

AGING POLIO SURVIVORS AND CHANGING VENTILATION NEEDS

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Case No. 1

Male, DOB 1939.

Dx: post-polio, quadriplegia, weakness in neck. Vital capacity: zero; vital capacity with GPB: 1.6L (1984).

- 1955: Polio. Months in iron lung, weaned to chest shell.
- 1956-1981: Day: pneumobelt (sitting) 12-14 hours; mouth intermittent positive pressure (MIPPV). Night: chest shell.
- 1981: Trial of poncho failed.
- 1981 to date: MIPPV with lipseal at night.
- 1987 to date: Cotton pledgets in nostrils to prevent night-time air leakage.

Discussion. Case No. 1 has used the pneumobelt for more than 40 years. It is possible to use the pneumobelt for a lifetime, but not if the abdomen is too obese. He had to give up the chest piece, because it no longer ventilated him adequately. After several years of using MIPPV at night, air started to leak from his nose. To prevent the leaks, he put cotton pledgets in his nose sealed with 3M paper tape.

Case No. 2

Female, DOB 1941.

Dx: post-polio, scoliosis. Vital capacity: 0.5L; vital capacity with GPB: 1.3L (1984).

- 1947: Polio. One month in iron lung.
- 1964-1966: MIPPV during day and evening.
- 1966-1981: MIPPV during night.
- 1981-1984: Covered face and mouthpiece with scarf.
- 1984: MIPPV with lipseal.
- 1996: Trial of nasal IPPV failed. Cotton pledgets in nostrils to prevent night-time air leakage.

Discussion. For almost 20 years, Case No. 2 used nothing, then she developed scoliosis which contributed to her need for ventilation. She began using MIPPV during the day when she felt tired, and when she was watching TV in the evenings. A few years later, she began using MIPPV during the night, and was adequately ventilated for 15 more years, until she noticed air leakage during the night. She tried to solve this by covering her face and mouthpiece with a scarf, but began having headaches during the night and upon awakening. A trial of nasal IPPV last year failed, because she had difficulty adjusting to the mask. Like Case No. 1, she finds cotton pledgets useful in sealing off the nose.

At Goldwater, we took a small (to be expanded) sample of eight post-polio ventilator users — all except one over 50 years of age — to track their changing ventilation needs. They all use IPPV, except for one who uses a pneumobelt around the clock (she sits up to sleep). Many use the old Maxivent (pressure-regulated) at the bedside because it is extremely reliable. Some have begun to use the volume ventilators, PLVs or LP10s. The In-exsufflator cough machine is used by several to prevent and control respiratory infections, and almost all of them agree that it is best to buy the one with the timing device, unless your caregiver is very experienced. It would be wise to rent the In-exsufflator for a week (call any of the Respironics/LIFECARE offices) in order to become familiar with it before the onset of a respiratory infection. Almost everybody has a manual resuscitator, but are unfamiliar with it. Everyone should take it with them when they go out, but should practice with it ahead of time.

The settings on the Maxivent cover a range and do not seem to relate to one's weight, but if you are over 150 lbs., pressures are 40-50 cm H₂O. This may seem high, but the pressure that you read on the machine is not the pressure you are getting in your lungs. It depends on the length of the hose between the machine and your mouth or your nose. The longer the hose the greater the drop of pressure — with a pressure of 40 on the machine, it may only be about 15 or 12 cm by the time it hits your mouth. Under 150 lbs., pressures can be 24-42 cm. A great deal depends on the compliance of your lungs.

With the volume ventilators, if one is under 110 lbs., the volume should be under 1000 ml of air. However, if weight is over 110 lbs., the volume is 1400-2400 ml of air, generally not more than 1700 ml. This allows for leaks. You need about 6L altogether per minute. The LP10 does have a flow-limiting device which allows it to be used as a pressure-regulated ventilator; which many ventilator users prefer. The PLV-100 can be used in the same way, but it is not quite as simple.

At night, most of the eight respiratory polio survivors are still using the Cascade humidifier with settings of 3 to 5. During the day, some of them use an in-line humidifier and some don't bother at all if they are using mouth intermittent positive pressure ventilation (MIPPV).

Only two in the sample are using the pneumobelt with pressures from 28-38 cm H₂O and higher if there is food in the stomach. Both are frog breathing more in order to speak efficiently and distinctly. The polio survivor who has been using the pneumobelt for forty years now finds he is frog breathing more than before; the pneumobelt isn't ventilating him as adequately. With the greater amount of frog breathing, he is also getting more gas in his stomach during the day.

Everybody in this group frog breathes, from ten minutes to a few hours daily when not using MIPPV. Others use it continuously in conjunction with MIPPV or the pneumobelt. Some use it to help produce a deep cough.

Weight is very important. Two female polio survivors have been able to keep their weight stable, but the weight gain varies from 15-70 lbs., and in one instance, more than 100 lbs. To lose weight, one female used a modified Weight Watchers diet. The other tried by hypnosis with the post-hypnotic suggestion to divide everything she eats by half. She has lost about 15 lbs.

Pulmonary function testing is usually performed annually. Vital capacity should be measured in both a sitting and supine position, because respiratory polio survivors may have a reasonable vital capacity sitting, but a very low one lying down, or vice versa. Pulse oximeters that clip on a finger are available for home use and a good way to monitor oxygen saturation. Oxygen desaturation due to mucus plugs or atelectasis (collapsed lung) or pneumonia which may be getting worse can be quickly assessed with a pulse oximeter. If it drops below 92%, it is time to call the doctor.

Most of the group take the flu vaccine every year and have had the pneumococcal vaccine once. The pneumococcal vaccine should last a lifetime, but if taken over ten years ago, one might decide to have it a second time, especially because of the increasing number of antibiotic-resistant bacteria. As always, ask the advice of a physician. Nutritional supplements are popular, as are multi-vitamins and minerals, the antioxidants such as Vitamin E, and the herbal medicines echinacea and pycnogenol.

Aging polio survivors should be aware of possible changes in their ventilation needs. As you get older the chances of becoming unconscious are greater; there is always the possibility of stroke or heart attack. Are you better off with trach intermittent positive pressure ventilation (TIPPV) if you become unconscious? Probably yes, but if you carry the manual resuscitator and have an attendant with you, you can be ventilated just as well as you would with

TIPPV. Many people who are rehabilitated with a trach don't use a cuff anyway. If there is no cuff on it, and if you're unconscious, it doesn't work for ventilation — everything leaks out of your nose and mouth. The nose and mouth must be sealed off for effective TIPPV in an unconscious individual.. ❀

DEFINITIONS:

CHEST SHELL — a fiberglass shell fitted across the chest. To assist inhalation, negative pressure is created outside the chest wall when air is sucked from the shell through tubing attached to a ventilator.

GPB — glossopharyngeal breathing or "frog breathing" is a method of obtaining more air by gulping air into the lungs using the tongue and throat muscles.

INTERMITTENT POSITIVE PRESSURE VENTILATION (IPPV) — air is delivered into the lungs at a controlled amount of pressure or volume, either via mouth (with lipseal or mouthpiece to suck air from), via nose (with nasal or face mask), or via tracheostomy.

LIPSEAL — mouthpiece strapped to head to prevent air from leaking from the mouth.

PNEUMOBELT — a corset-type affair worn around the abdomen to assist expiration. It intermittently inflates, compressing the abdomen, and forcing air out of the lungs. Effective only when sitting or standing.

PONCHO — fabric garment, similar to body wrap, attached by tubing to ventilator. Same negative pressure principle as chest shell. Effective only in supine position.

VITAL CAPACITY — the maximum amount of air that can be exhaled after taking a deep breath.

AUGUSTA ALBA, MD, Director, Department of Rehabilitation Medicine, Goldwater Memorial Hospital, came from the field of neurology into rehabilitation during the 1950s polio epidemics. She was completing her residency in 1953 at Goldwater, then one of the regional polio respiratory centers. Dr. Alba says, "I fell in love with the place and have been there even since." She has attended every GINI conference on post-polio since 1981, and has lectured and authored many medical journal articles on the subject.