



ANESTHESIA CONCERNS FOR THE POLIO SURVIVOR

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There are three types of anesthesia: general, regional, and monitored anesthesia care (MAC). *General anesthesia* 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 anesthesia*, only part of the body is numb. It is common to give some sedation also, so patients do not remember being awake. Spinal anesthesia and epidural anesthesia are common types of regional anesthesia and anesthetize the lower part of the body only. Regional anesthesia is useful when surgery is limited. It is also commonly used for prostate surgery. This anesthesia uses only a few drugs and is not as complicated as general anesthesia. MAC means that the surgeon injects local anesthesia at the site of surgery while an anesthesiologist gives sedation intravenously and ensures patient safety and comfort during the surgery. Cataract surgery is generally performed with MAC.

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

Problems may occur in post-polio patients during anesthesia. Sleep apnea may be worse immediately after surgery. Those individuals who do not have normal stomach emptying may be at risk for vomiting as anesthesia begins. Low blood pressure may occur with normal doses of common anesthesia medications. Changes in all patients' lungs occur during general anesthesia, 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, and they may have an increased need for ventilation post-operatively.

The most likely anesthesia risks for polio survivors occur with general anesthesia. 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 anesthesia.

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Measuring response to muscle relaxants is usually done routinely with a nerve stimulator which allows the anesthesiologist 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 anesthesia 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 pre-operatively 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 paralyzed but to varying degrees. The sensitivity of various muscles depends on muscle size and some other factors we don't 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 paralyzed when muscle relaxants are administered.

The paralyzing 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 anesthesiologist 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, mivcurium, rocuronium, atracurium, cis-atracurium, and succinylcholine. There are theoretical reasons to prefer mivcurium, atracurium, and cis-atracurium 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.

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Short-acting muscle relaxants often used in anesthesia are rocuronium and succinylcholine. They cause muscles to contract first, before paralysis occurs, and are often used at the start of general anesthesia 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 anesthesia in post-polio patients, it is useful to consider regional or MAC instead, if the operation can be done with those anesthetics. There is much less assault on the body and far fewer drugs are used. An epidural anesthetic 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 anesthetic. 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 anesthesiologist 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 anesthesiologist beforehand, surgery should be postponed until this critical conversation occurs. Many anesthesiologists 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 anesthesiologist, 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 anesthesiologist, ask for another. With attention to all these details, you can have surgery safely and remain in the best possible health. ➤