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Polio Survivors Network

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POST POLIO SYNDROME [PPS]

CRITERIA FOR A DIAGNOSIS OF PPS [2000]

1. **History of remote paralytic polio or findings on history, physical examination results, and laboratory studies compatible with polio virus damage of the central nervous system in earlier life.**
   [Halstead LS, MD - Silver J, MD Am J Phys Med & Rehabil Jan/Feb 2000]
2. **A period where we recovered.**
3. **A stable period of functioning from 10 to 50+ years.**
4. **New symptoms with no other explanation.**

THERE ARE NO TESTS IT IS A DIAGNOSIS OF EXCLUSION.

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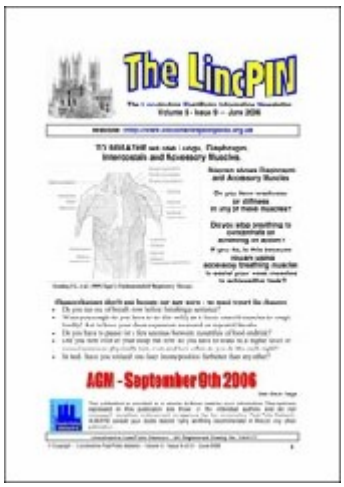
Polio Survivors Network recommend reading the two medical articles reproduced here with permission for an overall view of the symptoms and issues being experienced by Polio Survivors worldwide.

A Patient Plus article on Post Polio Syndrome from Patient.co.uk
Online at - patient.info/doctor/post-polio-syndrome

POLIO PATIENTS AND SURGERY Information for health staff
PTU The Danish Society of Polio and Traffic Victims
http://www.europeanpolio.eu/documents/13642_Polio_operation_eng_TRYK.pdf

117 newsletters to date - The LincPIN Vol. 1 to 6 . Post Polio Matters Vol. 7 to 10



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Patient

View this article online at: patient.info/doctor/post-polio-syndrome

Post-polio Syndrome

Post-polio syndrome (PPS) is the onset of new deterioration in function that may occur many years after recovery from acute poliomyelitis. PPS comprises various possible symptoms such as fatigue, weakness, joint and muscle pain, reduced respiratory function or dysphagia. PPS does not necessarily imply progressive deterioration, and can be helped by treatment. Management requires careful assessment and a multi-disciplinary approach.

Definition/diagnosis

- Accepted criteria for diagnosis of PPS are:- [1]
  - History of paralytic poliomyelitis.
  - Partial or complete recovery of neurological function followed by a period of stability (usually several decades).
  - Persistent new muscle weakness or abnormal muscle fatigability
  - Exclusion of other causes of new symptoms.

- The diagnosis is based on two or more of the following health problems occurring after the stable period: extensive fatigue, muscle and/or joint pain, new weakness in muscles previously affected or believed to have been unaffected, new muscle atrophy, functional loss, cold intolerance [2]

There is no universal definition of PPS, but most sources use one similar to the above. Some experts suggest that PPS may be diagnoses in those where there is no clear history or paralytic polio, but where the past history or investigations suggest that previous polio is likely [3]

Aetiology [4]

There is **NO** reactivation of the polio virus infection (patients may need assurance about this)

The exact cause of PPS is unknown:

- There may be new muscle atrophy and weakness relating to changes in motor neurones. Overuse or disuse of muscles plays an important role [5]
- The cause of PPS symptoms may be multifactorial. For example, disabilities resulting from acute polio, combined with activities or daily living, can produce large stresses acting on abnormal muscles and joints. This may lead to other problems which contribute to PPS such as:-
  - Joint deformities
  - Osteoporosis
  - Scoliosis
  - Cervical spondylosis.
  - Peripheral nerve entrapment (can occur with callipers, crutches, etc)

Epidemiology [5]

It is estimated that PPS may occur in 28—75% of patient with previous polio. The time interval is usually around 35 years, but may be 8 to 70 years after the acute polio episode.

Presentation

Common symptoms are [5]

- Generalised fatigue
- Joint and muscle pain
- New muscle or joint weakness
- Muscle atrophy
- Cold intolerance
- Bulbar symptoms—speech, swallowing or respiratory symptoms.
- Worsening respiratory function—may be present as headaches, fatigue or sleep disorder (see below under 'Respiratory and sleep problems in post-polio syndrome')

Any of these can lead to a deterioration in day-to-day functioning. A small change in clinical terms can mean a large one in its effects on daily living.

Assessment

- Listen to the patient's story
- The most important question to ask is not 'can you do this activity?' - e.g. climbing stairs - but '**HOW** do you do it?' This can reveal the functional change - e.g. stopping to rest halfway going up stairs and by shifting up on their bottom. [6]
- A Patient Questionnaire such as 'My Polio Life' can be useful [7]
- Multidisciplinary assessment may be needed - e.g. involving physiotherapist, occupational therapist, neurologist, orthopaedic/orthotic team and respiratory physician.

Bear in mind that various factors can make assessment more difficult [8]

- Polio survivors are used to coping and adapting. Hence the importance of asking - and observing **HOW** patients carry out each activity.
- Symptoms can vary from day to day and can be affected by recent activity, overuse or rest.
- Patients may deliberately allow for a stressful hospital visit day by resting beforehand. This can give a falsely good picture. Ask what symptoms are like 'on bad days'.
- Results can appear normal if patients are given long rests between tests, or if only the best result is recorded.
- Respiratory and sleep problems are easily missed (see below under 'Respiratory and sleep problems in post polio syndrome')
- Anecdotally, patients with PPS have had their symptoms dismissed after apparently normal or near normal results of tests, such as lung function or muscle power.

Investigations

These will depend on symptoms, but could include

- Muscle tests - but be aware that simple tests of isometric muscle strength may be insensitive [6] [9]
- Respiratory investigations (See below under Assessment of respiratory problems)
- Sleep studies (See below under Assessment of Respiratory problems)
- Swallowing studies - e.g. barium swallow (video fluoroscopy)
- Investigations to exclude other causes

Differential diagnosis

Other causes of fatigue or weakness—e.g.

- Multiple Sclerosis
- Motor Neurone disease
- Myasthenia gravis
- Other types of neuropathy or myopathy
- Systems conditions - e.g. anaemia, chronic infection, hypothyroidism, collagen disorders, medication side effects.
- Other causes of pain - e.g. arthritis, bursitis, tendonitis
- Myalgias - polymyalgia rheumatic, fibromyalgia.

Management [4]

A multidisciplinary approach is helpful [10]. Some important aspects of management are;-

- The correct balance of rest and exercise is essential [5]
  - Avoid overuse, as too much exercise causes increased weakness and fatigue in damaged muscles.
  - Graded exercise is beneficial - this should probably be broken up by periods of rest.
  - Non-swimming exercise in warm water often helps.
  - Many polio survivors are used to leading active lives and , to some extent, ignoring their disability. Adapting to PPS and the need for more rest may require lifestyle and employment changes [11]
- Orthopaedic and orthotic management of skeletal problems - e.g.
  - Simple supports for knee, ankle and cervical spine can improve function
  - Replace damaged aids.
- Muscle pain
  - Physical treatments, such as warmth/cold, massage, passive stretching
  - Transcutaneous nerve stimulation
  - Acupuncture
- Anaesthesia requires special consideration [12]
- Nutrition
  - Good nutrition and weight control
  - Some patients find that a high-protein diet is helpful (e.g. the post-polio institute ‘hypoglycaemia diet’) [11]
- Specific treatment of other problems - dysphagia and respiratory and sleep problems (see below under ‘Respiratory and sleep problems in post-polio syndrome)
-

Respiratory and sleep problems in post-polio syndrome [13] [14]

Importance

- Respiratory problems in PPS are an important cause of symptoms and complications, including sleep disorders
- They may be under-diagnosed or inadequately assessed.
- Treatment can improve both quality of life and prognosis.

Aetiology [14]

Respiratory problems in PPS may be due to one or more of

- Respiratory muscle weakness
- Bulbar impairment - this may affect control of the upper airway or the respiratory cycle if the upper airway is affected, there may be obstructive sleep apnoea
- Skeletal deformity - scoliosis or chest wall stiffness
- Other pathology - chronic obstructive pulmonary disease (COPD), asthma, obesity
- Aspiration - if swallowing is affected

All these are likely to worsen during sleep. The pattern of respiratory impairment may be hypoventilation, obstructive sleep apnoea or both.

Symptoms

Respiratory failure can develop insidiously - symptoms may be subtle or unnoticed. Breathlessness may not be a symptom in patients with limited mobility. Possible symptoms are:-

- Sleep disruption, eventually leading to insomnia, daytime sleepiness or fatigue
- Morning headaches, irritability, poor concentration, anxiety or depression.
- Abnormal sleep movements, nocturnal confusion, vivid dreams.
- Breathlessness which may be positional
- Weak cough, and chest infections.

Signs

These may be subtle - possible signs are:-

- Unexplained tachypnoea
- Use of accessory muscles
- Abdominal paradox - this is inward movement of the abdomen on inspiration while the upper chest expands.
    - May be best seen with the patient supine during a sniff manoeuvre. When upright, it can be missed, as the diaphragm passively descends at the beginning of inspiration.
- Severe, untreated nocturnal hypoxaemia can cause pulmonary hypertensions, giving signs such as raised JVP and ankle oedema.

Assessment of respiratory problems.

- Listen to the patient's story and preferences.
- Assess
    - Voice and cough
    - Chest deformity
    - Observe patients in realistic situations - e.g. doing repeated tests or actions, and doing everyday actions in which they may be using the necessary breathing muscles to achieve another task.
- Investigations
    - Peak flow and cough peak flow
    - Spirometry
        - Both seated and supine spirometry are needed.
        - A sensitive indicator or respiratory muscle weakness is reduction in maximal inspiratory pressure.
    - Oximetry (and possible capnography)
    - Sleep study (polysomnogram)
    - ECG and CXR if appropriate.

  Full sets of lung function tests and arterial blood gases may not be helpful in this scenario, unless intrinsic lung disease is suspected.

Management of respiratory problems.

There are various options - choice will depend on the patient's individual situation and preferences . Night-time mechanical ventilation is often used. This helps by resting the respiratory muscles at night and preventing deterioration of respiratory function during sleep. It also treats the secondary sleep disorder.

Supportive measures include:-

- Not smoking.
- Avoiding sedatives and alcohol
- Optimal weight and nutrition
- Pneumococcal and influenza vaccination
- Postural support if needed.
- Prompt treatment of chest infections
- Techniques such as assisted cough or glossopharyngeal breathing (frog breathing)
- Chest expansion exercises.

Assisted breathing options are:-

- Non-invasion ventilation (NIV), also called non invasive intermittent positive pressure ventilation (NIPPV), is often useful - see box below.
- Rocking bed
  - This helps breathing by rocking a patient consecutively head up and head down. It is surprisingly effective, especially where muscle weakness is mainly diaphragmatic.
- Pneumobelt
  - This gives intermittent abdominal pressure ventilation and is useful for daytime assistance.
- Negative pressure ventilation
  - Examples are tank ventilators (iron lung), jacket ventilators (Tunnicliffe) and cuirass ventilators. The devices are cumbersome, and mainly used where NIV is not tolerated, or to provide 'respite' from NIV.
- Tracheostomy ventilation.

Non-invasive ventilation and bi-levels explained [13] [14]
NIV increases alveolar ventilation. It is provided by a portable ventilator and a tightly fitting nasal or facial mask or nasal 'pillow'.

- NB NIV is NOT the same as continuous positive airway pressure (CPAP) CPAP is useful for obstructive sleep apnoea because it maintains the upper airway. It is not normally indicated for hypoventilation from respiratory muscle weakness..

People with neuromuscular disease may have difficulty breathing in, so require NIV with higher inspiratory than expiratory pressures. This can be provided using a 'bi-level' ventilator.

- Bi-level ventilators were developed by modifying CPAP. The inspiratory positive airway pressure (IPAP) and expiratory pressures (EPAP) settings are adjusted separately.
- The difference between IPAP and EPAP is called the span.
- For example, a patient may require an IPAP of 14 and an EPAP of 3.
- Sensitive flow triggers enable normal breathing to be supported. There may be a back-up control to provide ventilation if respiratory effort fails to trigger a breath.

Prognosis[1]

The symptoms of post-polio syndrome are slowly progressive, with periods of stability lasting 3 to 10 years.

Prevention

Prevention of acute polio infection is discussed elsewhere (separate article on Poliomyelitis)

Prevention of PPS is not much discussed in the literature. Given the various known contributing factors, it seems possible that PPS problems might be reduced by

- Careful management of exercise and daily living activities to optimise muscle weakness and joint use and prevent overuse or disuse.
- Correct maintenance of aids and prostheses.
- Monitoring and early treatment of associated/contributing problems such as
  - Osteoporosis
  - Obesity
  - Respiratory problems

Further reading & references [additional info added]

Polio Survivors Network	**poliosurvivorsnetwork.org.uk**
British Polio Fellowship	britishpolio.org.uk
Post-Polio Health International	post-polio.org
European Polio Union	europeanpolio.eu

1. Trojan DA, Cashman NR; Post-poliomyelitis syndrome. Muscle Nerve 2005 Jan;31 (1):6-19
2. EFNS guideline on diagnosis and management of post-polio syndrome; Report of an EFNS task force, European Federation of Neurological Societies)2006)
3. Halstead LS, Silver JK; Non paralytic polio and post-polio syndrome. Am J Phys Med Rehabil. 2000 Jan-Feb;79(1):13-8
4. Howard RS; Poliomyelitis and the post-polio syndrome. BMJ 2005 Jun 4;330(7503):1314-8 #
5. Khan F; Rehabilitation for postpolio sequelae. Aust Fam Physician. 2005 Aug;33(8):621-4
6. Boone H; Problems experienced by polio survivors and suggested solutions. Presentation for occupational therapists given after the Neurological Occupation Therapy Conference, October 2008. Contact. info@poliosurvivorsnetwork.org.uk for copy
7. My Polio Life; A patient questionnaire providing baseline information and comparison charts for use by polio survivors and their health professionals. Polio Survivors Network 2007. www.poliosurvivorsnetwork.org.uk/mypoliolife.pdf
8. Boone H; When test results do not match important symptoms. Conference presentation. Post Polio Association of South Florida, Miami 2007. Contact info@poliosurvivorsnetwork.org.uk for copy.
9. Hildegunn L, Jones K, Grenstad T, et al; Perceived disability, fatigue, pain and measured isometric muscle strength in patients with post-polio symptoms. Physiother Res Int 2007 Mar;12(1):39-49
10. Davidson AC, Auyeung V, Luff R. et al: Prolonged benefit in post-polio syndrome from comprehensive rehabilitation; a pilot study. Disabil Rehabil. 2009;31(4):309-17
11. Polio Outreach of Washington
12. Lambert DA, Giannouli E, Schmidt BJ; Postpolio syndrome and anesthesia. Anesthesiology. 2005 Sep;103(3) 638-44
13. Howard RS. Davidson C; Long term ventilation in neurogenic respiratory failure. J Neurol Neurosurg Psychaitry 2003 Sep;74Suppl 3:iii24-30
14. Lincolnshire Post-Polio Information Newsletter Volume 5, Issue 9, June 2006. Issue covering respiratory problems. [LPPN Now known as Polio Survivors Network, www.poliosurvivorsnetwork.org.uk/lincpin5-9.pdf

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POLIO PATIENTS AND SURGERY. Information for health staff.

PTU The Danish Society of Polio and Traffic Victims

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The A5 brochure was created with support from Helsefonden.

16 page A5 brochure. This version printed with permission.

PTU is an organisation that works to create equal conditions and quality of life for the more than 100.000 Danes how have serious injuries following an accident or an illness.

PTU owns and runs one of the foremost Rehabilitation Centers in Europe for people with polio.

Table of contents.

Dear colleague

Your patient who is to be anesthetized and undergo an operation, has had polio many years. Ago.

Even though it may not be apparent for the immediate clinical evaluation, the acute polio infection may have left a variety of sequelae, which are important to take into account when your patients is having an operation.

The intent of this pamphlet is to assist you in getting your patient safely through the operation.

Polio in Europe - It is estimated that in Europe around 700,000 people are now living with the late effects of polio.

General information about acute polio and sequelae.

Poliovirus is a piconarvirus which most often causes flu-like symptoms, but in approximately 1% of those infected it also affects the nervous system. Traditionally, polio is associated with asymmetric flaccid paresis of the extremities. Less known is that the virus also may affect the basic areas of the cerebellum, the cranial nerves, [bulbar polio] and the autonomic nervous system. After the acute stage, recovery occurs over a period from days to many months. The recovery may be total or only partial and comes through three different processes.

1. Neurons that are not totally destroyed regenerate totally or partly.
2. Surviving neurons develop an increased amount of axon endings which replace the field of innervation of the dead neurons.
3. The individual muscle fiber hypertrophies.

In this context, it is worth to notice a couple of facts. Before muscle weakness can be observed clinically, neuron loss has to exceed 50%, and neurons of affected muscles may innervate 10 to 20 times as many muscle fibers than neurons of unaffected muscles. Furthermore, degeneration whereby muscle atrophy may not be very apparent. Consequently, it reality damage from polio can be significantly more widespread than can be judge clinically.

The regenerative processes do not last, and many patients, who have had polio, experience a total or partial return of the initial symptoms 30 to 50 years after the acute infection. Some may even experience new symptoms that were not present earlier. Persons at risk of having late polio symptoms are those who had major nerve damage and extensive recovery at the time of the acute polio attack.

Psychological aspects

Many polio patients have, during their childhood, gone through long hospitalisations and rehabilitation periods, and these experiences may still influence them. In the mid-last century, it was proper attitude not to inform, children of coming operations, in order to avoid making them anxious. Children were therefore picked up without notice, taken away, and woke up with a plaster, pain and severe nausea. Many polio patients therefore carry with them horrible memories related to operations.

The polio children went through long and tough training courses, and were constantly encouraged to keep going and continue to get as far as possible. Generally, such experiences have given the patients the attitude that they do not ask for help until it is absolutely necessary. Therefore, it is particularly important that the staff is responsive to patients' request for help..

Operation and polio. PATHOPHYSIOLOGY AND ANATOMY.

Of relevance to surgical and anesthesia procedure - polio patients may have the following: sequelae:

- The respiratory center may have suffered, and respiratory regulation may still be affected, causing unrecognised chronic accumulation of CO2.
- Centres for pulse and blood pressure may have suffered, causing fragile regulation of pulse and blood pressure.
- Formatio Reticularis may have suffered, making it more difficult for polio patients to stay awake.
- Affection of the autonomic nervous system.
- Weakened respiratory muscle.
- Diminished number of neurons and dysfunction of synapses: The acute polio infection has not only led to a reduction in the number of nerve cells; it may also have caused a decrease in acetylcholine production of surviving cells
- Paresis of muscles in the oropharynx and oesophagus and of the recurrent nerve may not be recognised, as they may be slight and unknown to the patient.
- Affection of the pain sensation pathways in the spinal canal may have lead to suboptimal functioning of pain modulating reflexes.
- Abnormal distribution of tissues, decreased volume of muscle tissue and increased volume of adipose tissue.
- Decreased blood volume caused by a diminishing in volume of vessels in the paretic extremities.
- Scoliosis/kyphosis.
- Lack of muscle to cover nerves.
- Increased risk of cardiovascular diseases.

PATHOPHYSIOLOGY AND ANATOMY

In order to get your patient safely through an operative course, it is important to consider that polio patients may experience the following:

- Increased sensitivity to muscle relaxants. The extent of the paresis [primarily and current] may give an indication of how much.
- Increased sensitivity to opioids and other centrally functioning analgesics and sedatives. History of fatigue and medicine consumption can help estimate the extent of the problem.
- Increased risk of cardiac arrhythmia and a fall in blood pressure due to affection of the central and/or the autonomic nervous system.
- Cardiovascular diseases may be disguised by the low physical activity of the polio patient.
- Reduced ventilation caused by either weakened respiratory muscles, thoracic deformity or dysfunction of the respiratory centre.
- Increased risk of upper airway obstruction, caused by unrecognised paresis of the recurrent nerve or oropharyngeal muscles.
- Increased risk of aspiration caused by reflux and/or dysfunctional coughing reflex.
- Increased pain sensitivity caused by affection of pain reflexes in the spinal cord.
- Low blood volume in spite of normal haemoglobin values.
- Increased risk of peripheral nerve traction injuries.
- Increased sensitivity to cold because of a decrease in muscle mass and affected autonomic regulation.
- Increased risk of pressure ulcers caused by deformities.
- Increased risk of fractures caused by osteoporosis or paralyzed limbs.
- Increased risk of post-operative urinary retention.

Important for surgeons.

When a polio patient is to undergo surgery, it is important to focus on the following

Pre operatively

- A thorough history including all primary paresis, as the nerve damage generally is underestimated by the clinical investigation.
- A general assessment of the patient's functional ability, to disclose the need for physical assistance and planning a realistic post operative course.
- A dialogue with the patient to uncover any special problems in the position needed during the operation.
- An anterior access is to be preferred for a hip replacement because this does not cut the rotators.
- **Post Operatively.**
- Pain treatment should be multimodal with the use of NSAID and local anaesthesia in the wound, using the least possible amount of opioid.
- Blood loss should be replaced at a lower threshold, as paretic extremities may have lower blood volume and/or compensatory vasoconstrictive reflexes may be dysfunctional.
- Increased risk of aspiration caused by the oropharyngeal paresis or reflux.
- Increased risk of post-operative urinary retention.
- Increased risk of post-operative paralytic ileus caused by a possible affection of the autonomic nervous system.
- It will take longer than normal for the patient to regain his or her usual level of functioning.

- Mobility may be significantly affected as polio patients compensate for their paresis by the substitution of other muscles. This means that they have to be more awake to compensate, and that incisions through muscles which usually do not cause problems, may cause a serious problem for the mobilisation of polio patients.
- The longer period to regain normal activity means that any prophylactic anticoagulation should be maintained longer.

Rehabilitation.

- In training of polio patients, there's a risk of overloading and decrease of muscle strength. Most polio muscles are best trained by submaximal load, i.e. training of endurance rather than strength.
- It is important that the patient seek expert advice.

Except for minor operations polio patients are not suitable for outpatient surgery or fast tracked surgery

Important for Anesthesia staff

When a polio patient is to undergo surgery, it is important to focus on the following:

Pre operatively

- A thorough history including all details of paresis during the primary infection and the present condition. The clinical judgement will generally underestimate the nerve injuries.
- History of cranial nerve affection (bulbar polio or ventilator assistance), deformities and/or affection of muscles of thorax, shoulders or neck. A spirometry test should be made in these cases. If the vital capacity is less than 1.5 litres an (arterial) a-puncture should be performed.
- An assessment of whether neck scoliosis requires fiberscopes at intubation.
- A dialogue with the patient to uncover any special problems in the position needed during the operation.
- Restrictive dosage of pre medication.
- If there is suspicion of recurrens palsy (anamnestic information about cranial nerve affection or weakened voice - constant or intermittent) a laryngoscopy should be performed to evaluate plicae vocalis.
- Whenever possible, the patient should be put into position while awake.
- In general, start out with 50% of the normal dosage of anesthetics. If there is suspicion of extensive nerve damage, even less is recommended.
- Anesthetics must be carefully titrated using agents that are non depolarising and with short elimination time.
- Nerve stimulator should be used to monitor the effect of muscle relaxants.
- Pulse, blood pressure, oxygen saturation, and sleep depth should be monitored carefully.
- Low threshold for replacing blood loss, because the patient may have lower blood volume or dysfunctional vasomotor reflexes.
- Pain treatment should be multimodal whenever possible, with the use of NSAID preparations and local anesthesia in the wound and a minimum of opioids.
- Secure protection against cooling.

Post operatively

- Waking up time may be significantly prolonged.
- Post-operative respiratory treatment may be needed and must be possible.
- Patients should be observed in recovery ward at least twice as long as usual.
- Upper airway obstruction may occur if there is an unrecognized paresis of the oropharynx or recurrent nerve.
- Increased risk of aspiration caused by reflux and insufficient cough reflexes.
- Increased risk of post-operative blood pressure and oxygen saturation.
- Protection against cooling with extra blankets.

Regional anesthetics

Scoliosis can make it difficult to place the anesthetics, and the doses of anesthetics should be carefully administered**.**

Local anesthetics

Infiltration anesthesia and nerve blocks can be used without special precautions. As diaphragmatic paresis may occur during supraclavicular and Scalene block, they should not be used for patients that cannot tolerate a reduction in their vital capacity of 30%.

Respiratory treatment

Prior to surgery of polio patients with ventilators, their ventilator unit should be consulted.

Important for staff at the operating theatre.

When a polio patient is to undergo surgery, it is important to focus on the following:

- Whenever possible, the patient should be put into position while awake.
- The patient may need extra blankets
- The patient may have significant osteoporosis and subsequently a risk of fractures.
- The patient may have increased risk of nerve damage caused by traction, and of pressure ulcers.
- Patients may carry with them severe traumatic experiences of surgery in the past, and may therefore need special consideration to overcome the fear.

Important for staff at the recovery room.

When a polio patient is to undergo surgery, it is important to focus on the following:

- The wake up time may be significantly prolonged.
- An increased risk of the need for post operative ventilation.
- The patients should be observed in recovery room at least twice as long as usual.
- An increased risk of upper airway obstruction caused by unacknowledged paresis of the orthopharynx and recurrent nerve
- Increased risk of aspiration caused by reflux and insufficient cough reflexes.
- Increased risk of power operative urinary retention.
- Close check on pulse, blood pressure, and oxygen saturation.
- The patient may need extra blankets.
- Patients may carry with them severe traumatic experiences of surgery in the past, and may therefore need special consideration to overcome the fear.

Important for staff at the wards.

When a polio patient is to undergo surgery, it is important to focus on the following:

Pre operative

- Assessment of the patient's functional level to determine special needs of physical assistance and to make a realistic plan for the post operative course.

Post operative

- Pain treatment should be multimodal whenever possible, with the use of NSAID preparations and local anesthesia in the wound and a minimum of opioids.
- Low threshold for replacing blood loss, as the patient may have lower blood volume and/or dysfunctional compensatory vasoconstrictive reflexes.
- An increased risk of post operative paralytic ileus due to possible affection of the autonomic nervous system.
- Increased risk of aspiration caused by reflux and insufficient cough reflexes.
- Increased risk of post operative urinary retention.
- Extra blankets should be offered as the patient may be very intolerant to cold
- It may take longer than usual for the patient to regain his or her overall level of functioning.
- Mobility may be significantly reduced as polio patients generally compensate for paresis by substituting other muscles. This means that they have to be more awake in order to compensate. It also means that muscle incisions that usually do not cause problems, can be a serious obstacle to mobilization for polio patients.
- An extended mobilization period means that any thrombosis prophylaxis should be maintained for a longer period.

Rehabilitation.

- There is a risk of overloading and thereby promoting the degeneration of the regeneration processes. Polio muscles should generally be trained only with submaximal load, i.e. training of endurance rather than strength.

Moreover

- Except for very minor operations, polio patients are not suited for outpatient surgery of fast track surgery.

Patients may carry severe traumatic experiences of surgery in the past, and may therefore need special consideration to overcome their fear.

References

Acute polio.

Albert Sabin: Studies on the natural history of poliomyelitis. J Mount Sinai Hosp. 1944;X:4,185-206.

Erik Skinhøj. Some Problems of Acute Anterior Poliomyelitis and its Sequelae. Disputats 1949. Einar Munksgaard. København.

Polio Sequelae in General.

Marinos C Dalakas et al: A long term follow-up study of patients with post-poliomyelitis neuromuscular symptoms. New England Journal of Medicine 1986;314:15,959-963

Julie K Silver, Anne Gawne: Postpolio Syndrome, 2004 Hanley & Belfus.

Specific factors.

Hung-Chin Tsai et al: Prevalence and risk factors for upper extremity entrapment neuropathies in polio survivors. J Rehab Med 2006;41:26-31

Anne C Gawne et al. Cardiac Risk Factors in Polio Survivors, Arch. Phys Med Rehab 2003;84:694-6.

Alex Macario: Bilateral Vocal Cord Paralysis After Radical Cystectomy in a patient with a History of Bulbar Polio. Anesth Analg 1997;85:1171-2

Laszio Gyermek. Increased potency of Nondepolarising Relaxants After Poliomyelitis. J Clin Pharmacacol 1990;30:170-173

David A Lambert. Postpolio Syndrome and Anesthesia. Anaesthesiology 2005;103:638-644

LR Robinson et al. New Laryngeal muscle weakness in post-polio syndrome. Laryngoscope 1998;108:732-4

AF Mohammed et al. High increase of Osteoporosis and Fractures in an aging Post Polio Population. Eur Neurol 2009;62:369-374

Websites. www.ptu.dk www.post-polio.org

POLIO PATIENTS AND SURGERY

POLIO HISTORY FORM

Information about your polio patient's acute polio and sequelae

To be filled out by the patient undergoing operative procedure. Can be photocopied or cut out and included in patients records.

Name …… Date of Birth ……..

I contracted polio in 19 ……., and was hospitalised for ……..…….. months.

I was originally paralyzed in the following parts of my body

……

……

……

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At the moment, I experience the following consequences from polio. [Please circle]

Decreasing muscle strength	YES	NO
Muscle cramps, twitches or jerks	YES	NO
Muscle and joint pain	YES	NO
Breathing problems	YES	NO
General pronounced fatigue	YES	NO
Sleeping problems	YES	NO
Swallowing problems	YES	NO
Weakened voice	YES	NO
Cold intolerance	YES	NO
Urinary problems	YES	NO
Bowel problems	YES	NO

I use the following aids

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I need help with the following

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