LOS COBOS MEDICAL CENTER

compensar | UNIVERSIDAD EL BOSQUE

Mas allá de la glucosa: el papel de la insulina en la salud muscular del paciente viviendo con diabetes

Castillo
Jorge

Especialista en Endocrinología
Los Cobos Medical Center
Bogotá, Colombia

www.eldoctorcastillo.com

Conflicto de interés

- ❑ Esta es una conferencia patrocinada por laboratorios **Sanofi**
- ❑ Su contenido es producto de información científica no influenciada por el patrocinador
- ❑ He recibido honorarios como speaker de Amgen, Astra Zeneca, BD, Boeringher, Diabetrics, Euroetika, Gilead, Merck Serono, Merck Sharp and Dhome, Lilly, Novo Nordisk, Pharmatech, Pfizer, PTC, Procaps, Roche, Sanofi, Servier, Tecnofarma.

Conferencia disponible en…

www.eldoctorcastillo.com

- **Lo que deberíamos saber de la Insulina**

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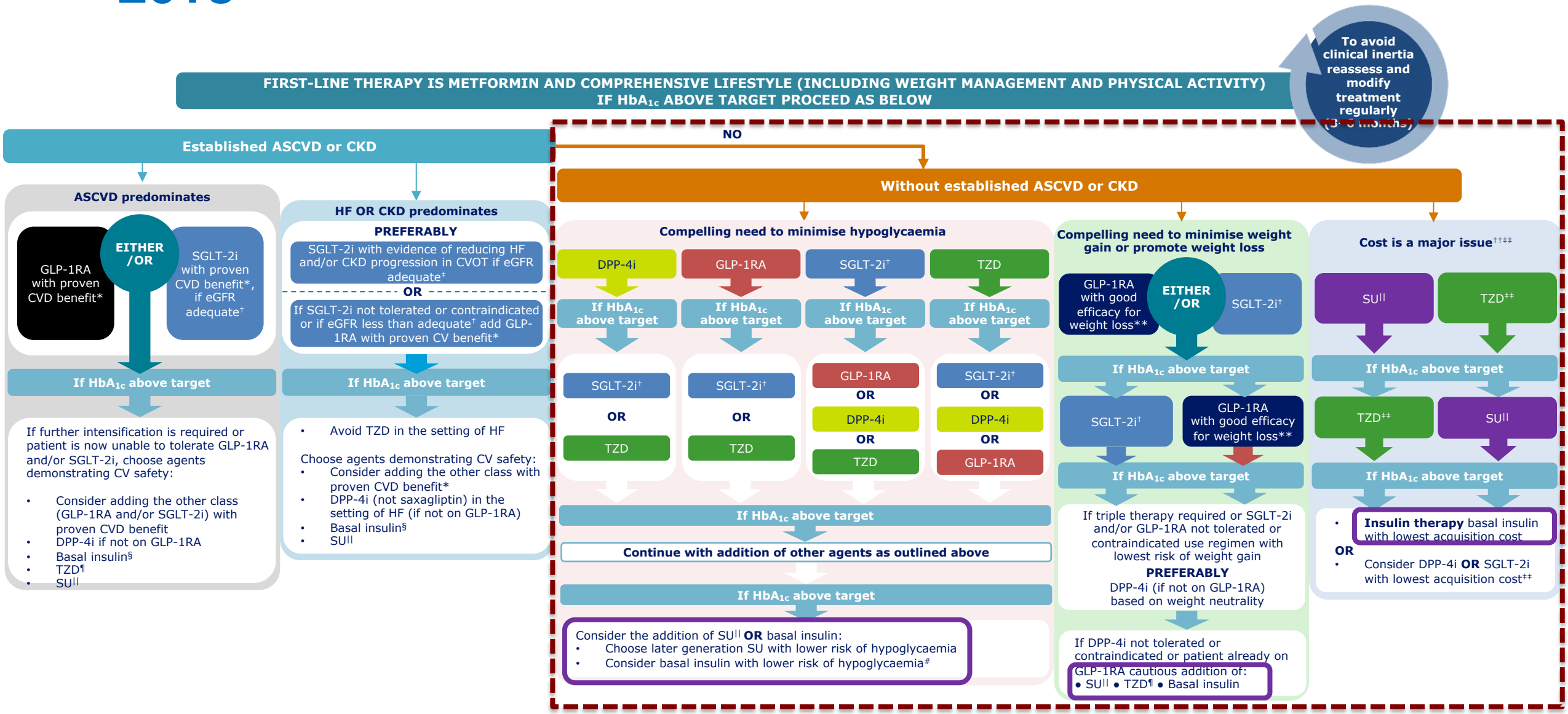
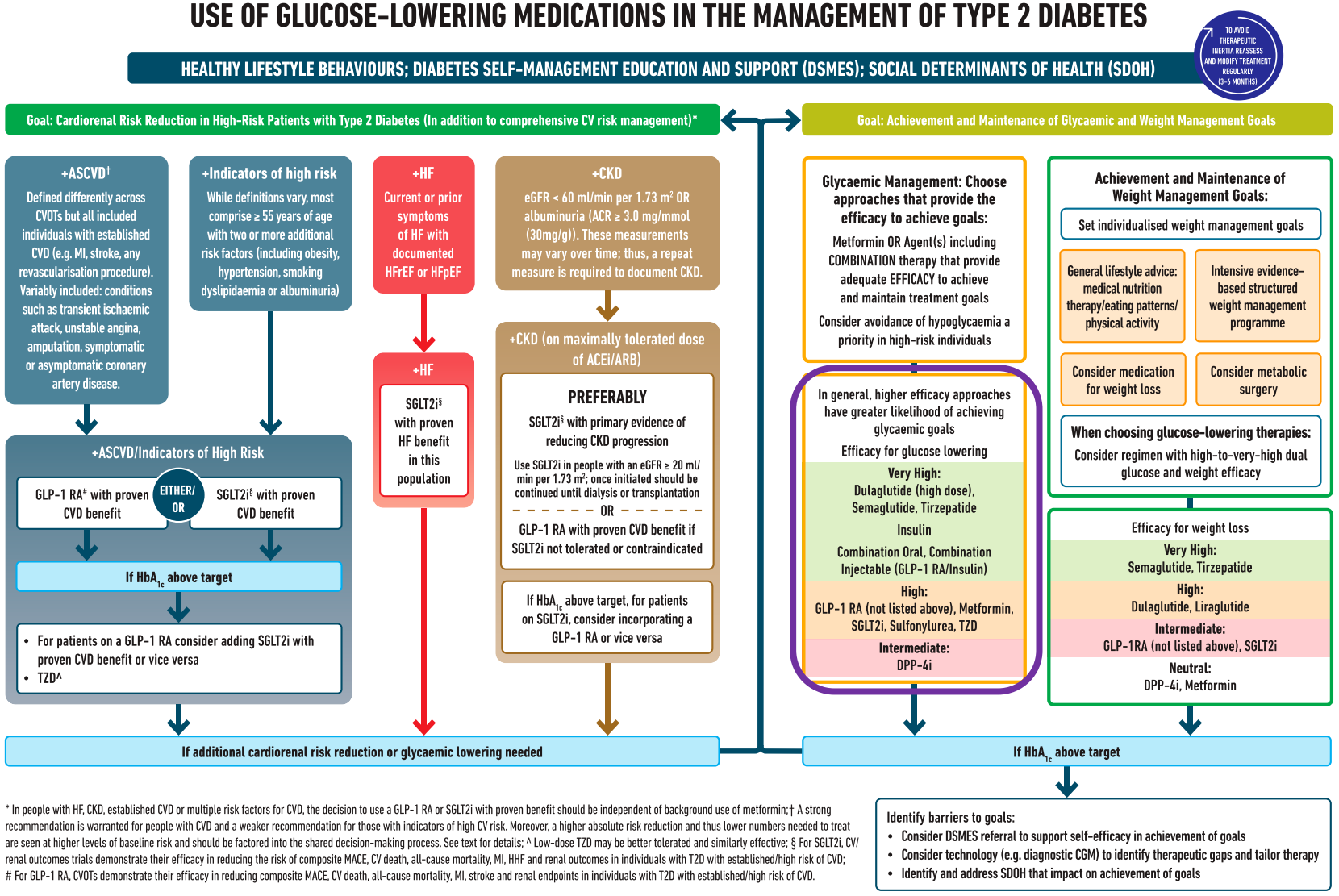
2018



*Proven CVD benefit means it has label indication of reducing CVD events. For GLP-1RA strongest evidence for liraglutide>semaglutide>exenatide extended release. For SGLT-2i evidence modestly stronger for empagliflozin>canagliflozin; †**Semaglutide>liraglutide>dulaglutide>exenatide>lixisenatide; ††If no specific comorbidities (i.e. no established CVD, low risk of hypoglycaemia and lower priority to avoid weight gain or no weight-related comorbidities); ‡‡Consider country- and region-specific cost of drugs. In some countries, TZDs relatively more expensive and DPP-4i relatively cheaper

2022

USE OF GLUCOSE-LOWERING MEDICATIONS IN THE MANAGEMENT OF TYPE 2 DIABETES



* In people with HF, CKD, established CVD or multiple risk factors for CVD, the decision to use a GLP-1 RA or SGLT2i with proven benefit should be independent of background use of metformin;† A strong recommendation is warranted for people with CVD and a weaker recommendation for those with indicators of high CV risk. Moreover, a higher absolute risk reduction and thus lower numbers needed to treat are seen at higher levels of baseline risk and should be factored into the shared decision-making process. See text for details; ^ Low-dose TZD may be better tolerated and similarly effective; § For SGLT2i, CV/renal outcomes trials demonstrate their efficacy in reducing the risk of composite MACE, CV death, all-cause mortality, MI, HHF and renal outcomes in individuals with T2D with established/high risk of CVD; # For GLP-1 RA, CVOTs demonstrate their efficacy in reducing composite MACE, CV death, all-cause mortality, MI, stroke and renal endpoints in individuals with T2D with established/high risk of CVD.

Davies MJ, Aroda VR, Collins BS, Gabbay RA, Green J, Maruthur NM, Rosas SE, Del Prato S, Mathieu C, Mingrone G, Rossing P, Tankova T, Tsapas A, Buse JB

Diabetes Care 2022; https://doi.org/10.2337/dci22-0034. *Diabetologia* 2022; https://doi.org/10.1007/s00125-022-05787-2.

In general, higher efficacy approaches have greater likelihood of achieving glycaemic goals

Efficacy for glucose lowering

Very High:
Dulaglutide (high dose), Semaglutide, Tirzepatide

Insulin

Combination Oral, Combination Injectable (GLP-1 RA/Insulin)

High:
GLP-1 RA (not listed above), Metformin, SGLT2i, Sulfonylurea, TZD

Intermediate:
DPP-4i

Davies MJ, Aroda VR, Collins BS, Gabbay RA, Green J, Maruthur NM, Rosas SE, Del Prato S, Mathieu C, Mingrone G, Rossing P, Tankova T, Tsapas A, Buse JB

Diabetes Care 2022; https://doi.org/10.2337/dci22-0034. *Diabetologia* 2022; https://doi.org/10.1007/s00125-022-05787-2.

The NEW ENGLAND JOURNAL of MEDICINE
ESTABLISHED IN 1812 SEPTEMBER 22, 2022 VOL. 387 NO. 12

Glycemia Reduction in Type 2 Diabetes — Glycemic Outcomes

The GRADE Study Research Group*

Table 2. Primary and Secondary Metabolic Outcomes.*

Outcome	Glargine (N = 1263)	Glimepiride (N = 1254)	Liraglutide (N = 1262)	Sitagliptin (N = 1268)
Primary metabolic outcome†				
Participants — no. (%)	852 (67.4)	908 (72.4)	860 (68.2)	981 (77.4)
Rate/100 participant-yr (95% CI)	26.5 (24.8–28.4)	30.4 (28.4–32.4)	26.1 (24.4–27.9)	38.1 (35.8–40.6)
Pairwise hazard ratios (95% CI)				
Glargine	—	0.89 (0.81–0.98)‡	1.02 (0.93–1.12)	0.71 (0.64–0.78)§
Glimepiride	—	—	1.15 (1.04–1.27)¶	0.79 (0.72–0.88)§
Liraglutide	—	—	—	0.69 (0.63–0.76)§
Hazard ratio in the treatment group as compared with all other treatments combined (95% CI)	0.87 (0.80–0.94)§	1.01 (0.93–1.09)	0.84 (0.78–0.91)§	1.37 (1.27–1.48)§

N Engl J Med 2022;387:1063-74.

The NEW ENGLAND JOURNAL of MEDICINE
ESTABLISHED IN 1812 SEPTEMBER 22, 2022 VOL. 387 NO. 12

Glycemia Reduction in Type 2 Diabetes — Glycemic Outcomes

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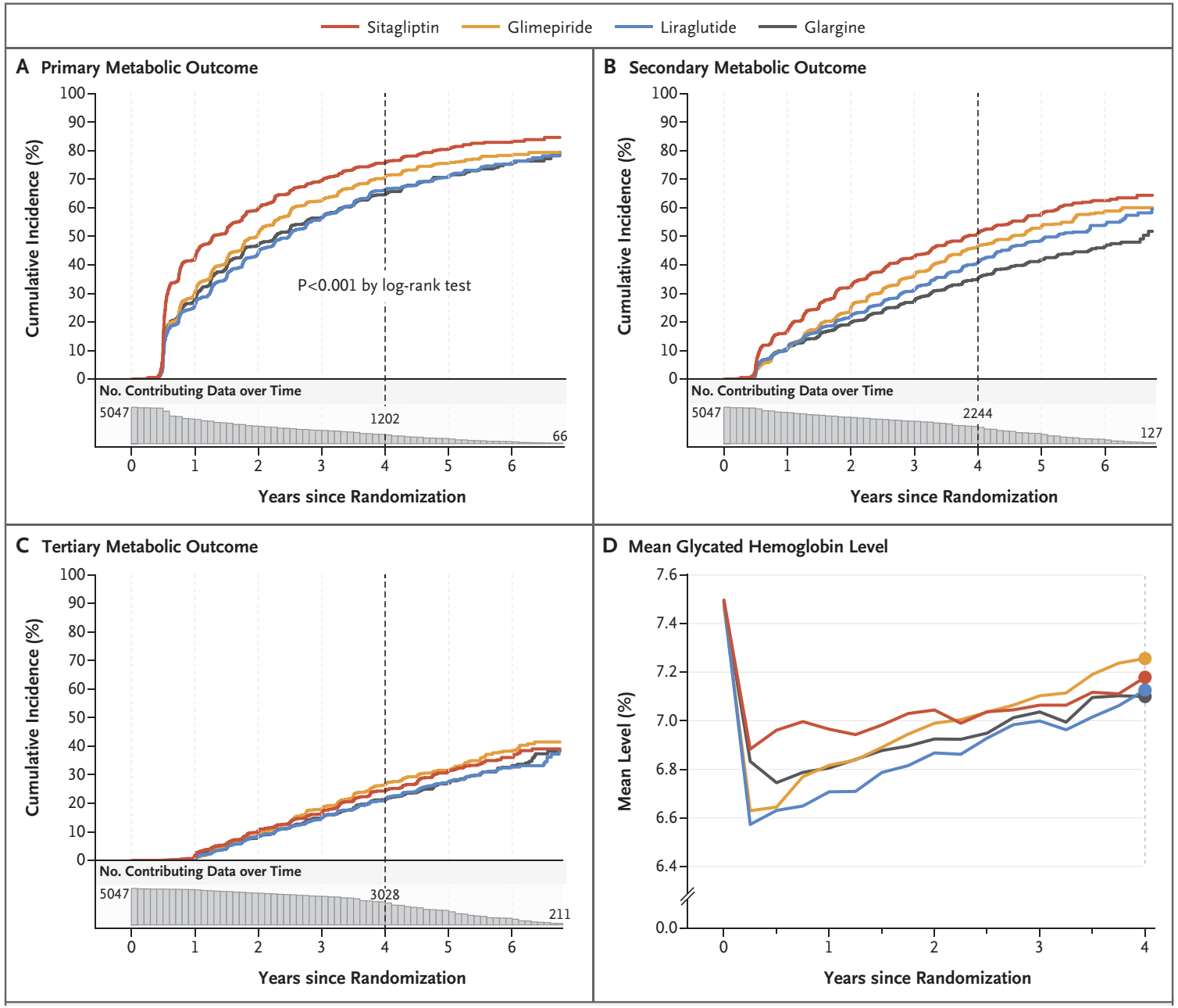

N Engl J Med 2022;387:1063-74.

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ESTABLISHED IN 1812 SEPTEMBER 22, 2022 VOL. 387 NO. 12

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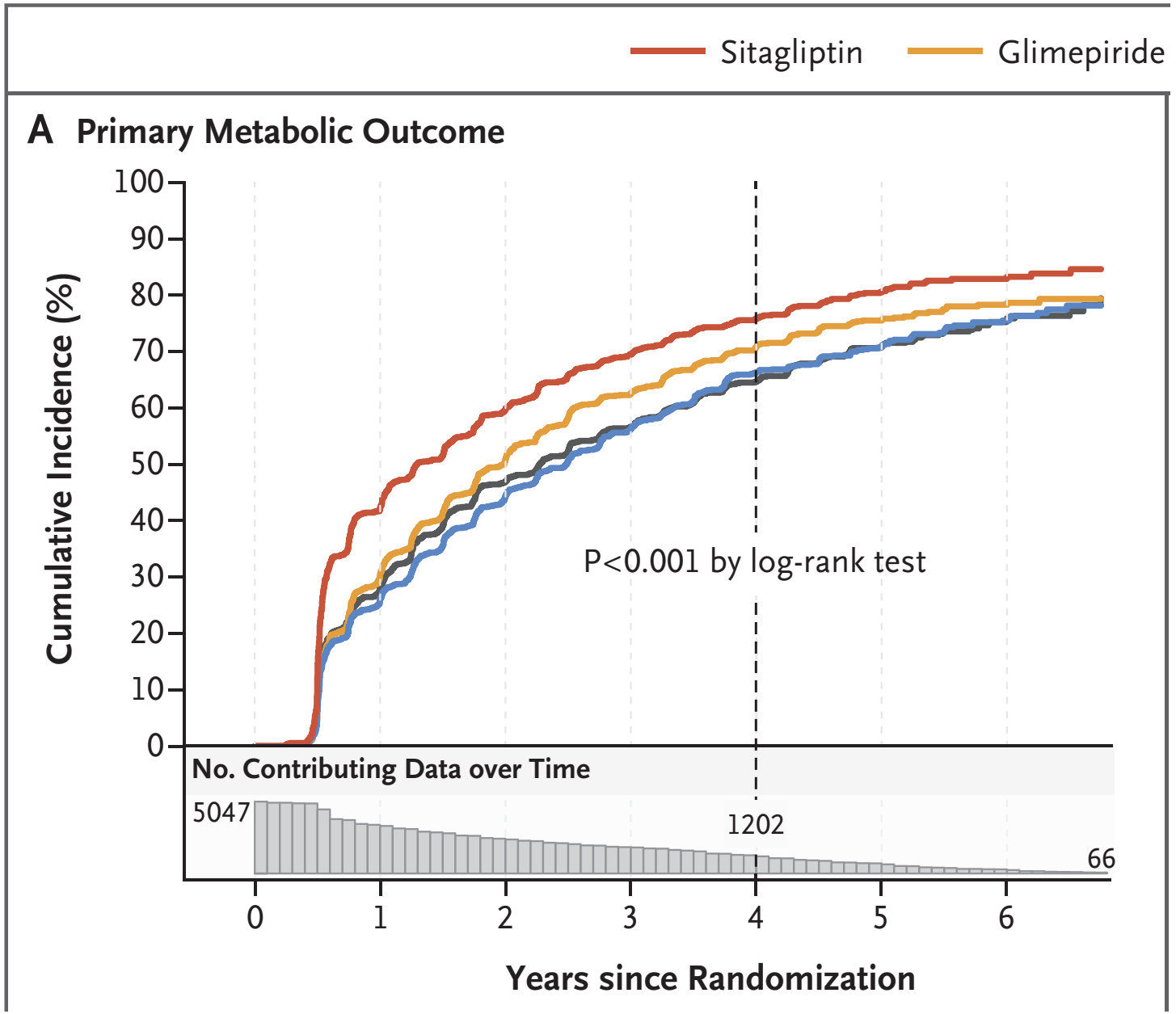
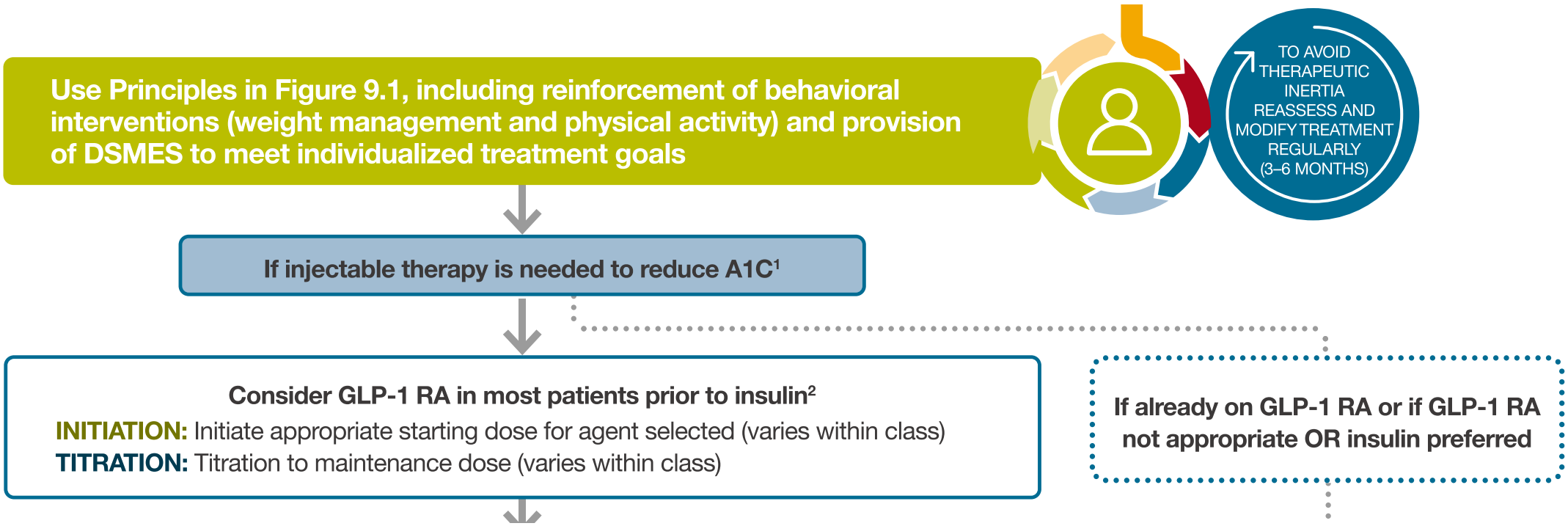


N Engl J Med 2022;387:1063-74.



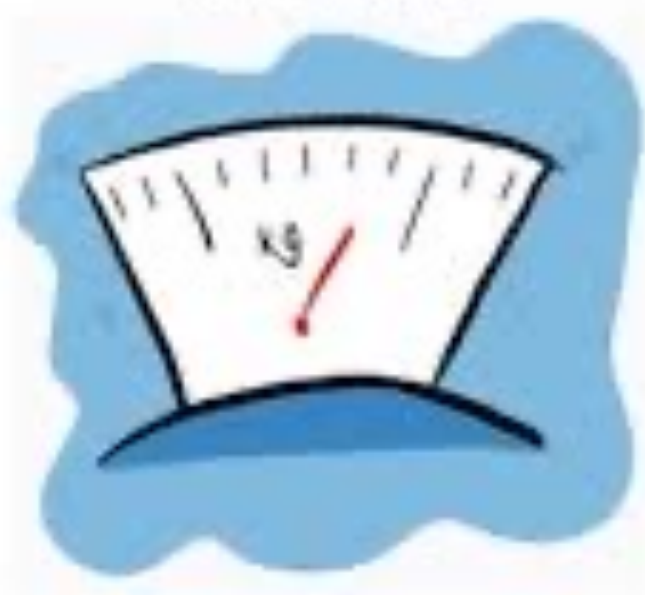
Diabetes Care 2021;44 Suppl. 1

Cúando Insulinizar

1	2	5	3	4
HbA1c	**HbA1c**	**ADOs**	**Estados Catabólicos**	**Condiciones especiales**
10% > 300 mg/dl	9% Síntomas clásicos	2 o 3 sin llegar a metas	Estado Hiperosmolar Cetoacidosis Urgencias	Embarazo Hospitalización

HIPOGLUCEMIA Y PESO

en diabetes tipo I



ORIGINAL PAPER

IJCP THE INTERNATIONAL JOURNAL OF CLINICAL PRACTICE

How much is too much? Outcomes in patients using high-dose insulin glargine

T. Reid,[1] L. Gao,[2] J. Gill,[3] A. Stuhr,[3] L. Traylor,[3] A. Vlajnic,[3] A. Rhinehart[4]

❑ Int J Clin Pract, January 2016, 70, 1, 56–65

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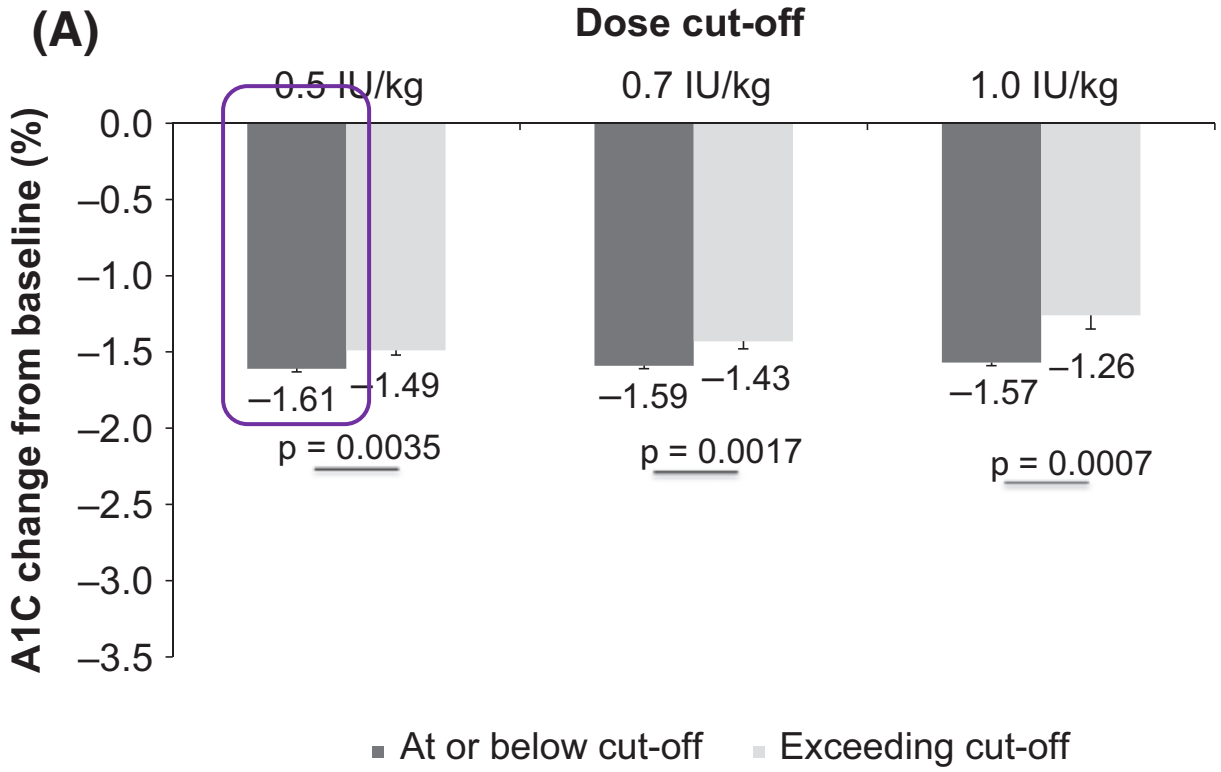
0.5 UI/Kg **n: 2837**

53-59 años
7.6 – 9.5 años con DM2



❑ Int J Clin Pract, January 2016, 70, 1, 56–65

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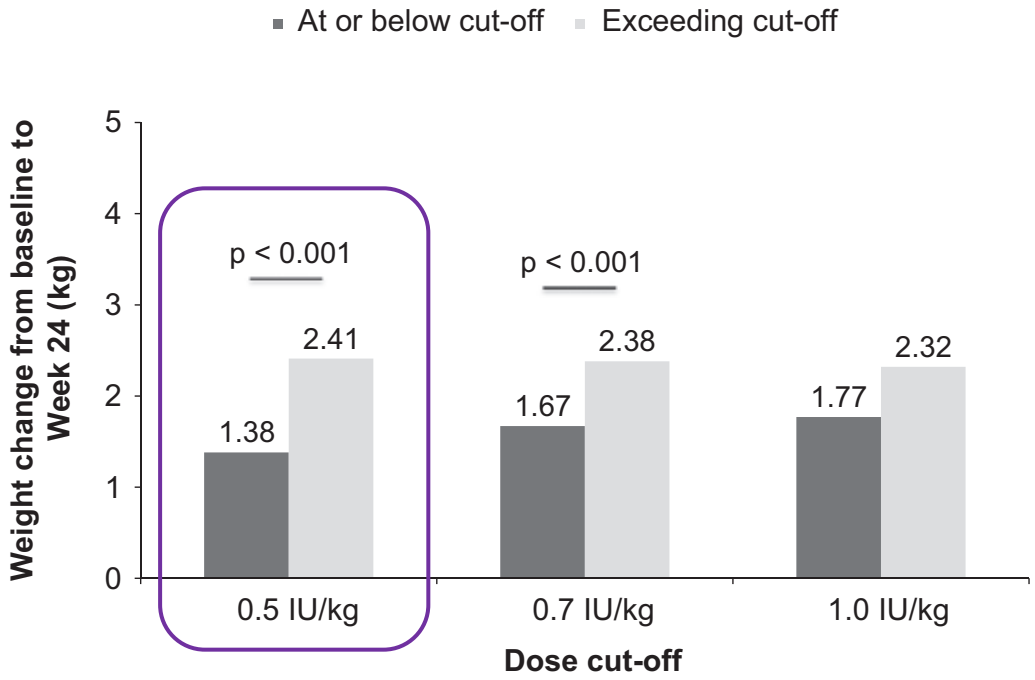
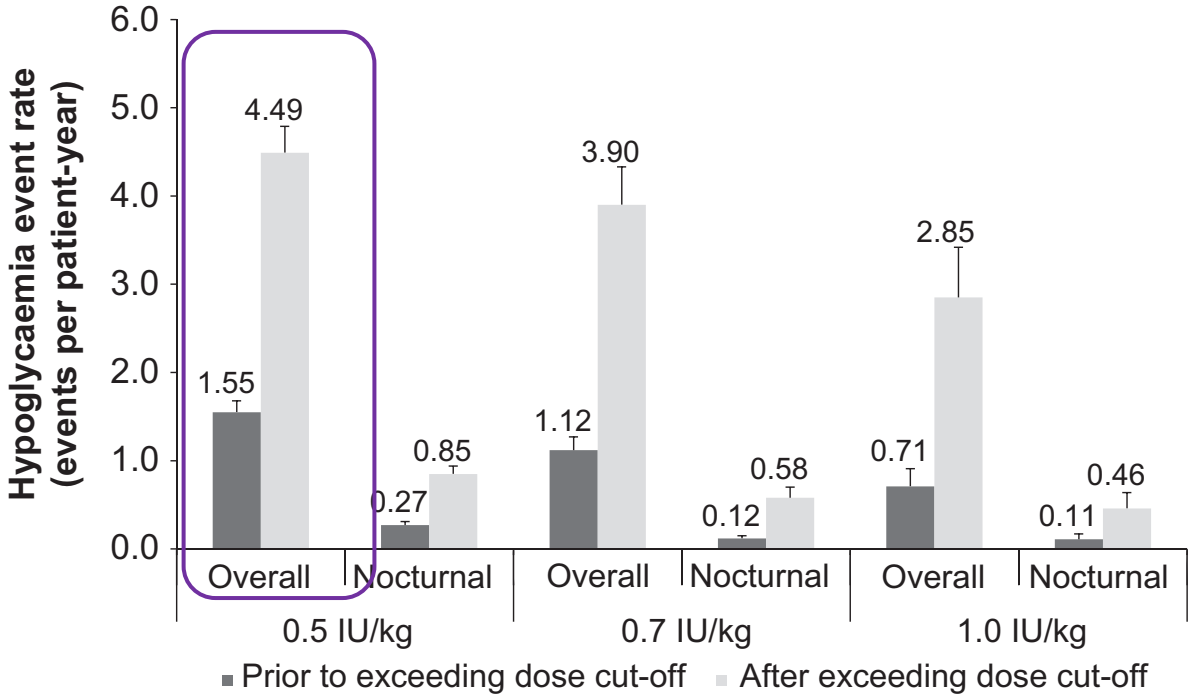
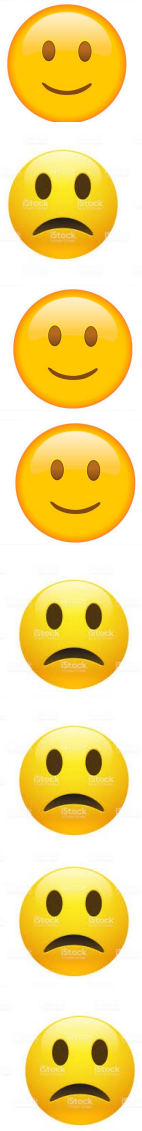




❑ Int J Clin Pract, January 2016, 70, 1, 56–65

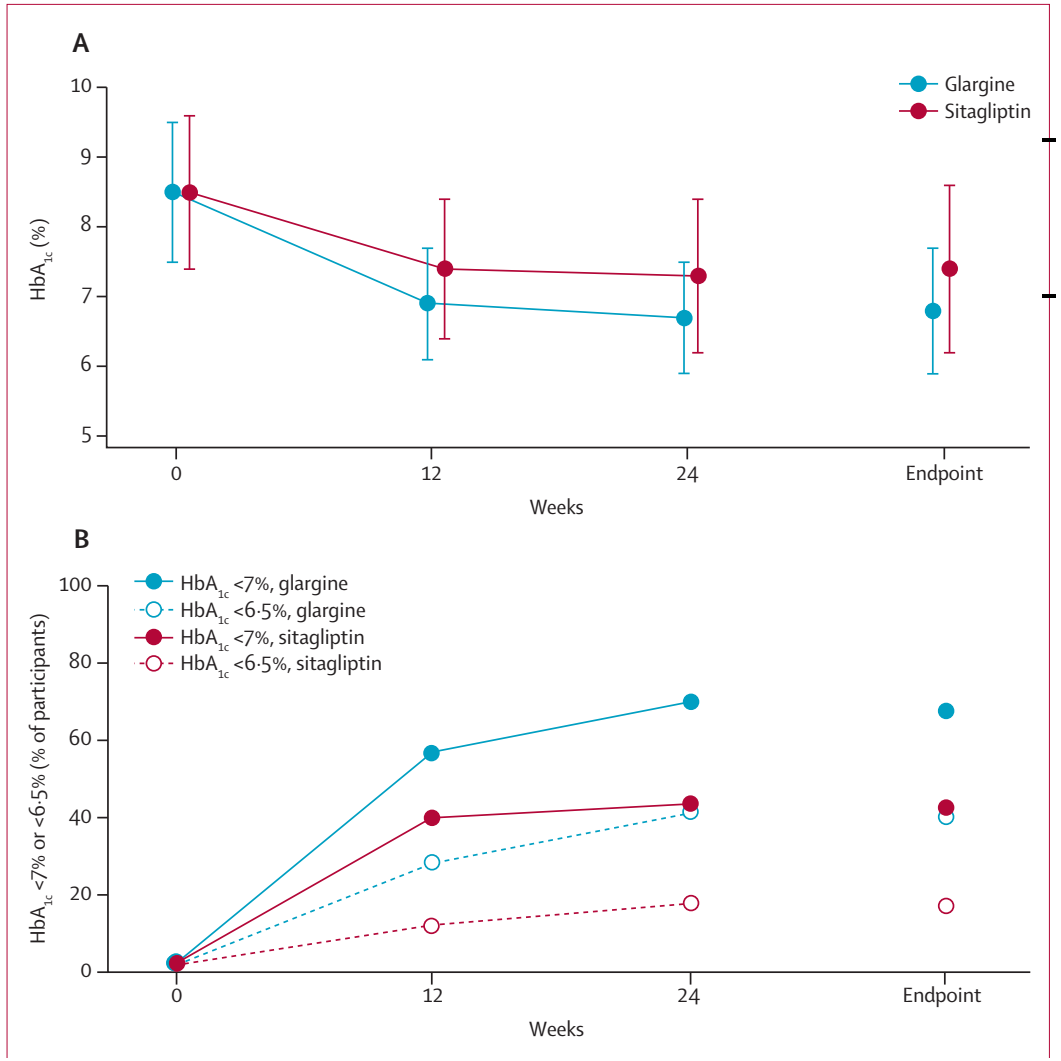
INSULINA



PESO

Insulin glargine versus sitagliptin in insulin-naive patients with type 2 diabetes mellitus uncontrolled on metformin (EASIE): a multicentre, randomised open-label trial

Pablo Aschner, Juliana Chan*, David R Owens, Sylvie Picard, Edward Wang, Marie-Paule Dain, Valérie Pilorget, Akram Echtay, Vivian Fonseca, on behalf of the EASIE investigators*



-1.13%

-1.72%

1.6 x

2.5 x

❑ The Lancet PublishedonlineJune9,2012 DOI:10.1016/S0140-6736(12)60439-5

0.5 x 0.5

"El control glucemico se alcanzó con 0.5 U/Kg y con tan solo una ganancia de peso de 0.5 Kg"

- The Lancet PublishedonlineJune9,2012 DOI:10.1016/S0140-6736(12)60439-5

- **Lo que deberíamos aprender de la Insulina**

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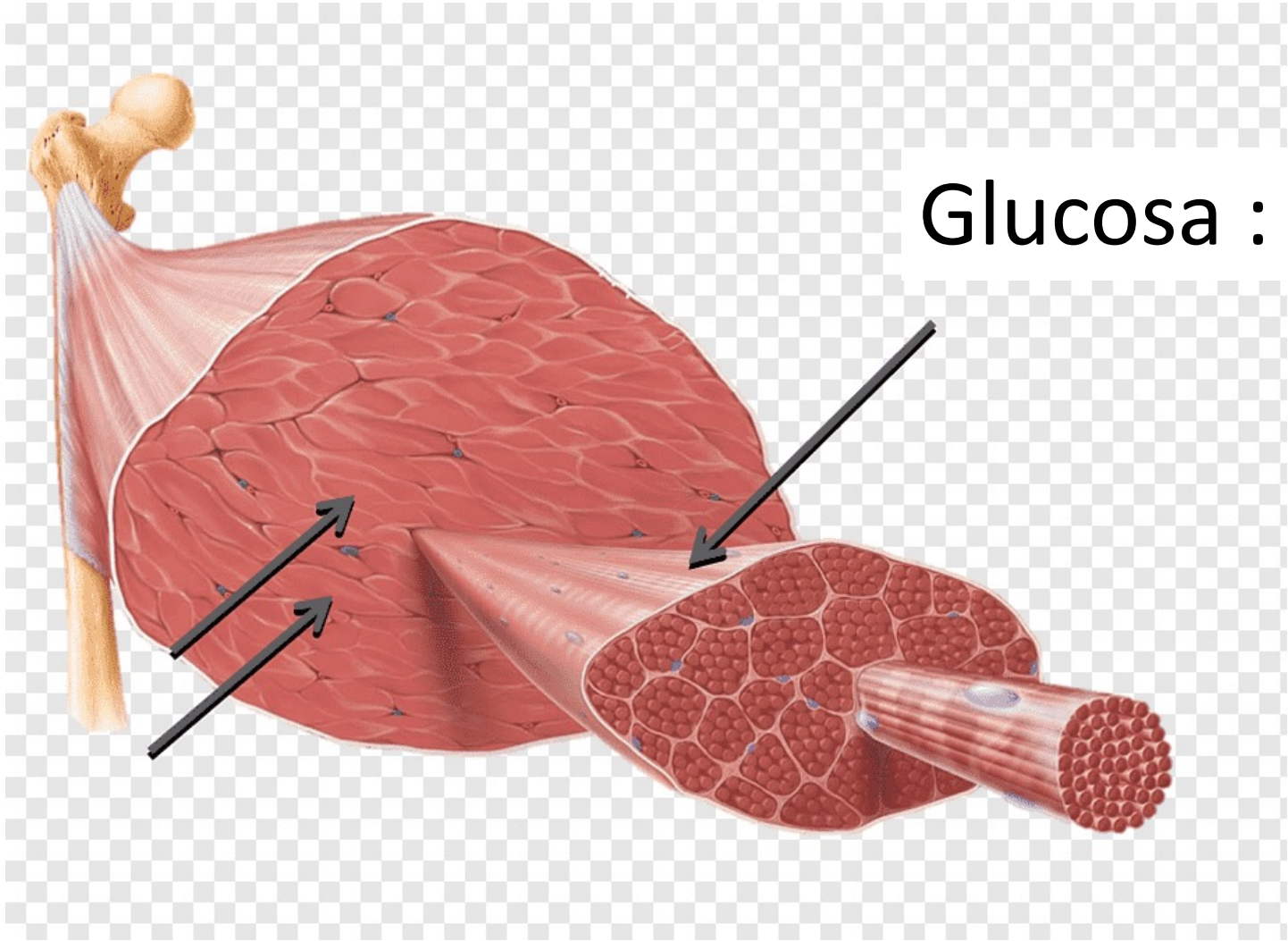


Glucosa : 80%

The Effect of Graded Doses of Insulin on Total Glucose Uptake, Glucose Oxidation, and Glucose Storage in Man

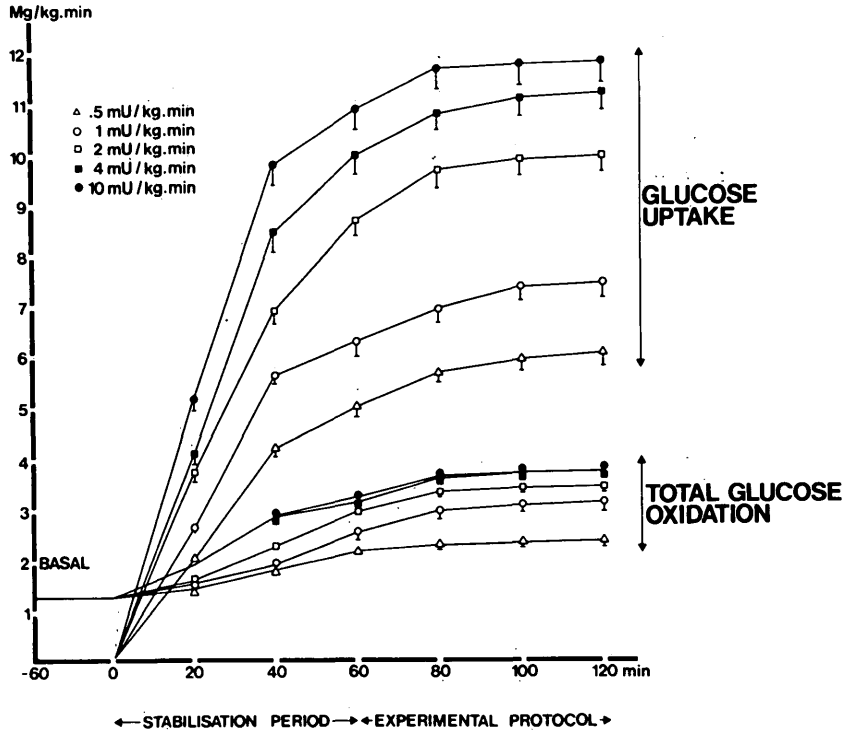
DANIEL THIEBAUD, ERIC JACOT, RALPH A. DeFRONZO, EVELYNE MAEDER, ERIC JEQUIER, AND JEAN-PIERRE FELBER

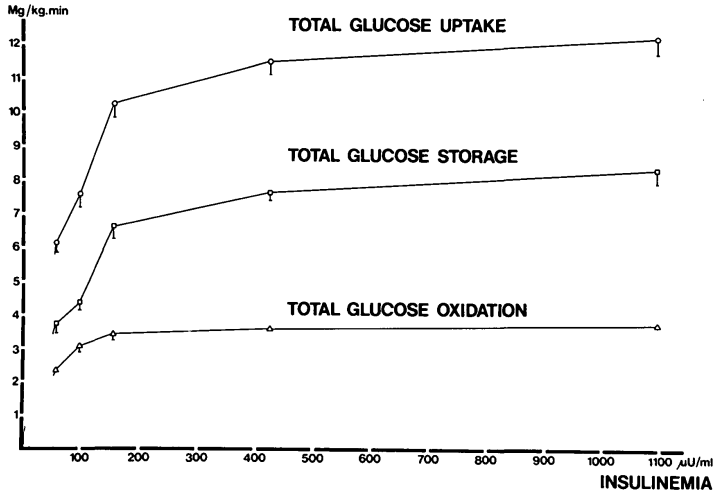
DIABETES, VOL. 31, NOVEMBER 1982

80%

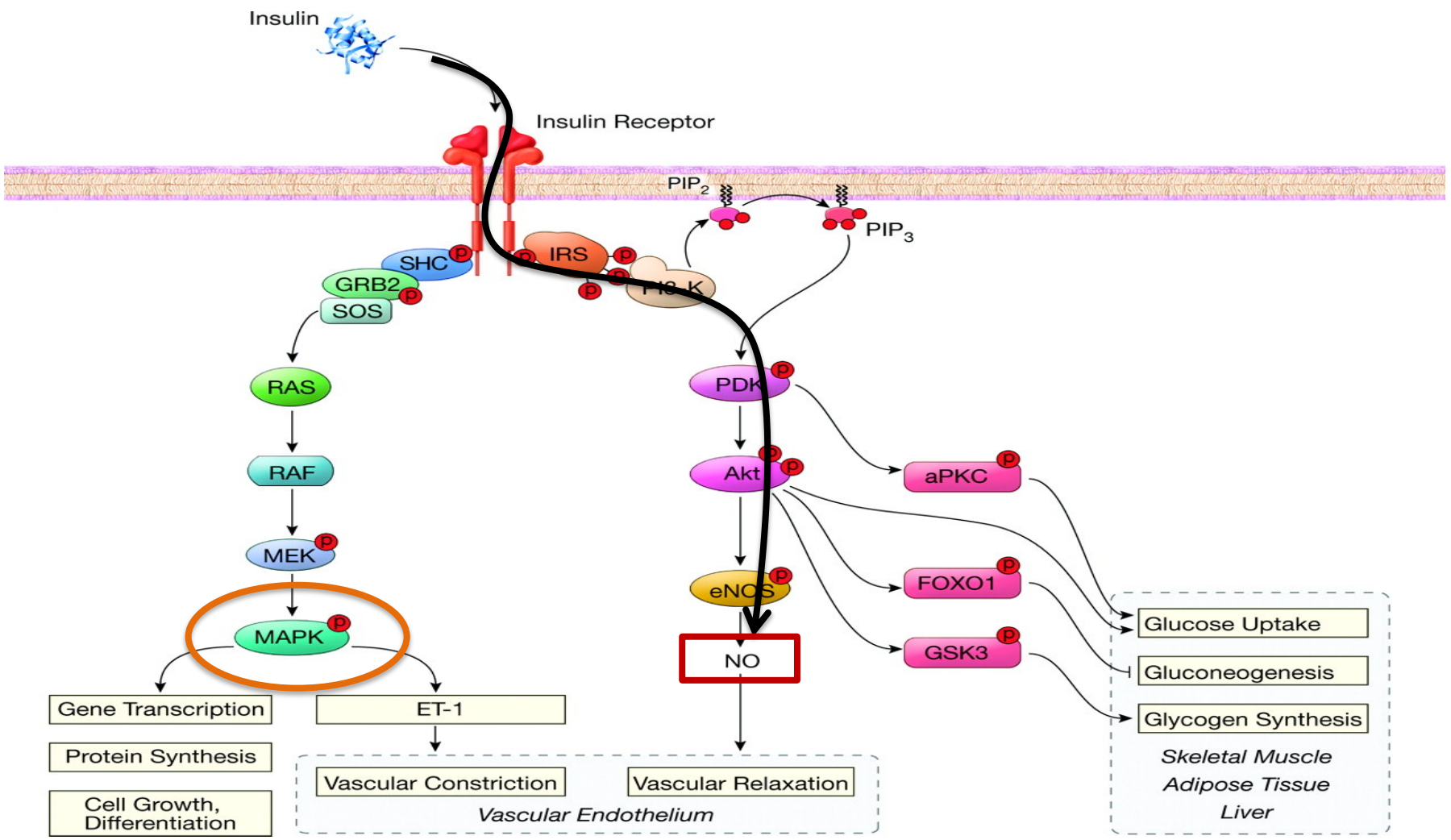
Lipid stores are large and potentially inexhaustible.

Carbohydrate
Skeletal muscle, 300–500 g of glycogen in
Liver 60–100 g of glycogen
Glucose 4–5 g of glucose circulating in the

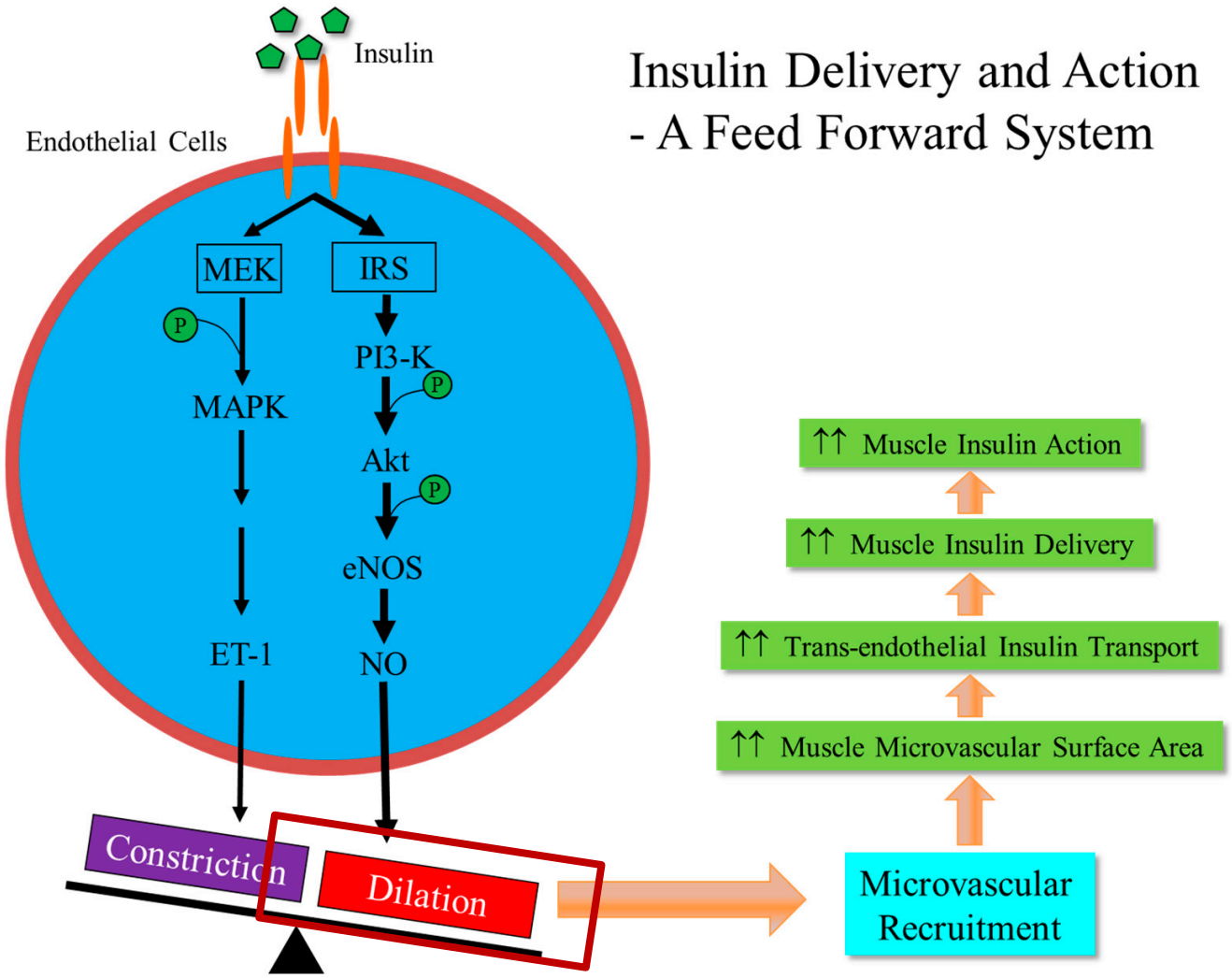




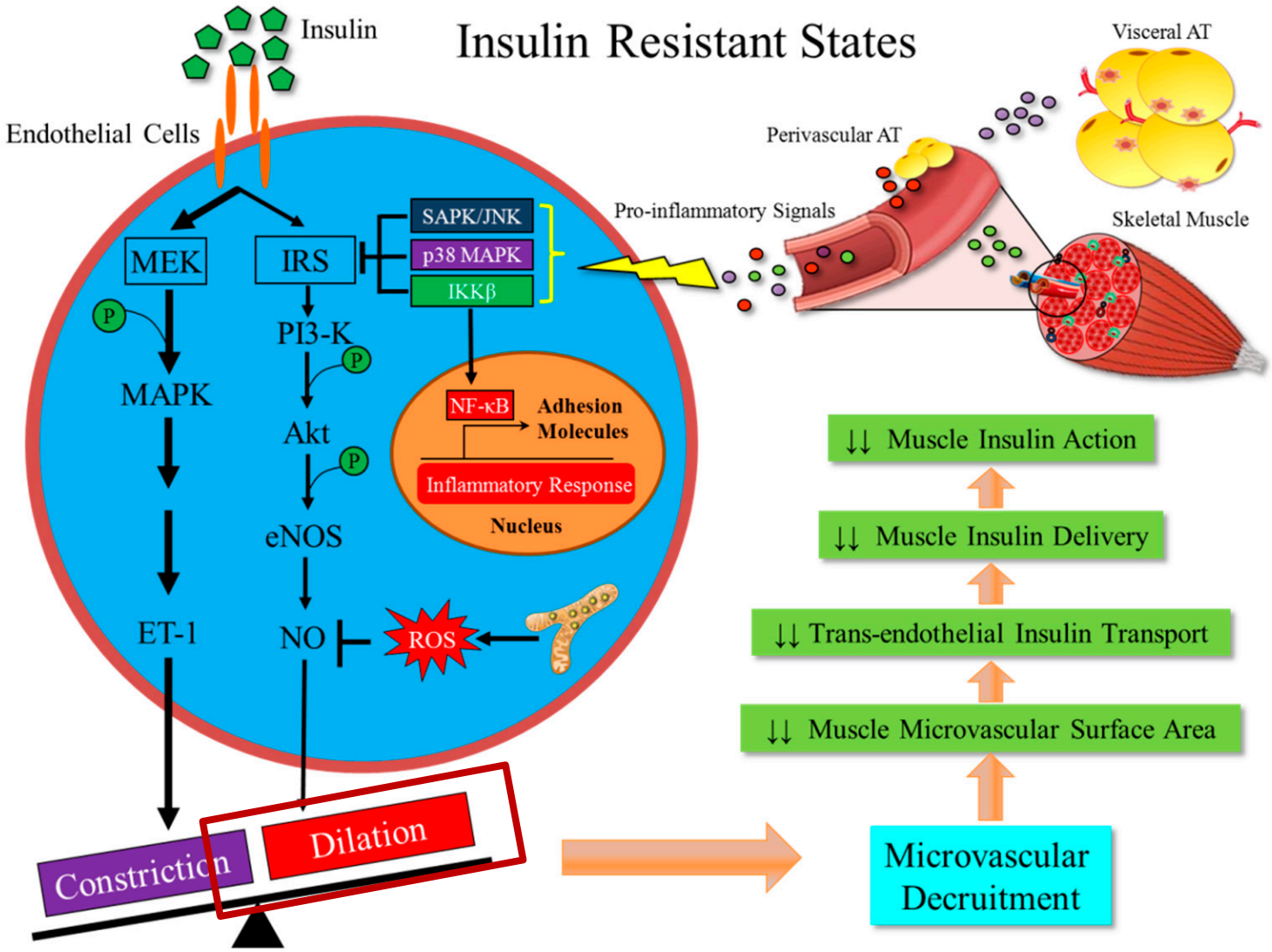
General features of insulin signal transduction pathways



Muniyappa, R. et al. Endocr Rev 2007;28:463-491



Int. J. Mol. Sci. **2019**, 20, 562



Int. J. Mol. Sci. **2019**, 20, 562

Review

Am J Physiol Endocrinol Metab 295: E732–E750, 2008.
First published July 8, 2008; doi:10.1152/ajpendo.90477.2008.

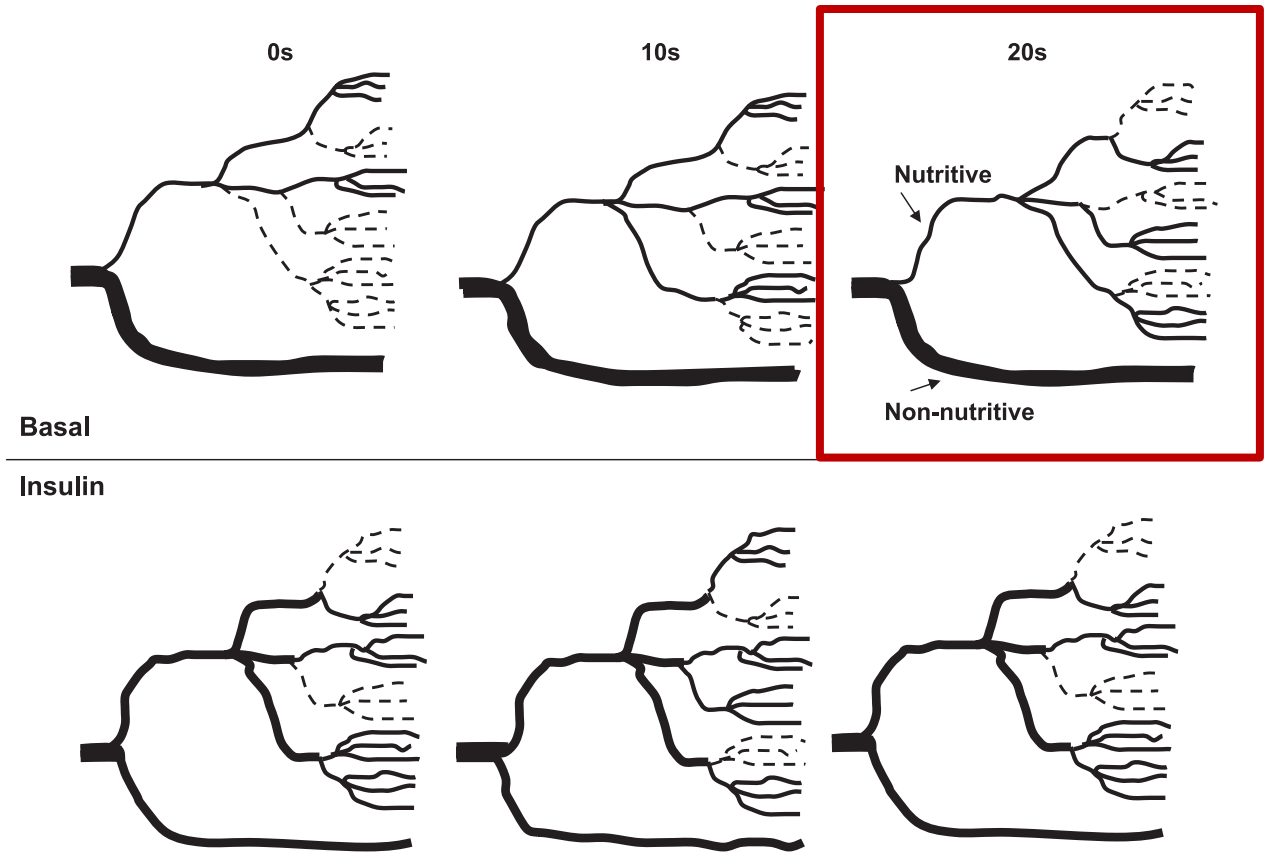
HISTORICAL PERSPECTIVE

Impaired microvascular perfusion: a consequence of vascular dysfunction and a potential cause of insulin resistance in muscle

Michael G. Clark
Menzies Research Institute, University of Tasmania, Hobart, Australia

Submitted 29 May 2008; accepted in final form 7 July 2008

Fig. 1. Proposed schematic blood flow patterns in muscle in vivo under basal conditions and following a physiological rise in plasma insulin



Am J Physiol Endocrinol Metab 295: E732-E750, 2008.

AJP - Endocrinology and Metabolism

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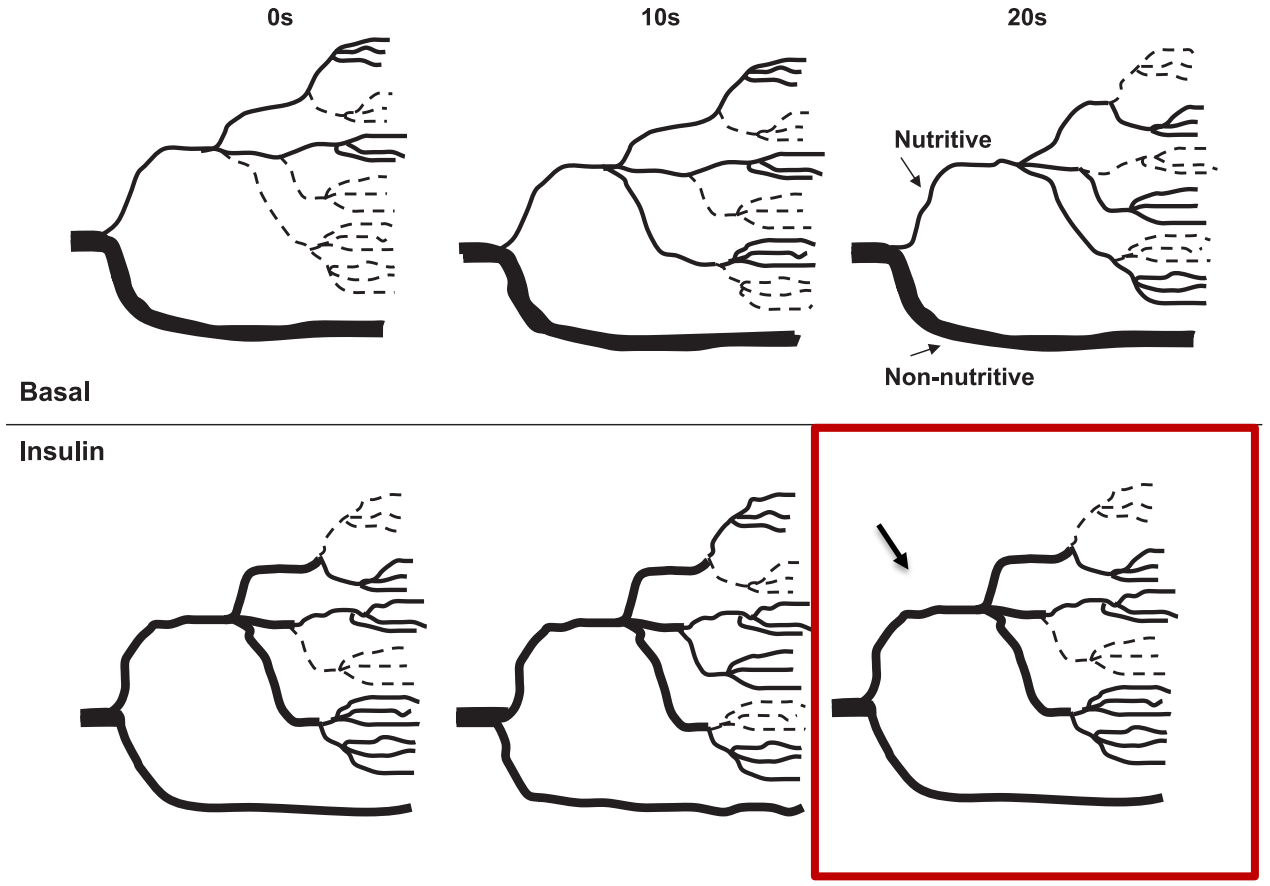

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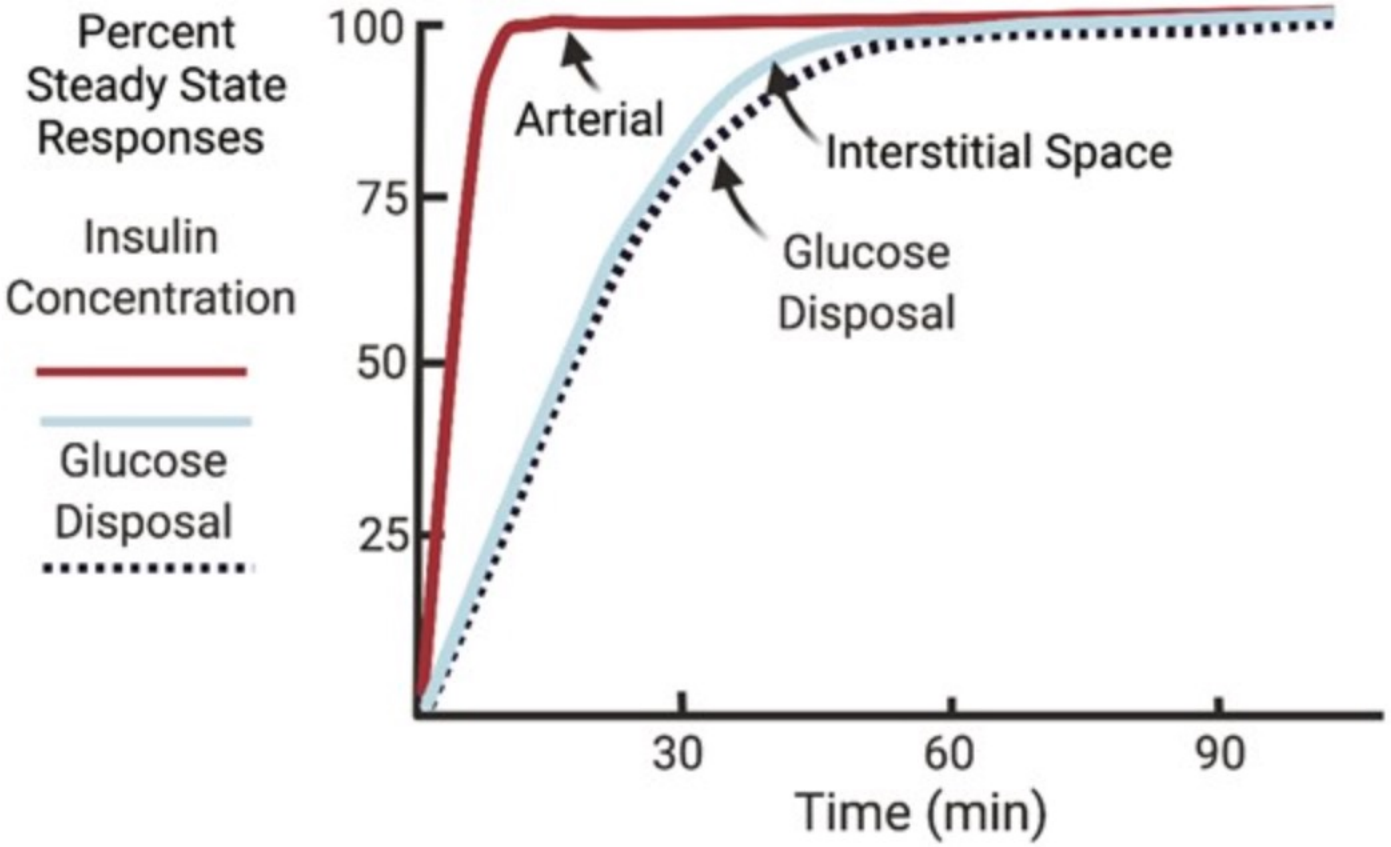
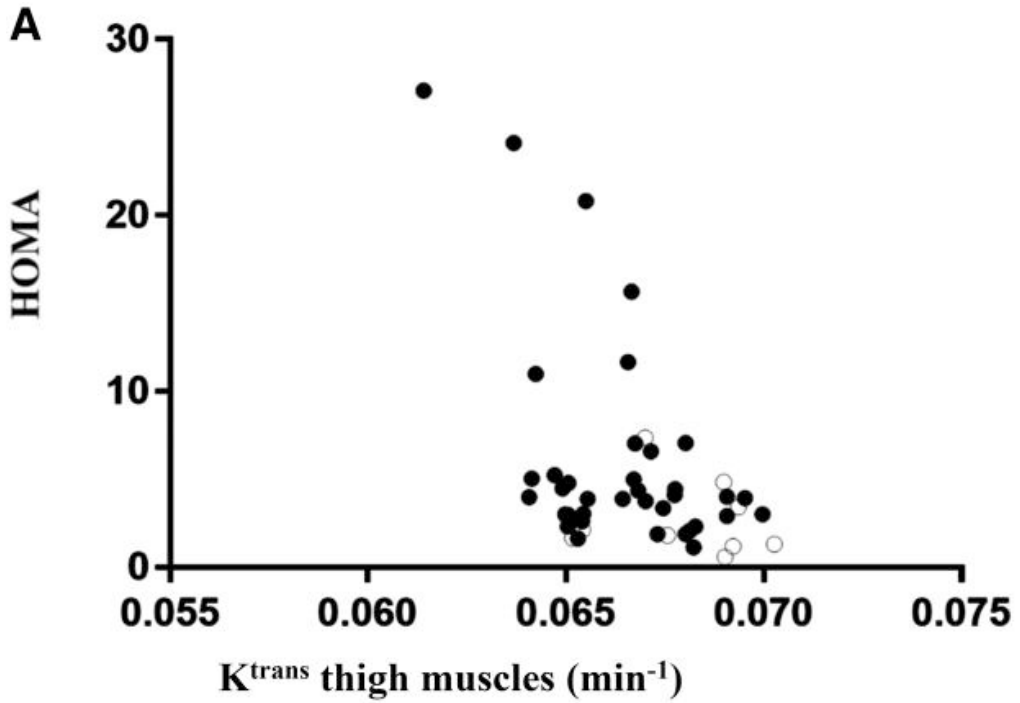


Endocrinology, Volume 163, Issue 2, February 2022, bqab252,

The Journal of Clinical Endocrinology & Metabolism, 2024, **109**, e137–e144
https://doi.org/10.1210/clinem/dgad481
Advance access publication 15 August 2023
Clinical Research Article

Insulin Resistance Is Associated With Reduced Capillary Permeability of Thigh Muscles in Patients With Type 2 Diabetes

Correlation analysis of the thigh muscles' constant of **permeability** (Ktrans) with HOMA index

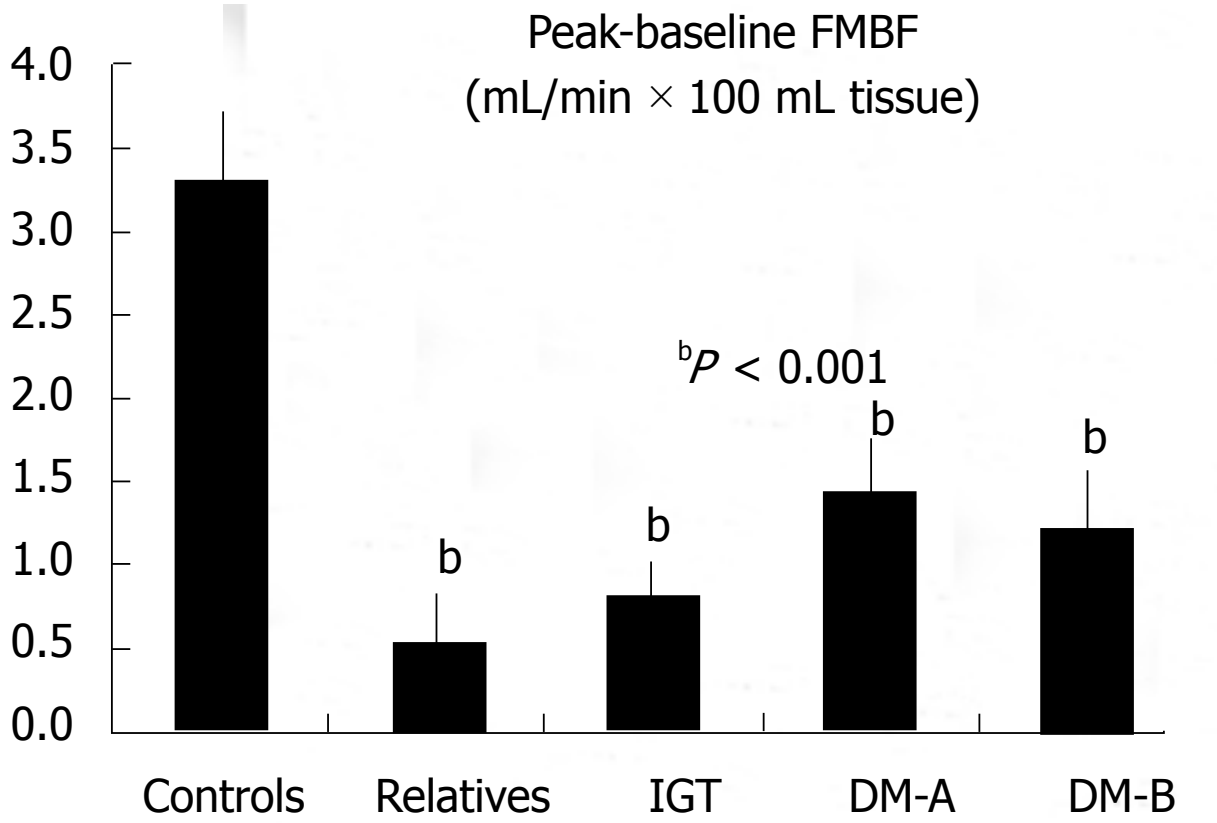


r = –0.37;
p = 0.011,

The Journal of Clinical Endocrinology & Metabolism, 2024, **109**, e137–e144
https://doi.org/10.1210/clinem/dgad481
Advance access publication 15 August 2023
Clinical Research Article

Insulin Resistance Is Associated With Reduced Capillary Permeability of Thigh Muscles in Patients With Type 2 Diabetes

Forearm muscle blood flow peak-baseline



Received: 20 February 2020 | Revised: 24 March 2020 | Accepted: 31 March 2020
DOI: 10.1111/1753-0407.13045

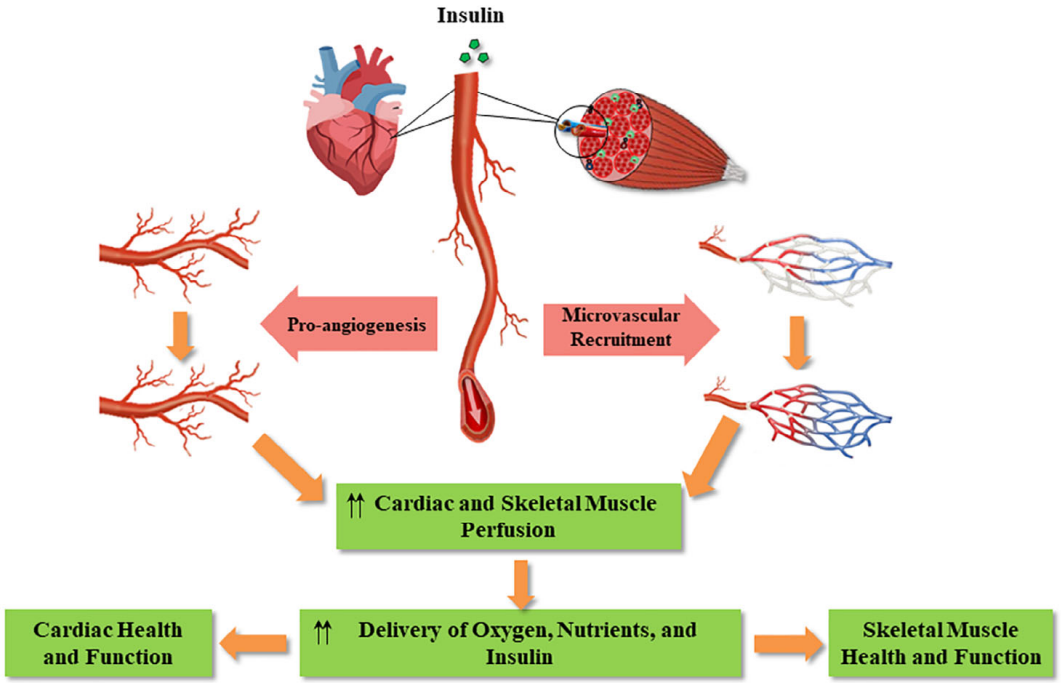
REVIEW ARTICLE

Journal of Diabetes WILEY

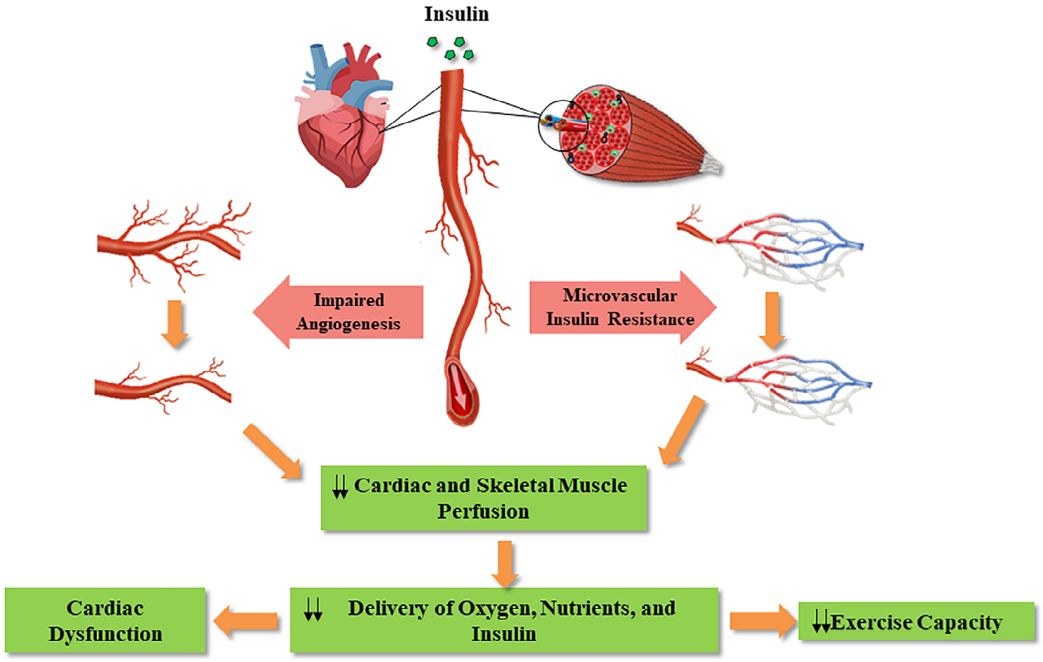
GLP-1 and insulin regulation of skeletal and cardiac muscle microvascular perfusion in type 2 diabetes

Kaitlin M. Love[1] | Jia Liu[1] | Judith G. Regensteiner[2,3] | Jane E.B. Reusch[2,3,4] | Zhenqi Liu[1]

Insulino Sensible



Insulino Resistente



Journal of Diabetes. 2020;12:488–498.

Received: 20 February 2020 | Revised: 24 March 2020 | Accepted: 31 March 2020
DOI: 10.1111/1753-0407.13045

REVIEW ARTICLE

Journal of Diabetes WILEY

GLP-1 and insulin regulation of skeletal and cardiac muscle microvascular perfusion in type 2 diabetes

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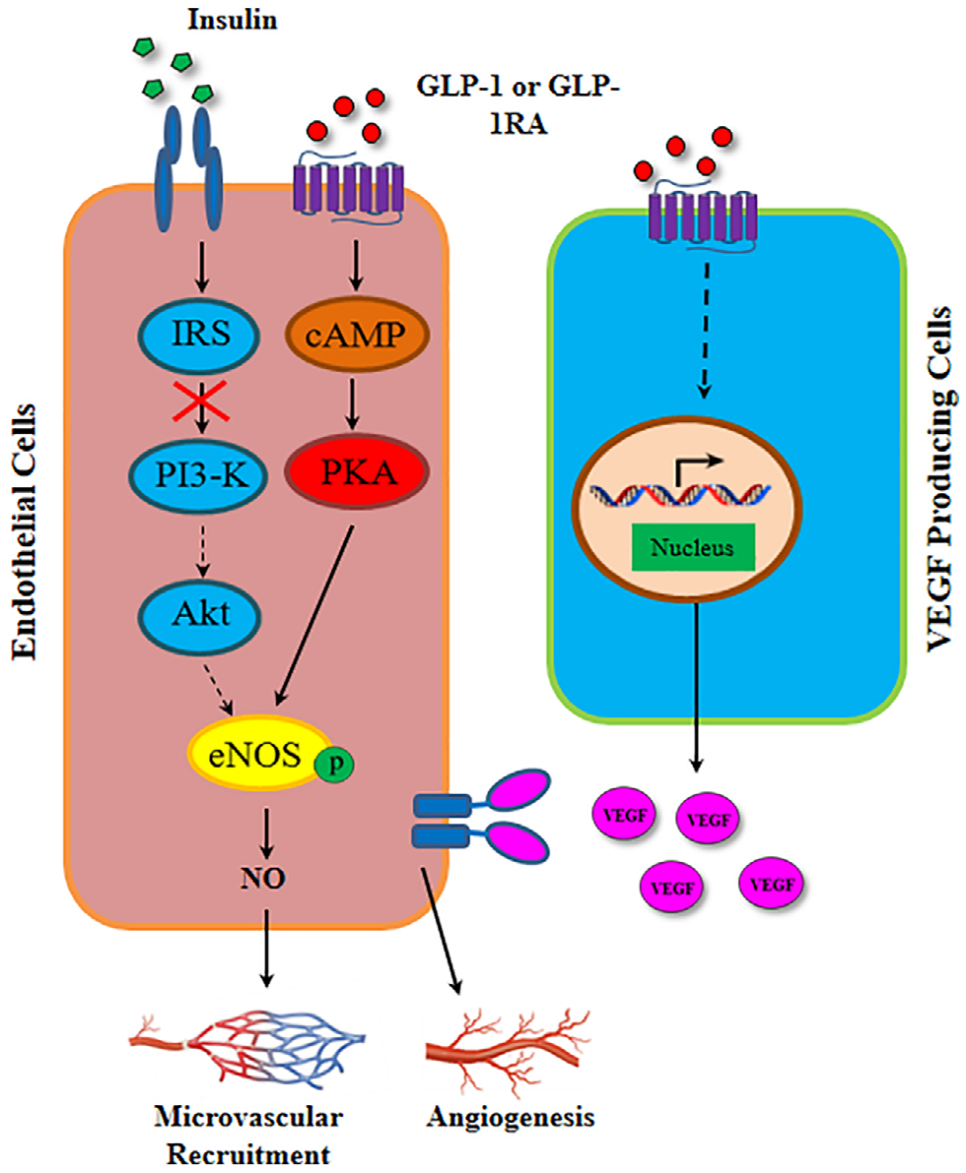


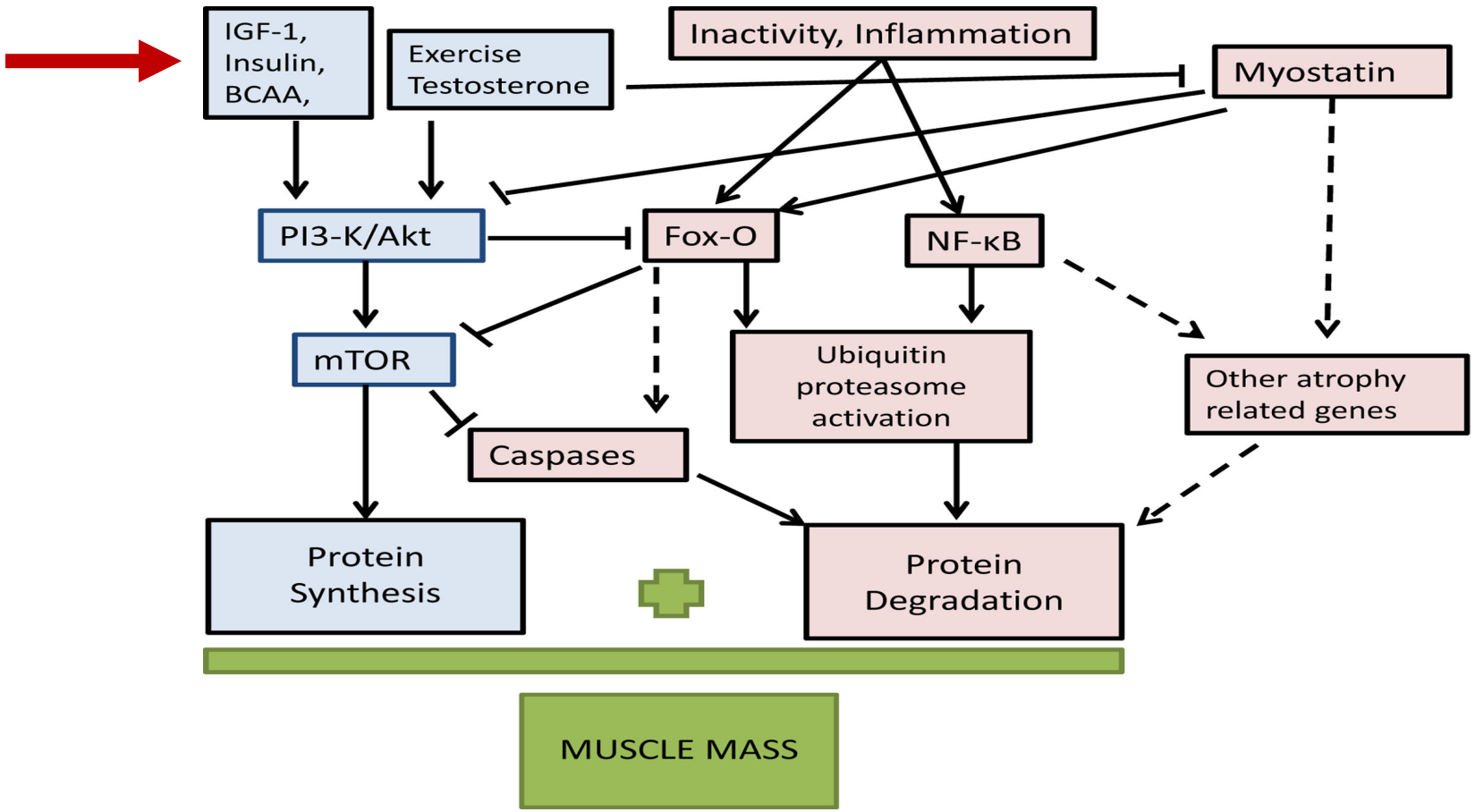
Journal of Diabetes. 2020;12:488–498.

Insulin Glargine is More Suitable Than Exenatide in Preventing Muscle Loss in Non-Obese Type 2 Diabetic Patients with NAFLD

▶ **Table 2** Interaction between changes in the Psoas Muscle Area (PMA) among subgroups.

		Unadjusted			Adjusted *		
		Changes of PMA (mm^2) β (95 %CI)	*P* value	Interaction test *P* value	Changes of PMA (mm^2) β (95 %CI)	*P* value	Interaction test *P* value
Insulin Glargine vs. Exenatide							
Total		178.54 (–99.98, 457.07)	0.214		202.39 (–76.34, 481.12)	0.16	
	Male	298.92 (–214.97, 812.81)	0.263	0.362	368.48 (–128.99, 865.95)	0.158	0.189
	Female	44.91 (–123.45, 213.27)	0.605		11.22 (–169.41, 191.84)	0.904	
	Age < 60 y	208.73 (–133.59, 551.06)	0.238	0.758	185.43 (–131.85, 502.72)	0.258	0.963
	Age ≥ 60 y	99.04 (–164.34, 362.42)	0.477		144.83 (–114.57, 404.23)	0.316	
	BMI < 28 kg/m^2	403.04 (–17.43, 823.51)	0.069	0.038	560.64 (77.88, 1043.40)	0.031	0.009
	BMI ≥ 28 kg/m^2	–112.92 (–466.65, 240.80)	0.537		–114.21 (–467.10, 238.68)	0.532	

* adjusted for baseline PMA, age, sex and center, if appropriate; PMA: posas muscle area; BMI: body mass index.



JAMA Network Open. 2021;4(1):e2033457. doi:10.1001/jamanetworkopen.2020.33457

The International Journal of Biochemistry & Cell Biology 45 (2013) 2239–2244

Contents lists available at ScienceDirect

The International Journal of Biochemistry & Cell Biology

journal homepage: www.elsevier.com/locate/biocel

Review

The regulation of muscle protein turnover in diabetes☆

Biruh Workeneh, Mandeep Bajaj*

Baylor College of Medicine, 1709 Dryden, Suite 900, Houston, TX 77030, USA

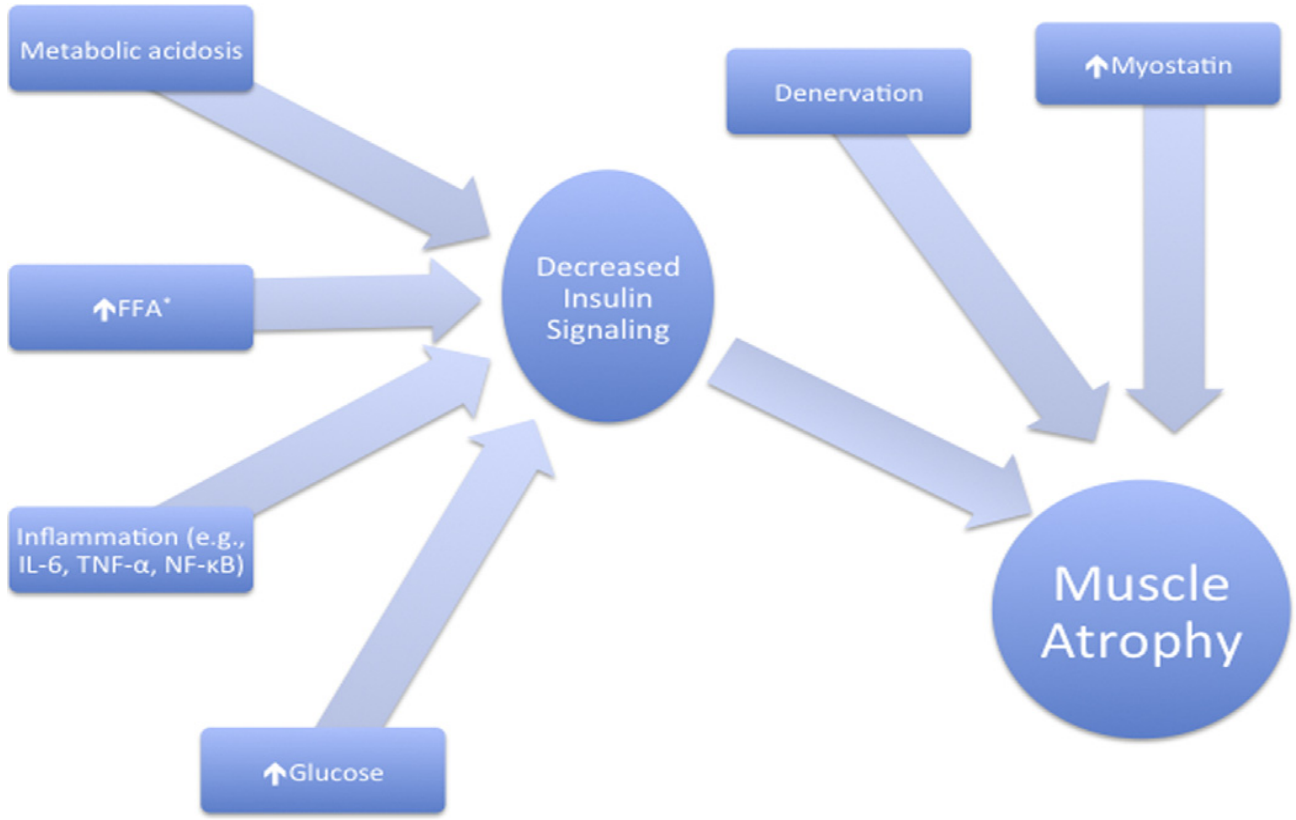


Fig. 1. This figure summarizes the major stimuli for muscle atrophy in type 2 diabetes. *FFA, free fatty acids.

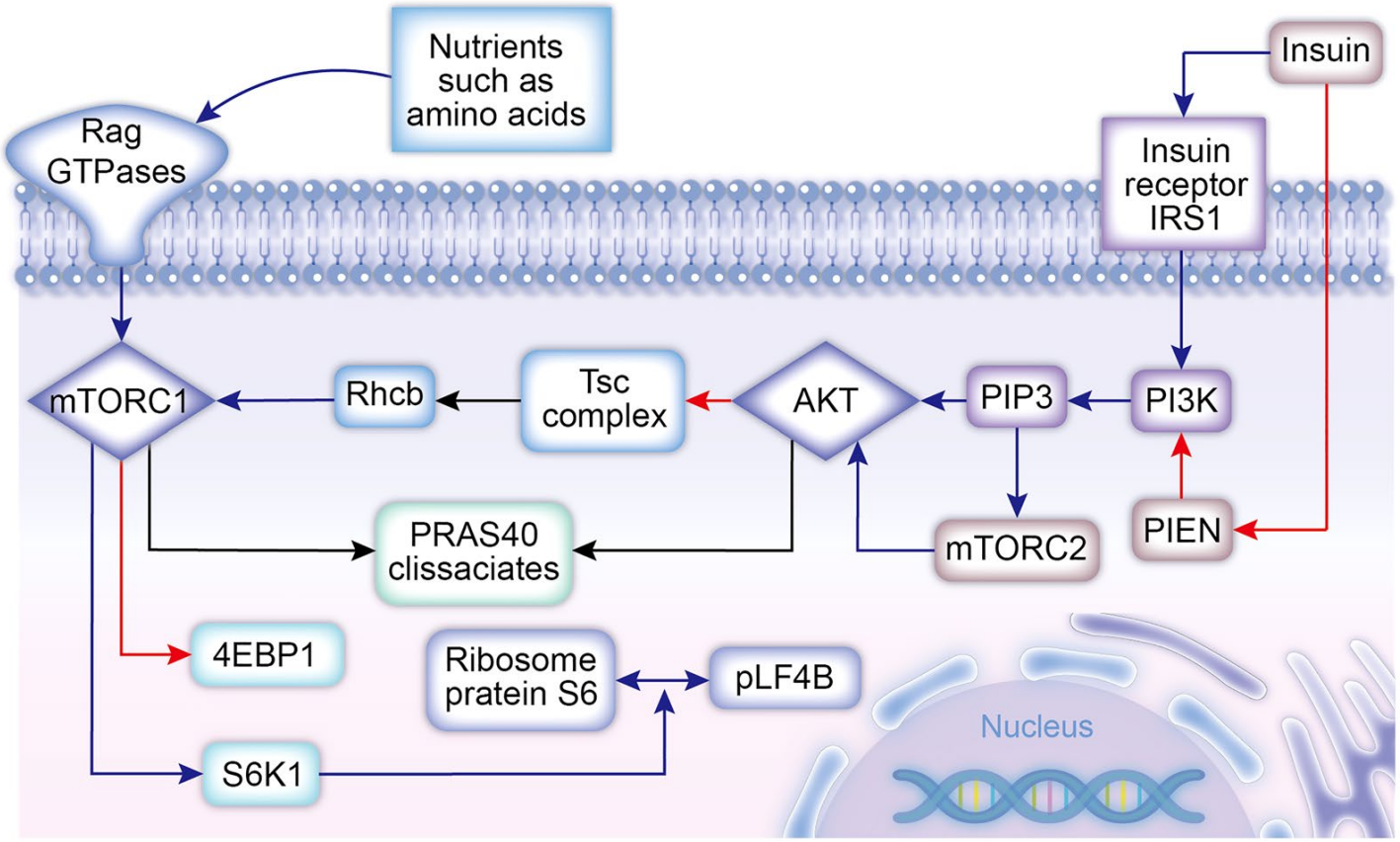
Liu and Zhu
Diabetology & Metabolic Syndrome (2023) 15:46
https://doi.org/10.1186/s13098-023-01022-z

Diabetology &
Metabolic Syndrome

REVIEW Open Access

Causal relationship between insulin resistance and sarcopenia

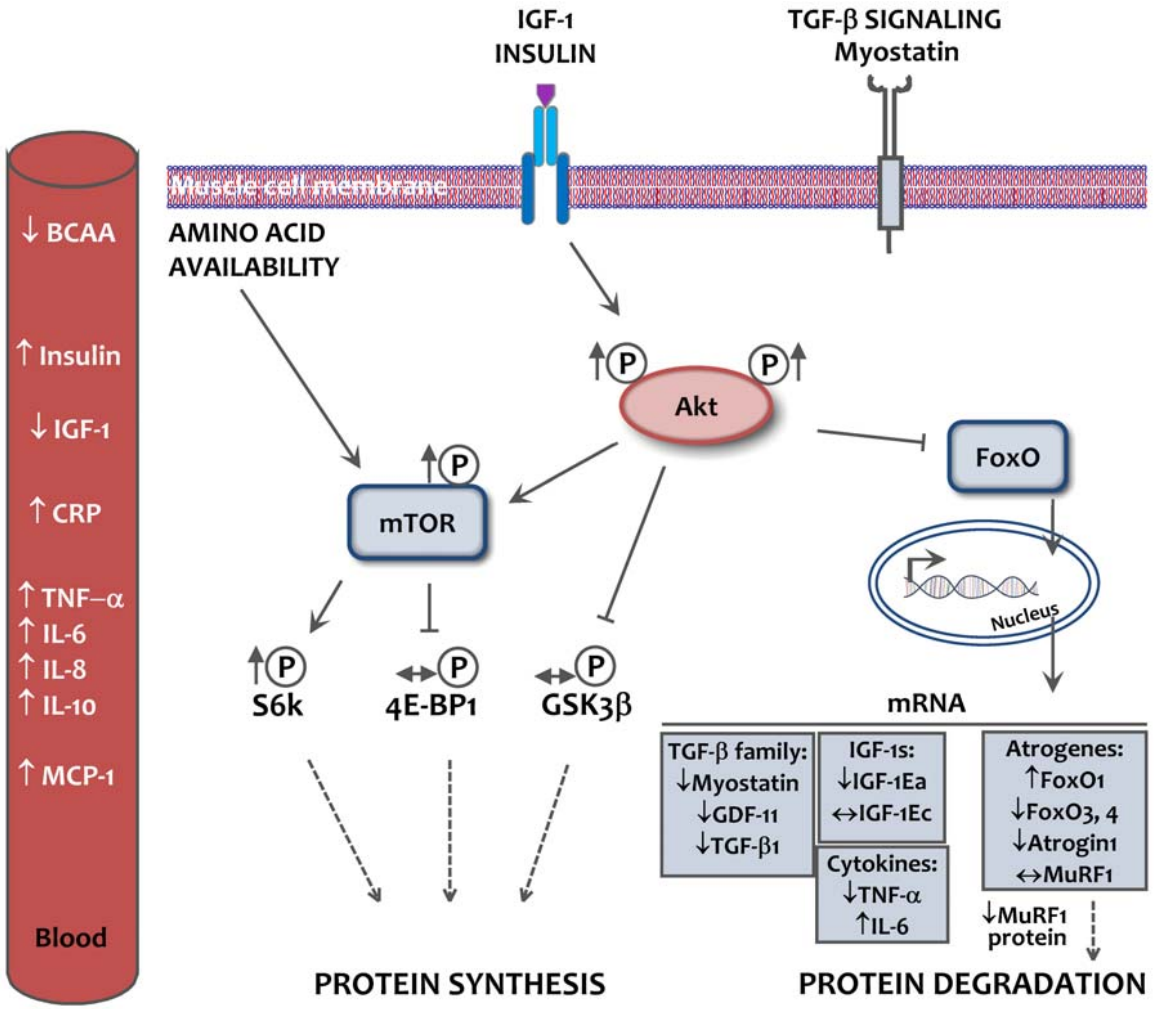
Zi-jian Liu[1] and Cui-feng Zhu[2*]



OPEN ACCESS Freely available online PLoS one

Activated Protein Synthesis and Suppressed Protein Breakdown Signaling in Skeletal Muscle of Critically Ill Patients

Jakob G. Jespersen[1]*, Anders Nedergaard[1], Søren Reitelseder[1], Ulla R. Mikkelsen[1], Kasper J. Dideriksen[1], Jakob Agergaard[1], Frederik Kreiner[2], Frank C. Pott[3], Peter Schjerling[1], Michael Kjaer[1]



Am J Physiol Endocrinol Metab. 2006 October ; 291(4): E745–E754. doi:10.1152/ajpendo.00271.2005.

Effect of insulin on human skeletal muscle protein synthesis is modulated by insulin-induced changes in muscle blood flow and amino acid availability

Satoshi Fujita[1,3], **Blake B. Rasmussen**[2,4], **Jerson G. Cadenas**[1,3], **James J. Grady**[5], and **Elena Volpi**[1,3]

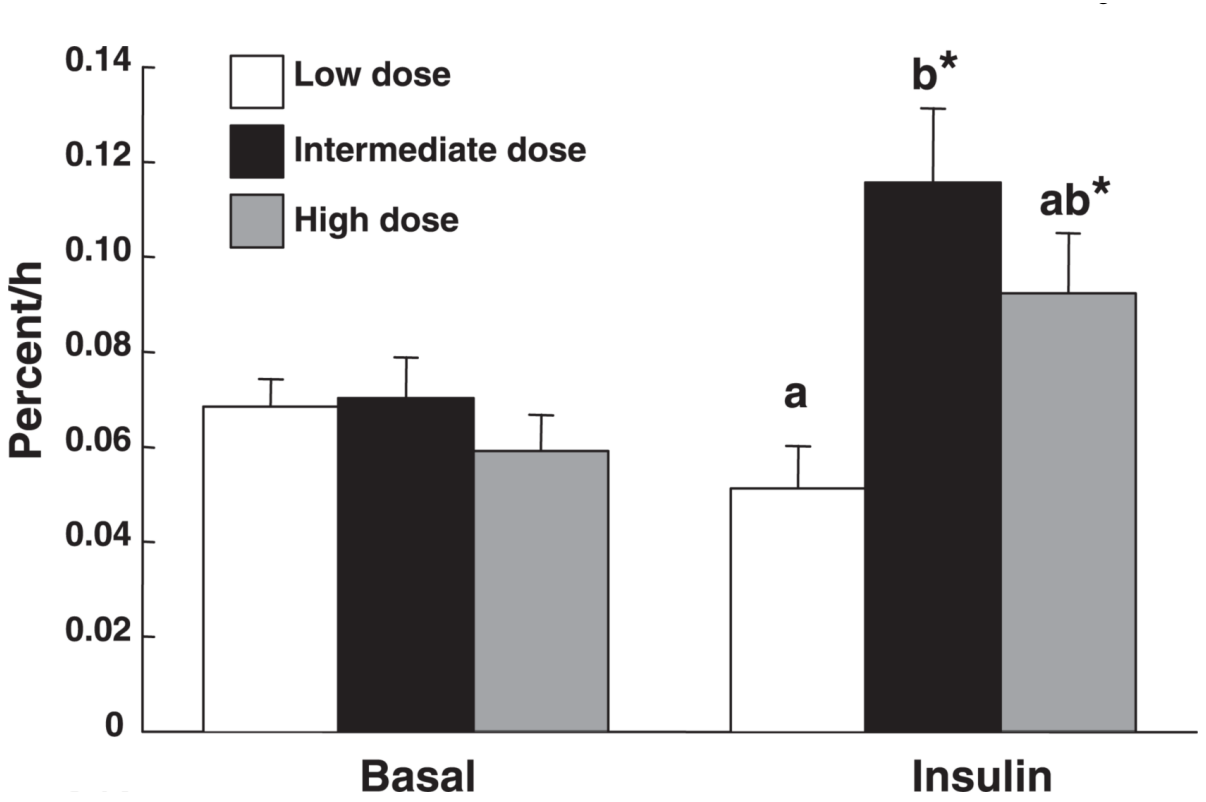
Table 1

Physical characteristics of the subjects

	LD	ID	HD	*P*
n	6	7	6	
Sex	4 M 2 F	3 M 4 F	4 M 2 F	0.60
Age, yr	29±3	25±2	28±2	0.51
Height, cm	169±5	169±4	170±2	0.99
Body weight, kg	72±7	63±6	74±5	0.44
Body mass index, kg/m^2	25±2	22±1	26±2	0.19
Fat-free mass, kg	50±4	45±5	54±3	0.30
Fat mass, kg	18±4	11±1	17±3	0.21
Leg volume, liters	9.5±1.1	8.4±5.9	9.9±3.5	0.33
Leg muscle mass, kg	8.6±8.9	7.3±8.9	9.9±3.3	0.21

Values are means ± SE. Subjects were randomized to 3 groups receiving a low (LD), intermediate (ID), or high dose (HD) insulin infusion. *P*, significance level for differences between groups.

Muscle protein fractional synthetic rates



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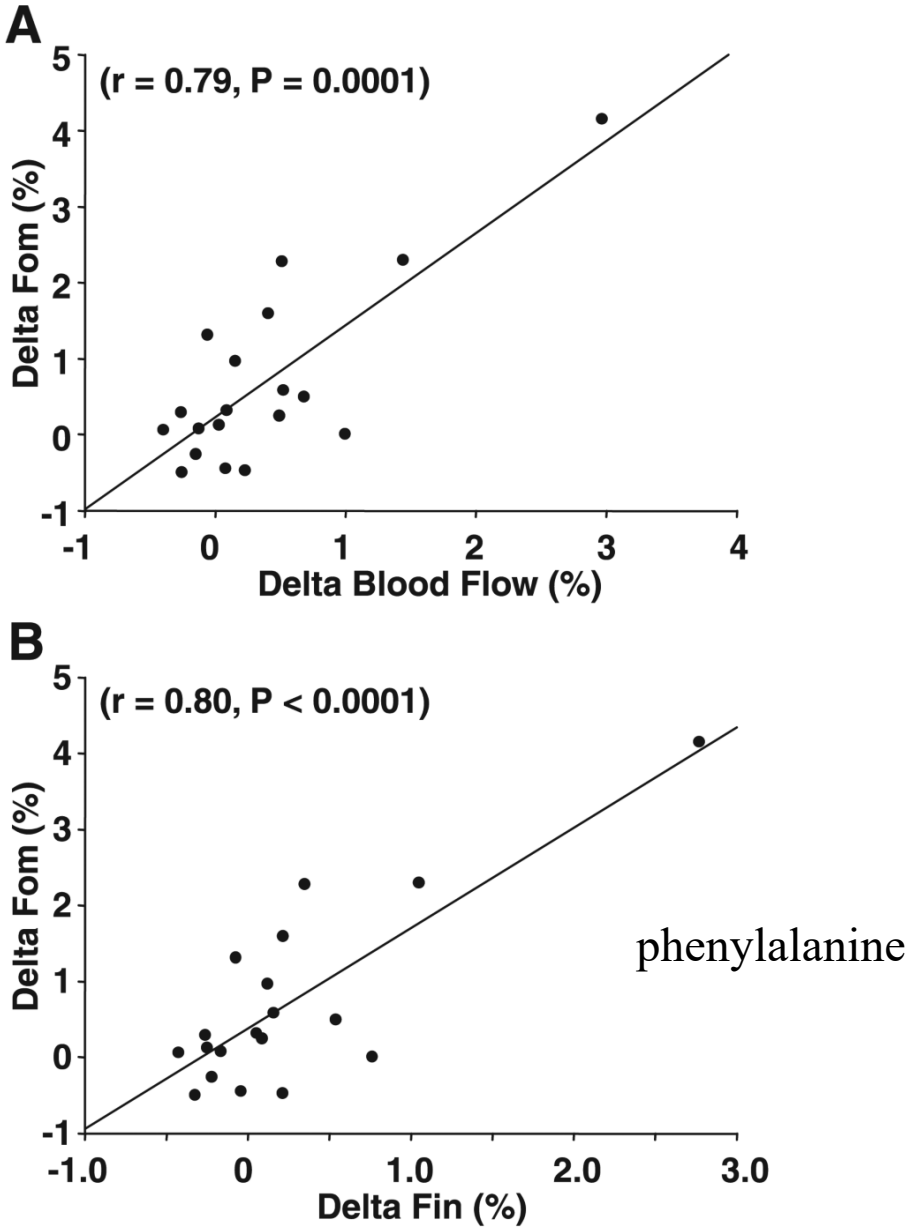
Síntesis muscular



phenylalanine

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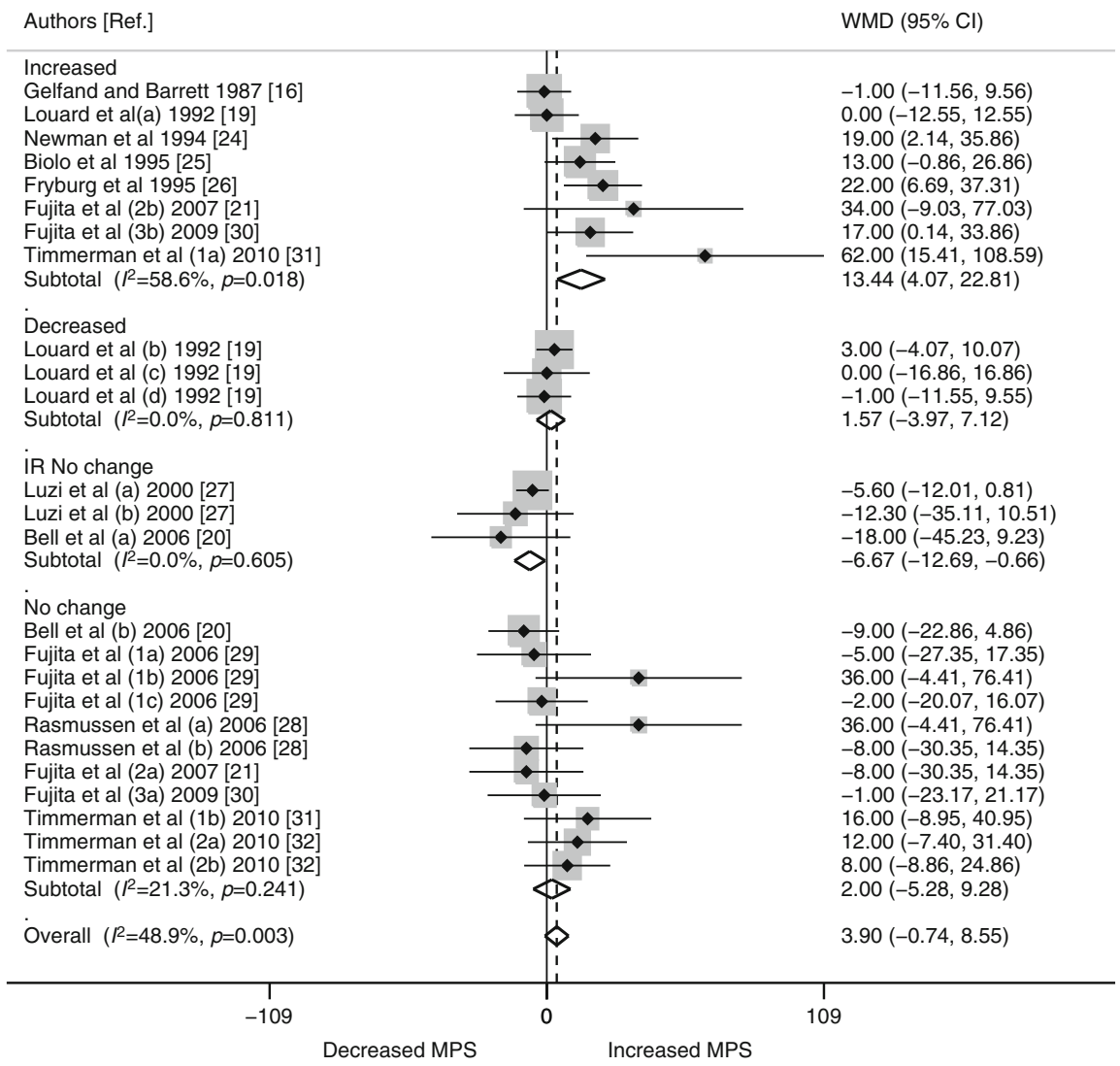
Muscle Protein Synthesis (MPS)

Diabetologia (2016) 59:44–55
DOI 10.1007/s00125-015-3751-0

META-ANALYSIS

Role of insulin in the regulation of human skeletal muscle protein synthesis and breakdown: a systematic review and meta-analysis

Haitham Abdulla[1] · Kenneth Smith[1] · Philip J. Atherton[1] · Iskandar Idris[1]



Diabetologia (2016) 59:44–55

Muscle Protein Synthesis (MPS)

Con disponibilidad de a.a.

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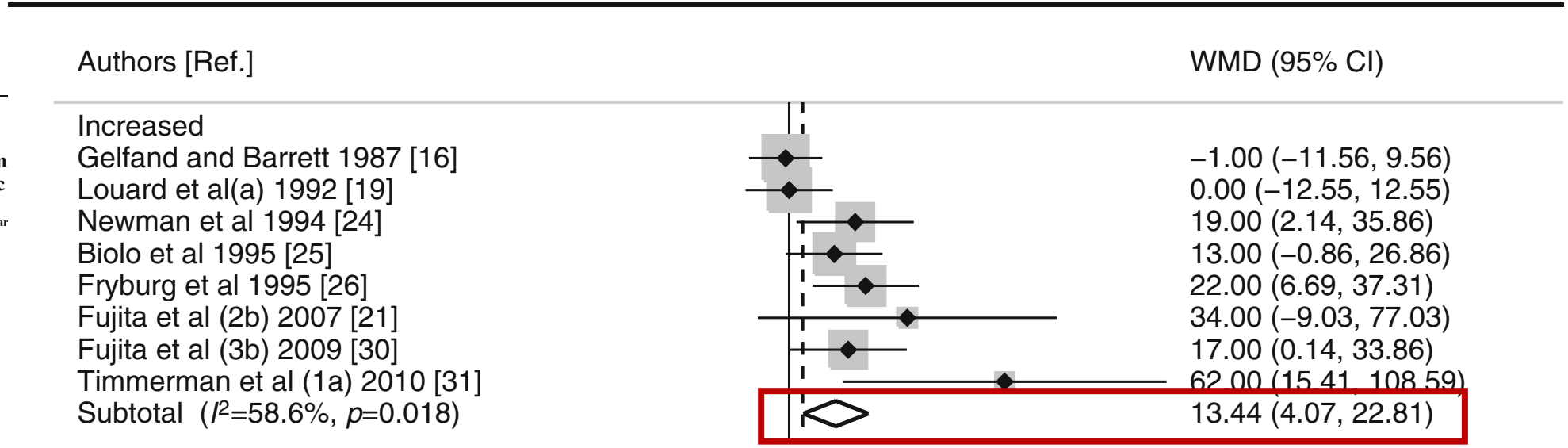

Diabetologia (2016) 59:44–55

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Muscle Protein Break- down (MPB)

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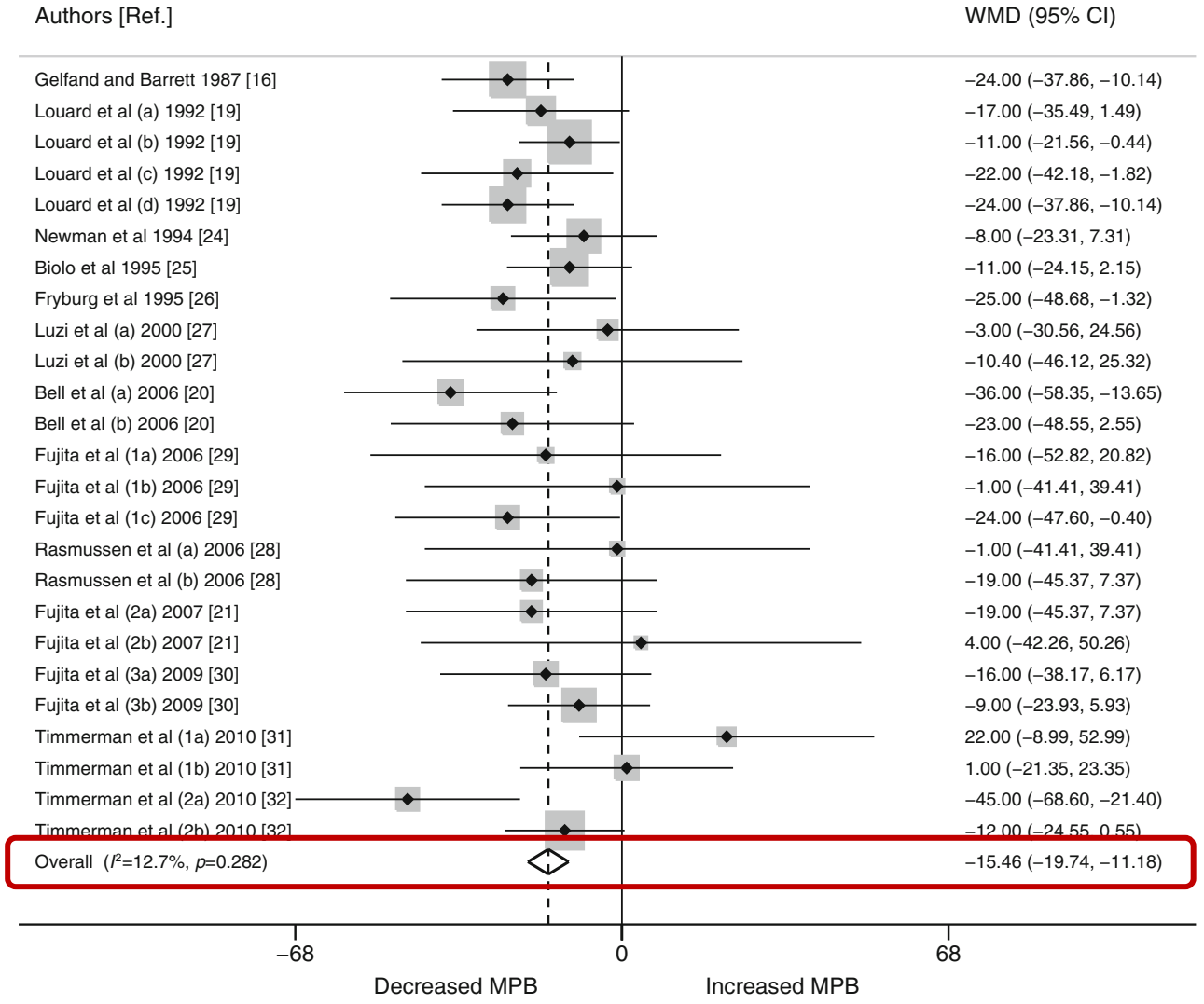

-15.46 nmol/100 ml volumen de pierna/min

-15.46 nmol menos de aminoácidos que salen de cada 100 ml de musculo, cada miniuto

Diabetologia (2016) 59:44–55

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- Sin insulina:
  → el músculo “pierde” aminoácidos constantemente
- Con insulina:
  → esa fuga baja en ~15–20%

👉 No construyes más músculo, pero **pierdes menos cada minuto**

-15.46 nmol/100 ml volumen de pierna/min

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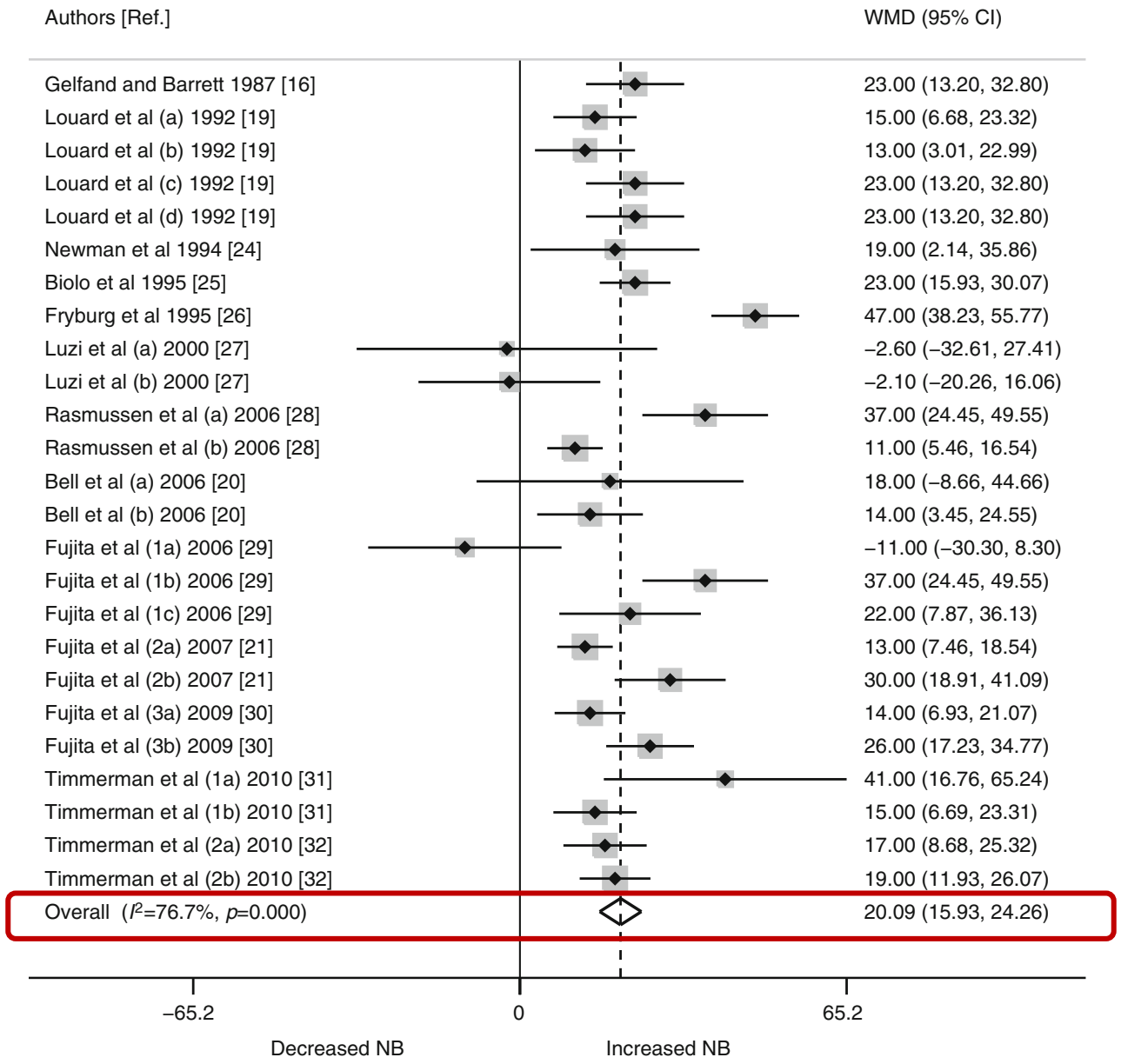

A pesar de su efecto variable sobre la síntesis, la insulina aumenta significativamente el balance neto de proteínas musculares

20.09 nmol/100 ml volumen de pierna/min

Diabetologia (2016) 59:44–55

Estudios Clínicos

Skeletal Muscle Protein Anabolic Response to Increased Energy and Insulin Is Preserved in Poorly Controlled Type 2 Diabetes[1,2]

Jill A. Bell[*], **Elena Volpi**[†], **Satoshi Fujita**[†], **Jerson G. Cadenas**[†], **Melinda Sheffield-Moore**[‡], and **Blake B. Rasmussen**[*,**,3]

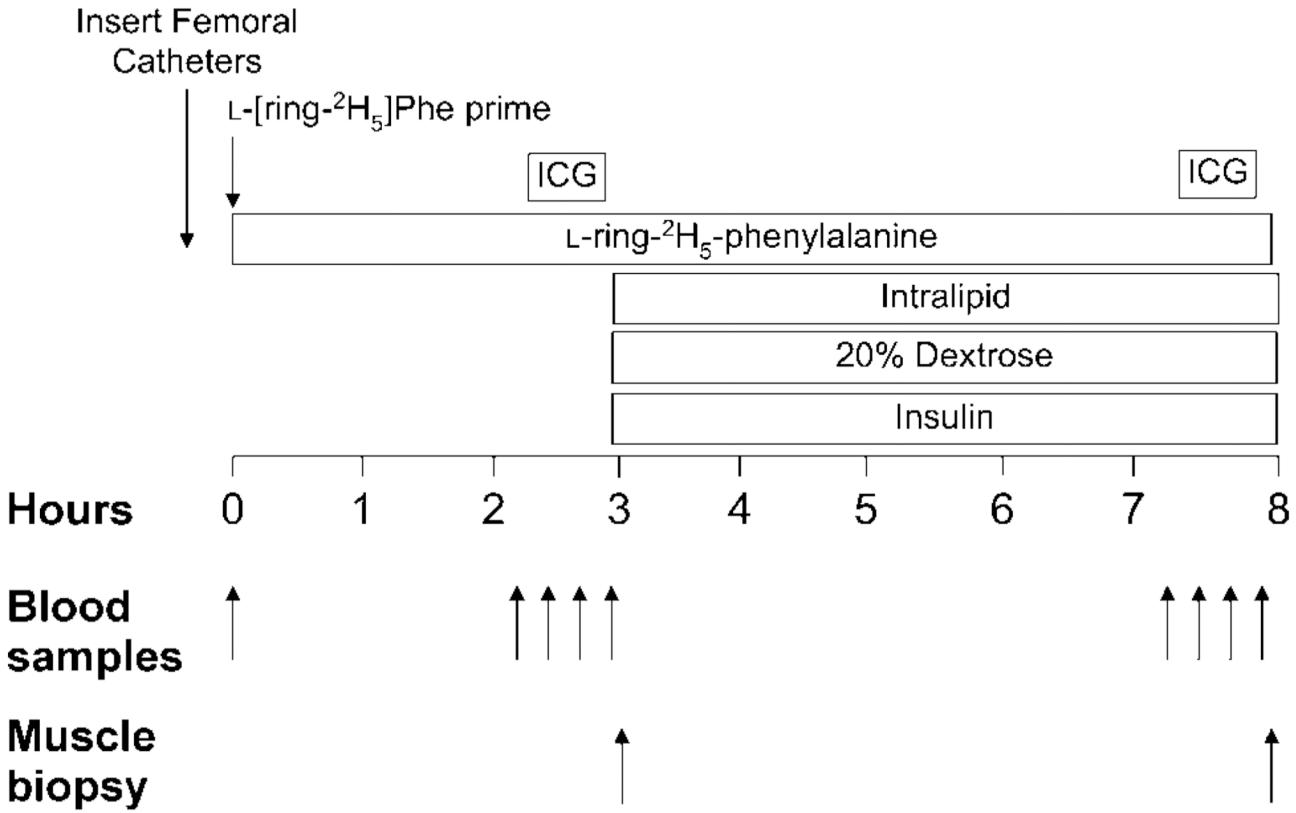

FIGURE 1.
Study design consisting of a basal postabsorptive period and a high energy-hyperinsulinemic clamp period. ICG, indocyanine green.

Skeletal Muscle Protein Anabolic Response to Increased Energy and Insulin Is Preserved in Poorly Controlled Type 2 Diabetes[1,2]

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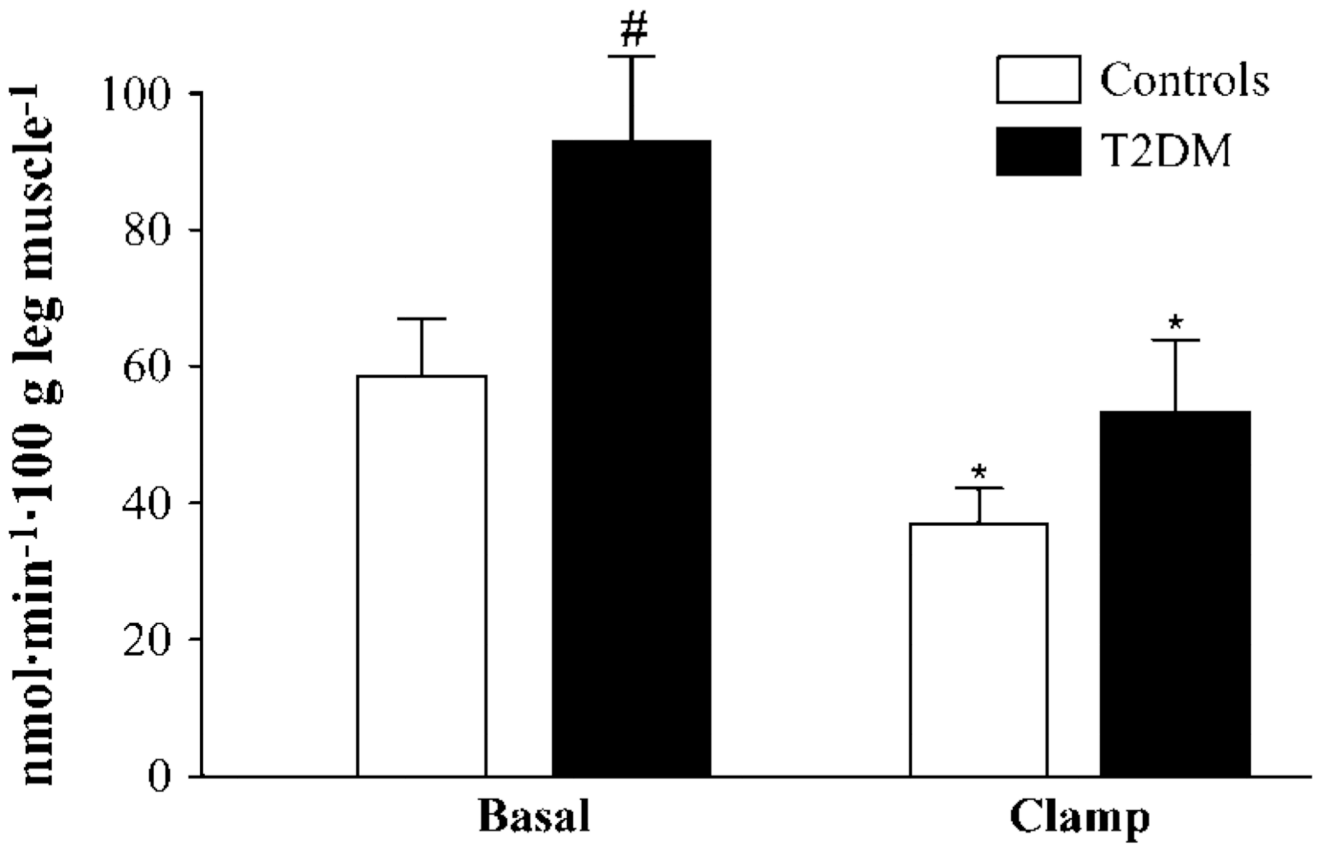

J Nutr. 2006 May ; 136(5): 1249–1255

Acta Diabetologica
https://doi.org/10.1007/s00592-020-01523-7

ORIGINAL ARTICLE

Longitudinal association of type 2 diabetes and insulin therapy with muscle parameters in the KORA-Age study

Uta Ferrari[1] · Cornelia Then[1] · Marietta Rottenkolber[1] · Canan Selte[1] · Jochen Seissler[1] · Romy Conzade[2] · Birgit Linkohr[2] · Annette Peters[2,3] · Michael Drey[1] · Barbara Thorand[2,3]

Table 1 Baseline characteristics of the study participants stratified by diabetes status

	Total [a] ($n=731$)		Diabetes[a] ($n=118$ (16.1%))		No diabetes[a] ($n=613$ (83.9%))		p value[b]
	Women	Men	Women	Men	Women	Men	Women/men
n (%)	360 (49.3)	371 (50.8)	58 (16.1)	60 (16.2)	311 (83.8)	302 (83.9)	0.9820[x]
Age (years)	74.5 ± 6.2	74.7 ± 6.2	76.4 ± 5.8	75.4 ± 6.3	74.1 ± 6.3	74.5 ± 6.1	0.006/0.255
BMI (kg/m^2)	28.3 ± 4.5	28.4 ± 3.9	31.0 ± 4.0	29.9 ± 4.4	27.7 ± 4.4	28.1 ± 3.7	< 0.001/0.007
GS (kg)	20.7 ± 5.3	34.3 ± 7.6	20.2 ± 5.9	34.4 ± 7.5	20.7 ± 5.1	34.3 ± 7.7	0.409/0.602
SMI (kg/m^2)	7.4 ± 0.9	10.1 ± 1.0	8.0 ± 1.0	10.5 ± 1.0	7.3 ± 0.9	10.0 ± 1.0	< 0.001/< 0.001
TUG (s)	10.5 ± 3.2	10.3 ± 2.9	11.8 ± 3.3	10.9 ± 2.6	10.3 ± 3.1	10.2 ± 3.0	< 0.001/0.018
PASE: Total Score	119.1 ± 48.9	131.1 ± 59.7	112.7 ± 53.1	110.4 ± 57.6	120.3 ± 48.1	135.1 ± 59.4	0.173/0.002
HbA1c (%) (mmol/mol)	5.7 ± 0.5 (39)	5.7 ± 0.6 (39)	6.5 ± 0.7 (48)	6.5 ± 0.6 (48)	5.6 ± 0.3 (38)	5.6 ± 0.5 (38)	< 0.001/< 0.001
Insulin therapy only			4 (6.9%)	5 (8.3%)			
Oral anti-diabetics only			33 (56.9%)	38 (63.3%)			
Combination therapy[y]			7 (12.1%)	4 (6.7%)			
No anti-diabetic treatment			14 (24.1%)	13 (21.7%)			
Current smoker n (%)	16 (4.4)	21 (5.7)	2 (3.5)	4 (6.7)	14 (4.6)	17 (5.5)	0.624/0.925
Ex-Smoker n (%)	71 (19.7)	197 (53.1)	14 (24.1)	32 (53.3)	57 (18.9)	165 (54.6)	
Non-Smoker n (%)	273 (75.8)	153 (41.2)	42 (72.4)	24 (40.0)	231 (76.5)	129 (42.7)	
No chronic disease n (%)	33 (9.2)	54 (14.6)	3 (5.2)	5 (8.3)	30 (10.0)	49 (15.8)	0.017/0.006
1 chronic disease n (%)	107 (29.9)	115 (31.0)	10 (17.2)	11 (18.3)	97 (32.3)	104 (33.4)	
≥ 2 chronic diseases n (%)	218 (60.9)	202 (54.5)	45 (77.6)	44 (73.3)	173 (57.7)	158 (50.8)	

Acta Diabetol . 2020 Sep;57(9):1057-1063. doi: 10.1007/s00592-020-01523-7. Epub 2020 Apr 4

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		Model 1		Model 2	
		Regression coefficient (95% CI)	*p* value	Regression coefficient (95% CI)	*p* value
Δ GS	Total *n* = 90	− 1.2 (− 3.6 to 1.1)	0.294	− 1.6 (− 4.1 to 0.8)	0.190
	Men *n* = 47	− 3.0 (− 6.3 to 0.4)	0.081	− 3.4 (− 6.7 to 0.02)	0.051
	Women n = 43	0.1 (− 3.1 to 3.3)	0.927	0.4 (− 3.3 to 4.1)	0.830
Δ SMI	Total *n* = 88	0.5 (0.2–0.9)	**0.005**	0.6 (0.3–0.9)	**0.001**
	Men *n* = 45	0.5 (0.02–1.0)	**0.041**	0.5 (0.1–0.9)	**0.021**
	Women *n* = 43	0.5 (− 0.02 to 1.1)	0.060	0.8 (0.2–1.4)	**0.009**
Δ TUG	Total *n* = 79	1.4 (− 0.3 to 3.0)	0.096	1.6 (− 0.2 to 3.4)	0.086
	Men *n* = 43	0.1 (− 2.0 to 2.2)	0.946	0.4 (− 2.0 to 2.7)	0.758
	Women *n* = 36	2.7 (0.1–5.4)	**0.041**	4.3 (1.1–7.5)	**0.010**

Acta Diabetol . 2020 Sep;57(9):1057-1063. doi: 10.1007/s00592-020-01523-7. Epub 2020 Apr 4

JAMDA

journal homepage: www.jamda.com

Original Study

Glycemic Control and Insulin Improve Muscle Mass and Gait Speed in Type 2 Diabetes: The MUSCLES-DM Study

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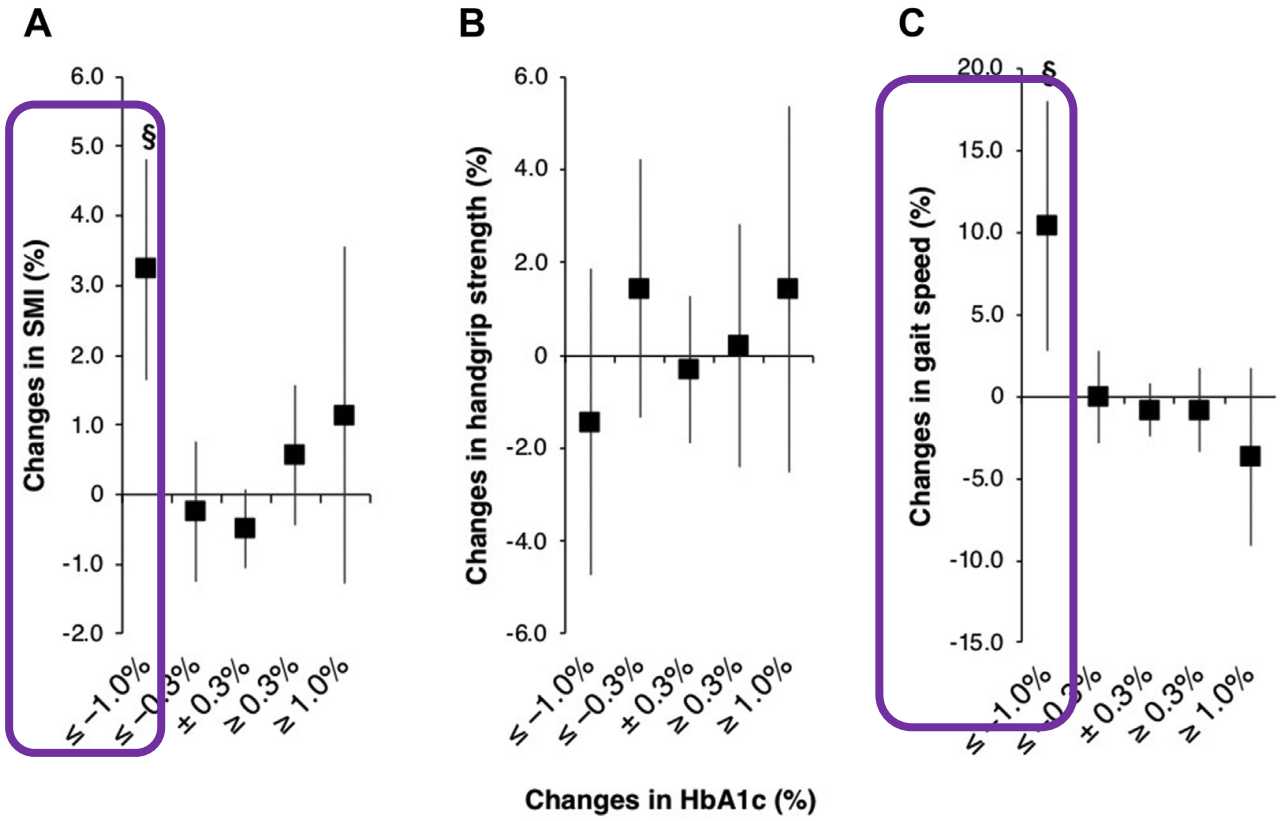
Clinical Characteristics of Study Patients (n = 588)

	Baseline	1-y Follow-up	*P* Value
Age (y)	70.0 ± 8.9	71.0 ± 8.9	
Sex, male (%)	58.8		
Body weight (kg)	63.4 ± 12.0	63.5 ± 12.0	.84
BMI	24.7 ± 4.0	24.8 ± 3.9	.002
Waist circumference (cm)	90.5 ± 10.2	91.2 ± 10.1	<.001
Creatinine (mg/dL)	0.8 ± 0.3	0.9 ± 0.3	.003
HbA_{1c} (%)	7.3 ± 1.2	7.1 ± 1.0	.001
HbA_{1c} (mmol/mol)	55.8 ± 12.7	54.5 ± 10.5	.001
Regular exercise habit (%)	55.6	56.5	.68
Antihyperglycemic treatment			
Sulfonylureas (%)	28.1	27.4	.49
Glinides (%)	9.5	10.4	.32
Biguanides (%)	39.1	41.8	.014
Thiazolidinediones (%)	15.3	16.3	.32
DPP-4 inhibitors (%)	61.6	62.4	.52
SGLT-2 inhibitors (%)	12.8	15.3	.019
α-Glucosidase inhibitor (%)	14.7	16.7	.028
Number of oral drugs	1.8 ± 1.3	1.9 ± 1.3	<.001
GLP-1 analogs (%)	4.6	4.8	.81
Insulin (%)	25.9	26.5	.47
Muscle mass and function			
SMI	7.5 ± 1.2	7.5 ± 1.2	.80
Handgrip strength (kg)	28.4 ± 9.3	28.3 ± 9.4	.40
Gait speed (m/s)	1.18 ± 0.25	1.17 ± 0.25	.11
Sarcopenia (%)	6.3	7.8	.12



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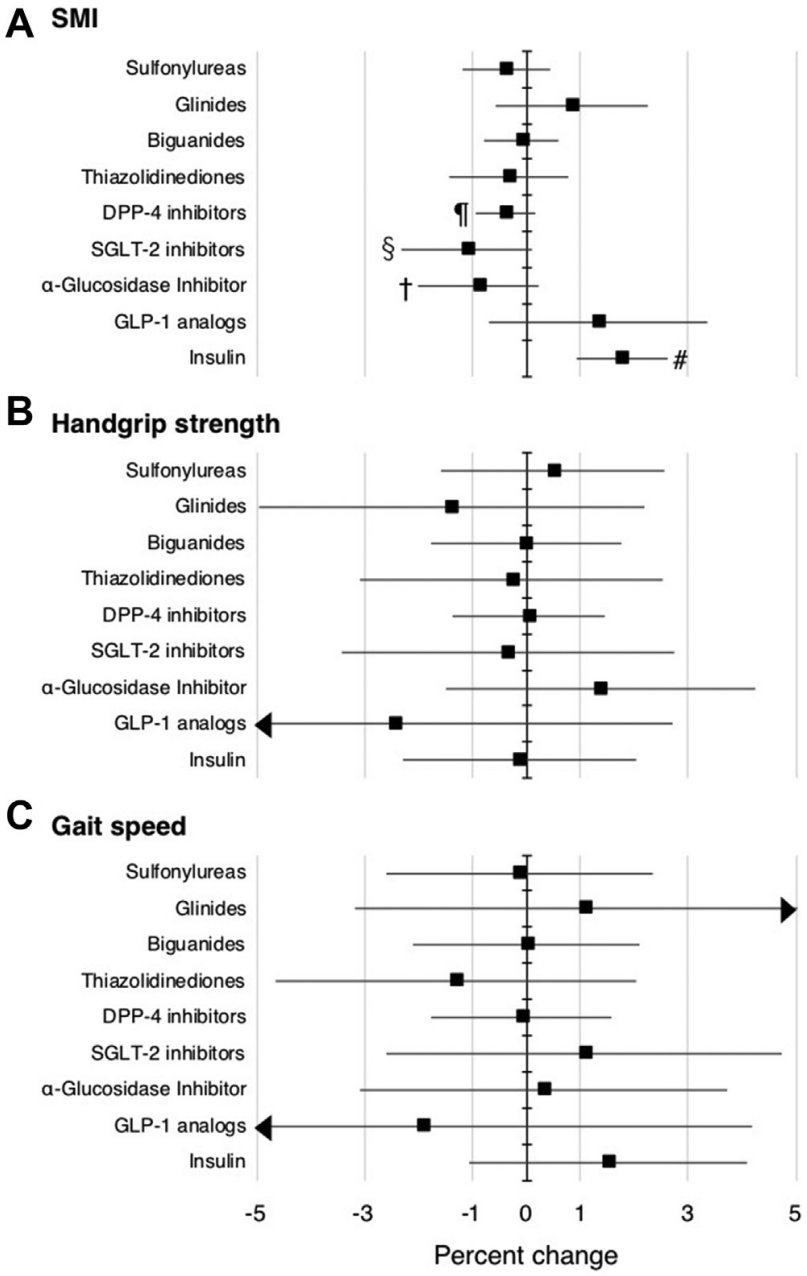
Linear Regression Analysis of Percentage Changes in SMI, Handgrip Strength, and Gait Speed During the Follow-up Period

	Percentage Change During Follow-up Period					
	SMI		Handgrip Strength		Gait Speed	
	β	*P* Value	β	*P* Value	β	*P* Value
Age (years)	−0.021	.638	−0.178	<.001	−0.236	<.001
Sex (men)	0.183	.006	0.336	<.001	0.027	.490
BMI	0.173	.012	0.024	.574	−0.085	.033
Baseline SMI	−0.341	<.001				
Baseline handgrip strength (kg)			−0.439	<.001		
Baseline gait speed (m/s)					−0.421	<.001
HbA_{1c} (%)	−0.003	.966	−0.096	.093	−0.067	.210
HbA_{1c} (≥1% decrease)	0.113	.027	−0.005	.914	0.145	.002
Regular exercise habit	0.015	.719	0.081	.054	0.050	.208
Antihyperglycemic drug use						
Insulin	0.115	.022				
DPP-4 inhibitors	−0.073	.104				
SGLT-2 inhibitors	−0.069	.125				
α-Glucosidase inhibitor	−0.068	.094				

n=558



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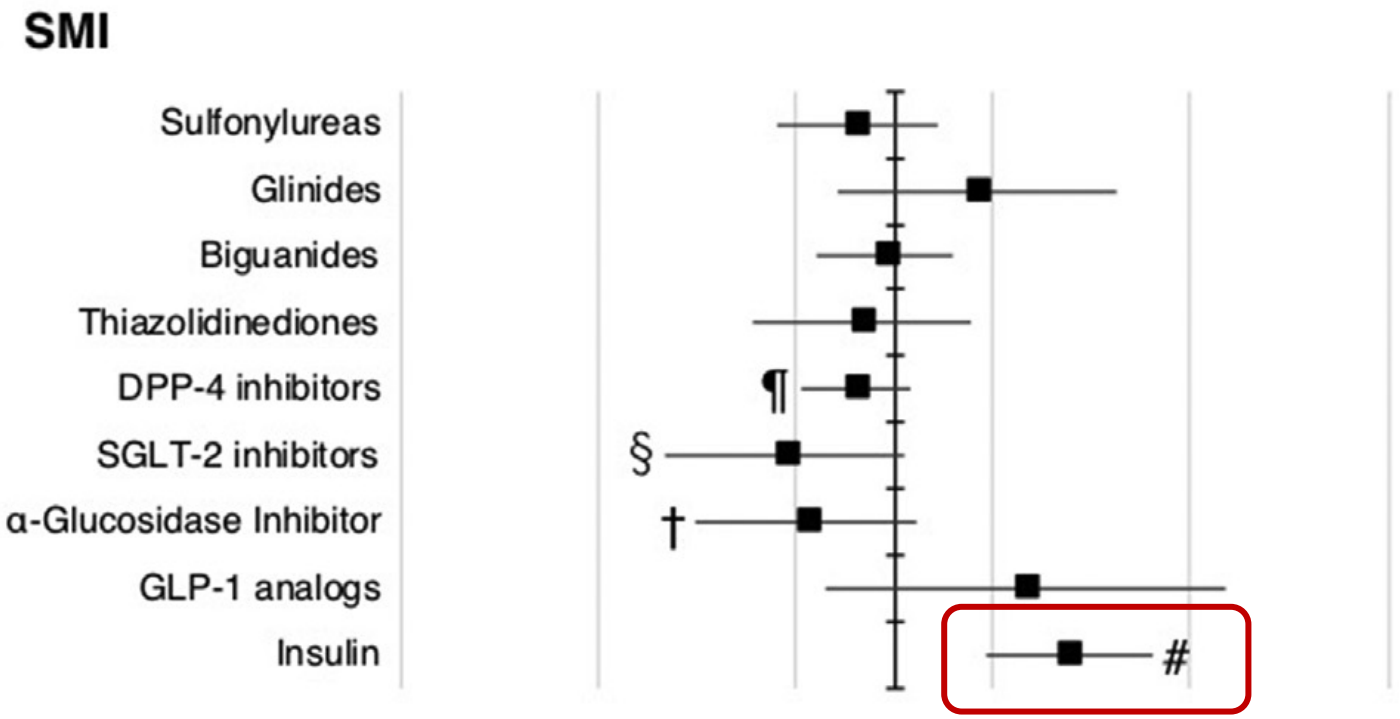
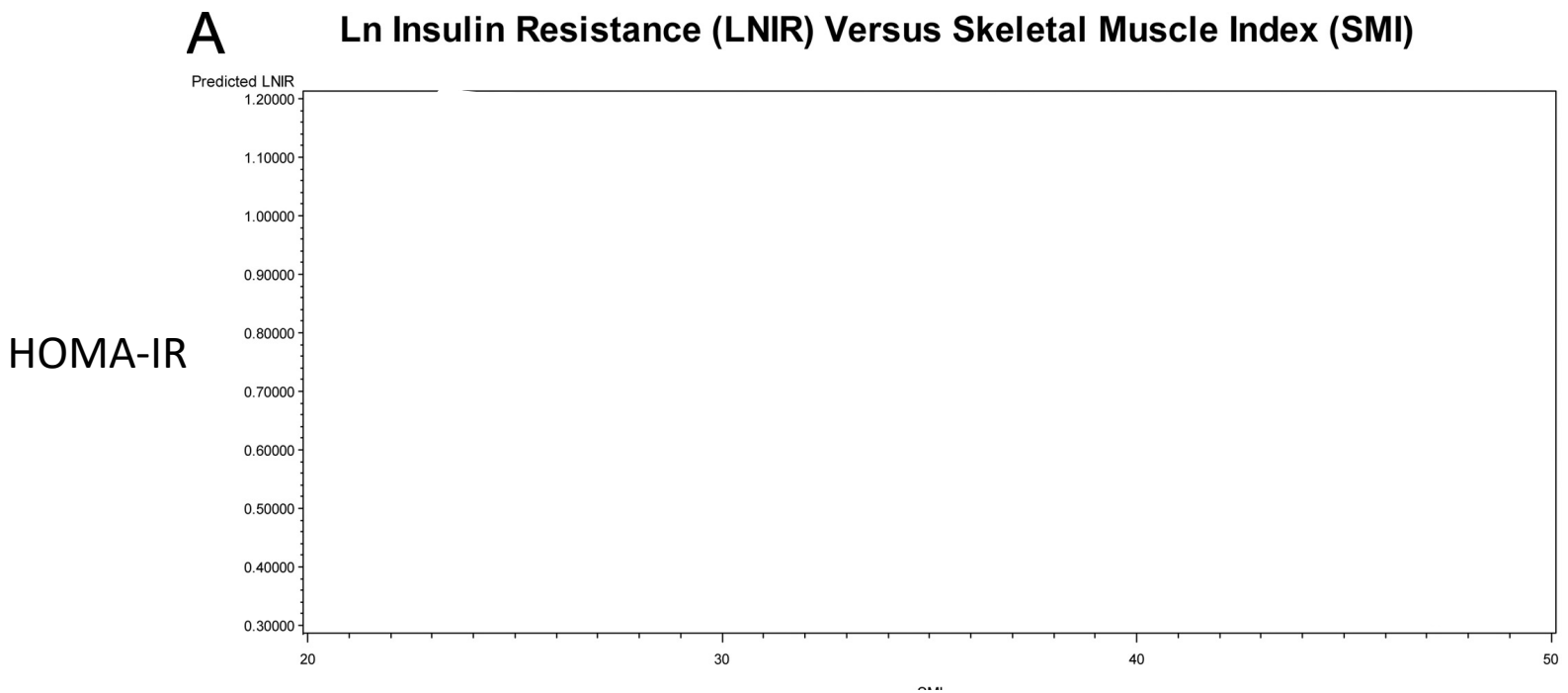


Lower insulin level is associated with sarcopenia in community-dwelling frail and non-frail older adults

Yanxia Lu[1], Wee Shiong Lim[2,3], Xia Jin[4], Ma Schwe Zin Nyunt[5], Tamas Fulop[6], Qi Gao[5], Su Chi Lim[7], Anis Larbi[6,8] and Tze Pin Ng[5]*

		Sarcopenic subgroups			
		Sarcopenia	**Possible sarcopenia**	**Non-sarcopenia**	***P***
Exploratory study					
Fasting insulin (pg/ml)	453.57 ± 318.30	375.90 ± 233.30^{*+}	489.34 ± 328.09	565.32 ± 453.61	0.023
C-peptide (ng/ml)	1.54 ± 0.85	1.35 ± 0.63	1.64 ± 0.81	1.72 ± 1.39	0.067
Fasting glucose (mmol/L)	5.33 ± 1.28	5.35 ± 1.37	5.36 ± 1.29	5.16 ± 0.80	0.755
IGF-1 (ng/ml)	1.02 ± 0.74	1.02 ± 0.72	0.99 ± 0.76	1.12 ± 0.77	0.751
Leptin (ng/ml)	11.07 ± 10.05	8.92 ± 9.49^{+}	13.16 ± 10.72	9.70 ± 7.27	0.029
Active ghrelin (pg/ml)	3.90 ± 4.51	3.47 ± 3.63	3.89 ± 4.72	5.38 ± 6.00	0.255
Validation study					
Fasting insulin (pg/ml)	307.92 ± 251.07	232.87 ± 206.93^{*+}	395.47 ± 251.30	351.33 ± 303.28	< 0.001
C-peptide (ng/ml)	1.03 ± 0.45	0.90 ± 0.36^{*+++}	1.17 ± 0.49	1.14 ± 0.53	< 0.001
Fasting glucose (mmol/L)	6.19 ± 1.57	6.23 ± 1.70	6.27 ± 1.53	5.94 ± 1.18	0.596
IGF-1 (ng/ml)	14.60 ± 7.15	15.36 ± 7.59	13.75 ± 6.97	14.47 ± 6.46	0.514
Leptin (ng/ml)	15.53 ± 16.23	10.96 ± 9.27^{+++}	23.27 ± 21.87**	13.34 ± 13.39	< 0.001
Active ghrelin (pg/ml)	21.57 ± 16.96	22.39 ± 16.95	21.97 ± 16.70	18.42 ± 17.67	0.510

** $P < 0.01$, * $P < 0.05$ vs. the non-sarcopenia group; $^{+++}$ $P < 0.001$, $^{+}$ $P < 0.05$ vs. the possible sarcopenia group.



Each 10% increase in SMI was associated with 11% relative reduction in HOMA-IR
(95% confidence interval, 6 –15%)

J Clin Endocrinol Metab, September 2011, 96(9):2898 –2903

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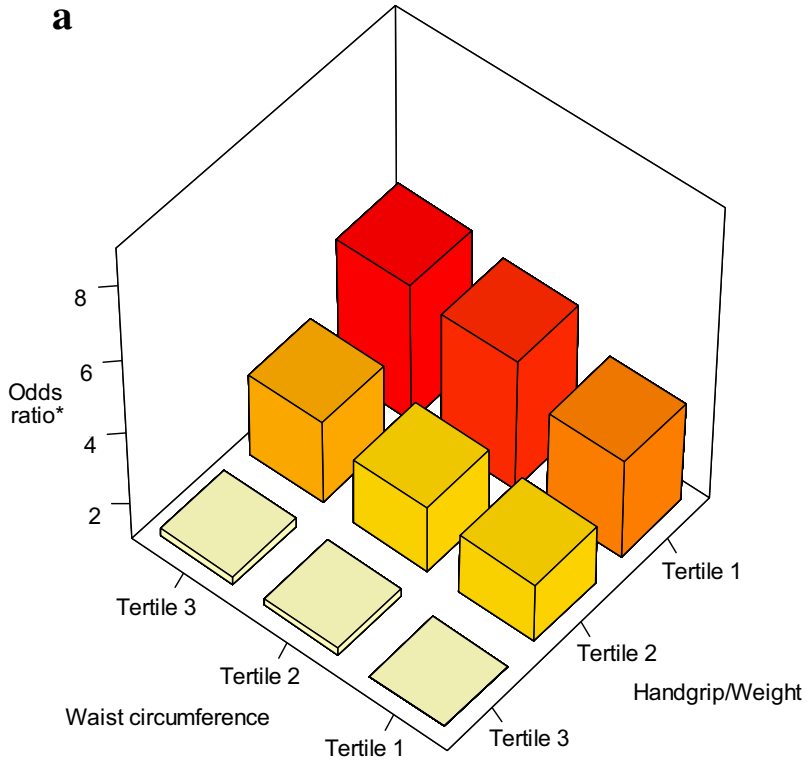
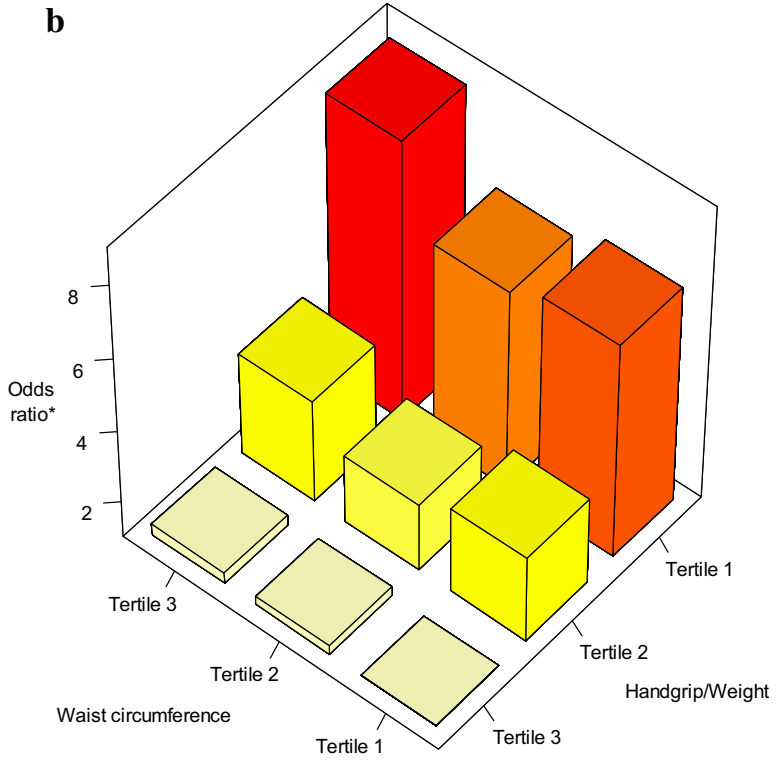
Lopez-Lopez et al. Cardiovasc Diabetol (2021) 20:68
https://doi.org/10.1186/s12933-021-01256-z

Cardiovascular Diabetology

ORIGINAL INVESTIGATION Open Access

The prediction of Metabolic Syndrome alterations is improved by combining waist circumference and handgrip strength measurements compared to either alone





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ORIGINAL ARTICLE

WILEY

In people with type 2 diabetes, sarcopenia is associated with the incidence of cardiovascular disease: A prospective cohort study from the UK Biobank

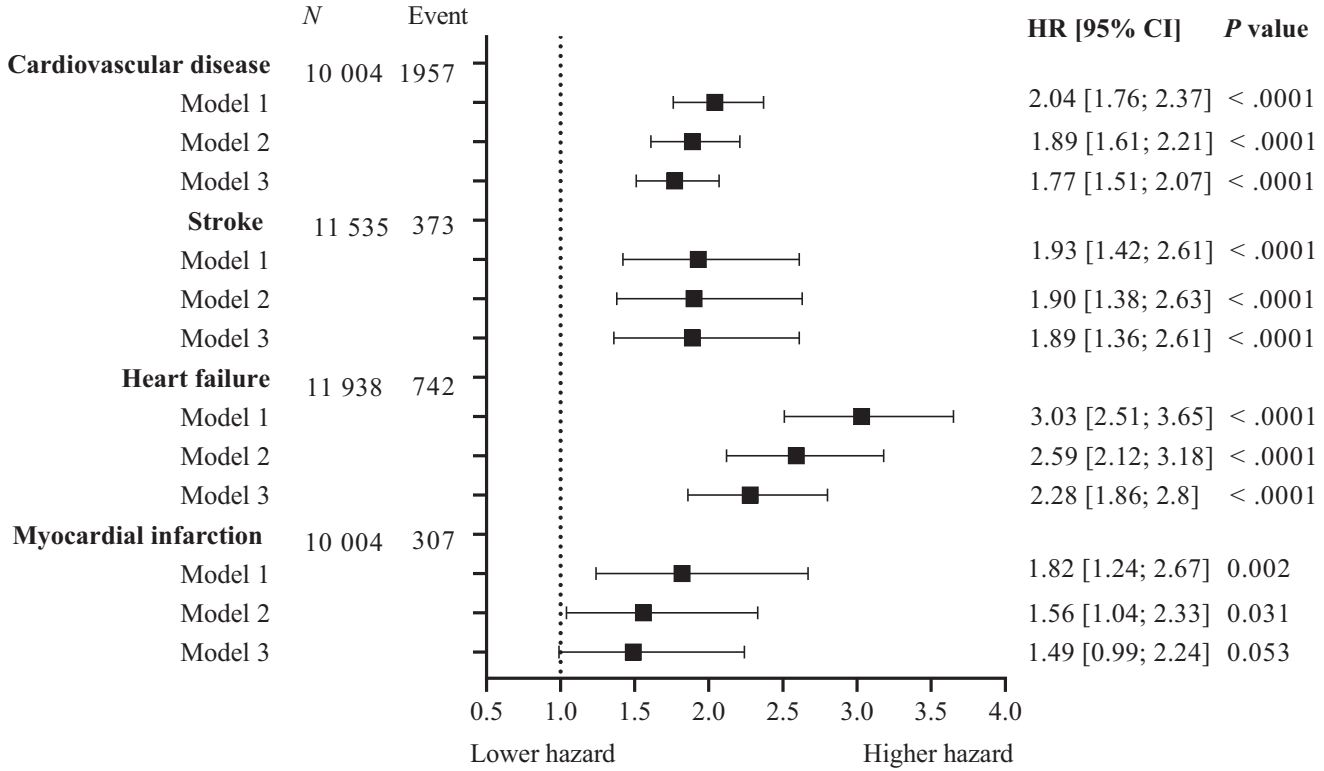


TABLE 2 The RAP among sarcopenia compared with non-sarcopenia.

Outcomes	RAP (95% CI)
Cardiovascular disease	14.5 (13.1; 15.6)
Stroke	13.7 (10.8; 15.1)
Heart failure	13.7 (13.3; 14.0)
Myocardial infarction	12.8 (2.4; 16.3)

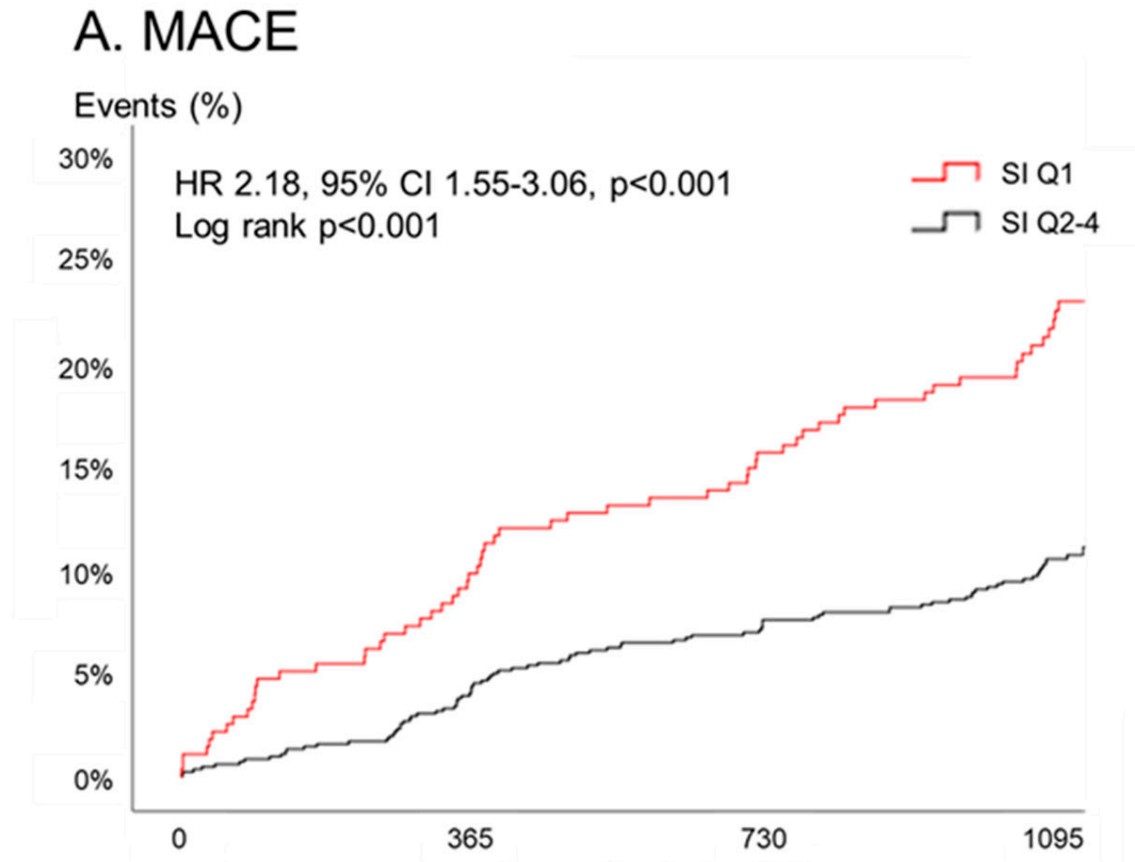
Journal of
Clinical Medicine

MDPI

Article

Sarcopenia Index as a Predictor of Clinical Outcomes in Older Patients with Coronary Artery Disease

Hak Seung Lee, Kyung Woo Park *, Jeehoon Kang, You-Jeong Ki, Mineok Chang, Jung-Kyu Han, Han-Mo Yang, Hyun-Jae Kang, Bon-Kwon Koo and Hyo-Soo Kim



Number at risk

SI Q1	273	246	230	172
SI Q2-4	813	777	751	576

J. Clin. Med. **2020**, 9, 3121; doi:10.3390/jcm9103121

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REVISTA COLOMBIANA de Endocrinología Diabetes & Metabolismo

Consensos

Consenso colombiano basado en evidencia y en la opinión de expertos en el manejo integral de pacientes con diabetes *mellitus* tipo 2 y sarcopenia

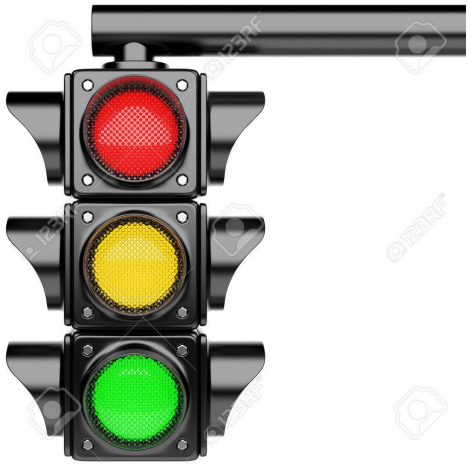
Jorge Castillo[1], Martín Vásquez[2], Jhon Jairo Duque[3], Diana Carolina Díaz Tribaldos[4], Juan Carlos Galvis[5], Jaime Ibarra[6], Edgar Castro[7], Carlos Rosselli[8], Angélica Veloza[9], Karen Cárdenas-Garzón[10], Juan Pablo Zuluaga Peña[10], Julio Ricardo Zuluaga Peña[10]

Insulina: efecto positivo. Se ha informado que previene la disminución de la masa muscular en las extremidades inferiores, no afecta la velocidad de la marcha y está asociada con una menor probabilidad de reducción del índice de masa muscular esquelética. Se recomienda dado su efecto sobre la ganancia de peso (26).

Inhibidores de la *DPP-4 (iDPP-4)*: efecto positivo o neutral. La evidencia sugiere que el uso de estos medicamentos impacta positivamente en los parámetros de sarcopenia.

Metformina: presenta un efecto positivo o neutral. Su uso se asocia con una menor pérdida de masa muscular esquelética total y apendicular, así como con una menor disminución en la velocidad de la marcha habitual y no altera los resultados de la prueba de fuerza de agarre.

Agonistas del receptor *GLP-1 (aGLP-1)*: efecto neutral. Los estudios de los *GLP-1* en las dosis recomendadas para el manejo del paciente con diabetes no reportan cambios significativos en la masa muscular esquelética.



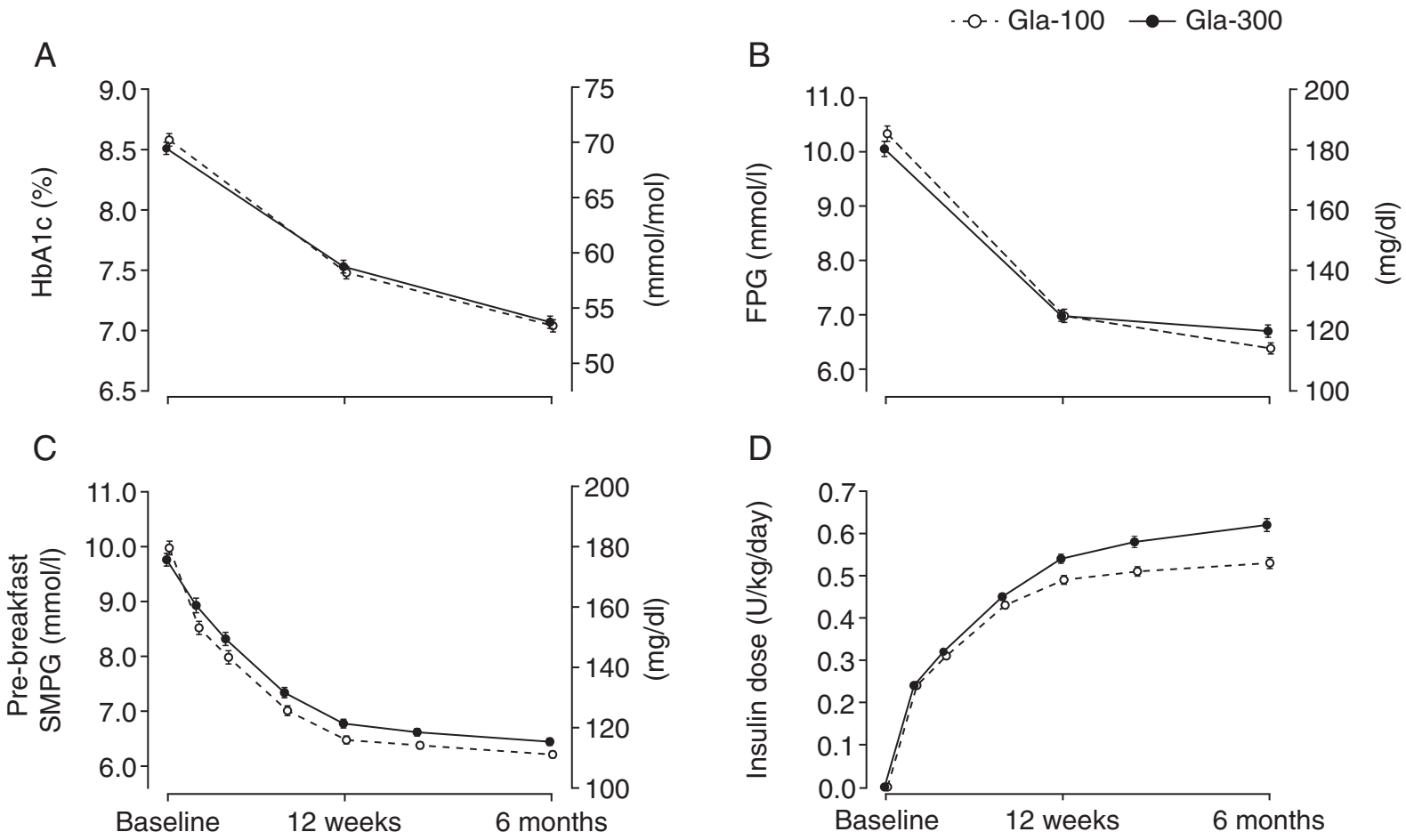
Inhibidores del *SGLT-2 (iSGLT-2)*: efecto neutro o incierto. No se han reportaron cambios significativos en la masa muscular esquelética.

Sulfonilureas y glinidas: tienen un efecto negativo, aunque la evidencia es limitada. Se han asociado con una disminución en la masa muscular esquelética, el índice de músculo esquelético, la fuerza muscular y la velocidad de la marcha.

Tiazolidinedionas: efecto negativo. Están relacionadas con una reducción significativa de la masa muscular y de la velocidad de la marcha habitual.

New insulin glargine 300 U/ml compared with glargine 100 U/ml in insulin-naïve people with type 2 diabetes on oral glucose-lowering drugs: a randomized controlled trial (EDITION 3)

G. B. Bolli[1], M. C. Riddle[2], R. M. Bergenstal[3], M. Ziemen[4], K. Sestakauskas[5], H. Goyeau[6], P. D. Home[7] & on behalf of the EDITION 3 study investigators



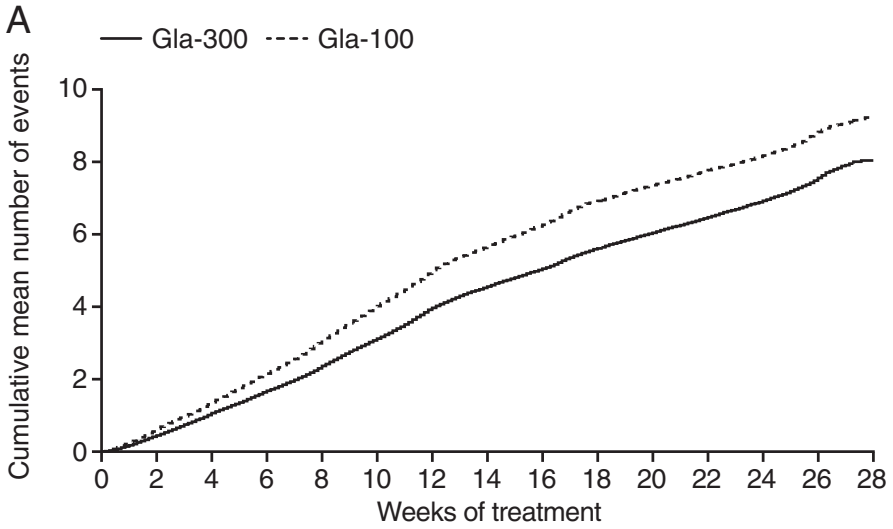
Diabetes, Obesity and Metabolism 17: 386–394, 2015

Diabetes, Obesity and Metabolism 17: 859–867, 2015.

Patient-level meta-analysis of the EDITION 1, 2 and 3 studies: glycaemic control and hypoglycaemia with new insulin glargine 300 U/ml versus glargine 100 U/ml in people with type 2 diabetes

R. Ritzel[1], R. Roussel[2,3,4], G. B. Bolli[5], L. Vinet[6], C. Brulle-Wohlhueter[7], S. Glezer[7] & H. Yki-Järvinen[8]

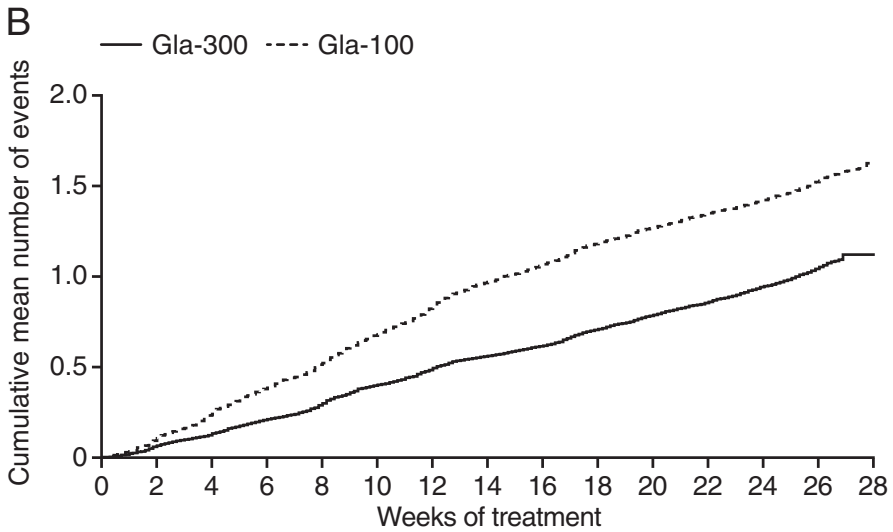
Any time of day (24 h)



RR 0.86, 95% CI 0.77–0.97; p = 0.0116

14%

Nocturnal (00:00–05:59 h)



Tasa de eventos anualizada < 70 mg/dl

2.10 vs 3.06, RR 0.69, 95% CI 0.57–0.84; p = 0.0002

31%

Diabetes, Obesity and Metabolism 17: 859–867, 2015.

@eldoctorcastillo

Diabetes, sarcopenia u obesidad ¿cuál es el enemigo?

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QUE LA
FUERZA
TE
ACOMPAÑE

Gracias

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