

Safety and feasibility of supervised exercise during adjuvant treatment of high-grade glioma

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BACKGROUND

Patients with high-grade glioma (HGG) undergo aggressive treatments, experience significant adverse-effects and report high unmet needs. Exercise may be an effective intervention to aid management of HGG but no previous research has examined the potential impact of exercise among these patients. The aim of this trial was to evaluate if exercise is a feasible and safe therapy in patients with HGG undergoing chemoradiotherapy.

METHODS

29 patients (69% men; 52±12 years) with HGG participated in this pilot study. Patients self-selected to receive either usual care (n=5) or a supervised exercise intervention (n=24) throughout chemoradiotherapy. The intervention involved an individualised prescription of moderate-intensity aerobic and resistance exercise during twice weekly sessions delivered at the hospital. Assessment of quality of life, fatigue, distress, physical function and body composition were conducted ≤10 days prior to and following chemoradiotherapy.

RESULTS

Four (14%) participants withdrew; baseline characteristics did not differ significantly from non-withdrawers (p<0.05). Exercise session attendance was ~80±4% and one adverse event relating to the intervention was reported (Table 1). The intervention improved function but few other changes were observed (Table 2). The changes were influenced by whether participants were receiving dexamethasone (Table 3). Function significantly improved while QOL and symptoms did not worsen in exercising patients not receiving dexamethasone. Patients receiving dexamethasone significantly decreased QOL, increased fat mass and did not improve function despite exercising.

Table 1. Safety and feasibility of exercise intervention. Variables presented for the exercise group as a whole as well as separated into patients not receiving (n=16) vs. receiving (n=8) dexamethasone

	EXERCISE (NO dexamethasone) n=8 (32%)	EXERCISE (YES dexamethasone) n=1 (12%)
Withdrawn	n=4 (14%)	n=1 (12%)
Reason - Time constraints	n=3 (14%)	n=1 (100%)
Reason - Too tired	n=1 (12%)	n=1 (100%)
Adverse Events Related to Exercise Intervention	1 - Aggravated previous shoulder injury	0
Attendance (%)	80.2 ± 3.7	62.5 ± 37.9
Rating of Perceived Exertion (target score 10-14)	13.3 ± 1.3	13.3 ± 0.9
Barriers to Participating in Exercise Intervention		
Time constraints	24%	20%
Lack of Motivation	24%	20%
Issues with Transportation	19%	14%
Perception of Exercise Intervention		
Beneficial	94%	100%
Enjoyable	94%	100%
Important	88%	100%
Feasible	88%	100%
Enjoyable	75%	100%
Willing to Continue to Exercise	100%	100%



Table 2. Comparison of study endpoints between exercise and usual care groups

	EXERCISE			USUAL CARE		
	Baseline	Post Chemo-radiotherapy	Change	Baseline	Post Chemo-radiotherapy	Change
Quality of Life						
EDRTC-C39 Global Health Status	63.9 ± 12.7	58.3 ± 24.8	-5.6 ± 24.7	61.1 ± 47.4	77.8 ± 19.3	16.7 ± 36.3
EDRTC-C39 Physical Functioning	91.1 ± 12.0	81.3 ± 19.1	-9.8 ± 16.3*	57.8 ± 36.7	71.3 ± 25.3	13.3 ± 13.3
SF-36 Physical Health Composite	48.8 ± 6.9	47.0 ± 8.6	-1.8 ± 8.4	41.4 ± 14.5	41.3 ± 16.2	-0.1 ± 1.7
SF-36 Mental Health Composite	47.5 ± 11.9	45.0 ± 12.7	-2.5 ± 10.6	48.8 ± 8.6	46.9 ± 8.4	-1.9 ± 0.3
Fatigue						
FACT-Fatigue †	41.4 ± 8.4	37.3 ± 11.1	-4.1 ± 8.5	36.3 ± 15.0	39.3 ± 8.4	3.0 ± 8.7
MFSI-SF	5.27 ± 5.96	4.20 ± 6.01	-2.93 ± 5.86	3.33 ± 5.52	4.09 ± 3.46	-1.33 ± 3.21
Psychological Distress (BSI-18)						
Global Severity Index †	5.87 ± 7.37	8.13 ± 8.30	2.27 ± 3.07*	4.50 ± 6.36	3.59 ± 4.05	-1.00 ± 1.41
Depression †	2.47 ± 3.98	3.29 ± 4.24	0.82 ± 3.23	3.00 ± 4.24	1.09 ± 1.41	-2.00 ± 2.83
Anxiety †	2.13 ± 3.72	2.47 ± 3.48	0.33 ± 3.81	3.59 ± 3.12	0.59 ± 1.71	-1.00 ± 1.41
Somatization †	1.07 ± 2.31	1.29 ± 2.19	1.22 ± 1.50*	0.99 ± 0.90	2.09 ± 2.83	2.09 ± 2.83
Physical Function						
400m Walk (s) †	229.4 ± 26.9	233.5 ± 47.4	4.1 ± 48.9	286.31 (n=1)	288.40 (n=1)	22.09 (n=1)
Repeated Chair Rise (s) †	18.72 ± 3.98	18.06 ± 4.28	-0.66 ± 1.17*	11.13 (n=1)	14.13 (n=1)	3.00 (n=1)
Leg Press 1-Repetition Maximum (kg)	116.3 ± 44.2	110.8 ± 15.8	-5.5 ± 20.2*	67.5 ± 16.4	65.9 ± 11.2	-1.6 ± 17.5
Ambulation (Fast pace 6-m walk) †	3.07 ± 6.37	2.94 ± 6.31	-0.13 ± 6.32	3.61 ± 8.44	4.08 ± 8.09	0.48 ± 8.09
Dynamic Balance (backwards tandem 6-m walk) †	14.37 ± 6.36	14.53 ± 9.10	0.14 ± 4.57	14.77 (n=1)	14.02 (n=1)	-0.75 (n=1)
Static Balance (Sensory Organisation Test)	76.7 ± 5.0	74.7 ± 12.1	-2.0 ± 5.6	74.0 ± 37.0	73.5 ± 11.4	-0.5 ± 3.5
Body Composition						
Lean Mass (kg)	55.3 ± 9.9	55.2 ± 10.0	-0.1 ± 2.0	52.2 ± 6.7	56.7 ± 6.8	-1.5 ± 6.1
Fat Mass (kg)	26.5 ± 8.9	26.6 ± 9.1	0.1 ± 6.3	32.2 ± 4.8	33.4 ± 9.5	1.2 ± 4.7
Percent Fat (%) †	29.5 ± 7.4	29.8 ± 8.0	0.4 ± 2.5	27.0 ± 6.4	38.1 ± 3.5	12.9 ± 3.2

* Significant (p < 0.05) within group change from baseline; † Reduction in value represents a beneficial improvement; 1RM – one repetition maximum (i.e. the maximum amount of weight that can be lifted once).

Table 3. Comparison of study endpoints among exercise group patients receiving patients not receiving (n=16) vs. receiving (n=8) dexamethasone (as self-reported at study entry).

	EXERCISE (NO Dexamethasone)			EXERCISE (YES Dexamethasone)		
	Baseline	Post Chemo-radiotherapy	Change	Baseline	Post Chemo-radiotherapy	Change
Quality of Life						
EDRTC-C39 Global Health Status	64.2 ± 21.2	66.7 ± 24.9	2.5 ± 23.9	63.3 ± 9.3	41.7 ± 15.6	-21.7 ± 13.2
EDRTC-C39 Physical Functioning	90.7 ± 20.7	86.0 ± 17.5*	-4.7 ± 15.1	92.0 ± 19.9	72.0 ± 19.7*	-20.0 ± 14.9*
SF-36 Physical Health Composite	46.9 ± 8.0	50.4 ± 7.4*	3.6 ± 7.5*	46.7 ± 4.5	40.0 ± 6.7*	-6.7 ± 5.7*
SF-36 Mental Health Composite	49.0 ± 12.7	47.7 ± 13.9	-1.3 ± 8.4	44.4 ± 10.7	39.5 ± 8.3	-4.9 ± 15.5
Fatigue						
FACT-Fatigue †	42.8 ± 7.8*	40.6 ± 11.3*	-2.2 ± 7.8	37.8 ± 11.2*	29.0 ± 5.5*	-8.8 ± 12.8
MFSI-SF	4.20 ± 5.55	6.10 ± 7.52	1.90 ± 3.70	7.40 ± 6.80	12.40 ± 8.00	5.00 ± 5.00
Psychological Distress (BSI-18)						
Global Severity Index †	5.50 ± 6.00	7.30 ± 5.50	1.80 ± 3.70	6.60 ± 7.40	3.80 ± 6.40	-2.80 ± 5.20
Depression †	2.40 ± 4.20	3.10 ± 4.45	0.70 ± 3.70	3.80 ± 3.70	2.80 ± 4.00	-1.00 ± 2.80
Anxiety †	2.10 ± 4.00	2.10 ± 4.00	0.00 ± 0.00	3.30 ± 3.30	3.20 ± 2.20	-0.10 ± 3.20
Somatization †	1.00 ± 2.80	2.10 ± 2.64	1.10 ± 1.79	1.30 ± 0.84	2.80 ± 0.84	1.50 ± 1.04*
Physical Function						
400m Walk (s) †	224.9 ± 26.9	216.6 ± 36.4	-8.3 ± 34.2	237.6 ± 27.1	264.6 ± 100.5	26.9 ± 81.3
Repeated Chair Rise (s) †	16.7 ± 2.3	9.9 ± 2.4	-6.8 ± 11.6*	10.7 ± 1.1	10.4 ± 2.3	-0.28 ± 1.6
Leg Press 1-Repetition Maximum (kg)	116.3 ± 47.6	105.4 ± 49.9	-10.9 ± 11.6*	120.4 ± 41.2	125.3 ± 19.3	4.9 ± 28.6
Ambulation (Fast pace 6-m walk) †	3.15 ± 6.42	2.95 ± 5.58	-0.20 ± 6.20*	2.94 ± 0.21	2.93 ± 0.40	-0.01 ± 0.38
Dynamic Balance (backwards tandem 6-m walk) †	14.90 ± 6.98	14.57 ± 10.66	-0.32 ± 4.50	13.43 ± 5.08	14.40 ± 0.48	0.97 ± 5.11
Static Balance (Sensory Organisation Test)	79.5 ± 8.4	75.5 ± 14.8	-4.0 ± 6.5	72.5 ± 8.6	73.5 ± 8.6	1.0 ± 1.8
Body Composition						
Lean Mass (kg)	53.8 ± 10.5	53.9 ± 10.6	0.05 ± 2.1	58.6 ± 8.5	58.0 ± 9.0	-0.5 ± 2.8
Fat Mass (kg)	23.3 ± 10.5	21.8 ± 9.6*	-1.4 ± 2.0*	27.3 ± 2.3	30.9 ± 2.8*	3.5 ± 1.8*
Percent Fat (%) †	28.7 ± 8.3	27.5 ± 8.5	-0.8 ± 1.7*	31.2 ± 5.0	34.0 ± 5.4	2.9 ± 11.4*

* Significant (p < 0.05) within group change from baseline; † Reduction in value represents a beneficial improvement; 1RM – one repetition maximum (i.e. the maximum amount of weight that can be lifted once).

CONCLUSIONS

Supervised exercise is safe and well tolerated by HGG patients undergoing chemoradiotherapy. Outcomes following exercise were better in HGG patients not receiving dexamethasone. Randomised controlled trials are required to further explore these findings.