

Sex specific patterns of FFM loss after bariatric metabolic surgery

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COI Statement

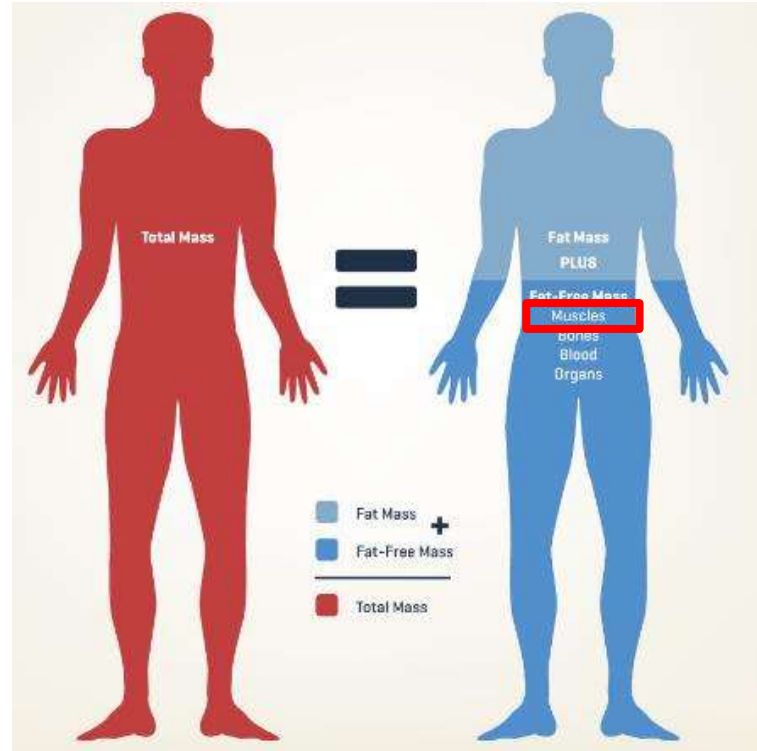
- No conflicts of interest need to be disclosed



Fat-free mass (FFM)

Skeletal muscle

- Physical movement
- Thermoregulation
- Bone (re)modelling
- Glucose regulation



Loss of FFM

- 3-14 kg in 12 months after bariatric metabolic surgery
- Effect of surgery-induced FFM loss on cardiorespiratory fitness/clinical outcomes?
- No sex-specific outcome data

Cross sectional study

	All patients (1022)	Male (221)	Premenopausal women (613)	Postmenopausal women (187)	P-value
Age (years)	48 [18 – 68]	49.0 [20 – 66]	44 [18 – 54]	59 [55 – 68]	p<0.002 ^c
RYGB, (n, %)	83.9% (857)	180 (81.4)	504 (82.1)	173 (92.5)	p=0.002 ^{a, b, c}
Weight (kg)	119.9 [76.4 -214.6]	140.9 (21.7)	119.0 (15.8)	112.7 (15.3)	p<0.001 ^{a, b, c}
BMI (kg/m ²)	42.4 (4.9)	42.7 (4.8)	42.7 (4.8)	41.2 (5.0)	p=0.001 ^c
Body fat content (%)	47.6 (5.6)	41.5 (6.8)	49.4 (3.6)	49.1 (4.2)	p<0.001 ^a
FFM (kg)	60.9 [44.1 – 112.9]	81.6 (11.8)	59.7 (6.1)	57.0 (6.4)	p<0.001 ^{a, b, c}
FFMI (kg/m ²)	21.5 [14.2 – 32.7]	25.1 [14.2 – 32.1]	21.3 [14.6 – 31.9]	20.5 [17.6 – 32.7]	p<0.001 ^{a, b, c}
Waist circumference (cm)	129.3 (13.1)	138.3 (13.8)	126.7 (11.7)	127.1 (11.5)	p<0.001 ^a
Hypertension at referral, % (n)	386 (37.8)	114 (51.6)	161 (26.2)	111 (59.4)	p<0.001 ^b
Dyslipidemia at referral, % (n)	197 (19.3)	69 (31.2)	67 (10.9)	61 (32.6)	p<0.001 ^b
Type II diabetes at referral, % (n)	202 (19.8)	71 (32.1)	74 (12.1)	57 (30.5)	p<0.001 ^b
OSAS, % (n)	185 (18.1)	76 (34.4)	77 (12.5)	32 (17.1)	p<0.001 ^a
Arthrosis, % (n)	180 (17.6)	32 (14.5)	81 (13.2)	67 (35.8)	p<0.001 ^c

Data are mean (standard deviation/SD) or percentage (%) and count (n). p-values for continuous variables are tested using one-way Anova when normally distributed or Kruskal Wallis test. Categorical variables are tested using X2-test.

RYGB, Roux-en-Y gastric bypass; BMI, body mass index; FFM, fat free mass; FFMI, fat free mass index; OSAS, obstructive sleep apnea syndrome;

^a significant difference vs male group

^b significant difference vs premenopausal group

^c significant difference vs postmenopausal group

FFM loss

- Absolute amount of Δ FFM (kg)
 - Higher in men

	Pre surgery	3 months	6 months	9 months	12 months	18 months	24 months
Male							
N	215	195	198	126	187	132	157
FFM (kg)	81.6 \pm 11.8	75.1 \pm 9.8*	72.8 \pm 9.3*	71.6 \pm 10.7	71.2 \pm 9.2	70.5 \pm 8.9	71.0 \pm 8.6
Δ FFM (kg)	NA	6.2 \pm 7.4	8.6 \pm 7.8*	8.5 \pm 8.7*	10.3 \pm 8.6	10.8 \pm 8.8	11.5 \pm 8.0
Premenopausal women							
N	600	559	565	401	536	379	416
FFM (kg)	59.7 \pm 6.1 ^a	53.9 \pm 5.3* ^a	51.7 \pm 5.4* ^a	50.8 \pm 5.6* ^a	50.2 \pm 5.5* ^a	49.8 \pm 5.5 ^a	50.4 \pm 6.1* ^a
Δ FFM (kg)	NA	5.9 \pm 3.6	8.0 \pm 3.7*	8.7 \pm 3.8*	9.6 \pm 4.0*	9.8 \pm 4.3^a	9.6 \pm 4.9^a
Postmenopausal women							
N	179	168	170	110	161	114	137
FFM (kg)	57.0 \pm 6.3 ^a	51.7 \pm 5.1* ^a	49.7 \pm 5.6* ^a	48.6 \pm 5.0* ^a	48.0 \pm 5.0* ^a	47.4 \pm 5.4 ^a	46.6 \pm 4.9 ^a
Δ FFM (kg)	NA	5.4 \pm 3.7 ^a	7.3 \pm 3.8* ^a	8.1 \pm 4.1* ^a	9.3 \pm 4.6* ^a	9.6 \pm 4.7 ^a	10.0 \pm 5.6

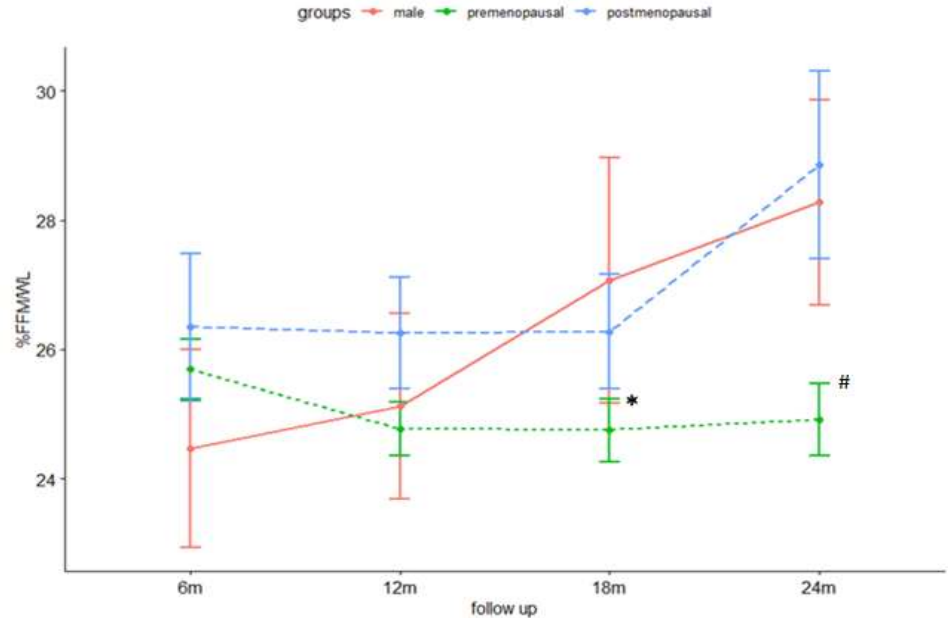
FFM loss

- Absolute amount of Δ FFM (kg)
 - Higher in men
 - No differences between pre- and postmenopausal women

	Pre surgery	3 months	6 months	9 months	12 months	18 months	24 months
Male							
N	215	195	198	126	187	132	157
FFM (kg)	81.6 ± 11.8	75.1 ± 9.8*	72.8 ± 9.3*	71.6 ± 10.7	71.2 ± 9.2	70.5 ± 8.9	71.0 ± 8.6
Δ FFM (kg)	NA	6.2 ± 7.4	8.6 ± 7.8*	8.5 ± 8.7*	10.3 ± 8.6	10.8 ± 8.8	11.5 ± 8.0
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FFM (kg)	59.7 ± 6.1 ^a	53.9 ± 5.3* ^a	51.7 ± 5.4* ^a	50.8 ± 5.6* ^a	50.2 ± 5.5* ^a	49.8 ± 5.5 ^a	50.4 ± 6.1* ^a
Δ FFM (kg)	NA	5.9 ± 3.6	8.0 ± 3.7*	8.7 ± 3.8*	9.6 ± 4.0*	9.8 ± 4.3 ^a	9.6 ± 4.9 ^a
Postmenopausal women							
N	179	168	170	110	161	114	137
FFM (kg)	57.0 ± 6.3 ^a	51.7 ± 5.1* ^a	49.7 ± 5.6* ^a	48.6 ± 5.0* ^a	48.0 ± 5.0* ^a	47.4 ± 5.4 ^a	46.6 ± 4.9 ^a
Δ FFM (kg)	NA	5.4 ± 3.7 ^a	7.3 ± 3.8* ^a	8.1 ± 4.1* ^a	9.3 ± 4.6* ^a	9.6 ± 4.7 ^a	10.0 ± 5.6

FFM loss

- Proportion of FFM loss within TWL
 - Significant higher in men and postmenopausal women compared to premenopausal women



Relationship loss of FFM with CRF and grip strength

Constant								
			Premenopausal women			Postmenopausal women		
	Intercept		β	95% CI	p-value	β	95% CI	p-value
CRF	Model 3	3.74	-0.0013	-0.026 to -0.0005	0.04	-0.0009	-0.029 to 0.012	0.42
	Model 4	0.90	0.0013	-0.011 to 0.014	0.84	-0.00033	-0.020 to 0.020	0.97
Hand grip strength	Model 5	51.27	-0.041	-0.20 to -0.11	0.62	-0.0020	-0.23 to 0.23	0.99
	Model 6	16.58	0.19	0.051 to 0.38	0.008	-0.14	-0.061 to -0.34	0.17

Model 1 & 2: crude models

Model 3: Comparison of association between groups (reference category men)

Model 4: Model 3 adjusted for groups, preoperative BMI, preoperative FFM and follow-up moment (reference category men)

Model 5: Comparison of association between groups (reference category men)

Model 6: Model 5 adjusted for preoperative BMI, preoperative FFM and moment of inclusion (reference category men)

Conclusion

- All patients lost a substantial amount of FFM after BMS
- Proportion of FFM loss to total weight loss was significantly lower in premenopausal than in postmenopausal women and men
- No sex differences in the association between surgery induced FFM loss and postoperative CRF

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Questions?

