

The Influence of Insulin Sensitivity on Body Fat and Cardiometabolic Health in Motor Complete Spinal Cord Injury

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INTRODUCTION

- Data suggests an increased prevalence of disorders of carbohydrate metabolism in persons with spinal cord injury (SCI)¹.
- These changes are often marked by insulin resistance, impaired glucose tolerance, and increased body fat².

PURPOSE

- To assess differences in cardiometabolic health and adipose tissue by insulin sensitivity (Si) in motor complete SCI.

METHODS

- **Subjects:** 67 participants with chronic, traumatic motor complete SCI were included in this cross-sectional study.
- **Body Composition:** Magnetic Resonance Imaging (MRI) was used to measure visceral (VAT) and subcutaneous (SAT) adipose tissue³. Dual-energy X-ray Absorptiometry (DXA) was used to measure percent total body fat, percent regional body fat, and fat mass.
- **Cardiometabolic Profiles:** Glucose effectiveness (Sg) and insulin sensitivity (Si) were measured using a standard intravenous glucose tolerance test⁴. Lipid profiles and blood pressure were measured using standard assessments.
- **Statistical Analysis:** Participants were divided into three groups based on Si tertiles (low Si <25%, high Si >75% percentiles, and mid Si in-between). One-way ANOVA with Tukey's post-hoc were used to analyze groups. ANCOVA was used to covary for BMI. Alpha<0.05.

RESULTS

- The table below displays mean±SD for demographics based on tertiles for levels of insulin sensitivity.
- When covarying for BMI, Sg, LDL-C, systolic BP, fat mass, VAT, and %VAT remained significant (P<0.05)

	Variable	One-Way Analysis of Variance				Tukey's Post-hoc		
		Low-level Si (n=17)	Mid-level Si (n=33)	High-level Si (n=17)	P-value	Low vs. Mid Si	Low vs. High Si	Mid vs. High Si
Demographics	Age (y)	47±14	46±10	41±11	0.221	NS		
	Sex (M/F)	14/3	28/5	13/4	NA	NS		
	Body Mass Index (kg/m ²)	32.1±6.1	26.5±5.6	24.7±3.9	<0.001	0.003	0.001	0.535
	Time Since Injury (y)	13±12	16±11	14±11	0.540	NS		
	Level of Injury (range)	C4-L1	C4-L1	C6-T11	NA	NS		
Body Composition	Waist Circumference (cm)	101.9±11.3	93.6±12.2	85.3±9.4	<0.001	0.043	<0.001	0.043
	VAT (L)	3.43±1.67	2.60±1.54	1.32±1.15	0.007	0.296	0.005	0.058
	% VAT	41.9±14.0	30.9±11.1	25.6±10.4	0.002	0.012	0.002	0.407
	Fat-Free Mass (kg)	56.0±11.5	50.5±9.5	47.7±9.4	0.058	NS		
	Lean Body Mass (kg)	51.9±10.1	47.2±9.3	44.6±9.2	0.085	NS		
	SAT (L)	5.83±3.50	4.43±2.01	4.14±2.09	0.219	NS		
	% SAT	9.7±7.3	11.4±10.3	12.4±7.6	0.720	NS		
	% Total Body Fat	42.9±6.6	38.8±8.3	35.2±12.7	0.060	0.287	0.048	0.414
	% Regional Body Fat	41.8±6.6	37.8±7.8	33.8±12.6	0.042	0.304	0.032	0.301
	Fat mass (kg)	40.6±13.8	32.0±11.1	24.1±9.9	0.001	0.042	<0.001	0.071
Carbohydrate Metabolism	Glucose Effectiveness	0.020±0.008	0.020±0.008	0.030±0.020	0.011	1.000	0.035	0.013
Lipid Profiles (mg/dL)	Total Cholesterol	148.2±32.9	156.9±32.7	160.4±25.1	0.495	NS		
	LDL-C	78.3±30.0	99.5±38.8	100.3±19.9	0.028	0.034	0.060	0.995
	HDL-C	32.7±7.6	34.9±8.0	40.8±8.8	0.013	0.634	0.014	0.047
	Triglycerides	153.4±77.9	110.6±51.6	92.4±46.8	0.009	0.043	0.009	0.551
Blood Pressure (mm Hg)	Systolic BP	124.5±13.7	109.8±14.0	115.9±9.5	0.001	0.001	0.138	0.254
	Diastolic BP	74.3±9.9	69.1±11.3	67.4±12.6	0.150	NS		

CONCLUSION

- Individuals with SCI and lower insulin sensitivity have significantly more body fat and cardiometabolic dysfunction.
- Further research is warranted to determine the causal relationship between insulin sensitivity, body fat, and cardiometabolic health following SCI.