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Commentary

Assessing Postoperative Risk in Oesophagogastric Surgery with Cardiopulmonary Exercise Testing

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DESCRIPTION

Oesophagogastric surgery, particularly for malignancies such as oesophageal and gastric cancer, is a complex and demanding intervention. Surgical resection remains one of the few curative options for patients with these types of cancer, but it is often associated with significant perioperative risks. These risks are amplified by the fact that patients undergoing this type of surgery are frequently older and may have multiple comorbidities, which can complicate both the surgical procedure and the recovery process. Assessing a patient's fitness for surgery has, therefore, become a critical component of the preoperative evaluation process.

One of the most effective methods for evaluating a patient's physical condition before major surgery is Cardiopulmonary Exercise Testing (CPET). CPET provides a detailed assessment of cardiovascular and pulmonary function, offering valuable insight into a patient's ability to withstand the physiological stresses of surgery. This article will review the role of CPET in oesophagogastric surgery, its methodology, the prognostic information it provides and its implications for surgical decision-making and outcomes.

Surgical procedures such as oesophagectomy and gastrectomy are major operations that place considerable strain on a patient's body. Complications, including cardiovascular, pulmonary and infectious issues, are common, with some patients requiring extended intensive care or experiencing significant postoperative morbidity. The primary goal of preoperative assessment is to identify patients at high risk of poor outcomes so that appropriate measures can be taken to optimize their condition before surgery.

Traditional methods for assessing preoperative fitness include clinical evaluation, pulmonary function tests and cardiac stress tests. However, these tests do not provide a comprehensive measure of the patient's overall ability to tolerate surgery. CPET, on the other hand, assesses the integrated function of the cardiovascular, pulmonary and musculoskeletal systems, offering a more holistic evaluation of the patient's physiological reserve.

CPET is a non-invasive test that evaluates how well the heart, lungs and muscles work together during physical exertion. It involves a patient performing incremental exercise on a stationary bicycle or treadmill while breathing through a mouthpiece connected to a gas analysis system. This system measures oxygen uptake (VO_2), carbon dioxide production (VCO_2), and ventilation, while continuous monitoring of heart rate, blood pressure and oxygen saturation provides additional data.

The exercise intensity is gradually increased until the patient reaches their maximal effort, at which point several key variables are analyzed to determine their cardiopulmonary fitness. These variables include peak oxygen uptake (VO_2peak), Anaerobic Threshold (AT), and the ventilatory equivalent for carbon dioxide (VE/VCO_2). Each of these parameters offers insight into different aspects of cardiopulmonary function and the body's capacity to cope with the demands of surgery. Peak oxygen uptake is considered one of the most important indicators of aerobic fitness. It reflects the maximum amount of oxygen that can be delivered to and used by the body's tissues during exercise. In the context of surgery, a higher VO_2 peak is associated with a greater capacity to tolerate physiological stress. Studies have shown that patients with a low VO_2 peak are more likely to experience postoperative complications and have a higher risk of mortality. Therefore, VO_2 peak is often used as a threshold value for determining whether a patient is fit for major surgery. Anaerobic Threshold (AT) is the point during exercise at which the body starts to accumulate lactic acid, signaling a shift from aerobic to anaerobic metabolism. The AT is a key indicator of endurance and reflects how well a patient can sustain physical activity without becoming fatigued. In surgical patients, a low AT has been associated with a higher risk of complications, particularly respiratory and cardiovascular events. AT values can help guide preoperative interventions, such as exercise training, to improve a patient's fitness before surgery. The ventilatory

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equivalent for carbon dioxide is a measure of how effectively the lungs can eliminate carbon dioxide during exercise. An elevated VE/VCO_2 slope suggests impaired ventilatory efficiency, which may be indicative of underlying respiratory or cardiac dysfunction. In oesophagogastric surgery, patients with a high VE/VCO_2 slope are at greater risk of developing respiratory complications postoperatively, such as pneumonia or respiratory failure.

One of the primary uses of CPET in oesophagogastric surgery is to stratify patients according to their risk of postoperative complications. By identifying patients who are at high risk, clinicians can take steps to mitigate these risks, either by optimizing their preoperative condition or by considering alternative treatment options.

For instance, patients with a low VO_2 peak or AT may benefit from prehabilitation programs designed to improve their physical fitness before surgery. These programs typically involve a combination of aerobic exercise, strength training and nutritional support, all aimed at enhancing the patient's overall resilience. Research has shown that prehabilitation can lead to improved surgical outcomes, including fewer postoperative complications and shorter hospital stays.