A case study: The anesthetic management of a patient with the Eaton-Lambert syndrome

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The author focuses on the anesthetic considerations for a patient with the Eaton-Lambert syndrome, and further elucidates the characteristics of the disorder including a brief discussion of electromyography, a comparison to myasthenia gravis, some theories on the etiology of the syndrome, and methods of treatment.

This is the case report of a 58-year-old white female weighing 60 kilograms who was admitted to the hospital because of a questionable chest x-ray. Her past history of multiple operations included an abdominal hysterectomy, pilonidal cystectomy, and a lumbar laminectomy. No anesthetic complications occurred with any of the procedures.

Her past medical history included a 20-pound weight loss within an 18-month period, extreme fatigue, dizziness, and difficulty ambulating due to an aching feeling in her legs. She had made numerous visits to various physicians and had had several negative work-ups. It was on admission for the lumbar laminectomy that a preoperative chest film revealed bilateral hilar adenopathy.

The patient was readmitted three months post-laminectomy for a left thoracotomy with biopsy of the perihilar lymph nodes. The preoperative evaluation included a chest x-ray, an electrocardiogram (ECG), and laboratory tests encompassing complete blood count (CBC), glucose, blood-urea-nitrogen (BUN) and serum electrolytes; all were found to be within normal limits.

The patient was scheduled for a general anesthetic. Preoperative medication included meperidine 50 mg, hydroxyzine 50 mg, and glycopyrrolate 0.2 mg intramuscularly. In the operating room an intravenous cannula inserted with a solution of 1000 cc 5% dextrose in Ringer's lactate was started. Thiopental, 350 mg, was given in divided doses for induction. Pancuronium, 4 mg, was given to facilitate oral endotracheal intubation.

The patient was placed in the right lateral decubitus position. Anesthesia was maintained with nitrous oxide 4 liters, oxygen 2 liters and meperidine, a total of 100 mgs. Respirations were controlled manually. Vital signs for the duration of the two-hour procedure were stable.

At the end of the procedure, a reversal dose of atropine 1.4 mg and neostigmine 3.5 mg was given. The
patient did not respond with adequate ventilations. The tidal volume, measured with a Wright's respirometer, was 25-50 cc. Naloxone, 0.4 mg, was given in incremental doses. The ventilation response did not change. Peripheral nerve muscle stimulation with a blockade monitor showed no response. The patient was sent to the recovery room with the endotracheal tube in place and placed on a ventilator.

Five and a half hours postoperatively, the patient was able to exchange an adequate tidal volume. She was removed from the ventilator and allowed to breathe spontaneously with oxygen administered over the endotracheal tube by means of an Ayres T-piece Adaptor. Shortly thereafter, arterial blood gases were drawn. Minute ventilation and negative inspiratory force were also measured and all were found to be within normal limits. The patient was extubated six hours postoperatively, and sent to the intensive care unit. The frozen section obtained during surgery revealed a small cell undifferentiated carcinoma—Class 5.

This patient was followed postoperatively until her discharge from the hospital two weeks later. She continued to complain of profound weakness, anorexia and a feeling of exhaustion. A diagnosis of myasthenia gravis was entertained, and the patient was given a course of pyridostigmine to no avail. Upon discharge the patient was able to ambulate with assistance.

Discussion

The first case study of what appeared to be a myasthenic syndrome was reported by Denny-Brown in 1948. In 1957 Eaton and Lambert studied and described a disorder resembling myasthenia gravis in some respects and differing from it very greatly in others.

The myasthenic syndrome has been recognized essentially as a condition found primarily in patients with bronchial carcinomas, and of those, less than 1% exhibit the syndrome. It is a condition of peripheral muscle weakness and increased fatigability of the extremities, predominantly involving the proximal limb muscles. The tendon reflexes are reduced or absent and muscle pains are common especially in the extremities.

There is a transient increase in strength of the muscle in response to voluntary exercise of a few seconds duration. Peripheral paresthesias as well as dryness of the mouth is often present in these patients. Treatment with anticholinesterases such as neostigmine and pyridostigmine often results in little or no response. Muscle relaxants, nondepolarizers and depolarizers, are greatly potentiated.

The Eaton-Lambert syndrome, as it is also called, is usually found in patients over the age of 40 and with a higher incidence in males. The prognosis is poor with a survival rate of less than ten years.

The syndrome appears to be due to a specific disturbance of the acetylcholine release from the presynaptic terminals of the motor neurons. "There is an increase in the total postsynaptic membrane area which may be due to a direct result of the factor(s) affecting acetylcholine release rather than a trophic response of the muscle to decreased acetylcholine release by the nerve." The defective acetylcholine release may be caused by factors liberated by the small cell carcinomas that are frequently associated with the disease.

In contrasting the Eaton-Lambert syndrome with myasthenia gravis it is interesting to look at the clinical presentation of both. In myasthenia gravis the clinical picture is one of weakness of muscle groups commonly involving cranial muscles, ocular, bulbar and facial muscles. Limb muscles, that are initially involved in the Eaton-Lambert syndrome, are involved in myasthenia gravis as a later sign only. Muscle pains as found in the Eaton-Lambert syndrome are uncommon in myasthenia gravis, as are reduced or absent tendon
reflexes. In myasthenia gravis there is fatigue on activity with no temporary increase in strength.

Both myasthenia gravis and the Eaton-Lambert syndrome are sensitive to muscle relaxants, the Eaton-Lambert syndrome more to depolarizing relaxants than myasthenia gravis. The greatest contrast between the two is the resistance of the Eaton-Lambert syndrome to the cholinesterase inhibitors. Myasthenia gravis responds well to these drugs and diagnosis and treatment often consists of the use of such agents.

There is usually no demonstrable neurologic deficit in patients with myasthenia gravis. In the Eaton-Lambert syndrome sensory neuropathy, myopathy and cerebellar degeneration with or without dementia has been observed. The time interval between the onset of the neuropathy—peripheral and/or sensory—and the first symptom of the carcinoma is often great.11

"The onset of the condition may be very gradual, progressing slowly over a period of months or even years or it may come on sub-acutely after a febrile illness and reaching a maximum in a few weeks, thereafter remaining stationary. There may be periods in which the symptoms lessen and the areas of sensory loss recede and this may be shown histologically by gliosis in the tracts involved."11

The Eaton-Lambert syndrome can be diagnosed and the separation between it and myasthenia gravis made through electromyography.11,12 Electromyography is the recording of electrical activity associated with the contraction of a muscle. The electrical activity is produced by the muscle fibers and is referred to as muscle action potentials. "Abnormally small action potentials which decrease in size are recorded at slow rates of supramaximal nerve stimulation. In contrast, at fast rates of stimulation the action potentials progressively increase in amplitude even to as much as six times the initial height."12

This facilitation presumably accounts for the temporary increase in muscle strength following exercise and perhaps also for the fact that neostigmine is not clearly helpful to these patients. This particular electromyographic pattern appears to be diagnostic of this syndrome and differs from the response found in myasthenia gravis. There are other patterns particular to the Eaton-Lambert syndrome, but this post-tetanic facilitation appears to be the most representative.2,3,6,7,11,12,15

There has been investigation into the etiology of this syndrome, but to date it is not known. There have been some suggestions that an autoimmune feature may play a role.10 Myasthenia gravis is said to be associated with a variety of autoimmune features including an association with other diseases having autoimmune concomitants. Steroid therapy has been tried with the Eaton-Lambert syndrome also with some improvement in muscle strength, but the findings at this point are still inconclusive.

The use of guanidine hydrochloride in the treatment of the Eaton-Lambert syndrome has also received attention in the recent past. Guanidine potentiates the calcium dependent release of the acetylcholine quanta from the presynaptic terminals. Guanidine has therapeutic implications, but the side effects of renal impairment, bone marrow depression and paralysis in patients with motor neuron disease have limited its use to severely ill patients with a short life expectancy.8,13,14

To date neither the Eaton-Lambert syndrome nor its frequent association with small cell carcinoma of the lung is fully understood.

Conclusion

The patient under discussion had had muscle relaxants administered during surgery three months previous to this case without complication. This again emphasizes the rapidity with which the Eaton-Lambert syndrome can present itself. Even though the incidence
of the syndrome accompanying known bronchogenic carcinoma is low, it would be prudent to suspect the syndrome in patients presenting with myalgia or myopathy and a suspicious chest x-ray.

In the management of such a patient it would be best to avoid muscle relaxants altogether, but if this is not possible very small doses should be given, preceded by a test dose. Blockade monitors should be placed on the patient prior to the administration of a relaxant. This allows the clinician to have or follow a controlled parameter of neuromuscular function. If a relaxant is necessary, it becomes an extremely useful aid.

REFERENCES

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