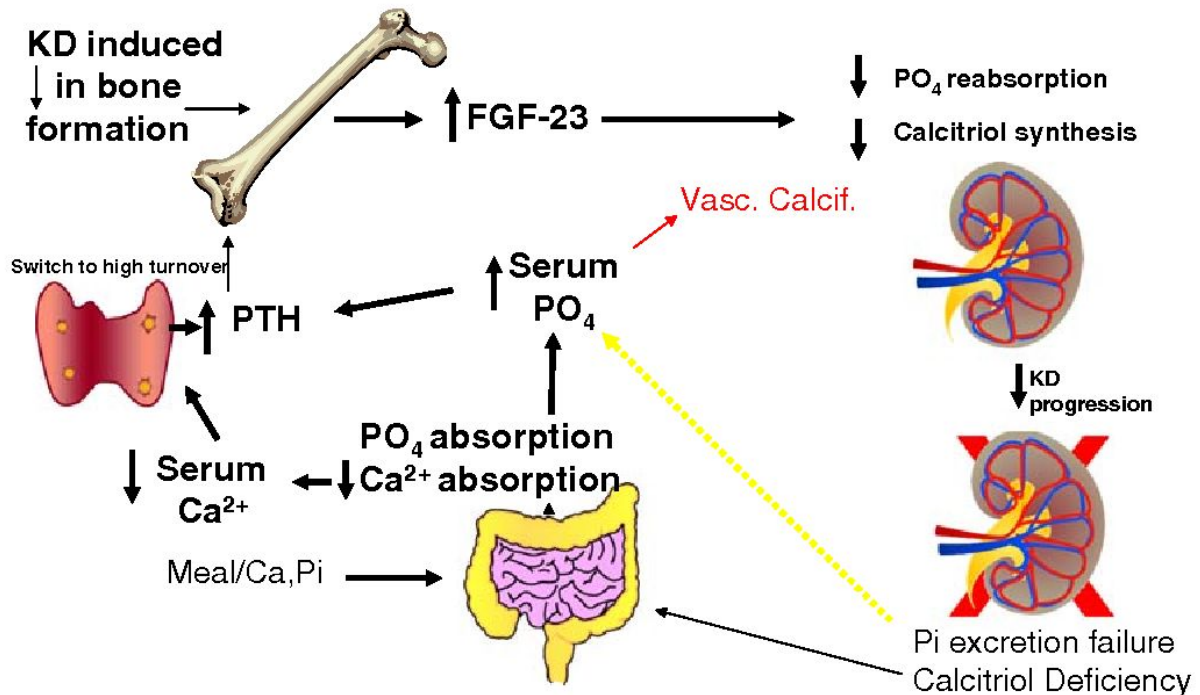


About Mineral Bone Disorder Management

According to KDIGO* the Mineral and Bone Abnormalities in Chronic Kidney Disease (CKD) are Renal Osteodystrophy (RO) and Mineral Bone Disorder (MBD).

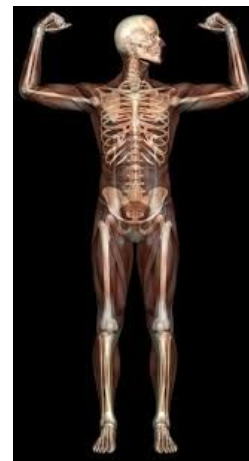


- **Renal Osteodystrophy (RO)** defines alterations in bone pathology associated with CKD determined by results that show how well your bones are building up or breaking down, mineralized and their volume.
- **Mineral Bone Disorder (MBD)** describes the clinical syndrome that develops as a systemic disorder of mineral and bone metabolism due to CKD and is determined by at least one or all of the following factors:
 - a. Biochemical abnormalities in Calcium, Phosphorus, Parathyroid Hormone (PTH), FGF23 and altered Vitamin D metabolism
 - b. Abnormalities of bone turnover (the total volume of bone that is formed over a period of time), bone mineralization, bone volume and bone strength
 - c. Vascular and or other soft tissue calcification

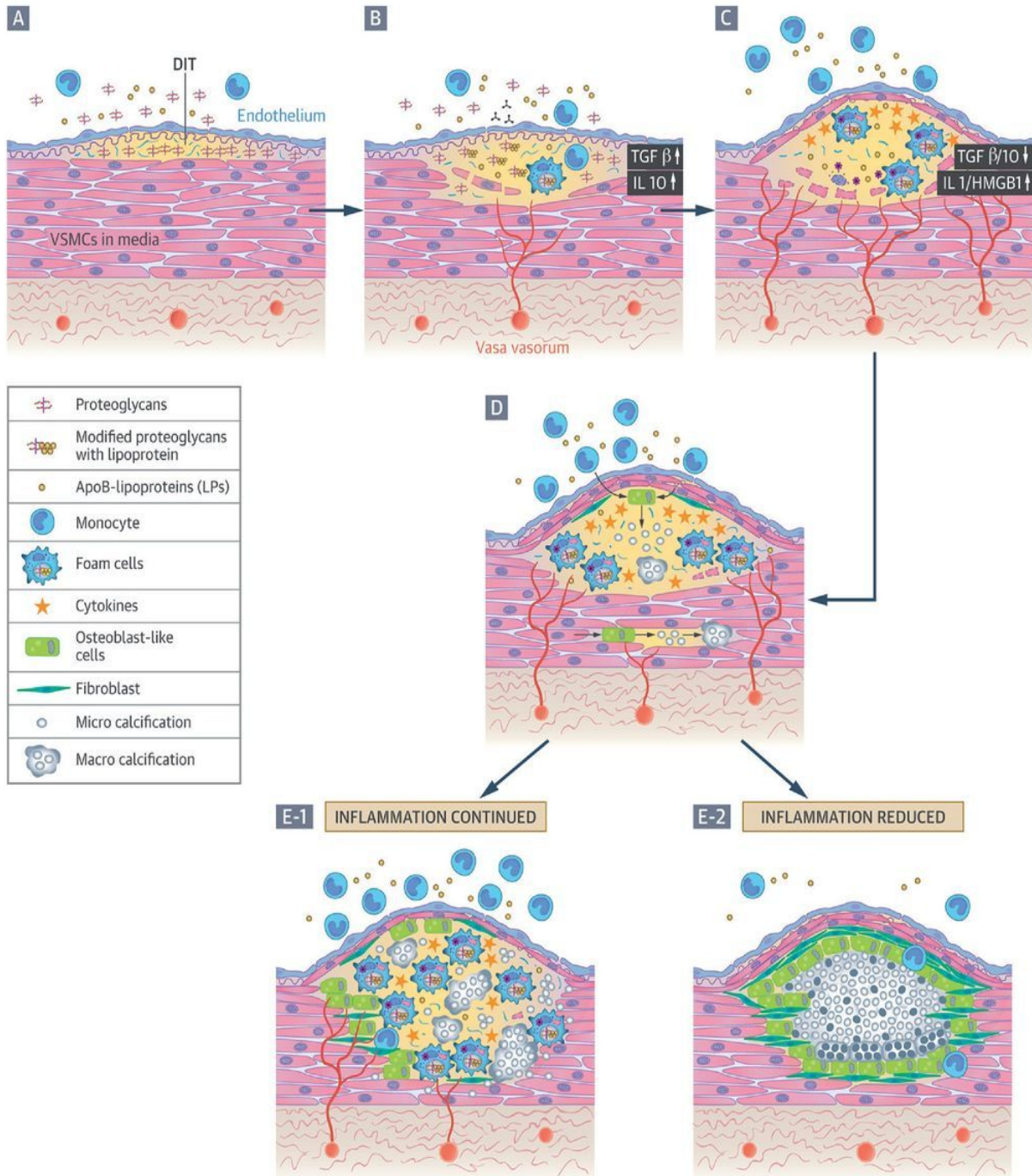


Symptoms that Result from RO and MBD

1. **Altered Vitamin D metabolism**
 - a. Causing low calcium
 - b. Causing elevated PTH
2. **Abnormal Processing of Minerals (Calcium, Phosphorus, Magnesium)**
 - a. Causes elevated FGF23
 - b. Causes elevated Phosphorus
 - c. Causes low Calcium
3. **Secondary Hyperparathyroidism (SHPT)**
 - a. Causes impaired skeletal response to PTH
 - b. Causes altered break down of PTH
 - c. Causes abnormal regulation of Calcium-dependent PTH secretion
 - d. Increases bone disease
 - e. Increases the parathyroid gland activity
 - f. Causes enlargement of the parathyroid gland
4. **Metastatic/Extraskeletal Calcifications (*See Central Illustration*)**
 - a. Calcification or mineralization of coronary arteries and cardiac valves
 - b. Potential skin ulceration and soft tissue necrosis (unprogrammed death of cells and living tissue, It occurs when too little blood flows to the tissue, caused by loss of membrane integrity and more)
5. **Fractures/ Bone Breaks**
 - a. Increased incidence of fractures related to bone quality
 - b. Fractures in CKD are associated with increased mortality
6. **Bone Pain**
 - a. This is less common now due to decreased use of aluminum based binders
 - b. Expressed as a general ache
7. **Itching - CKD-Associated Pruritus:** Possibly due to proinflammatory cytokines
8. **Dialysis Related amyloidosis**
 - a. This is a complication of kidney failure and long term dialysis because neither hemodialysis nor peritoneal dialysis effectively filters beta-2 microglobulin from the blood. As a result, elevated amounts of beta-2 microglobulin remain in the blood, causing pain, stiffness, and fluid in the joints, abnormal, fluid-containing sacs, called cysts, in some bones and carpal tunnel syndrome
9. **Proximal myopathy and muscle weakness (around the pelvis and shoulders)**
 - a. Usually due to SHPT, phosphorus depletion, aluminum toxicity or low vitamin D levels

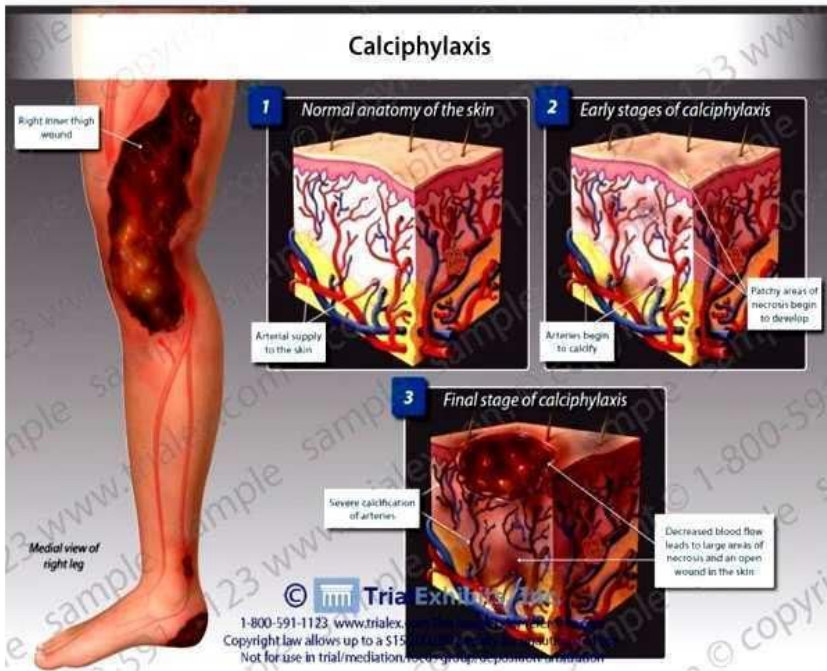


CENTRAL ILLUSTRATION: The Evolution of Atheroma and Calcification: Plaque Initiation, Inflammation, Microcalcification and Progression to Macrocalcification



Nakahara, T. et al. J Am Coll Cardiol Img. 2017;10(5):582-93.

This Calcification can lead to Calciphylaxis

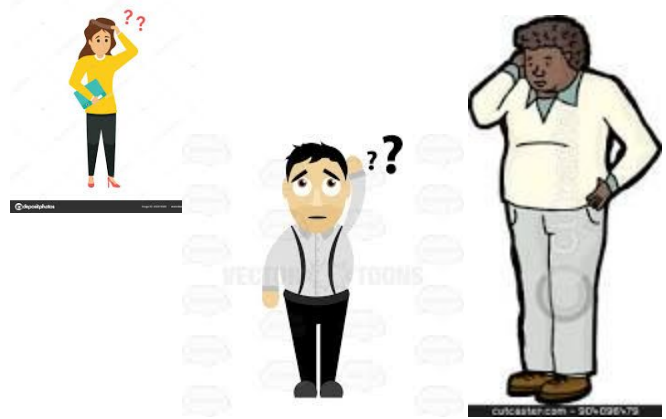


This can manifest from having the following:

- Elevated Calcium
- Elevated Phosphorus
- Normal to low alkaline phosphatase
- Low or very high PTH

QUESTION:

How Do I Limit or Avoid developing **Extraskeletal Calcification** and deposits of minerals in soft tissues?



ANSWER:

Put yourself first and **Manage your MBD biochemical markers daily** so they stay within the goal ranges discussed by your Health Care Team (Nephrologist, Nurse, Dietitian, Social Worker, Patient Care Technician).

Steps to Support Positive MBD Management: Suggested Markers

Step #1

Maintain your **Phosphorus** biochemical marker between **3.0 - 5.5 mg/dl** by doing the following:

- A. Follow a **Low Phosphorus Diet** by limiting or avoiding foods that are high in phosphorus. This excludes high biological value protein foods such as eggs, chicken, fish, beef, fresh pork, game, seafood which are encouraged in CKD-5 due to the high protein content.
 - Fresh Unprocessed foods tend to be Low Phosphorus or your body will absorb less or about 45% of the phosphorus
 - Processed / Junk Foods tend to be high in phosphorus and / or you may absorb 100% of the phosphorus



Processed & High Phosphorus Meal
AVOID

Vs. Whole Foods Low Phosphorus Meal
CHOOSE



AVOID: These are Foods That We Commonly See Cause Phosphorus to increase Significantly

CHOOSE : These are Foods That We Commonly See Cause Phosphorus to increase Significantly



Non dairy cheese





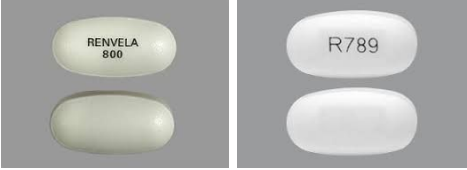



Zevia Soda's, Ginger Ale & Sprite



Non dairy Milk



- B. Take **Phosphate Binder/s** with every meal and snack ideally within 1 to 30 minutes of eating if your nephrologist has prescribed one for you.
- a. The binder can be taken before, during or just after the meal depending on your best tolerance.

 <p>Velphoro</p>	 <p>Auryxia</p>	 <p>Renvela (Sevelamer bicarbonate)</p>	
 <p>Phoslo (Calcium Acetate)</p>	 <p>Fosrenol (Lanthanum carbonate)</p>	 <p>Renvela Powder</p>	

Be Sure to Take Your
BINDER
with
EVERY MEAL & SNACK !

Talk to your Doctor about adjusting your binder if you find it difficult to take. Velphoro has the lowest Pill Burden with the average person using it taking 1 pill with each meal . Talk to your Dietitian about it.

Step #2

Achieve and Maintain **Calcium** between **8.4 - 10.2 mg/dl**

- Limit / Avoid use of calcium based medicines such as tums or rolaids for gastro-intestinal discomfort. Discuss issues with your nephrologist and dietitian to discuss dietary alterations and short term use of alternate medication.
- Limit calcium based binders
- Read food labels and avoid food fortified with extra calcium (Juices, breads, etc)
- If **Sensipar** (Cinacalcet) is prescribed, be sure to take it daily as prescribed.



Sensipar is best tolerated when taken with a large meal that has a lot of fat. A buttered roll with dinner is encouraged, especially when starting sensipar for the first week.

Talk to your doctor and healthcare team if you have stomach distress with Sensipar.

Step #3

Achieve and Maintain **Parathyroid Hormone (PTH)** within CKD 3-5 guidelines **150 - 600 pg/ml**

- Be sure to control your phosphorus. The better your phosphorus the easier it is to control your PTH
- Discuss use of intravenous Vitamin D (Calcitriol) during your dialysis treatment
- Consider talking to your doctor about using Sensipar if you are not already on it.
- Consider talking to your doctor about increasing your Sensipar if you are currently on it.



Step #4

Love Yourself and stay **Hopeful!** Keep these Affirmations in Mind:

- I release my hesitation and make room for Victory !
- With a solid plan and a belief in myself, there's nothing I can't do.
- I'm proud of myself for even daring to try; many people won't even do that !
- Today I am willing to fail in order to succeed !
- I know that I can master anything if I do it enough times.
- Fear is only a feeling; it cannot hold me back.
- I believe that I have the strength to make my goals and dreams come true!

