Information for ME/CFS Physicians

Cardiovascular function and exercise in CFS

An Overview of Exercise Physiology

Most patients with CFS complain of decreased exercise tolerance compared to their premorbid condition. As well they report prolonged fatigue after exercise that was previously well within their ability. Using a standard treadmill or bicycle model subjects are asked to slowly increase exertion to their maximum level. During this time measures of cardiovascular, pulmonary and metabolic function can be taken.

Oxygen ventilation rates per minute per kg body weight (VO2max) is the most commonly used indicator of oxidative capacity/fitness. VO2max depends upon cardiac output, pulmonary function and the muscle's ability to extract O2. In healthy people the cardiac output (CO) is the limiting factor. O2 uptake increases linearly with increasing exercise until a plateau is reached this is maximal work intensity. VO2max can also be estimated by peak HR (220 - age). The VO2max in healthy adults ranges from 25-35ml/min/kg (Lewis & Haller, 1991). At < 50% VO2max fatty acids are the predominant fuel, above 50% VO2max glycogen is the dominant fuel.

At a VO2max of 70-80% anaerobic metabolism is required to maintain activity level. This is marked by lactic acid accumulation which can be measured in the venous blood and a decrease in intracellular pH which can be measured by magnetic spectroscopy.

Exercise Findings in CFS

Most well designed, large studies show that PWCs have significantly lower fitness level than well matched sedentary controls (De Becker et al, 2000;Fulcher & White, 2000;Sisto et al, 1996; Rowbottom et al, 1998;Riley et al, 1990). PWCs tolerate a shorter duration of exercise and some cannot finish the protocol. Specific findings include:

- increased resting heart rate
- decreased VO2max
- decreased maximum HR during exercise
- decreased maximum work
- increased perceived effort
- PWCs reach the anaerobic threshold sooner than controls

Related Findings:

- Decreased O2 resaturation of hemoglobin post exercise or post ischemia (McCully & Natelson, 1999)
- Some studies suggest oxidative dysfunction eg. slower ATP recovery after exercise (Wong et al, 1992) but there is conflicting evidence
- Cognitive function declines immediately and 24 hours after exhausting exercise (Levine et al, 1997; Blackwood et al, 1998)
- Although resting EKGs are normal in CFS 24 hour Holter monitors show T-wave changes in subjects with no cardiac history (Lerner et al, 1993).

Of Note:

- One author suggests that subjects with CFS failed to make a maximal effort (Gibson et al, 1993), most others state the opposite
- There is no study supporting the hypothesis of hyperventillation in CFS
- There is no study showing similar exercise results in subjects with depression.

Is Deconditioning an Etiological Factor in CFS?

There is substantial evidence that PWCs are deconditioned compared with their premorbid conditions. What remains controversial is whether deconditioning is a normal and expected response to decreased activity due to chronic illness or whether deconditioning is in fact causes or perpetuates CFS. Proponents of the first hypothesis note that PWCs are already functioning at their maximal energy ability (Friedberg & Krupp, 1994;Lapp, 1997). They note that both physical and mental exertion cause a temporary decline in functioning in persons with CFS (Paul et al, 1999;Levine et al, 1997;Blackwood et al, 1998).

The proponents of the deconditioning theory of CFS conclude that because PWCs are out of shape, that deconditioning is a causal factor. A recent study disproved this hypothesis

(Bazelmans et al, 2001). There are two studies specifically assessing the effects of graded exercise in CFS. One with highly selected, mild and moderately ill patients showed improvement in fatigue levels with mild graduated exercise but the outcome was unrelated to increasing fitness. Like many treatment studies in CFS, the authors did not report on any physical symptoms of CFS (Fulcher & White, 1997). The other study had a high drop out rate in the exercise group and equivocal findings (Wearden et al, 1998). Despite the lack of evidence of benefit, several official bodies recommend graded exercise as a treatment of choice for CFS.

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