Anaesthesia Issues for Post Polio Patients

Summarised by Tessa Jupp RN from a paper presented by **Dr Selma Harrison Calmes MD,** Retired **Clinical Professor of Anaesthesiology,** UCLA School of Medicine, Sylmar, California, at the 10th International Polio Conference held at Warm Springs, Georgia, USA **24 April 2009.**

Many of us are having to face surgery as we are getting older and there is a small pack of papers we send out for you to give to your surgeon, anaesthetist and hospital staff if this is the case.

It is opportune that at the recent International Warm Springs Polio Conference held in USA in April 2009, a paper was presented by Dr Selma Harrison Calmes MD, an anaesthetist with much experience in post polio. Mary-ann Liethoff from Post Polio in Victoria attended this conference and notes have been distributed to all states via Polio Australia.

Dr Calmes writes that in the absence of any significant published information, these points are based on her clinical experience and ideas developed after extensive study of polio and post polio syndrome.

1. **Post polios** are nearly always **very sensitive to medications that sedate** them and it may take longer to emerge from sedation. It is probably due to changes in nerve cells in the brain due to polio, especially in the Reticular Activating System.

2. **Muscle relaxants** (particularly non-depolarising) can cause loss of function for a longer time in post polios. It is recommended that only half the usual dose is used. More can be added if necessary. The polio virus has caused extensive changes in neuromuscular junctions, even in seemingly normal muscles resulting in greater sensitivity. Careful monitoring is needed to prevent overdose which is a frequent problem. The significant decrease in total muscle mass due to polio is a contributing factor as drugs are taken up by muscle

3. **Succinylcholine** should be avoided as it often causes severe generalised muscle pain post op.

4. **Pain after surgery** is often significant due to the inflammatory response and pain pathways can be affected by the original poliovirus.

5. Polio often affects the normal functioning of the **autonomic nervous system,** leading to gastro-oesopageal reflux, fast heart beat and difficulty maintaining blood pressure with anaesthetics.

6. Polios who used or nearly needed iron lungs, or who now have sleep apnoea and/or use respiratory assistive devices, **need full respiratory evaluation** tests before having anaesthetic. Their respiratory physician should be involved in the pre-op and post-op care plans for these patients and provision for ICU care post op should be made.

7. **Muscle weakness** from polio can cause swallowing and laryngeal problems which can be worsened by intubation or upper extremity blocks.

8. **Body asymmetry** due to polio can cause difficulty in positioning on the operating table. Nerve damage can occur as well as fractures. Possible peripheral nerve damage is more likely with longer times in surgery. Loss of muscle and tendon bulk due to polio offers less protection.

9. **Spinal anaesthetics** and epidurals should be considered with caution as recent studies have shown inflammatory cytokines in the CNS of polios

Many polios have atrophied peripheral nerves and exposure to local anaesthesia, especially for long periods should be avoided or smaller doses given.

Supraclavicular and interscalene blocks of the upper body puts diaphragmatic paralysis at high risk and should probably not be used for polios.

SUMMARY

Polio patients can have anaesthesia and surgery safely, with careful preparation. For an optimal outcome, ALL aspects must be considered at high levels of performance. Few surgeries are truly urgent and there is usually time to get data from the web and reputable polio clinics like that of Dr Calmes at UCLA.

Take time to research the operation, the need for it, the consequences and to prepare adequate and informed post-op options for best recovery for the patient.

The usual post surgery recovery and rehabilitation expectations may need to be revised taking into account the consequences of polio on the patient's physical anatomy, muscle strength and ability, central nervous system, pain management, the immune system and systemic inflammatory processes.

HELPFUL RESOURCES

1. Post Polio Health International: Dr Selma Calmes see at **www.post-polio.org/ipn/anes.html**

2. "Post Polio Syndrome and Anaesthesia" by David Lambert MD et al, University of Manitoba, Winnipeg, Canada in the Sept 2005 issue of *Anesthesiology* (Vol. 103, No. 3, pp 638—644) see at **http://journals.lww.com/anesthesiology/Fulltext/2005/09000/Postpolio_Syndrome_and_Anesthesia.29.aspx**

International Polio Network

Summary of Anaesthesia Issues for Post-Polio Patients

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Polio results in widespread neural changes, not just destruction of the spinal cord anterior horn (motor nerve) cells, and these changes get worse as patients age. These anatomic changes affect many aspects of anaesthesia care. No study of polio patients having anaesthesia has been done. These recommendations are based on extensive review of the current literature and clinical experience with these patients.

1. Post-polio patients are nearly always very sensitive to sedative meds, and emergence can be prolonged. This is due to central neuronal changes, especially in the Reticular Activating System, from the original disease.

2. Non-depolarising muscle relaxants cause a greater degree of block for a longer period of time in post-polio patients. The current recommendation is to start with half the usual dose of whatever you're using, adding more as needed. This is because the poliovirus actually lived at the neuromuscular junctions during the original disease, and there are extensive anatomic changes there, even in seemingly normal muscles, which make for greater sensitivity to relaxants. Also, many patients have a significant decrease in total muscle mass. Neuromuscular monitoring intra-op helps prevent overdose of muscle relaxants. Overdose has been a frequent problem.

3. Succinylcholine often causes severe, generalized muscle pain post-op. It's useful if this can be avoided, if possible. There is no experience with Raplon yet.

4. Pain is often a significant issue. The anatomic changes from the original disease can affect pain pathways due to "spill-over" of the inflammatory response. Spinal cord "wind-up" of pain signals seems to occur. Proactive, multi-modal post-op pain control (local anaesthesia at the incision plus PCA, etc.) helps.

5. The autonomic nervous system is often dysfunctional, again due to anatomic changes from the original disease (the inflammation and scarring in the anterior horn "spills over" to the intermediolateral column, where sympathetic nerves travel). This can cause gastro-oesophageal reflux, tachyarrhythmias and, sometimes, difficulty maintaining BP when anaesthetics are given.

6. Patients who use ventilators often have worsening of ventilator function post-op, and some patients who have not needed ventilation pre-op have had to go onto a ventilator (including long-term use) post-op. The marker for real difficulty is thought to be a VC &60;1.0 litre. Such a patient needs good pulmonary preparation pre-op. Another ventilation risk relates to obstructive sleep apnoea in the post-op period. Many post-polios are turning out to have significant sleep apnoea due to new weakness in their upper airway muscles as they age.

7. Positioning can be difficult due to body asymmetry. Affected limbs are osteopenic and can be easily fractured during positioning. There seems to be greater risk for peripheral nerve damage (includes brachial plexus) during long cases, probably because nerves are not normal and also because peripheral nerves may be unprotected by the usual muscle mass or tendons.

Please feel free to contact me (pager 818-529-0325, office 818-364-4350, email scalmes@dhs.co.la.ca.us) if you have any questions. This brief summary may not cover everything you want to know.

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Anaesthesia Concerns for the Polio Survivor

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Selma Harrison Calmes, MD, Chair, Department of Anaesthesiology, Olive View-UCLA Medical Centre, contracted polio at age 8 in Southern California. She graduated from Baylor Medical School in Houston in 1965 (one of 3 women in a class of 1984).

There are three types of anaesthesia: general, regional, and monitored anaesthesia care (MAC). General anaesthesia is used primarily for major operations, and the patient is completely asleep. Gas and injected drugs, including muscle relaxants, are usually administered, and a breathing tube is usually placed. With regional anaesthesia, only part of the body is numb. It is common to give some sedation also, so patients do not remember being awake. Spinal anaesthesia and epidural anaesthesia are common types of regional anaesthesia and anaesthetise the lower part of the body only. Regional anaesthesia is useful when surgery is limited. It is also commonly used for prostate surgery. This anaesthesia uses only a few drugs and is not as complicated as general anaesthesia. MAC means that the surgeon injects local anaesthesia at the site of surgery while an anaesthesiologist gives sedation intravenously and ensures patient safety and comfort during the surgery. Cataract surgery is generally performed with MAC.

Although we know anaesthesia today is extremely safe, no one has studied how well post-polio patients do during anaesthesia. Patient safety during anaesthesia depends on the anaesthesiologist knowing the patient's history and selecting an appropriate anaesthesia plan, taking into account all of the patient's disorders, as well as the planned surgery. It is vital that polio survivors speak with the anaesthesiologist ahead of time and during the pre-surgery interview inform the anaesthesiologist of their special conditions such as ventilator use, sleep apnoea, body positioning problems, etc. Once the anaesthesiologist has the necessary information, a suitable, safe anaesthetic can be chosen. With this communication, polio survivors should not fear anaesthesia and surgery, but obviously it helps if the anaesthesiologist has had experience with polio survivors.

Problems may occur in post-polio patients during anaesthesia. Sleep apnoea may be worse immediately after surgery. Those individuals who do not have normal stomach emptying may be at risk for vomiting as anaesthesia begins. Low blood pressure may occur with normal doses of common anaesthesia medications. Changes in all patients' lungs occur during general anaesthesia, and lung function is worse in everyone for about 48 hours after surgery. How much trouble polio survivors may face depends on their pulmonary function before the surgery. They may have an increased need for ventilation post-operatively

The most likely anaesthesia risks for polio survivors occur with general anaesthesia. Because they have lost motor nerves, polio survivors are very sensitive to muscle relaxants, and in essence, they may overdose on what may be a usual dose for others. Another significant risk is worsening ventilation after surgery for those with respiratory muscle involvement. This is temporary and is due to changes in the lung with anaesthesia.

Measuring response to muscle relaxants is usually done routinely with a nerve stimulator which allows the anaesthesiologist to check each person's response to muscle relaxants. With cautious use of muscle relaxant drugs, usually at half the normal dose, and careful monitoring, polio survivors should have no problems. The only study of post-polio patients undergoing anaesthesia with the older muscle relaxants found that polio survivors were twice as sensitive to muscle relaxants as the general population. The recommendation was to cut the dose in half. Clinically, I think that recommendation is appropriate. If a patient also had vomiting preoperatively and had abnormal electrolytes (salts in the blood), even less than half the usual dose might be needed. Low electrolytes, common after vomiting and diarrhea, make muscle relaxants last longer.

With muscle relaxant drugs, all muscles are paralysed but to varying degrees. The sensitivity of various muscles depends on muscle size and some other factors we do not entirely understand. In general, the eye muscles are very sensitive to muscles relaxants while breathing muscles are very insensitive to muscle relaxants -- they are the last to be paralysed when muscle relaxants are administered.

The paralysing action of all muscle relaxant drugs eventually ends. The drugs are either redistributed away from the nerves, and thus diluted, excreted by the kidneys, or broken down by blood or liver enzymes. If paralysis is prolonged, the anaesthesiologist would use a ventilator to breathe for the patient until the patient could breathe on his/her own, perhaps for as long as an hour, or more. Use of a ventilator is fairly common after major surgery and is not considered a serious complication.

Curare was the first available muscle relaxant drug. It comes from natural plants and has many possible side effects, such as flushing of the skin and lowering of blood pressure. When it was first introduced, we also did not have any medicine to reverse its effects. From the time curare was introduced in the late 1950s, drug companies were always actively trying to synthesize better muscle relaxants. They have been successful in the last few years. As a plant preparation from the Amazon, curare is also difficult to obtain now. It is not commonly used today, because there are so many better synthetic muscle relaxant drugs.

Common muscle relaxant drugs are vecuronium, pancuronium, mivacurium, rocuronium, atracurium, cis-atracurium, and succinylcholine. There are theoretical reasons to prefer mivacurium, atracurium, and cisatracurium over the other drugs. The action of these drugs ends by an enzymatic breakdown and is not dependent of redistribution of the drug away from the nerves. There is no information on these drugs with post-polio patients, but theoretically, there would be less chance for overdose. if overdose did occur, the effects would not last as long.

Short-acting muscle relaxants often used in anaesthesia are rocuronium and succinylcholine. They cause muscles to contract first, before paralysis occurs, and are often used at the start of general anaesthesia to help place a breathing tube. [A new airway device, the laryngeal mask airway (LMA), helps support an adequate airway instead of a breathing tube, and muscle relaxants are not required to place it. However, patients can aspirate stomach contents into the lungs with the LMA. In my experience, many post-polio patients are at risk for aspiration because they often have gastroesophageal reflux or a hiatal hernia, and the LMA would not be safe for them. A breathing tube prevents aspiration which can be a serious and even fatal complication.] Succinylcholine and rocuronium can cause severe muscle pain in polio survivors especially if the survivors will be up and about soon after surgery and should be avoided if possible.

Because of the hazards of general anaesthesia in post-polio patients, it is useful to consider regional or MAC instead, if the operation can be done with those anaesthetics. There is much less assault on the body and far fewer drugs are used. An epidural anaesthetic probably has less risk for aggravating any pre-existing nerve damage in polio survivors and would be a good alternative to a spinal or general anaesthetic. Polio survivors, as with the general population, should be in the best shape possible for elective surgery. They should not have a cold or bronchitis. If they still smoke, they should stop smoking as soon as they know about the surgery. They should control their weight and eat a high-protein diet after surgery to help their muscles stay in the best condition possible.

if you are about to undergo surgery, you must inform the anaesthesiologist about your post-polio problems, possible sensitivity to muscle relaxants, and the need to monitor your response to them. If you are having elective surgery and have not had a chance to speak with the anaesthesiologist beforehand, surgery should be postponed until this critical conversation occurs. Many anaesthesiologists now have clinics or offices where they see patients several days before surgery. If the surgery is an emergency and you are physically able to communicate with the anaesthesiologist, please do so before the surgery, or have a family member who is knowledgeable about your special conditions speak for you. If you are not satisfied with the response of the anaesthesiologist, ask for another. With attention to all these details, you can have surgery safely and remain in the best possible health.

For Dr. Calmes' "Summary of Anesthesia Issues for Post-Polio Patients,", visit www.post-polio.org

Cautions for SURGERY post polio

by Tessa Jupp RN from an article written by Assoc. Prof. Richard Bruno; Director, Post Polio Rehab. and Research Service, Kessler Institute, also Clinical and Physical Medicine and Rehab. New Jersey Medical School and Chairperson, International Post Polio Task Force.

A number of our members have experienced problems during surgery, some waking up 3 days later in Intensive Care after a supposedly routine minor operation. This an important article so please remember to show it to your surgeon and anaesthetist before agreeing to any future surgery. It may not seem relevant now but if later you are confronted with surgery, don't just assume your doctors know. (Even if they tell you they do, it is still worth presenting your surgeon/anaesthetist/ ward staff with this summary, for your own safety.)

ESSENTIAL PRINCIPLES

1. Polios deteriorate 2 times faster than non-polios
2. Polios take twice as long to recover post-op.
3. Polios don't need muscle relaxants.
4. Polios don't need as much anaesthetic.
5. A full neurological and respiratory review should be undertaken pre-op.

RESPIRATORY

Whether you had breathing problems or not at acute polio it is recommended that pulmonary function be assessed by a respiratory specialist with some knowledge of polio complications. Those with lung capacity under 70% may need a respirator long after function should normally have recovered. This applies to any neck/ arm/ chest/ abdominal muscle weakness or swallowing difficulty also. *(We have one member who thought he only had polio in his leg but it was found during respiratory assessment at SCGH that he actually has half of his diaphragm paralysed as well.)*

GENERAL ANAESTHETICS

Polio survivors are exquisitely sensitive to anaesthetic. The polio virus damaged areas of the brain stem called the reticular activating system (RAS), which is responsible for keeping the brain awake. This occurred in both paralytic and non-paralytic polio. This means that a little anaesthetic goes a long way and lasts a long time.

Pre-op drugs, like valium, alone may induce sleep for 8 hours. Valium can induce unreality in polios. With intravenous anaesthetics, like sodium pentothal, or gaseous anaesthetic, polios may sleep for days! Also avoid atropine, buscopan, etc

Drugs are taken up by muscle tissue, which is reduced due to polio, so overdose is common. Doctors usually determine dose by weight. If muscle space is replaced by fatty tissue and enlarged muscle cells, as it is after polio, the weight may be there without the usual muscle to absorb the anaesthetic or drug.
This caution applies to Spinal Anaesthetics like epidurals as well. It is recommended that care be taken with local anaesthetic infiltration too.

RULE OF 2

Dr Bruno advocates the rule of 2 for post polio. Usual anaesthetic dose should be divided by 2 for post polios. Post anaesthetic recovery should be multiplied by 2. Pain medication could be needed for twice as long. Ambulation post-op may take twice as long. Hospital stay time may need to be twice as long. Rest time at home may take twice as long before resuming work or household duties. Feeling "back to normal" may take twice as long.

(Looking at secondary carnitine literature, severe illness, pregnancy, physical trauma (eg fractures) and surgery are recognised as trigger factors for precipitating or worsening carnitine deficiencies. These same trigger factors are seen as triggering the late effects of polio. *More carnitine is required by the body at these times. Carnitine is now recognised as supporting the work of the immune system too, which is stressed in these instances. Monitoring of serum carnitine levels pre-op is advised. Polios should be at* **high** *levels of normal)*

RECOVERY PERIOD

Polios with muscle wastage will have a smaller blood volume than expected for weight and height and **blood loss** during surgery may cause more of a problem post-op.

Atropine-like drugs which dry secretions during surgery also slow the gut. Gut muscles too are weakened by polio and so excessive **constipation** or paralytic ileus (blockage) may occur post-op.

Residual pain, lasting months, has been known to occur, resulting from over-extension of muscles on the operating table. It is advisable for the polio patient to be conscious during positioning on the table to report any areas of discomfit due to muscle wastage, tight tendons, scoliosis etc.

Polio also affects **body temperature** regulation areas of the brain, brain stem, spine and auto-nomic nervous system. Cold can be a problem.

Polios often wake from anaesthetic shivering violently. This is because the nerves that control blood vessel size have been damaged. This is why **cold intolerance** is a feature of post polio. During anaesthetic remaining nerves can be paralysed and blood vessels remain dilated, allowing body heat to escape rapidly. More blankets than normal will be needed in the recovery room and ward post-op.

Brain stem damage can cause vasovagal syncope and even brief asystoles (ie **more apt to faint**) particularly when attempting to vomit. It is important that post-op emetic (**vomit**) control be administered by the anaesthetist before polios leave theatre for the recovery room.

Another area of concern is **choking**. Even polios unaware of swallowing difficulties may have trouble with cough reflex, clearing secretions, swallowing and choking. Polios should be positioned on their side or in a position that allows drainage during recovery from anaesthetic and carefully monitored.

Polios may be twice as **sensitive to pain** and may not be given enough pain relief. This should be administered as required by the patient, to prevent under or over-dose. Increased pain sensitivity in polios is apparently related to damage to endogenous opiate-secreting cells in the brain. **(Our members have reported less post-op pain after taking magnesium and zinc supplements before surgery and while convalescing.)**

There is a tendency these days to **ambulate** people quickly after surgery. Whilst this is welcomed as any period of inactivity will deteriorate polio muscles, polios may not have fully recovered from the effects of anaesthetic, polio muscles may already be weakened, a conscious effort is often needed to walk in polios. *(How many of us normally have to watch our feet when we walk to avoid falling over anyway?)*

Many polios use **trick movements** to allow ambulatory function, and surgery may compromise these substitutions causing temporarily, greater disability. This may even affect movement in bed, necessitating **prolonged assistance** to turn over, sit up, get in and out of bed, toileting and showering. Nursing staff and physios need to be aware of this. Extra mobility aids may be required for a time and **passive physio** from day 1 should be part of the tone-ing process. Physios should be aware that polio muscles **fatigue easily** and work within the comfort zone of the patient. *(Some members have experienced 'resounding disbelief' from young physios with no experience of polio, when they say they cannot do a given exercise as they have never been able to use certain muscles since having polio.)*

Just being in hospital can be a problem for polio survivors. Insomnia, anxiety, even panic attacks are feasible when it is remembered that psychological and **emotional scars** can still be present **from hospitalisation at acute polio**. Many polio people have an aversion to both doctors and hospitals from the time of polio and often feel unable to cope, as they did back then. Staff need to be aware of the vulnerability felt and take care to be cheerful, caring and supportive.

When polio patients **return home**, typical Type A behaviour often prompts them to make light of how they really feel and attempt to take up where they feel expected to. The recovery process is longer due to rapid polio deconditioning and fatigue levels are easily reached. They should be encouraged to take things slowly and supplied with off-work certificates for twice the normal recovery time.

A 1985 US Survey of Polio Survivors found that **emotional stress is the second most common cause of the late effects of polio.** (Physical over-exertion being the most common.) Surgery is a powerful stressor. Polios should expect some increase in fatigue and muscle weakness due to surgery and all it entails. The recovery process will be longer but a well planned hospital stay with informed professional support should not result in a permanent decline in ability.

The onus is on the potential patient to ensure that the professionals they encounter are well informed to see them through. **Patients have rights,** *these days. We need to make this known.*

If you have trouble with doctors and health professionals who won't cooperate, the advice from the WA Health Dept is -

"Change your doctor - find one who will!"

PRE-OP CHECKLIST- - give articles and discuss

1. **Surgeon**
   assess respiratory/neurology, stand-by blood longer hospitalisation, post-op anti-emetic, operating table positioning, warmth in recovery room/ward, cough reflex/clearing secretions, post-op pain medications, physio - stretching & range-of-movement, educating hospital staff.
2. **Anaesthetist**
   respiratory results, no pre-med/relaxants, lower anaesthetic dose, ? respirator need, post-op anti-emetic, cough reflex/secretions in recovery.
3. **Nursing Staff**
   longer anaesthetic recovery time, pain administration, help moving in bed and with toilet/shower extra mobility aids, ?anti-embolism stockings.
4. **Physio**
   plan for post-op passive physio/exercise time. review getting in/out of bed, ambulatory abilities.