



Investigation of the immediate pre-operative physical capacity of patients scheduled for elective abdominal surgery using the 6-minute walk test

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Abstract

Objectives To evaluate the effects of repetition of the 6-minute walk test in patients scheduled to undergo abdominal surgery within the next 48 hours, and to verify the physical capacity of these subjects before surgery.

Design Cross-sectional study.

Setting University teaching hospital.

Participants Forty-two patients scheduled for elective abdominal surgery within the next 48 hours.

Outcome measures Distance walked in the 6-minute walk test, heart rate, peripheral oxygen saturation, dyspnoea and leg fatigue.

Results Thirty-one patients (74%) were able to walk for a longer distance when the test was repeated. In these subjects, the mean increase in distance walked was 35.4 [standard deviation (SD) 19.9] m. Heart rate, dyspnoea and leg fatigue increased significantly over time on both tests ($P < 0.05$). The mean heart rate at the end of the sixth minute was significantly higher on the second test ($P = 0.022$). Peripheral oxygen saturation remained above 90% in both tests. The furthest distance walked was, on average, 461.3 (SD 89.7) m. This value was significantly lower than that predicted for the sample ($P < 0.001$).

Conclusion Patients scheduled to undergo abdominal surgery were able to walk further when they performed a second 6-minute walk test. Moreover, they showed reduced physical ability before surgery. These findings suggest that repetition of the 6-minute walk test may increase the accuracy of the distance walked, which is useful for studies assessing the physical capacity of patients undergoing abdominal surgery.

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Keywords: Physical capacity; Pre-operative care; 6-Minute walk test

Introduction

Abdominal surgery is performed routinely for the treatment and diagnosis of many diseases. Such procedures can present postoperative complications due to anaesthesia and the operation itself. Furthermore, poor physical capacity in the pre-operative period, assessed by maximal exercise testing, is associated with all-cause mortality in patients undergoing major elective abdominal surgery [1].

Attempts to improve recovery of patients following abdominal surgery have tended to focus on the intra-operative and postoperative periods. However, some studies have suggested that it may be better to focus on the pre-operative period to modify factors such as poor physical condition, and possibly improve postoperative recovery [2].

The best-accepted measure of physical capacity is individual metabolic response, as assessed by gas exchange during cardiopulmonary exercise, which reflects the efficiency of oxygen transport and use during maximal-effort exercise. In patients undergoing surgery, maximum oxygen consumption – assessed by cardiopulmonary tests – is used to evaluate functional capacity and estimate the ability of different individuals to adjust to peri-operative stress [3].

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Cardiopulmonary exercise tests are considered to be the gold standard for the assessment of physical capacity [4]. However, the infrastructure, human resources and costs involved in these tests may preclude their inclusion in routine pre-operative assessment protocols. In addition, the level of physical effort required to perform such tests may prevent their safe use during the postoperative period, so pre- and postoperative comparisons may not always be possible.

The 6-minute walk test provides an interesting alternative for the assessment of a patient's physical condition, as walking capacity tends to be correlated with ability to perform daily life activities [5]. Some of the advantages of the 6-minute walk test are low cost and ease of administration as it requires minimal space and training.

The distance walked is the primary outcome of interest in the 6-minute walk test [5]. Considering the clinical relevance of this measure, studies have shown that distance walked tends to increase with repeated test administration among a variety of populations [5,6] because of familiarisation with the procedures (i.e. learning effect).

Some previous studies have assessed the physical capacity of patients undergoing abdominal surgery using the 6-minute walk test [2,7–9] in different populations and diseases. Nevertheless, most surgical studies have only included patients undergoing colorectal surgery [7–9].

Physical and functional disability in the pre-operative period should arouse the attention of professionals involved in the treatment of surgical patients because this reduces their ability to cope with surgery and hospitalisation. Moreover, among elderly patients, physical and functional disability can hinder postoperative recovery [10,11]. Interventions before surgery to modify factors such as poor physical condition are of interest and may help in the faster recovery of patients. The present authors believe that the 6-minute walk test can be a useful tool for the evaluation of physical capacity in these patients. As such, there is a need for further investigation about its application in surgical patients. Therefore, the purpose of this study was to investigate the repeatability of the 6-minute walk test in patients scheduled to undergo abdominal surgery within the next 48 hours, and to assess physical capacity in these subjects with this test.

Methods

Participants

Forty-two volunteers hospitalised before elective abdominal surgery were included in this study. All patients signed an informed consent form before taking part in the investigation, and the study was approved by the Research Ethics Committee of the Pontifical Catholic University of Campinas, São Paulo, Brazil (Protocol No. 0503/2011). Patients were recruited from a tertiary university hospital over a period of 8 consecutive months. The sample was selected from a surgical unit with 26 beds, of which nine beds were

destined for patients whose operations made them eligible for participation in this study. The following inclusion criteria were applied: hospitalisation for kidney, intestinal, gastric, oesophageal or bile duct resection; scheduled for surgery within ≤ 48 hours; age >40 years; and physically and cognitively able to undergo the 6-minute walk test. Patients with neurological, neuromuscular or vascular diseases, angina, uncontrolled arterial hypertension, visual or auditory impairment, orthopaedic/mobility impairments and previous experience of the 6-minute walk test were excluded from participation.

Study design and measures

All participants were referred to pre-operative physiotherapy by the surgical team as part of the hospital's multidisciplinary approach. After inclusion and exclusion criteria were assessed, patients were informed about the study objectives, and asked to sign the informed consent form.

Identification and demographic data, as well as diagnostic and surgical information, waiting time for surgery (interval between the time of indication for surgery and hospitalisation), medical history and pulmonary function information were obtained from patient records and from the pre-anaesthetic assessment. Height (in cm) and weight (in kg) were measured on the day that the 6-minute walk tests were conducted. Body mass index was calculated using the formula: weight/height squared, expressed in kg/m^2 . Patients were asked about their physical activity patterns, and those who reported limited activity levels, and had not been involved in any type of daily activity or regular exercise for the previous 6 months, were considered to be sedentary, as described by Steffens *et al.* [12].

Physical capacity was assessed by two 6-minute walk tests performed on the same day in a 30-m hospital corridor. The interval between tests was 30 minutes (timed using a stopwatch), during which time the patient was asked to rest in a seated position. The walk test was administered according to international guidelines [5], and all patients were assessed by the same investigator to minimise variability in test administration. The 6-minute walk distance (in m) walked by each patient was recorded and compared with predicted values for the Brazilian population [13]. The greatest distance walked in either test by an individual was considered as the measurement of physical capacity.

Oxygen saturation and heart rate were measured at rest with a pulse oximeter at three time points for each test: baseline (pre-test), immediately post-test and 3 minutes post-test (recovery period). Dyspnoea and leg fatigue were also assessed at these three time points using the modified Borg scale [5].

Data analysis

Categorical variables were described using frequency distributions, while quantitative variables were presented in

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