History
16-year-old female softball player with past medical history of COVID-19 in January 2021 and symptoms:
- Cough symptoms included loss of taste, myalgias, and headache.
- She has continued to play softball but has noted a persisting cough.
- She was hospitalized in October 2021 for chest tightness, SOB, and dyspnea.

Physical Exam
- Normal thyroid exam and no palpable lymphadenopathy.
- Respiratory exam: no wheezing or stridor at rest, clear to auscultation in all lobes.
- Cardiac exam: regular rhythm and rate, no murmurs.
- EKG: Ventricular rate 82, PR interval 129 ms, QRS duration 77 ms, QTc 376 ms.
- Normal sinus rhythm with no T wave or ST segment changes.

Cardiopulmonary Exercise Testing (CPET)
- Patient was exercised on a Lode Excalibur Sport cycle ergometer using a 20-watt, 1% grade ramp protocol.
- Resting spirometry was within normal limits.
- Patient’s resting VO2 (oxygen uptake) was 4.3 mL/kg/min.
- She achieved an anaerobic threshold at 7 minutes and 45 seconds and had VO2 max at 16.9 mL/kg/min an RER of 1.01.
- Peak power output was 160 watts which was 88% of predicted.
- Anaerobic threshold occurred below normal limits at 80% of VO2 max which was <60% of predicted.
- VO2 max was 29.9 mL/kg/min at 11 minutes 24 seconds and was below expected at 32.9 mL/kg/min an RER of 1.51.
- GET (anaerobic threshold) was determined by change in the VCO2-VO2 slope method and ventilatory equivalents method.
- She reached 96% of predicted maximal heart rate.
- Resting heart rate was high at 120 BPM.
- Heart rate responded appropriately to increasing workload.
- Patient exhibited a normal O2 pulse at 1.8 with a predicted value of 1.8.
- Her breathing reserve was high at 42% with normal O2 uptake being less than 33%.
- Oxygen saturation remained normal and patient did not develop any chest pain or shortness of breath.
- Blood pressure started at 120/81 and increased to 133/85 at peak work rate.
- The patient reported tightness in her throat at exercise termination.

FEV1
- FEV1 was measured during CPET with a decrease of 1% after the FEV1 measurement.
-Spirometry testing was within normal limits.
- Patient noted transient improvement with albuterol MDI in office.

Post Cardiopulmonary Testing
- 30 minutes after the test the patient became anxious and felt that she was wheezing although no audible wheezing was heard.
- Her PFTs remained within normal limits.

Diastolic Differential Diagnosis
- Anxiety
- Physical Deconditioning
- Exercise Induced Laryngeal Obstruction (EIO)
- Peri-exercise Anxiety
- Post-Anxiety Sequae of SARS-CoV-2 infection (PAS-COVID)

EIO is characterized by development of stridor, hyperpnea, respiratory distress, and panic attacks at the peak of exercise and lasting for about 2-3 min after exercise. Continuous laryngoscopy during exercise is the gold standard for diagnosis which our patient refused. Test is positive if symptoms are reproduced and identify a correlation with a pulmonary oxygen consumption. PAS-COVID has been found to be associated with vocal cord paralysis in several cases. Vocal cord paralysis can be associated with stridor and hoarse voice have been noted. In the case of vocal cord paralysis, hoarseness would also be present throughout the resting period in patients.

Patient was noted at baseline to have in setting of reduced RER and lack of meeting predicted work patient may have likely been the result of these changes in the PAS-COVID. Patient also had high resting HR which is consistent with her current anxiety treatment.

Final Diagnosis: Exercise Induced Laryngeal Obstruction (EIO) and Anxiety

PCP Follow Up and Beyond
- Patient has had no resolution of symptoms after applying the breathing exercises learned in speech therapy.
- Patient has minimal improvement with albuterol.

REFERENCES

- Department of Emergency Medicine, Advocate Lutheran General Hospital.
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