



POLIO PATIENTS AND SURGERY

Information
for health staff

●● Table of contents

Patient polio history form	03
General information about acute polio and sequelae	05
Operation and polio: pathophysiology and anatomy	06
Important for surgeons	08
Important for anesthesia staff	10
Important for staff at the operating theater	12
Important for staff at the recovery room	12
Important for staff at the wards	13
References	14

●● 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 patient is having an operation.

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



●● 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 cut out and included in the patient record)

Name _____ Date of Birth _____

I contracted polio in 19 _____ and was hospitalized for _____ months.

I was originally paralyzed in the following parts of my body _____

I was on a ventilator (please ✓) Yes No

I finished my rehabilitation in 19 _____

After rehabilitation, I was still paralyzed/had weak muscles in my _____

At the moment, I experience the following consequences from polio (please ✓)

Yes No

- | | | |
|--------------------------|--------------------------|----------------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | Decreasing muscle strength |
| <input type="checkbox"/> | <input type="checkbox"/> | Muscle cramps, twitches or jerks |
| <input type="checkbox"/> | <input type="checkbox"/> | Muscle and joint pain |
| <input type="checkbox"/> | <input type="checkbox"/> | Breathing problems |
| <input type="checkbox"/> | <input type="checkbox"/> | General pronounced fatigue |
| <input type="checkbox"/> | <input type="checkbox"/> | Sleeping problems |

Yes No

- | | | |
|--------------------------|--------------------------|---------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | Swallowing problems |
| <input type="checkbox"/> | <input type="checkbox"/> | Weakened voice |
| <input type="checkbox"/> | <input type="checkbox"/> | Cold intolerance |
| <input type="checkbox"/> | <input type="checkbox"/> | Urinary problems |
| <input type="checkbox"/> | <input type="checkbox"/> | Bowel problems |

I use the following aids _____

I need help for the following _____

A woman with brown hair, wearing a blue polo shirt, stands in a clinical or office environment. She is looking slightly to the right. In the foreground, a man with glasses is blurred, looking towards the woman. The background includes a whiteboard and a paper towel dispenser.

Polio in Europe

It is estimated that in Europe around 700.000 people are now living with the effects of polio.

●● General information about acute polio and sequelae

Poliovirus is a picornavirus 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 cerebrum, 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 10–20 times as many muscle fibers than neurons of unaffected muscles. Furthermore, denervated muscle fibers undergo fat degeneration whereby muscle atrophy may not be very apparent. Consequently, in reality damage from polio can be significantly more widespread than can be judged clinically.

The regenerative processes do not last, and many patients, who have had polio, experience a total or partial return of the initial symptoms 30–50 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 hospitalizations 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 unrecognized chronic accumulation of CO₂.
- Centers 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 recognized, 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 (primary 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 unrecognized 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 hemoglobin 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 of 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 pareses, 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.

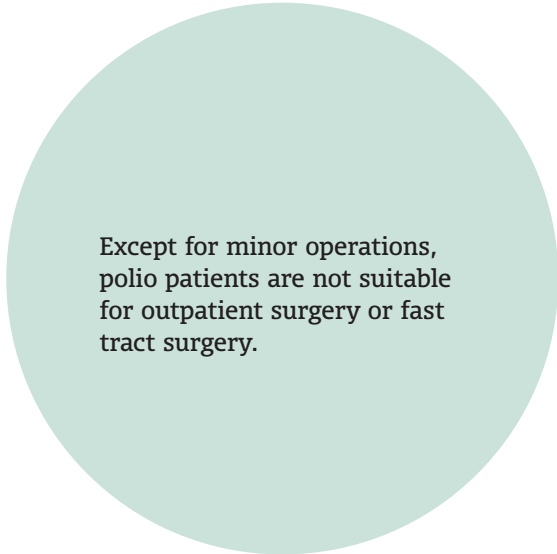
Post-operatively

- Pain treatment should be multimodal with the use of NSAID and local anesthesia 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 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 pareses by the substitution of other muscles. This means that they have to be more awake to compensate, and that incisions through muscles which usually does not cause problems, may cause a serious problem for the mobilization 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 tract 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 pareses during the primary infection and the present condition. The clinical judgment 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 liters an 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 premedication.
- 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.

Per-operatively

- 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 depolarizing and with short elimination time.
- Nerve stimulator should be used to monitor the effect of muscle relaxantia.
- 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 orthopharynx or recurrent nerve.
- Increased risk of aspiration caused by reflux and insufficient cough reflexes.
- Increased risk of postoperative urinary retention.
- Close check-up on pulse, 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 Scapular 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 theater

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 their 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 post-operative urinary retention.
 - Close check-up 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 their 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 pareses 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 regenerative 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 or "fast tract" 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; XI: 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.

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

Specific factors

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

Anne C Grawne 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.

Laszlo Gyermek. Increased potency of Nondepolarizing Relaxants After Poliomyelitis. J Clin Pharmacol 1990; 30: 170-173.

David A Lambert. Postpolio Syndrome and Anesthesia. Anesthesiology 2005; 103: 3,638-14.

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

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

Websites

www.polio.dk

www.post-polio.org



**FURTHER REFERENCES
AND INFORMATION:**

Polio Denmark – Danish Society
of Polio
Fjeldhammervej 8, 2610 Rødovre
Phone +45 3673 9000



Polio Denmark is an organization that works to create equal conditions and quality of life for the more than 100.000 Danes who have serious injuries following an accident or an illness.

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

Design: ESSENSSEN.COM // Photo: Lars Just/Polio Denmark // Print: Litrotyk.dk // 2011