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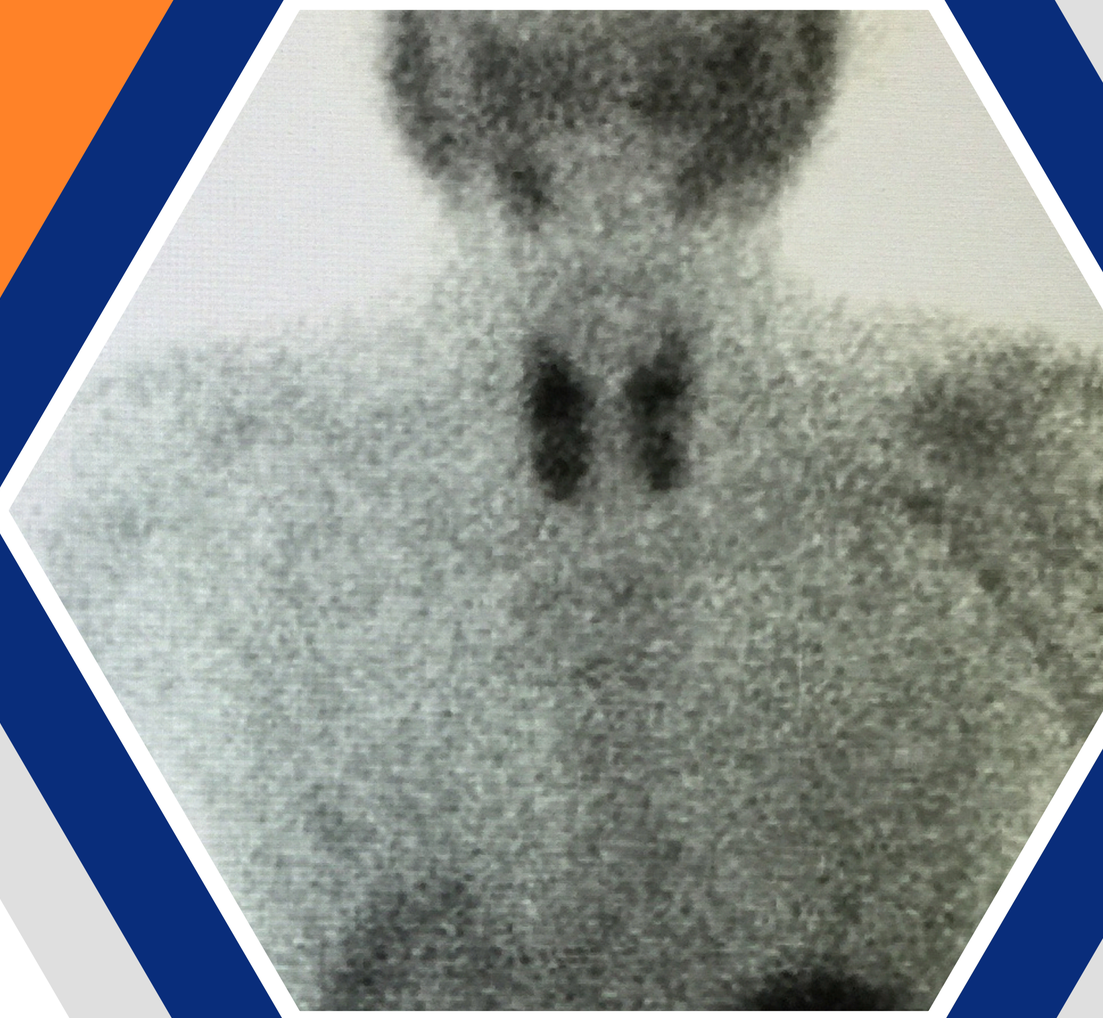
HYPERPARATHYROIDISM

NUTRITION IMPAIRMENT



Sinee Disthabanchong

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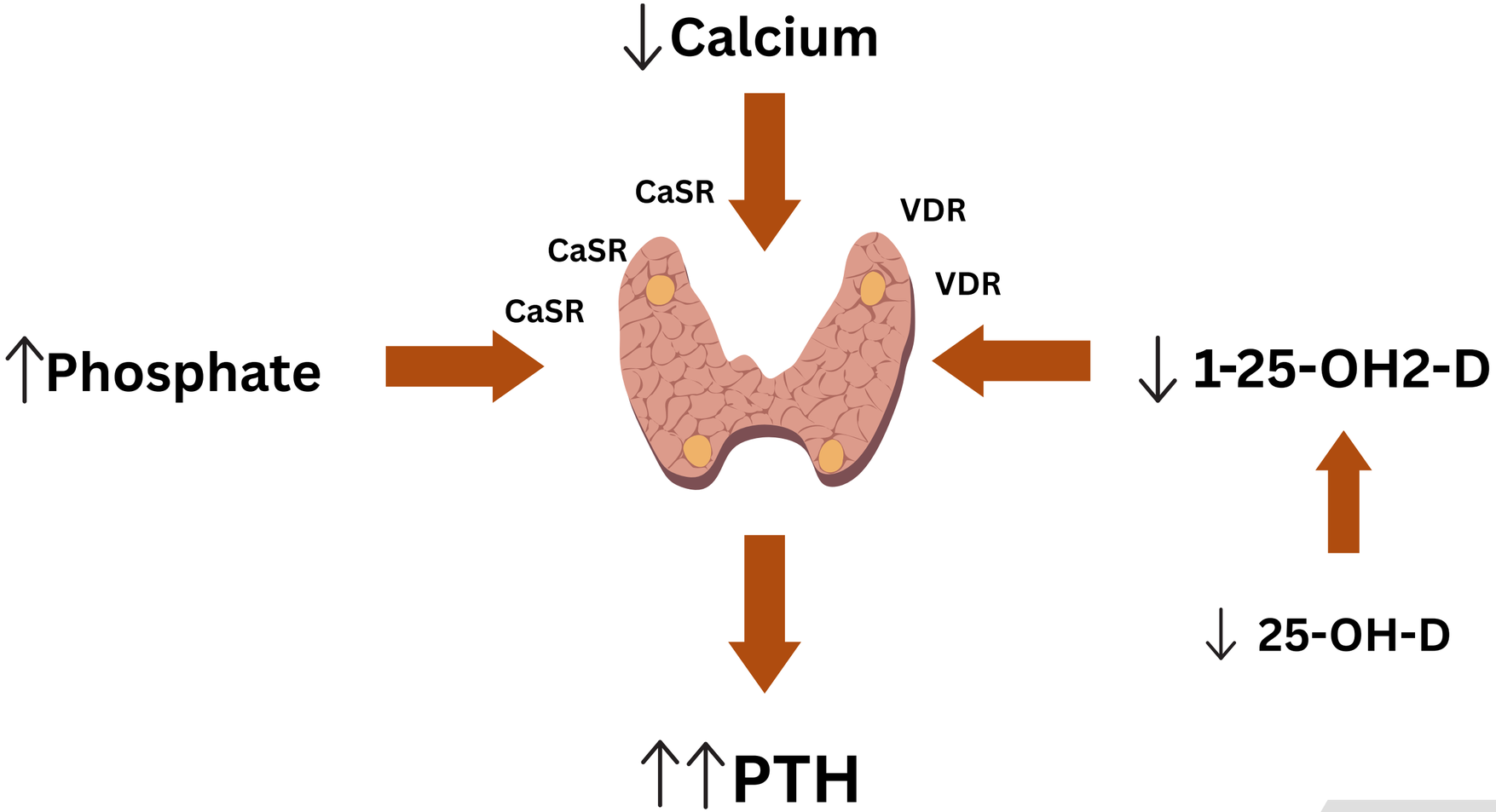
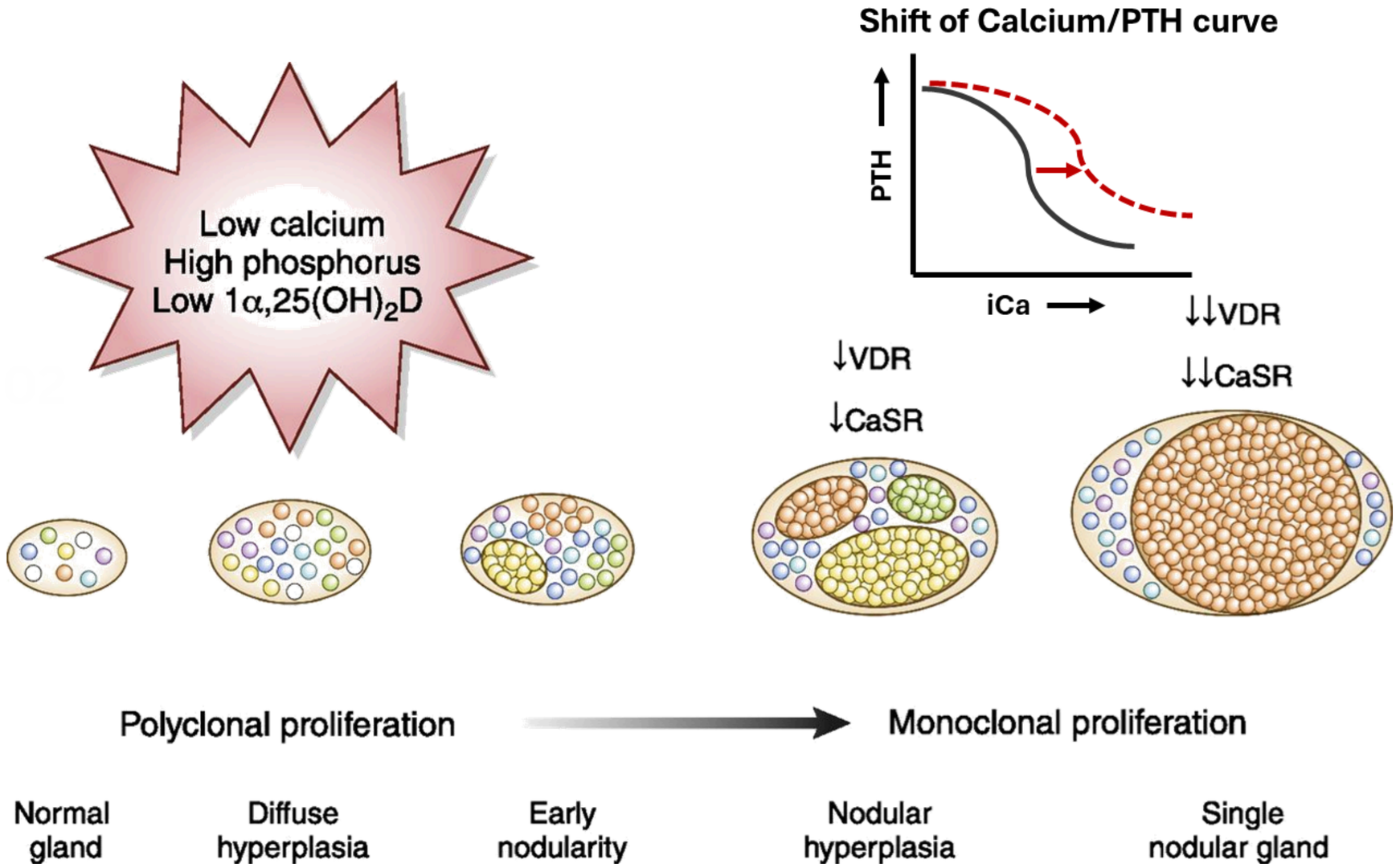
REGULATORS OF PTH SECRETION

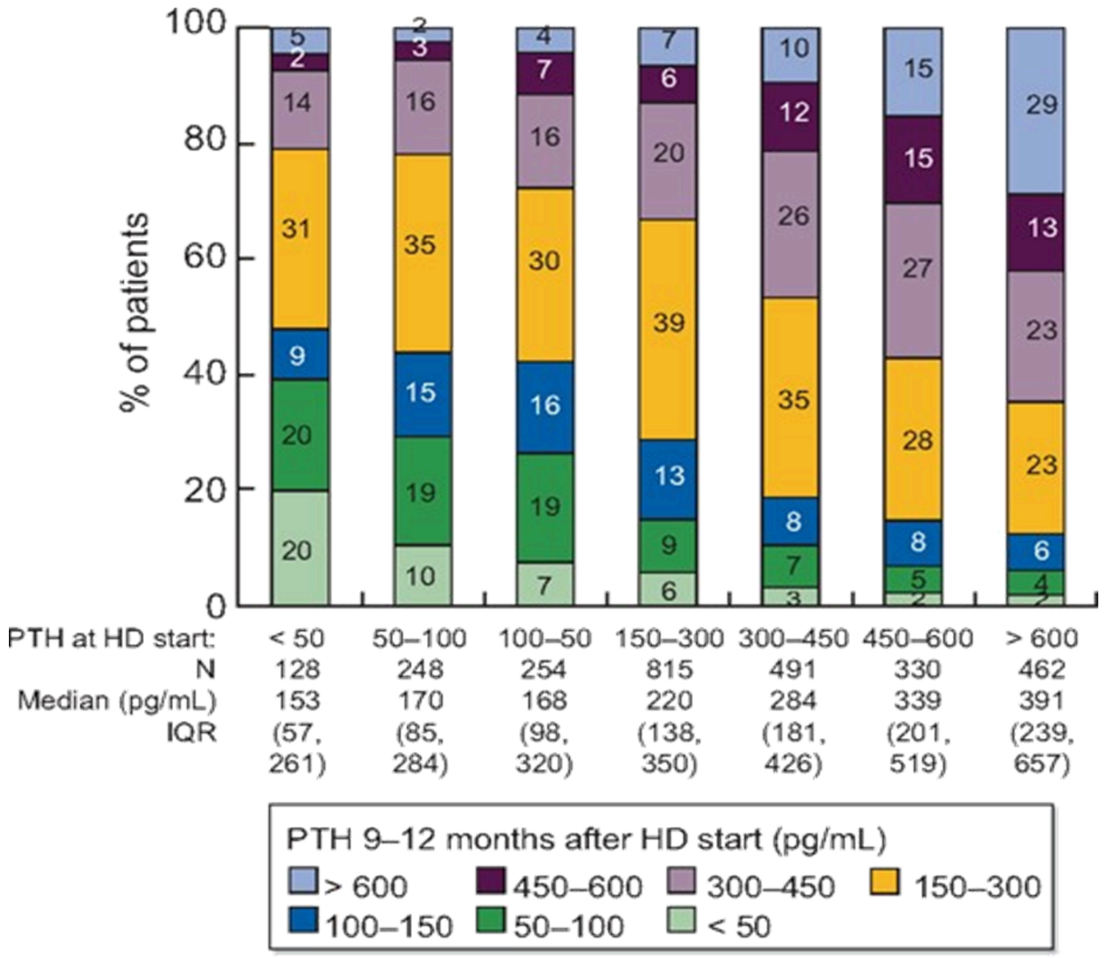


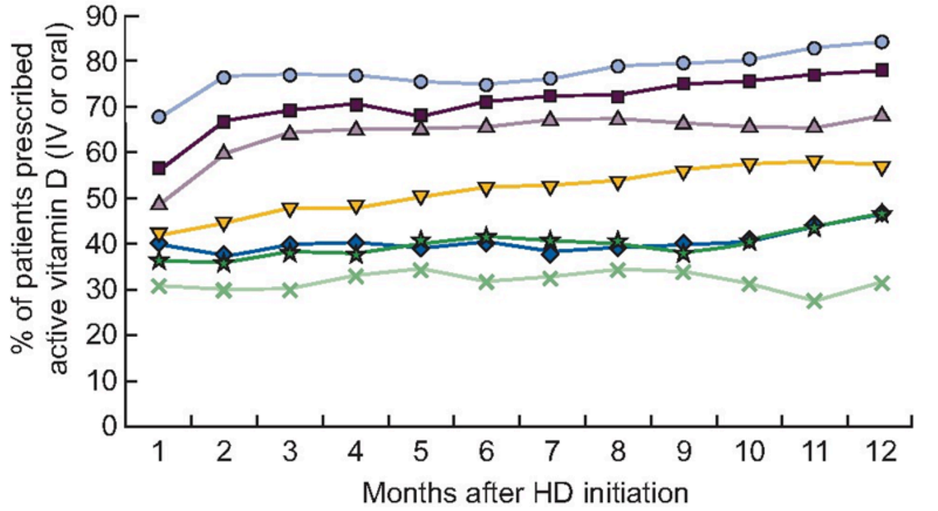
PROGRESSION OF HYPERPARATHYROIDISM

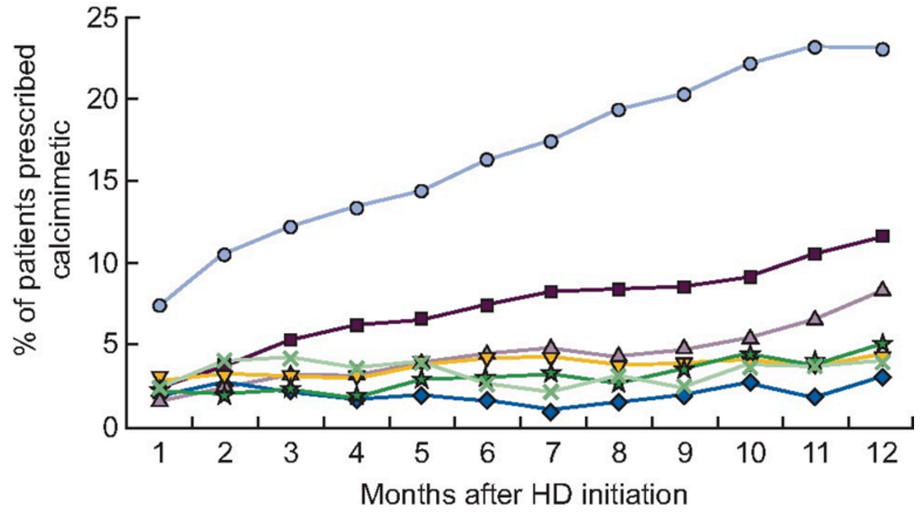


Lau WL and Kalantar-Zadeh K. Clin J Am Soc Nephrol. 2018;13(6):952-61
Disthabanchong S. Curr Opin Nephrol Hypertens. 2023;32(1):20-6

PROGRESSION OF HPT BASED ON BASELINE PTH LEVELS AT HEMODIALYSIS INITIATION







Tabibzadeh N and Young EW. Nephrol Dial Transplant. 2021;36(1):160-9

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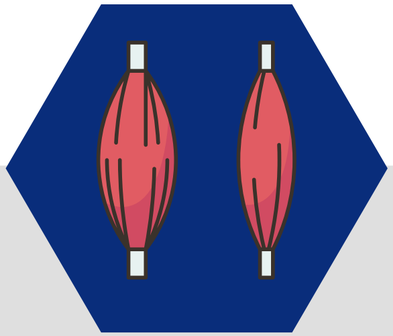
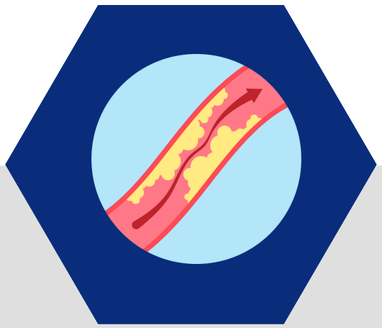
ADVERSE HEALTH EFFECTS OF HYPERPARATHYROIDISM

Bone Loss
Fracture



Protein Energy
Wasting
Weight Loss

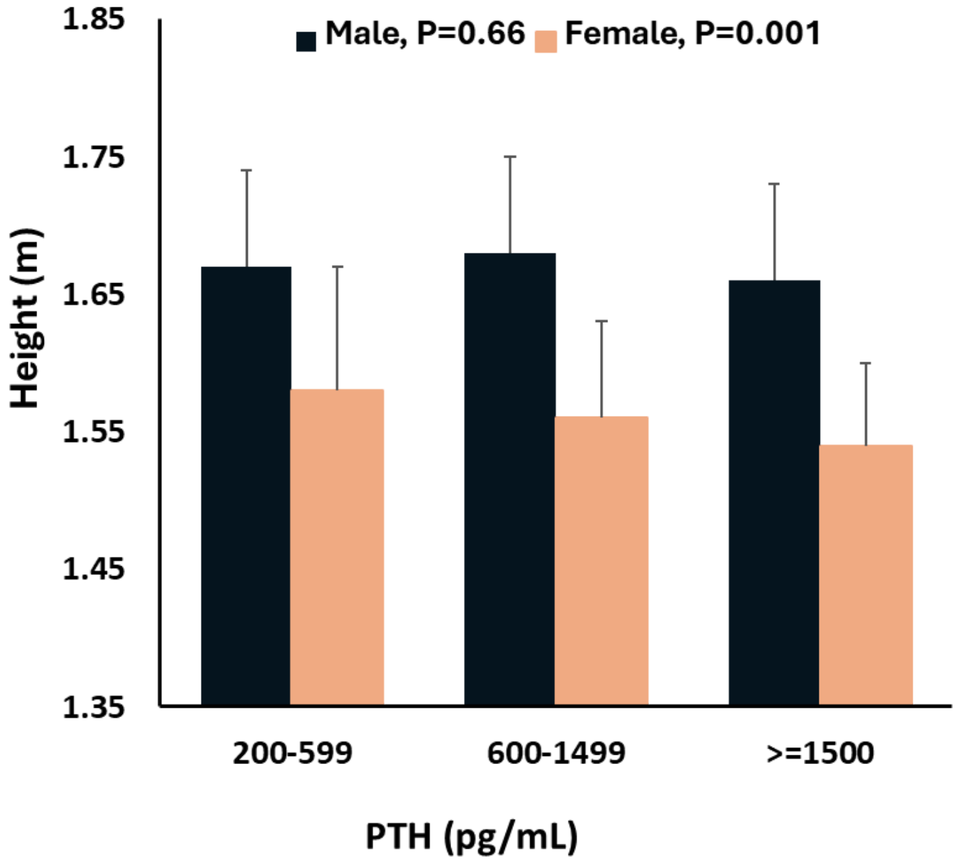


Vascular and
Soft Tissue
Calcification

Mortality

BONE LOSS AND PROTEIN-ENERGY WASTING

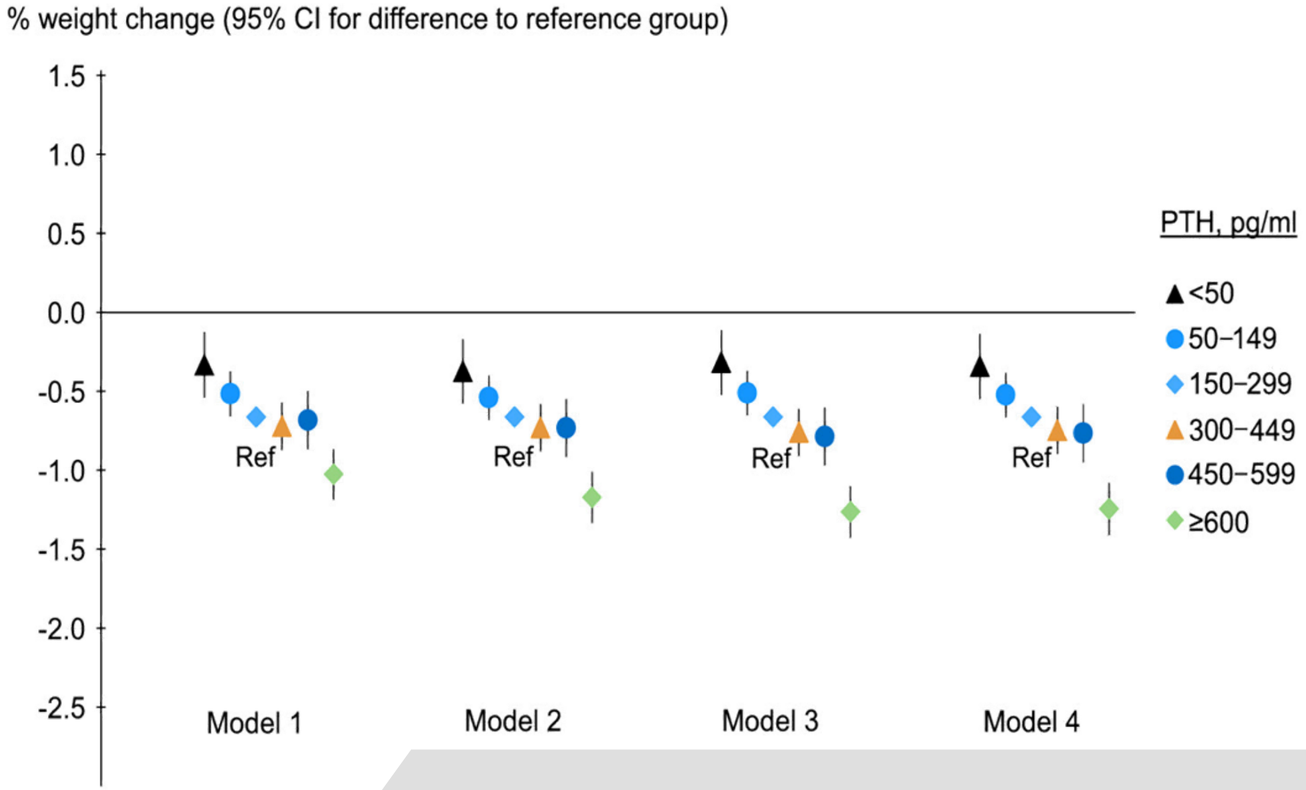
BONE AND HEGHT LOSS



Disthabanchong S. Front Nutr. 2022 Sep 13;9:933918

WEIGHT LOSS

42,319 chronic HD patients from DOPPs phases 2–6 (2002–2018)



Komaba H J Cachexia Sarcopenia Muscle 2021;12(4):855-65f

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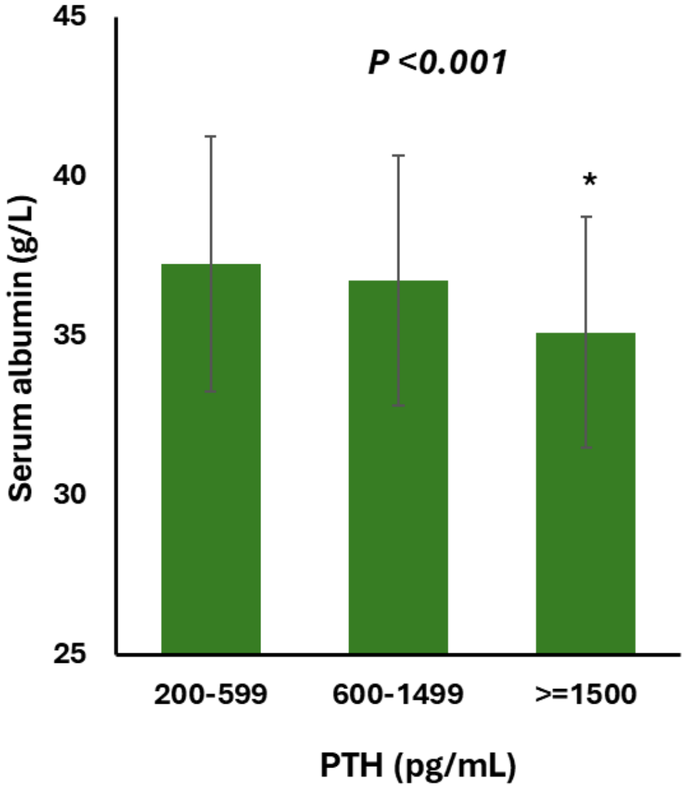
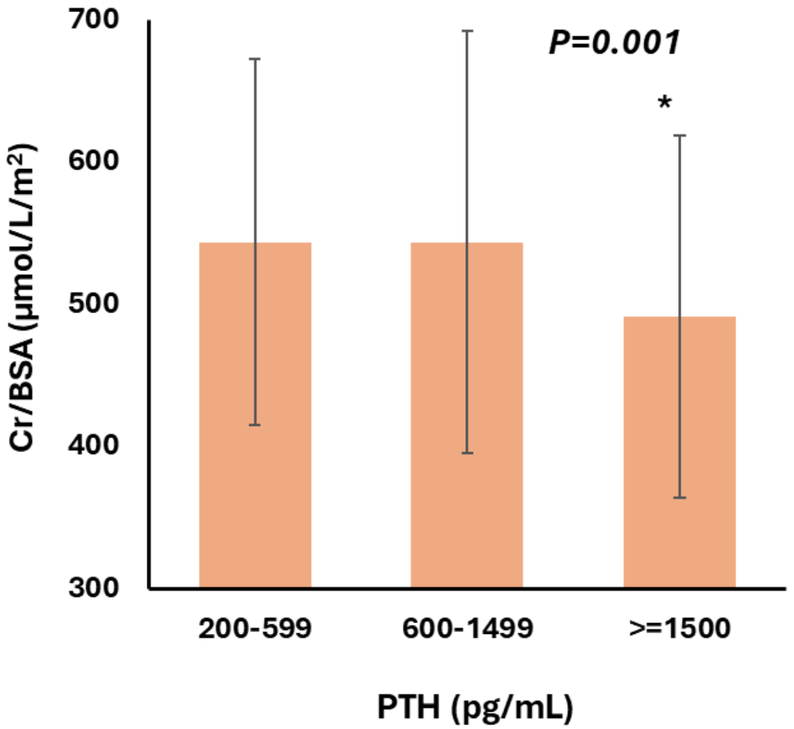
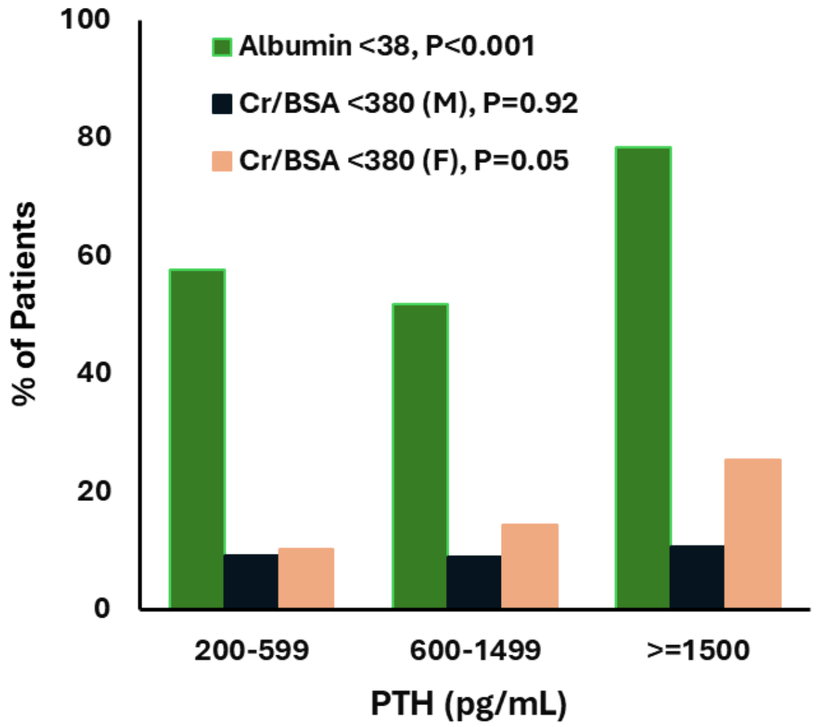
PROTEIN-ENERGY WASTING



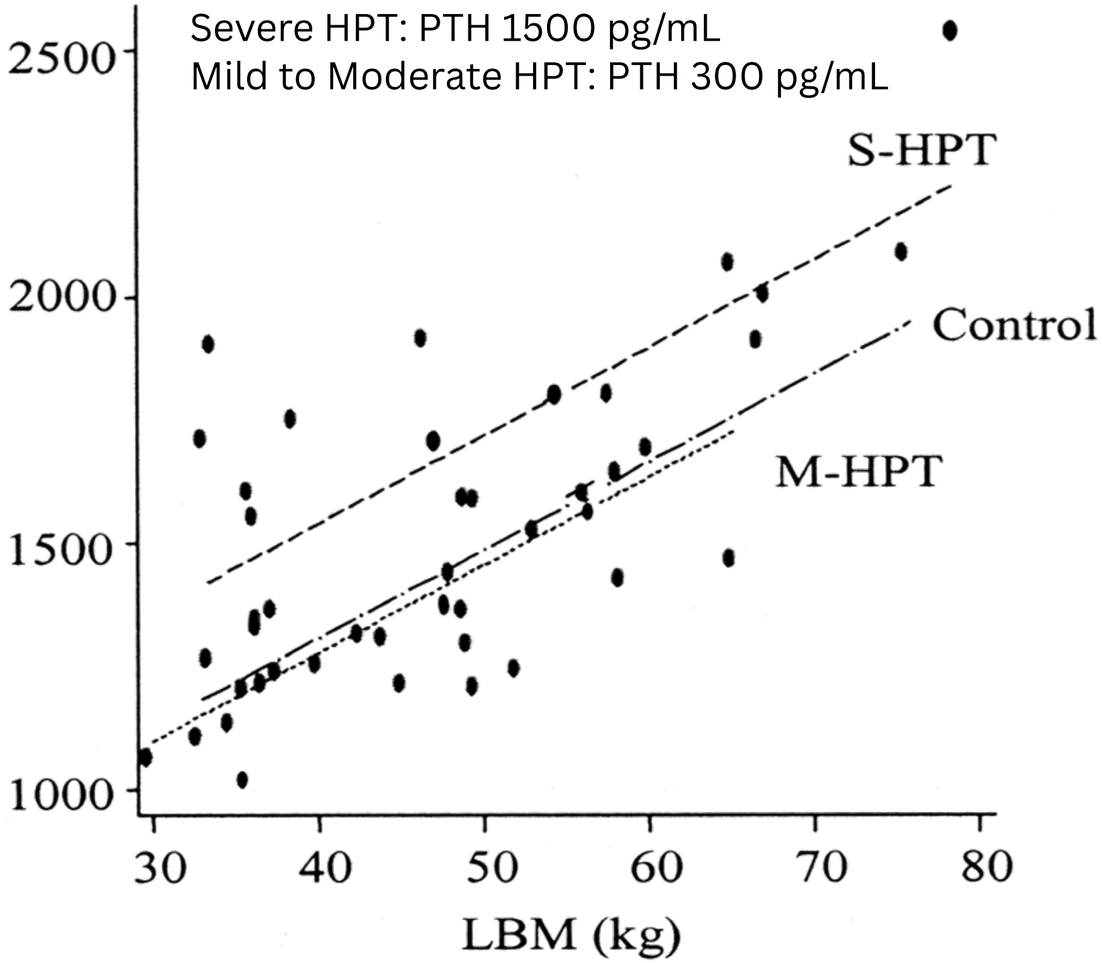




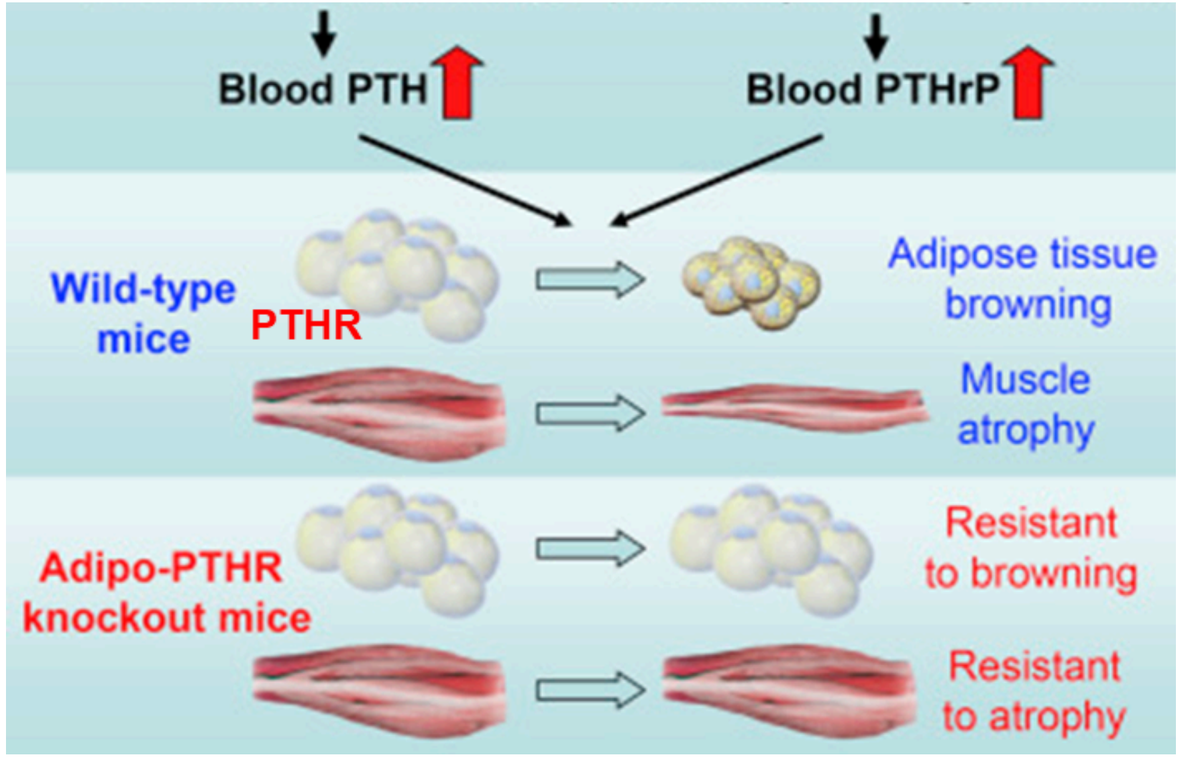
Disthabanchong S. Front Nutr. 2022 Sep 13;9:933918

INCREASED RESTING ENERGY EXPENDITURE IN HYPERPARATHYROIDISM

Severe HPT: PTH 1500 pg/mL
Mild to Moderate HPT: PTH 300 pg/mL

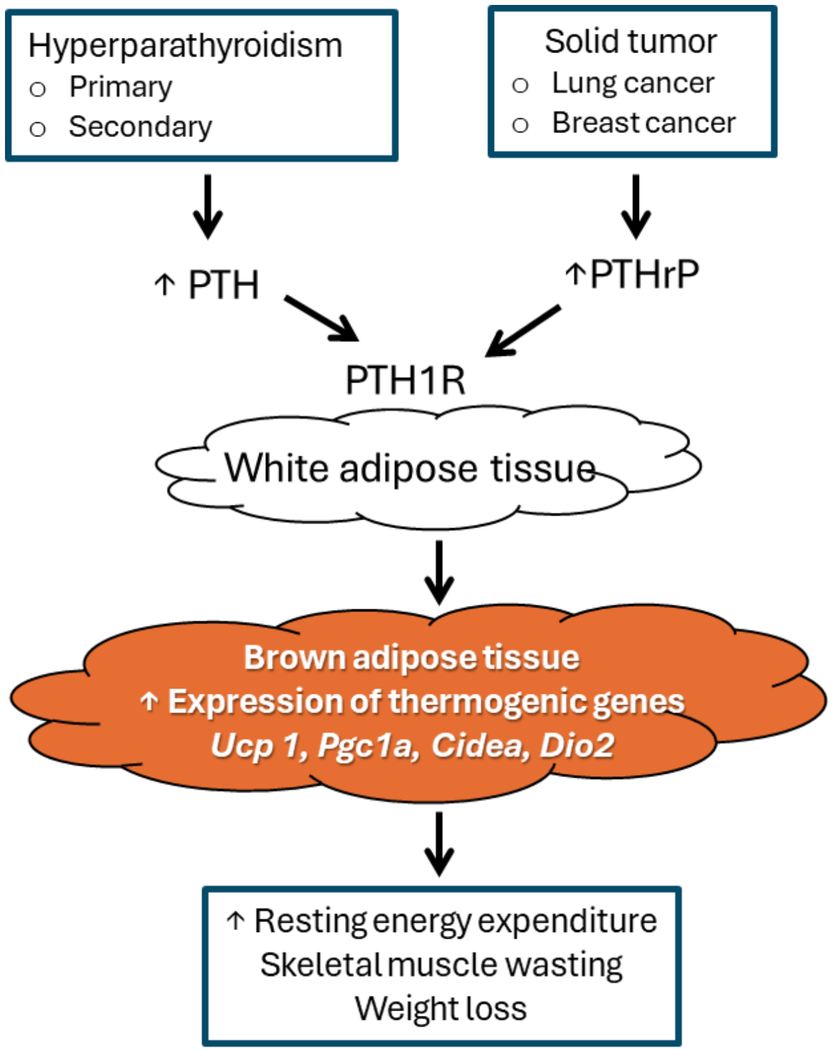


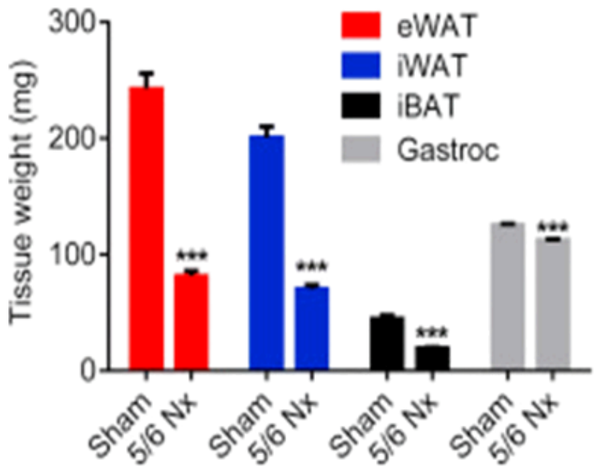
Cuppari L. J Am Soc Nephrol 2004;15(11):2933-9

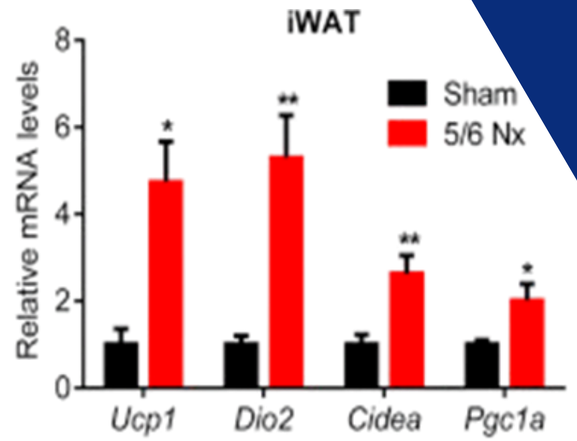


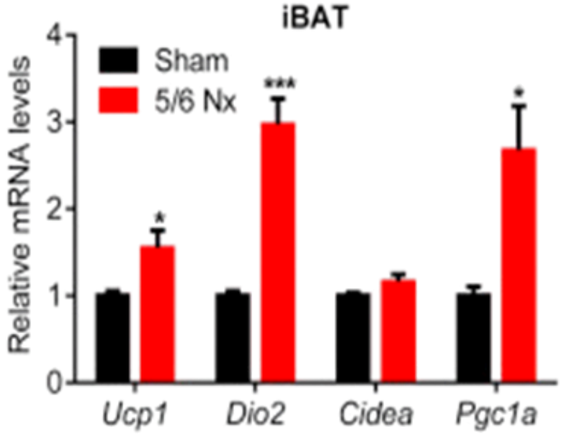
Kir S. Cell Metab (2016) 23(2):315-23

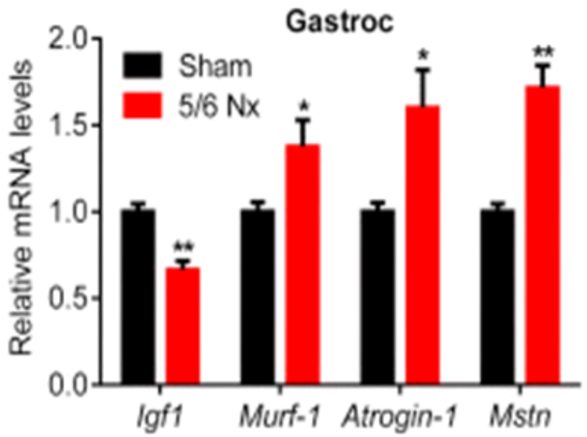
ADIPOSE TISSUE BROWNING











eWAT: Epidymal white adipose tissue (Visceral fat)
iWAT: Inguinal white fat (Subcutaneous fat)
iBAT: Intercapsular brown fat
Gastroc: Gastocnemius muscle

Srisuwarn P and Disthabanchong S. Front Biosci (Landmark Ed). 2023 ;28(8):167

Kir S. Cell Metab (2016) 23(2):315-23

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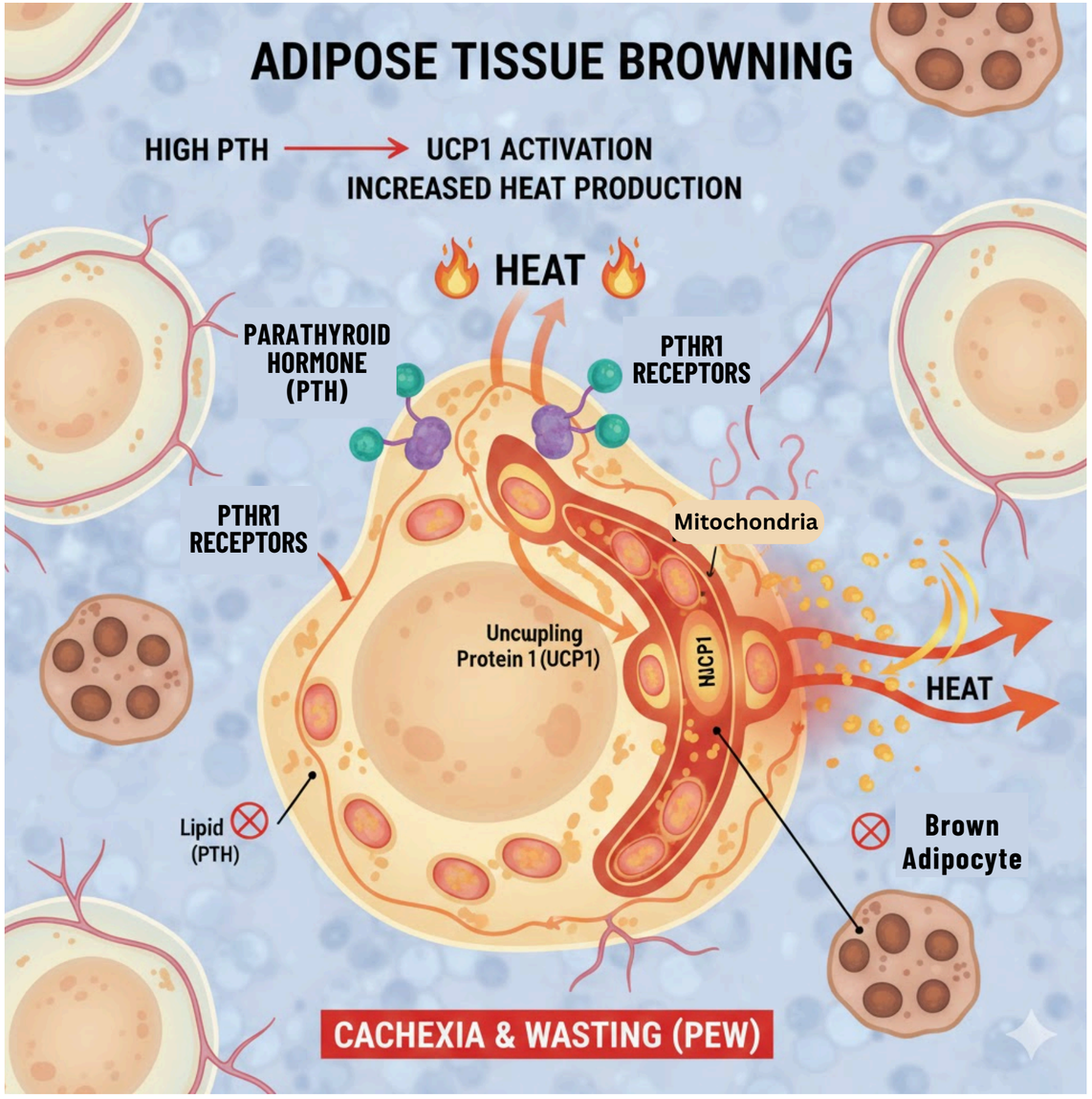
ADIPOSE TISSUE BROWNING



White adipose tissue (WAT) is primarily for energy storage. Brown adipose tissue (BAT) are specialized fat cells that generate heat by burning energy (thermogenesis). = Browning

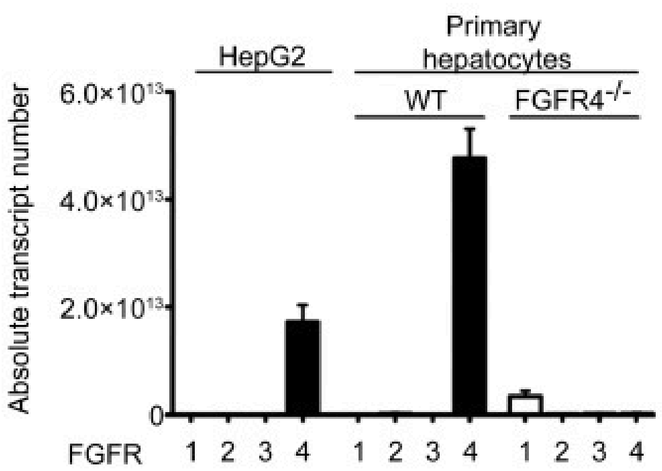
High concentrations of PTH (and related peptides like PTHrP) activate PTHR1 on the white adipocytes. This activation triggers signaling pathways that promote the expression of key thermogenic proteins, most notably Uncoupling Protein 1 (UCP1).

UCP1 uncouples the process of oxidative phosphorylation in the mitochondria, meaning the energy from food is dissipated as heat instead of being stored as ATP or converted into new fat/muscle mass.

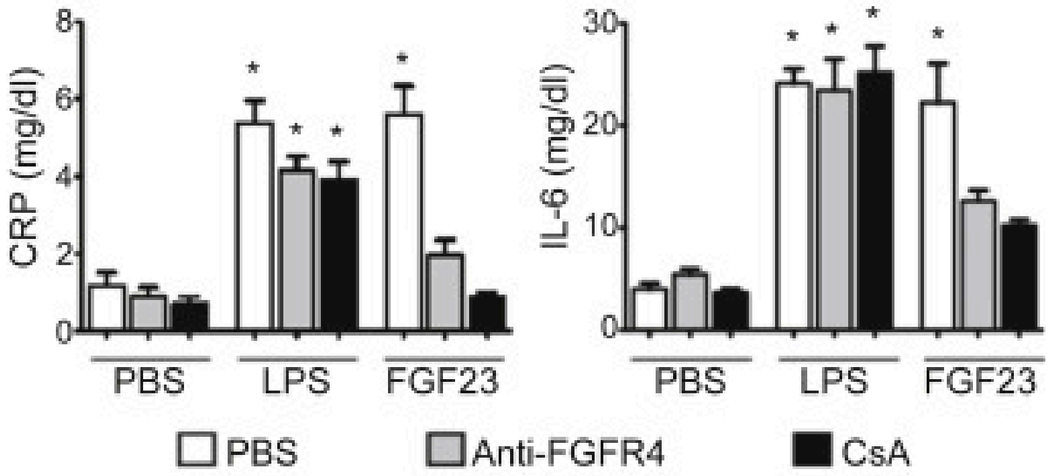
The net effect is a significant and persistent increase in the body's resting energy expenditure (REE). The body burns calories unnecessarily for heat, leading to a negative energy balance.

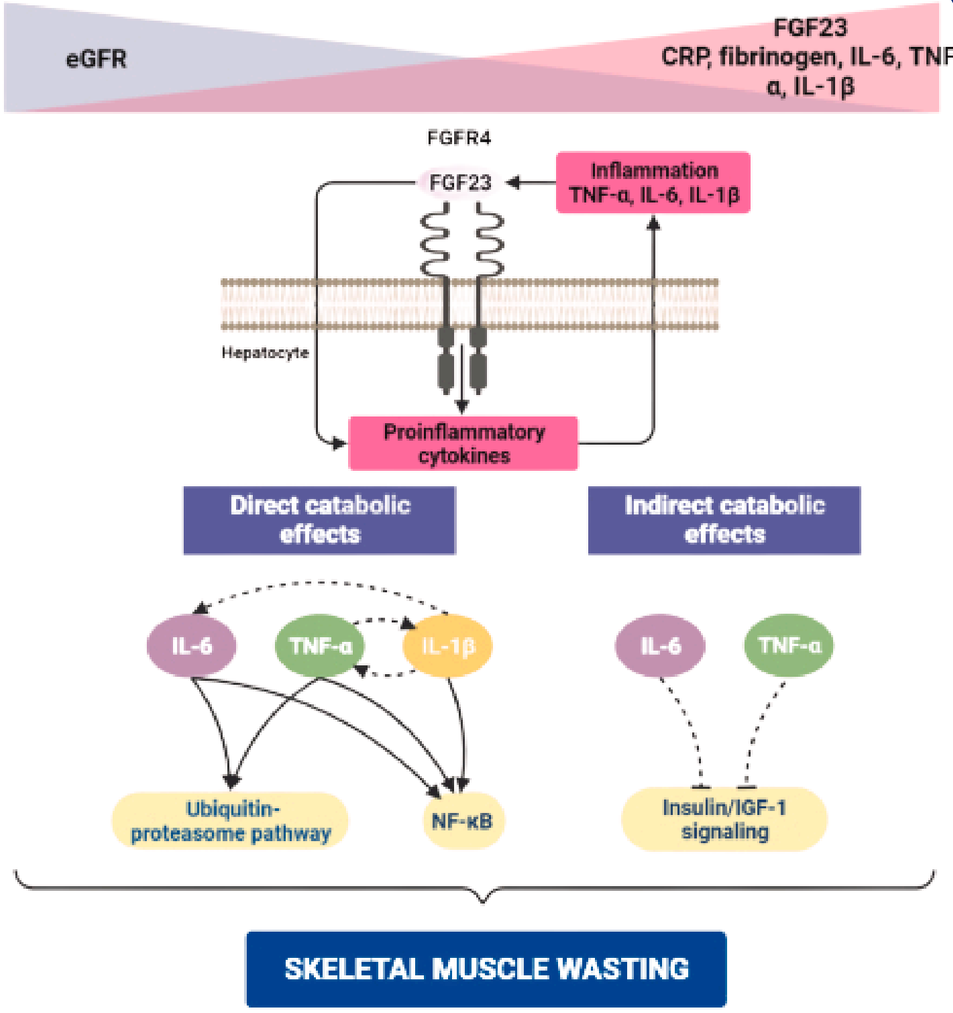
This high energy demand contributes directly to the breakdown of both fat and muscle stores, resulting in cachexia and wasting (PEW).

FGF-23 AND INFLAMMATION



FGF23 can directly induce cytokine production from hepatocytes through activation of FGFR4 expressed on hepatocytes, through PLC-Calcineurin-NFAT pathway





Singh S and Faul C. Kidney Int. 2016;90(5):985-96

Afsar RE. Kidney Int Rep. 2023 3;8(7):1301–1314

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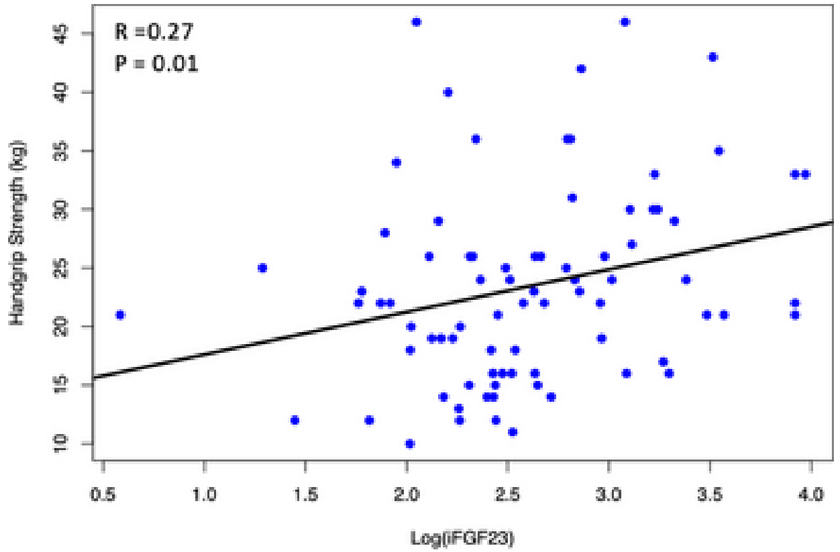
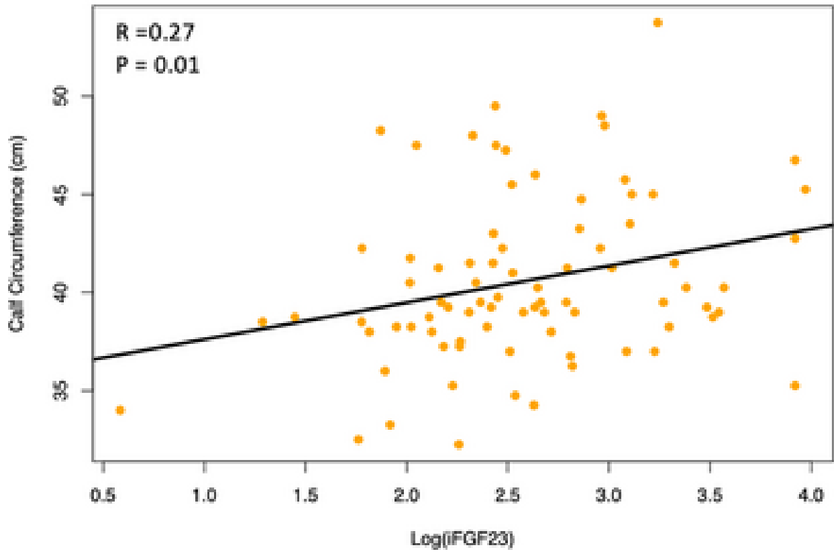
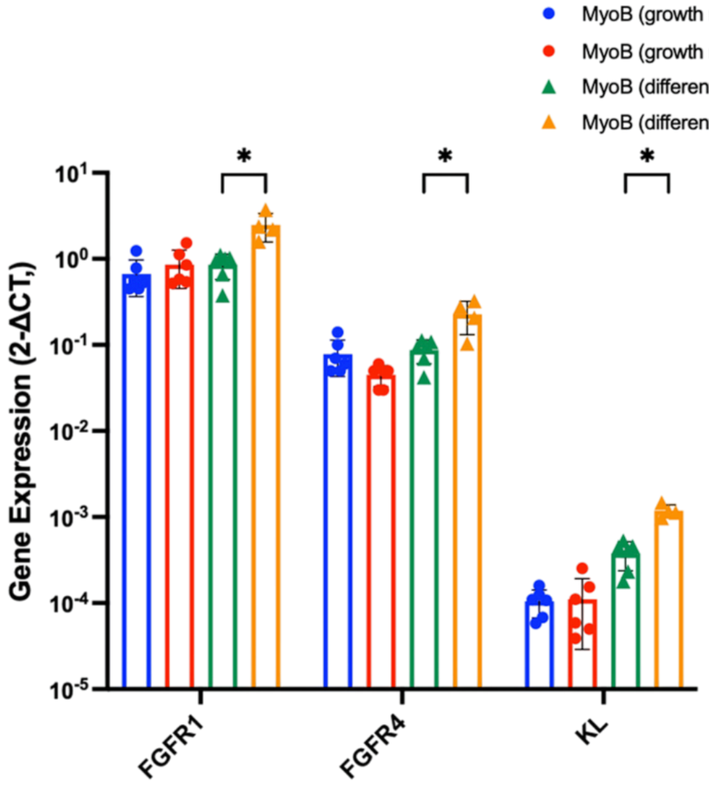
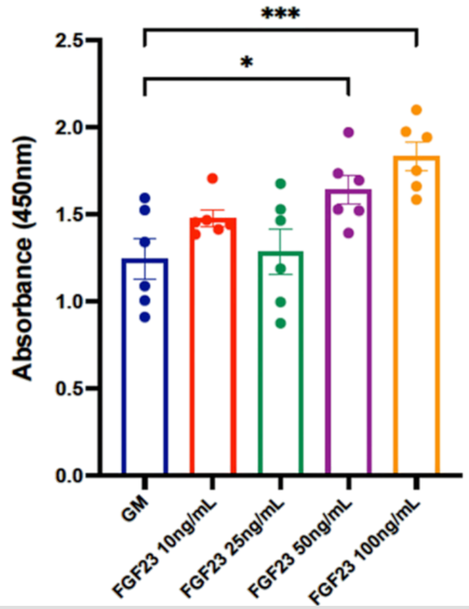
FGF-23 AND SARCOPENIA





- FGF-23 level is associated with muscle mass and strength in HD patients
- FGFR1, FGFR4, and klotho are present in adult human skeletal muscle myoblasts
- Increasing dose of FGF-23 promotes myoblast proliferation but but repressing myogenic differentiation





Wong L. J Cachexia Sarcopenia Muscle. 2025 Jun;16(3):e13848

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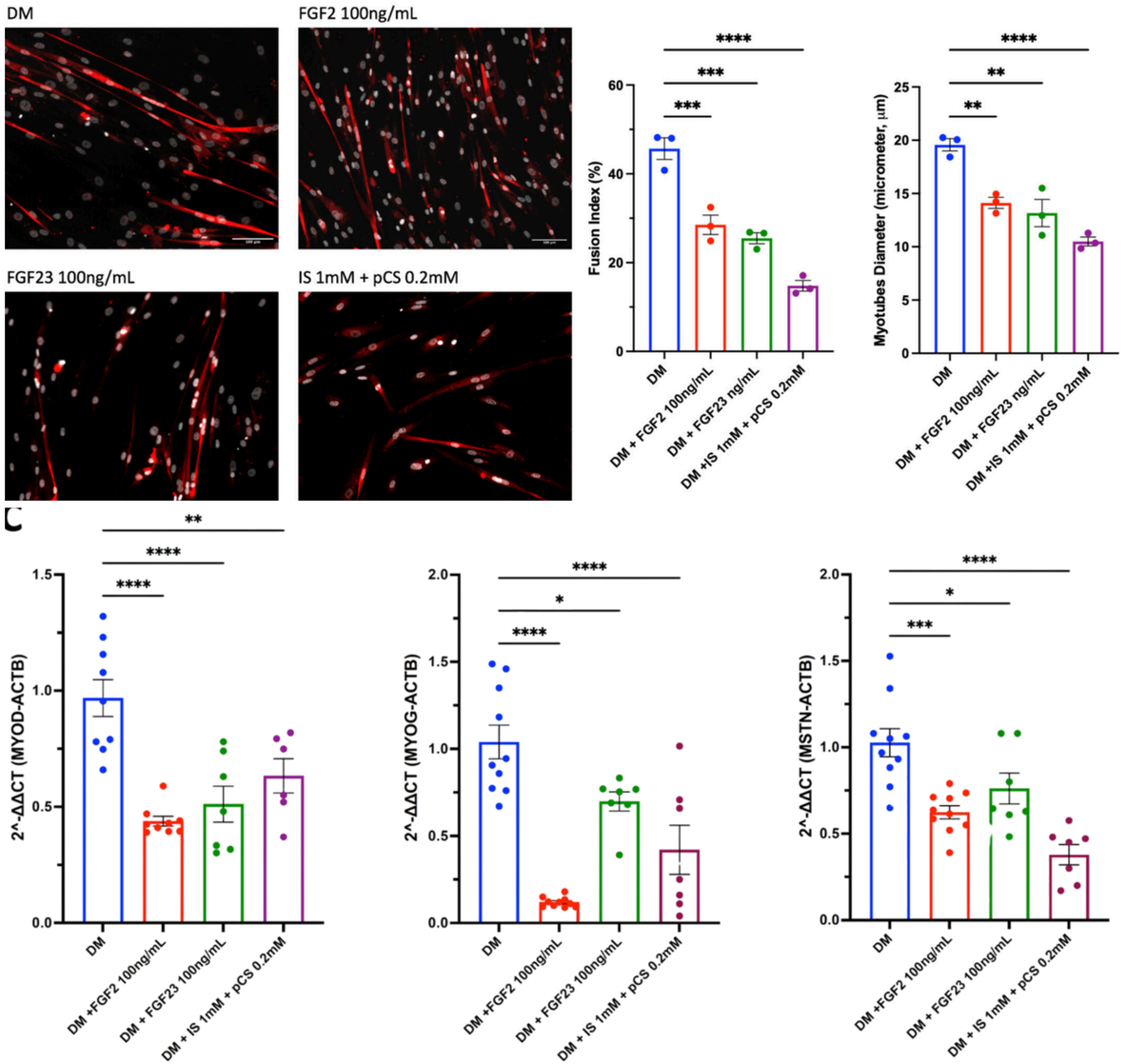
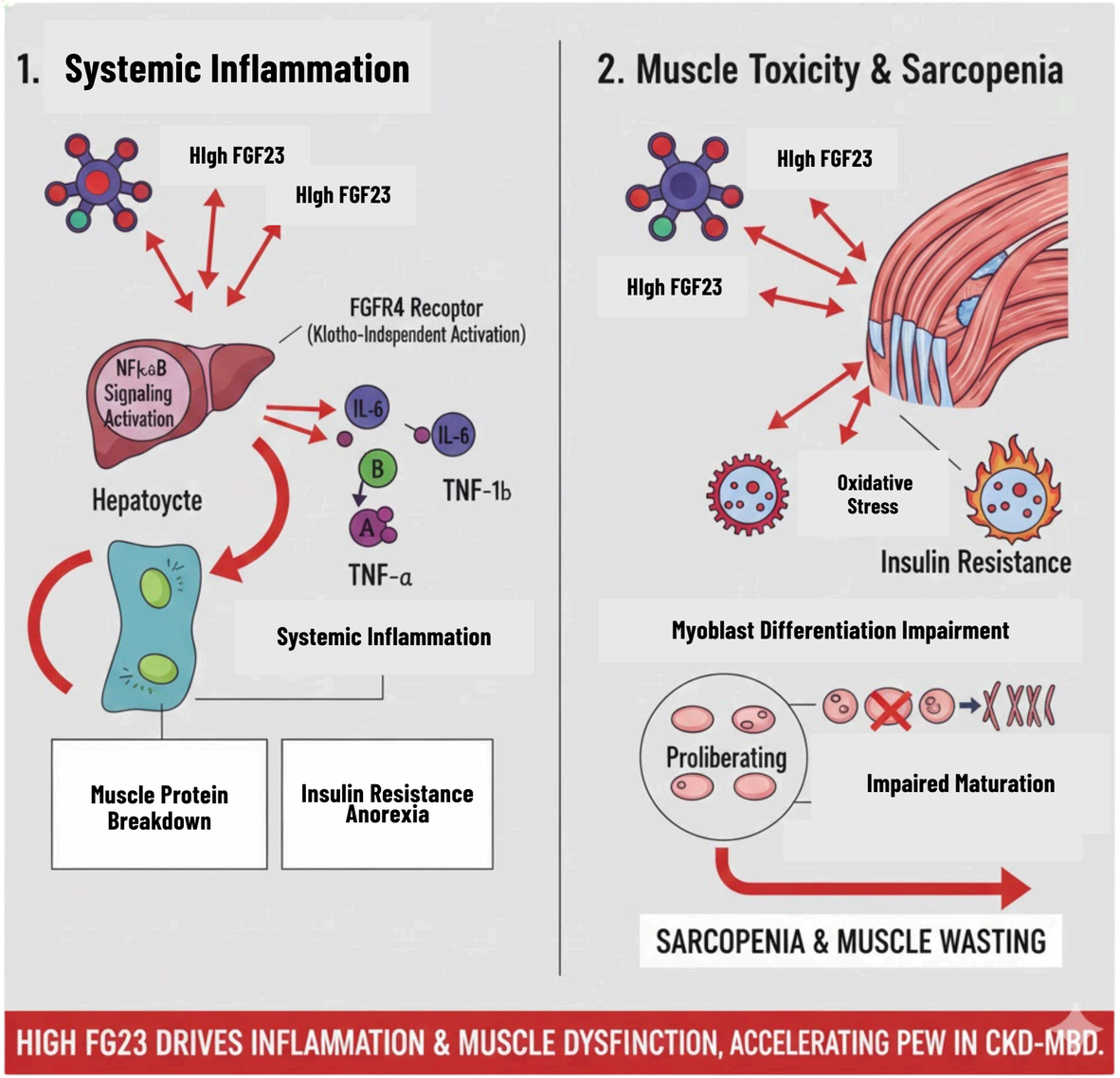
FGF-23 AND SARCOPENIA





Reduced myosin heavy chain (red staining), fusion indices and myotubes diameter after FGF-23 treatment. The expressions of MYOD, MYOG and MSTN were reduced in myoblasts cultured in differentiated medium (DM) in the presence of FGF-23

Wong L. J Cachexia Sarcopenia Muscle. 2025 Jun;16(3):e13848

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MANAGEMENT OF HYPERPARATHYROIDISM

MULTIMODAL TREATMENT IS THE KEY TO EFFECTIVE MANAGEMENT

- Phosphate Restriction
  Phosphate Binders
- Active Vitamin D
- Calcimimetics
- Parathyroidectomy

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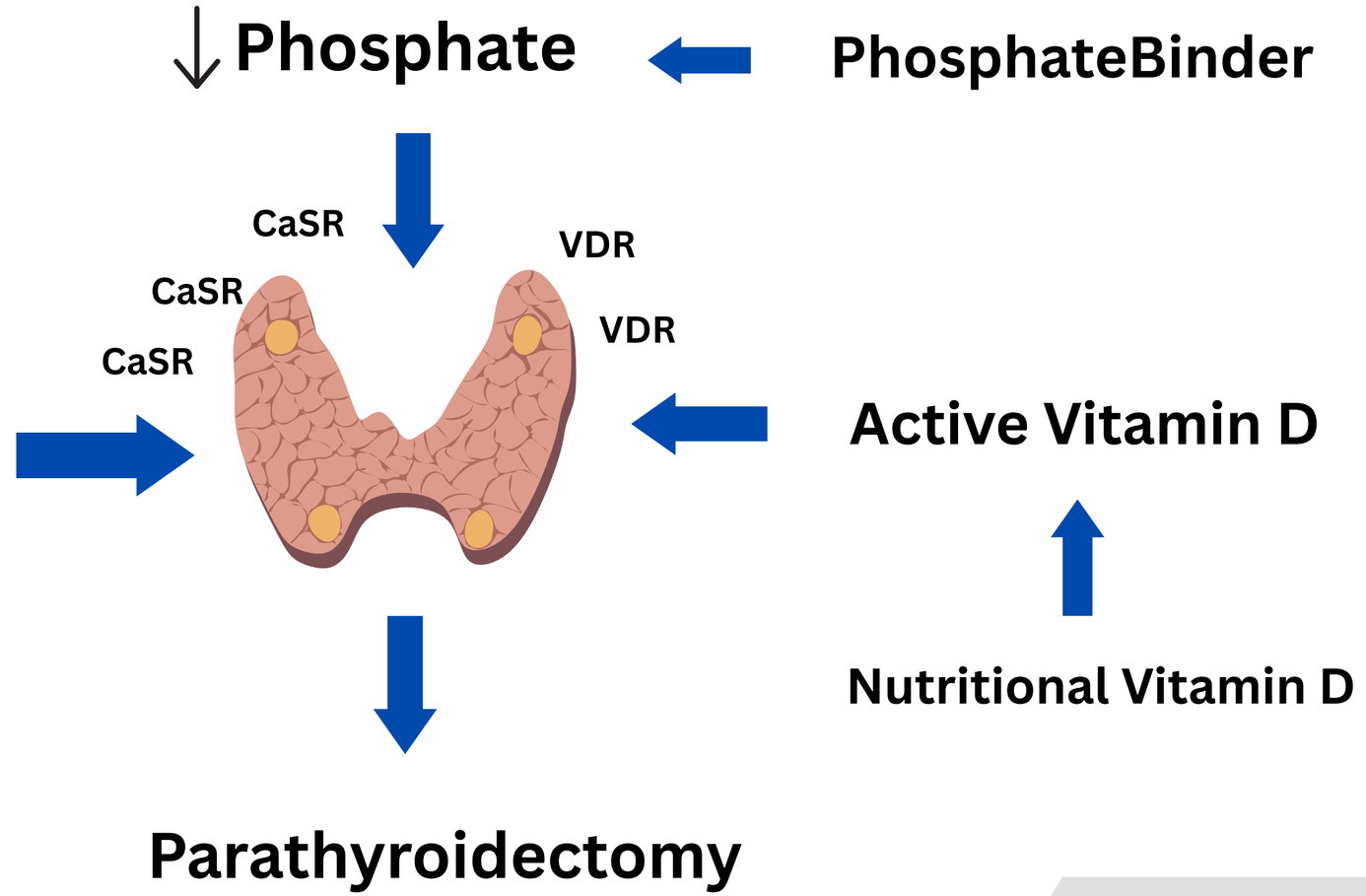
TREATMENT OPTIONS FOR HYPERPARATHYROIDISM



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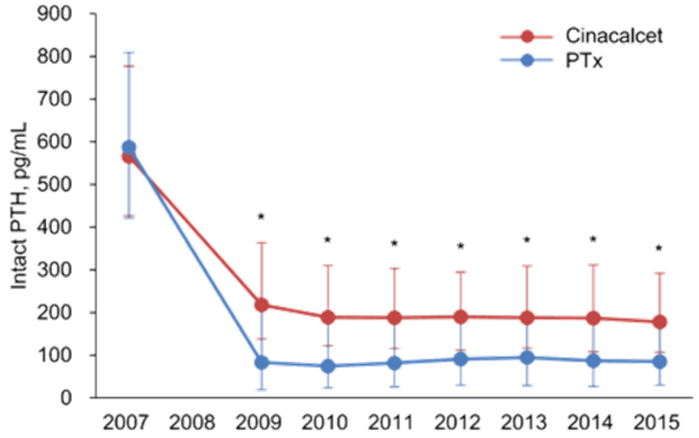
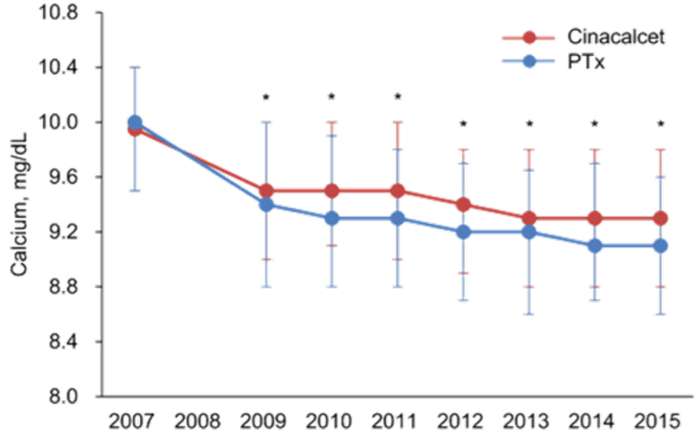
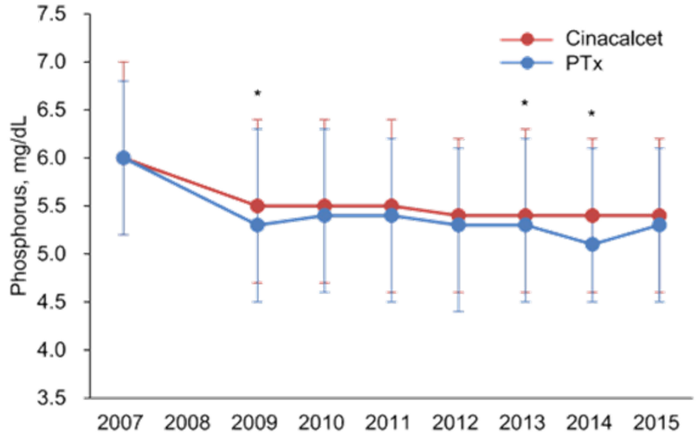
PARATHYROIDECTOMY AND NUTRITION



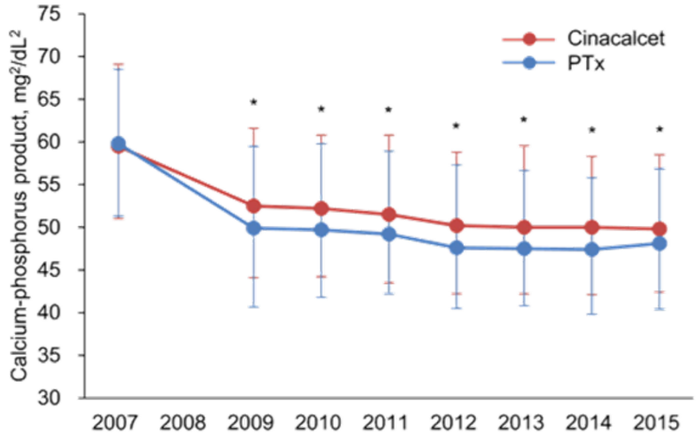
No. of patients	2007	2008	2009	2010	2011	2012	2013	2014	2015
Cinacalcet	2,682	NA	2,652	2,462	2,237	2,090	1,890	1,788	1,634
PTx	894	NA	872	802	753	718	681	662	598



No. of patients	2007	2008	2009	2010	2011	2012	2013	2014	2015
Cinacalcet	2,570	NA	2,619	2,457	2,265	2,112	1,909	1,811	1,655
PTx	863	NA	868	809	763	751	697	671	614



No. of patients	2007	2008	2009	2010	2011	2012	2013	2014	2015
Cinacalcet	2,675	NA	2,675	2,498	2,302	2,142	1,942	1,826	1,673
PTx	894	NA	890	825	784	756	709	678	619



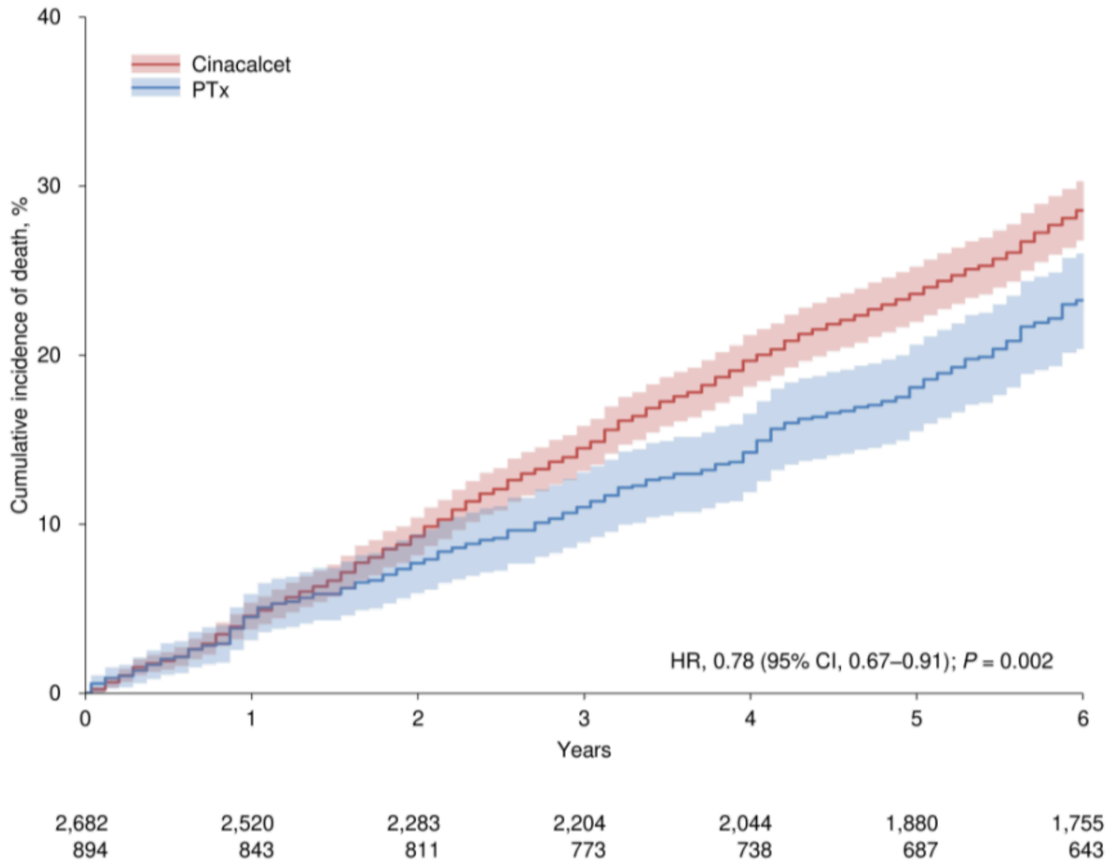
No. of patients	2007	2008	2009	2010	2011	2012	2013	2014	2015
Cinacalcet	2,570	NA	2,619	2,455	2,263	2,112	1,909	1,809	1,651
PTx	863	NA	868	807	763	751	697	671	614

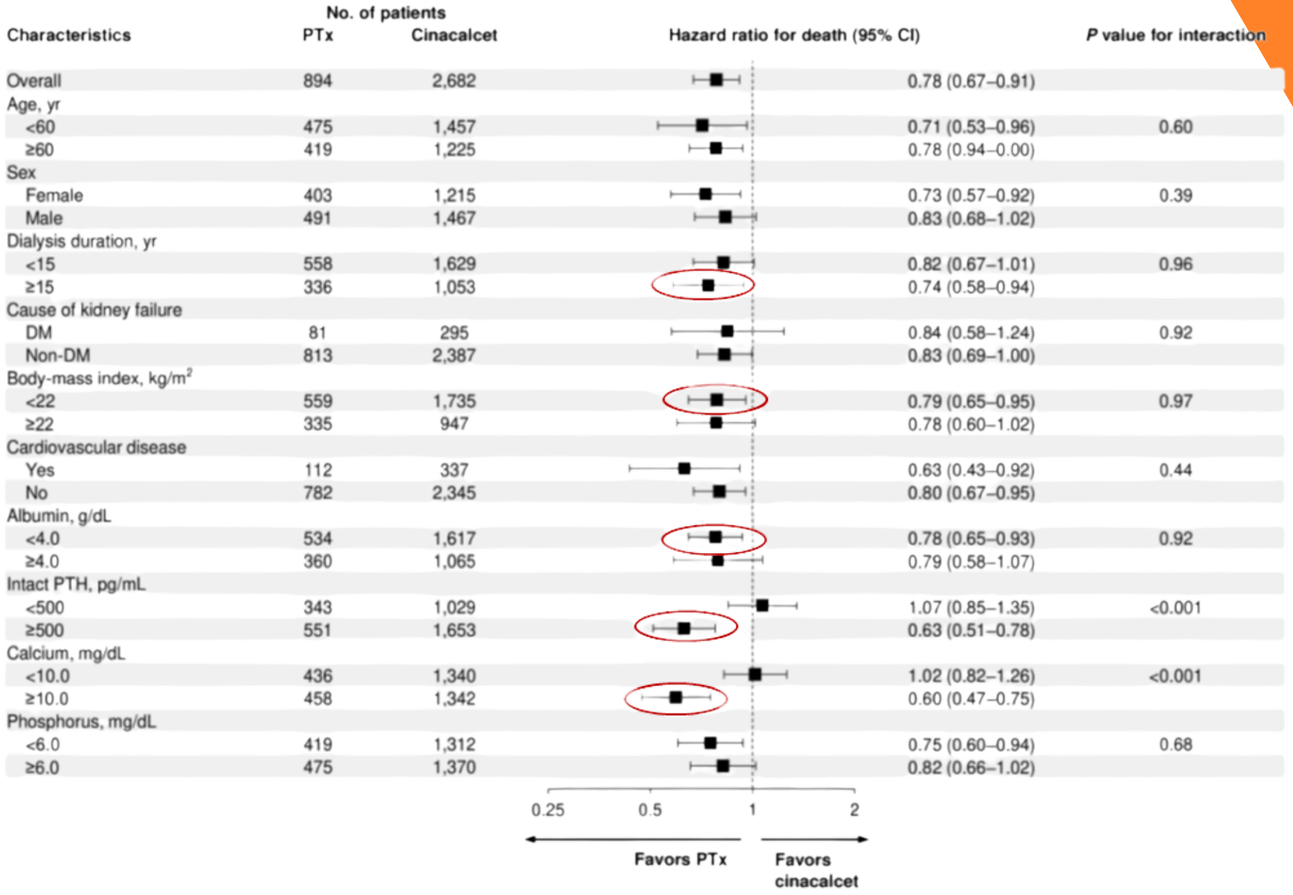
- Patients with iPTH ≥300 pg/mL underwent PTx or started treatment with cinacalcet were matched by propensity score 1:3 ratio
- Those who underwent PTX had lower serum calcium, phosphate, and PTH levels

Komaba H. J Clin Endocrinol Metab. 2022; 107(7):2016-25

PARATHYROIDECTOMY AND NUTRITION

The reduction in mortality was more pronounced among patients with more severe HPT and impaired nutrition





Disthabanchong S. Front Med (Lausanne). 2023;10:1132566

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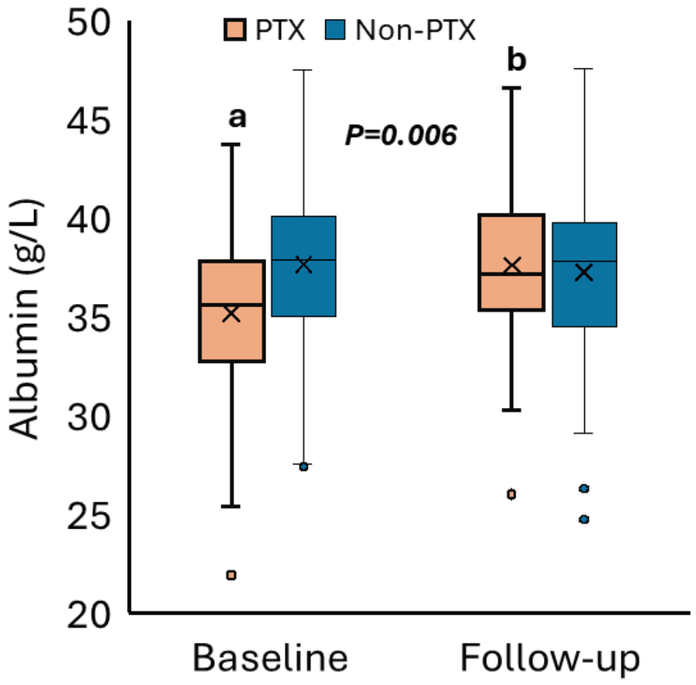
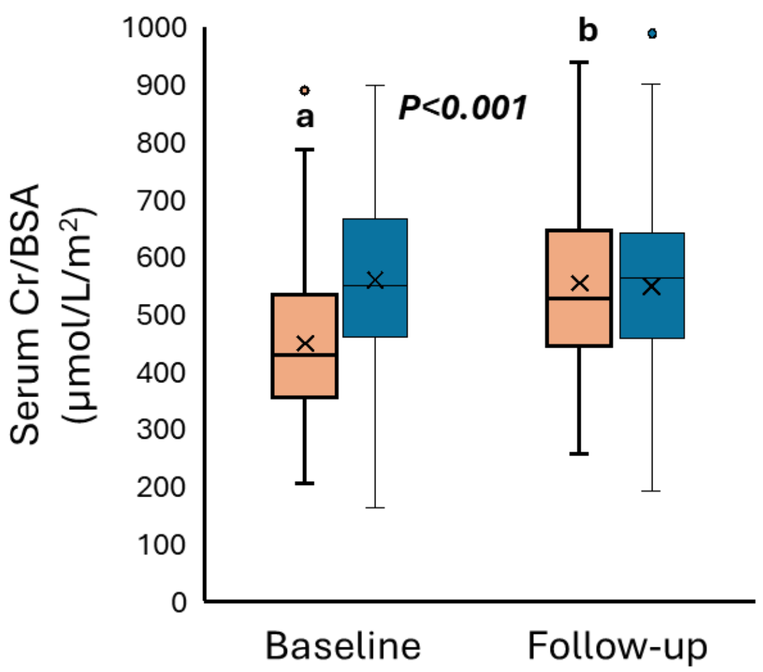
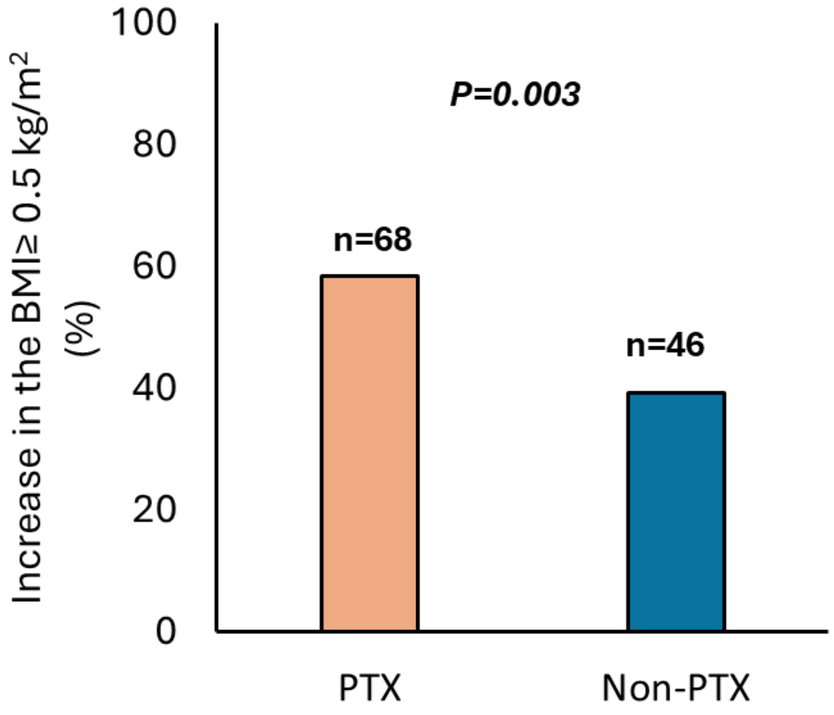
NUTRITIONAL IMPROVMENT AFTER PTX

- HD patients who underwent PTX were matched 1:1 to non-PTX and Pre-PTX HD patients
- Serum albumin, Cr/BSA, and BMI increased after PTX







Disthabanchong S. Front Med (Lausanne). 2023;10:1132566

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SUMMARY

01

ADVERSE HEALTH CONSEQUENCES OF SEVERE HPT

Bone loss, protein-energy wasting, weight loss, vascular and soft tissue calcification, dementia, and death.

02

MECHANISMs OF PROTEIN ENERGY WASTING

Adipose tissue browning and increased energy expenditure
Enhanced muscle proteolysis and impaired energy production
Systemic inflammation and hormonal imbalance

03

MANAGEMENT

Phosphate restriction/phosphate binders, active vitamin D, calcimimetics, and parathyroidectomy when medications fail.

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THANK YOU

FOR YOUR ATTENTION