Optimizing a frail elderly patient for radical cystectomy with a prehabilitation program

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Abstract

The purpose of this case report is to discuss the positive impact of a multimodal prehabilitation program on postoperative recovery of a frail patient undergoing radical cystectomy. An 85-year-old man with significant history for poorly controlled type II diabetes, anemia, chronic renal failure, and glaucoma was found to have muscle invasive urothelial carcinoma of the bladder with hydronephrosis. He was scheduled for elective radical cystoprostatectomy and ileal conduit diversion. He was enrolled in a multimodal prehabilitation program in view of his frailty (Fried score = 5), 15% body weight loss, weak grip strength, severe depression and moderate anxiety, poor nutritional status (patient-generated subjective global assessment [PG-SGA] = B), low functional walking capacity (6-minute walking test [6MWT] = 210 metres, predicted 621 metres). The 4-week program included moderate aerobic and resistant exercises, nutritional counselling with whey protein supplementation (20 g/day), and relaxation exercises. Surgery and the postoperative period were uneventful, although he required treatment of his hyperglycemia and hypomagnesemia. He left the hospital on postoperative day 7 and returned home where he continued the multimodal program for 8 weeks. Measurements of 6MWT, Health-Related Quality of Life (SF-36), physical activity, Hospital Anxiety and Depression Scale (HADS), were conducted at baseline, before surgery and at 4 and 8 weeks after surgery. These tests revealed a progressive remarkable improvement before surgery that continued after surgery.

Introduction

In 2012, the Canadian Cancer Society estimated that 7800 people in Canada were diagnosed with bladder cancer, and surgical resection is part of the standard treatment.[1] Radical cystectomy, like all major abdominal surgery, is associated with a 40% to 60% reduction in physiological and functional capacity, which is often expressed as fatigue for 8 to 12 weeks after hospital discharge.[2] The following report outlines the perioperative care of a frail man diagnosed with bladder cancer who had significantly impaired functional capacity at baseline and underwent a 4-week multimodal *prehabilitation* program to increase his physiological and metabolic reserve.

Case report

An 85-year-old man, diagnosed with bladder cancer, was scheduled for an elective radical cystectomy and ileal conduit. His medical history was significant for poorly controlled type 2 diabetes, anemia, acute on chronic renal failure requiring bilateral nephrostomy tubes, glaucoma, and severe weight loss (over 15% of usual body weight) during the previous 6 months (Table 1). Previous uneventful surgeries included left inguinal hernia repair, cataract, transurethral bladder resection, and right total knee arthroplasty. He was a regular smoker until he stopped 30 years ago, and now occasionally smoked a cigar. His present medications included gliclazide 80 mg, dorzolamide + timolol drops, pantoprazole 40 mg, ASA 81 mg, and acetaminophen 325 mg. The patient was residing at home and independent, but recently was moved to an assisted-living facility in view of the progressive physical deterioration prior to surgery.

The patient undertook a standard medical risk assessment in the preoperative clinic. His exercise tolerance was poor (3 metabolic equivalent [MET]). His American Society of Anesthesiologists (ASA) health status was 3. Chest x-ray was unremarkable and his electrocardiography showed some ischemic changes and sinus rhythm. The patient was referred by the surgeon for a 4-week preoperative prehabilitation program.

The assessment of functional capacity, physical strength, nutritional and psychological status was conducted by a kinesiologist, a registered dietitian, and a psychologist, respectively. Baseline walking capacity (6-minute walk test [6MWT]) was poor at 210 metres, and well below the pre-

dicted value for elderly population of his age and gender.[3] Nutritional risk was assessed using the cancer-validated patient-generated subjective global assessment (PG-SGA) tool, which revealed a global score of B moderate undernutrition requiring dietary intervention.[4] The self-reported health-related quality of life (SF-36) score was very low compared with other men of his age on the physical and mental functions (Table 1). On a self-rating scale of 0 to 100 for physical fitness, he scored 30. The patient's psychological state (Hospital Anxiety and Depression Scale [HADS] score) was very high on depression and moderate on anxiety (Table 2).[6] These results were consistent with the psychological report indicating depressive symptoms, lack of energy, and poor motivation. Self-reported physical activity (Community Healthy Activities Model Program for Seniors [CHAMPS])[7] at baseline was low (<1 kcal/kg/week).

Prehabilitation program

The multimodal program described was carried out for 27 days preoperatively and included aerobic and resistance exercise 3 times per week with 20 g of whey protein to be taken orally within 1 hour of exercise, and relaxation exercises. The home-based exercise program was initiated after the baseline assessment. The patient was asked to perform the given exercise program for an hour, for a minimum of 3 times per week. The program consisted of cardiovascular and resistance exercises. Thirty minutes were allocated to the cardiovascular component (5 minutes for warm up, 25 minutes of walking at a moderate intensity and 5 minutes for a cool down). Moderate intensity was assessed with the use of the BORG scale (rate of perceived exertion). The resistance exercises were prescribed starting at 1 set of 10 repetitions, which increased gradually per week (Table 2). Follow-up was done with phone calls every week. During this period the patient improved significantly in all the categories.

Table 1. Patient demographic and clinical data

Age (years)	85
Weight (kg)	69.6
Height (m)	1.75
Waist circumference (cm)	103
Hip circumference (cm)	97
Waist-to-hip ratio	1.06
Hemoglobin (g/L)	110
Hemoglobin A1c (%)	6.7
Random blood glucose (mmol/L)	16.3
Serum creatinine (μmol/L)	285
Serum albumin (g/L)	26
C-reactive protein (mg/L)	147

Perioperative course

The patient underwent radical cystoprostatectomy and ileal conduit diversion which lasted 5 hours and 25 minutes. The patient was diagnosed with invasive urothelial carcinoma, clinical T3b disease. Radical cystectomy was performed and pathological staging was pT4N.

The patient received general anesthesia and epidural analgesia. Intravenous fluids included 2 L of Ringer's Lactate, 500 mL of plasma expander, and 2 units of blood. Perioperative blood glucose was kept between 6 and 8 mmol/L with continuous intravenous infusion of actarapid insulin. Estimated total blood loss was 750 mL. His recovery was uneventful, except for hyperglycemia and hypomagnesemia which was treated for a period of 48 hours with insulin sliding scale and intravenous magnesium sulfate, respectively. On postoperative day 4, the patient progressed to a regular diet. The drains were removed on day 5 and the patient was discharged on postoperative day 7. At home the patient resumed the multimodal program for 8 weeks. He returned at 4 and 8 weeks after surgery to see the surgeon and for a physical, nutritional and cognitive assessment. Consistent improvements were reported on

Table 2. Prehabilitation program including physical activity, nutrition and relaxation exercises

Physical activity 1-2 sets of each exercise consisting of 10-15 repetitions (gradually increased over 4 weeks) 3 times per week	Resistance exercises with Theraband: • Shoulder horizontal abduction • Shoulder extension • Bicep and triceps extension • Abdominal curls • Quadriceps extension • Leg flexion • Calf raises Cardiovascular exercises • 30 minutes of walking per day
Nutrition	• Diabetic meal plan for 1900 calories consisting of 275 g of carbohydrates and 0.8 g/kg of whey protein • The carbohydrates were spread evenly throughout the day
Breathing relaxation exercise	• Abdominal breathing (15 minutes twice daily): Use of relaxation CD (nature sounds and breathing instructions)

Table 3. Health-related quality of life SF-36 subscales

Time of assessment	SF-36 component scores										Functional walking capacity
	Physical functioning	Role physical	Bodily pain	General health	Energy/ vitality	Social functioning	Role emotional	Mental health	PCS	MCS	6-minute walk test (min)
Baseline	20	0	21	57	5	0	0	68	28	32	210
Preoperative	80	75	72	67	55	63	67	76	50	46	291
4 weeks after surgery	35	0	41	30	35	50	67	40	30	41	240
8 weeks after surgery	85	75	72	67	60	75	67	80	50	48	310
Normative mean (SD)	65 (27)	68 (40)	73 (25)	71 (18)	65 (19)	85 (22)	82 (32)	81 (14)	44 (10)	55 (8)	621

SF: short-form; PCS: physical component scale; MCS: mental component scale; SD: standard deviation.

6MWT, both physical and mental components of the SF-36, self-rated physical fitness, together with a significant increase in functional walking capacity (Table 3, Table 4).

Discussion

Poor preoperative physical performance has been shown to increase the risk of mortality,[8] postoperative complications,[9] and prolong functional recovery.[10] Our case illustrates how a frail patient, with considerable risk factors for postoperative complications, underwent a short but intense, period of physical, nutritional and cognitive preparation. Because of this preparation, he was able to overcome the stress of surgery, and returned home after 1 week where he continued to improve his functional capacity and remained independent.

Endeavours to accelerate convalescence have focused on "post-surgery rehabilitation;" however patients during this period are tired and concerned about their health and prognosis. The preoperative period (*prehabilitation)* may in fact be a better time to optimize their physiological and mental function so they can withstand the stress of surgery and enhance postoperative recovery.[11] This program could be applied to patients who receive neoadjuvant chemotherapy to attenuate the associated side effects, such as fatigue and weight loss. Previous studies on the impact of a multimodal prehabilitation program in patients undergoing colorectal resection for cancer have shown significant improvement in postoperative functional capacity and quality of life.[12]

Conclusion

In this case report the prehabilitation program contributed to an increase, not only of the patient's functional walking capacity, but in emotional and cognitive function as previously reported.[13] Such improvement in cardiorespiratory function is evident in the increased capacity to perform more activities of independent daily living. Significant gains in functional capacity were well above the minimum (15 to 20 metres).[14] Although the possible mechanism underlying the improvement in functional capacity is unclear, physical exercise may have played a major role, together with the ingestion of whey protein within "the anabolic window of opportunity" following exercise. This improved physiologic reserve and gains in muscular strength as evidenced by the increase in grip-strength, 6MWT, and lean body mass measurements.[15] A registered randomized controlled trial (NCT01836978) in this population is ongoing.

Competing interests: Dr. Carli, R. Awasthi, C. Gillis and Dr. Kassouf declare no competing financial or personal interests.

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Table 4. Body impedance, grip strength, self-reported physical activity (energy expenditure), hospital anxiety and depression scale

Time of assessment	Body impedance (%)		Grip strength (kg)			Energy expenditure	HADS	
	Free fat mass (%)	Lean body mass (kg)	Right hand	Left hand	Average	Kcal/kg/week	Anxiety	Depression
Baseline	25.4	51.8	21.8	22.0	21.9	3.94	6	14
Preoperative	23.5	51.9	24.5	24.0	24.3	105	6	6
4 weeks after surgery	19.2	50.7	24.3	23.0	23.6	0.44	7	11
8 weeks after surgery	21.0	53.3	26.2	23.9	25.1	115	6	6

HADS: hospital anxiety and depression scale.

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