

Patients with poor baseline walking capacity are most likely to improve their functional status with multimodal prehabilitation



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Background. Evidence suggests that multimodal prehabilitation programs comprising interventions directed at physical activity, nutrition, and anxiety coping can improve functional recovery after colorectal cancer operations; however, such programs may be more clinically meaningful and cost-effective if targeted to specific subgroups. This study aimed to estimate the extent to which patients with poor baseline functional capacity improve their functional capacity.

Methods. Data for 106 participants enrolled in a multimodal, prehabilitation program before colorectal operations were analyzed. Low baseline functional capacity was defined as a 6-minute walking test distance (6MWD) of less than 400 m. Participants were categorized as higher fitness (6MWD \geq 400 m, n = 70) or lower fitness (6MWD < 400 m, n = 36). Changes in 6MWD over the preoperative period, and 4 weeks and 8 weeks after the operation were compared between groups. Secondary outcomes included patient-reported physical activity and health status, postoperative complications, duration of hospital stay, and readmissions. Less-fit patients were then compared with subjects in the rehabilitation arm of the original studies who had a baseline 6MWD < 400 m.

Results. Participants with lower baseline fitness had greater improvements in functional walking capacity with prehabilitation compared to patients with higher fitness (+46.5 [standard deviation 53.8] m vs +22.6 [standard deviation 41.8] m, P = .012). At 4 weeks postoperatively, patients with lower baseline fitness were more likely to be recovered to their baseline 6MWD than those with higher fitness. (74% vs 50%, P = .029). There were no differences in secondary outcome. Less-fit patients had a greater improvement through all the preoperative period compared to the control group.

Conclusion. Patients with lower baseline walking capacity are more likely to experience meaningful improvement in physical function from prehabilitation before and after a colorectal cancer operation. (Surgery 2016;160:1070-9.)

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COLORECTAL CANCER is expected to continue to increase as the population ages.¹ After a colorectal operation, postoperative complications occur in >1 in 4 patients² and, even in the absence of

complications, operations are associated with a 20–40% decrease in functional capacity.³ Especially in the elderly, functional recovery may take up to 6 months, and some patients never return to baseline functioning.⁴ This prolonged or incomplete recovery poses a health care burden for patients and caregivers and increases time away from work, leisure, family, and social activities.⁵

Impaired preoperative physical and morbid conditions are independent factors related to poor operative outcome.⁶ Poor cardiorespiratory fitness measured by gold standard cardiopulmonary exercise testing is associated with increased morbidity.⁷ Tests of functional exercise capacity, including the 6-minute walk test (6MWT), which

Presented at the Central Surgical Association meeting, March 10–12, 2016, in Montreal, Quebec, Canada.

Accepted for publication May 13, 2016.

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0039-6060/\$ - see front matter

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<http://dx.doi.org/10.1016/j.surg.2016.05.036>

measures the distance walked in 6 minutes (6MWD), correlate with formal exercise testing and also predict complications after a colorectal operation.⁸

Traditionally, interventions to decrease complications and improve functional recovery focus on in-hospital or postoperative care. Actually, the preoperative period may represent a salient opportunity to increase physiologic reserve in anticipation of the operative stress, an approach termed “prehabilitation.”⁹

We reported the results of a pilot study¹⁰ and a randomized, controlled trial¹¹ comparing a multimodal prehabilitation intervention, including aerobic and resistance exercise, nutritional counseling and supplementation with whey protein, and anti-anxiety strategies, with the same program begun postoperatively (rehabilitation). A 4-week prehabilitation program in colorectal cancer improved the primary outcome of walking capacity preoperatively and postoperatively; however, this study included patients with a wide range of baseline fitness levels.

As the prehabilitation intervention is resource-intensive, targeting at-risk populations would be an attractive strategy to increase its effectiveness. We hypothesized that patients with poor functional exercise capacity would derive the most benefit from prehabilitation. The objective of this study was to estimate the extent to which patients with poor baseline walking capacity (defined as 6MWD <400 m) benefit from a multimodal, prehabilitation program compared to those with higher baseline walking capacity and to determine whether the changes achieved in the preoperative period would continue to be present during the postoperative period. Furthermore, subjects in the interventional group were compared to those in the control groups of the original studies.

MATERIALS AND METHODS

Subjects. We re-analyzed the data of 106 participants from the intervention arms of one cohort study,¹⁰ one randomized controlled trial (RCT),¹¹ and one ongoing RCT (ethics approval code GEN11-004). As a control group, we reanalyzed data from participants in the rehabilitation group of the same studies. All participants were adults scheduled for elective colorectal cancer resection at a single institution (Montreal General Hospital, McGill University Health Centre, Montreal, Quebec, Canada) from November 2011 to August 2014. Patients with poor English or French comprehension and pre-morbid conditions that contraindicated exercise (severe cardiovascular

and neuromuscular diseases, only 3 patients) were excluded. All trials were approved by the Research Ethics Board of the McGill University Health Centre, Montreal, Canada.

Study design. Participants of the prehabilitation arms of the original studies were categorized into 2 groups with respect to their baseline walking capacity as measured by the 6MWT, a validated indicator of recovery in colon operations. We defined low functional capacity as a 6MWD less than 400 m (gait speed below the average of 1.1 m/s) as a cut-off. In older adults, the inability to walk this distance or achieve this gait speed is associated with a greater risk of mortality, cardiovascular disease, limitation in mobility, and disability.¹²⁻¹⁴ Furthermore, a 6MWD less than 409 m is predictive of a peak oxygen uptake (peak VO_2) <15 mL O_2 Kg^{-1} min^{-1} measured with cardiopulmonary exercise testing, the gold standard reference for the evaluation of physical fitness.¹⁵ A peak VO_2 less than this threshold is a well-validated, independent predictor of both postoperative morbidity and decreased mid-term survival after elective major surgery.¹⁶⁻¹⁸

Therefore, the cut-off of 6MWD of 400 m was chosen as an indicator of a level of physiologic reserve less than which mobility and independency are limited and operative complications are more frequent. Patients in Group A had a baseline 6MWD greater than 400 m, and those in Group B had a baseline 6MWD less than 400 m.

To investigate the role of prehabilitation in improving functional capacity in less-fit patients, changes in 6MWD were compared between participants in Group B and subjects in the rehabilitation arm of the original studies who had a baseline 6MWD less than 400 m (Group C).

Prehabilitation program. All 3 trials investigated the effect of multimodal prehabilitation (exercise, nutrition counseling and protein supplements, and anti-anxiety techniques) on perioperative functional capacity; all the subjects considered in this analysis underwent a similar prehabilitation program, described previously in detail.¹⁹

Briefly, a certified kinesiologist assessed and trained each participant following the guidelines of the American College of Sports Medicine.²⁰ The home-based training alternated aerobic, resistance, and flexibility exercises up to 50 minutes, 3 times per week. Aerobic exercise (bicycle, walk, swimming) was prescribed based on the rate of perceived exertion measured during the baseline 6MWT. Resistance training exercises targeting major muscle groups were performed using elastic bands.

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