Older age at the initial polio infection
Diagnosis for PPS

- Confirmed history of paralytic polio
  - Electromyography (EMG), History, Physical exam
- Partial or fully recovery from the acute Polio episode
- At least 15 years of having neurological and functionality stability
After the stable period, gradual or quick onset of weakness with or without generalized fatigue, muscle atrophy, muscle or joint pain

Persistence of symptoms for at least a year

No other medical explanation for the symptoms
Symptoms can be mild to moderate
- Those with severe symptoms from Polio, may experience more severe PPS symptoms

Symptoms include:
- Cramps
- Cold intolerance
- Generalized fatigue
- Joint degradations
- Muscle weakness
- Muscle atrophy
- Pain
Causes of Muscle Weakness

- Overuse of muscle increases weakness especially in:
  - Biceps femoris
  - Quadriceps muscles

- Muscle disuse increases weakness

- Patients experience increased muscle weakness after a period of low physical activity

http://lrgoodman.hubpages.com/hub/Muscles-Used-While-Running#slide3673780
Severe Symptoms

- Shortness of breath
  - Decline in function of respiratory muscles such as the diaphragm

- Dysphagia
  - Difficulty in swallowing can lead to issues with eating and drinking
Complications

- Aspiration pneumonia
- Dehydration
- Loss of balance may lead to a fall and fracture and potentially broken bones
- Malnutrition
- Osteoporosis can develop upon:
  - Immobility
  - Prolonged inactivity
Treatment
Treatment of PPS

- No effective pharmaceutical treatments has been proven to stop or reverse the effects of Post–Polio Syndrome

- Non–pharmaceutical options are currently recommended treatment
Treatment of PPS

- **Ineffective**
  - Amantadine
  - Coenzyme Q-10
  - Modafinil
  - Prednisone
  - Pyridostigmine

- **Possibly beneficial**
  - Intravenous immunoglobulin (IVIG)
  - Lamotrigine (Lamictal®)
Blood product
Antibody protein that can help regulate or boost the immune system
Intramuscular or intravenous administration
Contraindications
  - IgA deficiency, severe allergy to corn (Octagam), intolerance to fructose
Warnings and Precautions
  - Increased chance of blood clots
  - May be harmful to the kidneys
Side Effects
  - Irritation, headache, upset stomach and bowels
Lamotrigine (Lamictal®)

- Oral tablet
- Works by stabilizing neuronal membranes
- May improve activity limitations
- Contraindications
  - Severely allergic to lamotrigine
- Warnings and Precautions
  - May cause severe skin reactions, report to doctor
- Side Effects
  - Drowsiness, dizziness, headache, insomnia, upset stomach and bowels, blurred vision, anxiety, double vision, and rhinitis
Non-pharmacologic treatment options

- **Therapy**
  - Physical, speech, and occupational

- **Assistive Devices**
  - Braces, crutches, wheelchairs, scooters

- **Surgery**

- **Breathing Assistance Devices**
  - BiPAP: bi-level partial airway pressure
  - Ventilators

- **Static Magnetic Fields**

- **Physical exercise**
One study showed a decrease in pain immediately after treatment

Study used BIOflex® magnets on painful areas
- Muscle strength, endurance, and fatigue were not assessed
- No known side effects
Physical Exercise

- **Benefit**
  - Patients with regular physical activity have fewer symptoms and higher level of functioning

- **Avoid overuse**
  - Counterproductive
  - Further weakens rather than strengthens muscle groups

- **Physical Therapist is recommended**
  - Customize a routine
Physical Exercise

- Low to moderate intensity
- Slow progression
- Rotate exercise types
  - Stretching
  - Cardiovascular
  - Strength training
- Stop or reduce your regimen if
  - Additional weakness
  - Excessive fatigue
  - Prolonged recovery time
Symptomatic Treatment
Pain Classification

Somatic pain

- Bone, joint, muscle
- Localized, throbbing or sharp pains

Neuropathic pain

- “Nerve pain” due to damage of nerves
- Shooting, stabbing, prickly
Commonly somatic (muscle, joint, bone) and neuropathic pain

Pain classification in PPS
- Overuse pain
- Biomechanical pain
- Bone pain
- “True” PPS pain
  - Combination of muscle, joint, and/or bone pain
- Classification according to UCLA neurologist
  - Dr. Susan Perlman
Pain Management

- No guidelines or specific recommendations for pain management in PPS
- Depends on the type of pain experienced by a patient
  - Case by case, individualized treatment
Pain Management Therapy

“Overuse pain”

- No medications to target this type of pain

- Overuse pain can be a good thing
  - It helps you have a reference point of when it is time to cut back on certain physical activity
  - “Time to take it easy and rest”
Pain Management Therapy

“Biomechanical pain”

- Lower back pain, spine, neck, knees, feet, and ankles
- Non-steroidal anti-inflammatory drugs (NSAID’s)
  - Ibuprofen, naproxen (both prescription and Over-the-counter strengths)

Side Effects
- Mild, moderate, or severe pain along with inflammation
- Gastrointestinal bleeding, kidney impairment, long term use can affect blood pressure
Pain Management Therapy

“Bone pain”

- Includes both bone and joint

- Acetaminophen (Tylenol®)
  - Mild to moderate pain
  - Dosages
    - 325 – 650 mg by mouth every 4 – 6 hours
    - MAX: 3 grams per day
    - Liver damage
“True PPS pain”

- Includes muscle, joint, nerve pain
  - Somatic and neuropathic

- Non-narcotic drugs
  - Muscle relaxants
  - Serotonin stimulating agents
  - Nerve stabilizers

- Opioids
Muscle relaxants (commonly used products)

- Cyclobenzaprine (Flexeril®)
  - 5mg three times a day [Max: 30mg/day]
- Carisoprodol (Soma®)
  - 250–350mg up to four times a day
- Baclofen (Lioresal®)
  - 5mg three times a day [Max: 80mg/day]
- Tizanadine (Zanfalex®)
  - 4mg once a day [Max: 36mg/day]

Side effects:
Sedation, drowsiness, decreased liver function
Serotonin-stimulating agents

- Tramadol (Ultram®)
- Affects pain perception and response
- Now a controlled medication (Schedule IV)
  - Immediate-release: 25–100 mg Q4–6H
    - MAX: 400 mg/day
  - Extended-release: 100 – 300 mg Daily
    - MAX: 300 mg/day
- Patients with kidney and liver issues need lower doses

Side Effects
  - Stomach and intestinal issues, possibly seizures
Pain Management Therapy

Nerve stabilizers

- Gabapentin (Neurontin®)
  - Dose: 1800–3600mg/day
- Pregablin (Lyrica®) (controlled: Schedule V)
  - Dose: 150–600mg/day

Both need to be started at a low dose and gradually increased

- Side Effects
  - Sedation, dizziness, weight gain, and dry mouth
  - Patients with kidney problems need lower doses
Pain Management Therapy

Opioids

- Hydrocodone agents
  - Lortab®, Norco®, Vicodin®
    - Contain hydrocodone/acetaminophen (doses vary per product)
  - Recently changed to Schedule II
    - More of a challenge to get the prescription and currently in Las Vegas the supply is not meeting the demand

- Morphine
  - Immediate release and extended release

- Oxycodone
  - Very effective for most patients but has potential for tolerance and abuse
Pain Management Therapy

Marijuana

- Currently acceptable for chemo-induced nausea, glaucoma, multiple sclerosis, and neuropathic pain
  - PPS may be fitting due to neuropathic pain
- Legal Issues
  - Must obtain medical marijuana card
  - Conflicts with dispensaries
    - Depending location or state
  - Conflict with state and federal laws
Future of Polio and PPS
Polio Cure: Prevention

- No cure for Polio
- Can be prevented through vaccination
  - First polio vaccine was introduced in 1955
- Prevention of PPS is through protection against Polio

www.ei-resource.org/easyblog/entry/vaccinations-in-chronic-fatigue-syndrome-and-fibromyalgia/
## Vaccines

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<thead>
<tr>
<th>Oral</th>
<th>Injectable</th>
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<tr>
<td>Live</td>
<td>Inactivated</td>
</tr>
<tr>
<td>Low cost</td>
<td>Only used in countries with low risk of exposure and high vaccination coverage</td>
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<tr>
<td>Easy administration</td>
<td>Routinely used in United States, Scandinavia, and The Netherlands</td>
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<td>Can cause wild type infection</td>
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<td>◦ Rare, 1 case per 2.4 million vaccinated</td>
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<td>World Health Organization (WHO) still recommends as vaccine of choice</td>
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Summary

- PPS is a syndrome characterized by muscle weakness and fatigue that only occurs in Polio survivors after a period of at least 15 years of no symptoms.
- Oral vaccine is still utilized in other areas of the world even though there is a small chance it can cause the wild type infection with the Polio virus.
- In the USA only the inactive vaccine is used.
- Many people who get Polio develop PPS later in life.
There are no pharmaceutical options that are proven to work for PPS

It is important to use physical exercise appropriately which is why seeing a Physical Therapist is recommended

Pain associated with PPS can be treated with both over the counter options as well as prescription medications
Resources

Resources


Resources

Questions?