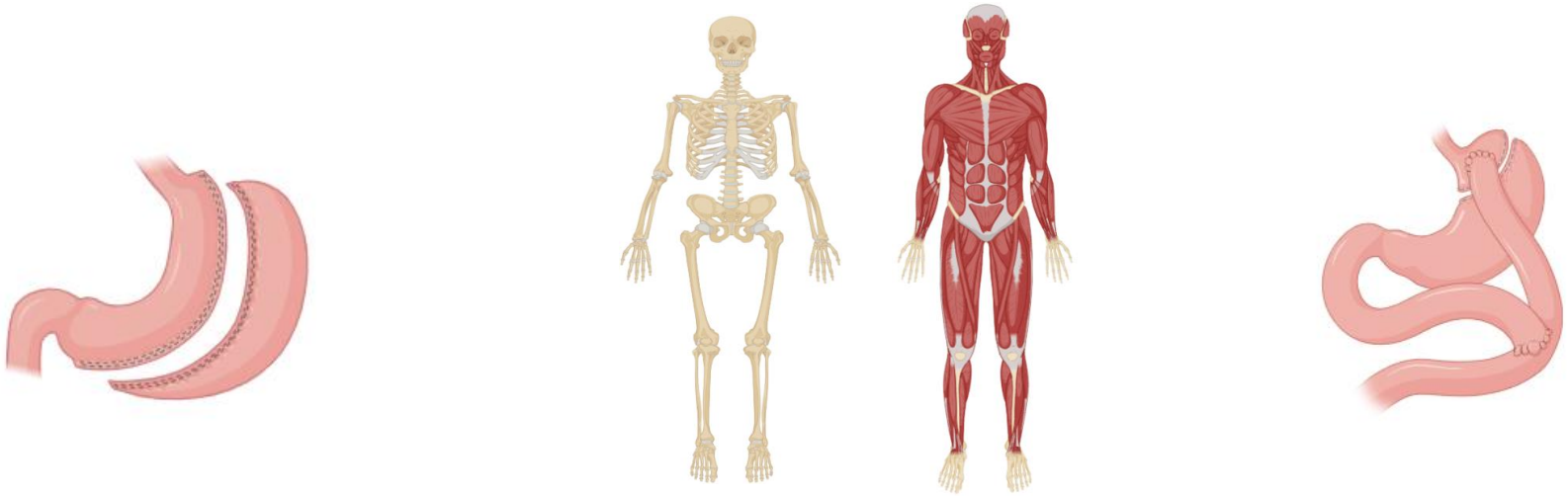
IFSO
XXIX IFSO World Congress
1-4 September 2026 | Toronto, Canada

Zoledronic Acid for prevention of bone and muscle loss after BAriatric Surgery (ZABAS)



BONE PROTECTION WITHOUT MUSCLE BENEFIT: ZOLEDRONIC ACID PRESVES BONE AT 1 YEAR BUT NOT AT 2 YEARS AFTER BARIATRIC SURGERY

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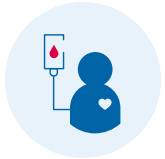
Esbjerg Sygehus
Grindsted Sygehus
Syddansk Universitetshospital

Region Syddanmark

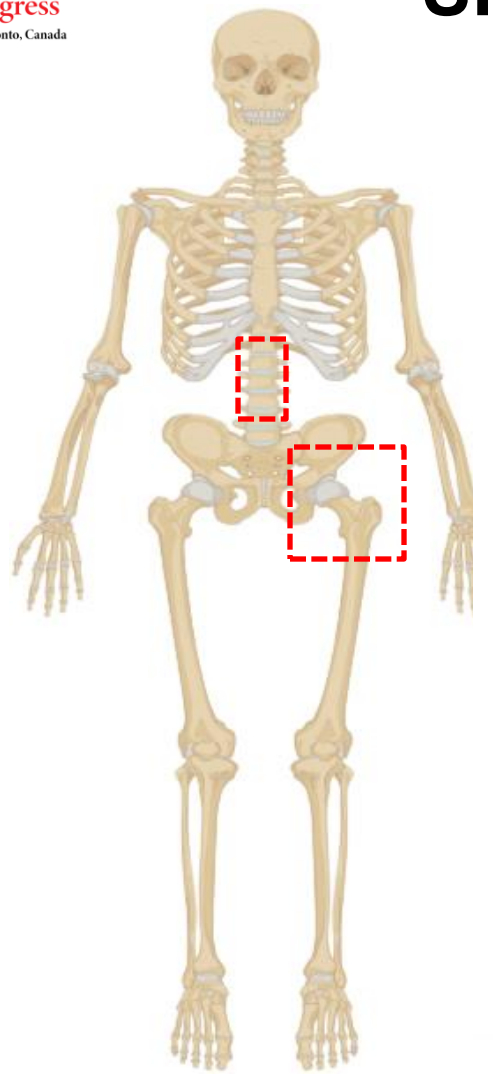
Disclosure Slide

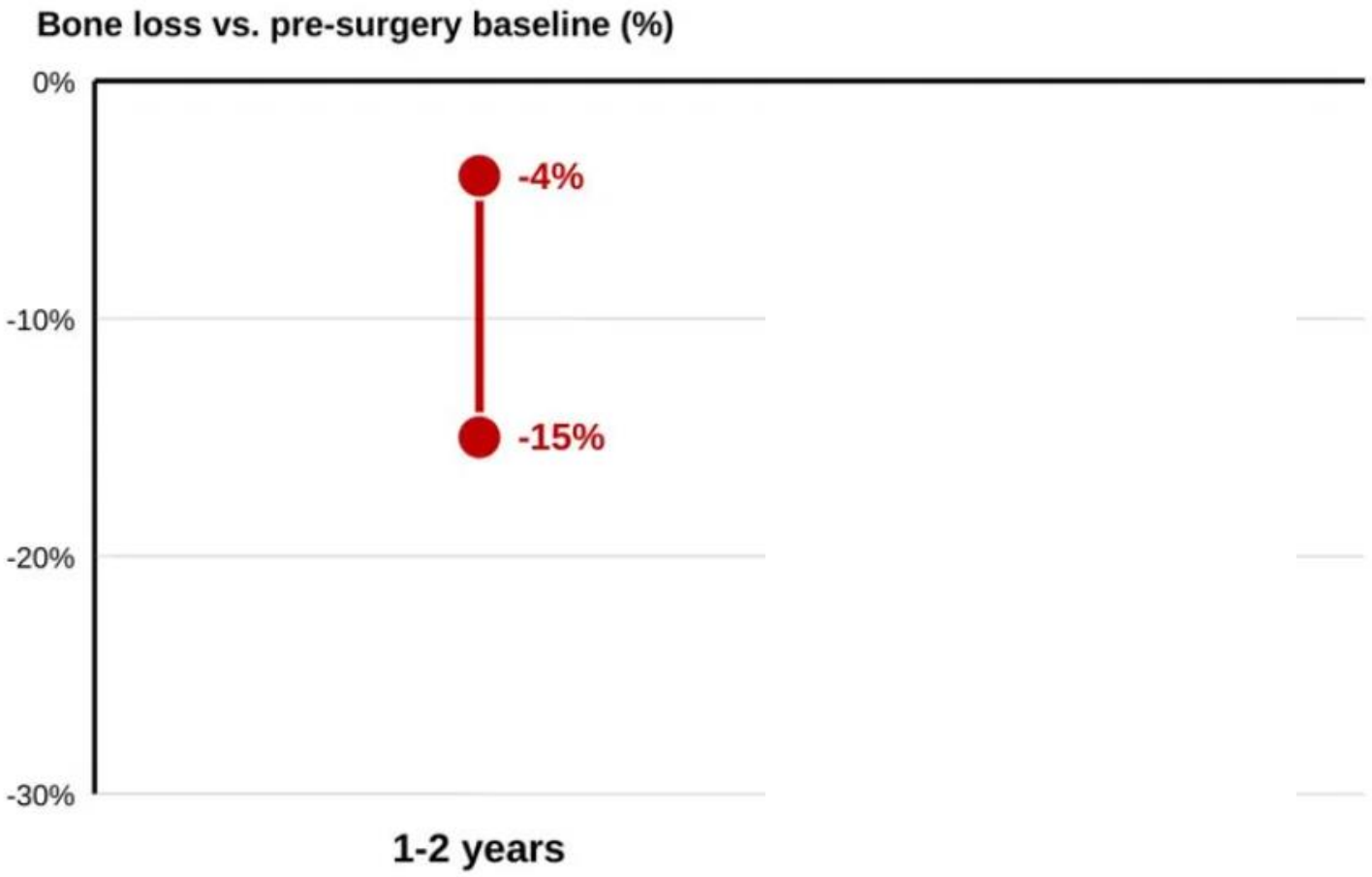


	No, nothing to disclose
	Yes, please specify:

Organization	Grants/Research Support	Speakers Bureau	Advisory Board/Consultant	Stock Ownership	Honoraria	Travel Support	Other
Novo Nordisk A/S				X			Personal stock ownership (purchased August 2025)

SHORT- AND LONG-TERM BONE LOSS





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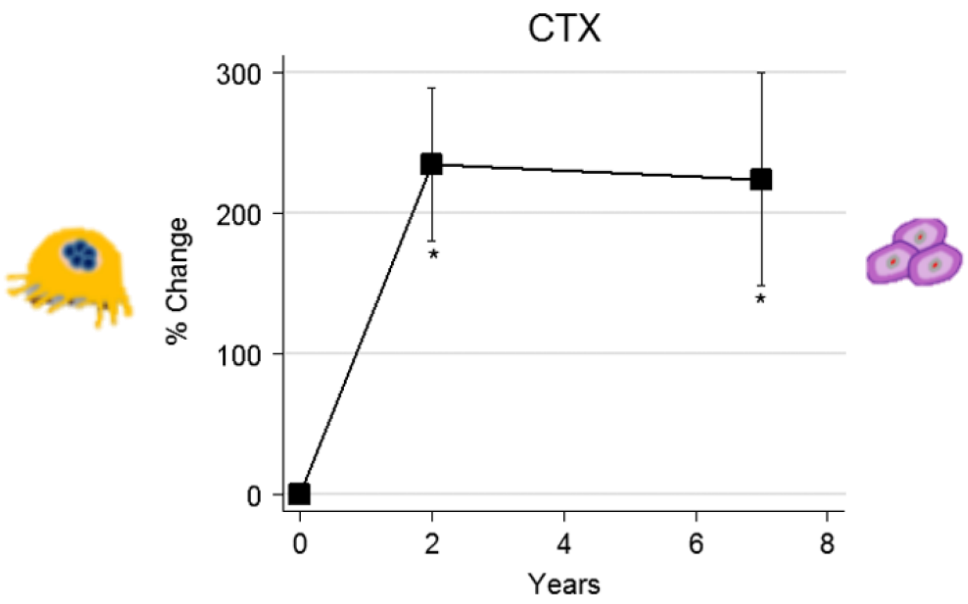
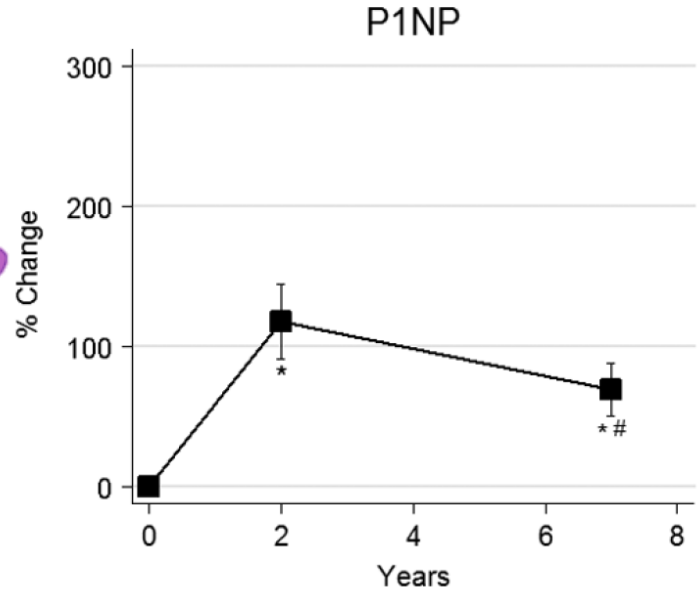
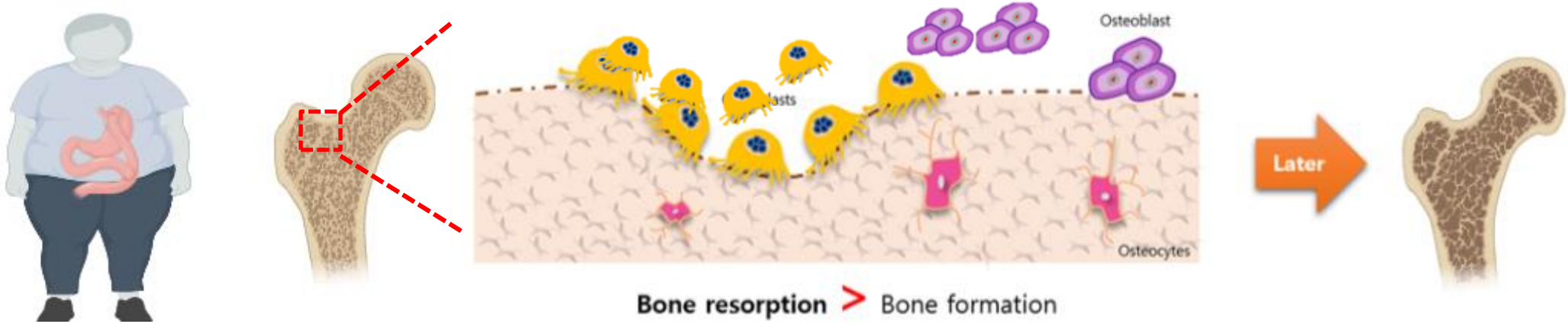
Sources:
J Clin Endocrinol Metab. 2021;106(4):e1868-e79.
Eur J Endocrinol. 2020;182(3):303-11.
Clin Endocrinol Metab. 2018;103(11):4104-12.
Bone. 2017;95:85-90.
Int J Obes (Lond). 2021;45(1):235-46.
J Clin Endocrinol Metab. 2015;100(4):1452-9.
J Bone Miner Res. 2014;29(3):542-50.
Bone. 2020;130:115069.

IMBALANCE BETWEEN BONE FORMATION AND RESORPTION







Source: : Eur J Endocrinol. 2020 Mar;182(3):303-311.

Figure: modified from Chang et al, 2019, Exp Mol Med
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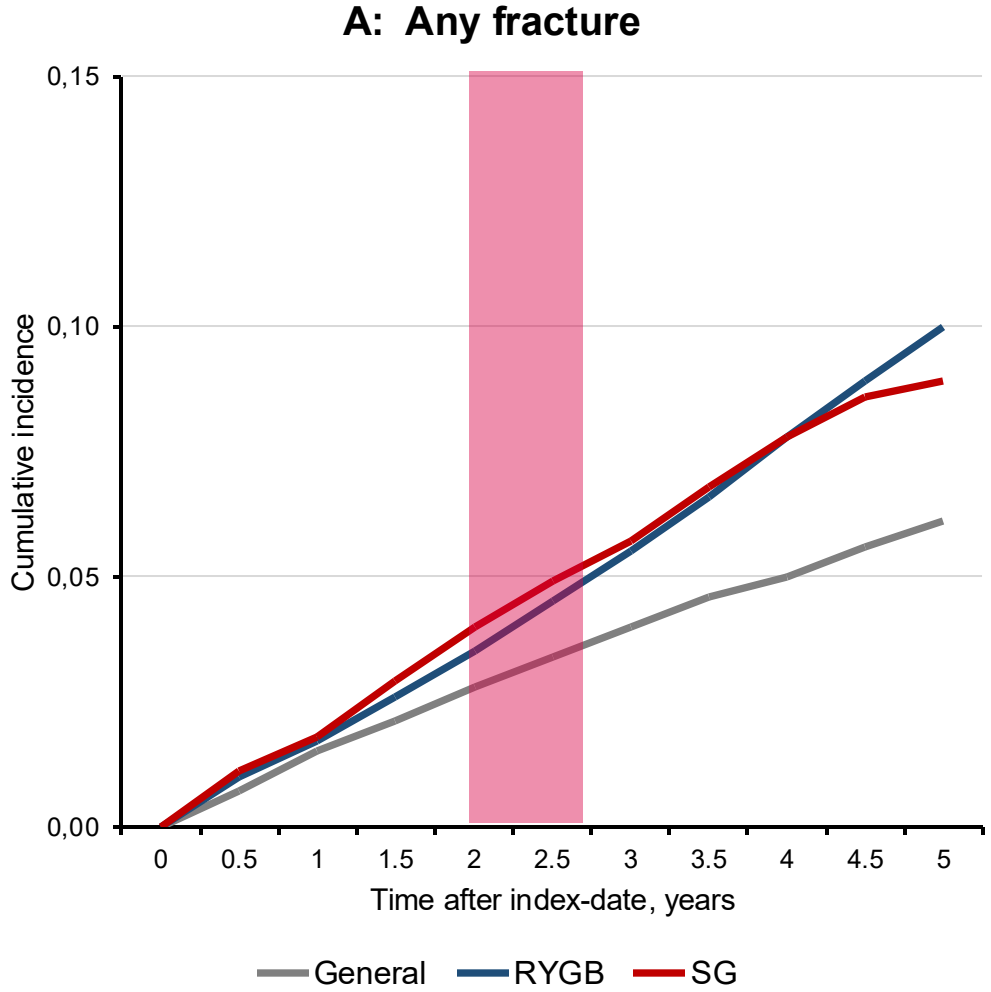
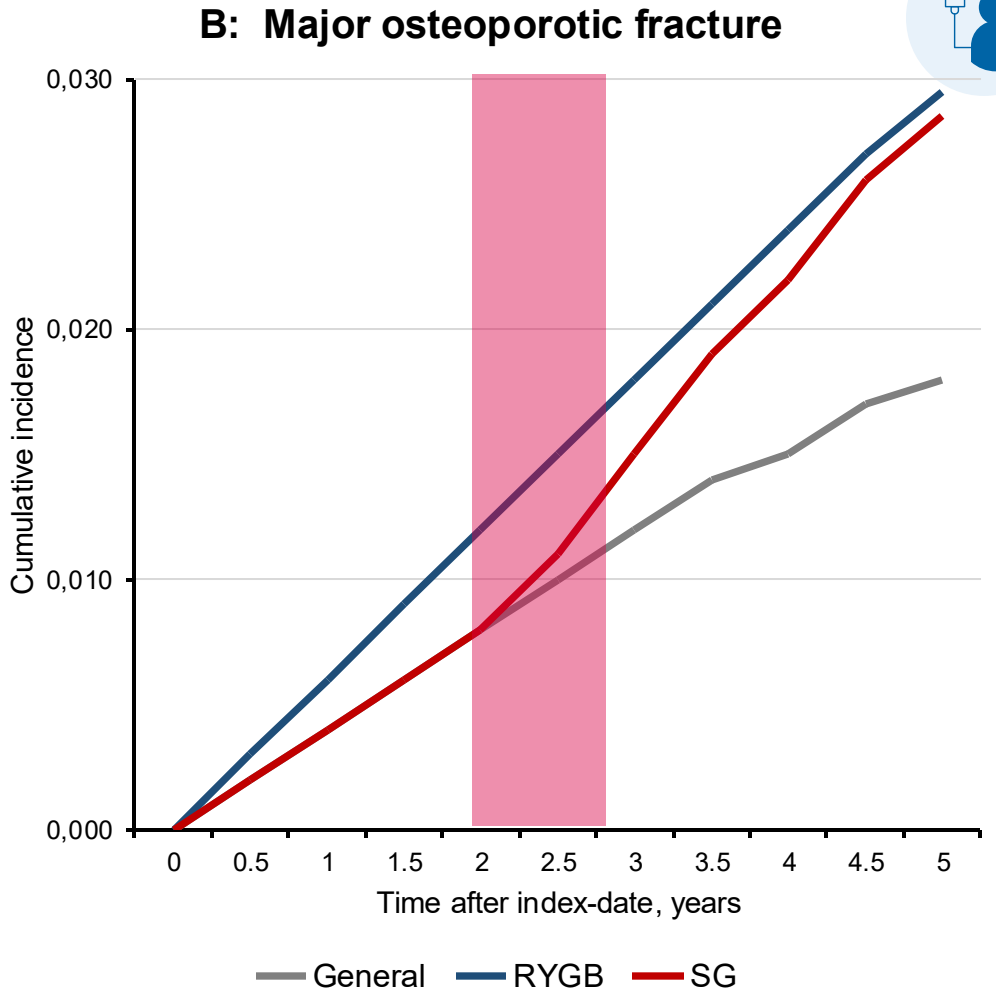
INCREASED FRACTURE RISK

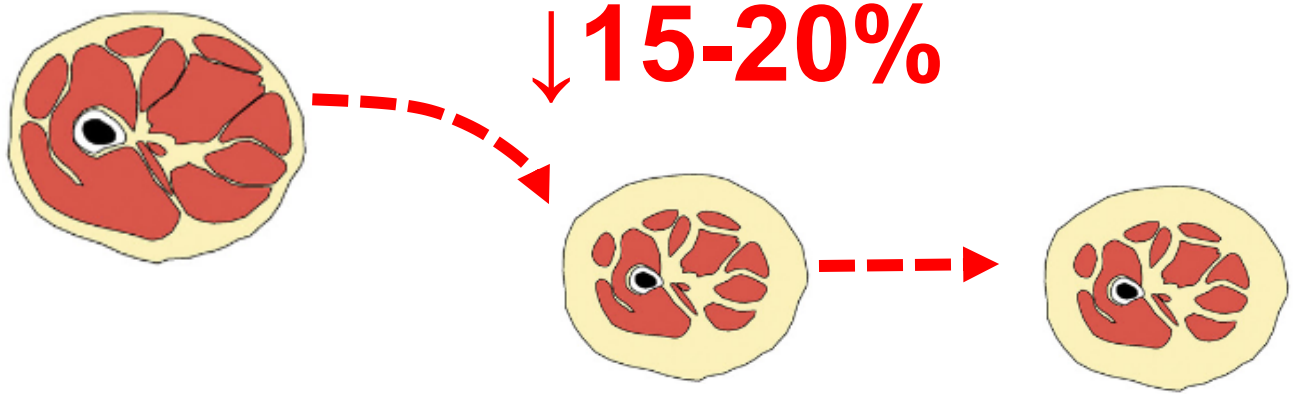




Note This figure has been modified from the original: the curves are approximately digitized from the original figure, colour-coded (instead of dotted/dashed/solid lines) and simplified to improve clarity for this presentation. Values are therefore approximate, not exact.

Source: Winckelmann LA, Gribsholt SB, Bødkergaard K, Rejnmark L, Madsen LR, Richelsen B. Risk of fractures following bariatric surgery with Roux-en-Y gastric bypass or sleeve gastrectomy: a Danish population-based cohort study. Eur J Endocrinol. 2024 Jul 2;191(1):1-8.

SHORT- AND LONG-TERM MUSCLE MASS LOSS (LBM)



10 kg

Time from surgery

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Sources:
Obes Surg. 2020;30(8):3119-26
Obes Rev. 2022;23(1):e13370
Surg Obes Relat Dis. 2019;15(11):1965-73

ASSESSMENT OF MUSCLE STRENGTH

First year from baseline:

↓16-42%

Soruces:
Int J Obes (Lond). 2021;45(7):1476-87.
J Bone Miner Res. 2021;36(3):489-99.
Obes Surg. 2008;18(9):1112-8.
Surg Obes Relat Dis. 2009;5(5):530-7

ZOLEDRONIC ACID TREATMENT FOR BONE LOSS

ZOLEDRONIC ACID
(Bisphosphonate)

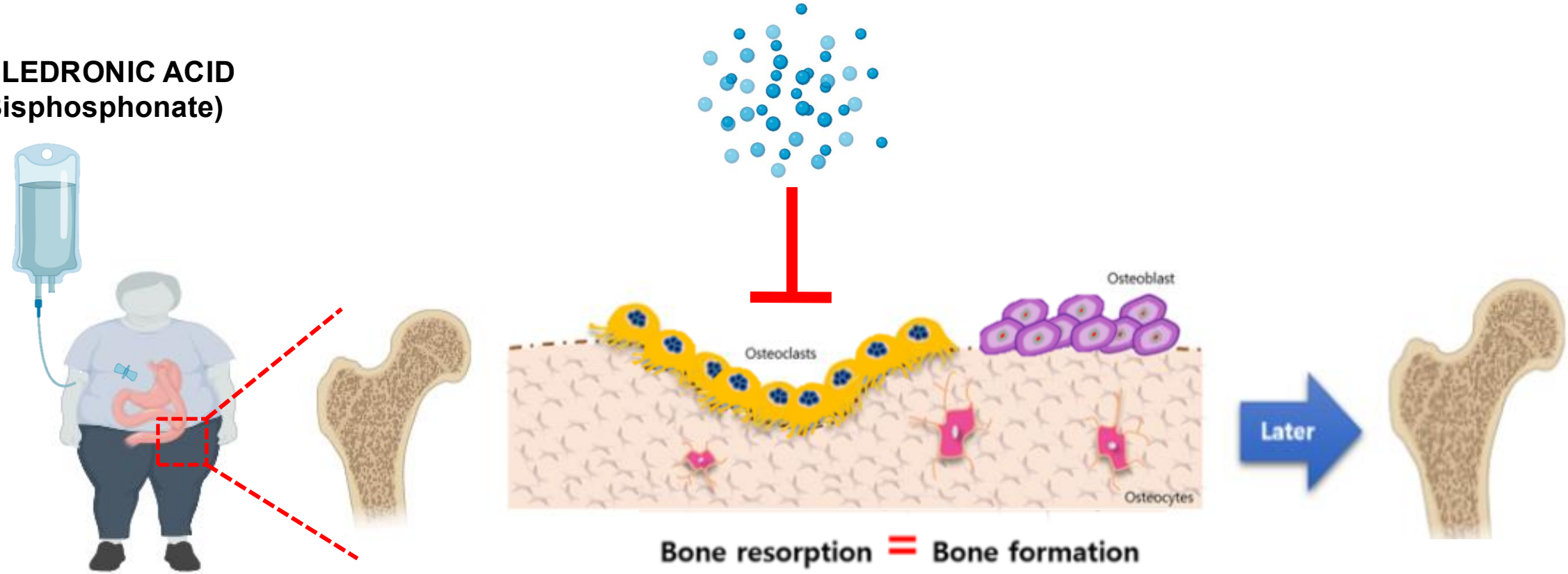

Figure: modified from Chang et al, 2019, Exp Mol Med
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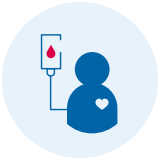
AIM & HYPOTHESIS



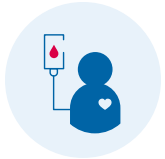
AIM

In this study, we aimed to assess if zoledronic acid can prevent bone loss in patients undergoing bariatric surgery.

Hypothesis

We hypothesize that zoledronic acid will reduce bone loss after bariatric surgery

STUDY DESIGN



Enrollment

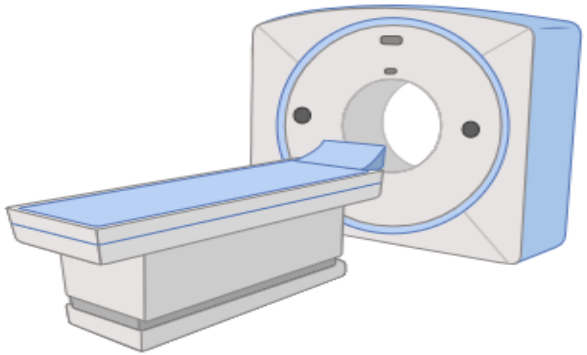
(Month -8 to Month -1)

Inclusion criteria:

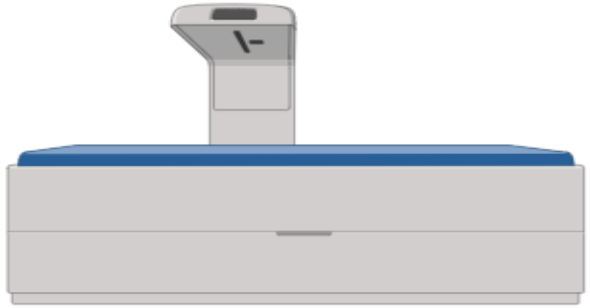
- Patients eligible for bariatric surgery
- Age ≥ 35 years

OUTCOMES (BONE)

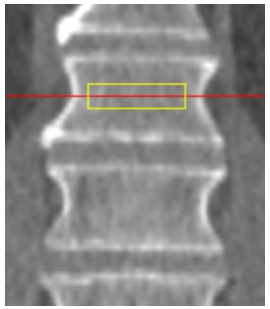
Quantitative Computed Tomography (QCT)



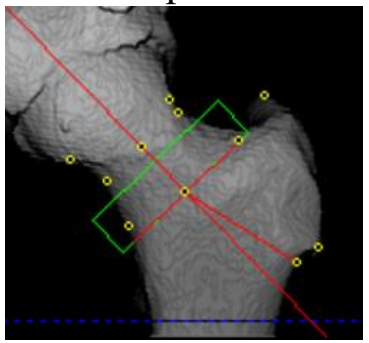
Dual-Energy X-ray Absorptiometry (DXA)



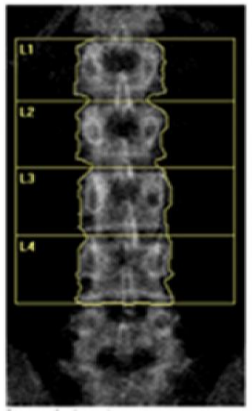
Spine vBMD



Total Hip vBMD



Spine aBMD



Total Hip aBMD

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OUTCOMES (MUSCLE STRENGTH)

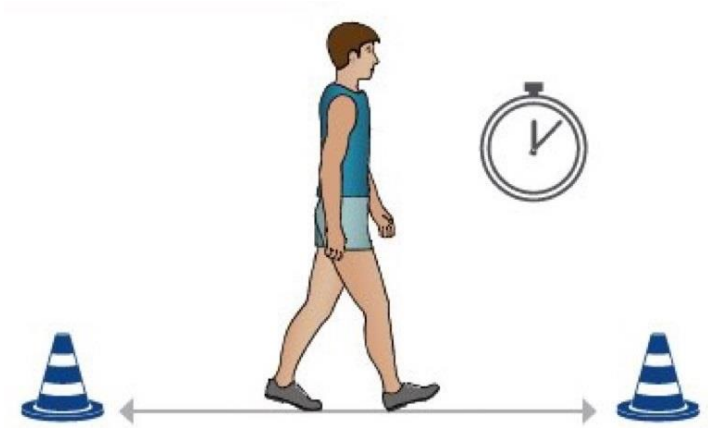
Isometric Knee extensor Strength

Outcome:

Abs. Newton-Meter (Nm)

Rel. Newton-Meter (Nm/kg)

OUTCOMES (PHYSICAL FUNCTION)



Maximal walking speed: 7.6MWT
Habitual speed: 3MWT

Outcome: Walking Speed (m/s)

Sit-to-Stand 5 reps (STS5)

Outcome: Time (s)

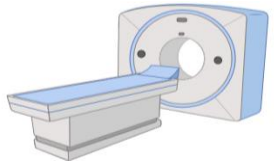
RESULTS

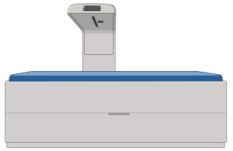
Table 1: Participant characteristics at baseline

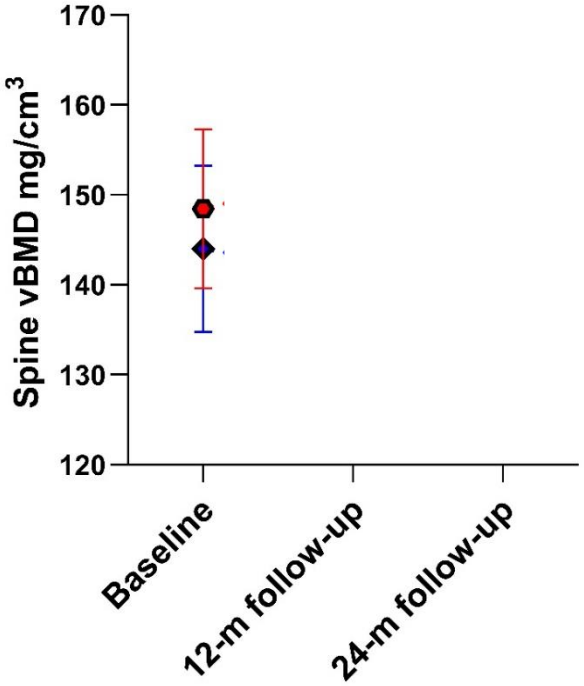
	All	INT	CON
N	59	31	28
Surgery type (RYGB/SG)	39/20	19/12	20/8
Age (years)	48.9 (6.3)	48.5 (6.3)	49.3 (6.5)
Female sex	43 (72.9%)	19 (61.3%)	24 (85.7%)
Male sex	16 (27.1.8%)	**12 (38.7%)***	4 (14.3%)
Postmenopausal women	19 (32.2%)	8 (44.4%)	11 (45.8%)
Males ≥ 50 years	9 (52.9%)	7 (53.8%)	2 (50.0%)
Height (cm)	171 (8.7)	172.3 (8.6)	169.5 (8.4)
Weight (kg)	123.7 (18.0)	124.6 (20.9)	122.8 (14.4)
BMI (kg/m^2)	42.3 (5.3)	41.8 (5.6)	42.8 (4.8)
Administration of the study medication prior to surgery (days)	33 (35.7)	26.3 (21.0)	40.4 (46.2)

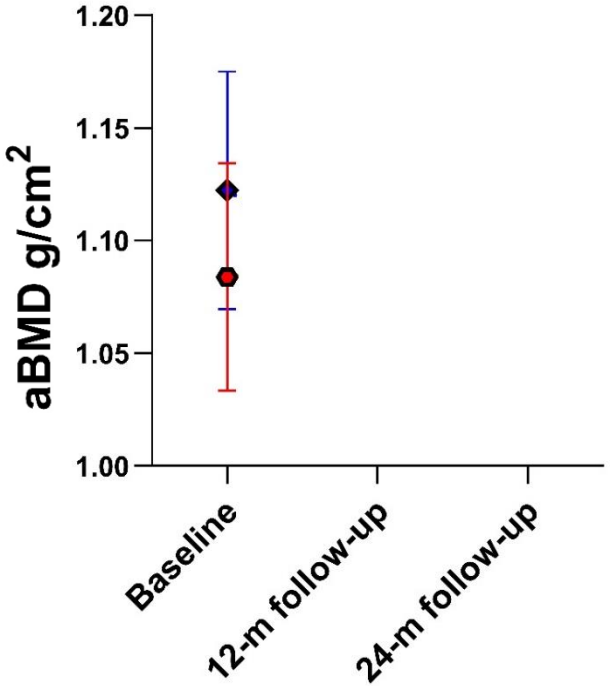
ZOLEDRONIC ACID HAS SHORT-TERM PRESERVING EFFECTS

ZOL
PLA



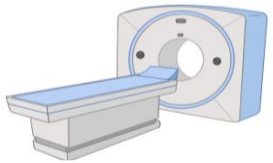


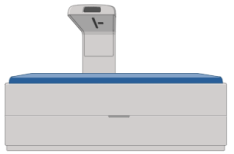


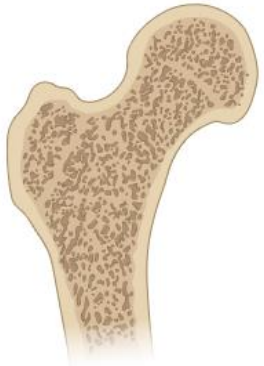


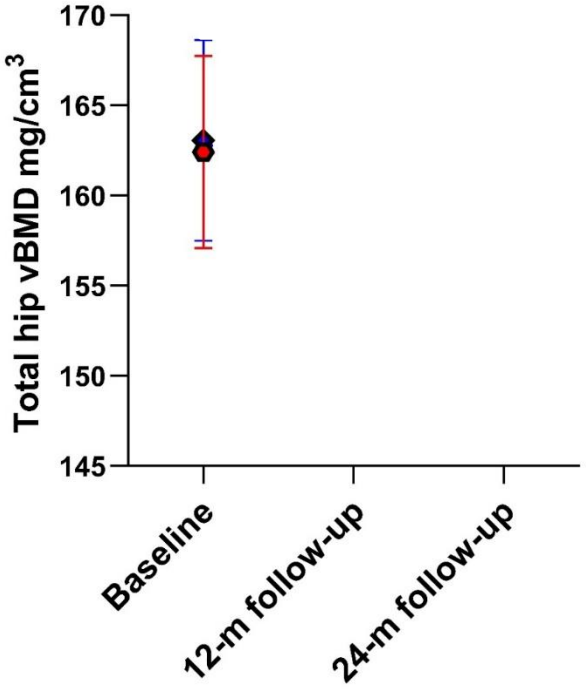
ZOLEDRONIC ACID HAS SHORT-TERM PRESERVING EFFECTS

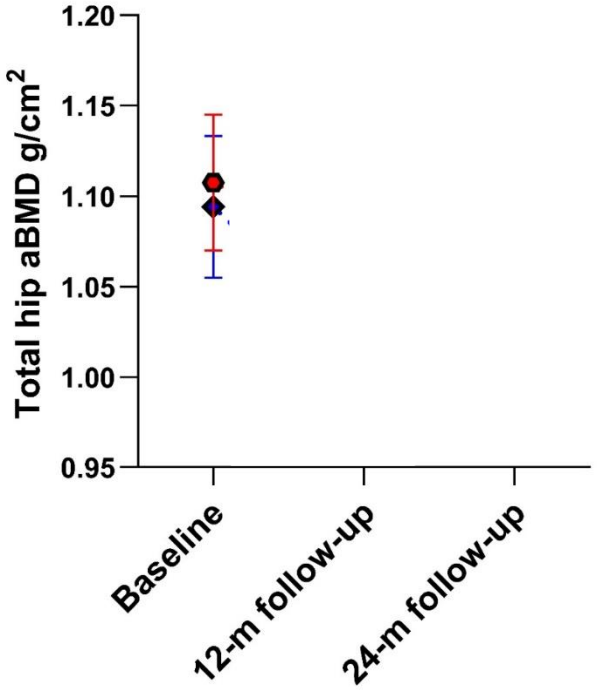
ZOL
PLA









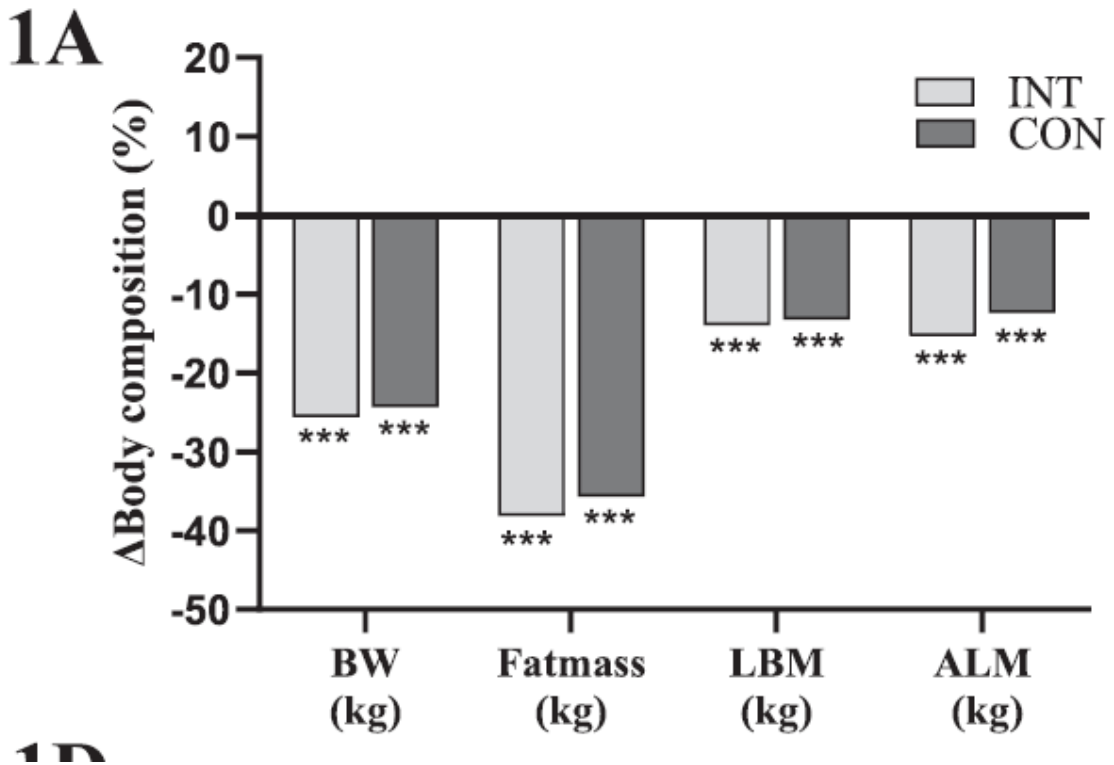


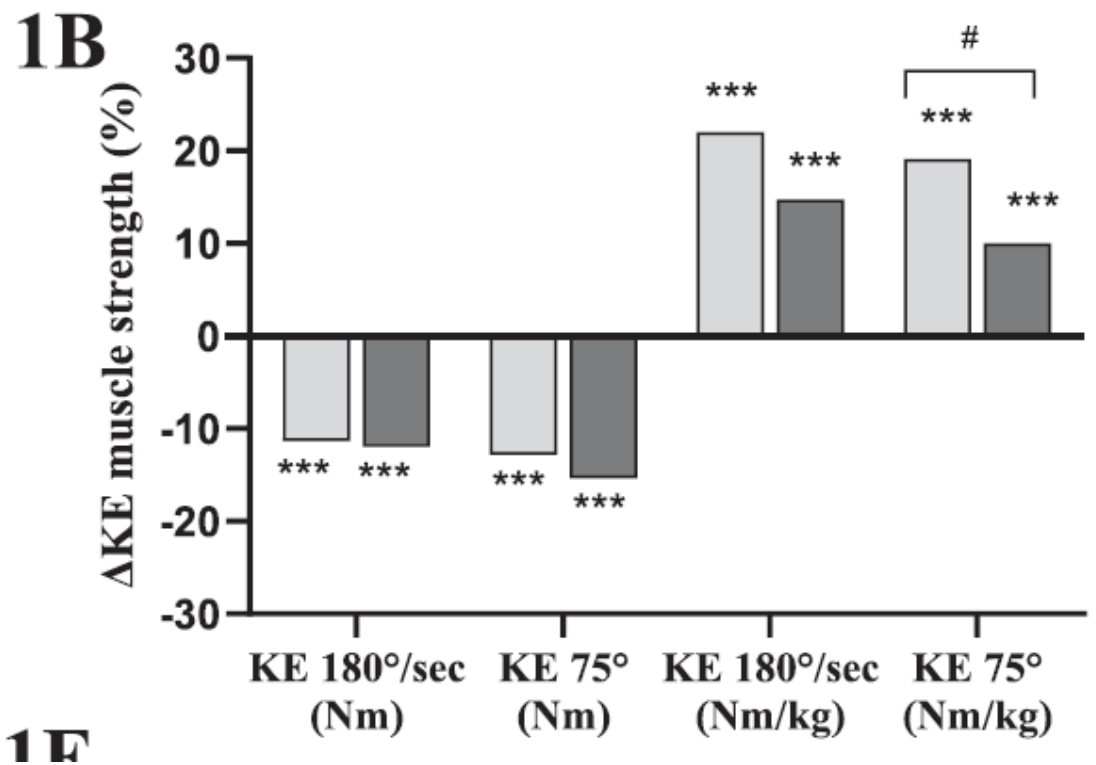
CONCLUSION

1. Zoledronic acid effectively prevents hip bone loss during the first year following surgery.

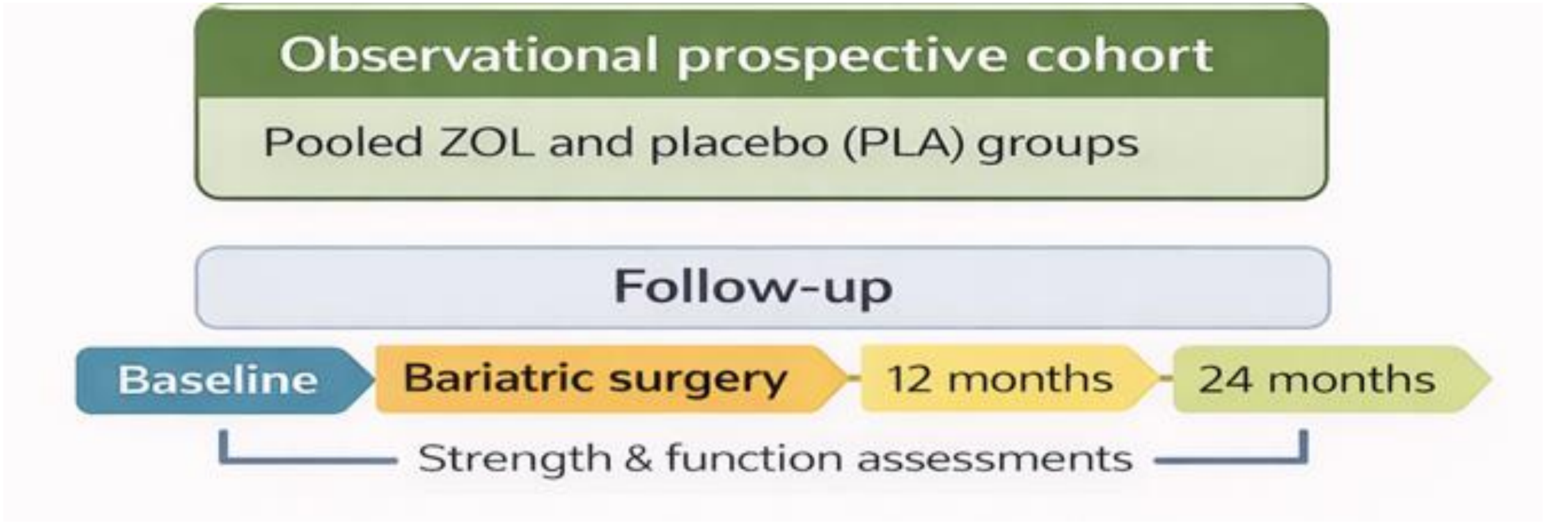
2. The treatment effect diminishes, with no significant difference observed at the 24-month follow-up.

ZOLEDRONIC ACID HAS NOT EFFECT ON MUSCLES

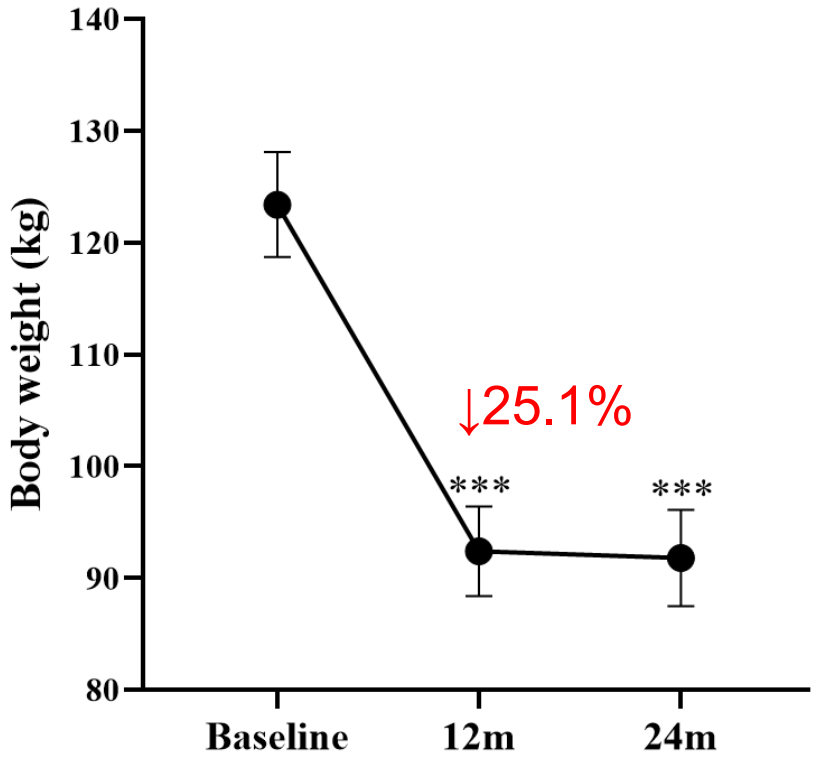




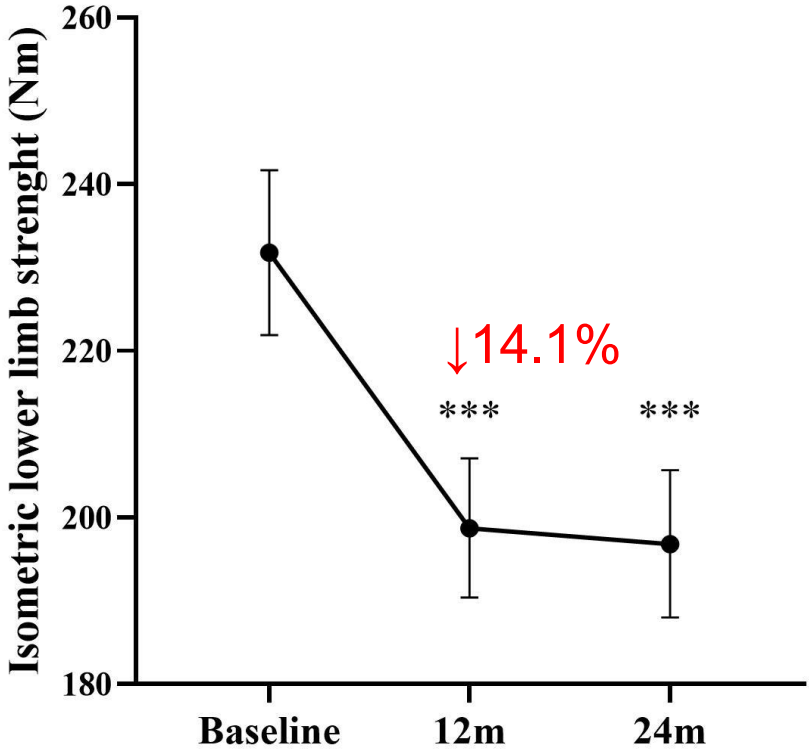
POOLED ANALYSIS FOR 24 MONTHS FOLLOW-UP



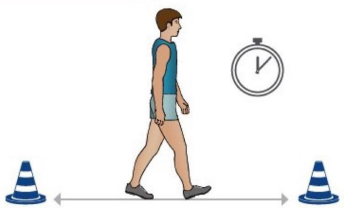
BODY COMPOSITION

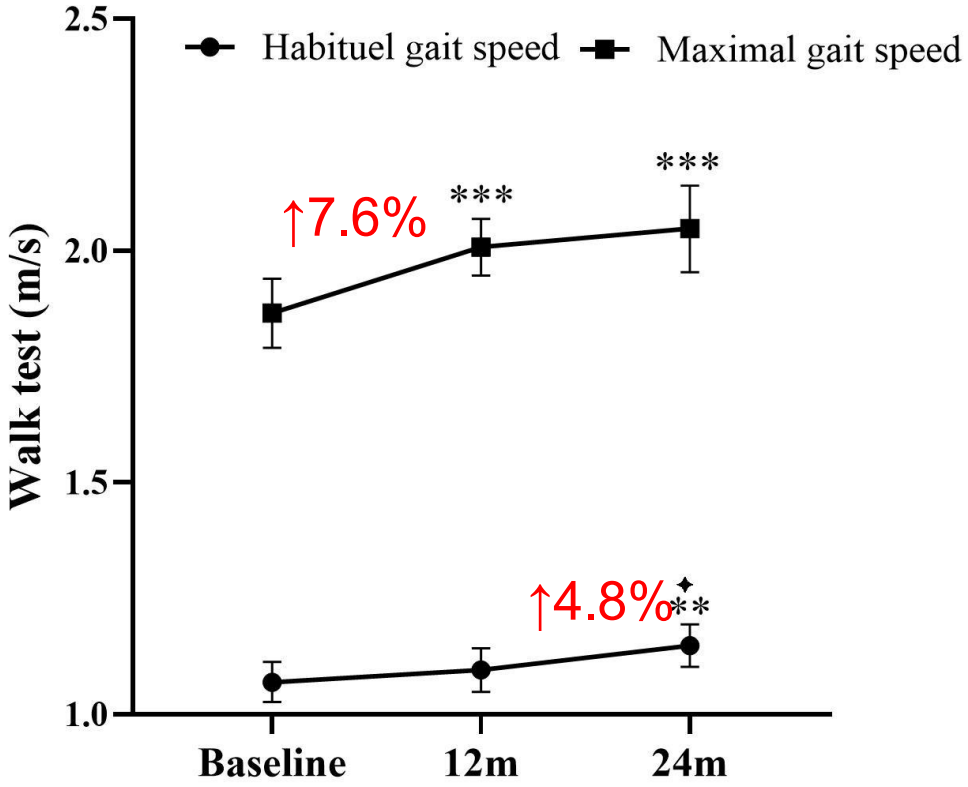


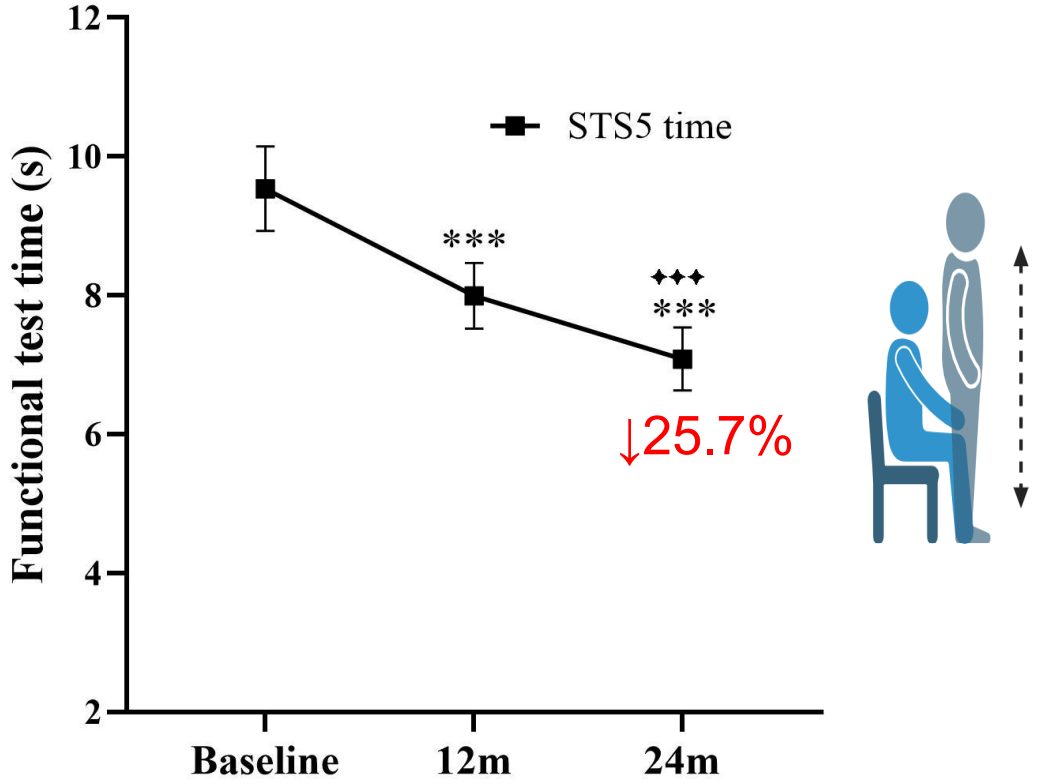
MUSCLE STRENGTH



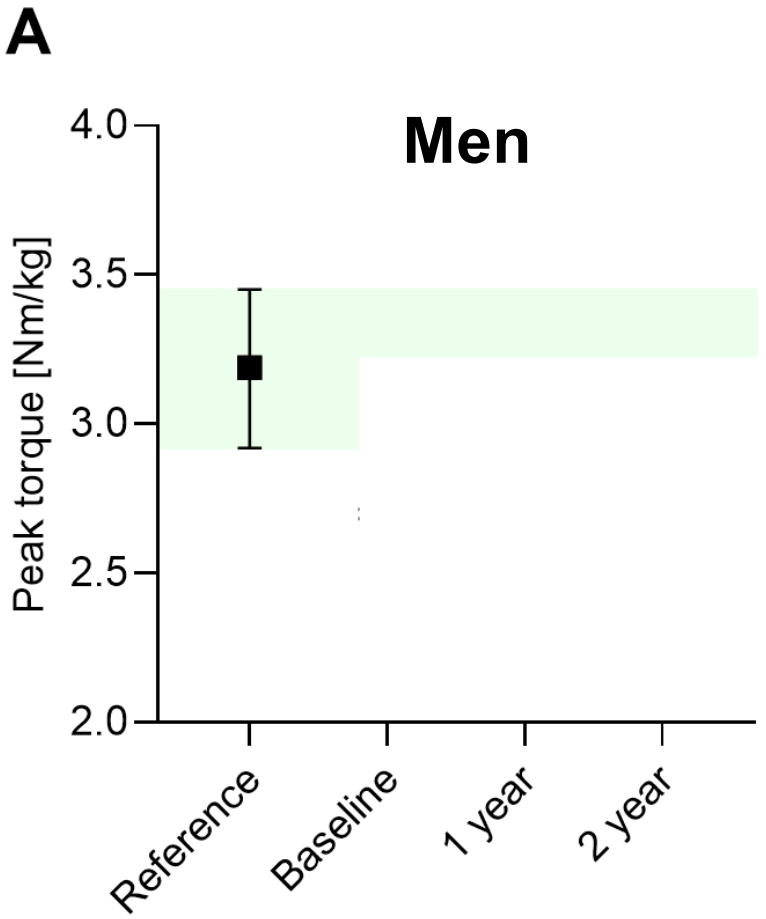
PHYSICAL FUNCION

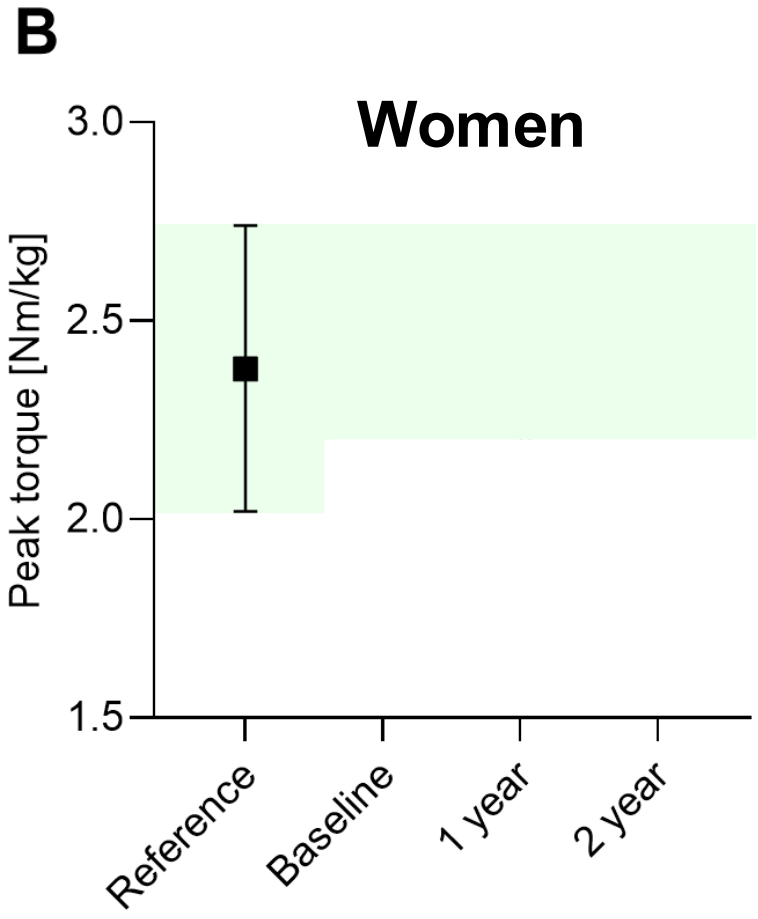






INDICATORS OF MUSCLE IMPAIRMENT IN THE ZABAS COHORT?





FUNDING

Aase og Ejnar Danielsens Fond

A.P. MØLLER FONDEN

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SDU University of Southern Denmark

Region Syddanmark Steno Diabetes Center Odense

IFSO
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1-4 September 2026 | Toronto, Canada

University Hospital of Southern Denmark, Esbjerg

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Syddansk Universitetshospital

Region Syddanmark

ZOLEDRONIC ACID IS SAFE AND WELL-TOLERATED

Table 4: Adverse events in zoledronic acid and placebo groups

	ZOL	PLA	P value
Adverse events (AE)	35 (1.1 ± 1.6)	27 (0.9 ± 1.0)	0.92
Serious adverse events (SAE)	13 (0.4 ± 1.0)	4 (0.1 ± 0.4)	0.35
Adverse reaction (AR)	19 (0.6 ± 0.6)	7 (0.2 ± 0.4)	0.02
Serious adverse reactions (SAR)	0	0	
Description of reported adverse reactions			
Flu-like symptoms	18	6	
Myalgia	0	1	
Syncope	1	0	
Hypocalcemia occurrence			
	ZOL	**PLA**	**P value**
1 month	2	0	0.50
12 month	0	0	-