Lean tissue mass loss after coronary artery bypass graft surgery: relation to post-operative clinical status and impact of endurance exercise-based rehabilitation

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Background

Despite the therapeutic success of CABG surgery, rapid decline in muscle protein synthesis induces significant lean tissue mass (LTM) loss. It has been established that an optimal LTM should be ambitioned to optimize the clinical status and prognosis in patients with heart disease.

Exercise based cardiac rehabilitation, for a duration of at least 12 weeks, is strongly recommended in prevention of cardiovascular disease after CABG surgery which has been shown to effectively elevate LTM in patients recovering from CABG surgery. However, it remains unknown whether this LTM gain fully compensates for observed post-operative LTM loss.

Objectives

- To explore the impact of amount of lean tissue mass loss after CABG surgery on clinical status at entry of rehabilitation
- Whether such loss can be fully remediated by endurance exercise based rehabilitation

Methods

Dexa-scan | Blood analysis | Cardiopulmonary exercise testing

Results

Table 1: Impact of CABG surgery and rehabilitation on secondary outcome measures

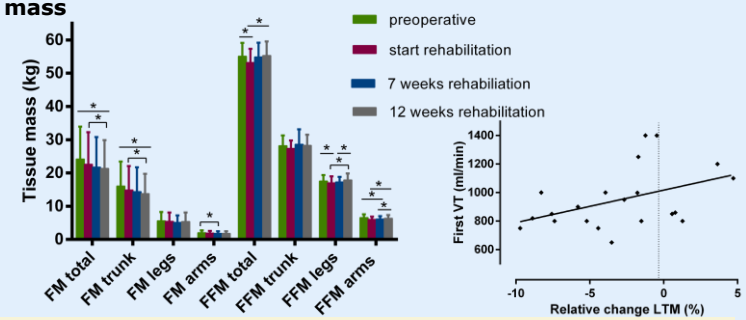
	Preoperative	Entry of rehabilitation	7 weeks of rehabilitation	12 weeks of rehabilitation
Subject characteristics				
Age (years)	64.3 ± 9	--	--	--
Sex (n=male)	21	--	--	--
Body mass index (kg/m^2)	**28.1 ± 4.1**[a#]	27.4 ± 4.3	27.5 ± 4.5	27.4 ± 4.7
Exercise capacity				
Peak cycling power output (W)	--	**188 ± 27***	144 ± 33	155 ± 46
Peak oxygen uptake (mL/min)	--	**1522 ± 284***	1869 ± 371	1941 ± 458
First ventilatory threshold (mL/min)	--	**962 ± 148***	1184 ± 253	1257 ± 269
Second ventilatory threshold (mL/min)	--	**1233 ± 259***	1472 ± 271	1494 ± 287
Peak heart rate (beats/min)	--	**109 ± 14***	125 ± 15	127 ± 18
Peak respiratory exchange ratio (RER)	--	1.16 ± 0.11	1.15 ± 0.09	1.16 ± 0.11
Test duration (sec)	--	370 ± 119	405 ± 78	408 ± 97

[a]Significant difference between preoperative parameters compared to entry of rehabilitation; *Significant difference between entry and end of rehabilitation (P<0.05).

	Preoperative	Entry of rehabilitation	7 weeks of rehabilitation	12 weeks of rehabilitation
Blood parameters				
Total cholesterol (mg/dl)	**155 ± 39***	132 ± 28	135 ± 22	138 ± 19
LDL cholesterol (mg/dl)	**84 ± 27***	72 ± 23	72 ± 18	71 ± 13
HDL cholesterol (mg/dl)	**40 ± 12***	**36 ± 9**[#]	41 ± 10	44 ± 9
Triglyceride (mg/dl)	**158 ± 95***	117 ± 54	103 ± 39	116 ± 84
Glucose (mmol/l)	6.1 ± 2.3	6.2 ± 1.4	6.3 ± 1.8	6.2 ± 1.9
C-peptide (ng/ml)	2 ± 1	1.9 ± 0.8	1.7 ± 0.7	1.8 ± 0.7
Insulin (mU/l)	11.1 ± 6.3	11.8 ± 8.7	12.7 ± 7.5	11.5 ± 7.4
HOMA-IR index	3.2 ± 2.4	3.7 ± 4.2	4.1 ± 4.6	3.7 ± 4.6
C-Reactive protein (mg/dl)	0.51 ± 0.8	1.02 ± 1.9	0.54 ± 0.9	0.22 ± 0.2
Cortisol (total; µg/dl)	18.9 ± 4.9	17.4 ± 5.4	18.2 ± 4.1	18.4 ± 3.7
Insulin-like growth factor-1 (µg/l)	143 ± 40	151 ± 51	149 ± 39	138 ± 49
Growth hormone (µg/l)	**0.18 ± 0.1***	0.84 ± 0.88	0.48 ± 0.51	0.52 ± 0.57

*Significant difference between preoperative parameters compared with entry of rehabilitation (start rehabilitation) (P<0.05). #Significant difference between entry and end of rehabilitation (P<0.05).

Impact of CABG surgery and rehabilitation on lean tissue mass



Conclusion

Significant decrements in LTM after CABG surgery within a few weeks relates only to a worse first ventilatory threshold at entry of rehabilitation. Moreover, 12 weeks of endurance exercise-based rehabilitation leads to a full restoration in LTM.